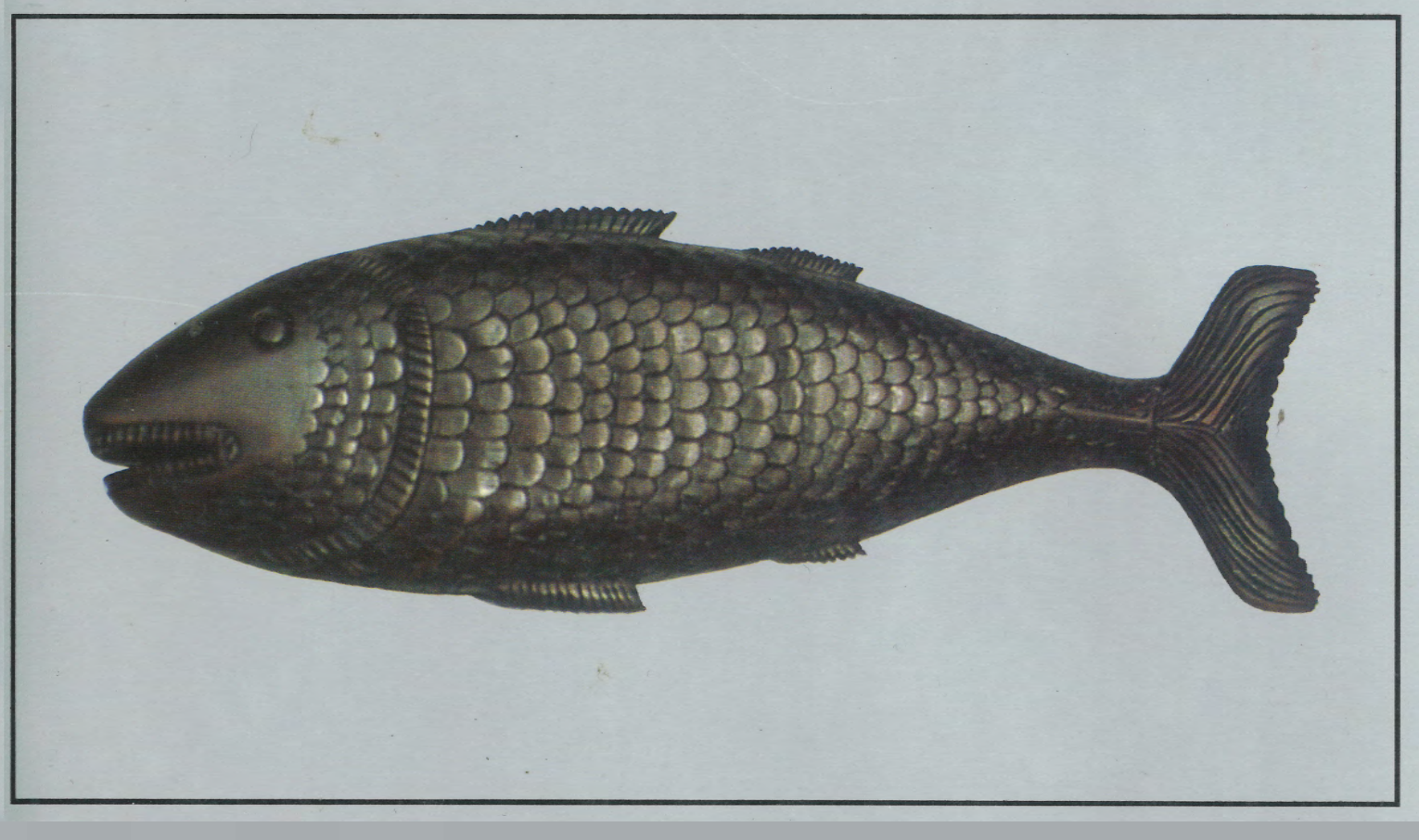
Trawled Fishes of Southern Indonesia and Northwestern Australia

Thomas Gloerfelt-Tarp
Patricia J. Kailola



TRAWLED FISHES OF SOUTHERN INDONESIA AND NORTHWESTERN AUSTRALIA

Thomas Gloerfelt-Tarp
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The information in this book was correct at 2 June 2022. For any correction or omissions please contact the authors.

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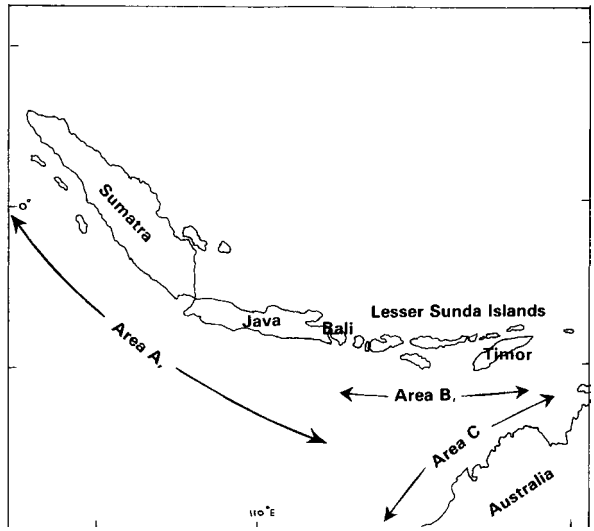
INTRODUCTION

With logistical support from the Food and Agricultural Organization of the United Nations, (FAO) an agreement was signed in 1979 by representatives from the governments of the Republic of Indonesia, the Federal Republic of Germany and Australia.

The purpose of this agreement was to establish a joint fishery project to assess the demersal fish stocks of southern Indonesia and northwestern Australia as a step towards their future utilization. JETINDOFISH was adopted as the acronym for the project - Joint Eastern Tropical Indian Ocean Fishery Survey.

The following agencies provided the necessary staff and research vessels:
The Directorate General of Fisheries (DGF) covered Area B from Bali to Timor
The German Agency for International Cooperation (GIZ) covered Area A from Bali to north Sumatra
The Commonwealth Scientific and Industrial Organisation (CSIRO) covered Area C from the Northwest Cape to the Timor Sea.



Because correct identification of the many species caught was essential to the objective of the project, CSIRO and GIZ respectively recruited taxonomists Dr Patricia Kailola from Australia and Dr Peter Whitehead from the British Museum of Natural History to assist the survey staff. At that time there were very few fish identification guides available for the project area so extensive work went into photographing, collecting, and engaging other international ichthyologists in order to correctly identify the species.

The amount of collected data eventually justified the publication of a field guide covering all of the caught species from the three areas. It was to be a field guide with short descriptions and photographs or drawings showing the fish as they appear when landed on the deck or sold in local markets, and so the illustrations are not the more aesthetically and perfect images of the same species observed when snorkeling or diving. Even so, the final product turned out to be more like a coffee table volume due to its comprehensive content and while it has been used extensively as a valued reference for that region, it is fair to say that the book did not become the hoped-for practical field guide.

As many species were still undescribed at the time of publication in 1984 and quite some were also mis-identified coupled with some recent major taxonomic revisions of many families, we decided to make an update of this book.

The Survey collected a total of 165 different families of bony fishes represented in 1,116 different species, of which 1,047 are figured in the main book and 69 are diagnosed in the Species List. In addition, the Survey also collected 69 different sharks and 52 different rays. Many of the species collected on the Survey were described as new so among the bony fishes, 19 are Holotypes and 32 are Paratypes.

Correct identification of species has never been more important for proper fisheries management and in the project area rapid population growth has placed even more pressure on the fish stocks with corresponding threats to livelihoods.

We hope that by putting this update as an online version field-workers will be able to make better use of this publication by merely printing the relevant pages for their particular tasks.

It is, however, also our wish that the publication will continue to be a cited reference in a region with one of the highest marine biodiversities in the world and where marine products continues to be dominant for food security.

An online version is also easier to correct when mistakes are identified and we shall welcome any inputs from ichthyologists and interested parties where corrections are needed.

Thank you. We trust you will find this online version useful for your different interests.

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We thank in particular:

Dr. William T. White, Senior Curator of the Australian National Fish Collection, CSIRO, for his thorough review of the shark and ray families.

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Alastair Graham and John Pogonoski from CSIRO in Hobart were always approachable and provided timely support.

We are very grateful to the following collection managers and associates for providing continued assistance to the completion of this update

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Dr James J. Dooley – Latilidae, Malacanthidae
Dr Tom Fraser – Apogonidae
Dr Ronald Fricke – Callionymidae, Draconettidae, Uranoscopidae
Dr Anthony Gill – Serranidae, subfamily Anthiinae
Dr Martin F. Gomon – Chlorophthalmidae, Paraulopidae, Trachichthyidae, Triglidae,
Dr Ofer Gon – Apogonidae
Dr Antony S. Harold – Sternoptychidae, Bregmacerotidae
Dr Harutaka Hata – Dussumieriidae, Engraulidae, Clupeidae, Pristigasteridae
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Dr Peter Last – Dasyatidae, Triglidae
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Dr John McCosker – Muraenidae
Dr Hiroyuki Motomura – Neosebastidae, Scorpaenidae, Sebastidae, Tetrarogidae, Synanceiidae, Engraulidae, Setarchidae, Apogonidae, Sphyraenidae

Dr Yuki Nagano – Hoplichthyidae
Dr Tetsuji Nakabo – Synodontidae
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Froese, R. & D. Pauly. Editors. 2022. FishBase. World Wide Web electronic publication. www.fishbase.org, version (02/2022).

It should be noted, that responsibility for any errors or misleading information presented in this update of the original publication, rests with the authors alone.

LIST OF ILLUSTRATIONS DONATED FOR THE COMPLETION OF THIS BOOK

Dr. William D. Anderson Jr.	Etelis radiosus, Symphysanodon typus.
Dr. Takao Arai	Coelorinchus maculatus, Coelorinchus acutirostris, Coelorinchus sp. 2, Coelorinchus posteromaculatus, Coelorinchus pardus, Coelorinchus thurla, Hymenocephalus heterolepis.
Dr. Julian Badcock	Sigmops elongatus, Phollichthys mauli, Polymetme corythaela.
Dr. Peter Castle	Ariosoma anago, Bathymyrus smithi, Dysomma anguillare, Heteroconger tricia, Nettenchelys gephyra, Macrocephenchelys brevirostris, Uroconger lepturus.
C.S.I.R.O. (listed in family order as in book). These images are the copyright of CSIRO and may not be used in any form without prior consent from CSIRO.	Chimaera ogilbyi, Gymnothorax cribroris, Gymnothorax longinquus, Gymnothorax pseudothyrsoideus, Gymnothorax mccoskeri, Gymnothorax minor, Lumiconger arafura, Saurenchelys sp., Anodontostoma chacunda. Herklotsichthys koningsbergeri, Herklotsichthys lippa, Ilisha lunula, Setipinna tenuifilis, Thryssa hamiltonii, Hime diactithrix, Euristhmus lepturus, Euristhmus nudiceps, Synodus sageneus, Harpadon translucens, Saurida elongata, Batrachomoeus occidentalis, Batrachomoeus trispinosus, Halophryne diemensis, Chlorophthalmus nigromarginatus, Antennarius hispidus, Antennarius striatus, Lophiocharon trisignatus, Tathicarpus butleri, Tetrabrachium ocellatum, Halieutaea sp 1, Bregmaceros pseudolanceolatus, Bregmaceros sp cf atlanticus, Sirembo imberbis, Sirembo amaculata, Encheliophis gracilis, Monocentris japonica, Myripristis botche, Ostichthys kaianus, Sargocentron rubrum, Zeus faber, Apistops caloundra, Dendrochirus brachypterus, Dendrochirus zebra, Minous pictus, Minous roseus, Minous versicolor, Neosebastes pleurostigma, Neomerinthe amplisquamiceps, Liocranium praepositum, Scorpaenodes smithi, Scorpaenopsis neglecta, Lythrichthys dentatus, Richardsonichthys leucogaster, Gargariscus prionocephalus, Lepidotrigla cf japonica, Lepidotrigla sp.1, Lepidotrigla macracaina, Lepidotrigla venusta, Pterygotrigla (Parapterygotrigla) multiocellata, Pterygotrigla (Bovitrigla?) leptacanthus, Satyrichthys welchi, Peristedion liorhynchus, Cymbacephalus nematophthalmus, Cymbacephalus bosschei, Inegocia harrisii, Inegocia japonica, Onigocia sp., Onigocia spinosa, Platycephalus endrachtensis, Ratabulus fulviguttatus, Insidiator macracanthus, Kumococius rodericensis, Cociella hutchinsi, Hoplichthys imamurai, Dactyloptena papilio, Pegasus volitans, Eurypegasus draconis, Centrogenys vaigiensis, Chelidoperca stella, Epinephelus maculatus, Epinephelus epistictus, Epinephelus multinotatus, Epinephelus radiatus, Epinephelus rivulatus (b), Epinephelus sexfasciatus, Epinephelus stictus, Plectropomus maculatus, Selenanthias analis, Diploprion bifasciatus, Glaucosoma buergeri, Glaucosoma magnificum, Pristigenys niphonia, Jaydia carinata, Ostorhinchus hartzfeldii, Ostorhinchus sp 1., Apogonichthyoides timorensis, Jaydia poeciloptera, Ostorhinchus sp. 2, Siphamia roseigaster, Doederleinia berycoides, Sillago robusta, Sillago vittata, Sillago ingenuua, Rachycentron canadum, Ulua aurochs, Carangoides humerosus, Carangoides gymnostethus, Caranx bucculentus, Caranx lugubris, Pantolabus radiatus, Caranx sexfasciatus, Elagatis bipinnulata, Seriola rivoliana, Nuchequula glenysae, Lutjanus gibbus, Nemipterus isacanthus, Pentapodus nagasakiensis, Pentapodus porosus, Pentapodus vitta, Diagramma pictum, Hapalogenys dampieriensis, Lethrinus atkinsoni, Lethrinus nebulosus, Lethrinus laticaudis, Lethrinus miniatus, Lethrinus genivittatus, Lethrinus semicinctus, Lethrinus variegatus, Atrobucca brevis, Johnius (Johnius) laevis, Johnius (Johnieops) borneensis, Parupeneus chrysopleuron, Upeneus australiae, Upeneus sundaicus, Zabidius novemaculeatus, Chaetodon assarius, Chaetodon aureofasciatus, Roa australis, Chelmon marginalis, Chelmon muelleri, Coradion chrysozonus, Heniochus diphreutes, Parachaetodon ocellatus, Chaetodontoplus duboulayi, Chaetodontoplus personifer, Histiopterus typus, Chromis fumea, Abudefduf bengalensis, Sphyraena flavicauda, Polydactylus multiradiatus, Anampses lennardi, Bodianus solatus, Choerodon cephalotes, Choerodon monostigma, Choerodon schoenleinii, Choerodon vitta, Choerodon cauteroma, Choerodon sugillatum, Leptojulis cyanopleura, Iniistius opalus, Iniistius dea, Scarus ghobban, Parapercis alboguttata, Ryukyupercis gushikeni, Parapercis muronis, Parapercis striolata, Parapercis nebulosa, Ichthyscopus fasciatus, Ichthyscopus insperatus, Uranoscopus bicinctus, Uranoscopus cognatus, Uranoscopus sp cf oligolepis, Uranoscopus sp cf japonicus, Uranoscopus kishimotoi, Opistognathus latitabundus, Bembrops platyrhynchus, Bembrops filiferus, Xiphasia setifer, Congrogadoides spinifer, Congrogadus subducens, Bleekeria viridianguilla, Callionymus goodladi, Callionymus grossi, Callionymus australis, Callionymus moretonensis, Synchiropus altivelis, Dactylopus dactylopus, Synchiropus rameus, Acanthurus grammoptilus, Siganus fuscescens, Scomberomorus commerson, Scomberomorus munroi, Scomberomorus queenslandicus, Benthodesmus vityazi, Psenopsis humerosus, Ariomma parini, Brachypleura novaezeelandiae, Arnoglossus waitei, Asterorhombus intermedius, Crossorhombus azureus, Engyprosopon grandisquama, Engyprosopon latifrons, Engyprosopon osculus, Grammatobothus polyophthalmus, Kamoharaia megastoma,

	Laeops parviceps, Parabothus kiensis, Pseudorhombus argus, Pseudorhombus arsius, Pseudorhombus diplospilus, Pseudorhombus elevatus, Pseudorhombus jenynsii, Pseudorhombus quinquocellatus, Pseudorhombus spinosus, Pseudorhombus megalops, Psammodiscus ocellatus, Samaris cristatus, Aesopia cornuta (A) and (B), Dexillus muelleri, Zebrias cancellatus, Brachirus annularis, Zebrias craticulus, Zebrias quagga, Paraplagusia longirostris, Paraplagusia bilineata Tricanthus biaculeatus, Anacanthus barbatus, Chaetodermis penicilligerus, Eubalichthys caeruleoguttatus, Monacanthus chinensis, Pseudomonacanthus peroni, Thamnaconus striatus, Thamnaconus tesselatus, Thamnaconus hypargyreus, Lactoria cornuta, Lactoria diaphana, Arothron manillensis, Tylerius spinosissimus, Feroxodon multistriatus, Canthigaster rivulata, Chelonodontops patoca, Sphoeroides pachygaster, Torquigener pallimaculatus, Triodon macropterus, Cyclichthys hardenbergi, Tragulichthys jaculiferus.
Dr. Roger Cressey	Synodus rubromarmoratus, Synodus usitatus.
Dr. James Dooley	Malacanthus brevirostris.
FishBase	Family drawings of: Apistidae, Ophichthidae, Neosebastidae, Scorpaenidae, Setarchidae, Sebastidae, Synanceiidae, Tetrarogidae, Muraenesocidae, Congridae, Paraulopidae, Peristediidae, Bembridae, Plectrogeniidae, Centrogenyidae, Pseudochromidae, Synagropidae, Malakichthyidae, Acropomatidae.
Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive. Reproduced with permission.	All shark drawings and some of the rays (Anoxypristis cuspidata, Narcine baliensis, Dentiraja healdi, Hypnos monopterygium, Mobula mobular, Myliobatis tobijei, Narcinops lasti, Neotrygon annotata, Pateobatis uarnacoides, Plesiobatis daviesi, Pristis clavata, Pteroplatygon violacea, Urogymnus granulatus), and most generic family drawings. Hoplobrotula armata.
Dr Ronald Fricke	Callionymus whiteheadi; all preopercular spines for the Callionymidae.
Dr Robert Gibbs, Jr	Astronesthes chrysophekadion.
Dr Antony S. Harold Reproduced with permission from Bulletin of Marine Science	Polyipnus soelae, Argyripnus pharos.
Dr Barry Hutchins	Chimaera ogilbyi, Chlorophthalmus sp 1 albatrossis, Velifer sp., Erosa erosa, Scorpaenopsis neglecta, Setarches guentheri, Rogadius patriciae, Cephalopolis boenak, Epinephelus amblycephalus, Ozichthys albimaculosus, Apogonichthyoides brevicaudatus, Ostorhinchus septemstriatus, Malakichthys griseus, Synagrops japonicus, Branchiostegus sawakinensis, Echeneis naucrates, Carangoides equula, Pterocaesio chrysozona, Etelis carbunculus, Lutjanus carponotatus, Plectorhinchus gibbosus, Protonibea diacanthus, Neoepinnula orientalis, Cantherhines pardalis, Arotrolepis filicauda, Paramonacanthus oblongus, Pseudomonacanthus elongatus, Thamnaconus modestoides, Xanthichthys lineopunctatus.
Mr Rudie H. Kuiter	Hippocanpus spinosissimus, Hippocampus angustus.
Dr Tony Lewis	Tail patterns of Platycephalus species.
Dr R.J. Mckay	Swim bladders of Sillaginidae.
Mr John Marek	Lutjanus boutton, Selar boops, Upeneus luzonius.
Dr Glenn Moore	Maurolicus javanicus.
Dr Alfred Post	All Paralepididae drawings.
Dr. Jack Randall	Scorpaenodes evides.
Dr Barry Russell	Nemipterus thosaporni, Scolopsis bilineata.
Dr Matthias Stehmann	Tetronarce nobiliana.
Dr David Woodland	Siganus argenteus.
Dr. William White	Aetomylaeus caeruleofasciatus, Aptychotrema timorensis, Aptychotrema vincentiana, Dentiraja falloarga, Irolita westraliensis, Neotrygon australie, Pastinachus ater, Rhinobatos sainsburyi, Rhynchobatus palpebratus, Urolophus westraliensis.

GLOSSARY

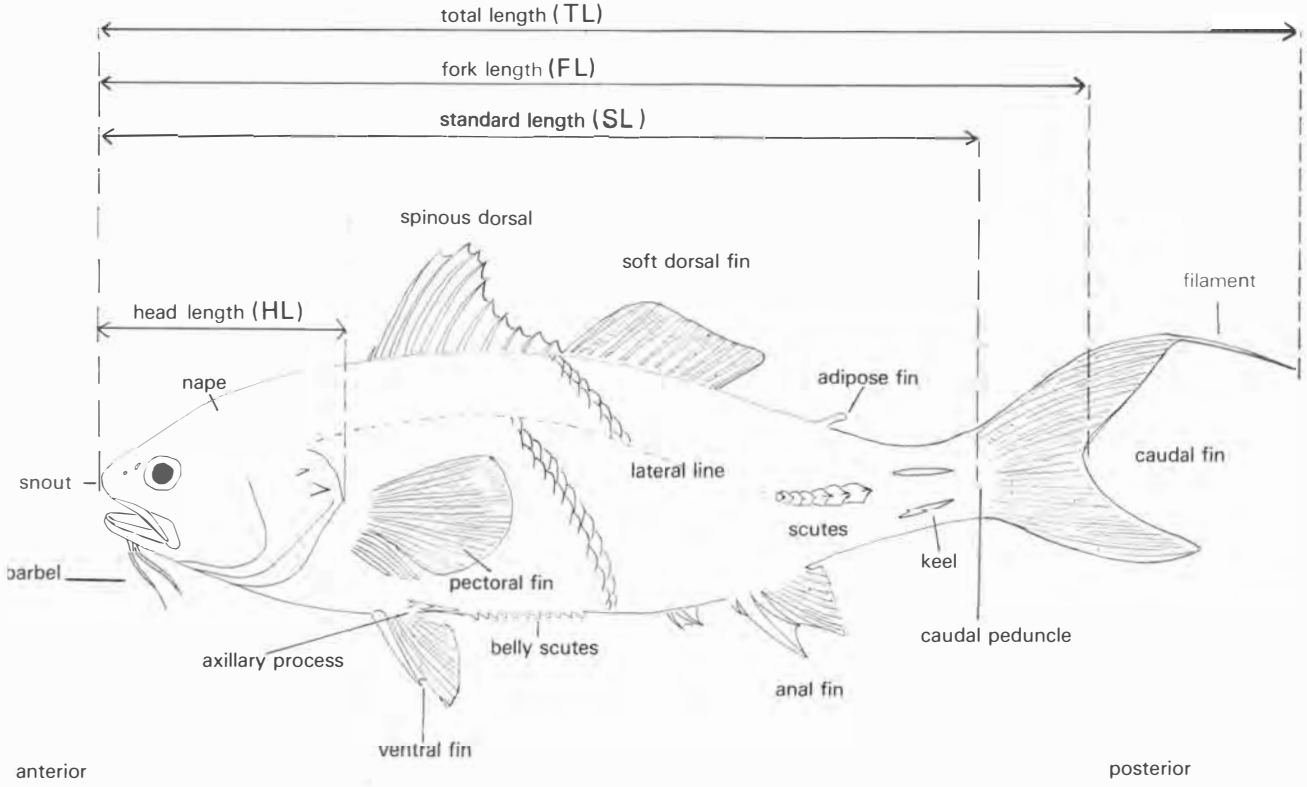
accessory lateral line: additional lateral line.
acute: sharp or pointed.
adipose eyelid (tissue): fatty transparent tissue around eye.
adipose fin: small fleshy fin without supporting spine or ray.
anal fin: fin behind the anus.
angular: not evenly curved; forming a distinct angle.
anterior: the front part.
antrorse: forward pointing.
apex: the tip; pointed end.
axil: innermost part between paired fins and body.
axillary scale: scale in the pectoral or ventral axil.
barbel: elongate fleshy tentacle on chin or front of upper jaw.
branched rays: rays that are forked distally.
branchiostegal rays: structures supporting the gill membrane behind the lower jaws.
bucklers: external bony or horny plates.
canine teeth: strong sharp teeth, like those of dogs (see plate 3).
caudal peduncle: the part of the body behind the dorsal and anal fins and before the caudal fin (usually the least depth of a fish).
caudal pit: a small groove or depression on the caudal peduncle.
chin: the anterior part below the lower jaws.
cirri: small, thin flaps of skin.
claspers: modified portions of the ventral fins in male sharks, rays and chimaeras, used in sperm transfer.
cleithrum: shoulder girdle.
compressed: laterally flattened (see plate 3)
concave: inwardly curved.
conical teeth: teeth shaped like a cone (see plate 3).
conspecific: individuals of populations of the same species.
convex: outwardly curved.
corselet: a band of specialised scales on the pectoral region of tunas.
cusp: main point of a tooth.
ctenoid scale: scale which has the exposed margin with tooth-like projections (see plate 3).
cycloid scale: scale with smooth exposed margin (see plate 3).
dorsal: the back or upper part of the body.
element: a ray or a spine of a fin
elevated: higher.
elongate: long, extended, drawn out.
emarginate: concave, inwardly curved.
embedded: term used when scales are completely covered by skin.
encased: completely surrounded by hard plates.
erectile: capable of being raised or erected.
filament: a thread-like process.
finlet: small rayed fin structure behind dorsal and anal fins.
forked: term to describe the shape of the caudal fin which is inwardly angular (see plate 2).
fossa: opening in a bone.
fusiform: cigar-shaped, rounded, broadest in the middle and tapering at each end.
genus (genera): a group of related species.
gill arch: the bony support for the gill filament and gill rakers (see plate 3).
gill membrane: membrane along the ventral and posterior margin of the operculum; it is supported by the branchiostegal rays.
gill opening: the opening on the head covered by the operculum, through which the water used for respiration is expelled.
gillraker: bony projections on anterior edge of the gill arch (see plate 3).
gular plate: situated behind the lower jaws and behind chin.
humeral: shoulder region.
illicium: the "fishing rod" and "bait" used by certain fishes to attract their prey.
incisiform teeth: flattened teeth with sharp edges, like the front teeth of man (see plate 3).
indented: refers to a structure with a small notch in the middle.
inferior: lower; term often relating to mouth (see plate 3).
interorbital: the region on top of the head between the eyes.
intestine: long tube of the digestive tract behind the stomach.
iridescent: display of brilliant reflecting colours.
isthmus: throat region of a fish situated ventrally from the breast and forward.
jugular: related to the throat.
keel: sharp or strong ridge; on ventral midline (CLUPEIDAE) or on caudal peduncle.
labial furrow: grooves around the lips (sharks).
lanceolate: broad at base, tapering to a point.
lateral line: series of openings to sensory canals along the sides.

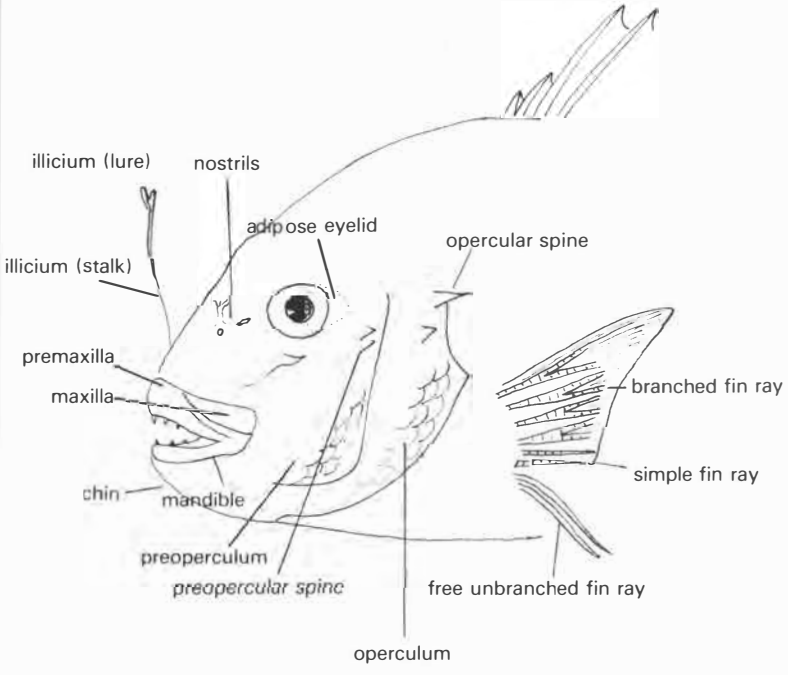
luminous organs: light producing organs.
lunate: term to describe a caudal fin which is deeply emarginate with narrow lobes (see plate 3).
mandible: lower jaw.
maxilla: lateral part of upper jaw.
molar teeth: rounded, low and broad teeth for crushing (see plate 3).
nape: dorsal part immediately behind the head.
nostril: the nasal opening.
notch: refers to structures, especially fins, which have a "dip" in the middle.
nuchal: upper dorsal part of head, nape.
operculum: bony gill cover; consist of four bones: opercle, preopercle, interopercle and subopercle.
orbit: refers to the eye.
palatines: a paired lateral bone in the roof of mouth, with or without teeth (see plate 3).
papilla: a small fleshy extension.
pectoral: the region of the side of the fish behind the gill opening.
pelvic: see ventral.
photophore: specialised light organ.
postorbital: region behind the eye.
posterior: the tail end.
premaxilla: the more anterior bone forming the upper jaw; it is this part which can be protruded by many fishes.
preoperculum: the bone which forms the posterior and lower margins of the cheek region (see plate 1).
procurrent rays: small rays that are divided into halves, but are unbranched and unsegmented.
produced: drawn out to a point; lengthened.
protractile: capable of being extended outwards.
protrusible: having mouth which can be extended forward.
pseudobranchial filaments: situated on the half gill arch which is located inside the operculum.
ray: segmented and usually branched rod that supports the fin membrane.
scaly sheath: scaled area covering part or all of a fin.
scute: an external bony plate or enlarged scale, often with a posteriory pointed spine (see plate 3).
serrate: saw-like.
sexual dimorphism: difference of physical form between male and female.
snout: the region of the head in front of the eyes.
soft rays: segmented rays, flexible and often branched.
spine: an unsegmented bony process consisting of a single element, often sharp and pointed.
spiracle: an opening between the eye and the first gill slit of sharks and rays.
standard length: the length of a fish from front of upper lip to the posterior end of the vertebral column.
supramaxilla: a small additional bone lying along the upper edge of the maxilla.
symphysis: a "link", usually immovable between two bones (e.g. the anterior junction between the lower jaws).
synonym: a term referring to the existence of invalid different scientific names for the same species.
temporal region: area behind and above eye.
truncate: term to describe a caudal fin with a straight vertical hind border (see plate 2).
uniserial: arranged in a single row.
venomous: toxic.
ventral fin: paired fins situated near the ventral midline (absent in some fishes).
villiform teeth: small slender teeth forming a band (see plate 3).
vomer: the unpaired bone at front in the roof of mouth; different-shaped and the anterior part often with teeth (see plate 3).

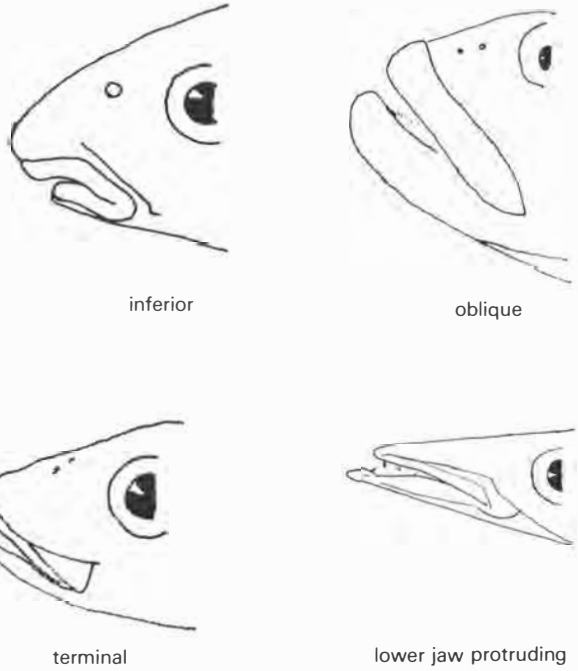
ABBREVIATIONS USED IN TEXT.

A (followed by a number - roman and/or arabic): number of spines and/or rays in the anal fin.
D (followed by a number - roman and/or arabic): number of spines and/or rays in the dorsal fin.
D_1 (followed by a number): number of spines in the first dorsal fin.
D_2 (followed by a number): number of rays in the second dorsal fin.
P: pectoral fin.
V: ventral fin (often called pelvic fin).
SL: standard length
TL: total length
FL: fork length
i: unsegmented rays in the ventral fin.
GR.: gill rakers.
L. lat.: lateral line.
Tr (followed by a number): number of horizontal scale rows between the back and the ventral midline and is usually counted in two parts.
Tr above: number of scales from dorsal mid-line to the lateral line.
Tr below: number of scales from the lateral line to the ventral mid-line.

Plate 1

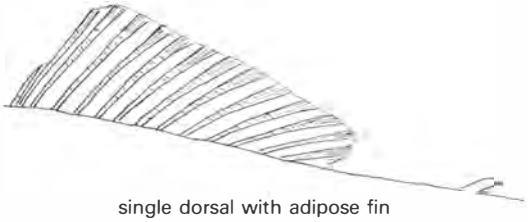






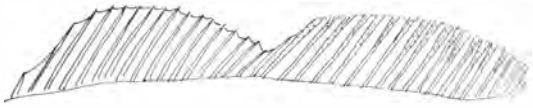
Mouth position

Plate 2

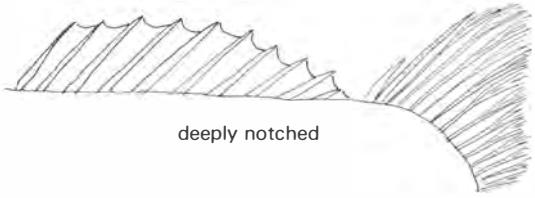


single dorsal with adipose fin

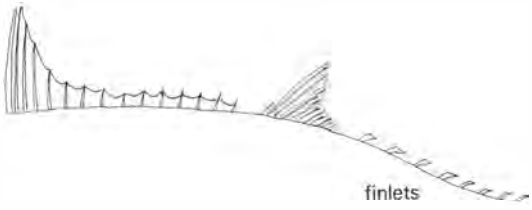
two dorsal



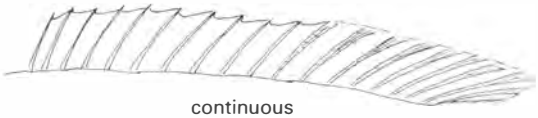
notched



deeply notched

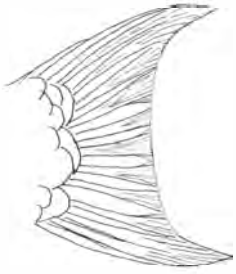


finlets

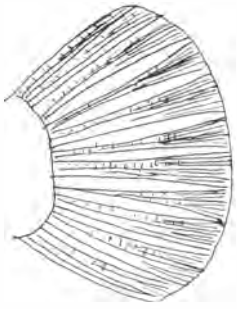


continuous

Types of dorsal fins



lunate

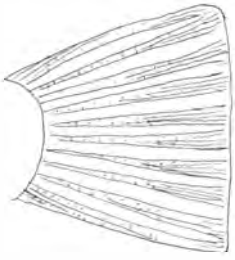


rounded

rhomboid

forked

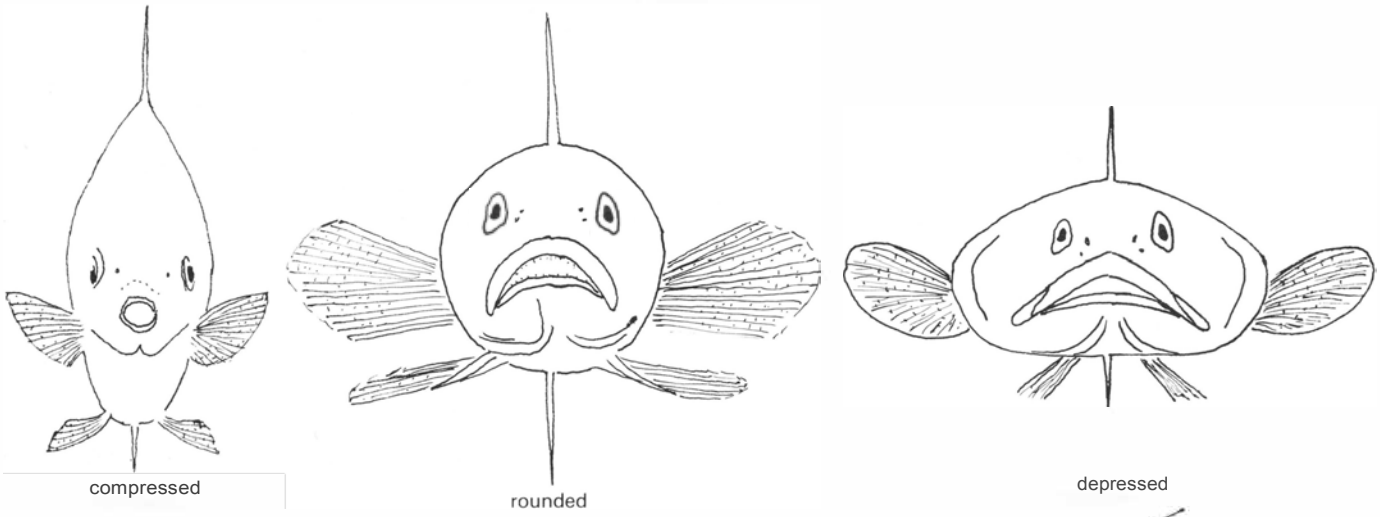
emarginate



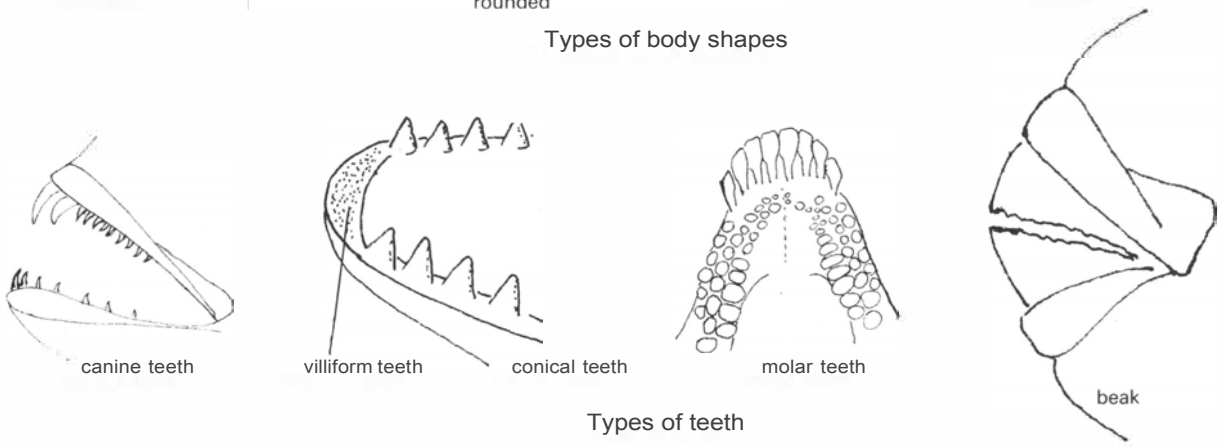
truncate

Types of caudal fins

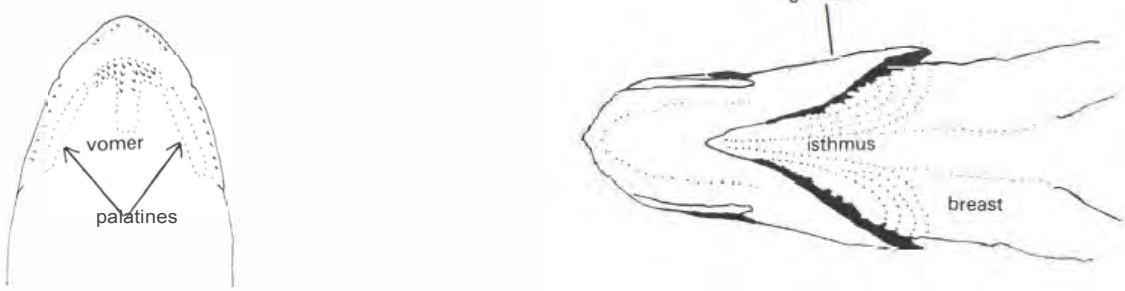
Plate 3

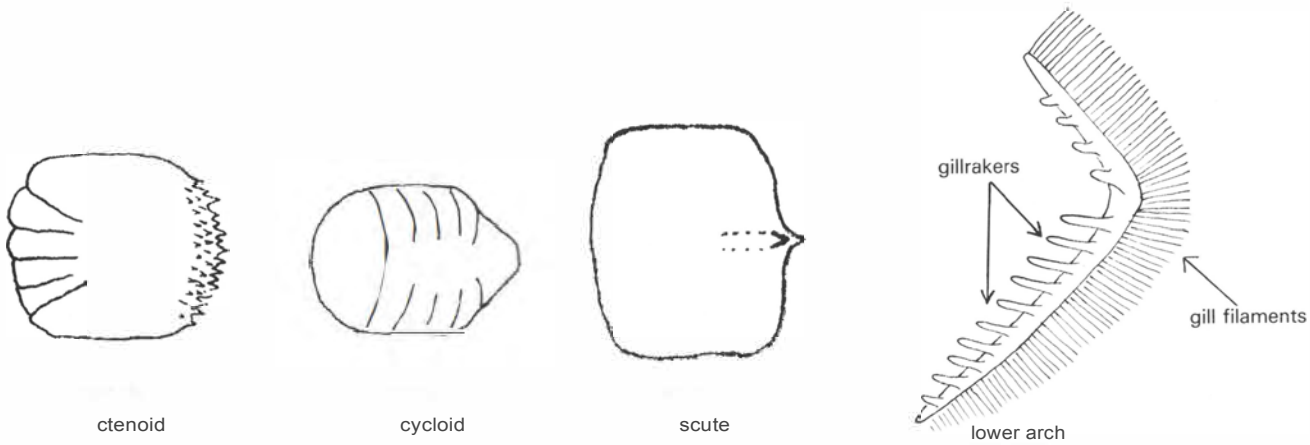


Types of body shapes



Types of teeth





SHARKS

REFERENCES: Last & Stevens, 2009; Last, White, de Carvalho, Séret, Stehmann,& Naylor, (eds.) 2016; White, Last, Stevens, Yearsley, Fahmi & Dharmadi 2006; Ebert, Fowler & Compagno, 2013.

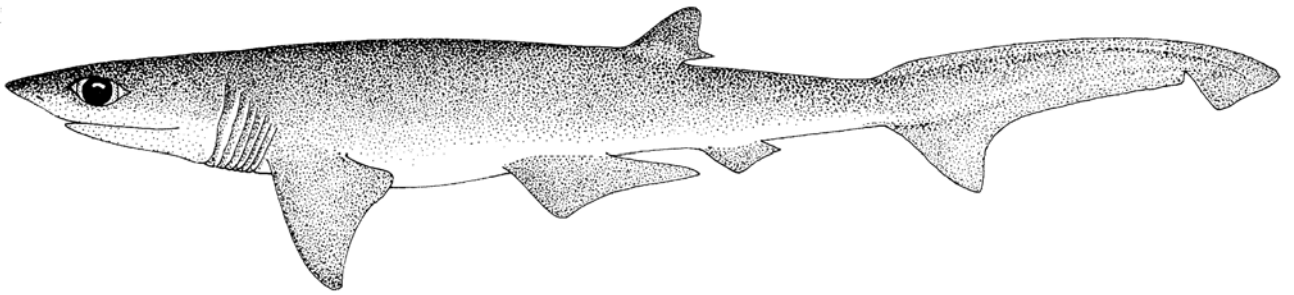
HEXANCHIDAE

Cow Sharks

Small to rather large sharks (mature at 140-480 cm) found in all oceans, mostly in fairly deep water, but also close inshore and near surface. Body cylindrical or fairly slender in some species. Mouth ventral, teeth quite different in the two jaws; those of the upper jaw with a single conical cusp, preceded and/or followed by an increasing number of minor cusps in the teeth around the side of the jaw; teeth lower jaw broad, saw-like or comb-like with a series of about 10 cusps usually decreasing in size. Six or seven gill slits, the lower ends of the first pair not meeting under head. Dorsal fin far back on body; anal fin short, below or just behind dorsal fin; caudal fin with a strong subterminal notch.

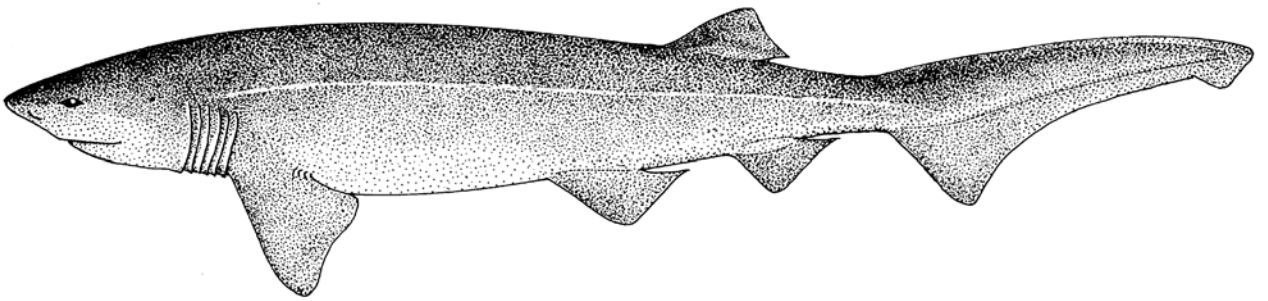
No distinctive colouration. Cow Sharks are oviviparous, i.e. give birth to fully-formed young, which have not been nourished by a placenta.

Three genera (*Hexanchus* with 6 gill slits, and *Heptranchias* and *Notorynchus* with 7 gill slits), with five species recognised, of which three are recorded here.



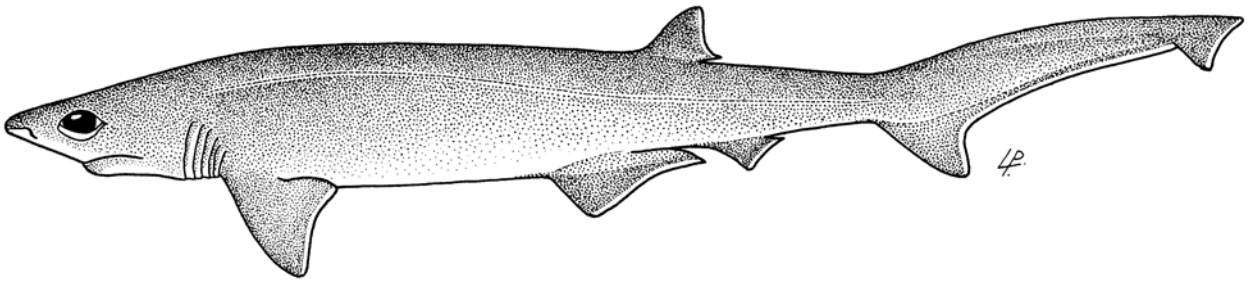
Heptranchias perlo (Bonnaterre, 1788)

Head and snout narrow, pointed; eyes very large; lower jaw with 5 rows of large comb-like teeth on each side, one cusp much large than those that precede or follow it. Dorsal fin much farther from beginning of caudal fin than its own base length. A small species, reaching only 140 cm TL.



Hexanchus griseus (Bonnaterre, 1788)

Snout short, blunt and broad; lower jaw with 6 rows of large comb-like teeth on each side; 6 gill slits. Dorsal fin about as far from beginning of caudal fin as its own base length. A large species, reaching 470 cm TL; mostly found in deep water, but comes to surface.



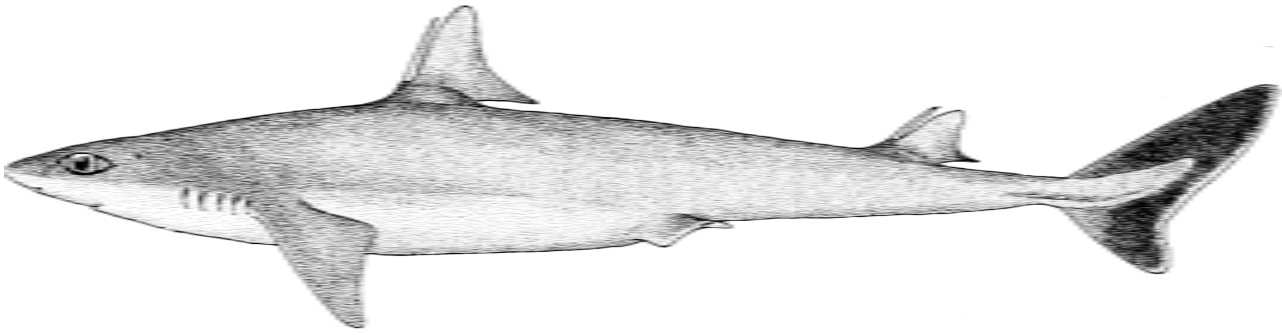
Hexanchus nakamurai Teng, 1962

Snout longer and more pointed; lower jaw with 5 rows of large comb-like teeth on each side; 6 gill slits. Dorsal fin much farther from beginning of caudal fin than its own base length. A small species, reaching only 180 cm TL; found at 90-600 m, but comes to surface.

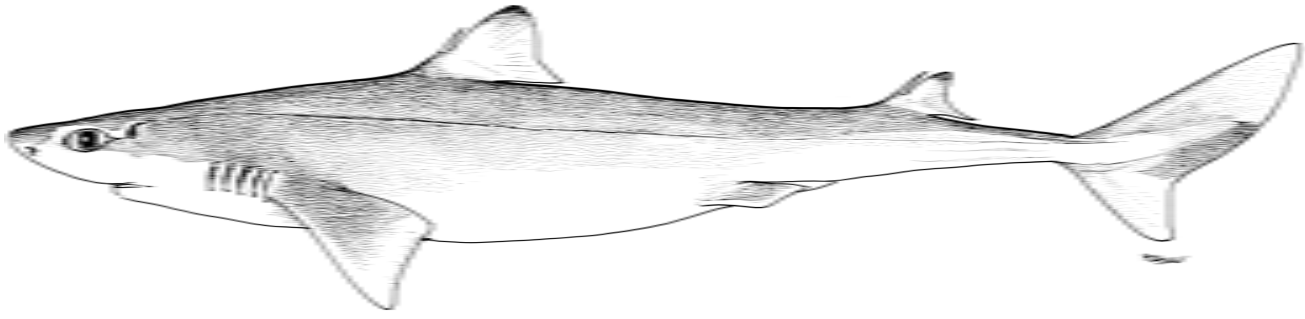
SQUALIDAE

Dogfish sharks

Small moderately large sharks (some to about 200 cm), mostly of deeper waters (50 m or more) in tropical seas. Body somewhat cylindrical with at most inconspicuous ridges between pectoral and ventral fins. Snout variable (short and blunt to long and pointed); mouth ventral, teeth similar or dissimilar in upper and lower jaws, blade-like in most, with a single oblique cusp, but with smaller cusplets on either side of main cusp in some. Five gill slits, none over pectoral fins. Two dorsal fins, some with and some without a spine in front, the first dorsal fin sometimes far back on body and smaller than second; no anal fin; caudal fin variable, form strongly asymmetrical to nearly symmetrical, the lower lobe strong to virtually absent. No distinctive colouration; deep-water species dark grey to black; light organs present in some. Dogfish sharks are viviparous with yolk-sac dependency. 41 species globally.



Squalus altipinnis Last, White & Stevens, 2007
Snout rather pointed. Teeth similar in jaws, small, compressed, with a single oblique cusp. Dorsal fin spines prominent and strong, reaching to apex or above of each fin, without grooves, second dorsal fin a little smaller than first. A low keel on each side of caudal peduncle. Pectoral fins with posterior end nearly straight.

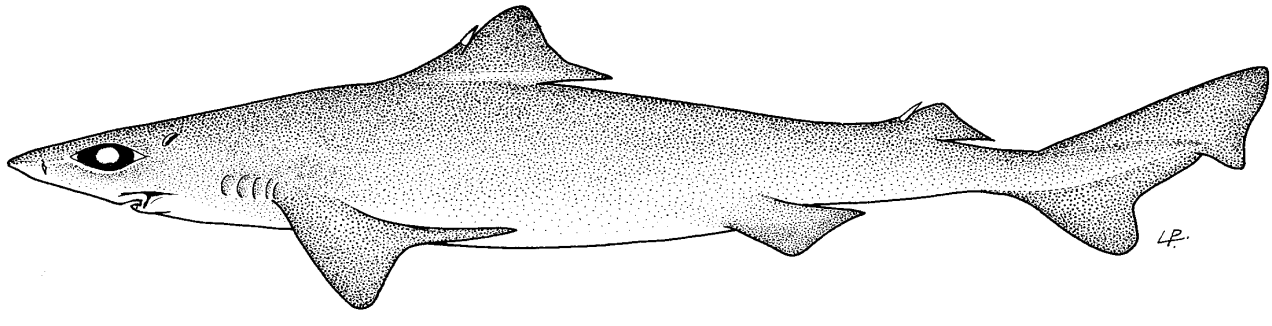


Squalus montalbani Whitley, 1931
Snout pointed and slightly larger than mouth width. Eye large. First dorsal spine does not reach apex. Pectoral fins rather broad, their inner corners usually acutely pointed and their posterior margins deeply concave.

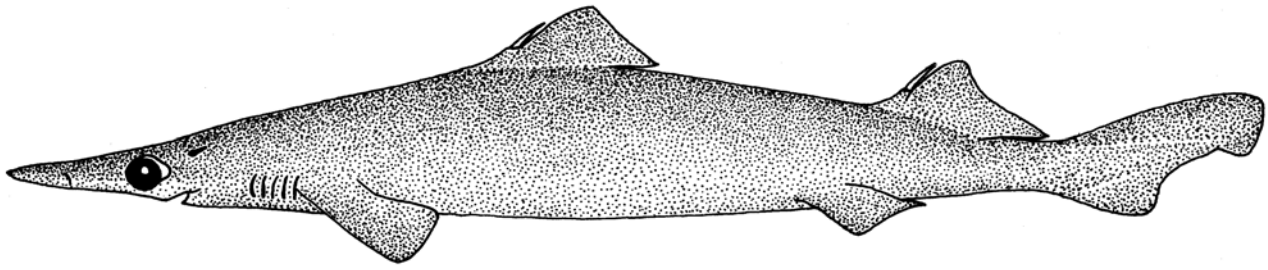
CENTROPHORIDAE

Gulper Sharks -

Gulper sharks comprise two genera and about 17 species of deepwater, bottom-dwelling sharks that are 0.9–1.7 m long at maturity. They are distinguished from related families in being cylindrical in cross-section, having two dorsal fins (the first of which originates well in advance of the ventral fins) that are preceded by grooved spines, and lacking both an anal fin and a saw-like snout. They have large green or yellowish eyes, blade-like teeth (with those in the lower jaw larger than those in the upper jaw), large spiracles, variable denticle sizes and shapes, and have a subterminal notch on the caudal fin. All species are viviparous (aplacental) and are reported to have litters of 1–12.



Centrophorus moluccensis Bleeker, 1860
Snout fairly long and pointed. Teeth in jaws dissimilar, upper teeth relatively broad and low-cusped, lower teeth low and wide. Dorsal fin spines prominent and strong, the first over or just behind inner margin of pectoral fin, the second dorsal fin distinctly smaller than first; inner corners of pectoral fins angular and elongated.

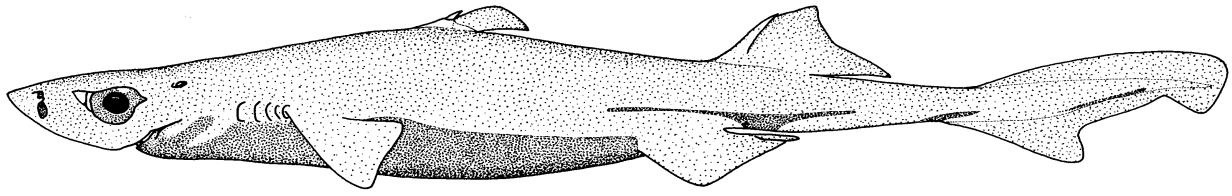


Deania quadrispinosa (McCulloch, 1915)
Snout long and pointed. Teeth in jaws dissimilar, upper teeth erect, without cusplets on either side of main cusp, lower teeth larger, broader, with an oblique blade-like cusp. Dorsal fin spines prominent, second dorsal fin about same size as first; inner corners of pectoral fin rounded; a low keel behind ventral fins along lower part of caudal peduncle.

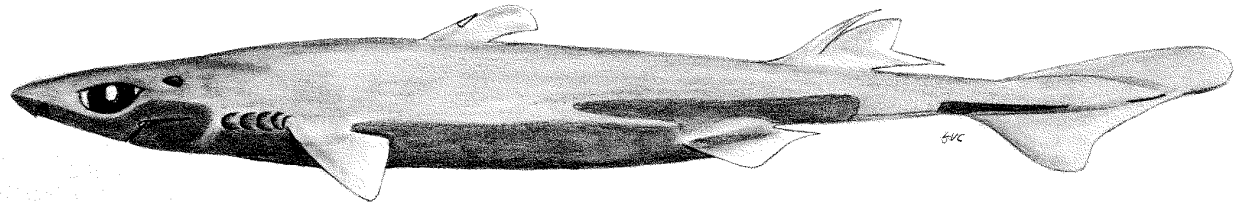
ETMOPTERIDAE

Lantern sharks -

Lantern sharks are very small to moderate-sized sharks (0.2–1 m long at maturity) that include the smallest known species of sharks. They are distinguished from related families in being cylindrical in cross-section, lacking both an anal fin and a saw-like snout, and having light organs and two dorsal fins (the first of which originates in advance of the pelvic fins), preceded by spines. They have single or multicuspid teeth of varied shapes that may be the same or different in each jaw, large spiracles, variable denticle sizes and shapes, and they have a sub-terminal notch on the caudal fin. There are five genera and more than 40 species worldwide. All are viviparous (aplacental) and are reported to have litters of 3–20.



Etmopterus lucifer Jordan & Snyder, 1902
Snout rather rounded. Teeth in jaws dissimilar, upper teeth erect, with one or more cusplets on either side of main cusp, lower teeth larger, broader, with oblique blade-like cusp. Dorsal fin spines prominent, second dorsal fin noticably larger than first. Denticles on sides of body with cusps.



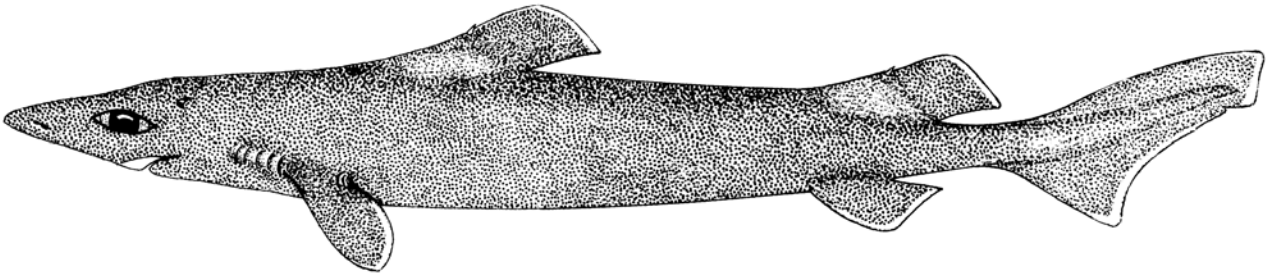
Etmopterus pusillus (Lowe, 1839)
Similar to *E. lucifer*, but denticles on sides of body without cusps.

SOMNIOSIDAE

Sleeper Sharks

Sleeper sharks are small to very large sharks (0.7–6 m in adult length). They are distinguished from related families in being cylindrical in cross-section, lacking an anal fin and a saw-like snout, and having two dorsal fins (the first of which originates in advance of the pelvic fins), usually preceded by small spines. They have small dagger-like unicuspid upper teeth, larger blade-like lower teeth, large spiracles, denticles of variable size and shape, and have a subterminal notch on the caudal fin. The labial furrows, which vary from short to long (and almost connected), can be useful in distinguishing between species.

There are seven genera and 18 species. All are viviparous (aplacental) and are reported to have litters of 4–59 young.



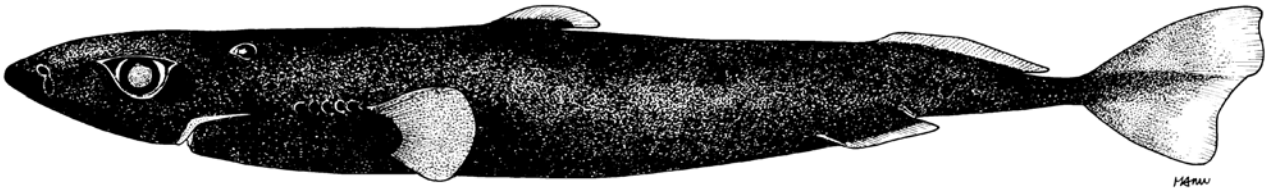
Centroselachus crepidater (Berbosa du Bocage & de Brito Capello, 1864)
Snout long and rather pointed. Teeth in jaws dissimilar, upper teeth erect, with single cusp, lower teeth larger, broader, with an oblique blade-like cusp. Dorsal fin spines very small, the first over pectoral fin tips, the second dorsal fin about same size as first; inner corners of pectoral fins rounded.

DALATIIDAE

Kitefin sharks -

Kitefin sharks are very small to medium-sized (0.2–1.6 m long as adults) deepwater sharks. They are distinguished from related families in being cylindrical in cross-section, lacking an anal fin and a saw-like snout, and having two spineless (except *Squaliolus*) dorsal fins (the first of which originates in advance of the pelvic fins). They have conical-shaped heads, small, dagger-like upper teeth and large, blade-like lower teeth, large spiracles, variable denticle sizes and shapes, and a subterminal notch on the caudal fin.
Viviparous (aplacental) with up to 16 pups in a litter; some species are ectoparasitic on large fishes and cetaceans.

About seven genera and 10 species occur worldwide.

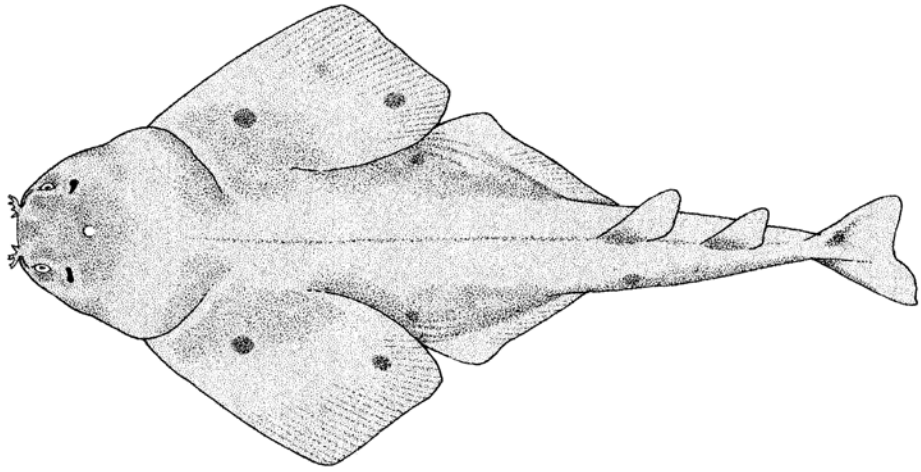


Squaliolus aliae Teng, 1959
Snout pointed but only moderately elongate. First dorsal fin with small spine, nearer to pectoral than to ventral fin base, no spine in second, the first dorsal fin smaller than second; pectoral fins small and rounded; caudal fin nearly symmetrical.

SQUATINIDAE

Angel sharks

Ray-like sharks of moderate size found in all oceans from shallow inshore waters down to the upper continental slope. Body greatly depressed, flattened. Head flattened, with distinct 'neck' at pectoral fin base; eyes on upper side of head; mouth terminal, teeth in upper and lower jaws the same, small, with a single needle-like cusp, but no cusplets. Five gill slits, not visible from above. Two dorsal fins, without spines; no anal fin; pectoral fins wing-like, not joining smoothly to head in front, but with distinct lobes that cover gill slits; ventral fins large; caudal fin almost symmetrical (lower lobe slightly larger). Colouration may include darker markings or light ocelli. Angel sharks are viviparous, i.e. give birth to fully-formed young which have not been nourished from a placenta. A single genus (*Squatina*) with about five species, of which one is recorded here.

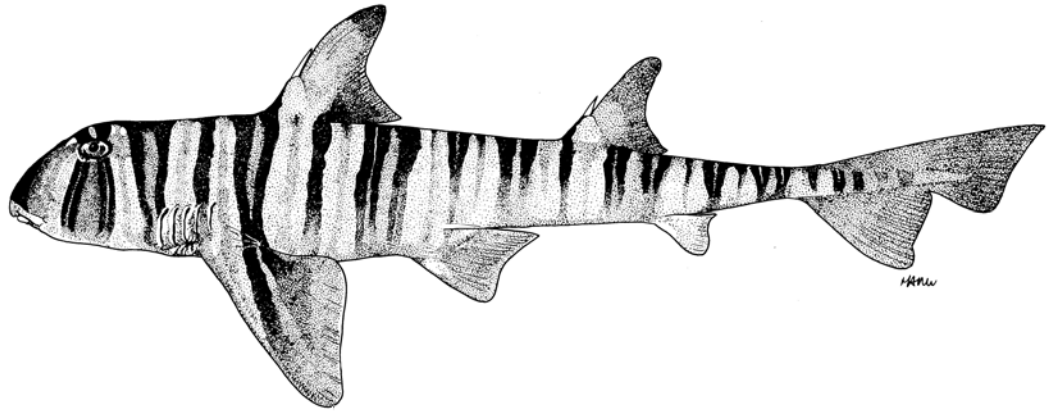


Squatina pseudocellata Last & White, 2008
Body and head greatly depressed, thus resembling a species of ray, but front edge of pectoral fins not smoothly joined to head. Snout short, rounded; eyes on top of head. Two dorsal fins, without spines; no anal fin; pectoral fins wing-like, angular. Body brown with occelate markings on pectoral fins.

HETERODONTIDAE

Bull head Sharks

Moderate-sized sharks found in the Indo-Pacific, also Eastern Pacific, often in shallow-water. Body tapering from rather bulky head. Snout blunt and rounded, eyes fairly high on head; mouth well in front of eyes, teeth in upper and lower jaws the same, small and with cusps in front, enlarged and molar-like behind. Five gill slits, the last 3 above pectoral fins. Two dorsal fins, each with a stout spine; anal fin below or just behind base of second dorsal fin. Various distinctive colour patterns of bands, bars or spots. Bullhead sharks are oviparous, laying eggs in characteristic spiral-shaped egg cases. A single genus (*Heterodontus*) with six species, of which one is recorded here.



Heterodontus zebra (Gray, 1831)
Snout blunt and broad; jaws with small cusped teeth in front, broad molar-like teeth behind; 5 gill slits. Two dorsal fins, each preceded by a spine; anal fin present. Body light brown, with distinctive dark transverse bands. A small species, reaching 85 cm.

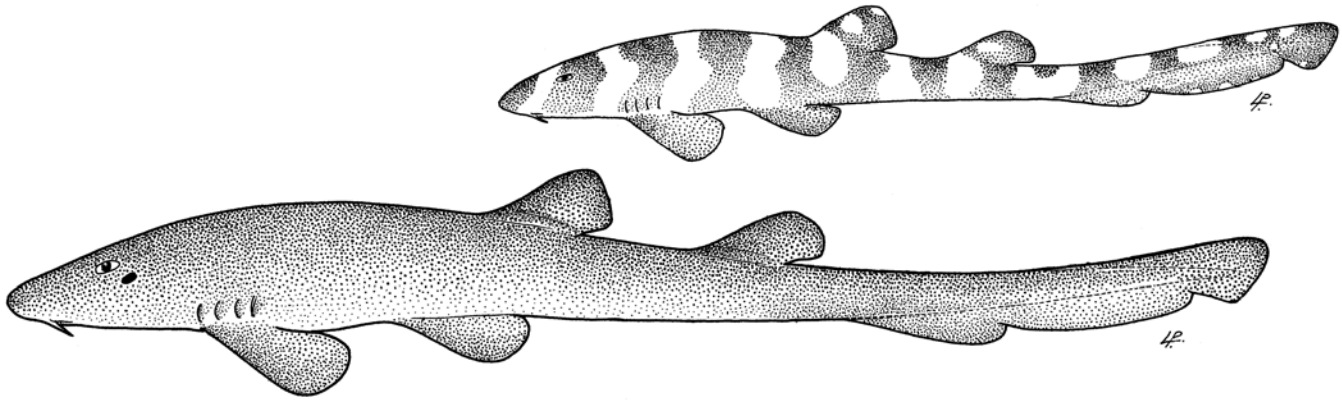
HEMISCYLLIIDAE

Longtailed Carpet Sharks - Cutcut sembilang; Cutcut toke

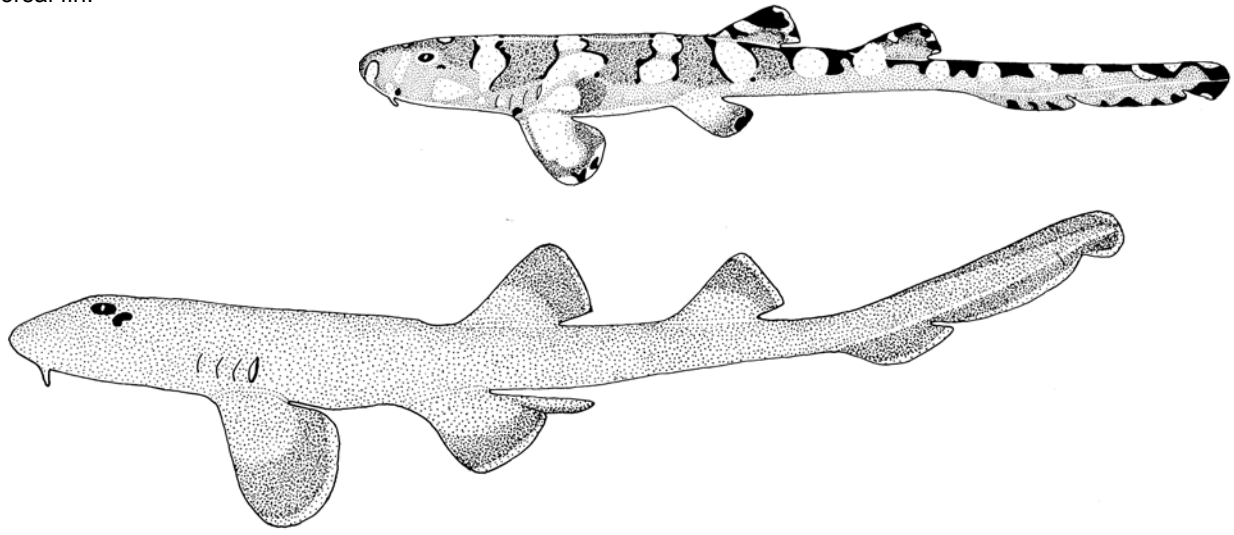
Small slender sharks (to less than 100 cm) found inshore water of the tropical Indo-Pacific. Body cylindrical or slightly depressed, with or without ridges on sides. Snout broadly rounded or a little pointed; eyes fairly high on head; mouth ventral and nearly transverse, teeth on upper and lower jaws more or less similar, with a main cusp and in some species small cusplets on either side. Five gill slits, the fifth overlapping the fourth. Two dorsal fins, without spines and about equal in size; anal fin present, a little smaller than second dorsal fin, separated by a notch from lower lobe of caudal fin; upper part of caudal fin almost in line with body axis. Various colour patterns, including dark saddles and dark or light spots. Longtailed Carpet Sharks are oviparous (egg-layers). Two genera, with about five species, of which three are recorded here.

Two genera which can be separated as follows:

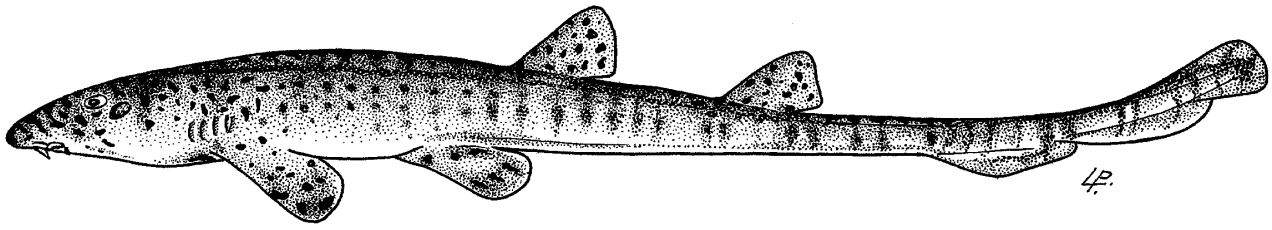
A. Distance from nose tip to mouth goes more than 5 times in head length . . . . . **Hemiscyllium**
B. Distance from nose tip to mouth goes less than 5 times in head length. . . . . **Chiloscyllium**



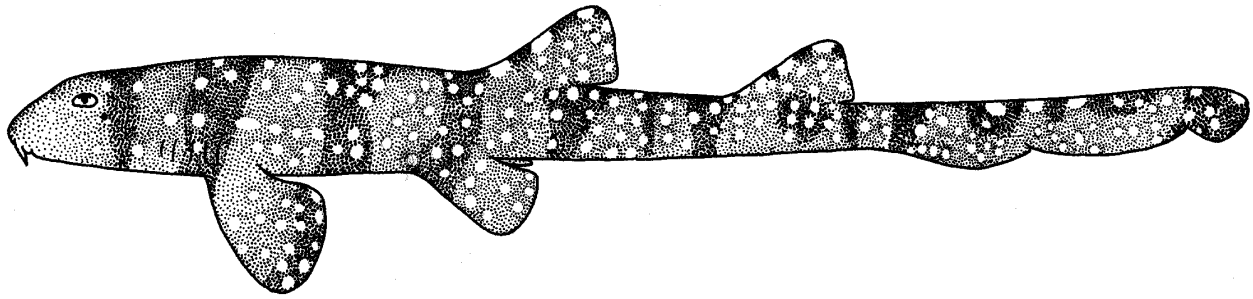
Chiloscyllium griseum Muller & Henle, 1838
Juveniles with light grey-brown and dark grey-brown bands; adults become uniformly tan to light brown; belly cream to light tan. First dorsal fin base longer than that of second. A mid-dorsal ridge present; origin of anal fin only a little behind second dorsal fin.



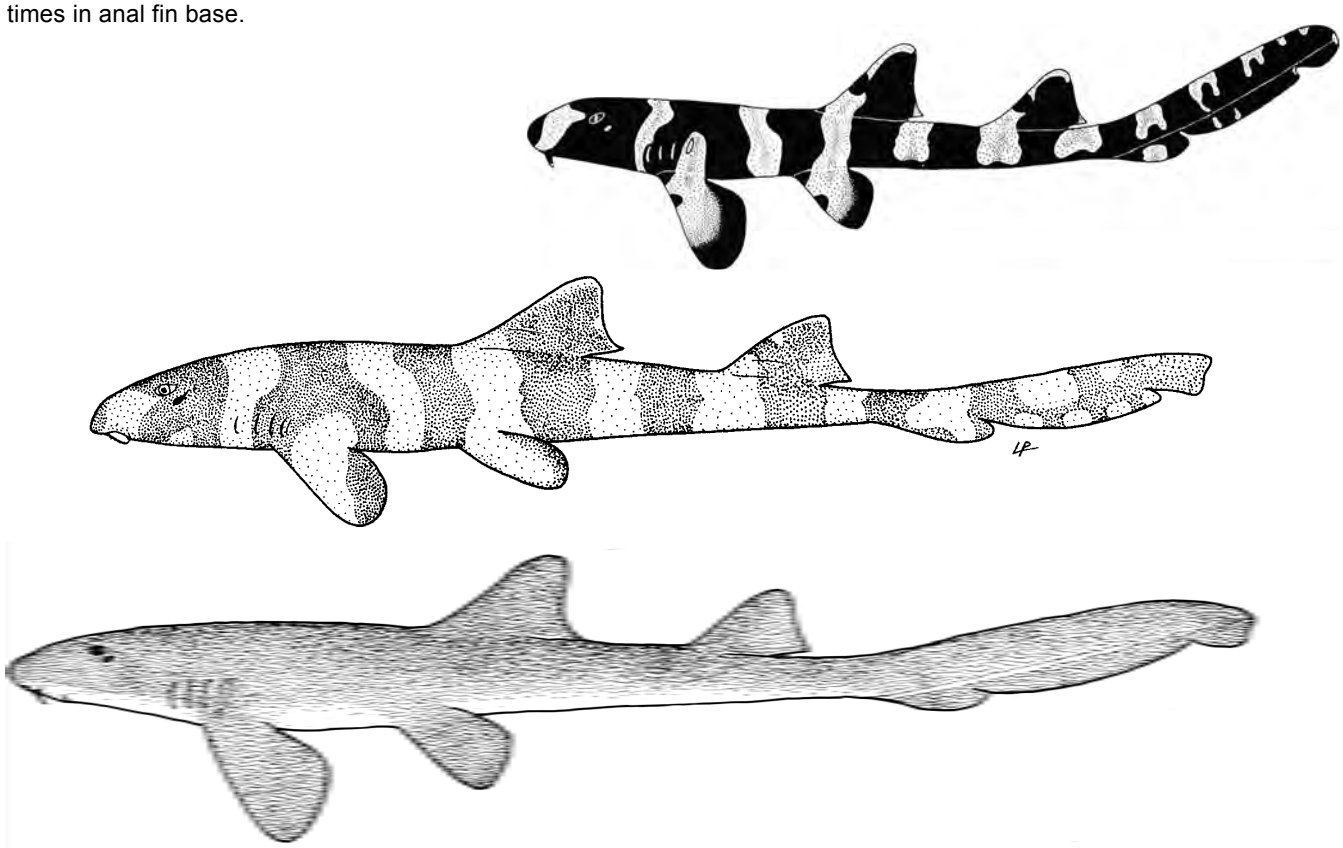
Chiloscyllium hasseltii Bleeker, 1852
Juveniles with black-edged bands of grey-brown or dark-brown colour. These bands disappear with age although traces of the black edges often can give the specimen the appearance of being spotted. First dorsal fin base longer than that of second. Nearly identical to *C. griseum* but can be separated by: second dorsal fin height usually less than 5.8% of TL; first dorsal fin height usually less than 6.6% of TL; distance from first dorsal to second dorsal usually less than 9.3% of TL. These figures are usually higher for *C. griseum.*



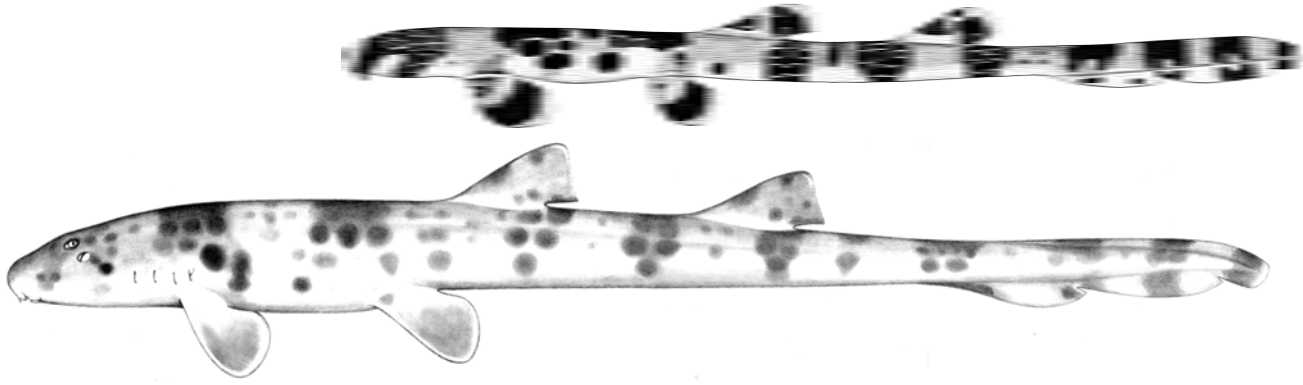
Chiloscyllium indicum (Gmelin, 1789)
The bands in the juveniles become less distinct in adults. The bands are medium to dark brown with scattered darker spots; background colour is cream or light brown. Lateral dermal ridge present. Anal fin origin well behind second dorsal fin; anal fin height goes more than six times in anal fin base.



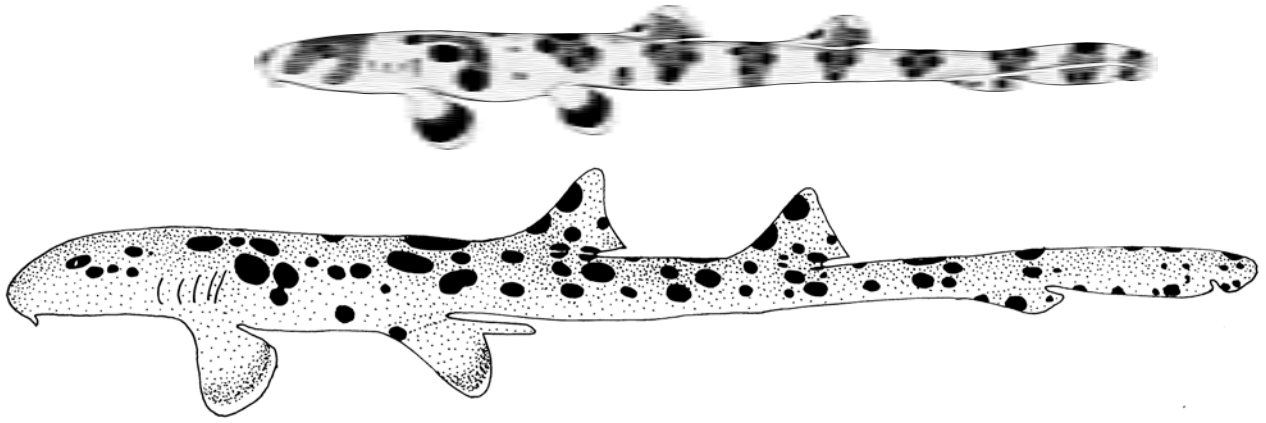
Chiloscyllium plagiosum (Bennett, 1830)
Juveniles and adults are both banded and patterned, the juveniles being very dark; the adults with fainter margins. Light grey on belly. Distinct lateral ridges present. Anal fin origin well behind second dorsal; anal fin height goes less than six times in anal fin base.



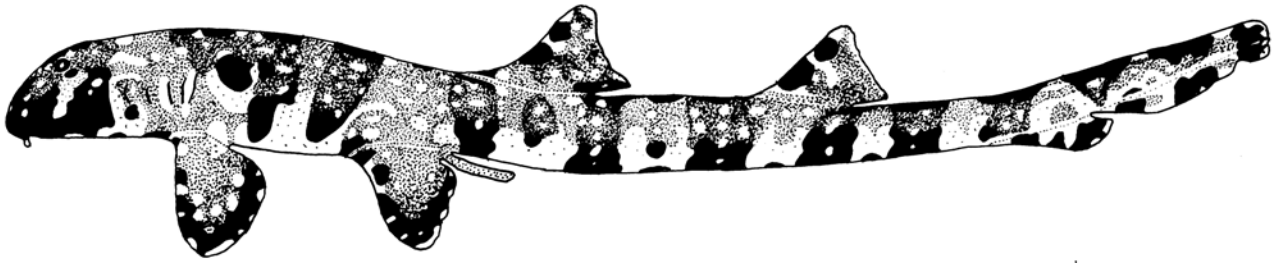
Chiloscyllium punctatum Müller & Henle, 1838
Juveniles are strongly banded in alternating black and white bands. With age these bands fade and a more uniform colour appear with small black spots over body. At maturity the body colour is uniformly light brown. Anal fin origin below end of second dorsal fin.



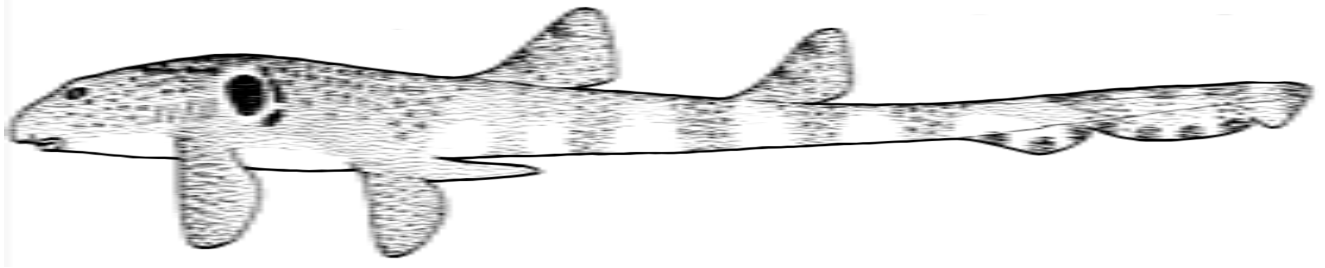
Hemiscyllium freycineti (Quoy & Gaimard, 1824)
Juveniles with dark brown and tan bands; the dark bands break up into spots and more spots appear in the light bands, reaching the adult colour pattern which appears as red-brown spots on a cream to light tan background; belly white or cream. Spots on head in front of eye of equal size to eye.



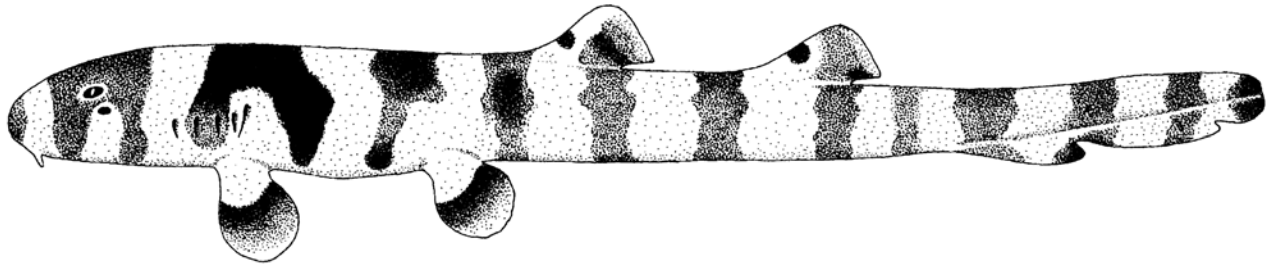
Hemiscyllium hallstromii Whitley, 1967
Adults have dark brown to black spots most of which are subequal or larger to the very dark brown "shoulder" spot. The background colour is tan to light brown. Juveniles with dark bands which break up into spots and with age more spots appears and with more intense colour.



Hemiscyllium strahani Whitley, 1967
This species has dark bands and spots on throat; tip of barbels white; back and sides have light spots on the dark grey to black background. The "shoulder" spot not easily seen against the dark background. Belly white to cream.



Hemiscyllium trispeculare Richardson, 1843
Head anterior to eyes covered with small spots, less than half the diameter of the eye; "shoulder" spot broken up into at least two and usually three separate spots. Body colour tan to light brown with many dark brown spots somewhat with a greenish tinge. Belly cream or white.

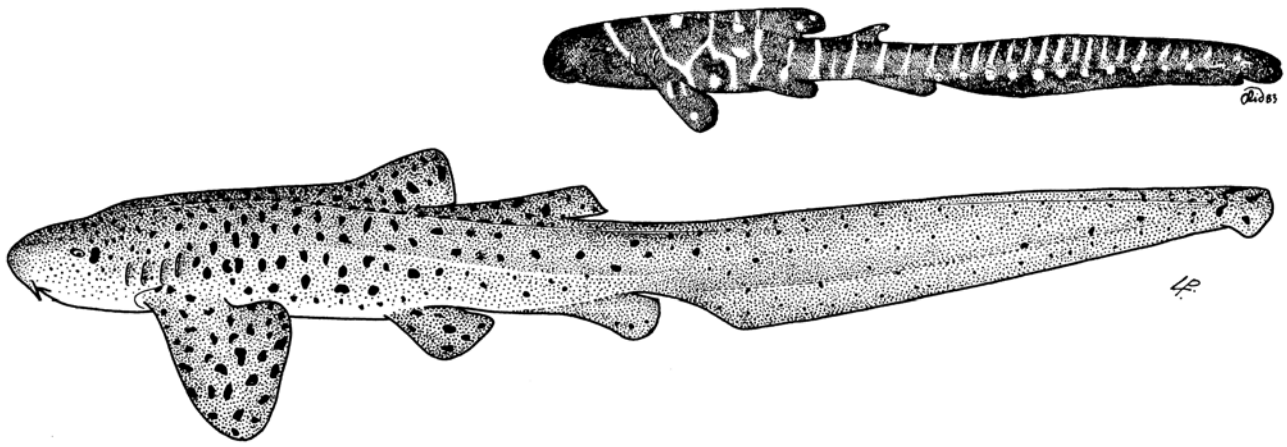


Hemiscyllium henryi Allen & Erdmann, 2008
Body covered with white and black bands, no spots. The picture shown is from the only juvenile caught.

STEGOSTOMATIDAE

Zebra Shark - Cutcut tekeh

Small to moderate-sized sharks of the warmer parts of the Indo-Pacific. Body cylindrical, with prominent ridges on sides. Snout broad and very slightly rounded; eyes on side of head; mouth almost terminal, teeth about the same in both jaws, with a central cusp and small cusplets on either side. Five gill slits, small, the fourth overlapped by the fifth. Two dorsal fins, the first larger than second; anal fin present, larger than second dorsal fin, its base broad, separated from lower part of caudal fin by narrow notch or small space; upper part of caudal fin forming low angle with body, long, about half length of entire fish. Body with dark saddles in young, changing to spots in adults. Zebra sharks are oviparous laying purplish egg cases. One species is recorded here.

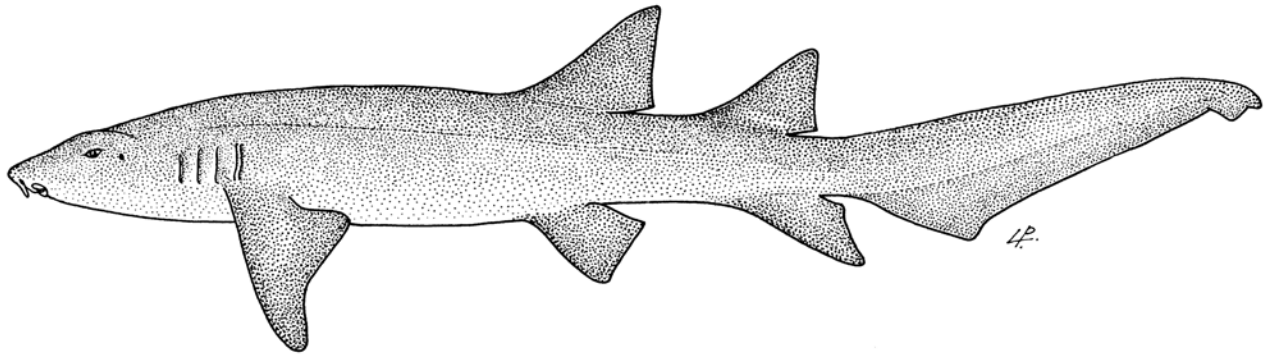


Stegostoma triginum (Foster, 1781)
Description as for family. Juveniles with dark brown saddle - shaped bands on upper part of body, gradually changing to spots or blotches in adults.

GINGLYMOSTOMATIDAE

Nurse sharks - Cutcut buta

Small to large nocturnal sharks (some to 100 cm, others to about 300 cm), found in all tropical and subtropical seas in shallow waters down to at least 70 m. Body cylindrical or moderately depressed, without ridges on sides. Mouth subterminal, teeth about the same in both jaws, with a main cusp and small lateral cusplets. Five gill slits, the fourth almost overlapped by the fifth. Two dorsal fins, about equal or the first somewhat larger, the first dorsal origin over or just before ventral fin base; anal fin present, about as large as second dorsal fin, separated by small space from lower lobe of caudal fin; upper lobe of caudal fin at low angle to body and less than a third length of entire fish. Caudal peduncle without lateral keels. Nurse sharks are perhaps mostly ovoviviparous (give birth to fully-formed young), but at least *Nebrius ferrugineus* is aplacentally viviparous (embryos nourished from yolk sac). There are 2 genera of which one is recorded here.

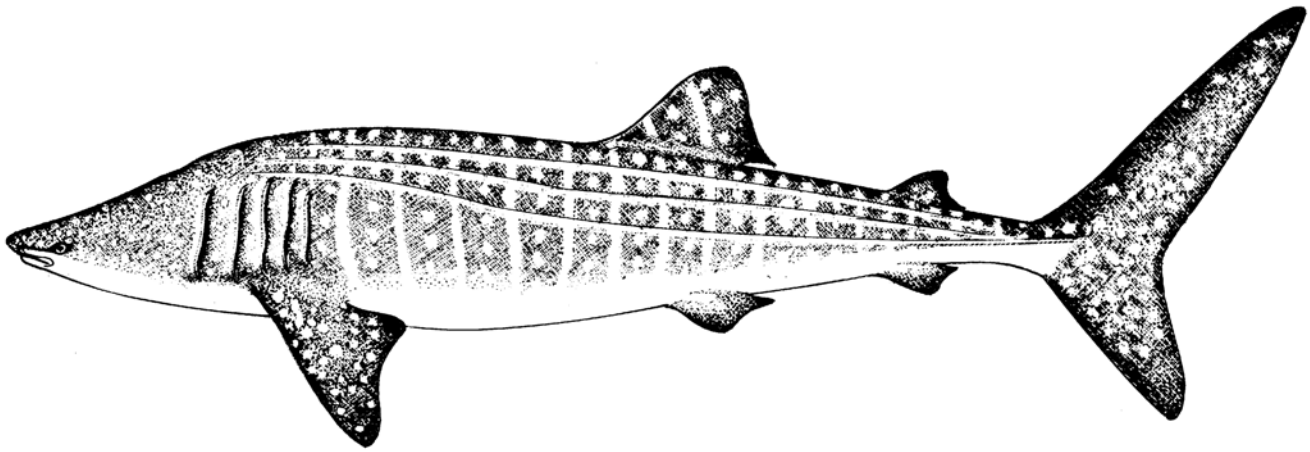


Nebrius ferrugineus (Lesson, 1830)
Teeth more or less compressed at sides of jaw, imbricated (overlapping). Dorsal, anal and pectoral fins pointed at tips, pectoral fins narrow and falcate.

RHINCODONTIDAE

Whale Sharks -

Very large sharks (perhaps to about 2000 cm), found in all tropical seas. Body, bulky, but tapering evenly to tail, Snout short and blunt; mouth almost terminal, teeth very small and numerous, with hooked cusps; no gill rakers, but filter grids. Five gill slits, last 3 over pectoral fins. Two dorsal fins, second half size of first; anal fin present; caudal fin asymmetrical, but with strong lower lobe. Caudal peduncle depressed with a strong keel on each side. Whale sharks are viviparous (retain egg-cases in uterus where they hatch and then born); feed on pelagic crustaceans, small fishes and squids. A single genus and species.

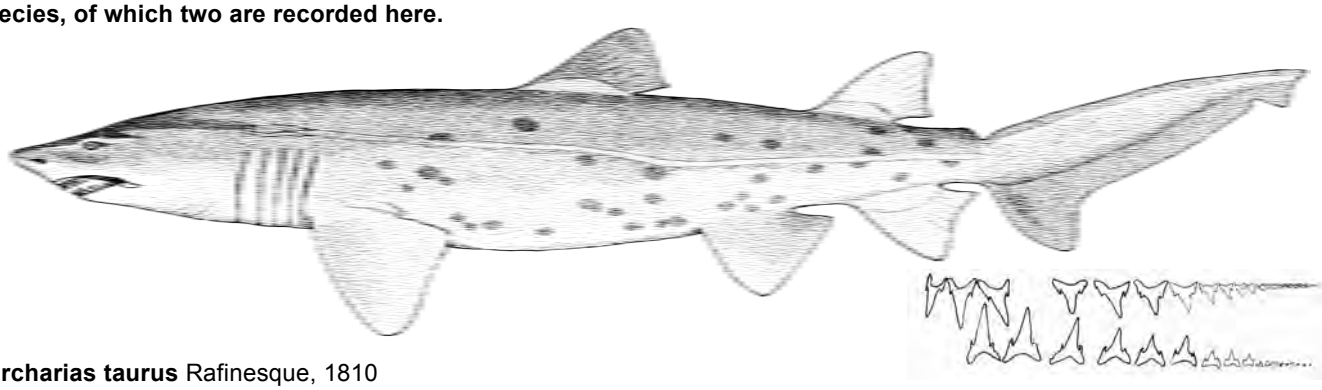


Rhincodon typus Smith, 1828
Description as for family. Body dark grey, reddish or greenish grey above, with white or yellow spots and transverse stripes.

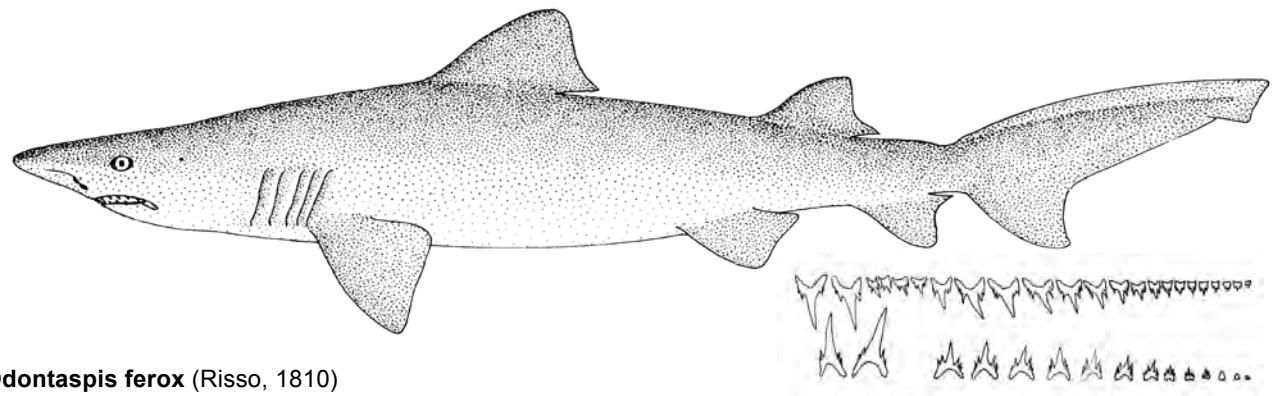
ODONTASPIDIDAE

Sand Tiger Sharks -

Large sharks (some to 360 cm or more) of tropical to cool temperate waters down to moderate depths. Body fairly bulky. Snout more or less pointed; mouth ventral, teeth with a large slender cusp and one or more small cusplets on either side, teeth at front enlarged and separated from lateral teeth by a gap and/or tiny intermediate teeth. Five gill slits, all in front of pectoral fin. Two dorsal fins, the first well in front of ventral fins; anal fin present; caudal fin asymmetrical, but lower lobe well developed. Caudal peduncle without keels on sides. Sand Tiger Sharks are ovoviviparous (have fully formed young which have not been nourished by a placenta). Two genera, with about six species, of which two are recorded here.



Carcharias taurus Rafinesque, 1810
Snout very short, moderately flattened; eyes small. Enlarged teeth at front of upper jaw in 3 rows on either side. First dorsal fin only a little before ventral fins, not larger than second dorsal fin. *Carcharias taurus* is adelphophagous, where embryos eat other eggs in their egg case then hatch into uterus and prey on other embryos in utero until only one left in each uterus

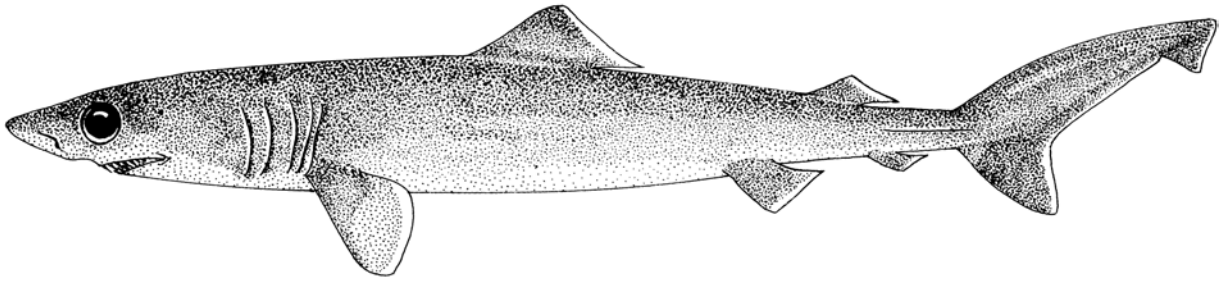


Odontaspis ferox (Risso, 1810)
Snout moderately elongate, bulbously conical; eyes fairly large. Enlarged teeth at front of upper jaw in 2 rows on either side. First dorsal fin well before ventral fins, larger than second dorsal fin.

PSEUDOCARCHARIIDAE

Crocodile Sharks -

Small to moderate-sized sharks (to about 100 cm), oceanic and found in all tropical seas. Body slender, elongate. Snout rather pointed; eyes large on side of head; mouth ventral, reaching well behind eyes, teeth with long slender cusps, without lateral cusplets, anterior teeth enlarged in both jaws and a little hooked. Five gill slits, none over pectoral fins. Two low dorsal fins, the first larger than the second and more or less equidistant between pectoral and ventral fin bases; anal fin present, smaller than second dorsal fin; caudal fin strongly asymmetrical, lower lobe short. Caudal peduncle depressed, with a low keel on each side. No distinctive colouration. Crocodile-sharks are ovoviviparous (give birth to fully-formed young which have not been nourished by a placenta). A single genus.



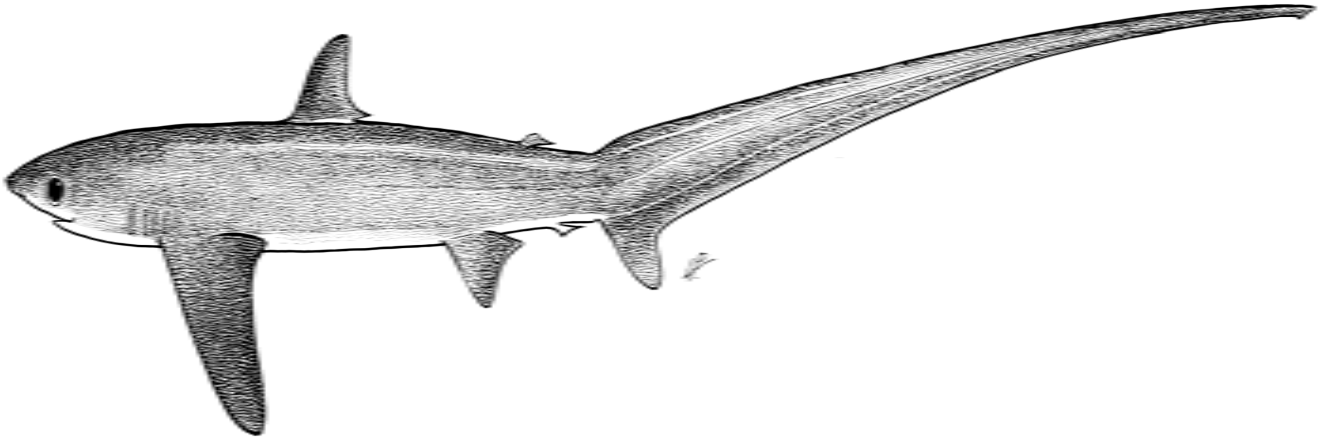
Pseudocarcharias kamoharai (Matsubara, 1936)
Description as for family. Body greyish above, lighter below, sometimes with small white spots and a white blotch between the mouth and gill slits; fins white-edge

ALOPIIDAE

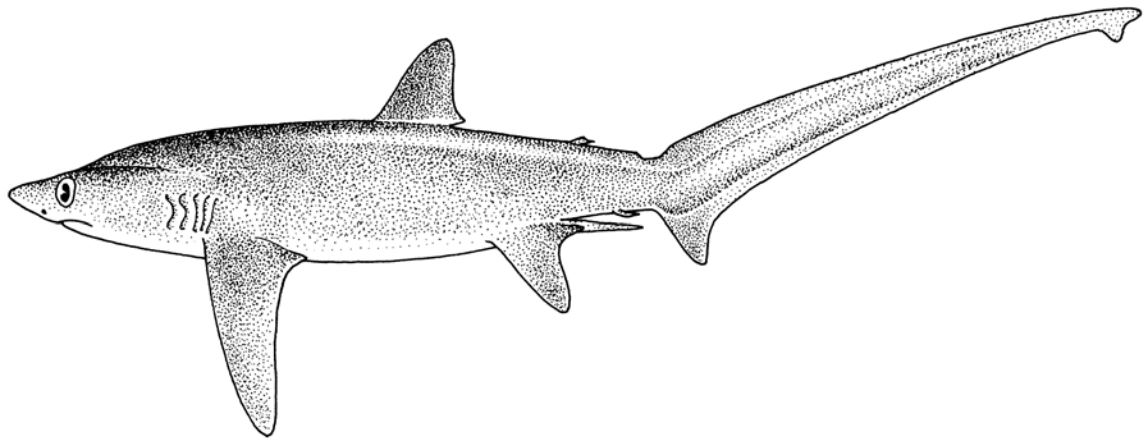
Thresher sharks -

Large pelagic sharks (to about 500 cm), mostly of shallow to moderate depths, but one deeper-water species, found in all oceans. Body cylindrical, moderately stout. Snout moderately long, conical and pointed, mouth ventral, teeth small or moderate, compressed, blade-like, with less than 60 rows in each jaw. Five gill slits, last two over pectoral fins. First dorsal fin at about midpoint of body or a little behind, high and erect, second dorsal fin minute; anal fin minute, behind second dorsal fin base; pectoral fins long and narrow; ventral fins as large as first dorsal fin and set well behind it; caudal fin with upper lobe about as long as body. No distinctive colouration. Thresher sharks are they are oophagous - embryos feed on eggs continually ovulated by the mother and give birth to fully-formed young.

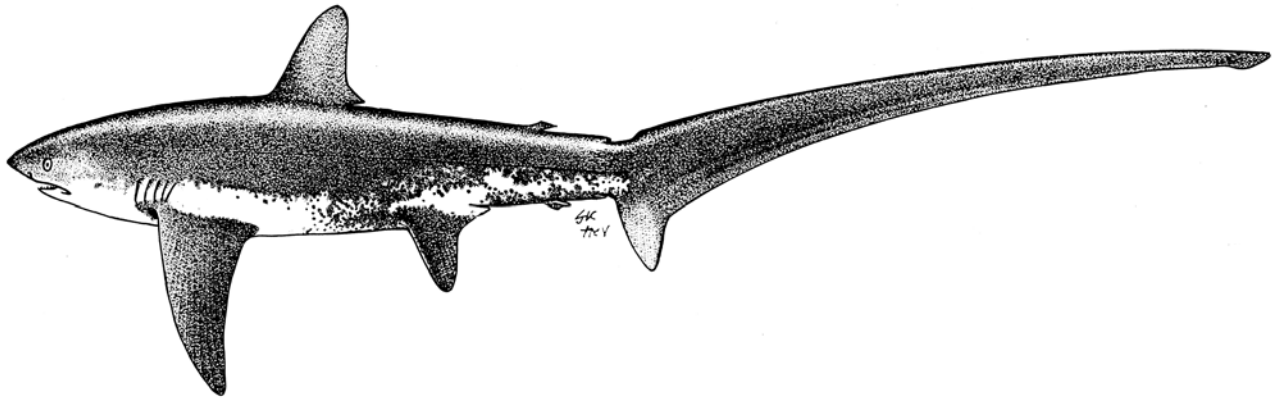
A single genus (*Alopias*) with three species, all of which are recorded here.



Alopias pelagicus Nakamura, 1935
Weak horizontal groove on each side of nape, forehead not indented over eyes, which are small. Teeth small, more than 29 rows in each jaw. First dorsal fin about equidistant between pectoral and ventral fin bases; pectoral fins long, narrow, the tips rounded. White of belly not expanded over pectoral fin bases.



Alopias superciliosus (Lowe, 1841)
Deep horizontal groove on each side of nape, forehead distinctly indented over eyes, which are large and expanded onto top of head. Teeth large, less than 25 rows in each jaw. First dorsal fin much closer to ventral fin base; pectoral fin long, narrow, the tips rounded. White of belly not expanded over pectoral fin bases.

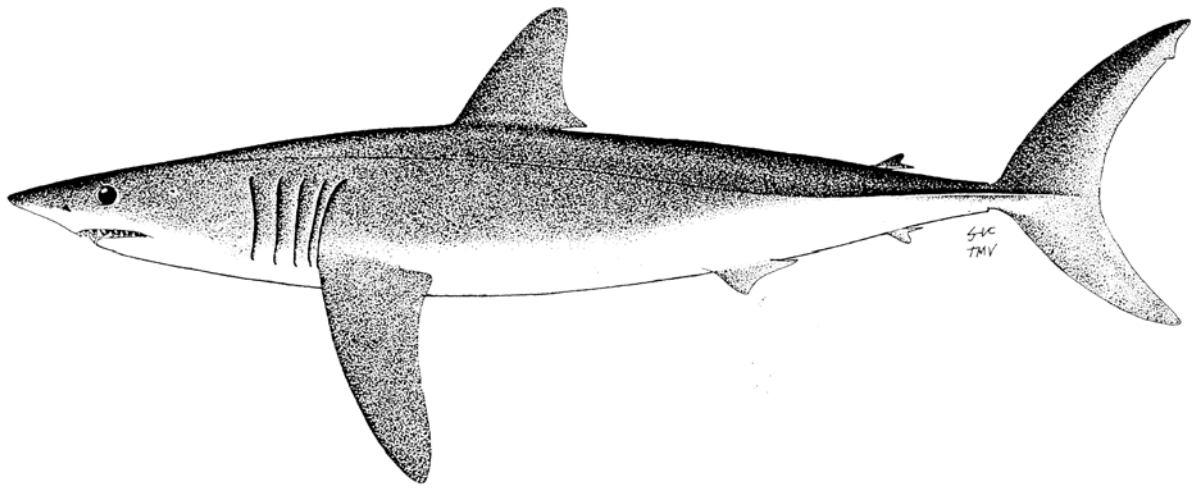


Alopias vulpinus (Bonnaterre, 1788)
No horizontal grooves at nape, forehead not indented over eyes, which are small. Teeth small, usually more than 29 rows in each jaw. First dorsal fin about equidistant between pectoral and ventral fin bases; pectoral fins long and falcate, with pointed tips in adults. White of belly expanded over pectoral fin bases.

LAMNIDAE

Mackerel Sharks -

Large sharks (to at least 300 cm, but *Carcharodon* to 640 cm). found in all tropical and temperate waters. Body fusiform, sometimes stout. Snout moderately long, more or less pointed; mouth ventral, teeth large, but variable, slender and awl-like to broad or blade-like. Five gill slits, all in front of pectoral fin. Two dorsal fins, the first short-based and well in advance of ventral fins, the second much smaller; anal fin present, as small as second dorsal fin; caudal fin lunate. Caudal peduncle depressed, with a prominent keel on each side extending back onto base of caudal fin. No distinctive colour patterns. Mackerel sharks are oophagous - embryos feed on eggs continually ovulated by the mother and give birth to fully-formed young. Three genera, with about seven species, of which one is recorded here.

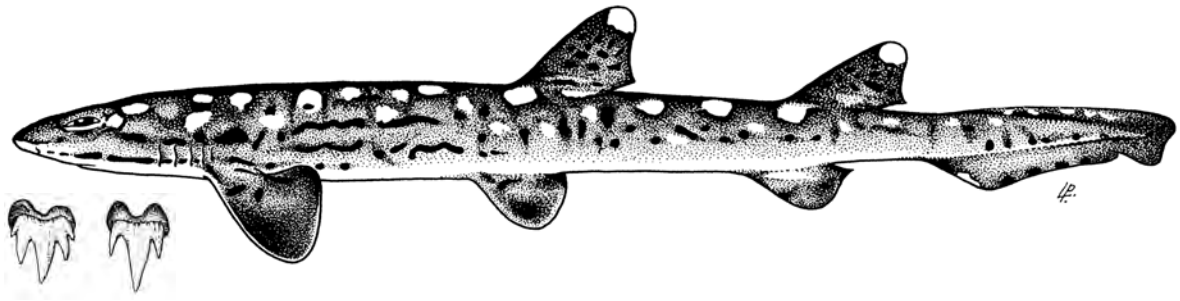


Isurus oxyrinchus Rafinesque, 1810
Snout acutely pointed. Teeth moderately slender, without cusplets at side, edges smooth. First dorsal fin origin just behind inner corner of pectoral fin; pectoral fin falcate, shorter than head, tip pointed in adults. Underside of snout and around mouth pale.

SCYLIORHINIDAE

Cat sharks - Cutcut kembang

Mostly small sharks (to less than 100 cm), found in all oceans, usually in shallow to moderate depths. Body more or less round, fairly slender. Snout often somewhat depressed; eyes oval or slit-like; nostrils connected to mouth by a groove in some species; mouth ventral, teeth small, with acute narrow cusps and often small cusplets on either side. Two dorsal fins, the first over or behind ventral fin base, its origin near midpoint of body in some species, but well behind in others; anal fin present; ventral fin origin before base of first dorsal fin; lower caudal fin lobe small, sometimes absent, upper lobe not rising steeply from line of body and sometimes almost horizontal. Variegated colour patterns in some species. Cat sharks are mostly oviparous (egg-layers), but some species are ovoviviparous (give birth to fully-formed young which have not been nourished from a placental) seven genera, with 49 species, of which one is recorded here.

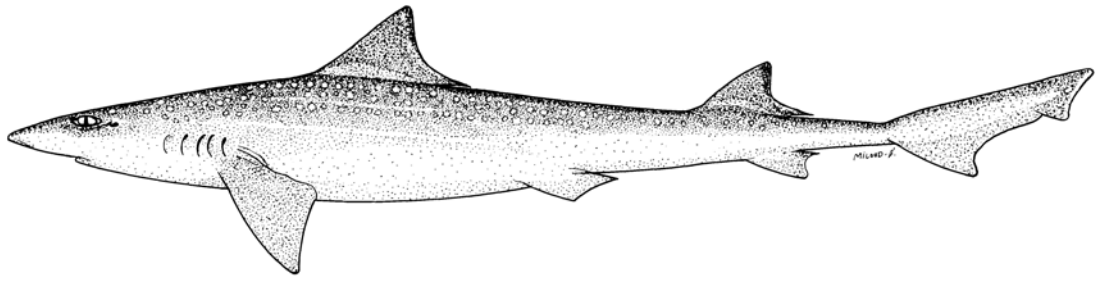


Atelomycterus marmoratus (Bennett, 1830)
Body moderately slender, not tadpole-shaped, firm and thick-skinned. Snout short, bluntly round; space between nostrils less than half nostril width; eyes on upper part of head, with a narrow ridge below. Two dorsal fins, the second a little smaller than first. Upper parts of body with dark spots and marbling, interspersed with white blotches; white blotches at tips of dorsal fins.

TRIAKIDAE

Hound-sharks -

Small to moderate-sized sharks (to about 150 cm) widely distributed in tropical and warm temperate seas, from shallow waters to moderate depths (300 m or more). Body elongate to stout. Eyes elongate or oval; mouth ventral, teeth either large, blade-like with small cusplets but no serrations, or numerous, small, without cusps and arranged in a pavement. Two dorsal fins, the first before ventral fins, the second somewhat smaller than first; anal fin present, not larger than second dorsal fin; caudal fin asymmetrical, upper edge not rippled, lower lobe variable (strong in some, almost absent in others). Body sometimes with pale or dark spots, otherwise no distinctive markings. Hound-sharks are ovoviviparous (give birth to fully-formed young which are not nourished from a placenta) or viviparous (yolk sac forms a 'placenta' before birth).

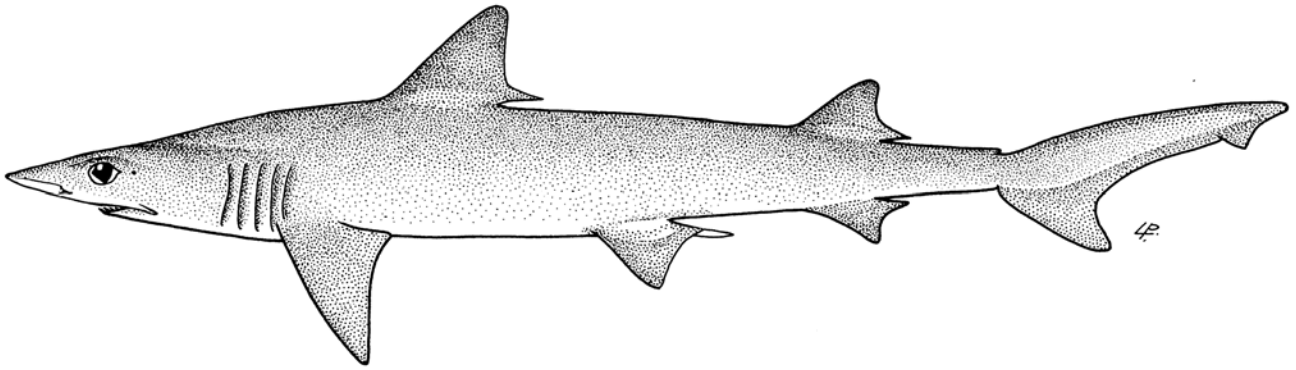


Mustelus stevensi White & Last, 2008
Relatively large species with moderately tall dorsal fins, posterior margin mostly upright distally, about 72/75 teeth rows; dorsal color light yellowish grey with numerous small, diffuse-edged white spots in staggered, irregular rows on postspiracular head and body; the light and dark tonal coloration are not well demarcated.

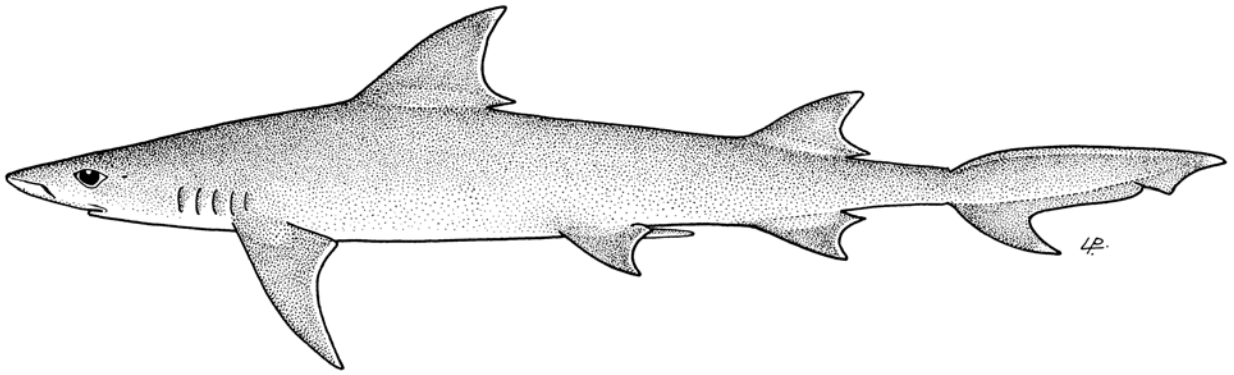
HEMIGALEIDAE

Weasel sharks -

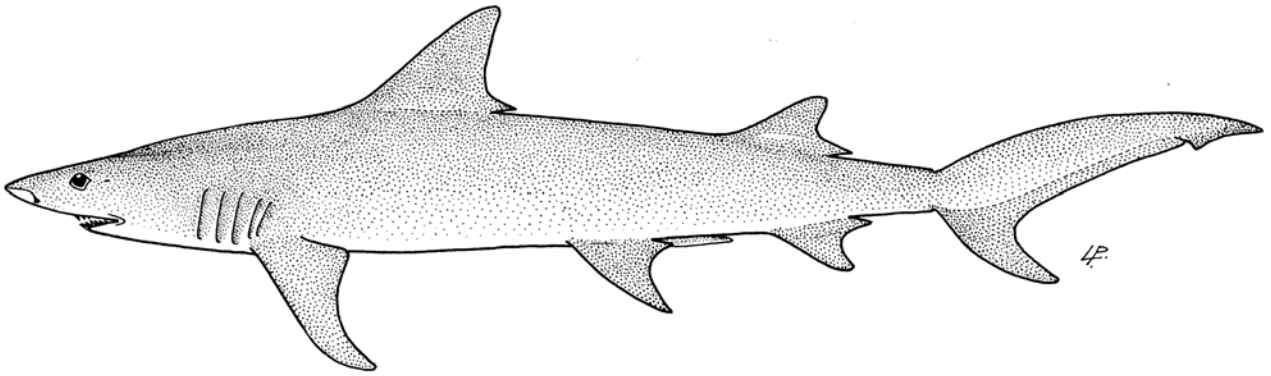
Small to moderate-sized sharks (to about 150 cm) of the Indo-Pacific and one species in the Atlantic. Body cylindrical. Head and snout somewhat depressed; eyes oval; mouth ventral, teeth small to large, blade-like, with a single cusp, also cusplets or serrations on upper teeth, cusplets sometimes present on lower teeth, anterior teeth of upper jaw not larger than lateral teeth. Five gill slits, the last 2-3 over pectoral fin. Two dorsal fins, without spines, the first between pectoral and pelvic fin bases, the second about ⅔ size of first; anal fin present; caudal fin strongly asymmetrical, its upper edge rippled or undulated. No distinctive colouration. Weasel sharks are viviparous (give birth to fully-formed young which have been nourished by a 'placenta' formed from the yolk sac). Four genera, with about 8-10 species, of which three are recorded from Survey



Chaenogaleus macrostoma (Bleeker, 1852)
Snout obtusely wedge-shaped when seen from above. Gill slits large, over twice length of eye. Front teeth of lower jaw with long strongly hooked cusps that protrude when mouth closed; edges of upper teeth smooth. Fins not falcate, hind edges of pectoral and pelvic fins straight or only slightly concave.



Hemigaleus microstoma Bleeker, 1852
Gill slits small, less than twice eye length. Front teeth of lower jaw short, without strongly hooked cusps, not protruding when mouth closed; no cusplets on lower teeth. Fins falcate, including lower caudal lobe. (any specimens caught in Australia would be *Hemigaleus australiensis* White, Last & Compagno, 2005.)

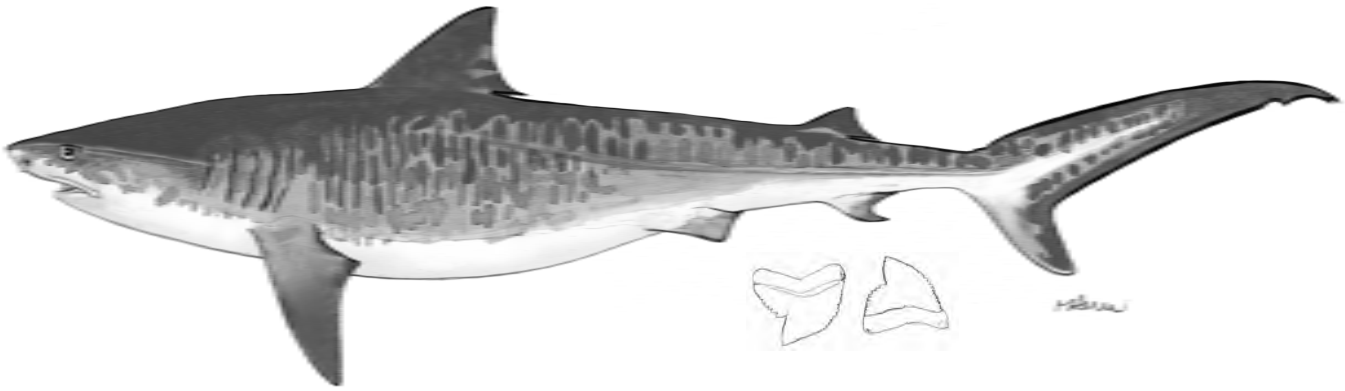


Hemipristis elongata (Klunzinger, 1871)
Snout bluntly rounded when seen from above. Gill slits large, over twice length of eye. Front teeth on either side of lower jaw symphysis with long, strongly hooked cusps that protrude when mouth closed; edges of upper teeth serrated in fishes over 60 cm. Fins strongly falcate, hind edges of pectoral and pelvic fins deeply concave.

GALEOCERDIDAE

Tiger shark - Hiu Macan

Tiger sharks are large, mostly nocturnal predators with the widest food spectrum of all sharks. Specimens are recorded longer than 5 m. This family was previously included in the CARCHARHINIDAE but differs on the following characteristics: spiracle present, small and slit-like; caudal peduncle with low, rounded, lateral keel; upper labial furrows very long, subequal to preoral length; snout broad, very short and bluntly rounded (viewed from underneath). Tiger sharks are aplacentally viviparous (eggs develop and hatch inside the body without a placenta); teeth are unique with very sharp, pronounced serrations and an unmistakable sideways-pointing tip. A single species.



Galeocerdo cuvier (Peron & LeSueur, 1822)
Dorsal surfaces grey with dark, vertical reticulations in newborns, forming vertical bars in sharks up to 300 cm TL, faint or absent in large adults. Fins without markings. Ventral surfaces white.

CARCHARHINIDAE

Requiem sharks - Cucut

Small to large sharks (some to 100-150 cm, others to 300 cm or more), found in all seas. Body cylindrical, without lateral ridges; head conical to moderately depressed. Snout prominent; eyes round, with a well-developed nictitating lower eyelid. Mouth ventral, teeth small to large, blade-like, with a single large cusp (often serrated) and smaller lateral cusplets in some. Five gill slits, the last 1-3 over pectoral fin. Two dorsal fins, the first usually much longer than second, its base about equidistant between pectoral and ventral fins; anal fin present; caudal fin strongly asymmetrical, upper edge rippled or undulated, lower lobe well-defined. Caudal peduncle strongly depressed, weak keels on sides only in two genera; precaudal pits well developed. Requiem sharks are vivoparous (give birth to fully formed young which have been nourished from a placenta). One of the largest shark families; there are numerous genera and species, of which nine genera and 28 species are recorded here. The information given here is taken from W. White, 2019.

SYNOPSIS OF GENERA

Triaenodon : teeth with high cusplets on either side of main cusp.

Negaprion : second dorsal fin almost as big as first; upper teeth with slender smooth cusps.

Lamiopsis : second dorsal fin almost as big as first; upper teeth with triangular serrated cusps, lower teeth with narrow smooth cusps.

Scoliodon : snout strongly depressed, trowel-shaped; pectoral fin broad.

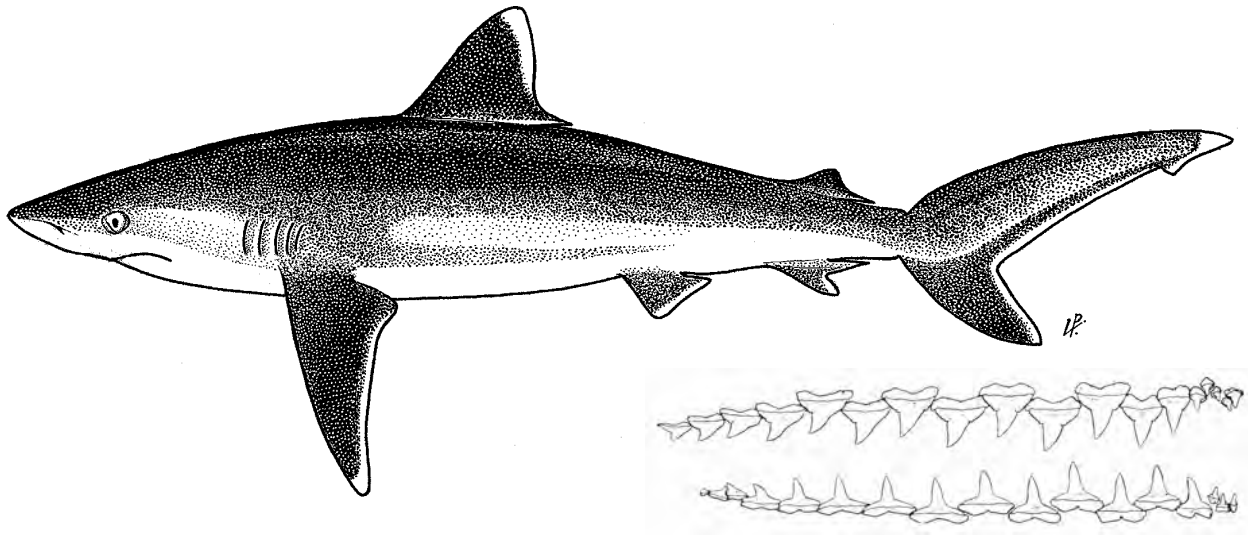
Loxodon : eye with posterior notch

Rhizoprionodon : long paired ridges before anal fin; anal fin origin distinctly before origin of second dorsal fin.

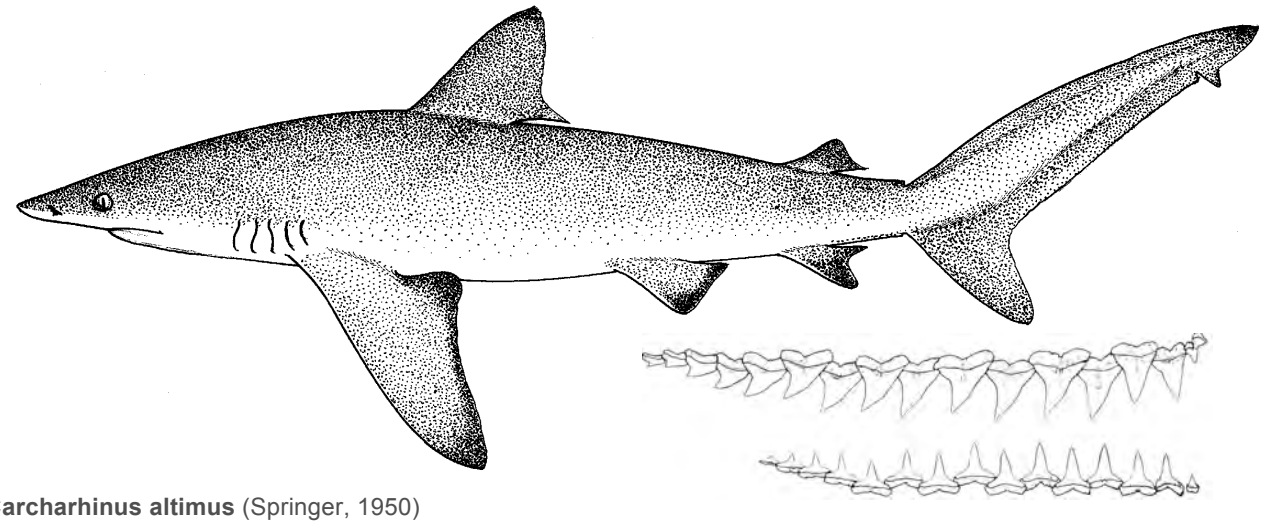
Prionacae : papilla-like gill rakers; weak keels on side of caudal peduncle back brilliant blue.

Glyphis : lower teeth long, hooked, protruding when mouth closed.

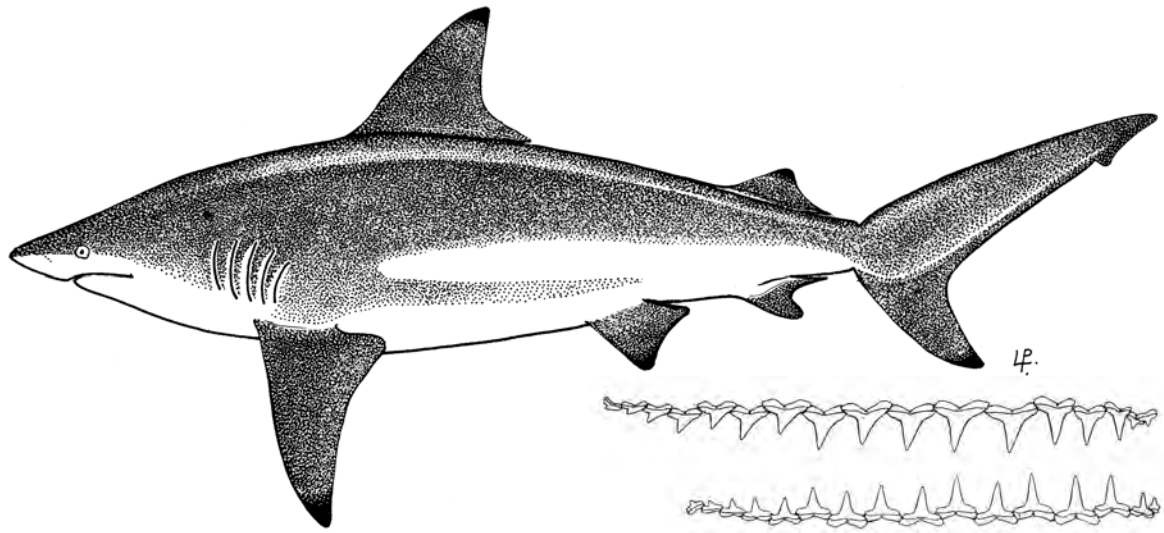
Carcharhinus : anal fin origin at most only a little before origin of second dorsal fin; no papilla-like gill rakers; lower teeth not protruding when mouth closed.



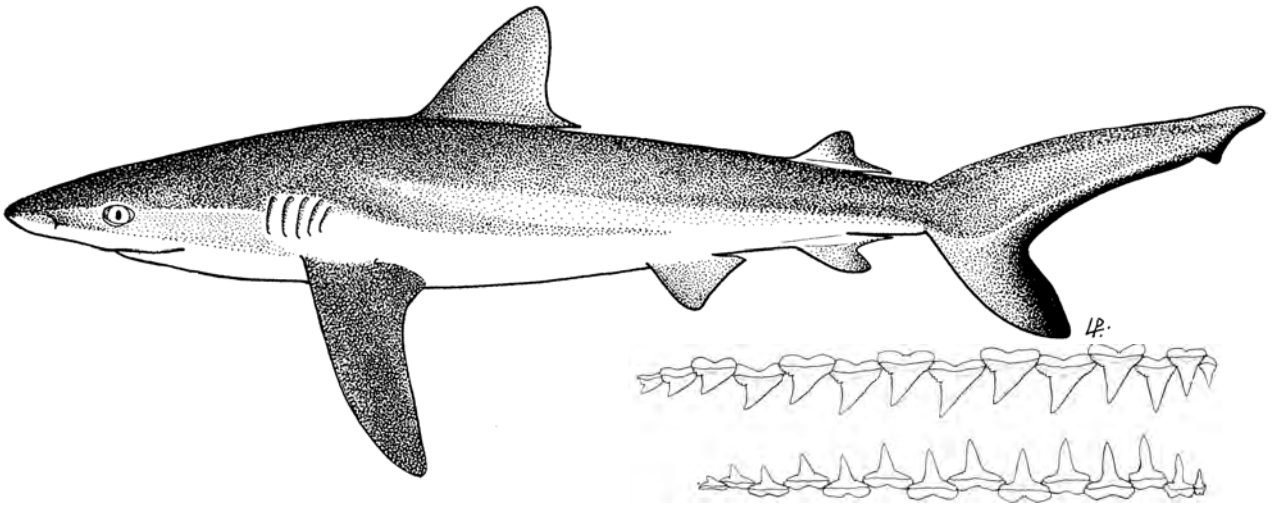
Carcharhinus albimarginatus (Rüppell, 1837)
Snout moderately long and parabolic. Upper teeth broadly triangular and erect at front of mouth. Second dorsal fin moderately high; dermal ridge between dorsal fins. All fins have white tips and white hind margins.



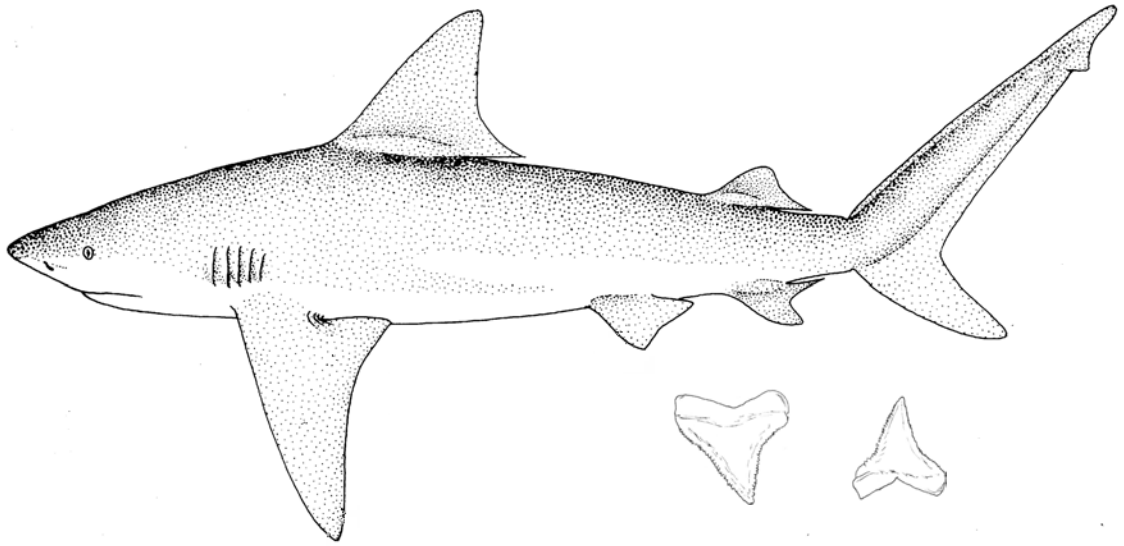
Carcharhinus altimus (Springer, 1950)
Snout rounded and rather long. Upper teeth broadly triangular and erect at front of mouth. First dorsal fin moderately high, with a narrowly rounded apex, its origin over inner margins of pectoral fins; pectoral fins long and not strongly falcate; high dermal ridge between dorsal fins.



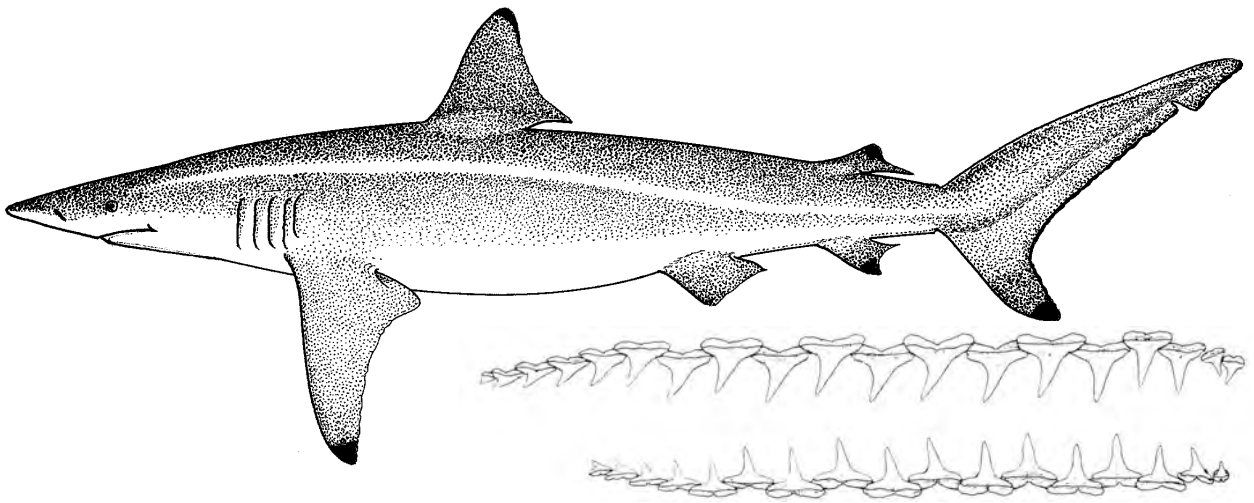
Carcharhinus amblyrhynchoides (Whitley, 1934)
Snout short but pointed, less than mouth width. Upper teeth with a narrow cusp, no prominent cusplet. First dorsal fin moderately high. No dermal ridge between dorsal fins.



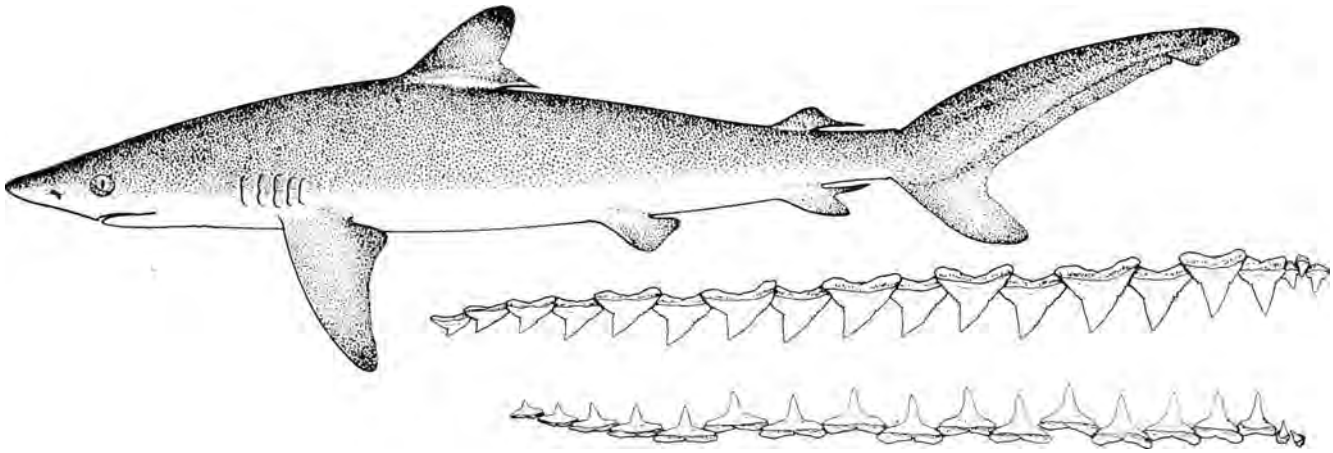
Carcharhinus amblyrhynchos (Bleeker, 1856)
Snout broadly rounded, less than mouth width. Upper teeth narrowly triangular, high, erect at front but becoming oblique further back. Dermal ridge between dorsal fins weak or absent. Posterior margin of caudal fin distinctly blackish.



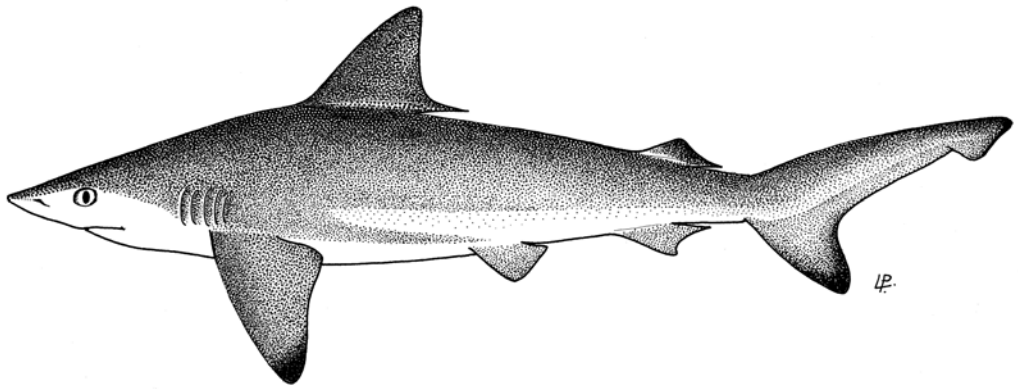
Carcharhinus amboinensis (Müller & Henle, 1839)
Body rather stout, snout short. Upper teeth triangular, with a broad, heavy, serrated cusp. First dorsal fin very high, second dorsal fin low. No dermal ridge between dorsal fins.



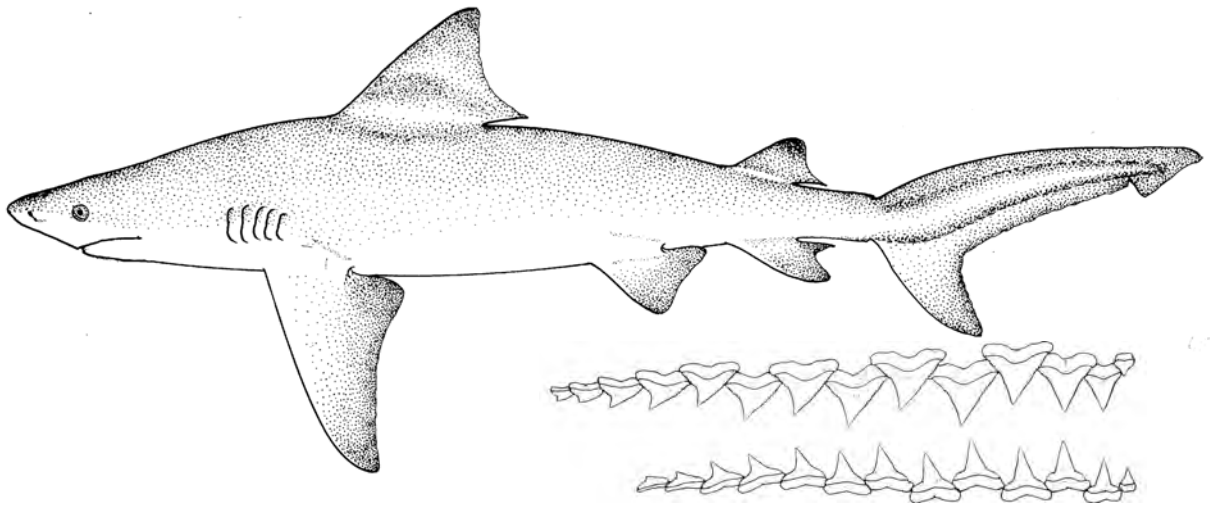
Carcharhinus brevipinna (Müller & Henle, 1839)
Snout pointed and long. Upper and lower teeth nearly symmetrical and very similar, cusps narrow, serrated in upper jaw, smooth in lower. Gill slits relatively long. Origin of first dorsal fin above or slightly behind free hind tips of pectoral fins. Pectoral fins short, 13.5-16% TL. No dermal ridge between dorsal fins.



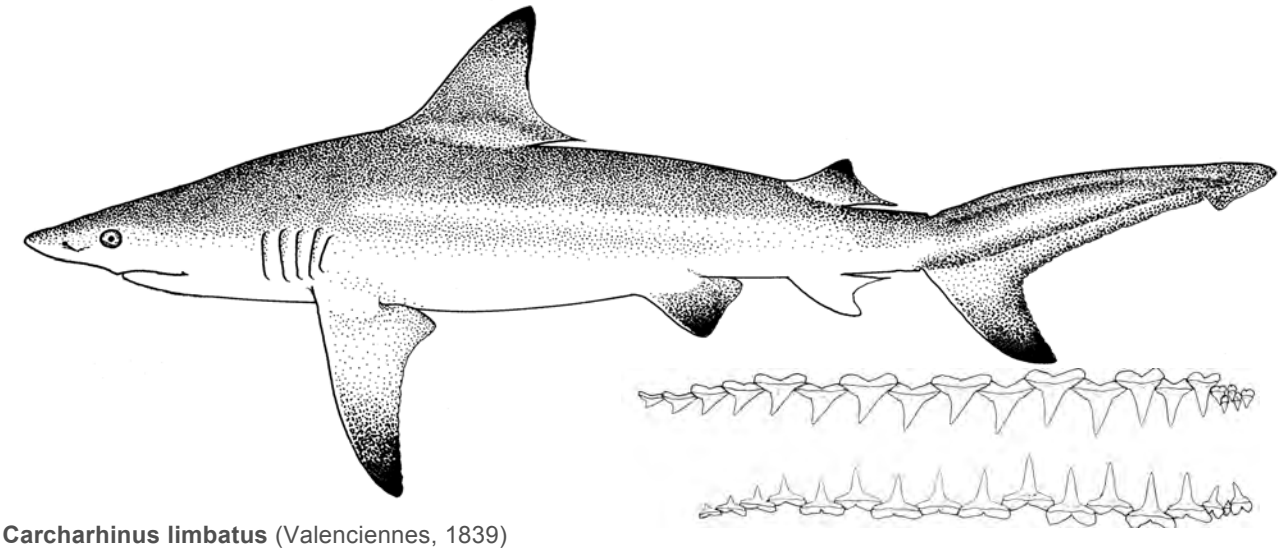
Carcharhinus falciformis (Bibron, 1839)
Body rather slender. Snout moderately long, narrowly rounded. Upper teeth with a narrow serrated cusp, well delimited from broad and serrated base. Origin of first dorsal fin a little behind free hind tips of pectoral fin; inner margin of second dorsal fin twice the length of the fin. A dermal ridge between dorsal fin.



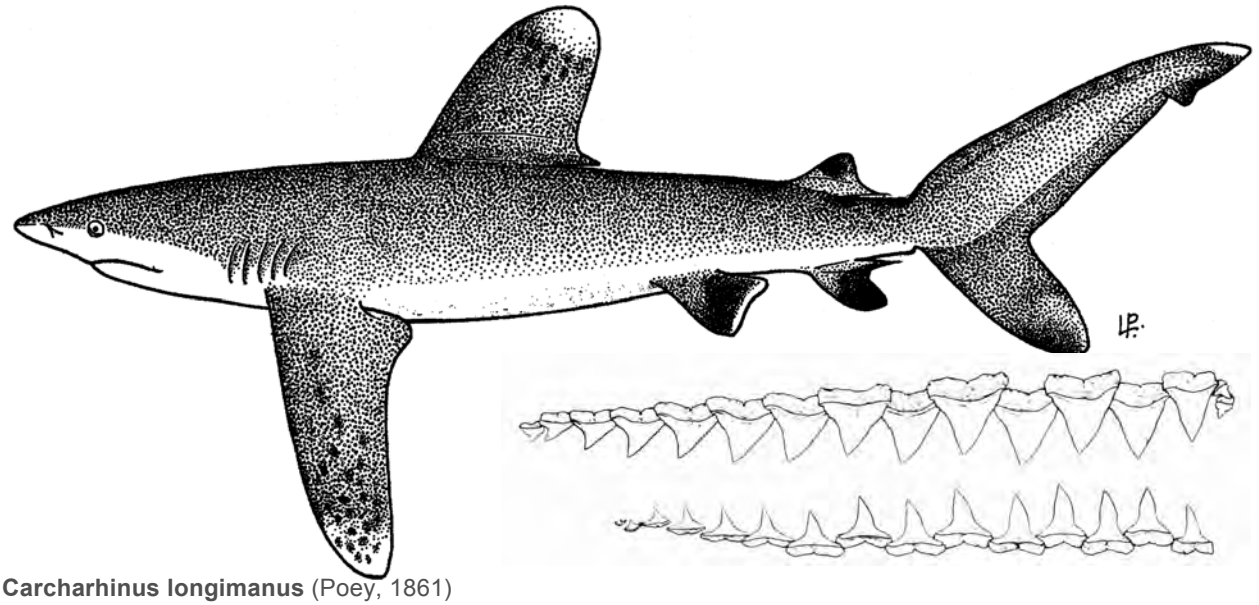
Carcharhinus hemiodon (Valenciennes, 1839)
Snout moderately pointed and parabolic. Upper teeth with a more or less oblique, narrow, smooth or weakly serrated cusp and strong cusplets. Inner margin of second dorsal fin elongated, but less than twice length of fin. A dermal ridge between dorsal fins.
Note: *C. hemiodon* is a very small and extremely rare shark. Specimen was not kept, so this is an uncertain record.



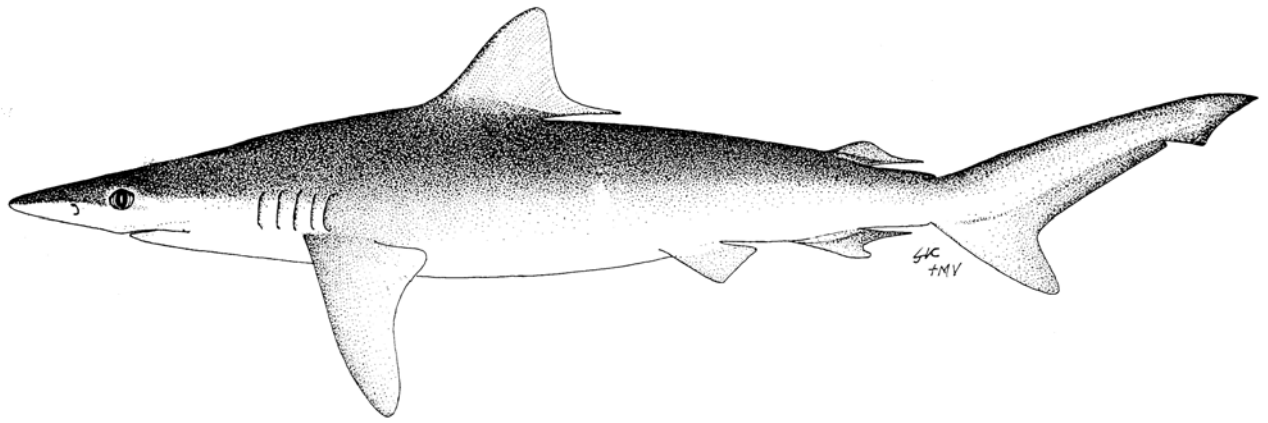
Carcharhinus leucas (Valenciennes, 1839)
Snout extremely short and broadly rounded. Upper teeth triangular, with a broad, heavy, serrated cusp. First dorsal fin high and broad with a slightly rounded apex, its origin over base of pectoral fins; pectoral fins broad, with narrow pointed tips. No dermal ridge between dorsal fins.



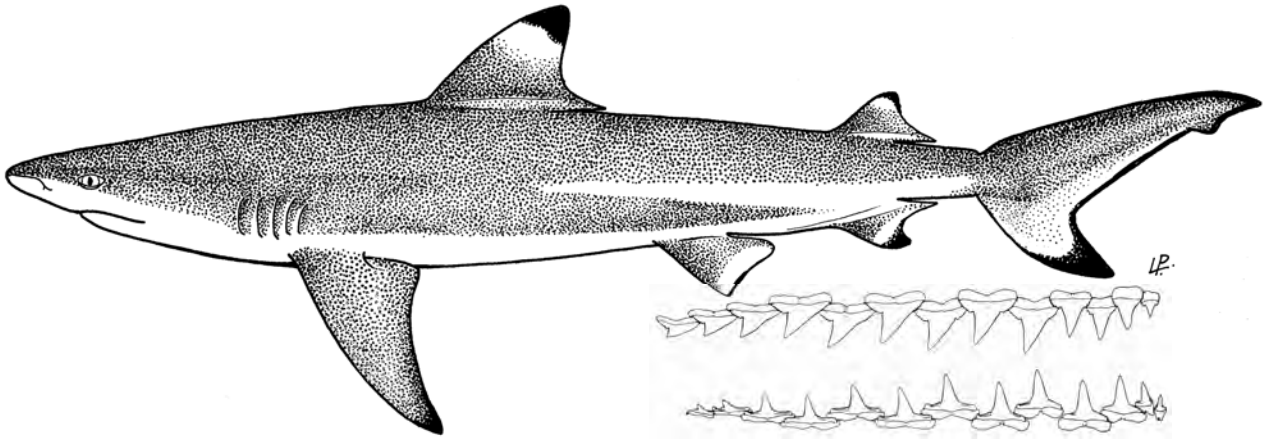
Carcharhinus limbatus (Valenciennes, 1839)
Snout long. Upper and lower teeth nearly symmetrical, with erect, narrow and serrated cusps. First dorsal fin more or less pointed, its origin above or just behind pectoral fin base. No dermal ridge between dorsal fins. Dark band along flank to about ventral fins, tips of latter consistently black. (Species may include *C. tilstoni.* White pers comm. 2019).



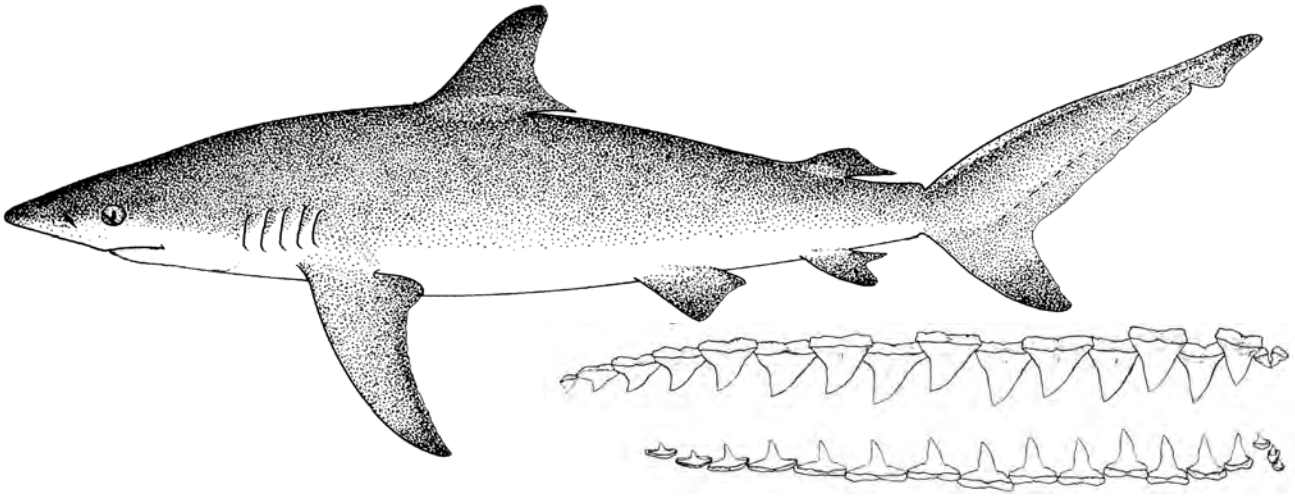
Carcharhinus longimanus (Poey, 1861)
Snout short and broadly rounded. Upper teeth triangular, with a broad heavy, serrated, mostly erect cusp. First dorsal fin noticeably large, with a broadly rounded apex; pectoral fins very long, tips broadly rounded. A dermal ridge between dorsal fins.



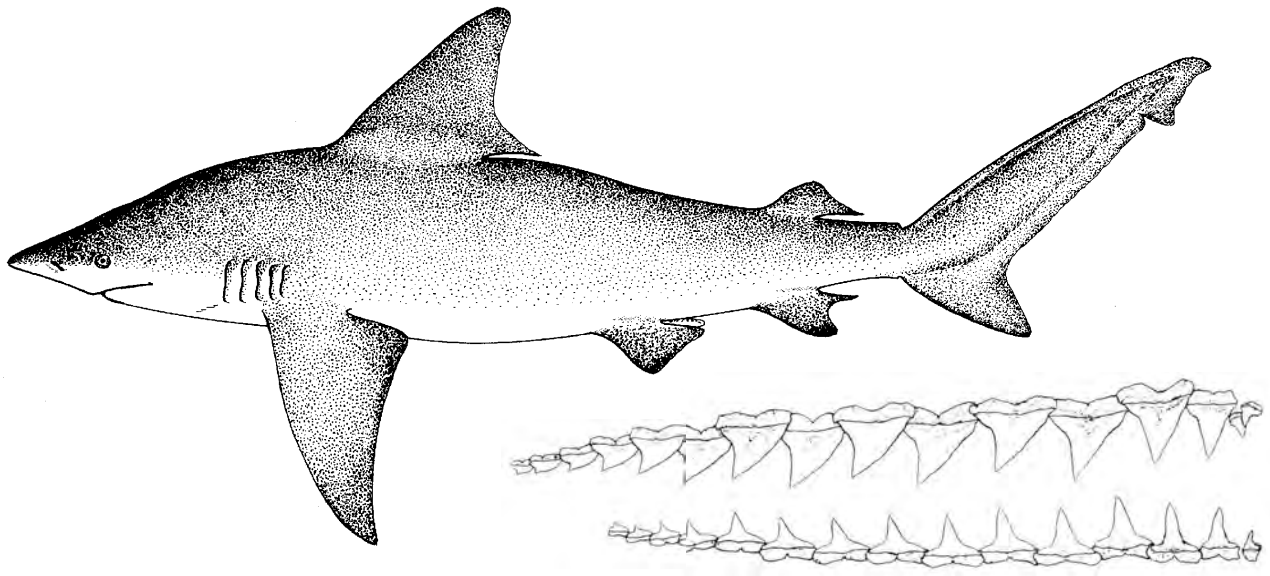
Carcharhinus macloti (Müller & Henle, 1839)
Snout very long and narrowly rounded or pointed. Teeth with smooth edges, those in upper jaw with an oblique or nearly erect cusp flanked by strong cusplets. Lower tip of first dorsal fin very elongated; second dorsal fin very low, inner margin more than twice fin length. No dermal ridge between dorsal fins.



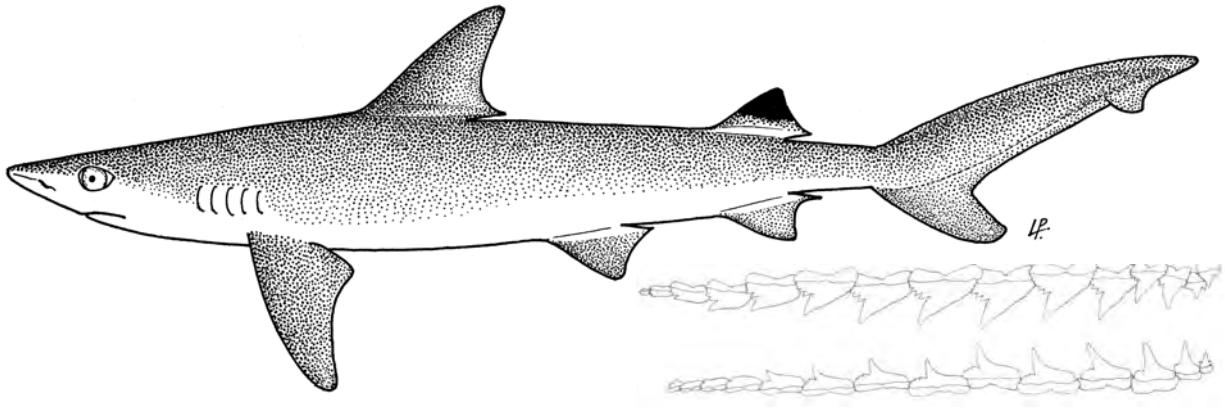
Carcharhinus melanopterus (Quoy & Gaimard, 1824)
Snout very short and broadly rounded, its length less than mouth width. Upper teeth more or less oblique, with a narrow cusp and low basal cusplets. Second dorsal fin fairly high. No dermal ridge between dorsal fins. Back yellow-brown; all fins with black tips, that of first dorsal fin with a whitish band below.



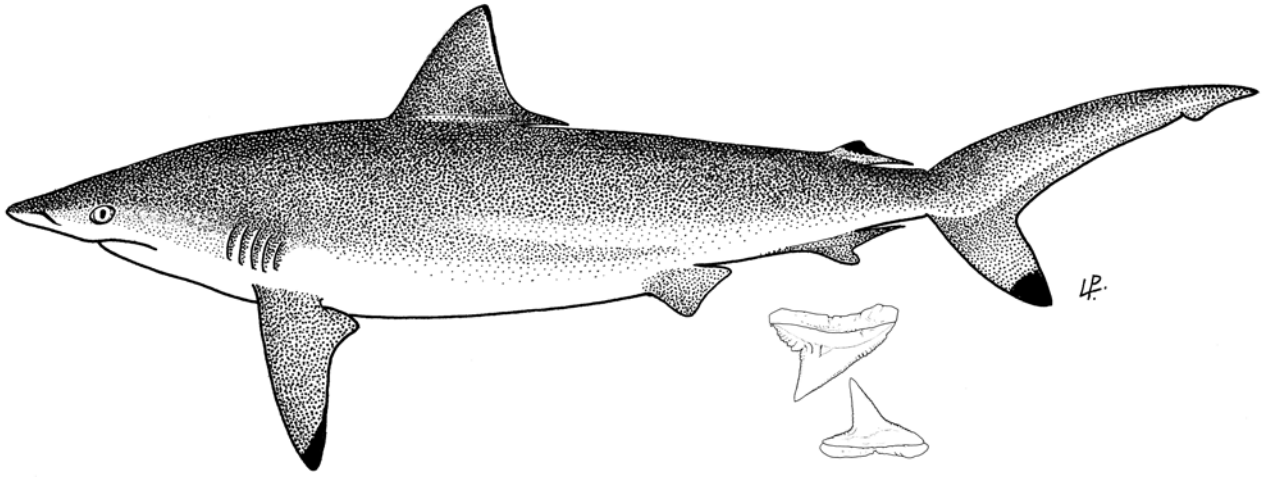
Carcharhinus obscurus (Lesueur, 1818)
Snout short and rounded, its length less than mouth width. Upper teeth broadly triangular. First dorsal fin relatively small, its front margin arched; second dorsal fin low. A low dermal ridge between dorsal fins.



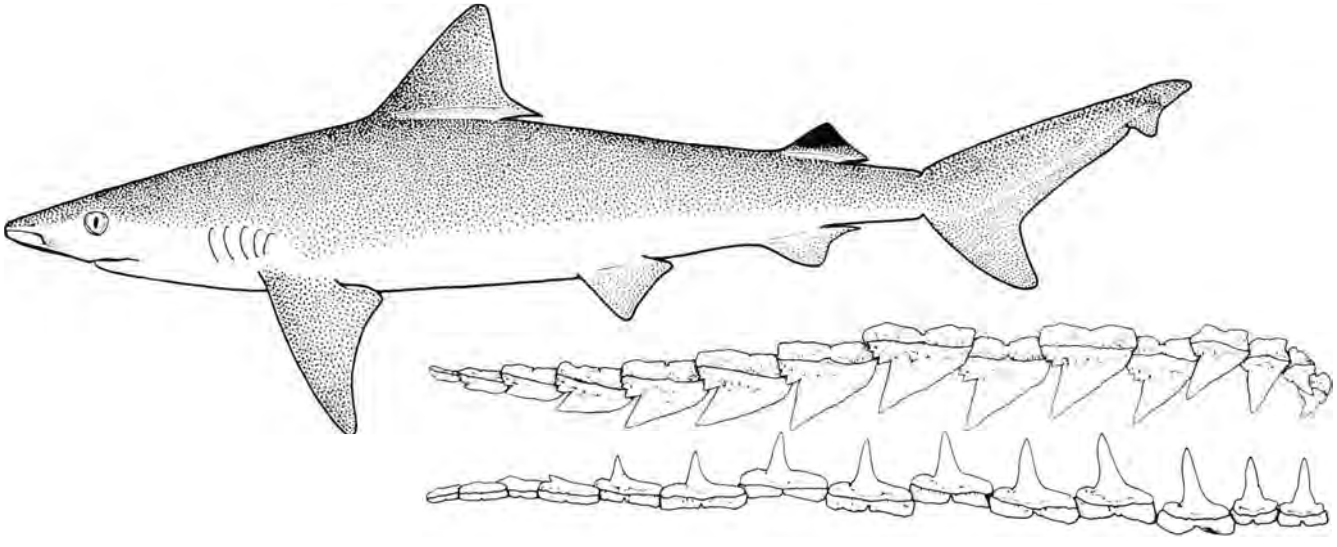
Carcharhinus plumbeus (Nardo, 1827)
Snout short and broadly rounded, its length less than mouth width. Teeth with finely serrated edges, those in upper jaw broadly triangular. First dorsal fin very high and triangular, its origin over base of pectoral fins. A dermal ridge between dorsal fins.



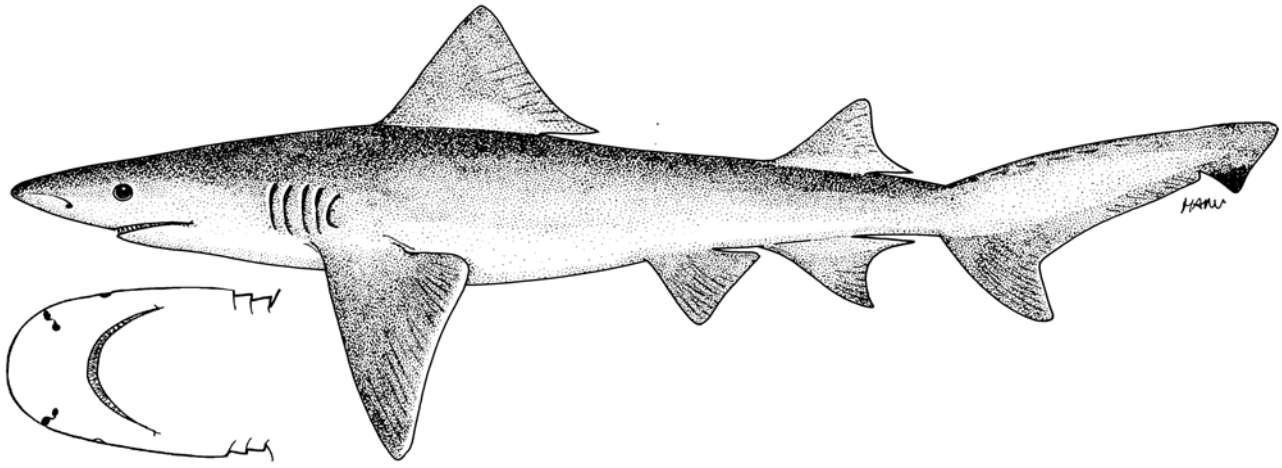
Carcharhinus sealei (Pietschmann, 1913)
Snout rather long and narrow parabolic or wedge-shaped. Teeth with serrated edges, those of upper jaw with a narrow based, strongly oblique cusp and strong, smooth cusplets. First dorsal fin moderate, second dorsal fin high. A dermal ridge between dorsal fins. Top of second dorsal fin with black spot. (Australian species now *C. coatesi* - previously called *C. dussumieri*. W. White pers. comm. 2009)



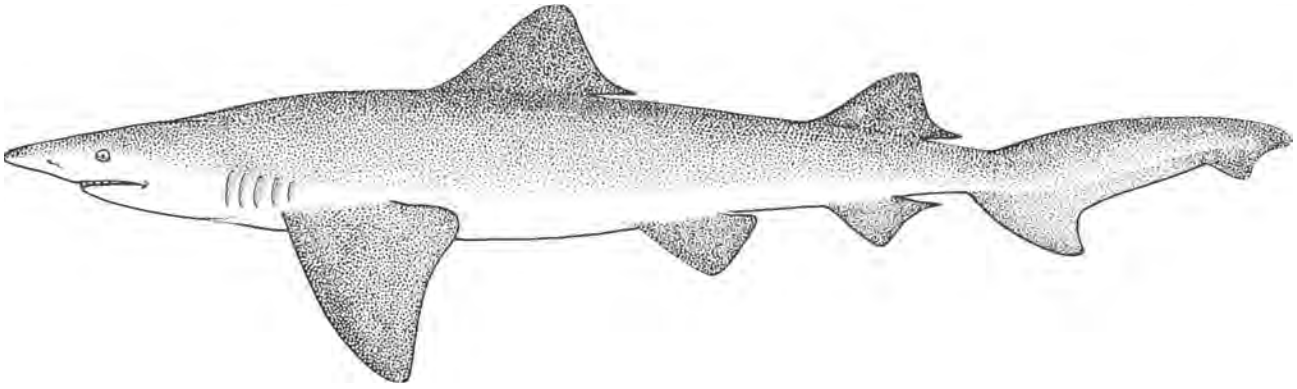
Carcharhinus sorrah (Valenciennes, 1839)
Snout moderately pointed, parabolic and long. Upper teeth with a more or less oblique, narrow, serrated cusp and strong cusplets. Second dorsal fin low, with elongate lower tip over twice fin height. A dermal ridge between dorsal fins. Pectoral, second dorsal and lower caudal fin lobe black.



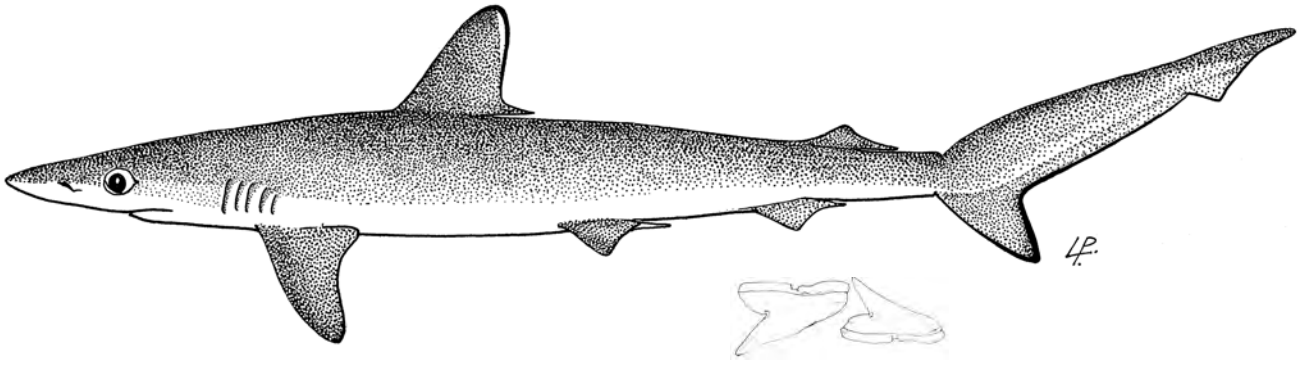
Carcharhinus tjutjot (Bleeker, 1852)
Snout moderately long and broadly parabolic or wedge-shaped. Upper teeth with a narrow-based strongly oblique cusp and strong, serrated cusplets. First dorsal fin not falcate. A dermal ridge between dorsal fins (occasionally absent). Black spot on second dorsal fin.



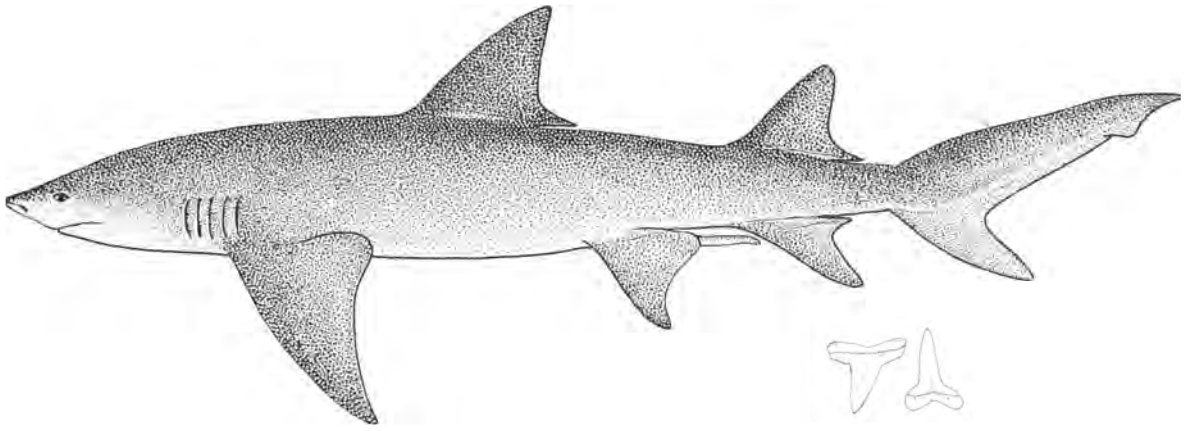
Glyphis garricki Compagno, White & Last, 2008 or ***G. glyphis*** (Müller & Henle, 1839)
Snout short, rounded, less than mouth width; eyes very small. Upper teeth triangular, with a broad, high, serrated cusp; lower teeth long, hooked, protruding when mouth closed. Origin of first dorsal fin over pectoral fin base. No dermal ridge between dorsal fins.



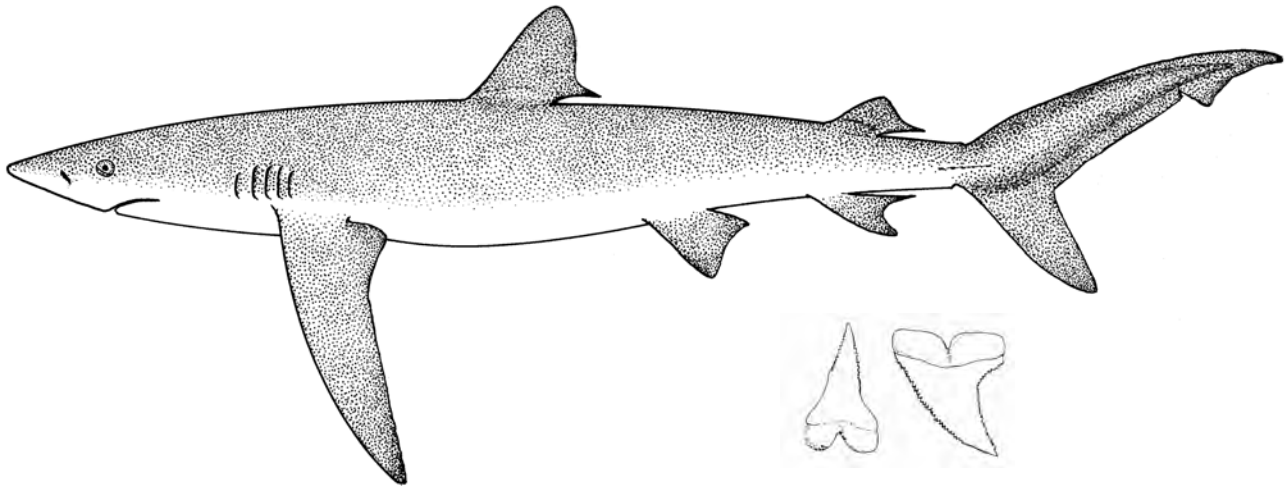
Lamiopsis tephrodes (Fowler, 1905)
Snout moderately long, parabolic in shape. Upper teeth broadly triangular, erect or semi-oblique, serrated, no cusplets; lower teeth slender, erect, hooked, smooth, no cusplets. Second dorsal fin almost as large as first. No dermal ridge between dorsal fins.



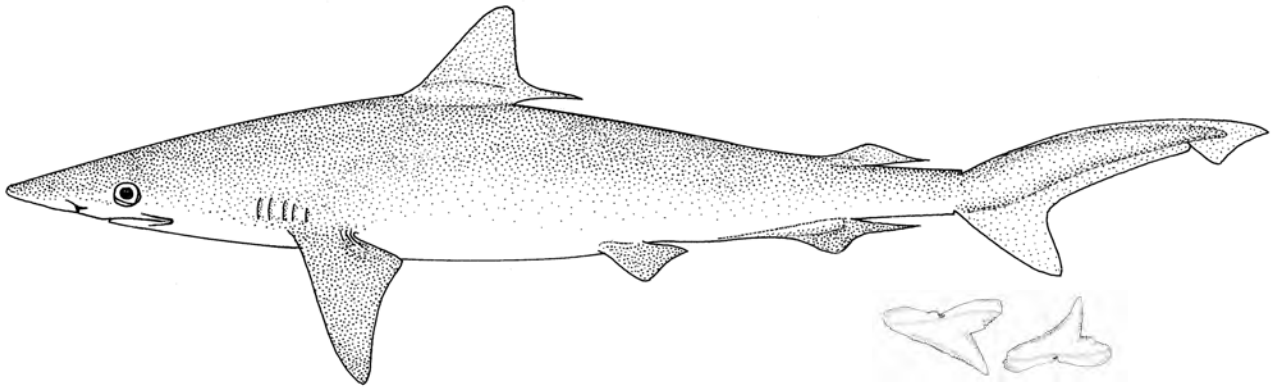
Loxodon macrorhinus (Müller & Henle, 1839)
Small, slender species (usually to about 70-80 cm TL.). Snout very long, parabolic in shape; hind edge of eye with distinct notch. Teeth low, cusp narrow, oblique, smooth, no cusplets. First dorsal fin small, second dorsal fin beginning just behind anal fin base. Usually no dermal ridge between dorsal fins.



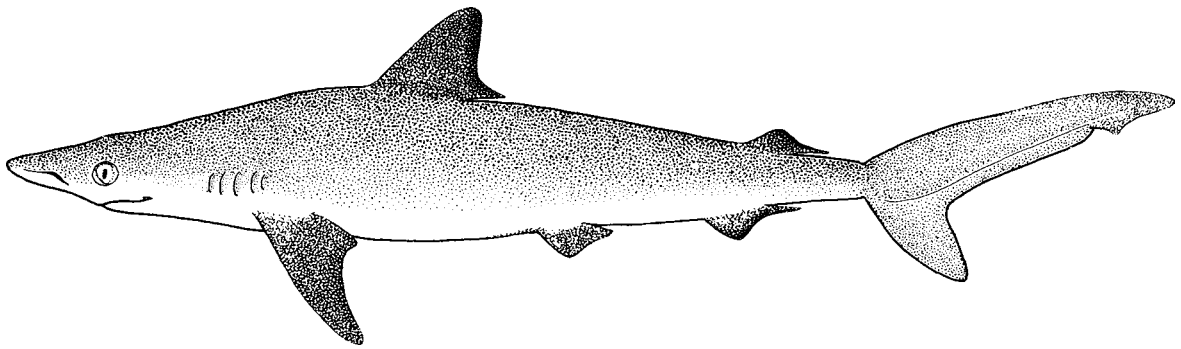
Negaprion acutidens (Rüppell, 1837)
Snout short, broadly rounded. Teeth narrow, erect at front of jaws, becoming oblique, cusps smooth-edged, no cusplets. Second dorsal fin almost as large as first. No dermal ridge between dorsal fins.



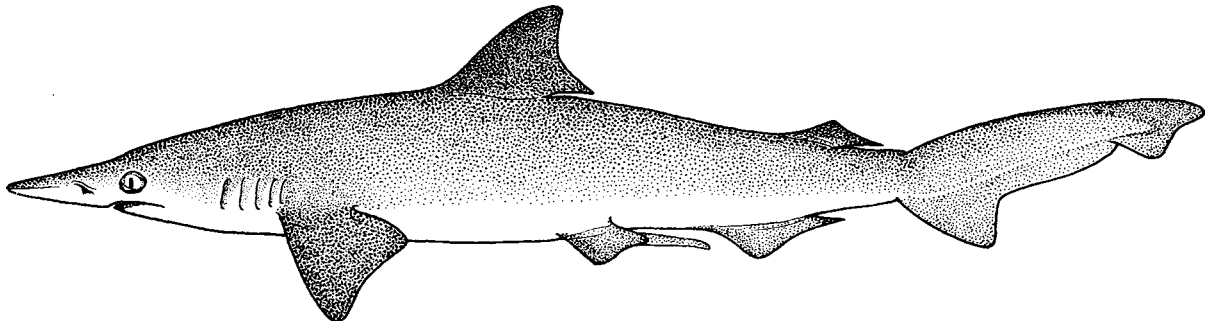
Prionace glauca (Linnaeus, 1758)
Body very slender; snout long and narrow rounded. Upper teeth broadly triangular, curved, serrated. Inner gill arches with gillraker papillae (visible through open mouth). Pectoral fins very long, narrow, somewhat falcate. A weak keel on either side of caudal peduncle. Back dark blue, sides bright blue.



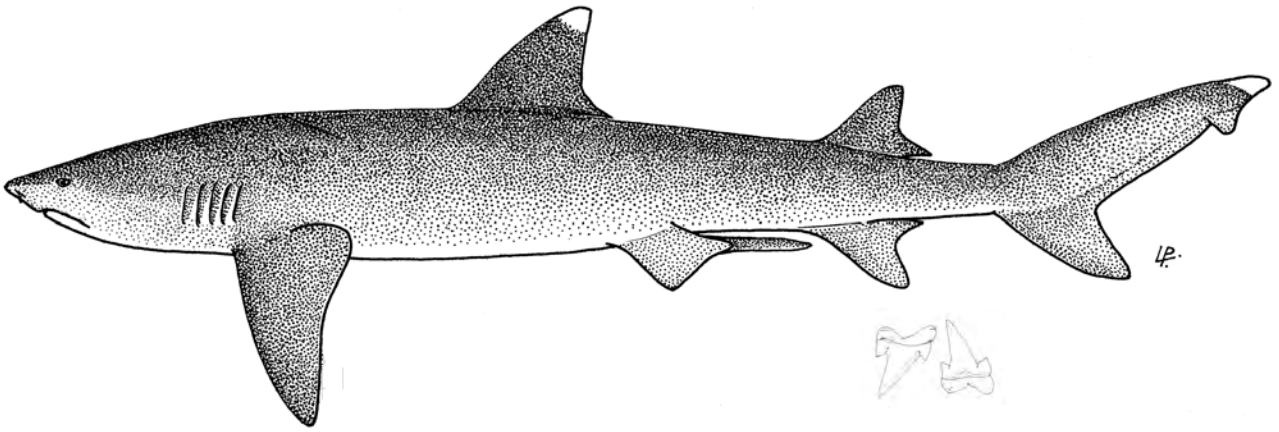
Rhizoprionodon acutus (Rüppell, 1837)
Small slender species (usually to about 60-70 cm TL.). Teeth low-crowned, oblique, narrow-cusped, outer edges deeply notched, no cusplets. Second dorsal fin smaller than anal fin, origin of latter distinctly before former; long paired ridges before anal fin.



Rhizoprionodon cf taylori (Ogilby, 1915)
Snout long with a narrowly-rounded tip, small labial furrows confined to the corners of the mouth, and 7-11 pores on either side of the mouth; eye relatively large; interdorsal ridge occasionally present; origin of second dorsal fin behind origin of anal fin. Jaw teeth deeply notched, oblique and narrowly triangular with smooth edges.



Scoliodon macrorhynchos (Bleeker, 1852)
Snout long and extremely flattened; slender body and tail; smooth-edged teeth with slender, strongly oblique, blade-like cusps and no cusplets; anterior teeth strongly sexually dimorphic, for adult males greatly elongate and flexuous; total tooth row counts 25-28/23-28 rows or 48-56 total rows; second dorsal fin origin well posterior of anal fin origin, about opposite posterior third of anal-fin base;



Triaenodon obesus (Rüppell, 1837)
Snout very short, broadly rounded, less than mouth width. Teeth with a high, narrow, smooth-edged cusp and strong cusplets on each side, no serrations. Second dorsal fin large, more than half height of first. No dermal ridge between dorsal fins. Tips of first dorsal fin and upper caudal fin lobe white.

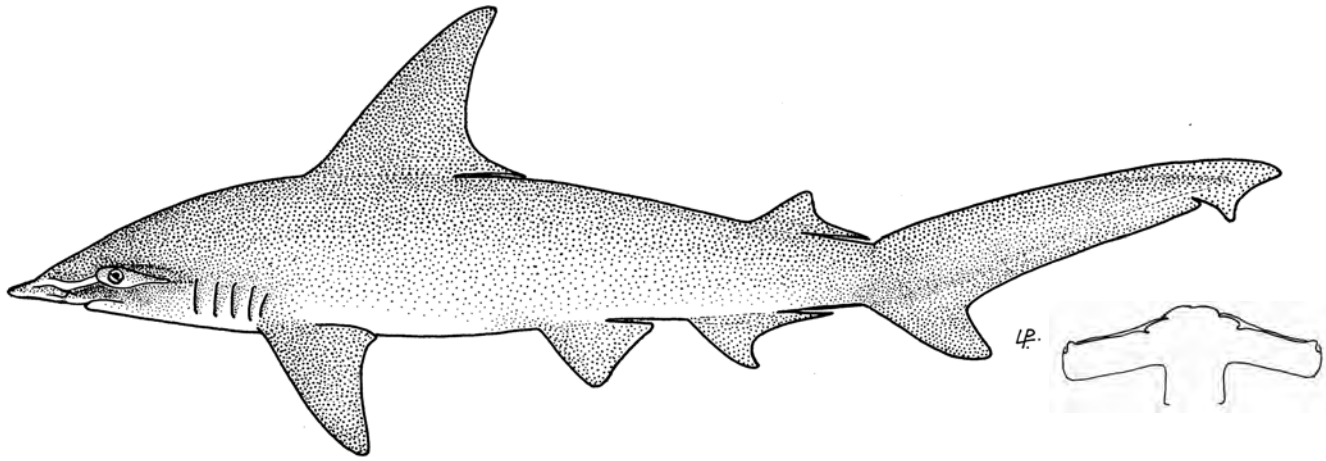
SPHYRNIDAE

Hammerhead sharks - Cucut martil

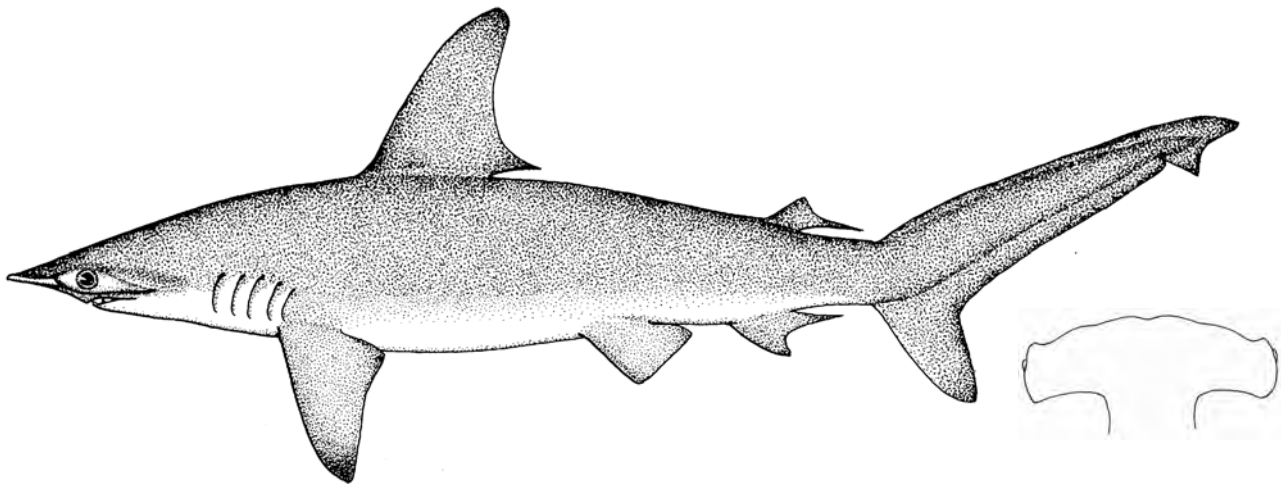
Medium to large sharks (to 600 cm, possibly more), found in all warm seas. Body elongate and moderately slender. Front of head greatly flattened and expanded into 'hammer' or 'spade' shape, the eyes at outer edges. Mouth ventral, crescentic, teeth blade-like, with a single cusp. Five gill slits, the last over pectoral fins. Two dorsal fins, the first short-based, high and well before ventral fins, the second much smaller, anal fin present, a little larger than second dorsal fin; caudal fin strongly asymmetrical, but lower lobe well defined. Hammerhead sharks are viviparous (give birth to fully-formed young which have been nourished by a 'placenta' formed from the yolk sac). Species often placed in a single genus, *Sphyrna*, but recent work suggests two genera in the present area.

Eusphyra : expanded lateral blades of head very narrow and wing-like, with distinct bumps along front edge.

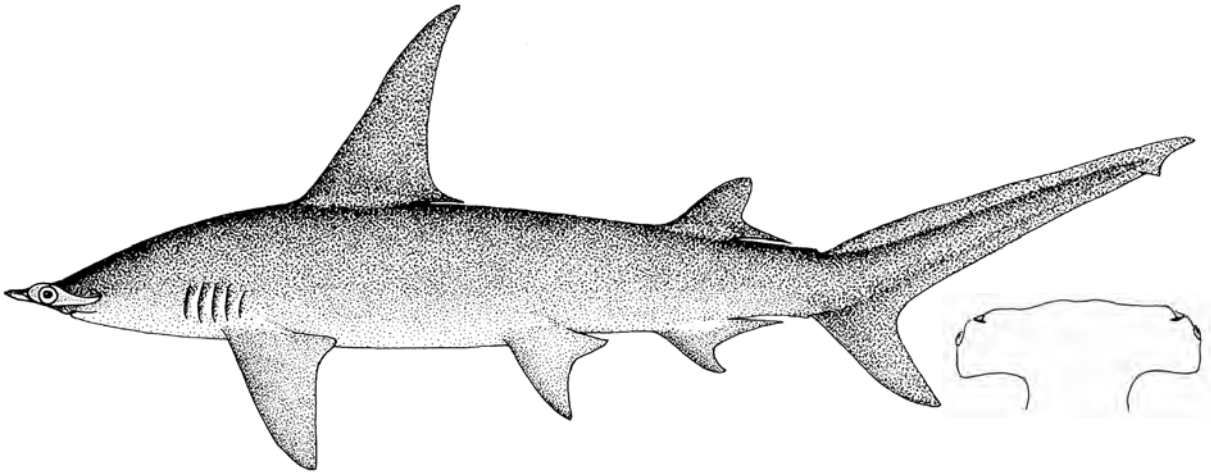
Sphyrna : expanded lateral blades of head relatively broad, not wing-like, without anterior bumps.



Eusphyra blochii (Cuvier, 1816)
Lateral expansion of head wing-like, somewhat resembling an aeroplane when seen from above or below, the wings long and narrow; front edge of expansion with distinct bumps; nostrils greatly elongated, wider than mouth. First dorsal fin high and falcate.



Sphyrna lewini (Griffith & Smith, 1834)
Lateral expansion of head more or less arched in front, with a shallow but distinct indentation at centre. Ventral fins with nearly straight hind margin; anal fin base distinctly longer than second dorsal fin base.



Sphyrna mokarran (Rüppell, 1837)
Lateral expansion of head more or less straight in front, with a shallow but distinct indentation at centre. First dorsal fin strongly falcate; ventral fins with deeply concave hind margin.

RAYS (BATOIDEA)

The batoid fishes are distinct from the sharks by having the pectoral fin attached to the side of the head, no free upper eyelid, the 5 (rarely 6) gill openings ventrally placed and well-developed spiracles. Most batoids have a very depressed body with the pectoral fins expanded sideways, giving a disc-like shape, and the tail marked off from the rest of the body. Eyes and spiracles are on the dorsal surface, mouth on the ventral surface. The sawfishes (PRISTIDAE) and less so the other four families (RHINIDAE to TRYGONORRHINIDAE) have a shark-like body but the position of the gill openings and pectoral fins indicate their affinity with the remaining batoid fishes. Within the group, there is no anal fin, a caudal and dorsal fin(s) are present or absent, the ventrals are expanded sideways; the cloaca is separate from the ventral fins and the skin is naked, prickly or with tubercles or thorns.

Representatives of 18 of the 26 families of batoid fishes were obtained during the JETINDOFISH Survey. Initial identification of this material was more than difficult, for a number of reasons. There were problems encountered during the Survey itself (larger specimens were photographed only on the dorsal surface and then often discarded because of insufficient storage facilities; many specimens were also mutilated after capture); and many specimens could not be identified within the project time-frame.

Dr. William White, Dr. Peter Last, and Mr. John Pogonoski all provided exceptional assistance with identification for this update.

REFERENCES: Last, 2004; Last, White, de Carvalho, Seret, Stehmann & Naylor, 2016; Last, White & Fahmai, 2006; Last, White & Pogonoski, 2008; Last & Gomon, 1987; Notarbartolo-di-sciona, 1987; Last, 1987; Finucci, White, Kemper & Naylor, 2018.

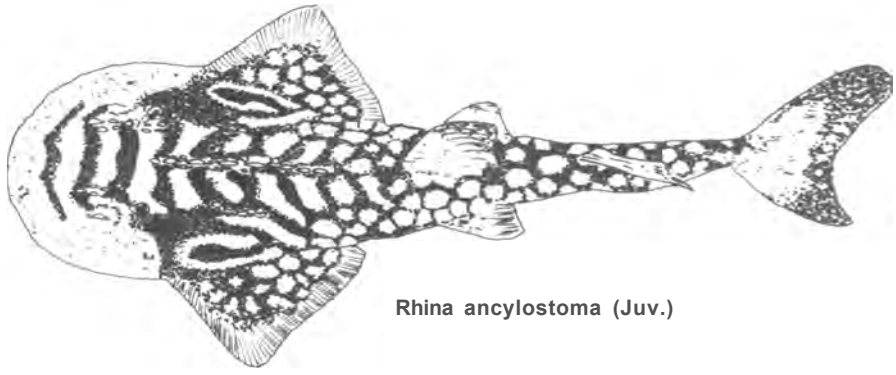
RHINIDAE

Wedgefishes - Napeh, Kekeh

These rays have moderately depressed body and thick powerful tail which is slightly longer than the rest of the body. The snout is narrow and pointed and moderately large. The pectoral fins are angled out from the head and are well separated from anterior margin of pelvic fins. The first of two well-developed, triangular dorsal fins begins above or just before the ventral fin bases. Two distinct pointed lobes form the caudal fin which has a concave posterior margin. There are 2 low vertical ridges or skin folds along the hind border of the spiracles, mouth is small and horizontal. A process at the middle of the lower jaw fits into an opposing notch on the upper jaw when the mouth is closed.

The family comprises three genera and 10 species. Two genera, three species found in the survey area.

Size: attains nearly 3 m in length.



Rhina ancylostoma (Juv.)

Rhina ancylostoma Bloch & Schneider, 1801

Eye slightly smaller than spiracle; nostril large and oblique; row of enlarged, coarse tubercles along midline of back, additional rows along shoulder and above eye. Adults plain brown, sometimes with few white spots and dark lines; juveniles grey-blue with bold pattern of white and blue lines and spots, black shoulder spot and rosy caudal fin. Material: TGT1379 (from 08° 46'S., 115° 02'E.); drawing of juvenile specimen from Area C (not kept); CSIRO CA2983; determined by P. Last & CSIRO. Areas A, B, C.

Rhynchobatus australiae Whitley, 1939

Large eyes placed just before smaller spiracles; nostrils large and oblique; many tubercles in a row along midline of back and tail, patches of tubercles on each shoulder. Dorsal surface yellowish to dark brown, large dark brown or black spot on each shoulder, white spots along disc margin and side of tail.
Material: TGT3184 (from 08º 58'S., 116º 31'E.) and TGT2567 (from 01º 57'S., 99º 26'E.), det by M. Stehmann, P. Last & CSIRO on photo. Areas A, B, C.

Rhynchobatus palpebratus (juv)

Rhynchobatus palpebratus Compagno & Last, 2008

It is distinguished by its broader snout and usually a ring of 4 white spots around the black shoulder spot. Dorsal surface dark yellowish or greyish. Thorns very small and partly embedded along midline.
Material: CSIRO CA2373. (13ºS, 136ºE, det by L. Compagno & P. Last. Area C.

RHINOBATIDAE

Guitarfishes; Shovelnose rays - Kekeh

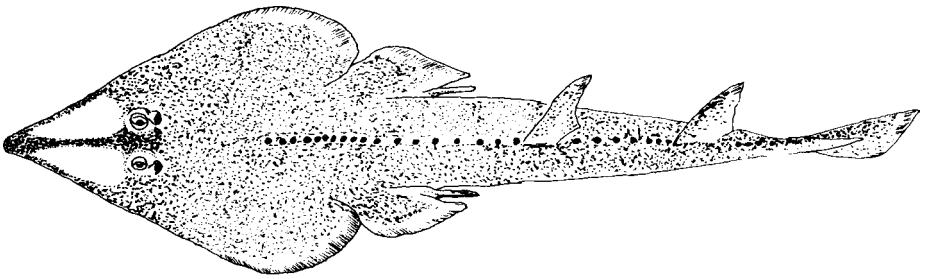
These rays are similar to the RHINIDAE in possessing a long, thick and powerful tail and 2 well-developed dorsal fins, however, the trunk is strongly depressed. They can be distinguished by the pectoral fin extending backwards as far as or farther than the pelvic fin origin, the first dorsal fin originating noticeably behind the posterior tip of the ventral fin and the well-developed caudal fin without a distinct lower lobe. The snout is wedge-shaped, either obtuse or prolonged; mouth and upper lip almost straight. Large nostrils not greatly elongated, length usually only just exceeding inter-nasal distance; anterior nasal opening circular or oval.

Size: 1.2m -2m in length.

A large family of three genera and 35 species. We obtained a poor sample of rhinobatid fishes but from the photographs and few specimens examined, it appears that only *Rhinobatus* is represented in the Survey material:

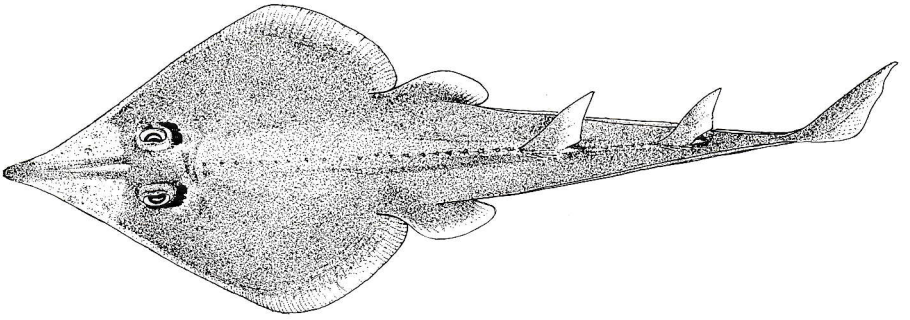
Rhinobatos sainsburyi Last, 2004

Body pale yellowish brown dorsally, with dense cover of faint dusky blotches (blotches sometimes absent or more golden); somewhat paler near hind margin of pectoral fin; paler yellowish to white on lateral snout, anterior edge of orbit, lateral cutaneous fold of tail, and between ridges of rostral cartilage; nasal capsules not sharply demarcated from lateral snout; snout tip and fins plain. Ventral surface uniformly white; no dark tip on snout apex.
Material: CSIRO CA2863 (from 18º 20'S., 118º 27'E.). CSIRO CA1257 (from 19º 50'S., 115º 59'E.). TGT (PJPW) 803. det W. White. Area A, C.



Rhinobatos sp. cf jimbaranensis Last, White & Fahmi, 2005

Dorsal surface brown, speckled dark and light; front nostril valve not extending inwards much past level of inner nostril edge; snout long; rostral ridges close together for most of their length; mouth width 3.5 in snout length. Indonesian only, not occurring in Australia (W. White pers. comm. 2019). det. P. Last



Rhinobatos sp.1

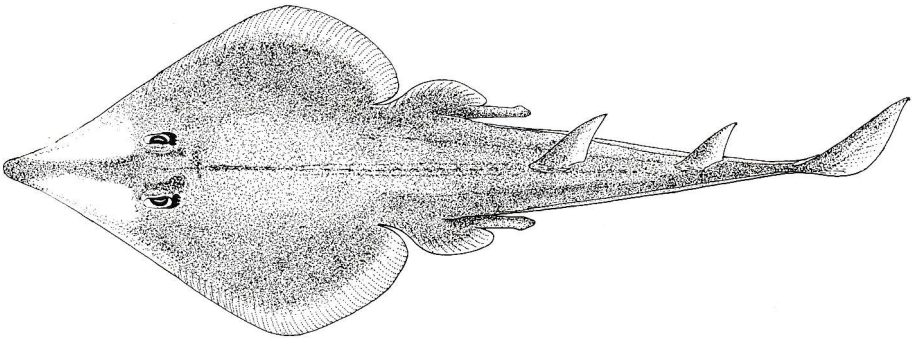
Plain brown dorsal surface, fins light brown. It is possible that this specimen is a female of *R. jimbaranensis.* Material: TGT2606 (from 08º 33'S., 114º 31'E. Area A, B. (det PK on drawing.

GLAUCOSTEGIDAE

Giant Guitarfishes -

Large rays with a flattened, spade-like to wedge-shaped disc with a robust, depressed shark-like trunk. Mouth and upper lip almost straight. Nostrils relatively oblique; long and narrow, length greatly exceeding internasal distance; anterior nasal opening retangular. Skin covered with fine denticles with small thorns along mid-line of body and on patches near eyes and shoulder. The small caudal fin lacks a ventral lobe. Colour is plain brownish or greyish with anterior craniun and rostral cartilage sharply demarcated from a much paler translucent snout. No stripes, spots or blotches.

Size: 2m to more that 3m
A single genus



Glaucostegus typus (Bennett, 1830)

Dorsal surface brown, side of snout and tail fins grey or fawn; front nostril valve extends well onto space between nostrils which is about equal to nostril length; snout very long, narrow, rostral ridges close together for most of their length; mouth width 2.6-3.3 in snout length.
Material: TGT 1659 (from 08º 57' S., 116º 57'E.). det. P. Last. Area B.

TRYGONORRHINIDAE

Banjo rays -

Small to large guitarfishes (with adults reaching 1.5 m TL) with a broad suboval or wedge-shaped disc and depressed trunk; snout very long and pointed or broadly rounded; spiracle with one well developed fold (*Trygonorrhina*) or single fold weak or absent (*Aptychotrema, Zapteryx*); nostrils is almost horizontal; mouth and upper lip distinctly curved; skin with medium-sized to very large thorns in row along midline of body; tail with well-developed lateral skin folds extending along its ventrolateral margin; ventral fins are short- to long-based; two dorsal fins well separated, first well to slightly behind rear tips of pelvic fins; small caudal fin, lacking an extended ventral lobe.

Aptychotrema vincentiana (Haacke, 1885)

Dorsal surface brown, hind spiracle margin smooth, without folds or ridges; nostrils transverse, lobes from their anterior margins well-separated. Nostrils slightly oblique, 2 spiracular folds feebly developed.
Material: CSIRO CA1259 (from 19º 38'S., 117º 44'E.). det. P. Last.

Aptychotrema timorensis Last, 2004

Characterised by narrow snout apex, disk width 48% TL, eye diameter = interorbital width, first dorsal fin 6% TL, caudal fin 12% TL; dorsal aspect of body with scattered white spots over brown dorsal surface, spines in rows and patches on disc, tail strong and compressed.
Material: CSIRO CA1258 (from 10º 14'S., 130º 03'E.). det. P. Last; BMNH unregistered - PJPW 103 (08º 45'S, 114º, 17'E). Area B, C. Holotype.

ARHYNCHOBATIDAE

Softnose skates -

Small to large rays with heart-shaped or rhomboid disc, pectoral fins broadly rounded to pointed, and a variably angular and flexible snout, sometimes with a prominent lobe at tip. Tail very slender, with lateral folds, usually 2 reduced dorsal fins and a reduces caudal fin. Electric organs weak, developed from caudal muscles. Skin prickly in most species, the prickles often in a row along midline of dorsal. Thorns usually present on tail.

REFERENCE: Last, Mallick & Yearsley, 2008:

Irolita westraliensis Last & Gledhill, 2008

Small skate with a smooth subcircular disc, rather long tail usually lacking orbital thorns, dense coverage of greyish pores ventrally and widely spaced bluish spots dorsally on brown skin. Snout very short, broad, flexible, lacking a firm rostral cartilage with a minute fleshy lobe at tip.
Material: CSIRO CA2800 from 19° 44'S., 117° 58'E., det. P. Last. Area C

RAJIDAE

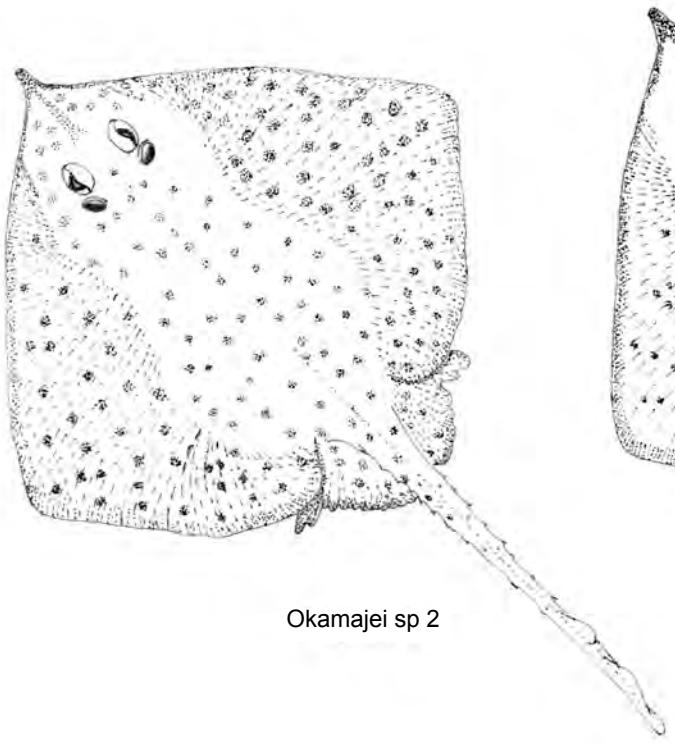
Skates, Hardnose Skates -

Members of the skate family have a rhomboid, sometimes almost circular disc and a narrow, often short tail. The 2 dorsal fins are small and placed near the blunt tail tip which lacks a caudal fin, or the caudal is represented by a low fold mostly on the dorsal tail surface. The large ventral fins are formed into 2 lobes. There is a definite snout supported by a strong rostral cartilage and not easily bendable. The nasal curtain from the small nostrils is large and joined to the median isthmus before the mouth. Rows of small spines and granules often cover the surface of the tail and mature males (with prominent claspers) have patches of sharp spines on the disc edge anteriorly. This is a widespread family with about 17 genera but several unnamed genera and species are known to exists.

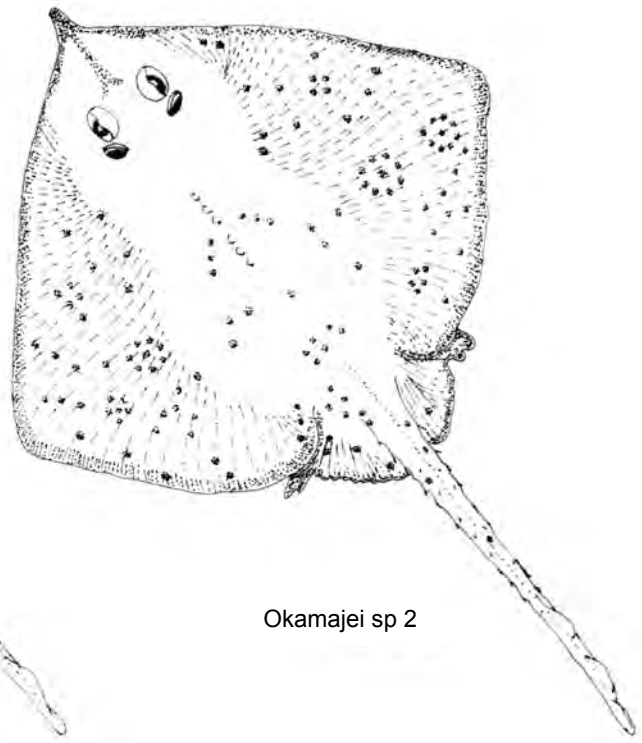
Although the Survey specimens of RAJIDAE are distinctive in their colouration. Most cannot easily be assigned to species because of insufficient comparative material.
Size: up to 1.7m in length.

Okamejei sp. 1

Dorsal surface brown with pattern of many fawn or grey spots and cream circular blotches; small circular cream ocellus edged black and surrounded by many white spots on inner part of each pectoral fin. No thorns on body behind shoulder. About 70 tooth rows in upper jaw.
Material: TGT3221 (from 09° 01'S., 116° 18'E., det. and diagnosed M. Stehmann, ZMH 120386). Area A.

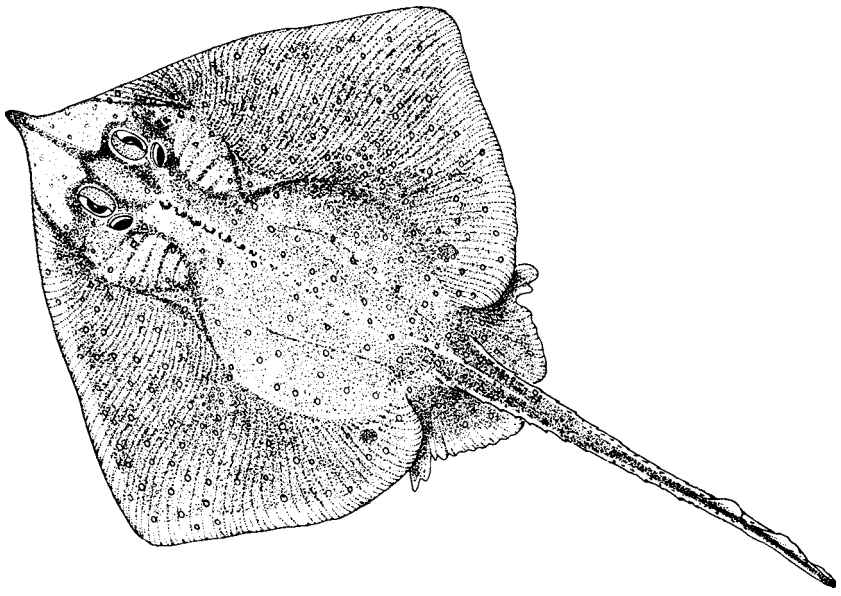


Okamajei sp 2

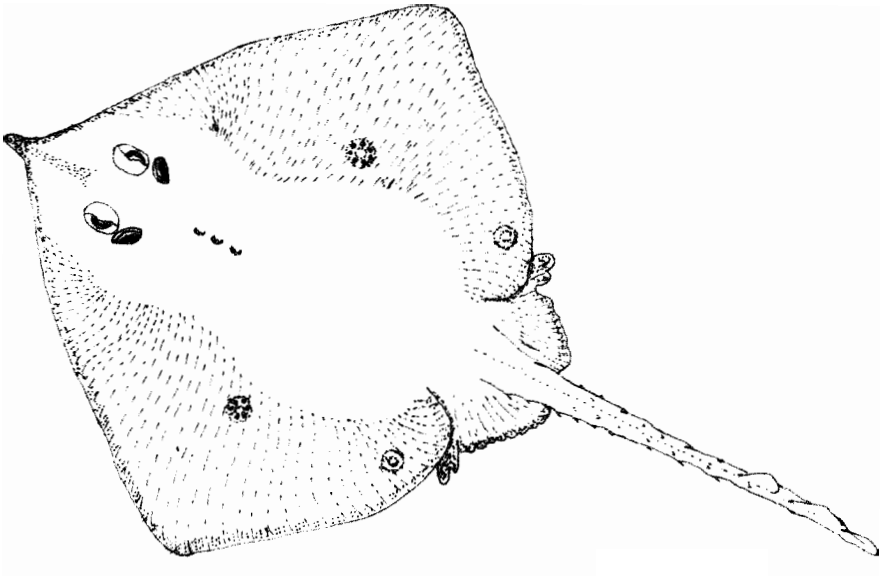


Okamajei sp 2

• **Okamejei sp. 2**
Dorsal surface dark grey to dark brown with many dusky yellow spots and circular blotches evenly scattered over disc, ventral fins and tail sometimes forming clusters on pectoral fin. Lower surface white with grey patches. Median row of thorns from nape to first dorsal, parallel thorn rows on tail anteriorly. About 56-61 tooth rows in upper jaw.
Material: TGT(PJPW)768 (from 98º 37'S., 115º 59'E., NTM S.10766-002) (Fig 2); TGT(PJPW)769 (same data, NTM S.10766-002). both det. and diagnosed M. Stehmann. Area B.



• **Raja (Okamejei?) sp. 1**
Material: TGT2604 (from 08° 33'S., 114° 31 'E., det. M. Stehmann on photo)

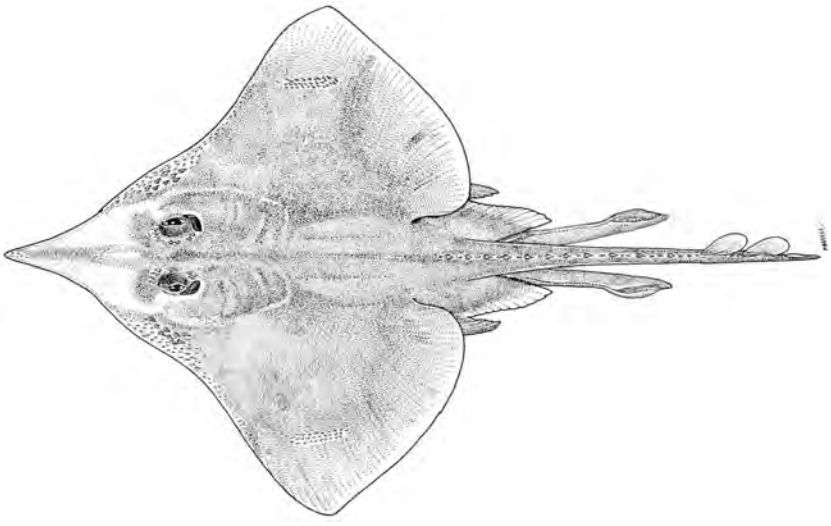


***Okamejei sp. 3**

Dorsal surface dark brown with pattern of many black dots, a pale ocellus margined with black dots on each inner pectoral fin and small circular patch of black spots at each pectoral axil. Lower surface grey-brown, blotched lighter; inner side of nasal curtain dark brown; each mucus pore marked black. About 47 tooth rows in upper jaw. Additional specimens from Area C.
Material: TGT(PJPW)767 (from 08° 37'S, 115° 59'E, Lombok Strait), det. M. Stehmann, NTM S.10766-001. Area B, C.

Dentiraja falloarga (Last, 2008)

Pale yellowish grey to brownish with 2 white ocellate markings on each inner pectoral fin. Tooth row in lower jaw 34-41. Material: CSIRO CA2857 (from 18° 21'S., 118° 26'E.). det. P. Last. Area C.



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• **Dentiraja healdi** (Last, White & Pogonoski, 2008)

Uniformly pale yellowish brown, darkest near eyes, at mid-disc and along tail. paler around disc margin. Dorsal fins dusky in adults, black in juveniles. Disc anterior margin deeply concave and its apex angular.
Material: CSIRO CA2830 (from 17° 49'S., 118° 29'E. det. P. Last. Area C.

PRISTIDAE

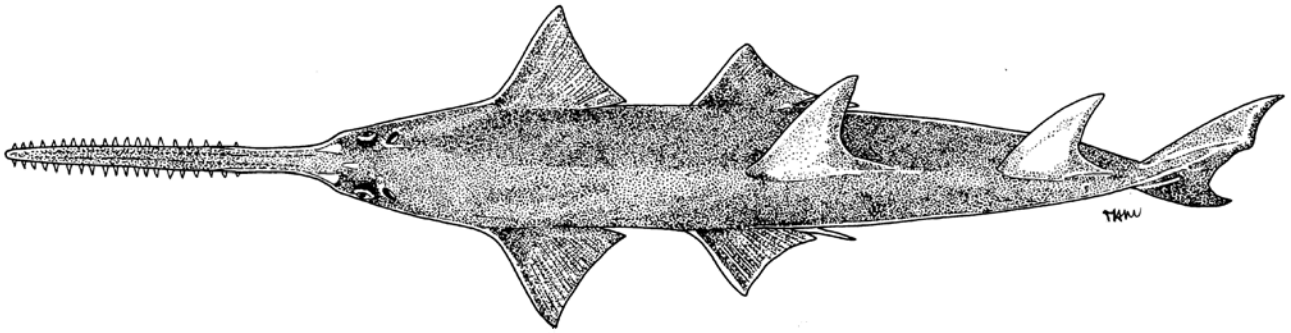
Sawfishes - Cucut gargaji; Cucut pedang; Hiyu parang

Sawfishes are very distinctive as they possess a hard, flat blade (saw or rostrum) as an extension of the snout and which has a row of stout 'teeth' along each edge. The body is thick and robust, tapering to a well-developed caudal fin which may have a lower lobe (subcaudal lobe). The pectoral fins are moderate-sized and end well before the ventral fins and there are 2 large, widely separated dorsal fins. The nostrils are placed well before the mouth. Size: attains length of 7m-8 m.

Dr. G. Dingerkus has provided us with information on this family. There are two genera and five valid species, all occurring in the Survey area.

A. Rostral teeth large and triangular, no grove on posterior margin . . . . . Anoxypristis

B. Rostral teeth long and thin, grove on the posterior margin . . . . . .Pristis



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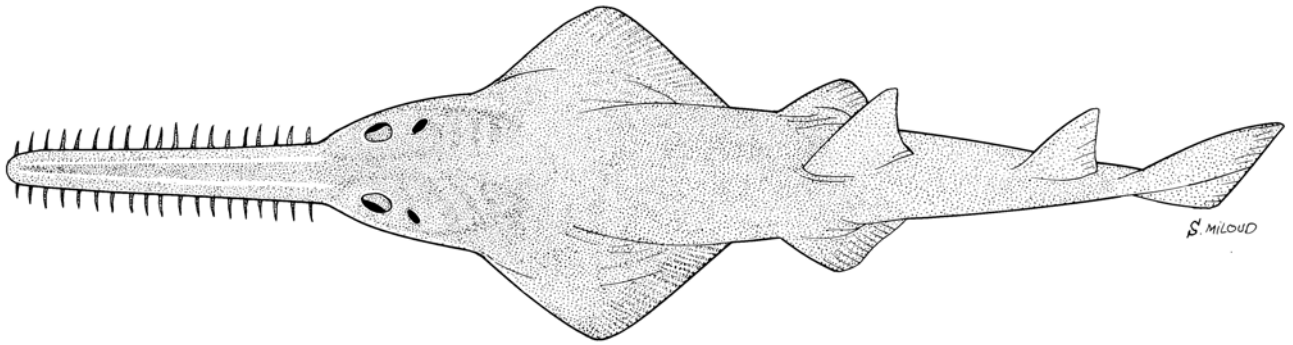
Anoxypristis cuspidata (Latham, 1794)

Body greyish when alive. The skin is virtually naked of dermal denticles. First dorsal fin originates behind the ventral fin; subcaudal lobe extremely large. The rostral teeth are large and triangular, with no groove on their posterior margin. Strictly marine species and is only found in the Indo-Pacific region.



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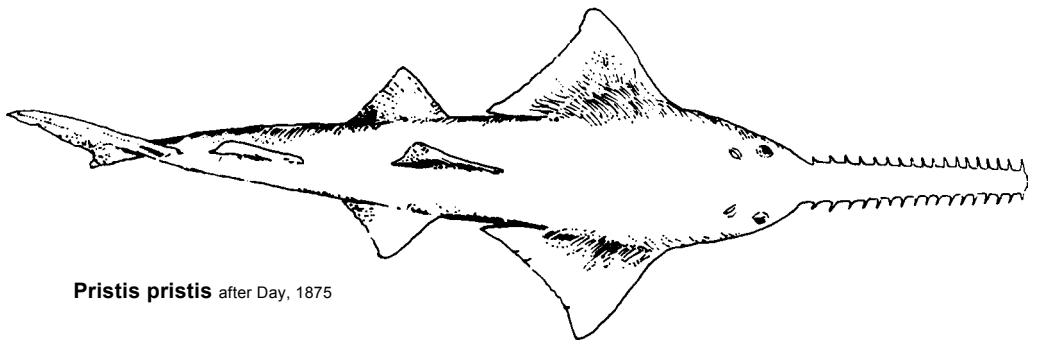
Pristis clavata Garman, 1906

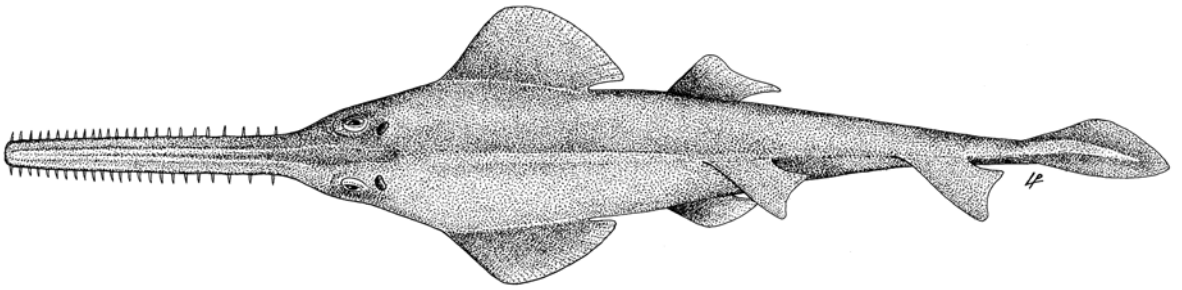
Colour greyish brown. First dorsal fin originates above the origin of the ventral fins; no subcaudal lobe present. The distance between the rostral teeth is uniform, or gradually increasing from the first to last rostral teeth. The species is marine, rarely entering rivers.



Pristis pristis after Day, 1875

Pristis pristis (Linnaeus, 1758)

Colour greyish brown. First dorsal fin originates anterior to the origin of the ventral fin; subcaudal lobe only small but distinct. Less than 22 pairs of rostral teeth, with grooves on their posterior margin. Mainly found in fresh water rivers and has a worldwide distribution.



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Pristis zijsron (Bleeker, 1851)
Colour greyish brown. First dorsal fin originates about half way above the ventral fin. The last 2 or 3 pairs of rostral teeth are separated by a much larger distance than all of the preceding ones. The species is mainly marine; rarely entering rivers and is only found in the Indo-Pacific region. *P. zysron* is an older spelling.

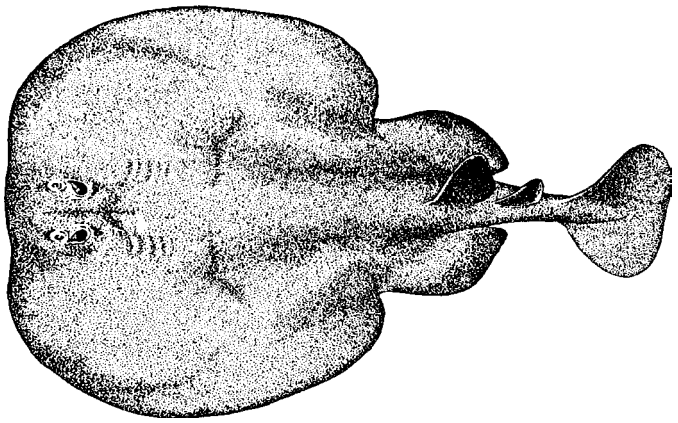
ELECTRIC RAYS

The Survey recorded specimens from 3 of the 4 families in this group of specialised fishes - TORPEDINIDAE, HYPNIDAE, and NARCINIDAE. In these, the skin is soft and all body surfaces are typically naked, the disc is thick and fleshy towards its margin, the eyes and spiracles are small and a caudal fin is present. All members of this group possess powerful electric organs which are paired and situated on each side of the anterior part of the disc.

TORPEDINIDAE

Torpedo Rays -

Disc circular, longer than tail; 2 dorsal fins, 1st dorsal origin at least partly over ventral fin base; ventrals not united anteriorly below pectoral fin; skin folds present on tail; well-developed caudal fin rounded, truncate or emarginate. Teeth with one cusp.
Size: to 2 m in length.
Species collected:



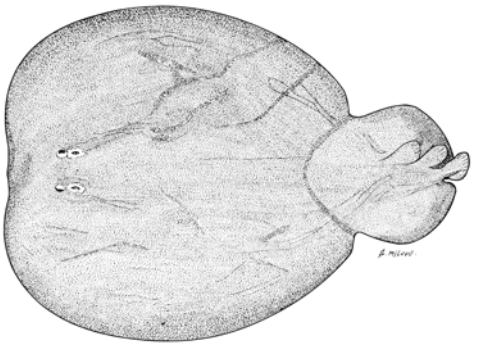
Tetronarce nobiliana (Bonaparte, 1835)

Dorsal surface uniform tan or dark grey; half base of first dorsal fin above ventral bases; caudal lobes rounded, hind margin emarginate; margins of spiracle smooth.
Material: TGT (PJPW)541 (from 07º 52'S., 109° 04' E. det. M. Stehmann on photo, BMNH 1984.4.11.3). Area A.

HYPNIDAE

Coffin Ray -

Pear-shaped, the large disc joined posteriorly with the large rounded ventral fins which unite to form a smaller disc; 2 dorsal fins placed above ventrals; tail very short, caudal small and rounded. Teeth with 2 or 3 cusps and spiracle margin fringed (see also TORPEDINIDAE and NARCINIDAE).
Size: to 0.7 m in length.
This family contains a single species



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Hypnos monopterygium (Shaw, 1795)

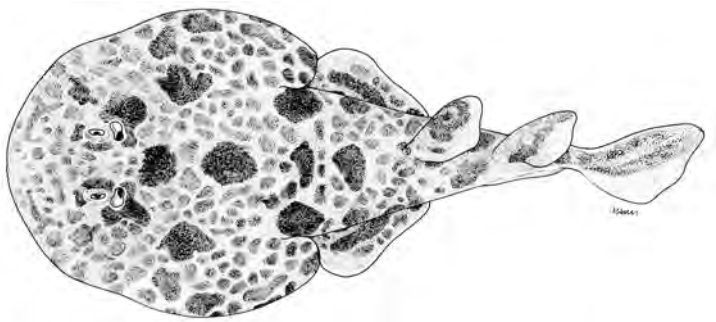
Dark brown or reddish above, white or yellowish beneath.
Material: CSIRO CA3993 (from 19° 00'S., 117° 48' E.). det. W.White. Area C.

NARCINIDAE

Numbfishes -

Disc circular or oval, slightly longer or shorter than tail; ventral fins distinct, not united; 2 dorsal fins, both situated on tail, origin of 1st above or just behind ventral bases; well-developed skin folds on side of tail; caudal fin ovate or truncate. Margins of spiracle smooth, corrugated or fringed (see also HYPNIDAE and TORPEDINIDAE).

Our material belongs to the genera ***Narcine*** and ***Narcinops*** (teeth well exposed when mouth closed; nasal curtain as broad or broader than deep).



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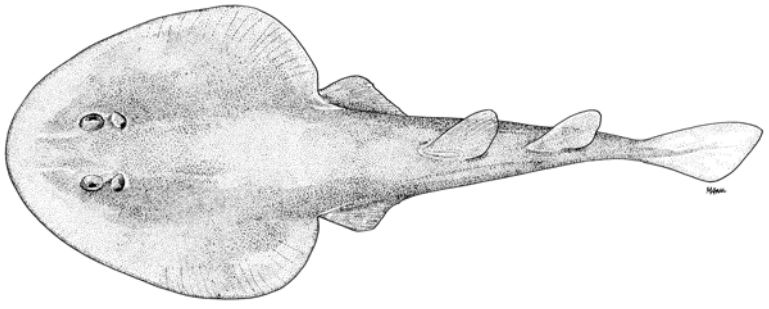
Narcine baliensis Carvalho & White, 2016

Dorsal surface pale brown, covered with symmetrical pattern of dark brown blotches and smaller spots; markings largely circular or oval. Dorsal fin blackish anteriorly, hind margin pale; caudal fin blotchy above and ventral lobe pale. Material: TGT (PJPW)766 (from 08° 37'S., 115° 59'E.). BMNH 1984.4.11.2. det. Carvalho. Area A. Holotype.

Narcinops ornata (Calvalho, 2008)

Fawn dorsal surface with elaborate patterns of dark brown spots or bands, tail banded dark brown; spiracle adjacent to and equal to eye length, margins smooth.
Material: CSIRO CA2273 (from 10º 48'S., 139º 55'E., det. Carvalho. Area C.



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• **Narcinops lasti** (Carvalho & Seret, 2002)

Dorsal surface uniformly pale yellowish, somewhat lighter over pelvic fin margins and lateral bases of tail; dorsal and caudal fins translucent. Nostrils circular with elevated rims, not divided into 2 separate openings.
Material: CSIRO CA2873 (from 18° 31'5., 118° 09'E.) det. Carvalho. Area C.

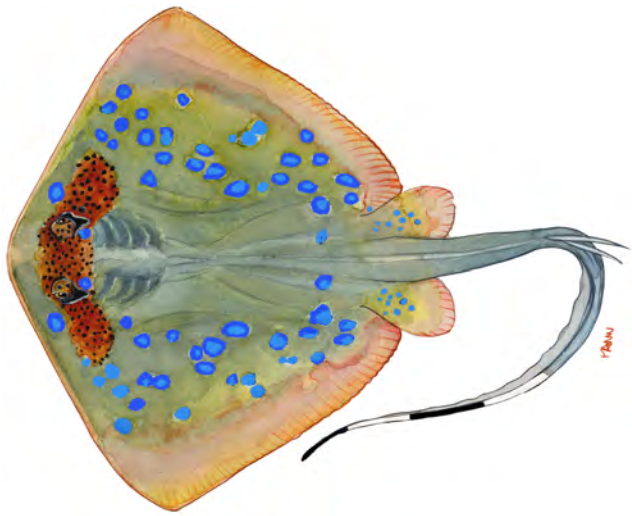
DASYATIDAE

Stingrays - Pari; Pari kembang; Pari macan

The dasyatids lack both dorsal and caudal fins and the disc is either diamond-shaped (rhombic), oval or nearly circular, not more than 1.3 times wider than long. The pectoral fin is fused to the head along its entire length, the nasal curtail is fringed and there are fleshy papillae on the floor of the mouth. The tail is slender and whip-like, much longer than the disc (when undamaged) and bears one or more long, serrated venomous spines near its base. In some species, there is a skin fold or ridge along the tail on the upper and/or lower surfaces.

Size: attains 2.5m - 3m breath of disc. These fishes were very common in Survey area.

The generic classification in the family is complex but presently contains 19 genera and at least 89 species.



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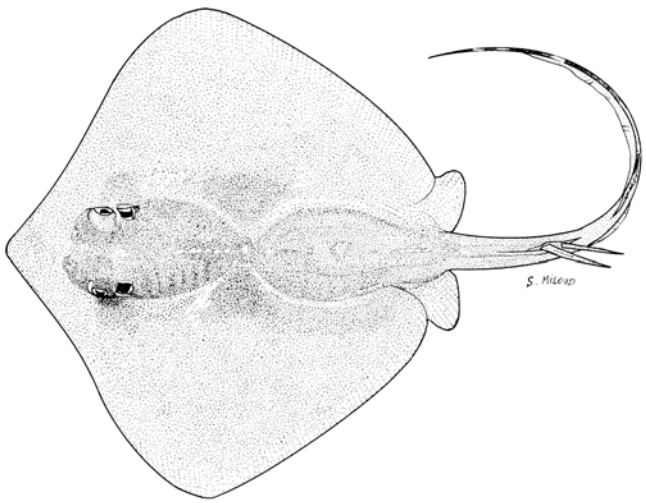
- **Neotrygon sp cf. kuhlii** (Müller & Henle, 1841)
  Disc diamond-shaped, broader than long; few or many low tubercles on midline of back; tail 1-2 times disc length. Dorsal surface colouration: brown or olive to pale pink with large blue and small black spots, or with reddish brown reticulations and grey patches, or with numerous black or reddish spots and pale reticulations. Posterior tail markings: always alternating white and blackish blue bands.
  Material: TGT2327 (from 03º 24'S., 100º 33'E.). det TGT; TGT2326 (same data); TGT1092 (from 08º 56'S., 115º 10'E.). det. Stehmann, ZMH 120534. Area A, B, C.
  Note. *Neotrygon kuhlii* is endemic to the Solomon Islands but there are several species in the 'kuhlii complex'. W. White pers comm. 2020.



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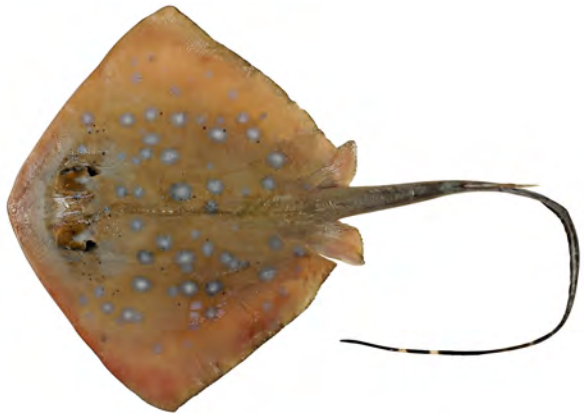
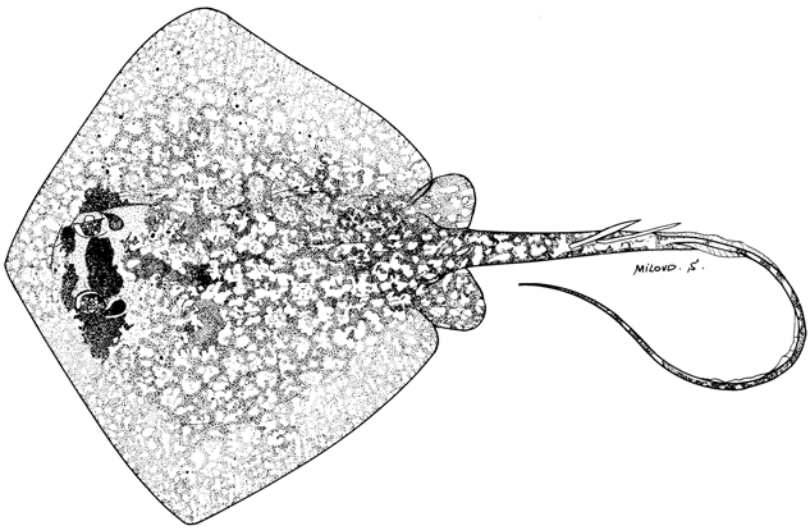
- **Neotrygon annotata** (Last, 1987)

  Dorsal surface uniform brown to greyish green; mask-like markings moderately well developed, pair dark blotches on mid-disc. Faint alternating dark and light bands posteriorly on tail. Snout angular. 4-13 small, seed-shaped thorns along mid-line of disc, 0-4 on anterior tail before caudal sting.
  Material: CSIRO CA 1248 (from 13º 41'S., 126º 31'E.). det. P. Last. Area C



Neotrygon australiae Last, White & Seret, 2016

Upper surface pale yellowish brown with large blue spots; spots usually ocellate (bluish white with thick darker grey-blue ring); mask-like markings distinct; dark speckles concentrated on mask, comparatively sparse elsewhere. Tail with black and white bands near tip; dorsal and ventral folds blackish.
Material. CSIRO CA1241 (from 12º 88'S., 125º 60'E.). det. P. Last. Area C.



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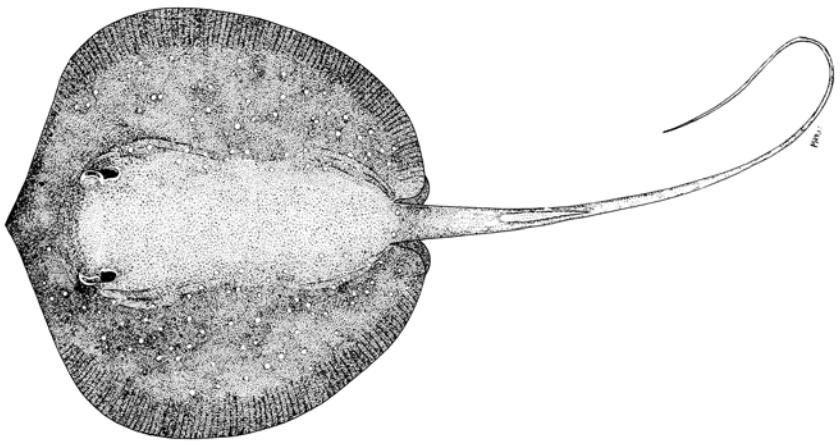
Neotrygon leylandi (Last 1987)

Small stingray uniformly pale brownish to yellowish above, covered with elaborate network of darker reticulations and flecks; mask-like markings well defined, blotches on mid-disc usually faint. Tail bands strong, ventral fold pale with dark markings. Small thorns usually confined to central disc.
Material. CSIRO CA1273 (from 19º 73'S., 117º 21'E.). det W. White. Area C.



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• **Urogymnus granulatus** (Macleay, 1883)

Large ray with an oval disc, rough skin, well-developed band of denticles on central disc. Tail whip-like without folds. Dorsal surface geyish or yellowish brown, covered with small white flecks and often with dark mucus; tail white behind sting. dark margin on ventral surface; disc oval; snout broadly triangular.
Material: CSIRO CA1255 (from 12º 05'S., 130º 00'E.). det. P. Last. Area C.

Fig.1

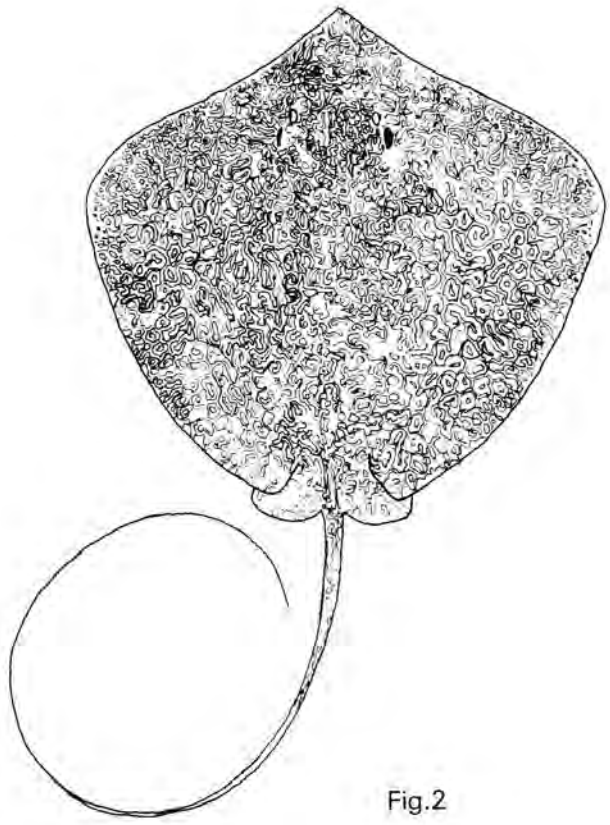


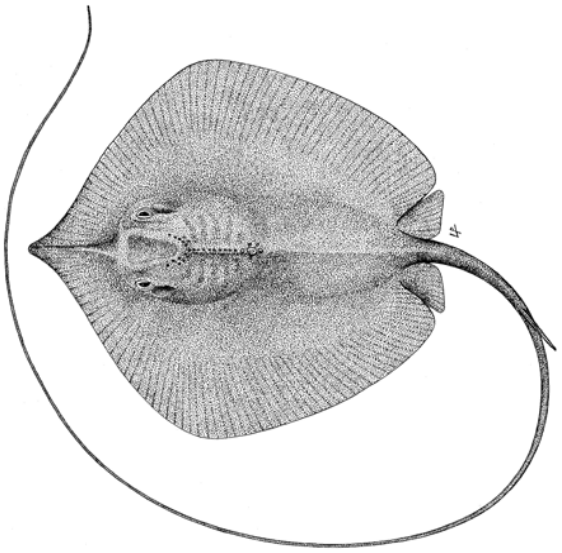
Fig.2

• **Maculabatis astra** (Last, Manjaji-Matsumoto & Pogonoski, 2008)

Dorsal surface greyish brown with dense pattern of black spots; black spots small, diffuse-edged, usually surrounded by slightly smaller whitish spots or rings. Tail with many alternating black and white bands beyond caudal sting in juveniles.
(Fig 1) Material: CSIRO CA1245 (from 18º 53'S., 120º 49'E.). det. P. Last. Area C.
(Fig 2) Material: Unnumbered specimens from Areas B, C. det. P. Last.

Himantura leoparda Manjaji-Matsumoto & Last 2008

Dorsal surface yellowish brown with densely reticulated patters of dull yellow or white lines encircling brownish violet spots over entire disc; tail banded. Disc diamond-shaped; pearl-like nuchal thorn (rounded tubercle) on middle of back; 2 large and 2 small papillae on mouth.
Material: TGT 1409 (from 08º 03'S., 110º 05'E., Paratype as NTM S. 10765-002). det. Manjaji-Matsumoto. Area A.



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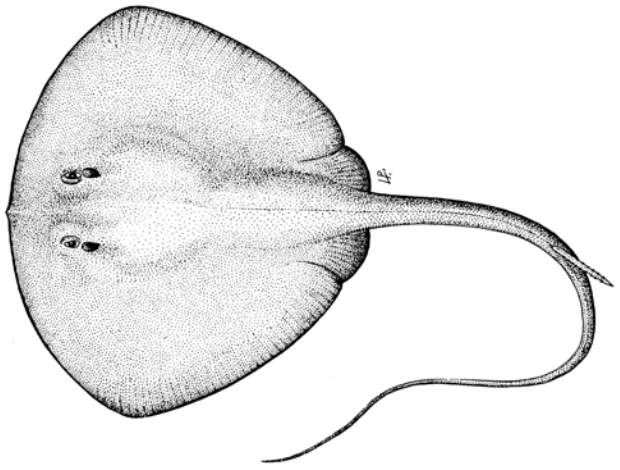
• **Pateobatis uarnacoides** (Bleeker, 1852

Dorsal surface plain brown with partial mottling on posterior part of disc; pairs of light spots along tail; broad dark margin on ventral surface of disc. Slightly oval or diamond-shaped disc; snout triangular and pointed; 2 tail spines; 2 large and 2 small papillae in mouth.
Material: TGT1426 (from 08° 56'S., 116° 24'E., det. W.White. NTM S. 10765-004). Area A.



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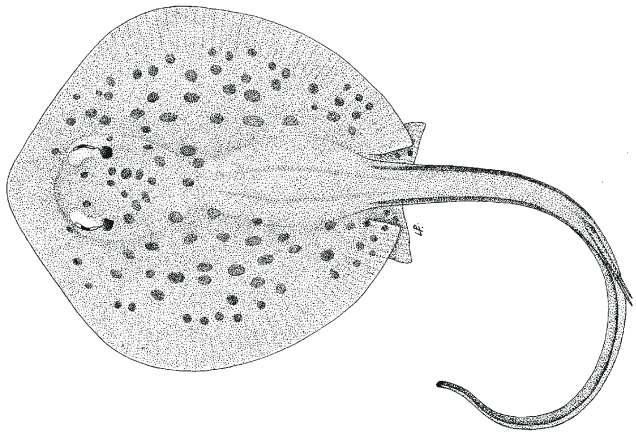
• **Pteroplatytrogon violacea** (Bonaparte, 1832)

Upper surface, tail folds and whip-like portion of tail uniformly black. Ventral surface of disc and tail dark brownish or black. Cloaca, thorns and sting mostly pale.
Material: unnumbered specimen (from 09º 30'S., 116º 45'E.). det P. Last. ZMH 120489. Area B.

• **Pastinachus ater** (Macleay, 1883)

Dorsal surface uniformly greyish brown, grey or blackish, tail tip and skin fold black; disc rhombic, dorsal surface prickly in larger specimens, one or few tubercles in midline of disc; 4 papillae in mouth; 1-2 tail spines.
Material: PJPW101 (from 08° 45'S., 114° 17'E., det. M. Stehmann on photo, BMNH 1984.4.11.1); CSIRO CA1247 (from 12º 38'S., 129º 50'E.). det. P. Last. Areas A, C.



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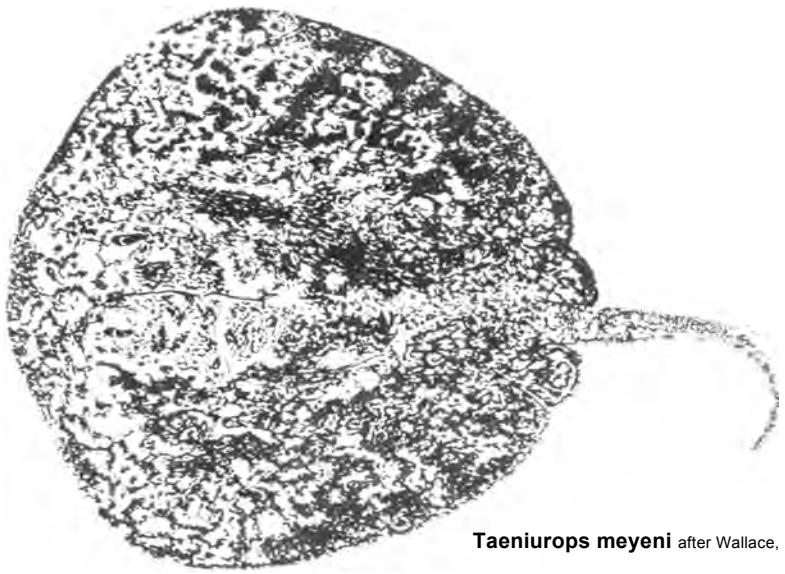
• **Taeniura lymma** (Forsskål, 1775)

Dorsal surface greyish or tan, scattered with bright blue spots, blue stripe along each side of tail; disc ovoid, longer than wide; eyes prominent; skin smooth except for low tubercles along midline of disc; 1-2 tail spines.
Material: TGT1552 (from 08° 22'S., 117° 15'E., specimen lost); TGT1164 (from 08° 28'S., 119° 08'E., specimen lost), both det. M. Stehmann on photo; unnumbered specimen (from 08° 45'S., 115° 05'E., det. M. Stehmann. ZMH 120535); CSIRO CA1246 (from 20º 40'S., 116º 43'E.) det. P. Last. Areas B, C.



Taeniurops meyeni after Wallace, 1967b

• **Taeniurops meyeni** (Müller & Henle, 1841)

Dorsal surface bluish grey, mottled or "splattered" with dark or charcoal spots and blotches, tail skin fold black; disc almost circular, slightly wider than long; eyes prominent; dorsal surface covered with spinules, few tubercles on midline of disc; 1-2 tail spines; 4 papillae in mouth.
Material: unnumbered specimen ("47-77-31" from Area A, specimen lost, det. M. Stehmann on photo); unnumbered specimen (from Area C, specimen lost, det. P. Last on photo).

UROLOPHIDAE

Stingarees -

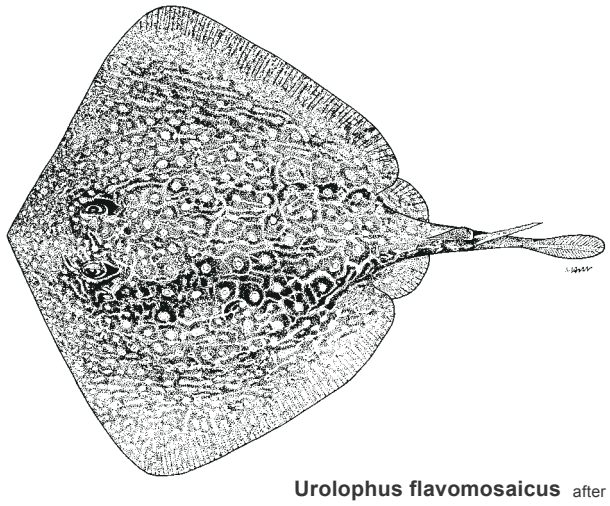
This family is characterised by its moderately short, stout tail which ends in a well-developed oval or "leaf"-shaped caudal fin. The tail bears a long serrated stinging spine sometimes preceded by a short dorsal fin. Other features, shared with the DASYATIDAE, are: a rhombic or slightly circular disc, the head not free from the pectoral fins along its length, there are fleshy papillae on the floor of the mouth and the nasal curtain is fringed.
Size: to 90 cm in total length.

There are 3 genera in this family, differing slightly on external characteristics, 2 of which occur in Australian waters. Colour is often an important character for identifying fresh specimens to the species level.
Trygonoptera – a broad and flattened fleshy lobe along lateral margin of nostril.
Urolophus – no enlarged fleshy lobe along lateral margin of nostril.
Spinilophus – fine denticles on dorsal disc. (found only in PNG).

• **Urolophus cf mitosis** Last & Gomon, 1987
Dorsal surface greenish brown with pattern of dark dots forming confluent oval blotches and transverse and longitudinal bands; disc slightly broader than long; 4 widely-spaced oral papillae.
Material: TGT1652 (from 08° 57'S., 116° 17'E., det. S. Weigmann. ZMH 120361). Area B.

Urolophus mitosis

• **Urolophus mitosis** Last & Gomon, 1987
Dorsal surface reddish brown or grey-green with few pale, elongate or round blotches, each containing small blue spots, blotches either oblique or transversely arranged; snout tip pointed.
Material: CSIRO CA2874 (from 18° 39'S., 117° 53'E., det. P. Last). Area C.



Urolophus flavomosaicus after Last and Stevens, 1994

• **Urolophus flavomosaicus** Last & Gomon, 1987
Dorsal surface yellowish, central disc covered with pale spots surrounded by narrow yellowish rings and reticulations; spots rather regularly spaced, less obvious near disc margins. Caudal and dorsal fins usually pale yellowish.
Material: CSIRO CA2866 (from 18° 20'S., 118° 27'E.). det. P. Last. Area C.

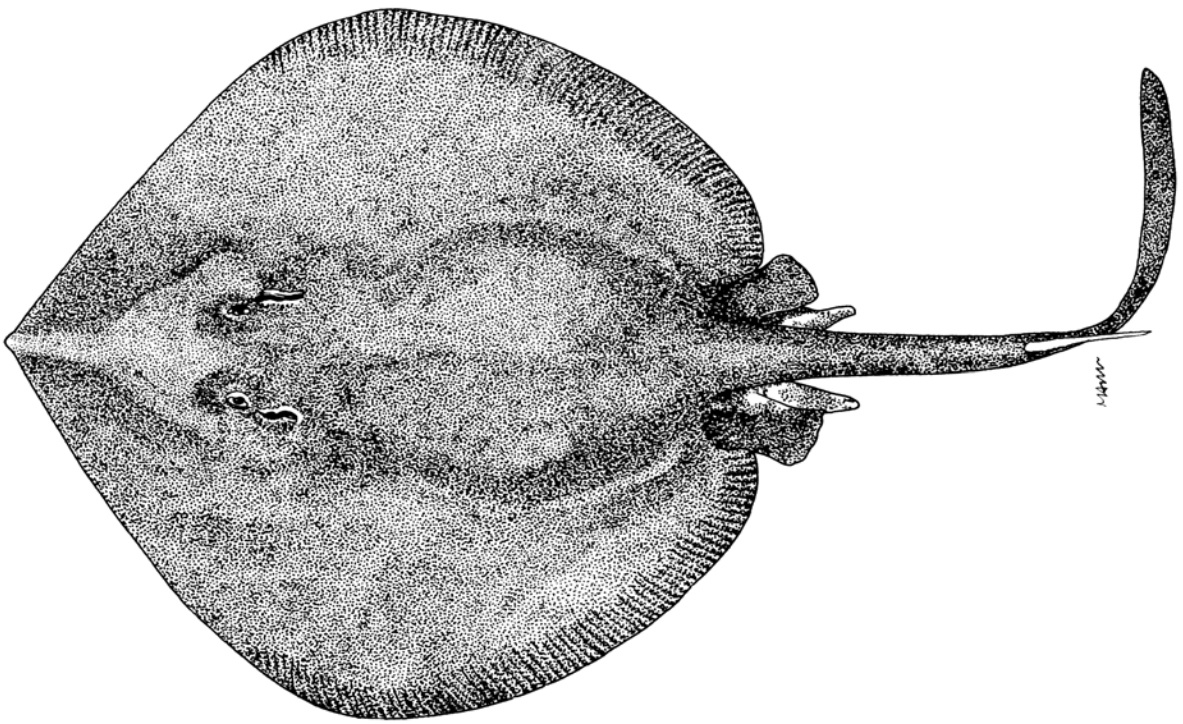
Urolophus westraliensis Last & Gomon, 1987

Uniformly yellowish to pale brown, lacking spots but often with 3 indistinct dusky crossbars (across eyes, middle of gills and mid-disc); young pale yellowish; caudal fin yellow with black margins. Ventral surface white.
Material: CSIRO CA2870 CA2802 (from 18º 34'S., 118º 46'E.). det. P. Last. Area C

PLESIOBATIDAE

Giant stingarees -

Characterised by nasal curtain incompletely united, not reaching the mouth. Caudal fin present; sting present on tail; 5 pairs of gill openings. Their pectoral disc is rounded and confluent with a broadly angular, pointed snout. The disc is slightly longer than it is wide, is grayish brown to black, and is covered with small denticles.
Maximum length 2.7 m.
Family comprises one genus, one species.



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Plesiobatis daviesi (Wallace, 1967)

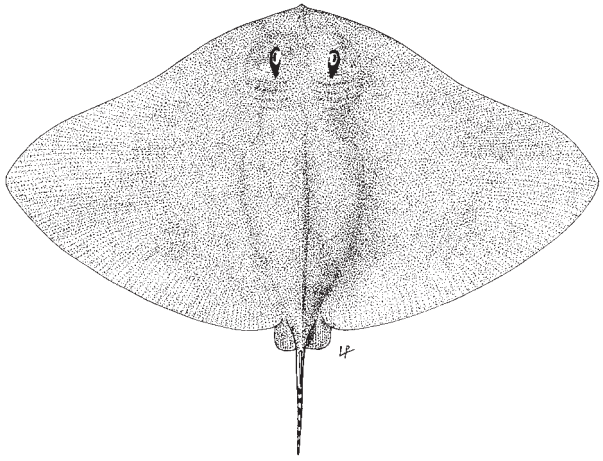
Dorsal surface uniform reddish brown or grey; disc anteriorly wedge-shaped, snout pointed; fine prickles above on disc, tail and centrally on ventrals; 38 tooth rows in upper jaw; ventral fins narrowly elongate.
Material: TGT1422 (from 08º 03'S., 100º 06'E.). det W. White. (NTM S. 10765-001) Area A.

GYMNURIDAE

Butterfly rays; Rat-tailed rays - Pari lempur; Pareh

The butterfly rays are easily recognised by their wide disc - at least 1.5 times broader than long - and their short thin tail - even shorter than the disc length. The pectorals are completely fused to the whole length of the head. The tail has one or more long, serrated spine(s) (barbs); a small dorsal fin maybe present but never a caudal fin, and low skin folds lie along one or more surfaces. The nasal curtain is usually smooth-edged and there are no papillae on the mouth floor.

Size: attain a disc width of 2 m.
The family comprises one genus and 10 named species.



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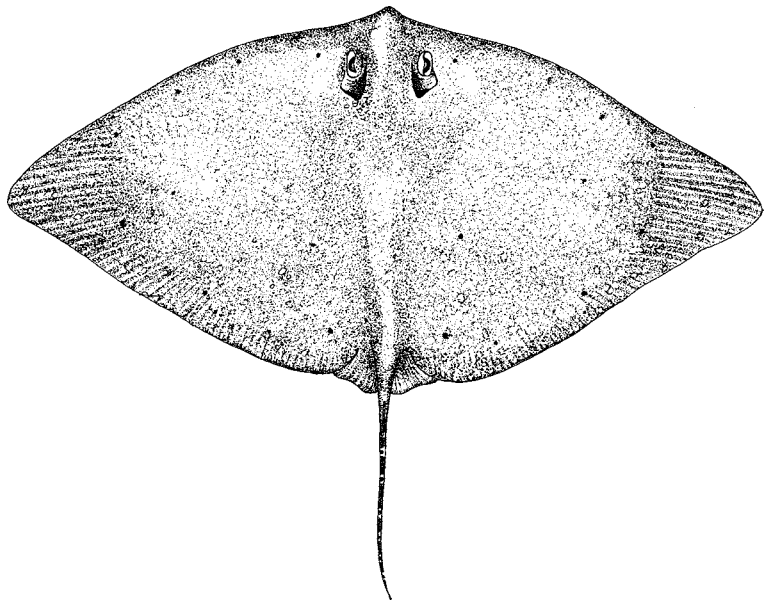
• **Gymnura poecilura** (Shaw, 1804)

Dorsal surface uniformly light to dark brown; sometimes with black dots or with weak round whitish spots. Ventral surface whitish or brownish. Tail banded; dark spot frequently between each black band. A small dorsal fin originates at posterior ventral fin margin.
Material: PJPW148 (from 08º 45'S., 114º 17'E. NTM S. 10767-001). det. M. Stehmann. Area A.

• **Gymnura australis** (Ramsay & Ogilby, 1886)

Dorsal surface olive grey to brown, speckled light and dark with black spots, lower surface white with darker markings; tail alternately banded white and black on sides, the bands of equal width.
Material: CSIRO CA2883 (from 19° 32'S., 116° 43'E.). det. P. Last. Area C.



• **Gymnura cf zonura** (Bleeker, 1852)
Dorsal surface olive-grey to brown, speckled yellow, regularly spaced black spots along outer disc margin, another pair on midline on disc; tail banded white and black, the black bands alternately broad and narrow; snout extremely short.
Material: TGT2215 (from 06º 13'S., 105º 44'E.) and unnumbered specimen at the BMNH from Area A. Both det. P. Last & M. Stehmann on photos. Area A.

MYLIOBATIDAE

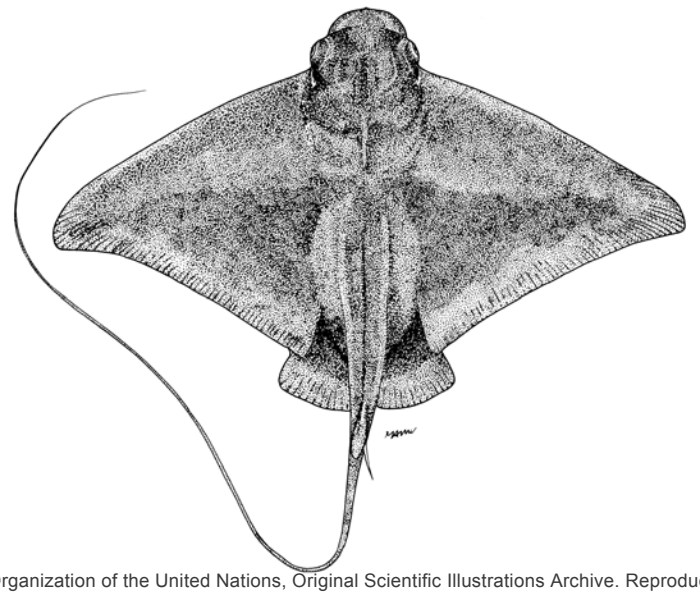
Eagle rays - Penmanuk; Pari burung

This family and the RHINOPTERIDAE can be distinguished from other rays by the large angular, "wing"-like pectoral fins which form the disc, being distinct from the raised, anterior part of the head. The eyes and the large spiracles are thus situated on the side of the head and the anterior parts of the pectoral fins form an undivided, fleshy lobe low on the snout (subrostral lobe. The tail is longer than the disc and whip-like, lacking a caudal fin but having a small dorsal fin on its base not far behind the ventral fin. One or more long, serrate venomous spines are sometimes present behind the dorsal. There are several fleshy papillae on the floor of the mouth.
Size: 2.5-3 m in breadth.
We collected specimens belonging to:
Aetomylaeus **-** usually 7 rows of teeth in each jaw; no spine on tail; subrostral lobe separate from main pectoral fin.
Myliobatis **-** usually 7 rows of teeth in each jaw; subrostral lobe continuous with main pectoral fin.

Aetomylaeus nichofii (Bloch & Schneider, 1801)

Dorsal surface dark greenish-brown with 3-5 transverse grey or blue bands, fading with age; dorsal fin origin opposite end of ventral fin base; tail 2-4 times length of disc. Faint banding present on tail.
Material: TGT2242 (from 06º 25'S., 105º 34E.), det. M. Stehmann on photo. Area A.

• **Aetomylaeus caeruleofasciatus** White, Last & Baje, 2015
A greenish to yellowish brown ray with 5-8 broad blueish (sometimes dark-edged) bands across the disc. Faint banding on tail. Ventral surface white.
Material: CSIRO CA1254. (from 13º 18'S., 128º 21'E.). det. P. Last. Area C.



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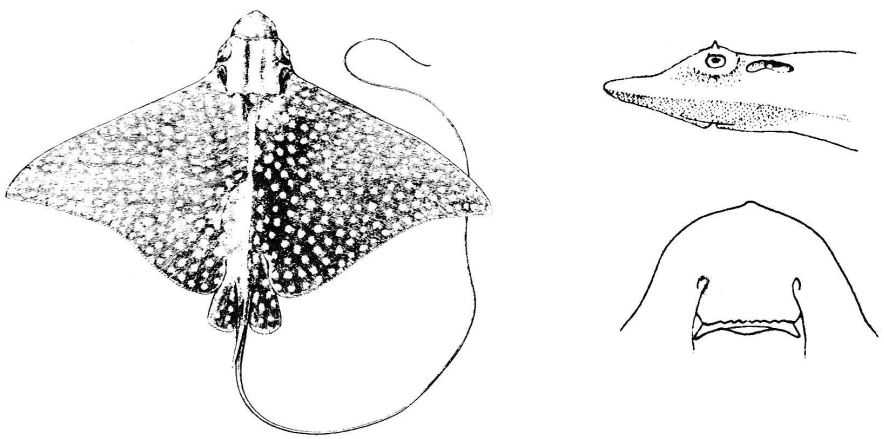
• **Myliobatis tobijei** Bleeker, 1857
Dorsal surface yellowish brown to olive brown, sometimes with irregular shaped, darker brownish spots and blotches of various sizes. Ventral surface mostly white; pectoral tips and posterior margins of disc usually dark brown. Disc entirely smooth, without denticles or thorns. Tail whip-like 1.5 times dorsal width.
Material: TGT1421 (from 08º 03'S., 110º 05'E.), det. P. Last and M. Stehmann. NTM S.10765-003. Area A.

AETOBATIDAE

Pelagic eagle rays -

This family is distinguished from MYLIOBATIDAE by a deeply-notched nasal curtain and only a single row of teeth plate.



• **Aetobatus ocellatus** (Kuhl, 1823)
Dorsal surface brown or blue grey with many small white or cream spots; snout projecting; tail up to 4 times length of disc.
Material: 2 photographs of unkept specimens and PJPW167 (from 08º 45'S., 114º 17'E., specimen lost), all det. M. Stehmann on photos. Areas A, C.

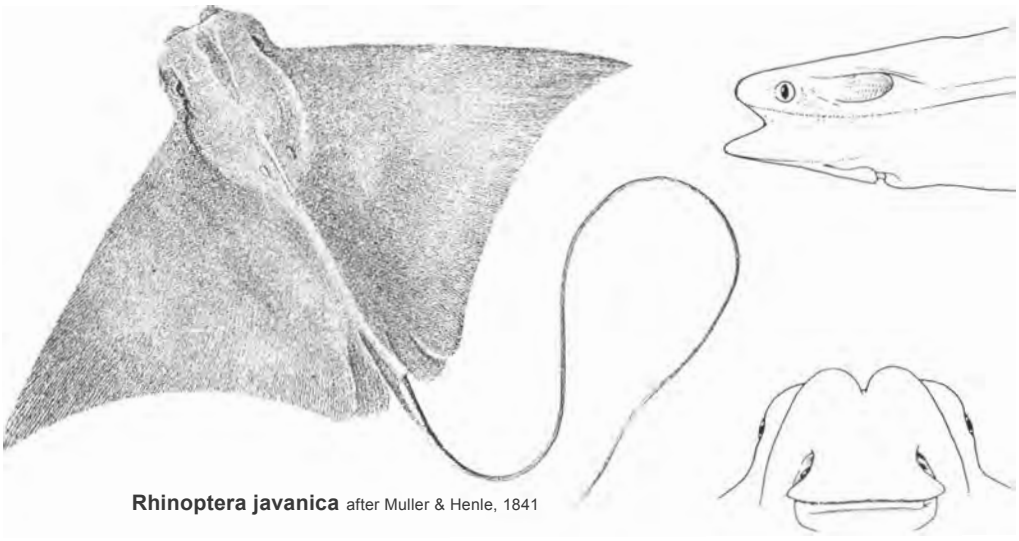
RHINOPTERIDAE

Cownose Rays - Pareh burung

The cownose rays differ from the previous two families mainly in the size and shape of the fleshy subrostral lobe on the head which does not extend as far forward and is deeply indented in the midline, appearing as 2 distinct lobes. In addition, there are 5-20 rows of teeth in the bony dental plate and there are no fleshy papillae on the floor of the mouth.

Size: to about 2.5 m breath.

The family contains a single genus, ***Rhinoptera*** with 8 species.



Rhinoptera javanica after Muller & Henle, 1841

underside of head

• **Rhinoptera javanica** Müller & Henle, 1841

Dorsal surface uniform reddish-brown; skin smooth; tail 2-3 times disc length; teeth in 7-9 rows in both jaws. Material: TGT (PJPW) 804 (from 08º 43'S., 114º 15'E.). det. P Last on photo, BMNH specimen. Area A.

• **Rhinoptera cf javanica**

Dorsal surface uniform greenish brown; skin roughened with small prickles along mid-body and tail to dorsal fin; tail 2-3 times disc length; teeth in 9 rows in upper jaw, 7-9 rows in lower jaw.

Material: TGT2126 (from 08º 45'S., 114º 17'E.). det S. Weigmann. ZMH 120119. Area B.

MOBULIDAE

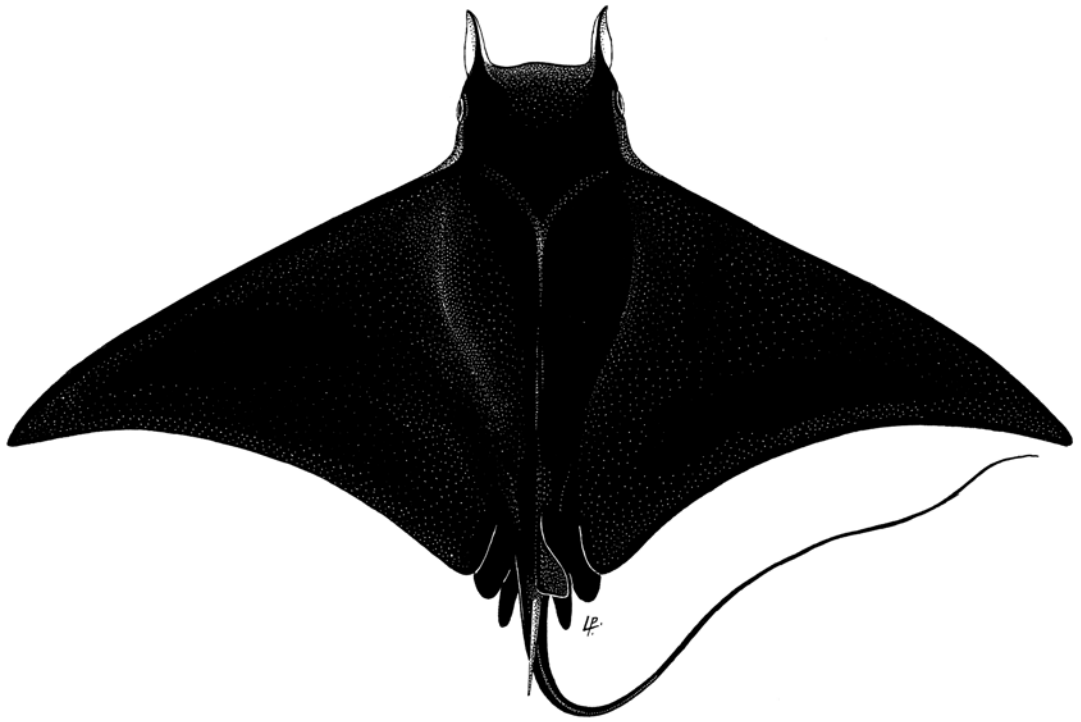
Devil rays; Manta rays - Pareh

This family includes the largest rays in the world, with "wing span" (breadth of disc) of up to 7 m. The head is partly marked off from the rhombic disc, giving them a similarity of form to the previous three families. The head however, is not elevated, although the eye and spiracle are laterally placed, and it has 2 long, forward projections (cephalic fins). The minute teeth are arranged in bands in the jaws, and the gill openings are well-developed. There is no caudal fin, and the small dorsal is placed on the base of the whip-like tail.

The manta and devil rays are pelagic and migrate over long distances. They swim near the surface by flapping their "wing"-like pectoral fins.

Two species were previously assigned to the genus *Manta*, which differs from *Mobula* is having a terminal versus subterminal mouth; however, based on evidence from DNA analyses they should not be considered separate genera.

• **Mobula kuhlii** (Müller & Henle, 1841)
Mouth terminal, extending across front of head. Dorsal surface dark blue to black. Dorsal fin plain or with white tip.



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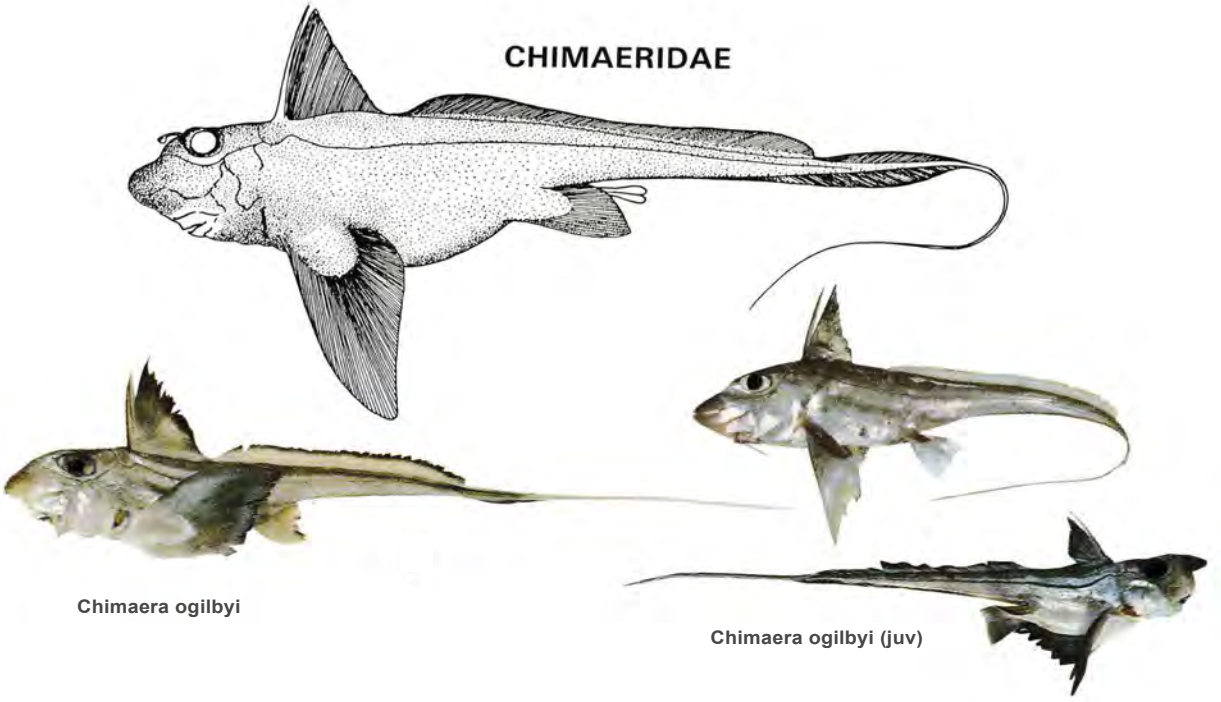
Mobula mobular (Bonnaterre, 1788)
Mouth on lower surface of head. There are additional species occurring in the survey area: *M. birostris* (Walbaum, 1792); *M. tarapacana* (Philippi, 1892); *M. thurstoni* (Lloyd, 1908) and *M. alfredi* (Kreft, 1868) . W. White pers. comm. 2019.

TELEOSTEI

Ray-finned fishes

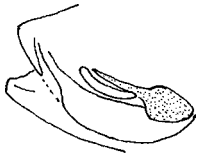
CHIMAERIDAE



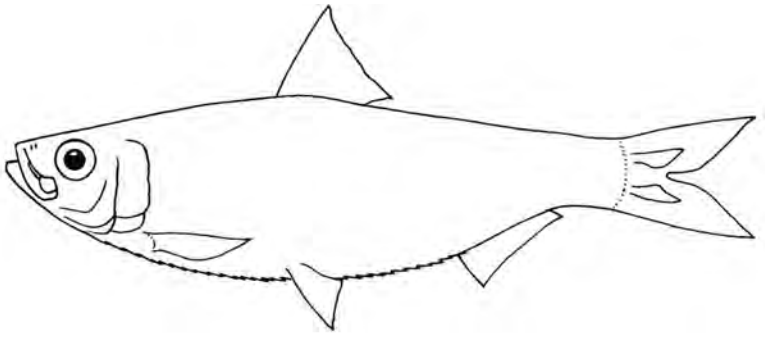
Chimaera ogilbyi

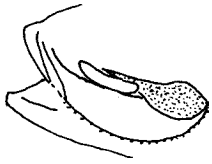
Chimaera ogilbyi (juv)

CLUPEIDAE



Herklotsichthys





Sardinella

Amblygaster leiogaster

Amblygaster sirm

Anodontostoma chacunda

Escualosa thoracata

Herklotsichthys koningsbergeri

Herklotsichthys lippa

CHIMAERIDAE

Ghost sharks –

Body robust anteriorly, tapering to a point at tail. Head large, snout short and rounded; mouth inferior, separated narrowly from nostrils. No spiracle. Skin naked or slightly prickly. Lateral line distinct, much branched over head and shoulder. Dorsal fin in two parts; first dorsal short-based, high, and with a very strong spine; second dorsal fin low and long-based. Anal fin usually absent. Pectoral fins very large, low on sides. Mature males with claspers near ventral fins. Caudal fin long, narrow and tapering, vertebral column continuing to its tip.

Two genera in the family, and many species.

REFERENCE: Finucci, White, Kemper & Naylor 2018.

Chimaera ogilbyi

No anal fin. Snout narrow and long; skin thick. Eye large, about 3-4 in HL; preopercular and oral lateral line canals usually not sharing a common branch; lateral line with tight waves; dorsal spine long, usually longer than first dorsal fin height; height of second dorsal the same along its whole length. Head and body silvery grey, darker above; dusky or black border to both dorsal fins.
(voucher: 370 mm TL)

CLUPEIDAE

Herrings, Sprats, Shads; - Tembang; Lemuru; Cincin

Small, mostly silvery fishes, variously round-bodied to compressed. Scutes often present along belly. Scales cycloid, often easily shed; no lateral line. No spiny rays in fins; single, short dorsal fin, usually near midpoint of body; anal fin short; ventral fin about equidistant between pectoral fin base and anal origin; caudal fin deeply forked. Distinctive colours include dark marks on fin tips or margins, or spots on flanks.

About 50 genera worldwide, and representatives of six were obtained on the Survey.

REFERENCES: Munroe, Wongratana & Nizinski 1999b; Stern, Douek, Goren & Rinkevich, 2017; Whitehead, 1985.

Ambkygaster leiogaster

Body rather slender (less than 4 in SL) and a little compressed, belly rounded; scutes not forming a sharp keel. Back blue-green above; no dark spots along upper flanks.
Lower GR 31-35.

Amblygaster sirm

Body rather slender (less than 3.3 in SL) and little compressed, belly rounded; scutes not forming a sharp keel. A series of small black spots along upper flanks (gold in life).
Vi, 7. Lower GR usually 33-42.
(voucher: 165 mm SL)

Anodontostoma chacunda

Body deep (1.5-3.3 in SL) and strongly compressed. Mouth inferior, snout projecting. Head gold above, large black spot behind gill cover.
Lower GR 54-96.
(voucher: ? mm SL)

Escualosa thoracata

Body compressed and deep, depth 2.7-3.3 in SL. Belly with keel of scutes. Body silvery-brown with bright silvery mid-lateral band about equal to eye diameter from head to tail base. Caudal fin lobes tipped black.
V i, 6. Lower GR 27-40. Scutes 18-19 + 9-12.
(voucher: 75 mm SL)

Herklotsichthys koningsbergeri

Body fairly deep, usually more than 3.3 in SL; belly with strong keel of scutes. Distinct wing-shaped scales hidden beneath normal predorsal scales; scales on flanks not strongly toothed. Up to 14 oval black spots along flanks from head, sometimes a second shorter row of spots below.
Lower GR usually 28-32. Scutes 17-18 + 11-13
(voucher: ? mm SL)

Herklotsichthys lippa

Body moderately slender, usually not more than 3.3 in SL. Belly with strong keel of scutes. Distinct wing-shaped scales hidden beneath normal predorsal scales; scales on flanks toothed. About 8-12 small round black spots in a row along upper flanks behind black shoulder blotch.
Lower GR about 28-34. Scutes 17-18 + 11-13.

Herklotsichthys quadrimaculatus

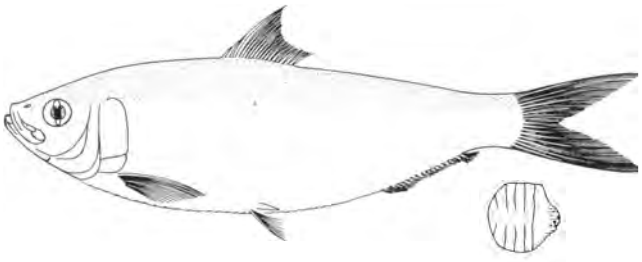
Hilsa kelee

scale

Sardinella brachysoma

scale

Sardinella gibbosa

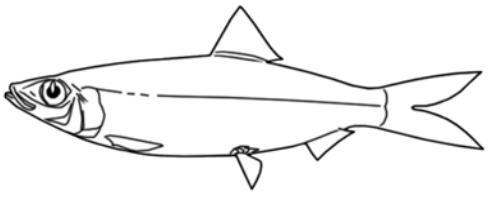


Sardinella fimbriata

Scale

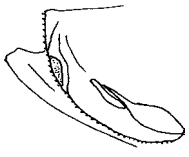
Sardinella lemuru / Sardinelle aurita

DUSSUMIERIIDAE

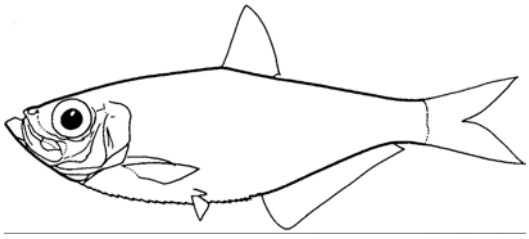


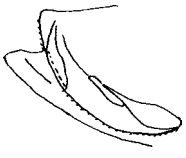
Dussumieria elopsoides

PRISTIGASTERIDAE

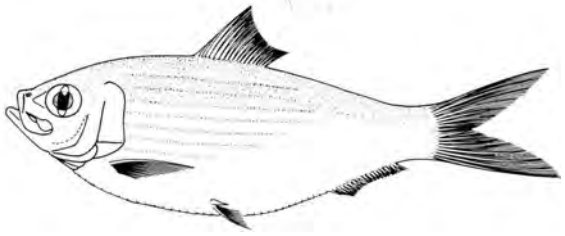


Pellona





Ilisha



Ilisha melastoma

Ilisha lunula

Opisthopterus tardoore

Pellona ditchela

Herklotsichthys quadrimaculatus

Body slender, depth 3.3-5.5 in SL; belly with strong keel of scutes. Distinct wing-shaped scales hidden beneath normal predorsal scales; scales on flanks usually toothed on hind edge. On capture, two gold spots visible behind gill opening and a blue midlateral stripe; dorsal fin pale yellow or grey.
Lower GR usually 30-36. Scutes 17-18 + 12-14.
(voucher: 89 mm SL)

Sardinella brachysoma

Body deep (2.5-3.3 in SL), compressed; belly with sharp keel of scutes (usually 18 + 13 or total of 30-31). Scale margin very crinkled, striae continuous and overlapping at scale centre. A black spot at dorsal fin origin.
V i, 7. Lower GR 48-67. Scutes 18 + 13 (total 29).
(voucher: 115 mm SL)

Sardinella fimbriata

Body moderately compressed and deep (2.9-4 in SL); belly with sharp keel of scutes. Scale margin at centre crinkled and with small holes, striae straight and not joining, separated by wide gap at scale centre. Number of gill rakers increasing with body length. Plain blue-green back without spots or stripes.
Vi, 7. Lower GR 54-82. Scutes 8 + 13 (total 30-32).
(voucher: ? mm SL)

Hilsa kelee

Body deep (2.5-3.3 in SL). Belly keeled. Gill rakers numerous, curved, number increasing with body length. . Distinct notch in midline of upper jaw when wiewed from front. Dark blotch behind gill opening and usually a row of 7-8 smaller blotches behind it along upper sides. Dorsal fin plain dusky yellow.
A 20-22. Lower GR 75-175. Scutes 16 + 13 (total 29).
(voucher: 123 mm SL)

Sardinella gibbosa

Body moderately compressed and deep (usually 3.3-4 in SL); belly with a strong keel of scutes. All of hind scale margin crinkled; striae straight and not joining, separated by wide gap at scale centre. Number of gill rakers increasing with body length. On capture, a gold line along flanks.
V i,7. Lower GR 45-50--60. Scutes 18 + 15 (total 32-34)
(voucher: 131 mm SL)

Sardinella lemuru / Sardinella aurita

Body slender (less than 3.3 in SL) and slightly compressed; belly rounded and scutes not sharp. Gill rakers many, long and slender, curled on 2nd, 3rd and 4th arches, number increasing with body length.
V i, 8 (all other *Sardinella* in area have V i, 7). Lower GR 100-200. Scutes 19 +15 (total 33-34).
(voucher: 152 mm SL)

DUSSUMIERIIDAE

Round herrings -

Differs from CLUPEIDAE in having numerous (11-18) branchiostegal rays, abdomen lacking hard scutes except for a W-shaped pelvic scute supporting ventral fin, and premaxilla rectangular. Two genera worldwide, one obtained on the Survey.

REFERENCES: Lavoué et al., 2017; Hata, Lavoue & Motomura, 2020; Munroe, Wongratana & Nizinski 1999b.

Dussumieria elopsoides

Body slender, depth 4.5-6.3 in SL; no keel of scutes along belly. Small pointed mouth. On capture, body iridescent blue-green with a bronce or gold mid-lateral stripe.
Lower GR 21-32. A 15-16.
(voucher: 154 mm SL)

PRISTIGASTERIDAE

Longfin herrings -

The species belonging in this sardine family can be recognised by their long anal fin comprising 30 or more rays. In most species the ventral fin is situated well forward such that the pectoral fin tip reaches or extends beyond a vertical through the base of the ventral fin.

The family comprises nine genera which were formerly placed in the family CLUPEIDAE; representatives of three genera caught on the Survey.

REFERENCES: Kailola, 1986; Munroe, Wongratana & Nizinski 1999a; Whitehead, 1985.

Ilisha melastoma

Lower jaw projecting. Body deep (2.4 -3 in SL), strongly compressed. Vertical striae overlap and continuous across scale centre. Two tubular extensions of swim bladder posteriorly. Caudal fin forked. Back blue-green; fins pale, stippled dusky.
A 35-48. Lower GR 21-25. Scutes 18-20 + 8-9 (total 27-29).
(voucher: ? mm SL)

Opisthopterus tardoore

Lower jaw prominent, mouth upturned. Body slender (3-3.7 in SL) and strongly compressed; belly keeled. No ventral fin. Anal fin long; pectoral fin longer than HL, 3.5-3.8 in SL. Body silvery, dark spot behind gill opening.
A 51-63. Lower GR 25-28. Scutes usually 29-35 (total).
(voucher: 215 mm SL)

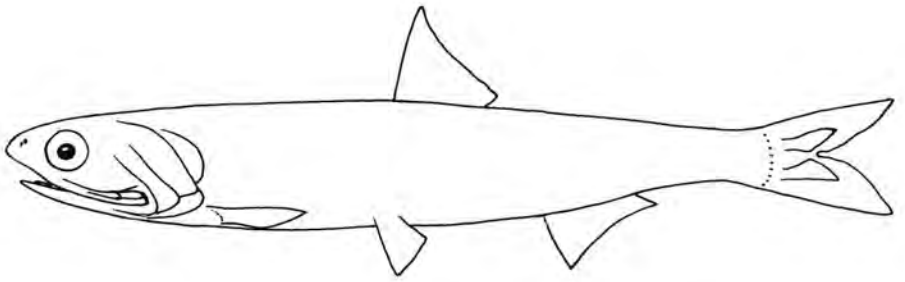
Ilisha lunula

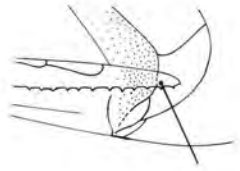
Lower jaw projecting. Body deep (2.4-2.8 in SL), strongly compressed; belly keeled. Vertical striae overlap but do not join at scale centre. Two tubular extensions of swim bladder posteriorly. Caudal fin lunate, lobes produced to nearly twice head length. Back dark olive-yellow; fins pale yellow, margins dark brown.
A 36-48. Lower GR 18-20. Scutes 28-29 (total).
(voucher: ? mm SL)

Pellona ditchela

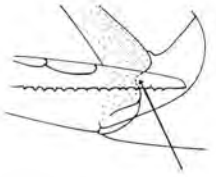
Lower jaw projecting, entire lower edge of upper jaw toothed, hypomaxilla present. Body deep (2.7-3.1 in SL), strongly compressed; belly keeled. Vertical scale striae overlap at centre of scale. Hind caudal fin margin dusky.
A 34-42. Lower GR 22-27. Scutes 19+8-9 (total 27-28).
(voucher: 130 mm SL)

ENGRAULIDAE





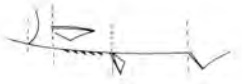
Preoperculum rounded



Preoperculum indented

Setpinna

Thryssa



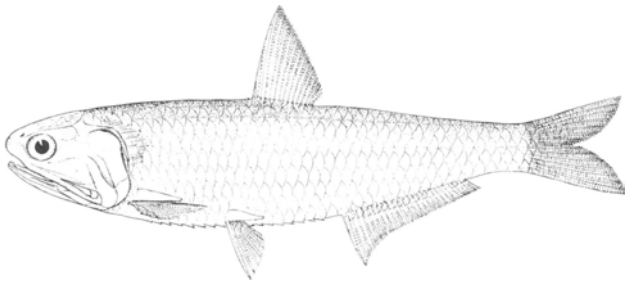
Stolephorus

Setipinna tenuifilis

Stolephorus balinensis

Encrasicholina heteroloba

Stolephorus baweanensis



Thryssa baelama

Thryssa encrasicholoides

Thryssa hamiltonii

Thryssa mystax

Thryssa setirostris

ENGRAULIDAE

Anchovies - Kenaren; Teri; Bangkok

Small, mostly silvery fishes, variously round-bodied to compressed (body tapering to point in *Coilia*). Scutes usually present along belly (except in *Engraulis*). Snout usually "pig"-like and projecting, lower jaw characteristically "underslung"; hind tip of upper jaw (maxilla) extending well beyond eye. Scales cycloid, often easily shed; no lateral line. No spiny rays in fins; a single short dorsal fin, usually near midpoint of body; anal fin long or short; ventral fin about midway between pectoral fin base and anal fin origin; caudal fin usually forked. Distinctive colours include dark marks on fin tips and margins.

Eight genera in the Indo-Pacific, of which four were obtained on the Survey.

REFERENCES: Hata & Motomura, 2017; Hata, Lavoué & Motomura, 2019; Hata, Lavoué & Motomura 2021; Wongratana, Munroe & Nizinski 1999; Kottelat, 2013.

Setipinna tenuifilis

Body strongly compressed, depth 3-3.7 in SL; dorsal profile rising evenly, back gently convex. Belly keeled. Maxilla not reaching gill opening. First ray of pectoral fin filamentous, reaching to 9-21st anal fin ray. Ventral fin not reaching to anus.
A 49-59. Lower GR 13-17. Scutes 18-20 + 7-8.
(voucher: ? mm SL)

Encrasicholina heteroloba

Body slender, almost cylindrical; sharp needle-like scutes before ventral fins, none behind. Maxilla tip pointed, reaching to or beyond posterior border of preoperculum. A small diamond-shaped bony plate between front of isthmus and hind border of branchiostegal membrane. Hind border of preoperculum round (convex). HL 25%-29% in SL; 3 unbranched dorsal and anal fin rays. A dark fish with silvery mid-lateral band on flanks.
Lower GR 21-26. Scutes 3-6.
(voucher: 70 mm SL)

Stolephorus baweanensis

Body slightly compressed; sharp needle-like scutes before ventral fins, none behind. Maxilla tip pointed, reaching past gill opening. Isthmus reaching to hind border of branchiostegal membrane. Ventral fin tip does not reach a vertical line from dorsal fin origin. A pale fish with small black spots on underside of snout, under eye and on lower jaw.
Lower GR 19-22. Scutes 4-7. 3 unbranched dorsal and anal fin rays.
(voucher: 75 mm SL)

Thryssa encrasicholoides

Belly rounded; predorsal scutes before level of pectoral fins sometimes lost, then preventral scutes, then post-ventral scutes. Maxilla with very blunt tip, not reaching hind border of preoperculum.
A 27-35. Lower GR 20-22. Scutes 1-2 + 6-7 + 8-10.
(voucher: 81 mm SL)

Thryssa mystax

Body compressed, slender, depth 3.5-4 in SL. Belly keeled. Maxilla reaching just past gill opening. Tip of snout at about level of eye centre. Black venulose area behind gill cover, dorsal fin tip black as also upper, lower and hind borders of caudal fin.
A 34-40. Lower GR usually 13-16. Scutes 17-19 + 8-12.
(voucher: 106 mm SL)

Stolephorus balinensis

No predorsal scutes; posterior border of preopercle convex, rounded; Ventral fin short, its posterior tip not reaching the vertical through dorsal fin origin; ventral fin short. Short maxilla, posterior tip just reaching or slightly beyond anterior border of preopercle, 14.3–17.2% SL. A pale fish with a silver mid-lateral ban on its flanks. two pairs of dark patches on upper back in head; no black spots below eye and lower-jaw tip.
D iii, 11-14. A iii, 14-19. P. 13-16. GR (first arch) 35-42.
2-6 pre-pelvic scutes, without spines. Total scutes 37-41.
(voucher: 133 mm SL)

Thryssa baelama

Belly rounded; no scutes before level of pectoral fins, pre-ventral and post-ventral scutes present. Maxilla tip very blunt, not or barely reaching hind border of preoperculum. Olive above, silvery below; head golden, dark patch on shoulder.
A 27-32. Lower GR 20-26. Scutes 7-8 + 8-10.
(voucher: ? mm SL)

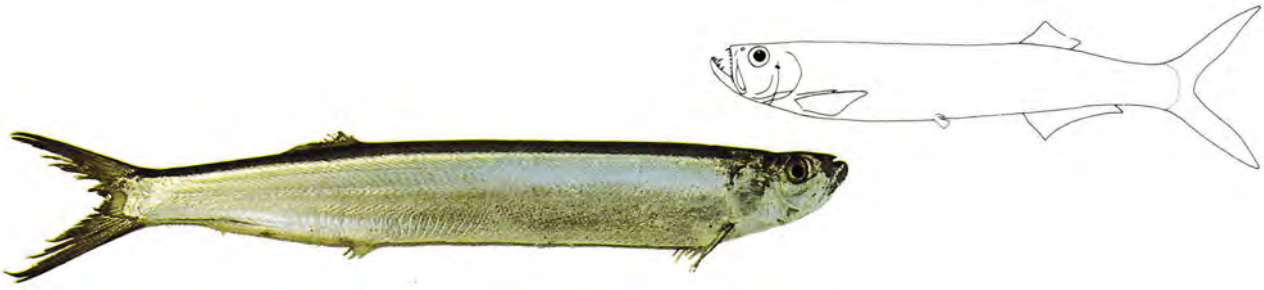
Thryssa hamiltonii

Body compressed and deep, depth 3.1-3.4 in SL. Belly keeled. Maxilla just to gill opening or slightly beyond. Tip of snout above level of eye centre. Black venulose area behind gill cover; midline of back with dark bands or lines.
A 38-43. Lower GR 11-15. Scutes 17-18 + 10-11.
(voucher: ? mm SL)

Thryssa setirostris

Body compressed; belly keeled. Maxilla very long, reaching to base of ventral fin and beyond. Tip of snout below level of eye centre. Black venulose area behind gill opening; orange in gill cavity. Head bronze, fins yellow, hind caudal fin margin brown.
A 33-38. Lower GR 10-12. Scutes 16-18 + 9-10.
(voucher: 142 mm SL)

CHIROCENTRIDAE

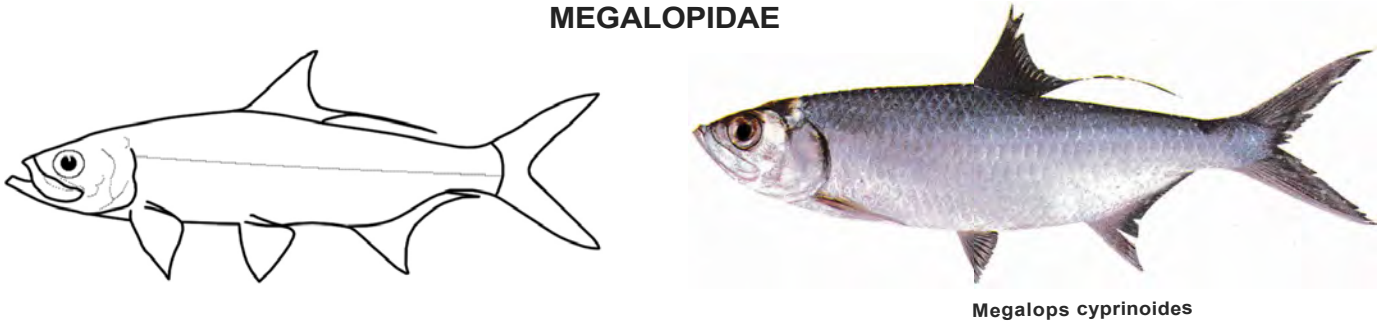


Chirocentrus dorab

ELOPIDAE

Elops machnata

MEGALOPIDAE



Megalops cyprinoides

ALBULIDAE

Albula argentea

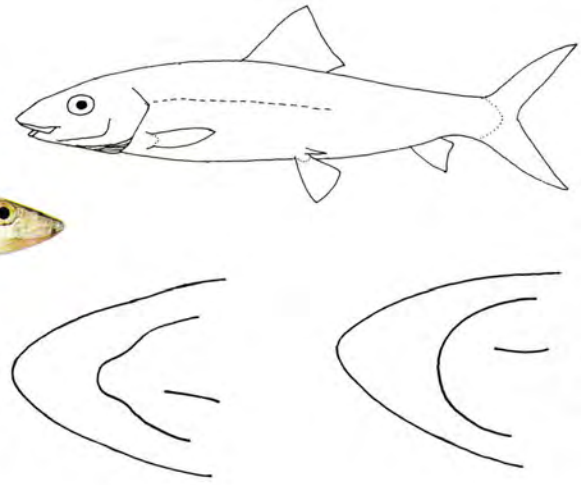


Fig. 1

Fig. 2

CHIROCENTRIDAE

Wolf-herrings - Parang-parang; Golok-golok

Very elongate and compressed, "strap - like" fishes. Mouth large and oblique. large fang-like teeth in both jaws: eye small. Cycloid scales very small. thin and easily shed; no lateral line; no scutes along belly (as in CLUPEIDAE). Fins without spines; single dorsal fin placed well back on body, opposite anal fin; pectoral fin low on body; small ventral fin about halfway between pectoral and anal fins; caudal fin deeply forked.

One genus in the family, and two species.

REFERENCES: Kottelat, 2013; Munroe, Wongratana & Nizinski, 1999.

Chirocentrus dorab

Body strongly compressed, depth 7-7.5 in SL; belly sharp. Pectoral fin 7.6-9 in SL, head depth 9-12.5 in SL. Back bright blue green, flanks brilliant silvery; upper part of dorsal fin black, caudal fin yellow.
D 16-18. A 32-32.
(voucher: 396 mm SL)

ELOPIDAE

Tenpounder - Bondeng lelaki

Body fusiform, slightly compressed. Eyes big and partially covered with adipose eyelid. Mouth terminal, upper jaw extending to posterior border of eye. Bony plate (gular plate) covering anterior part of throat. 20-25 rays in dorsal fin, pelvic with 12-16 rays. Dorsal and anal fins with base in scaly sheath.

One genus in the family and seven species; only one found on the Survey.

REFERENCES: Fricke, 2008; Smith, 1999a, www.fishbase.ca/summary/Elops-machnata.html.

Elops machnata

Body slender, depth 5-6 in SL, belly rounded. Scales very small; lateral line tubules unbranched. Maxilla reaches well behind eye. Back olive or dull green-blue, flanks silvery.
D 23-27. A 15-18. L. lat. about 100. Branchiostegal rays 25-35.
(voucher: 122 mm SL)

MEGALOPIDAE

Tarpon - Bulan-bulan

Large, silvery fish having a fusiform, compressed body. Lower jaw prominent, gular plate ventral between two branches of lower jaw. Branchiostegal rays 23-27. Dorsal fin without a spine, with 13-21 rays, the last one extended as a long filament. Pectorals very low on body; anal fin 22-29; ventral fin 10-11. Branched tubes radiate over lateral line scales. Can attain more than 2 m in length. Larval stage consists of translucid leptocephali.

One genus in the family, two species, of which the single Indo-Pacific member was caught on the Survey.

REFERENCE: Smith, 1999b.

Megalops cyprinoides

Body oblong, depth 3.5-5 in SL, belly slightly rounded. Scales large, lateral line tubules branched. Last dorsal fin ray produced into strong filament reaching tail base. Back blue-green, flanks silvery white; fins yellowish.
D 17-20. A 24-31. L. lat. 36-42. Branchiostegal rays 26-27.

ALBULIDAE

Bonefishes - Bandeng cecurut

Moderate-sized silvery fishes found in all warm waters, associated with shallow sandy bottoms. Body elongate with a rather flat belly without scutes. Snout conical. projecting, small inferior mouth; a bony gular plate between lower jaw; branchiostegal rays 12-14. A single short dorsal fin; anal fin short. far back on body; ventral fins about mid-way between pectoral and anal fins. More than 60 scales in lateral line.

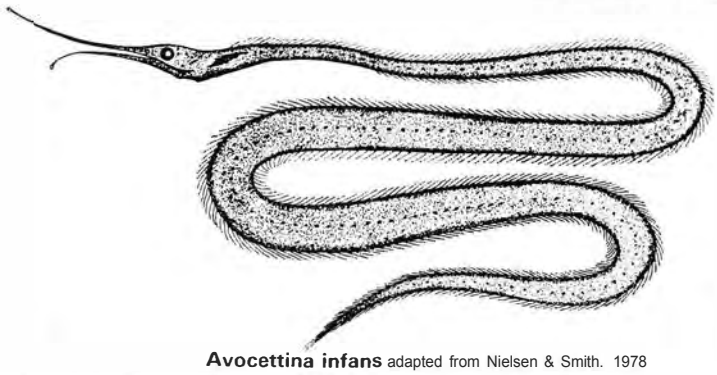
A single genus, with about 4-5 species.

REFERENCES: Hidaka, Iwatsuki & Randall, 2008; Kottelat, 2013; Randall, & Bauchot. 1999.

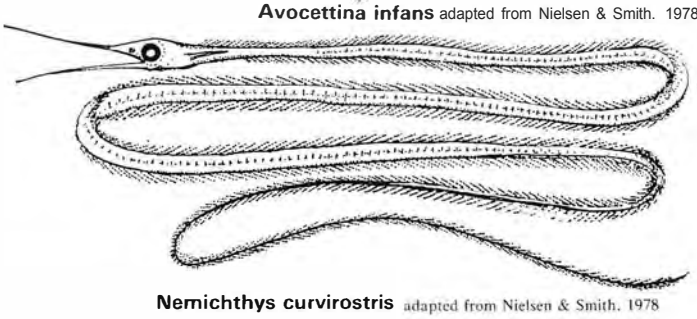
Albula argentea

Body fusiform; belly rather flat without scutes. Lower jaw pointed (Fig. 1). Body scales small. Body plain silvery, yellow-blue on back. Tooth plate on tongue rather elongate.
GR 10-12. L. lat. 63-69.
(voucher: ? mm SL)

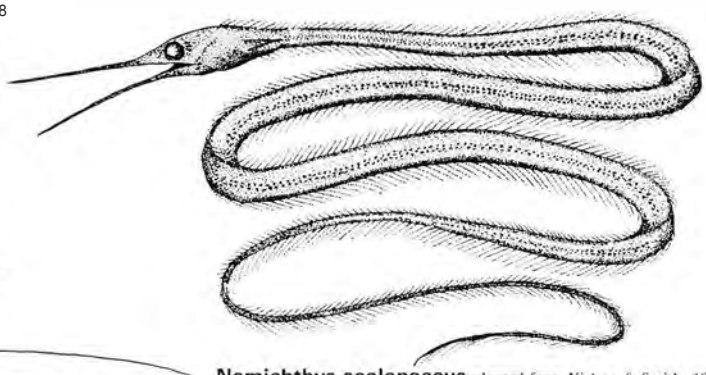
NEMICHTHYIDAE



Avocettina infans adapted from Nielsen & Smith. 1978



Nemichthys curvirostris adapted from Nielsen & Smith. 1978

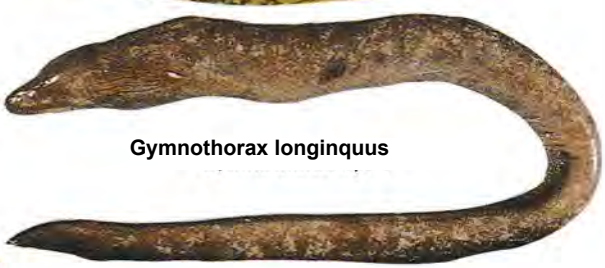


Nemichthys scolopaceus adapted from Nielsen & Smith. 1978

MURAENIDAE

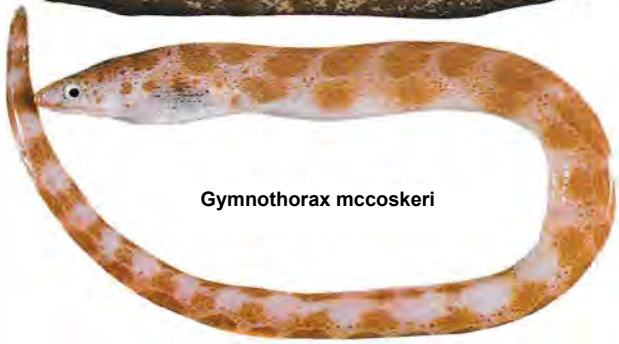
Gymnothorax cribroris

Gymnothorax minor

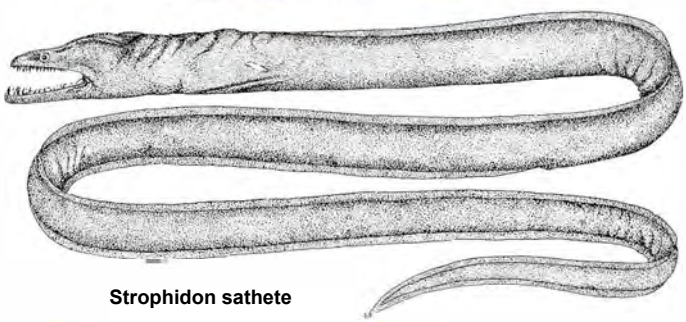


Gymnothorax longinquus

Gymnothorax pseudothyrsoideus



Gymnothorax mccoskeri



Strophidon sathete

NEMICHTHYIDAE

Snipe Eels -

Very long, tapering eels with jaws diverging and produced into a long beak; jaws with many small teeth each bearing a cusp. Eyes very large; pectoral fins present, dorsal, caudal and anal fins united as one, origin near pectoral fin base; lateral line complete. Tongue not free from floor of mouth. Anus situated from just under middle of pectoral fin to about a head length behind pectoral fin base (*Avocettina*).
The family comprises three genera and nine species; three species were collected on the Survey.

REFERENCES: Smith, 1999e; Nielsen & Smith, 1978.

Avocettina infans

Eye 2-4 times in postorbital distance. Elongate sensory ridges on head behind eyes; upper jaw much longer than lower jaw. Lateral line comprising a single row of pores. Dorsal fin begins behind pectoral fin base; anus well behind pectoral fin; caudal fin without a filament. Body finely mottled black brown.
P 14-18. L. lat. 181-201.
(voucher: ? mm TL)

Nemichthys curvirostris

Teeth large; upper jaw slightly longer than lower jaw. No ridges on head. Three lateral lines, close together along mid-line of body. Dorsal fin begins before pectoral fin base; anus under pectoral fin; body ends as a short filament. Body pale with scattered black stippling on lower half of body especially around belly; vertical dark bars along body. Fins edged black posteriorly. 5-14 pores behind eye; 2-6 pores along preopercular rim. Mature males lack the long jaws.
P 8-12.
(voucher: ? mm TL)

Nemichthys scolopaceus

Teeth small; upper jaw slightly longer than lower jaw. No ridges on head. Three lateral lines, close together along mid-line of body. Dorsal fin begins before pectoral fin base; anus under pectoral fin; body ends as a short filament. Body brown or dark grey, darker ventrally. 3-20 pores behind eye; 2-18 pores along preopercular rim. Mature males lack the long jaws.
P 10-14.
(5 specimen seen))

MURAENIDAE

Moray eels - Kerondong

Body thick and scaleless. Jaws strong, about equal in length; teeth strong, sharp, often depressible. Tongue fixed. Anterior nostril a tube near snout tip; posterior nostrils as rounded openings on top of head near eye. Gill openings as small slits or rounded opening on side of body. Fins usually covered with thick skin; dorsal, anal and caudal fins present; no pectoral fins.

Seven species in two genera were collected on the Survey.

REFERENCES: Bohlke, McCosker & Smith, 1999d; Bohlke, 2000; Bohlke & McCosker, 2001; Castle & Randall, 1999; Chen, Shao, & Chen, 1994; Li, Zang, Feng, Loh, Zheng & Li, 2018; Smith & Bohlke, 1997.

Gymnothorax cribroris

Body and head dull olive-yellow or grey overlain with fine brown reticulations, darker on tail giving appearance of large pale spots. Two-3 rows of dark spots behind eye. 8-10 long canines on vomer, jaw teeth usually in one row.
(voucher: 413 mm TL)

Gymnothorax longinquus

Body and head dark brown to blackish, with irregular large grey or cream patches; fins dark with black margin; gill opening white; inside mouth dark brown. Slender eel, 10-12 vomerine teeth in one row; single row of smooth-edged jaw teeth.
(voucher: 510 mm TL)

Gymnothorax mccoskeri

25-27 oblique interrupted broad brown bands over body from head to tail, extending onto dorsal and anal fins in tail region and broken into patches of spots on belly. Many teeth in single rows in jaws, their edges finely serrated. 16 vomerine teeth.
(voucher: 365 mm TL)

Gymnothorax minor

Fourteen-20 almost vertical continuous broad brown bands across body from head to tail, especially noticeable on lower sides, brown spots on head and upper sides. Jaw teeth in one row, their edges serrated; 7-12 vomerine teeth.
(voucher: 340 mm TL)

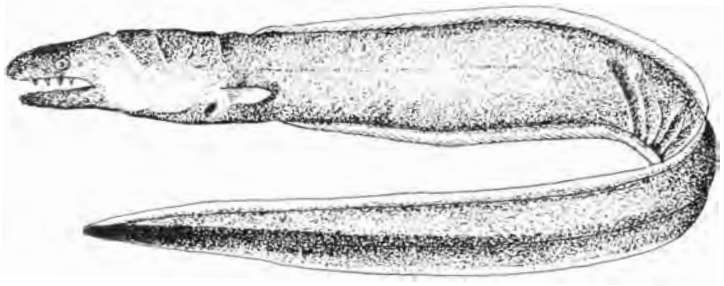
Gymnothorax pseudothyrsoideus

Head cream anteriorly, remainder and body finely marbled cream over dark brown; 3-4 rows of faint dark blotches along body. Robust eel; 8-12 vomerine teeth in one row, jaw teeth smooth-edged, sometimes in two rows anteriorly. Dorsal fin origin well before gill opening.
(voucher: 416 mm TL)

Strophidon sathete

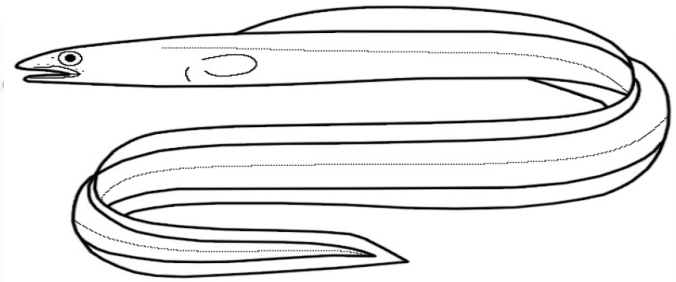
Extremely long and slender, tail 1.5 to twice length of rest of body. Anterior nostrils simple tubes, body cylindrical. Body and fins uniform grey or brown, fins darker.
(voucher: 1280 mm TL)

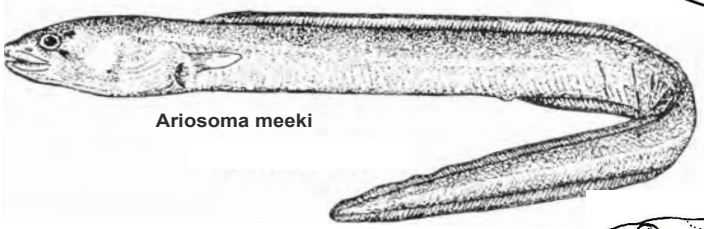
SYNAPHOBRANCHIDAE



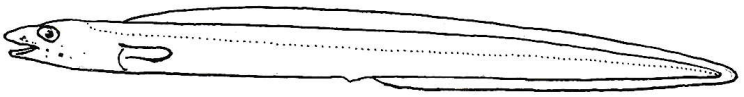
Dysomma anguillare after Castle, 1986a

CONGRIDAE

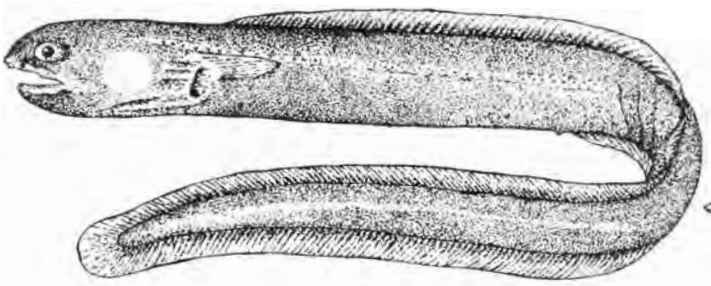




Ariosoma meeki

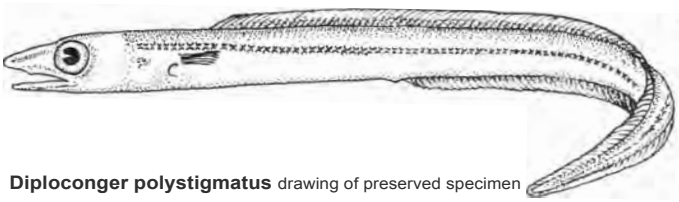


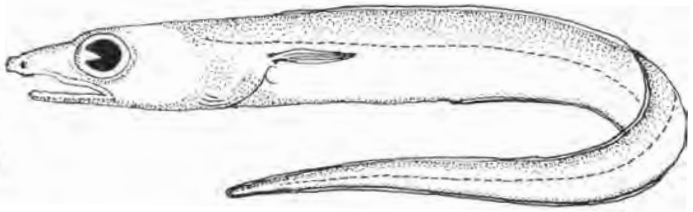
Ariosoma mauritianum after Castle, 1968



Bathymyrus smithi after Castle, 1986a

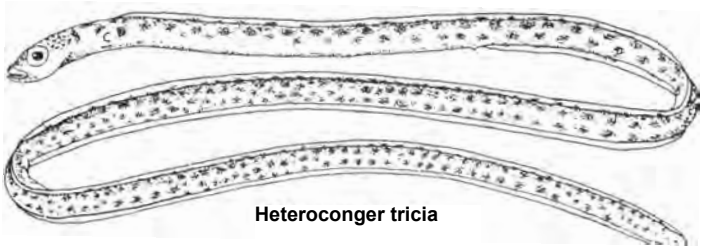
Blachea xenobranchialis after Karrer & Smith, 1980





Diploconger polystigmatus drawing of preserved specimen

Gnathophis nasutus drawing of preserved specimen



Heteroconger tricia

SYNAPHOBRANCHIDAE

Cutthroat Eels -

Compressed eels with plump. robust body. Body naked or scaled in various ways. Eyes covered by skin; snout short, mouth gape wide reaching well past eye. Tongue not free from floor of mouth. Pectoral fin present or absent. Teeth sharp and small. Gill openings ventral, before or under pectoral fin bases. separated. or united into a single slit under throat. Anus not far from gill opening or placed ⅓ along body length. One species (in subfamily Dysommatinae) collected.

REFERENCES: Castle, 1986c; Smith, 1999c; Ho, Smith & Tighe, 2015; Prokofiev, 2019a.

Dysomma anguillare

Body depth 20-23 in TL; head 6.5-7.5 in TL. Snout flattened, 4.5-5 in HL; eye very small, 19-21 in HL. Upper jaw overhangs lower jaw; gape large; skin covers eye; corner of mouth extends far behind eye; short papillae on snout. Jaw teeth fine and in bands in upper jaw; 4 or 5 enlarged double canines on vomer, bases of teeth surrounded by fleshy tissue. Gill opening ventral, just before small pectoral fin. Anus just behind pectoral fin tip. Dorsal fin begins before pectoral fin. Dorsal and anal fins low anteriorly. Body black or dark brown, fins slightly paler.
(voucher: ? mm TL)

CONGRIDAE

Conger Eels - Belut laut

Body robust, sometimes slender. Pectoral fins usually well-developed (small or absent in subfamily Heterocongrinae). Rays of dorsal, anal and caudal fins usually clearly visible. Snout not produced; posterior nostril simple, close to front of eye margin. Jaws strong; small and sharp teeth in 1-2 rows along jaws; usually few vomerine teeth. Tongue conspicuous and free from floor of mouth. Gill opening before and below pectoral fin. Anus usually before middle of body length.

Thirty genera in the family and many species; 11 genera were represented in the Survey.

REFERENCES: Castle, 1986a; Castle & Paxton, 1984; Castle & Randall, 1999; Chen & Weng, 1967; Ho, Smith & Shao, 2015; Karmovskaya, 1993; Karmovskaya, 2018; Karmovskaya & Paxton, 2000; Karrer & Smith, 1980; Lin, Shao & Smith, 2018;Mao, Aoyama, Miller, Minegishi, Inoue & Tsukamoto, 2008; Smith, Ho, Huang & Chang, 2018; Smith & Ho, 2018; Shen, 1998; Smith, 1999g;

Ariosoma meeki

Fin rays unsegmented; caudal fin short. Premaxillary teeth in a rounded patch, partly extending outside of mouth. Posterior nostril a simple opening before eye. Dorsal fin origin behind head. Eye very large, 4-5.4 in HL. Head and body yellow. Two conspicuous triangular brown marks at upper and lower corners of eye posteriorly, brown mark at corner of mouth; dark spots on head and throat. Dorsal, anal and caudal fins edged black. Lateral line pores before level of anus 54-58.

Bathymyrus smithi

Premaxillary teeth wholly outside of mouth and curving up on front of snout. Posterior nostril a slit below lower front eye border. Head 6.5-7.3 in TL; body depth 13.5-16.5 in TL. Fin rays unsegmented; caudal fin short. Grey-brown body tinged violet-pink, paler below; tips of dorsal, caudal and anal fins black, caudal fin base cream. Dorsal fin rays before level of anus 50-65; lateral line pores before level of anus 43-47.

Diploconger polystigmatus

Fin rays unsegmented; anus about ⅓ along body length. Snout prominent, anterior nostril rim high, entire, not slit; lips well-developed. Jaw teeth sharp and slender, in bands; premaxillary tooth patch partly outside mouth. Dorsal fin rays before anus 28-35; lateral line pores in double row, 26-30 before level of anus. Tail tip stiff, caudal fin reduced. Body coppery-fawn, dusky band from head along top of lateral line to tail base, a transverse bar across nape joining band on each side; dark band along snout; fin rays streaked dark brown, tail tip charcoal.
(voucher: ? mm TL)

Heteroconger tricia

Body very long and 'worm'-like, slender and cylindrical. Mouth very small, oblique, not reaching level of eye. Teeth numerous, in many rows on jaws and palate; lip continuous across front midline of upper jaw, anterior nostril opening through lip anteriorly. Dorsal fin origin above middle of small, rounded pectoral fin. Body pale, head freckled with brown spots above; 2 rows of large brown blotches along upper ⅔ of body, lower ⅓ of body plain cream. Lateral line pores before level of anus 64-68.
(voucher: ? mm TL)

Ariosoma mauritianum

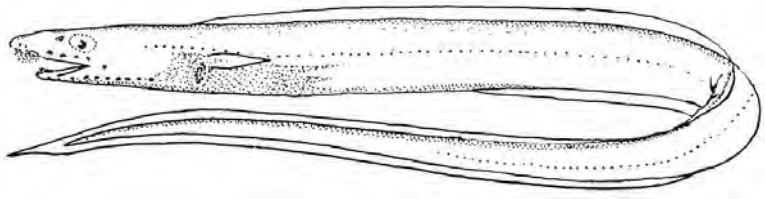
Fin rays unsegmented; anus near middle of body length; caudal fin short. Premaxillary teeth forming an oval patch, partly extending outside mouth. Posterior nostril a simple opening before eye. Eye large and prominent, 4.5-5 in HL. Upper lip with well-developed upturned flange. Head dusky, body plain fawn or pinkish, dark edge to unpaired fins; pectoral fin pale. Lateral line pores before anus 50-56; dorsal fin rays before level of anus 60-65.

Blachea xenobranchialis

Fin rays unsegmented, long and filamentous in dorsal fin, about 60 dorsal fin rays before anus; tail slender and tip flexible. Two or 3 branchiostegal rays protrude from gill membrane on sides and lie free. Lateral line broad and canal-like with 2 rows of pores (one row on dorsal edge of line, one row on ventral edge), clusters of curved bony processes supporting canal space between pores. Snout acute; teeth small, sharp, in single rows on jaws and premaxilla. Body dusky above, yellow below and stippled black. Mouth and gill cavity black, peritoneum dark brown, gut black; fins yellow with black edges.
(voucher: ? mm TL)

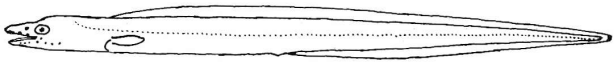
Gnathophis nasutus

Second, and 6th to 13th lateral line pores raised above level of lateral line. Fin rays segmented; anus about ⅓ along body length. Caudal fin rather long, tail tip stiff. Several rows of teeth in jaws; 3 postorbital pores; a slit in rim of anterior nostril. Eye large, 4.1-4.7 in HL; lips well-developed. Body fawn or pinkish, top of head charcoal, operculum silver, abdomen iridescent pink. Swim bladder and intestine silver, stomach black. Dark margin on dorsal, anal and pectoral fins. Dorsal fin rays before level of anus 28-32; lateral line pores before level of anus 27-29.
(voucher: ? mm TL)

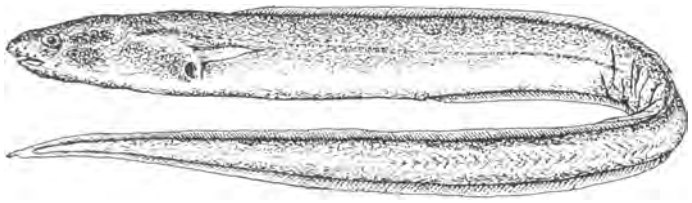


Lumiconger arafura after Castle & Paxton, 1984

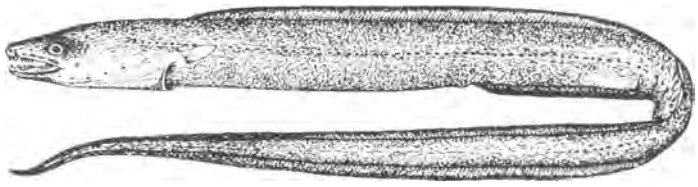
Parabathymyrus macrophthalmus after Chen & Weng. 1967



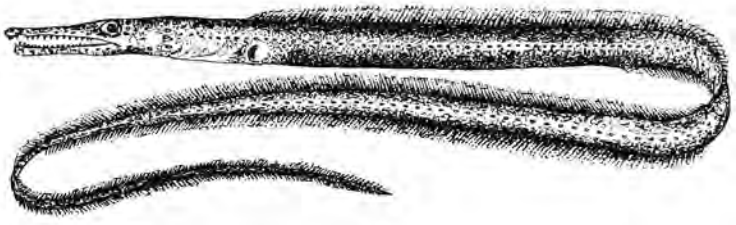
Bathycongrus guttulatus after Castle. 1968



Macrocephenchelys brevirostris

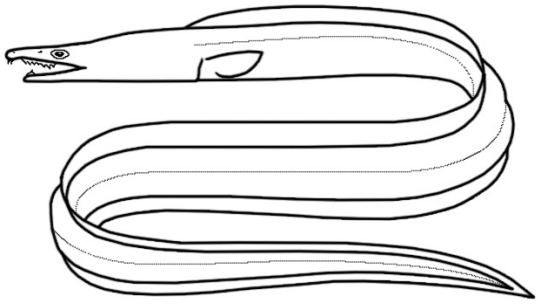


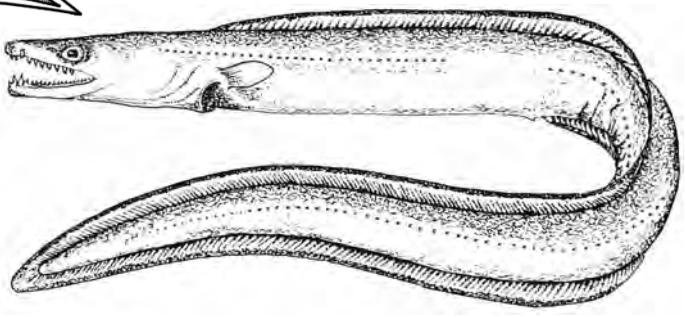
Uroconger lepturus after Castle, 1986a



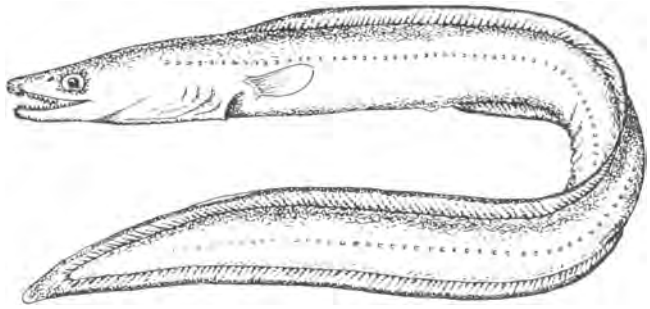
Gavialiceps javanicus

MURAENESOCIDAE

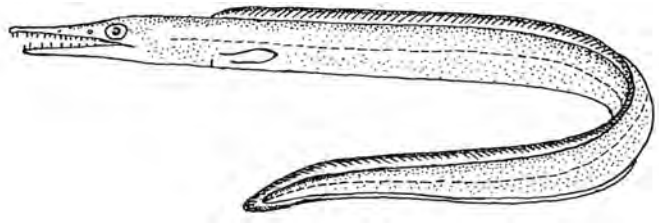




Muraenesox bagio after Castle, 1986b



Muraenesox cinereus



Oxyconger leptognathus after Chen & Weng, 1967

Lumiconger arafura

Fin rays segmented, tail tip soft, fin rays segmented. Snout pointed, 3-4 in HL. Elongate patch of granular premaxillary teeth exposed; vomer teeth in short band; lower gill opening attachment at mid-base of pectoral fin. Head, throat, belly and anal fin black and iridescent, rest of body fawn; 2 brown lines along body; fin edges black. Dorsal fin rays before level of anus 56; lateral line pores before level of anus 32-33.
(voucher: ? mm TL)

Bathycongrus guttulatus

Fin rays segmented; anus ⅓ along body length; tail noticeably long, its tip soft and flexible. Snout projecting, twice eye diameter. Teeth sharp, large, in 2 rows on jaws and in small patch anteriorly on vomer; lips well-developed; gill opening small. Dorsal fin begins behind pectoral fin base; tail noticeably long, tip soft and flexible. Body brownish or dusky yellow, fins grey or black, peritoneum black. Dorsal fin rays before level of anus 59-72; lateral line pores before level of anus 36-39.
(voucher: ? mm TL)

Uroconger lepturus

Fin rays segmented; anus about ⅓ along body length; tail tip soft and flexible. Teeth sharp, large, in 2 rows on jaws and in one row of 10-20 teeth on vomer, extending well back on roof of mouth; most of premaxillary band exposed. Snout 1.5 times eye diameter; eye 5.5-6.5 in HL. Body blue-grey or tan, fins edged black, peritoneum pale. Dorsal fin rays before level of anus 46-62; lateral line pores before level of anus 42-44.

Parabathymyrus macrophthalmus

Fin rays unsegmented; caudal fin short and tail tip stiff. Premaxillary teeth forming an oval patch, not extending outside mouth; posterior nostril a slit, low on cheek below front eye border and covered by a flap; eye 5.5-7 in HL. Body fawn or yellowish, pectoral and caudal fins plain yellow or cream, dorsal and anal fins yellow edged brown. Dorsal fin rays before level of anus about 86; lateral line pores before level of anus 36-44.
(voucher: ? mm TL)

Macrocephenchelys brevirostris

Fin rays segmented; anus about ⅓ along body length, tail rather long, its tip flexible. Snout blunt, 5-6 in HL; posterior nostril an opening above front margin of eye; small papillae on chin and head above. Mouth inferior, teeth fine, in bands on jaws, premaxillary and vomer teeth in broad connected band. Dorsal fin origin above or just behind pectoral fin; gill opening small, below pectoral fin base. Body pale fawn below, snout brown; gill opening, lips and inside mouth black; fins mostly pale, tail tip black. Dorsal fin rays before level of anus 41-43; lateral line pores before level of anus 28-31.

Gavialiceps javanicus

Body very long, soft and sticky, its depth 34-38 in TL. Dorsal and anal fins high, rays segmented; anus about ⅓ along body length; tail tip soft and flexible. Lips reduced; jaws very long, slender, notched behind tip; head flattened above. Teeth small and pointed, inner row of premaxillary teeth separated from outer rows by longitudinal toothless groove; vomer with 9-10 large canines each interspersed with 2-3 small ones. Posterior nostril located far forward on snout; supraorbital pores enlarged and slit-like. Pectoral fin absent; gill opening ventral. Body grey, dark brown or black on top of head and on back; gill opening and end of tail black.
(voucher: ? mm TL)

MURAENESOCIDAE

Pike Eels - Pucuk; Remang

Robust eels, cylindrical anteriorly, tail compressed. Mouth large, upper jaw extending well behind eye; teeth large and powerful, several rows of conical teeth on side of jaws; large canines on vomer and in front of lower jaw. Tongue not free from floor of mouth; anterior nostril tubular; posterior nostril opposite middle of large eye. Gill openings large or small. Anus before midpoint of body. Dorsal and anal fins well-developed; pectoral fin present.

The family has 6 genera and 15 species; representatives of four species in three genera were collected on the Survey.

REFERENCE: Castle, 1986b; Smith, 1999d.

Muraenesox cinereus

Jaws projecting. Canine teeth in jaws in 3 rows, compressed, those in middle row largest; long canines in front of jaws. Teeth on vomer in 3 rows, those in middle row large, compressed and sharp, each with sharp edges and cusps at base. Eye 2-2.8 in snout length; interorbital 7.2-9 in HL. Dorsal rays from origin to a vertical line through anus 65-78; number of lateral line pores before anus 40-47. Head and body dark grey or brown, lower sides grey. Dorsal, anal and caudal fins dark grey with broad black margins. Pectoral fin black.
(voucher: ? mm TL)

Muraenesox bagio

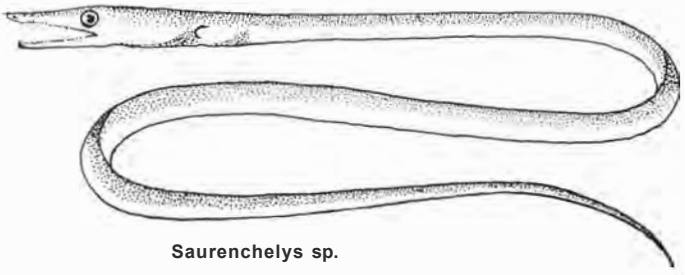
Jaws projecting; canine teeth in jaws compressed and in 3 rows, those in middle row largest; very large in front of jaws. Teeth on vomer in 3 rows, those in middle row large, compressed and sharp, each with sharp edges and cusps at base. Eye 2.9-3 in snout length; interorbital 9.0-10.7 in HL. Number of dorsal rays from origin of fin to a vertical line through anus 47-59; number of lateral line pores before anus 33-40. Head and body grey, lower sides white. Dorsal, anal and caudal fins grey with brown edge. Pectoral fin pale.

Oxyconger leptognathus

Jaws projecting and sharp. Three rows of teeth in jaws, middle row of simple canines, conspicuously long and well-spaced. A short row of simple small canine teeth in front of vomer. Eye large and circular, 3-3.5 in snout length. Body depth 20-21 in TL. Upper head and body tan or coppery; operculum and sides iridescent mauve; peritoneum black, swim bladder silver. Dorsal, caudal and hind part of anal fin edged brown.

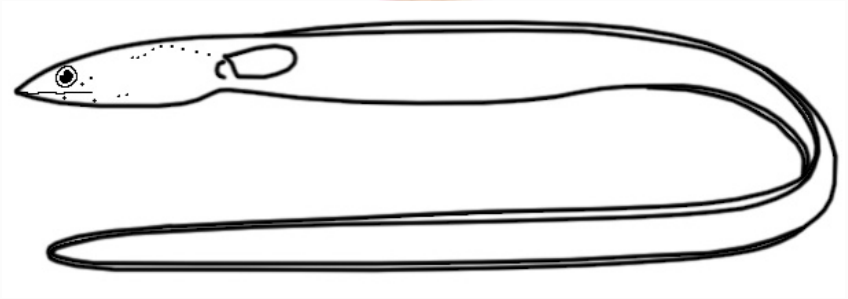
NETTASTOMATIDAE

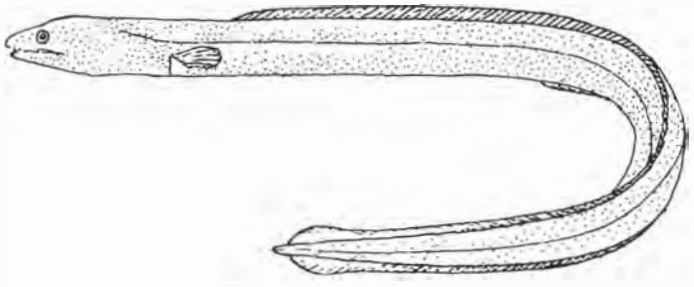
Nettenchelys gephyra



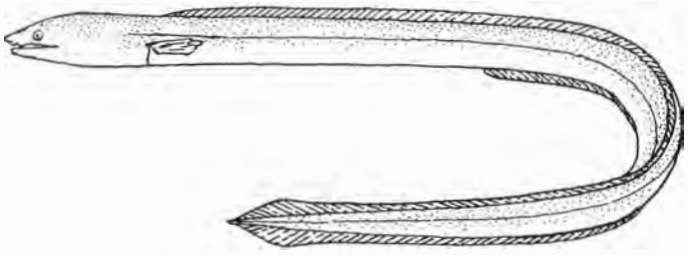
Saurenchelys sp.

OPHICHTHIDAE



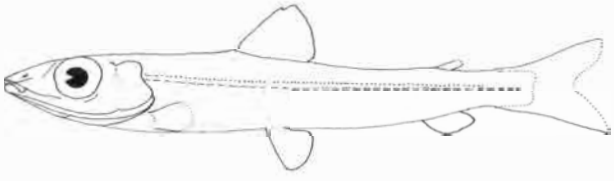


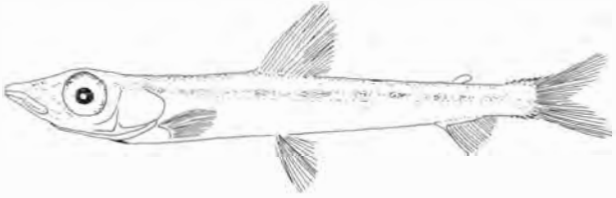
Ophichthus urolophus after Chen & Weng. 1967



Pisodonophis cancrivorus after Chen & Weng. 1967

ARGENTINIDAE





Glossanodon australis

NETTASTOMATIDAE

Witch Eels, Duckbill Eels -

Body slender, compressed and elongate. Snout long and pointed, strong; teeth in jaws and on vomer numerous and close together. Tongue fixed to floor of mouth. Gill openings small and slit-like. Anus before midpoint of body though far behind gill opening. Pectoral fins usually absent. Tail long and tapering, ending in a slender tip or filament.

There are six genera in the family; members of two species collected during the Survey.

REFERENCES: Smith,1999f; Smith, Lin, Chen & Pogonoski, 1915; Karmovskaya, 2004.; Lin, Smith, Shao & Chen, 2015.

Nettenchelys gephyra

Snout sharp and beak-like, its length about 2.8 in HL; posterior nostril on top of head slightly behind eye; 8-10 pores along upper jaw. Jaw teeth in bands, inner series distinctly larger; long patch of vomerine teeth, 3 enlarged teeth in a separate part anteriorly. Body deepest in middle and tapers towards both ends; its depth about 28 in TL. Dark brown above, grey or cream below.
(voucher: ? mm TL)

Saurenchelys sp

Jaws strong and projecting. Posterior nostril just in front of eye. Many rows of sharp fine teeth in jaws; 3 rows of teeth on vomer, sharp and larger in the median row; teeth on pterygoids. Body depth 37 in TL. Body pale yellow or grey, top of head and end of tail brown; eye green, operculum and belly brilliantly silver.
(voucher: ? mm TL)

OPHICHTHIDAE

Snake Eels -

Elongate or cylindrical robust eels. Tongue not free from mouth; snout projects beyond lower jaw. Posterior nostril usually a slit in border of upper lip, pointing downward; anterior nostril a tube on or under front border of snout or upper lip. Teeth sharp, conical or granular. Anus at or behind midpoint of body. Tip of tail finless and muscular, pointed. Pectoral fin present or absent.

The family comprises 62 genera and numerous species, just two species were collected during the Survey.

REFERENCES: Chen & Weng, 1967; McCosker, 2010; Smith & McCosker, 1999; McCosker & Randall, 2001.

Ophichthus urolophus

Body depth 24-27 in TL; head 8-9 in TL; snout 5.5-6.5 in HL; eye 8-10 in HL. Snout short, tip rounded; anterior nostril a simple tube. Teeth pointed, mostly in single rows. Pectoral fin present, longer than eye diameter, its base narrow and opposite upper half of gill opening. Dorsal fin begins behind pectoral fin, posterior parts of dorsal and anal fins elevated. Anus about ⅓ along body length. Body plain fawn or tan, paler below; pectoral fin dusky anteriorly.

Pisodonophis cancrivorus

Body depth 22-34 in TL; head 8.5-10 in TL; eye 9-12 in HL. Teeth low and granular, in bands of several rows. Pectoral fin well developed, its base broad, twice or less in fin length. Dorsal fin begins above middle of pectoral fin; anus in anterior ⅓ of body length. Body tan or coppery brown, unpaired fins with dark margins.
(voucher: ? mm TL)

ARGENTINIDAE

Herring Smelts -

(Subfamily *Argentininae* Moderately elongate, silvery fishes. Mouth small, teeth absent on upper jaw, present on palate and lower jaw; eye large 'looking' outwards. Scales cycloid, easily lost; lateral line present. No spines on fins, single dorsal midway along body, begins before ventral fin; adipose fin present, above anal fin; pectoral fin low on sides of body, base close to head; caudal fin forked.
(Subfamily *Microstomatinae* has tubular eyes 'looking forward', no adipose fin, dorsal fin behind ventral fin, pectoral fin well up on sides).

REFERENCES: Kobyliansky, 1998; Parin & Belyanina 2007; Paxton & Cohen, 1999a.

Glossanodon australis

Silvery yellow, dark blotches above lateral line, dark lines along dorsal profile and to anus along ventral profile; gill rakers pale or streaked charcoal. Anus just before anal fin base, teeth along all of lower jaw; body width 2.5-2.9 in HL, snout 2.8-3.2 in HL, maxillary expansion 7.4-10.3 in HL.
D 10-14. A 9-12. P 20-25. L. lat. 50-54. Lower GR 19-22.
(voucher: 168.4 mm SL)

* BATHYLAGIDAE

(See Species list)

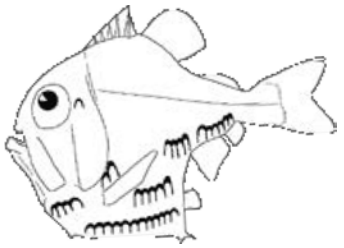
STERNOPTYCHIDAE

Hatchetfishes -

Small and mainly deep-water fishes found in all oceans from the surface to a depth of over 3000 m but most commonly around 1000-1800 m. Formerly only the very characteristic Hatchetfishes - with the short and extremely compressed body, well developed dorsal blade and post abdominal spine - were included in this family, but based on the arrangement of photophores, presence of gill rakers, pseudobranch and a gas-filled swim bladder, several genera previously in the GONOSTOMATIDAE have been included here, making a total number of 10 genera. The dorsal blade of the Hatchetfishes represents the highly specialised dorsal pterygiophores and they are seen either as a thin plate, a small pair of bony keels or as a single spine. The family is characterised by the arrangement of photophores in compound clusters. An adipose fin may be present or absent.

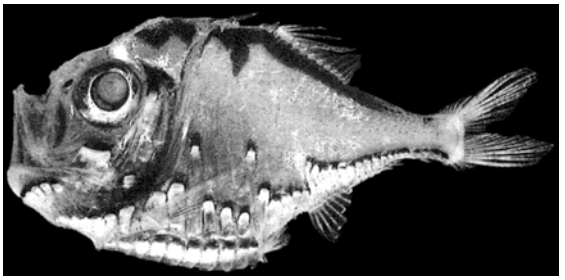
Four species in three genera were collected in the Survey.

REFERENCES: Harold, 1994. Harold, 1999a; Harold, Kemp & Shore, 2016; Harold & Lancaster, 2003; Parin & Kobyliansky, 1996..

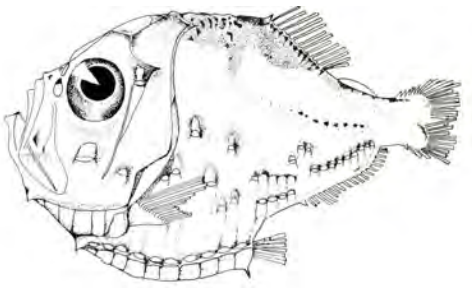


Argyripnus pharos (photo of preserved specimen) from Proc. Biol. Soc. Wash, Dec 2003

Maurolicus javanicus



Polyipnus soelae after Harold, 1994



Polyipnus triphanos after Schultz, 1938

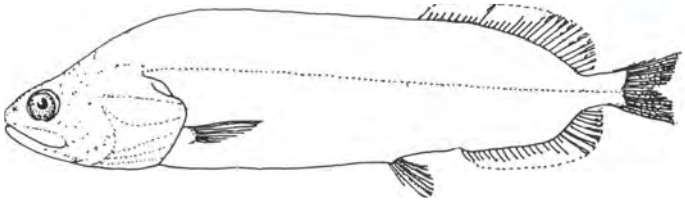
ALEPOCEPHALIDAE

Slickheads -

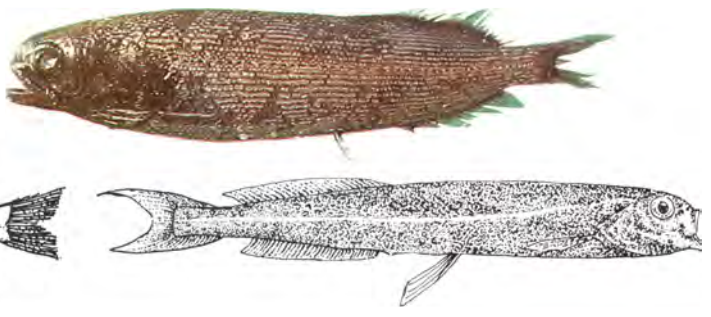
Deep-sea fishes with variable habitats from usually benthic to midwater. They are most numerous below 1000 m and are found in all oceans. The fishes are predominantly brown or black, although the members of one genus are bright blue. The body shape is highly variable, from moderately deep to elongate and eel-like. All but one species lacks scales on the head and if present on the body, the scales are always cycloid (smooth to touch) though easily lost. A lateral line, when present, is composed of either pored scales, a pored tube supported by ring-like scales, or papillae. The dentition of the jaws and roof of the mouth is variable, but teeth are usually present on the premaxilla and mandible. The gill rakers are moderate to long and have small tooth-like structures. The single dorsal fin may be continuous with the caudal and anal fins. There are no adipose fins. Light organs are present in four genera.

Only two species in the 20 known genera were collected in the Survey.

REFERENCE: Sazonov & Markle, 1999.



Microphotolepis schmidti after Sazonov & Parin. 1977



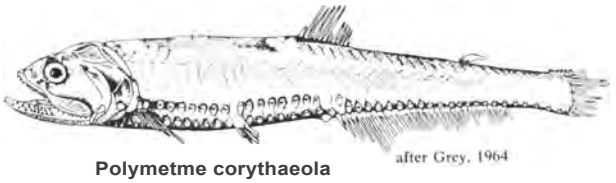
Xenodermichthys copei after Günther. 1887

PHOSICHTHYIDAE
Lighthousefishes-

Small to moderate-sized fishes. They are generally oceanic but some are benthopelagic, mostly found between 200 and 300 m at day time. A pattern of vertical migration often takes place during the night for some species. Dorsal and adipose fins are present; the dorsal fin placed above the anal fin. These fish lack a chin barbel. Gill rakers are well-developed. Photophores are present on the isthmus and in two rows on the lower flanks (except *Varella*) up to the anal fin origin. A single row of photophores follows behind the anal fin onto the caudal peduncle.
Seven genera in the family; two species obtained on the Survey.

REFERENCE: Harold, 1999c.

Pollichthys mauli after Grey, 1964



Polymetme corythaeola after Grey, 1964

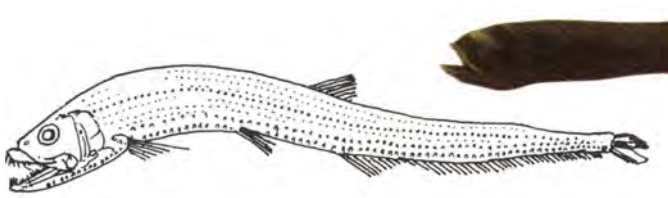
GONOSTOMATIDAE
Lightfishes -

Small to moderate sized fishes rarely exceeding 25 cm in length and found in all oceans at depths between 200 and 3000 m during day time; pre-metamorphic post-larvae are found near the surface but during metamorphosis they sink down to a preferred depth. Many species perform vertical migration during the night to feed on zooplankton in the upper water layers.

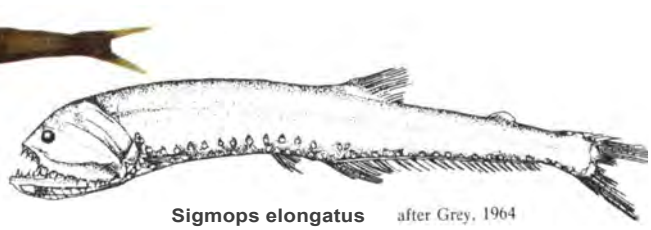
The body is usually elongated and compressed, the head is without barbels, eyes small and the large mouth has teeth in both jaws. The gill opening is wide. Contrary to other stomioid fishes, the GONOSTOMATIDAE often have true gill rakers. Positions of the dorsal and ventral fins are variable, an adipose fin is often present and the pectoral fin is placed low on the body. The cycloid scales, if present, are large, thin and easily lost. Photophores (light-organs are present on all species except *Cyclothone obscura* and are arranged as one or more on the head, always one series on the branchiostegal membranes and one or more rows on the body. Additional patches of luminous tissue may be present on the head and/or on the body. The body is either uniformly dark brown or black, often with silvery iridescence on the body and cheeks; or the fish is translucent white with scattered black chromatophores.

These are very common fishes. The family GONOSTOMATIDAE contains eight genera and 32 species, two of which were obtained on the Survey.

REFERENCES: Harold, 1999a; Miya & Nishida, 2000.



Manducus greyae after Johnson, 1970



Sigmops elongatus after Grey, 1964

STOMIIDAE

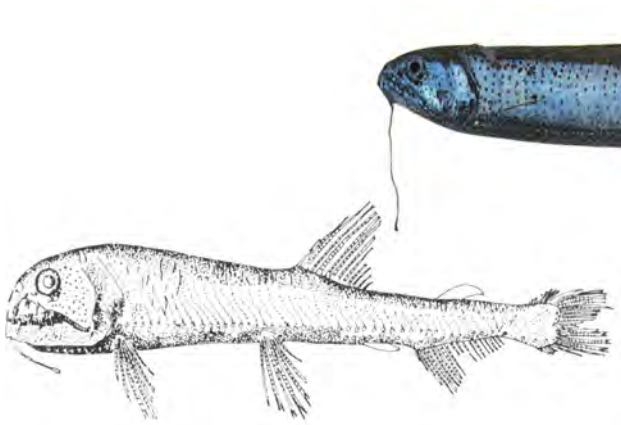
No true gill rakers in adults; one infraorbital bone; one or no supramaxillary; mesopterygoid reduced in size or absent; photophores without ducts or lumen; usually a chin barbel in most, associated with hyoid apparatus; pectoral fin rays absent in *Tactostoma*, *Idiacanthus*, and *Photostomias*; most are darkish in colour.

Subfamily Astronesthinae
Stareaters, Snaggletooth -

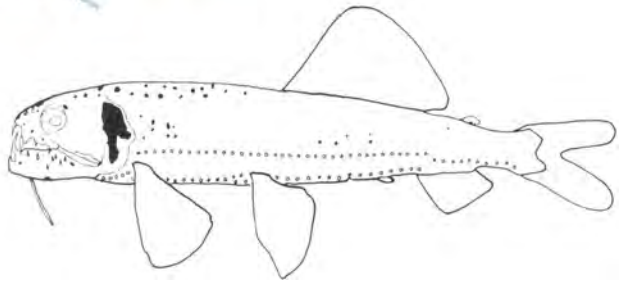
Small-sized fishes rarely exceeding 15 cm in length, found in all oceans – from 200m (small species) to 2000m. The body is black. Small photophores are present over most of the body, becoming abundant ventrally. Two rows of photophores on the lower flanks are usually divided into discrete sections; two mid-ventral rows of photophores between the major series are often developed. In front of the eye is a small luminous organ and behind the eye a larger light organ, which is sometimes divided into a small anterior and a large posterior part. A row of photophores lies along the maxilla. The dorsal fin origin is well in front of the anal fin and over or behind the ventral fins. A dorsal adipose fin is usually present. The head and mouth are large; fangs are present on the premaxilla and anterior lower jaw, while slender or comb-like teeth are on the maxilla. The gill arch possesses gill 'teeth' instead of true gill rakers. A barbel is present on the chin; during sampling, care should be taken not to damage it as it is important in identification. The Atlantic species *Astronesthes niger* has been reported to flash violet-blue light over the fins, along the barbel and on the anterior part of the body. Very little is known about the life history or food habits of these fishes.

Six genera and 59 species in this subfamily, of which five were collected on the Survey.

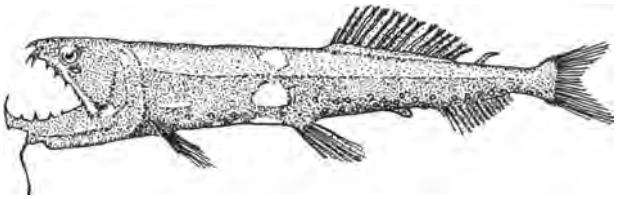
REFERENCES: Liao, Chen & Shao, 2006; Parin & Borodulina, 2003; Harold, 1999d.



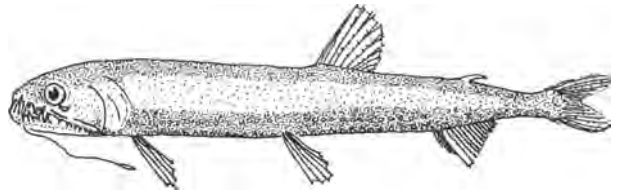
Astronesthes chrysophekadion



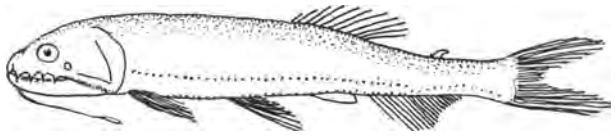
Astronesthes cyaneus after Goodyear & Gibbs, 1970



Astronesthes indicus after Regan & Trewavas. 1929



Astronesthes martensii after Lutken. 1892



Astronesthes splendidus after Brauer 1906

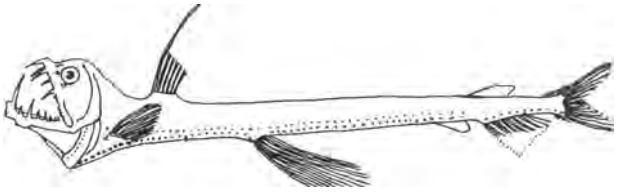
Subfamily Chauliodontinae

Viperfishes -

These are small to medium sized fishes growing to about 30 cm in length, occurring in all oceans but apparently less abundant in the Central Pacific. They are found from 20-2800 m, the larger species generally occurring in the deepest waters. The body is slender and compressed, tapering at its end. The large, rather heavy scales that cover the body, though easily lost, form five longitudinal rows. Under each scale is a hexagonally-patterned pigmented area, the pigment being absent over each small light organ which thus shines through the transparent scale. Luminous organs are present immediately before and behind the eye. A row of large light organs lies on each side of the body from the gill opening to above and near the end of the anal fin; another row below these begins at the isthmus and ends at the caudal fin base. A wavy row of smaller organs runs between these rows and small groups are also present on the mid-ventral line. The entire body is covered by a gelatinous membrane which is usually lost on preserved material. The dorsal fin is well in advance of the anal fin and adipose dorsal and adipose anal fins are present. The first dorsal fin ray is filamentous and tipped with a light organ which presumably is used as a lure. Large fang-like teeth arm the mouth which can open 90° and thus accommodate large prey. A barbel is present on the chin.

The subfamily comprises one genus and nine species, of which one was obtained on the Survey.

REFERENCE: Harold, 1999e.



Chauliodus sloani after Regan & Trewavas. 1929

Subfamily Melanostomiinae

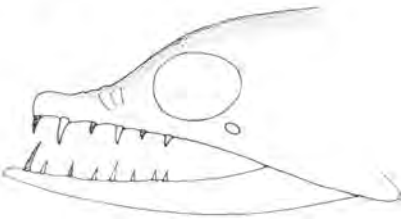
Scaleless black Dragonfishes -

Small deep-water fishes found in all oceans from the surface down to 4500 m, although the majority is found in layers shallower than 1000 m. The body is long and slender and slightly compressed (except for one species). The head is rather short, the nostrils small. The jaws are large, nearly as long as the head. Teeth on the premaxilla, maxilla and mandible are erect anteriorly but only as small denticles posteriorly. A chin barbel is present and variously developed, showing sexual dimorphism in some groups. The dorsal and anal fins are placed far back on the body: confined to the caudal peduncle. Except for *Chirostomias*, a dorsal adipose fin is present. A pectoral fin may be present also. The skin is usually naked, covered with more or less numerous minute light organs. These are scattered over the head and the body, arranged especially into vertical rows. A postorbital photophore is usually present but it may be absent in females. Two rows of light organs are present on the lower flanks of the body up to the anal fin, followed by a single row on the caudal peduncle which is often separated from the two anterior rows by a space.

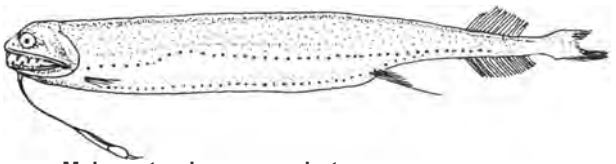
This family comprises 15-16 genera and 195 species, of which seven were obtained on the Survey.

REFERENCES: Harold, 1999f; Prokofiev & Klepadlo, 2019; Prokofiev, 2019b; Koeda & Ho, 2019.

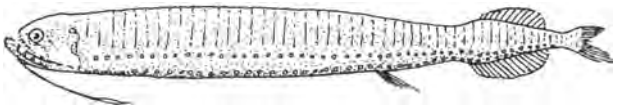
Echiostoma barbatum after Regan & Trewavas. 1930



Eustomias bifilis after Gibbs. 1960



Melanostomias macrophotus after Matsubara. 1938



Photonectes albipennis after Imai. 1957

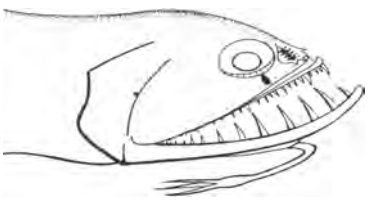
Subfamily Stominae

Scaly Dragonfishes

Small fishes found in all oceans except for Arctic and Antarctic regions, from the surface to as deep as 2000 m, with the majority appearing between 300-500 m. The body is long, slender and compressed, covered by a thin, gelatinous, transparent membrane. Beneath this membrane are the scales, which are very thin, completely transparent and easily lost as no apparent scale pockets exist. The scales form 5 or 6 longitudinal rows and beneath each scale a pigmented hexagonally-patterned area is visible, its centre a luminous organ. A light organ lies below and behind the eye; other small light organs are scattered over the head and body. A row of larger light organs lies on each side of the body from the gill opening to the origin of the anal fin; another row of light organs below these begins on the isthmus and ends near the caudal fin base. Small photophores are also present on the branchiostegal membranes. The dorsal and anal fins are on the posterior part of the body, the ventral fins at or just behind the midlength of the body. No adipose fins are present. The teeth on the premaxilla and mandible are rigid and fang-like and there are numerous fine teeth on the posterior part of the maxilla. The vomer has a pair of teeth and there are one to three teeth on each side of the palatines. There are no true gill rakers but gill 'teeth'. These fishes possess a chin barbel which is either long or short and has a light organ at its end, sometimes with a filament as well.

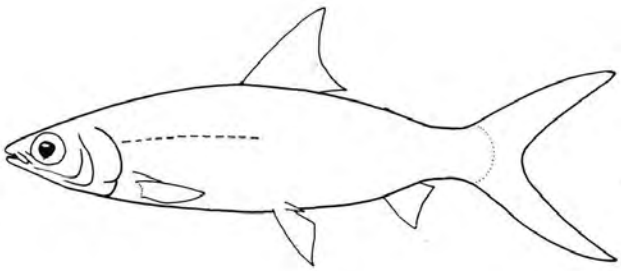
The family comprises one genus and eleven species, of which one was obtained on the Survey.

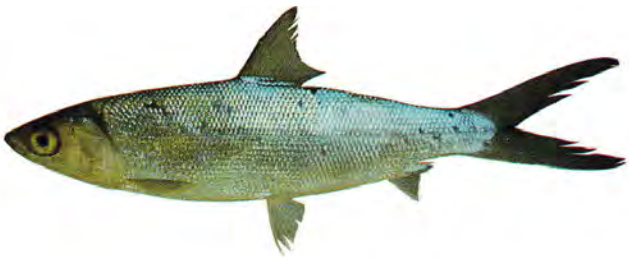
REFERENCE: Harold, 1999.



Stomias nebulosus after Brauer, 1906

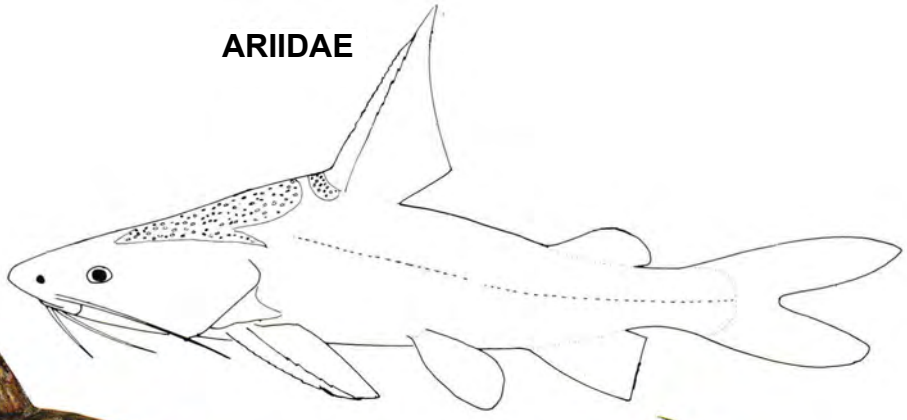
CHANIDAE





Chanos chanos

ARIIDAE



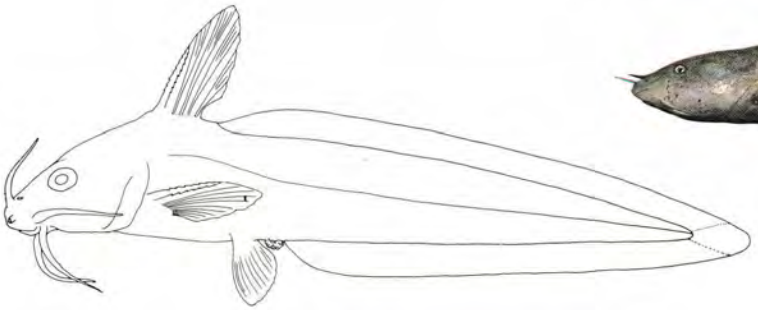
Plicofolis tonggol

Arius maculatus

Netuma thalassina

Netuma bilineata

PLOTOSIDAE



Euristhmus lepturus

CHANIDAE

Milkfishes - Bandeng

Body oblong, moderately elongate. Head naked. Gill membranes united but free from throat. Four branchiostegal rays. Mouth small, toothless; knob on symphysis of lower jaw; adipose tissue over eye. No gular plate. No belly scutes. Scales small; lateral line present. Dorsal and anal fins with basal sheath of scales; pectoral and caudal fin deeply forked. Eleven to 12 rays in ventral fin.

Chanos chanos

Olive-green back, silvery-yellow below. Dorsal, anal and caudal fins edged black. Maxilla does not reach eye. Dorsal fin in middle of dorsal profile.
D 13- 17. A 9-11.
(voucher: 179 mm SL)

REFERENCES: https://www.fishbase.ca/summary/Chanos-chanos.html; Bagarinao, 1994.

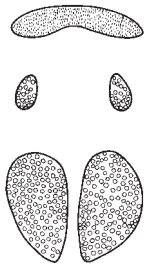
ARIIDAE

Fork-tailed catfishes - Manyong; Jahan

Oblong, robust, heavy-bodied fishes with naked body. Head moderately depressed with strong bony shield on top extending almost to dorsal fin origin ('occipital process'); mouth moderate to wide; bands of fine or conical teeth in jaws; patches of fine or granular teeth often present on palate; 1, 2 or 3 pairs of barbels around mouth the maxillary barbels usually longest; nostrils close together. Gill opening wide, or restricted, lateral line distinct. Dorsal fin short-based, of a strong serrated spine, and 7 rays. Adipose fin behind dorsal fin, short-based. Anal fin which has 15-30 rays; pectoral fin low on sides, with a strong, serrated spine; caudal fin forked. Inner ventral fin rays in mature females often develop a thick pad or blunt hook.

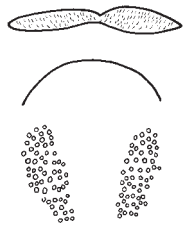
REFERENCES: Kailola, 1999; Kailola, 2004; Kottelat, 2013.

Plicofollis tonggol



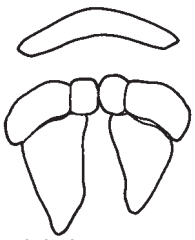
Teeth on palate granular, in 4 patches, the 2 anterior patches small but always visible, posterior patches broadly oval, running obliquely along palate. Head shield rugose, striate posteriorly. Sides of occipital process slightly convex, keel moderate. Snout conical, head length 30-31% SL. No rakers on back of first gill arch. Body bluish grey above, white below, often a black patch on adipose fin, unpaired fins dark or dark-margined.
A 18-20. GR total 9-12.
(voucher: 275 mm SL)

Arius maculatus



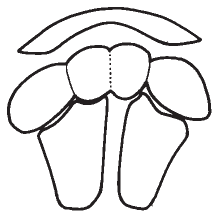
Teeth on palate granular, in 2 patches (Fig); patches semi-oval and placed far back on palate. Teeth on upper jaw in narrow band. Occipital process keeled and rough with strong granules and low ridges; sides straight. HL 3.6-4 in SL; base of adipose fin 4-6 in its distance from dorsal. Body silvery blue, cream below, conspicuous black spot over outer half of adipose fin.
A 19-22. Lower GR 13-15.
(voucher: 177 mm SL)

Netuma thalassina



Teeth on palate fine and slender, in 2 large triangular patches, each of 3 smaller patches (Fig). Snout prominent and 'shark-like' (especially in large fish), exposing maxillary tooth band, distance from snout to tip of dorsal origin 2.4-2.7 in SL; triangular occipital process rough to smooth, keel low, sides straight and converging posteriorly. Body blue-green, sometimes dusky above, cream below, usually with coppery-golden sheen, especially over head.
A 14-17. Lower GR 8-9.
(voucher: 390 mm SL)

Netuma bilineata



Teeth on palate fine and slender, in 2 large triangular patches, each of 3 smaller patches (Fig.). Snout bluntly rounded, never very prominent, none or half of maxillary tooth band exposed, distance from snout tip to dorsal fin origin 2.6-2.9 in SL; oblong or slightly triangular occipital process rough, keel moderate, sides almost parallel. Body dusky blue-brown above, paler below, usually with bronze sheen, especially over head.
A16-20. Lower GR 9-10.
(voucher: 283 mm SL)

PLOTOSIDAE

Eeltailed catfish - Sembilang karang

Body elongate and robust, tail tapering. Scales absent. Four pair of barbels around mouth. A serrated spine in front of dorsal fin and one in front of each pectoral fin. Thickened caudo-dorsal fin continuous with long-based anal fin. The three species collected during the Survey have a much-branched dendritic organ before anal fin origin (absent in many representatives of the family).

Ten genera and 42 species in this family, most of them inhabiting fresh waters.

REFERENCES: Ferraris, 1999; Murdy & Ferraris, Jr., 2006.

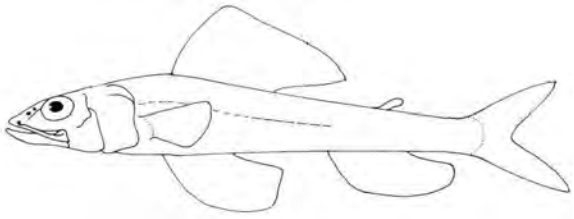
Euristhmus lepturus

Gill membranes not joined, separated by broad isthmus. Body depth less than 8 in SL. More than two rows of teeth on vomer. Body grey-brown.
(voucher: 366 mm SL)

Euristhmus nudiceps

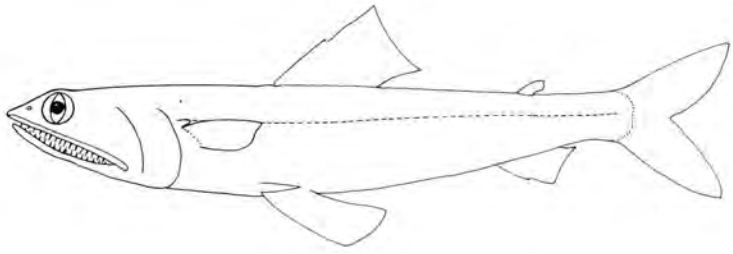
Plotosus lineatus

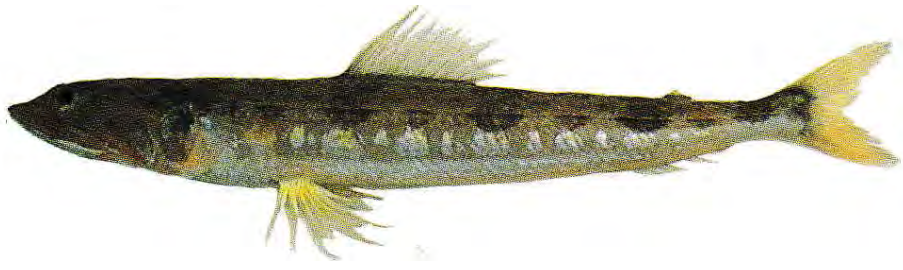
AULOPIDAE



Hime diactithrix

SYNODONTIDAE
Subfamily Synodontinae





Synodus hoshinonis

Synodus indicus

Synodus jaculum

Euristhmus nudiceps

Gill membranes not joined, separated by broad isthmus. Body depth more than 10 in SL. Two rows of teeth on vomer. Body dark brown.
(voucher: 152 mm SL)

Plotosus lineatus

Gill membranes free from isthmus and joined across it. Nasal barbels do not reach past eye. Body tan or with 2 or 3 or white stripes along body.
(voucher: 87 mm SL)

AULOPIDAE

Flagfins -

Body elongate and cylindrical. Head large; mouth oblique, maxilla broad posteriorly, with two supramaxillary bones; teeth small and sharp. Scales ctenoid or cycloid, those on cheeks and operculum enlarged. No spines in fins. Dorsal fin long and high with 14-21 rays. Adipose fin present. Nine rays in large ventral fins; 9-13 anal fin rays. Caudal fin deeply forked. Sexes differently coloured.

REFERENCES: Lee & Chao, 1994; Prokofiev, 2008; Gomon & Struthers, 2015; Gomon, Struthers & Stewart, 2013.

Hime diactithrix

Snout equal to eye diameter. Dorsal fin elevated anteriorly. Second to fourth rays elongated in males; fin long-based. Red-brown above, silvery-white below. Three to 4 oblique blotched brown bands across back. Three series of orange spots along dorsal fin; orange band along anal fin; ventral fin rays red basally.
D 14-17. A 8-10. L. lat. 39-45. Lower GR 11-13.
(voucher: 185 mm SL)

SYNODONTIDAE

Lizardfishes; Grinners - Beloso; Kepala busok

Small to medium-sized cylindrical fishes with spineless fins and large mouth full of slender sharp teeth, even on tongue. Voracious predators of small fishes.

REFERENCES: Cressey, 1981; Russell, 1999; Ganga, Thomas & Sukumaran, 2015; Inoue & Nakabo 2006; Polanco, Acero & Betancour-R, 2016.

Subfamily Synodontinae

Body elongate and cylindrical. Head depressed, 'lizard-like'; mouth very large with rows of small, sharp, slender teeth. Usually an adipose dorsal fin present. Always scales on body, few or none on caudal fin rays. Dorsal and anal fins short-based and single; pectoral fin well developed; caudal fin forked; 8 rays in ventral fin, inner rays much longer than the outer ones.

Two genera and 59 species in the sub-family; we collected 13 species on the Survey.

REFERENCES: Cressey, 1981; Russell, 1999; Polanco, Acero & Betancour-R, 2016.

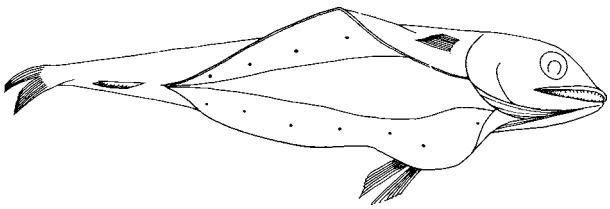
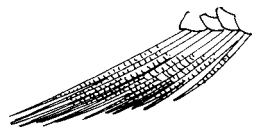


Diagram showing peritoneal spots



Ventral fin

Synodus indicus

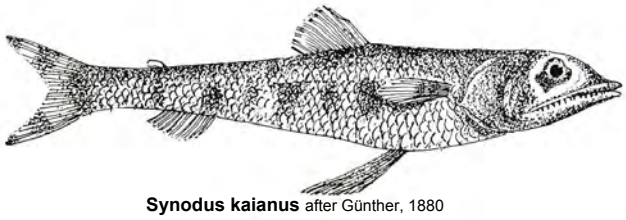
All teeth on palatine band the same length. Pectoral fin does not reach a line drawn between origin of ventral and dorsal fins. Two small black marks on upper corner of operculum; blue spots and wavy short longitudinal bands on back and sides. Pale peritoneum with 9-11 black spots.
D 11-13. A 9-11. L. lat. 52-58. Tr above 3½.
(voucher: 120 mm SL)

Synodus hoshinonis

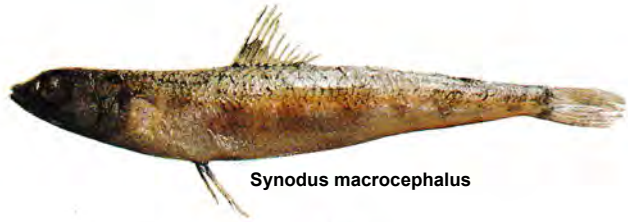
Anterior teeth of palatine band longer than posterior ones. Pale peritoneum with 12-13 black spots. Prominent black area on upper corner of operculum split above into 3 or 4 branches. Brown bars across back.
D 12-14. A 8-10. L. lat. 55-57. Tr above 3½-4½.
(voucher: 150 mm SL)

Synodus jaculum

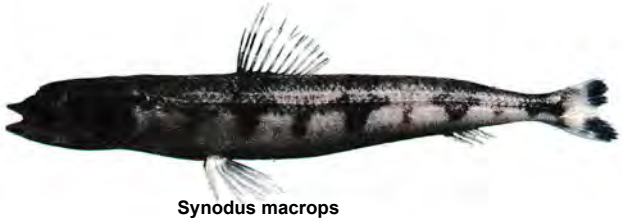
Anterior teeth of palatine band longer than posterior ones; no scales on cheek behind corner of mouth; 11-13 black spots on pale peritoneum. Conspicuous large black spot on side of caudal peduncle at base of caudal fin.
D 11-13. A 8-10. L. lat. 59-62. Tr above 5½-6½.
(voucher: 93 mm SL)



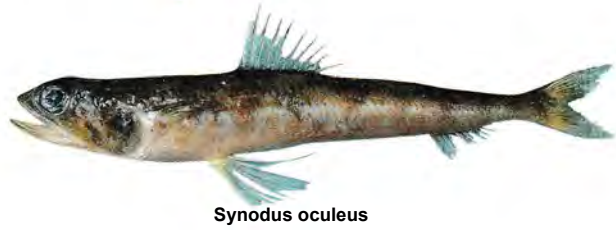
Synodus kaianus after Günther, 1880



Synodus macrocephalus



Synodus macrops

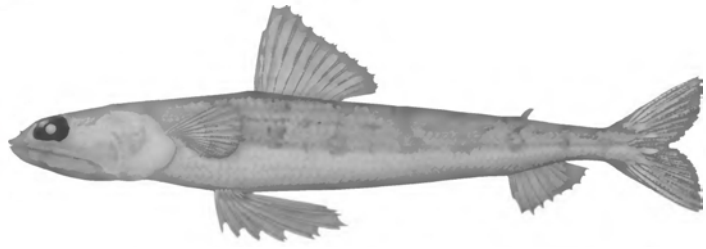


Synodus oculeus

Synodus rubromarmoratus from Cressey, 1981

Synodus segeneus

Synodus tectus

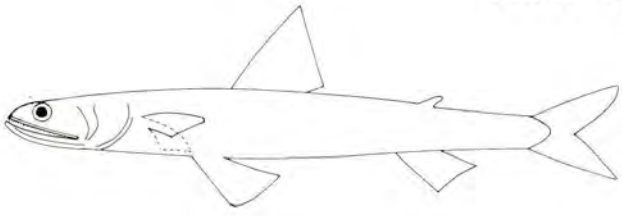


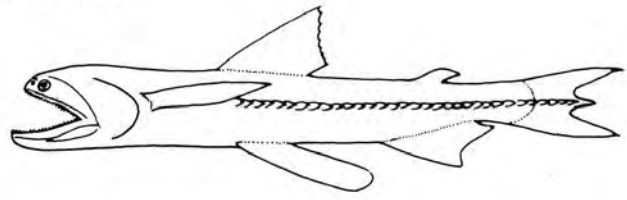
Synodus usitatus from Cressey, 1981

Synodus variegatus

Trachinocephalus trachinus

Subfamily Harpadontinae





Hapradon microchir

Harpadon nehereus

Synodus kaianus

All teeth on palatine band same length; fleshy tip on both jaws. Pectoral fin reaches beyond a line drawn between origin of dorsal and ventral fins. Three broad dark brown patches below lateral line and narrower patches in interspaces; dark bar across each lobe of caudal fin; basal half of pectoral fin dark brown. Peritoneum dark brown, nearly black.
D 10-13. A 10-11. L. lat. 59-63. Tr above 7½-8½.
(voucher: ? mm SL)

Synodus macrops

Three or 4 conspicuous dark grey "X" -shaped markings spaced along side of body; peritoneum dark brown with 6-7 black spots. Palatine teeth of equal length; tip of lower jaw fleshy.
D 11-12. A 10-11. L. lat. 51-55. Tr above 3½.
(voucher: 135 mm SL)

Synodus rubromarmoratus

Pectoral fin does not reach a line drawn between origin of dorsal and ventral fins; all teeth in palatine band of equal length. Body and fins mottled red, 8 dark markings along back and sides, conspicuous below lateral line; 12-13 black spots on pale peritoneum
D 10-12. A 9. L. lat. 54-55.
(voucher: ? mm SL)

Synodus tectus

Prominent black patch on upper corner of operculum. Anterior teeth of palatine band longer than posterior ones. Pale peritoneum with 10-11 black spots. Bars across body indistinct.
D 13-14. A 9-10. L. lat. 55-57. Tr above 3½.
(voucher: 120 mm SL)

Synodus variegatus

Usually six dark spots at snout tip. Two longitudinal series of about 9 irregular diamond-shaped blackish blotches (which may have pale centres) on upper half of body, each blotch narrowly joined with the one in vertical alignment, the intervening zone often appearing as a pale bluish stripe; a second fainter bluish stripe sometimes apparent. Anterior teeth of palatine band longer than posterior ones; usually no scales on cheek behind corner of mouth. Pale peritoneum with 10-12 black spots.
D 10-13. A 8-10. L. lat. 56-61. Tr above 5½-6½.
(voucher: 60 mm SL)

Synodus macrocephalus

Snout pointed when viewed from above; all teeth on palatine band the same length; pectoral fin reaches beyond a line drawn between origin of dorsal and ventral fins. Two or 3 dark bars over dorsal fin. 7 black spots on pale peritoneum.
D 11-13. A 9-11. L. lat. 55-56. Tr above 3½.
(voucher: 78 mm SL)

Synodus oculeus

Dorsal fin high, longest ray 5.3-6.3 in SL. All teeth on palatine band of equal length; snout rounded when viewed from above. Body and fins plain, without distinct markings. Seven or 8 black spots on pale peritoneum.
D 12-13. A 9-10. L. lat. 54-57.
(voucher: 106 mm SL)

Synodus sageneus

Anal fin base longer than dorsal fin base; snout longer than eye diameter and sharply pointed; adipose fin very small or absent, especially in large individuals. Faint yellow-mauve band from pectoral fin base to caudal fin; small brown spot on operculum above pectoral fin base. Fins and remainder of body without distinct markings.
D 12-13. A 12-15. L. lat. 50-55.
(voucher: 143 mm SL)

Synodus usitatus

Pectoral fin reaches well beyond a line drawn between ventral and dorsal fin origins; 14-17 black spots on pale peritoneum; all teeth in palatine band the same length. Five dark bands across back; 2 or 3 faint bands on dorsal fin.
D 12. A 8-9. L. lat. 58-60.
(voucher: ? mm SL)

Trachinocephalus trachinus

Snout blunt, shorter than eye diameter, 9-15% HL. Anal fin base longer than dorsal fin base. Body with alternating narrow light blue and dark-edged yellow stripes, shading to whitish ventrally; a large diagonally elongate black blotch behind upper end of gill opening.
A 14-16. P 11-13.
(voucher: 115 mm SL)

Subfamily Harpadontinae

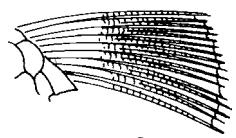
Bombay ducks; Saurys; - Luli; Buntut kerbo; Lumpah

Body elongate and cylindrical (*Saurida)* or compressed *(Harpadon)*. Mouth very large, either with bands of many sharp, slender teeth or with rows of larger, sharp and curved teeth. Head thick, depressed or somewhat rounded; eye moderate to small. An adipose dorsal fin is usually present; ventral fin with 9 rays and noticeably large; caudal fin forked or trilobate (3-lobed). Scales present or absent from body, always on caudal fin rays.

Representatives of the two genera were collected during the Survey.

REFERENCES: Inoue & Nakabo, 2006; Ganga, Thomas & Sukamaran, 2015; Russell, 1999.

Saurida: scales on body present; body robust; caudal fin forked.
Harpadon: scales few and weakly attached on flabby body; caudal fin 3-lobed.



Ventral fin

Harpadon microchir

Body slender; pectoral fin short, reaching much less than half-way to dorsal fin origin. Lateral line tubules long and narrow; scales over basal half of adipose fin and in caudal region. Body silvery blue; dorsal, caudal and anal fins dusky over outer two-thirds, pectoral fin brown; mouth and gill cavities.
D 13-15.
(voucher: ? mm SL

Harpadon nehereus

Body deep, depth 5-8 in SL; pectoral fin long, reaching past dorsal fin origin. Body dusky yellow, stippled black over lower sides; fins pale, dorsal and caudal fins tipped brown; operculum charcoal.
D 12-13. A 13-15. L. lat. 40. Scales on trunk and caudal region.
(voucher: ? mm SL)

Harpadon translucens

Harpadon mortenseni

Harpadon sp. cf nehereus

Saurida gracilis

Saurida longimanus

Saurida micropectoralis

Saurida nebulosa

Saurida tumbil

Saurida macrolepis

Saurida wanieso

Saurida elongata

Harpadon translucens

Body deep, depth 4.8-6.6 in SL; pectoral fin moderately short, reaching about half-way to dorsal fin origin. Body translucent, greyish-green, darker above and finely stippled black; fins darker along margins.
D 14-15. A 15. L. lat. 55. Body scales on trunk and caudal region.
(voucher: ? mm SL)

Harpadon sp. cf nehereus

Body deep, depth about 3.5 in SL; pectoral fin long, reaching past dorsal fin origin. Body bluish violet, darker above; head brown, iridescent over operculum; fins brown to black, ventral fin barred black, pectoral fin completely black.

Saurida longimanus

Pectoral fin long, reaching well past ventral fin origin, less than 5 in SL, its axillary scale long and pointed. Both palatine tooth bands narrow, outer with 2-3 rows of teeth. Body greenish to charcoal above, lower sides and dins grey; pectoral fin dark brown or black.
L. lat. 49-52.
(voucher: 215 mm SL)

Saurida nebulosa

Axillary scale of pectoral fin short and broad; pectoral fin length 8.5-10 in SL and ending opposite 4th to 6th scale before dorsal fin origin. Upper jaw length 6.3-7.1 in SL. Body dusky green above, silvery below, sides mottled and blotched brown; brown checks on lips; dark bands and spots on fins.
D 10-11. P 11-13.
L. lat. 48-52. Peritoneum dark on upper half.
(voucher: 74 mm SL)

Saurida macrolepis

Head 23-27% SL, pectoral fin 14-18% SL, reaching line between ventral and dorsal fins; hind margin of pectoral fin moderately concave. Body dusky olive above, silvery white below, a row of dark blotches on lateral line may be present. Pectoral fin dark brown, its inner side dusky; two brown streaks on preoperculum; brown checks along leading edges of dorsal and caudal fins sometimes present, upper lobe of caudal yellow, fin hind margin black.
P. 13-15. L. lat. 46-49.
(voucher: 210 mm SL)

Saurida elongata

Scale in axil of pectoral fin long and pointed; pectoral fin short, not reaching base of ventral fin; anterior rays of dorsal fin elongate in larger individuals. Outer bands of palatine teeth in 3 or more rows anteriorly. Grey or pale brown above, silvery white below, about 8 distinct white spots along upper sides but no dark cross bands on back; front edges of dorsal and caudal fins dark brown.
L. lat. 62-66.
(voucher: 210 mm SL)

Harpadon mortenseni

Body slender, depth about 7-8 in SL; pectoral fin short, reaching about one-third distance to dorsal fin origin. Body dark grey; inside mouth and gill cavity dark; fins pale, outer half of each caudal lobe dark brown.
D 60-70. D 13-14. Body scales on lateral line and caudal region.
(voucher: ? mm SL)

Saurida gracilis

Axillary scale of pectoral fin short and broad; pectoral fin length 7.6-8.5 in SL and ending opposite 2nd to 3rd scale before dorsal fin origin. Upper jaw length 5.1-6 in SL. Body yellowish brown above, creamy silver below; brown blotches and spots over sides; fins banded and spotted brown; lips checked brown. Peritoneum mostly pale.
D 11-12. P 12-14. L. lat. 48-52.
(voucher: 128 mm SL)

Saurida micropectoralis

Pectoral fin short, less than 8.7 in SL and never reaching ventral fin origin when laid towards it. Three or more rows of teeth in anterior part of outer palatine band. Body fawn above, white below, with traces of dark blotches across back; brown spot at base of adipose fin; upper half of inner pectoral fin dusky and black bar across ventral fin.
L. lat. 56-58.
(voucher: 215 mm SL)

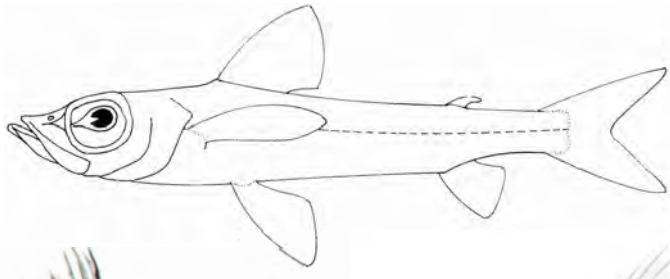
Saurida tumbil

Pectoral fin only just reaches ventral fin origin when laid towards it, length 8 in SL. More than 3 rows of teeth in anterior part of palatine tooth band. Back dusky green to brown, with faint crossbars, more distinct along lateral line; inner ventral fin charcoal, margin white; lower caudal fin lobe charcoal, upper lobe fawn.
L. lat. 50-53.
(voucher: 325 mm SL)

Saurida wanieso

Pectoral fin 5.6-7.1 in SL; reaching ventral fin origin when laid towards it; upper caudal fin lobe longer than lower; 2nd (sometimes 3rd and 4th) dorsal fin ray elongate and filamentous in larger fish. Two rows of teeth in anterior part of outer palatine tooth band. Back greenish brown, dark blotches apparent along lateral line; pectoral fin and lower caudal fin lobe charcoal.
L. lat. 54-58.
(voucher: 180 mm SL)

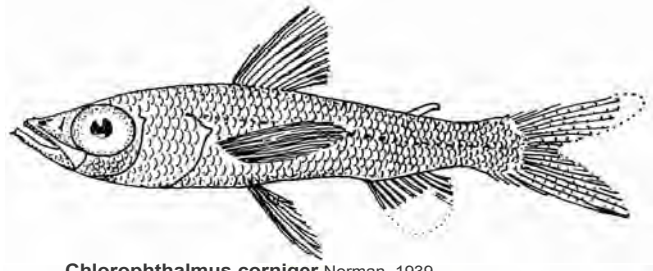
CHLOROPHTHALMIDAE



Chlorophthalmus acutifrons

Chlorophthalmus sp 1 cf albatrossis

Chlorophthalmus sp 2 cf albatrossis

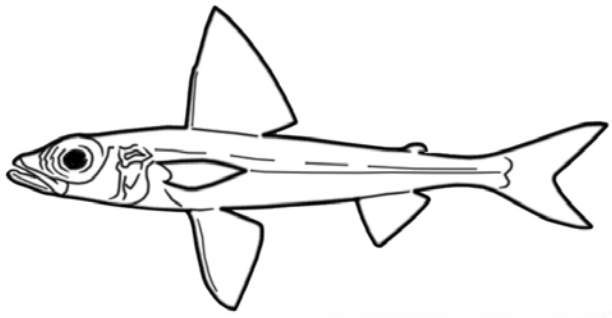


Chlorophthalmus corniger Norman, 1939

Chlorophthalmus nigromarginatus

Chlorophthalmus vityazi

PARAULOPIDAE



Paraulopus brevirostris

Paraulopus oblongus

CHLOROPHTHALMIDAE

Greeneyes -

Body small to moderate, compressed posteriorly. Head moderately large; eye large. Scales ctenoid or cycloid, absent from top of head. No spines in fins: dorsal fin single, before middle of body, with 9-13 rays; adipose dorsal fin present; seven to 11 rays in anal fin. Pectoral fin large or moderate with 15-17 rays. Caudal fin forked. Anus either near ventral fin bases or just before anal fin origin. Mouth slightly superior, lower jaw protruding noticeably in advance of upper jaw, anterior tip clearly visible in dorsal aspect; jaw teeth in few rows, overlapping little, if at all, onto lateral surfaces of premaxilla or dentary; oblique rows of scales on sides often indicated by narrow dark lines near their posterior margins, especially anterodorsally.

The family comprises two genera and 17 species; six species were obtained on the Survey.

REFERENCES: Bineesh, Akhilesh, Gomon, Abdussamad, Pillai & Gopalakrishnan, 2014; Kobyliansky, 2013; Kamohara, 1953.

Chlorophthalmus acutifrons

Body compressed, head width 2.4-2.6 in HL. Snout more than eye diameter, 2.9-3.2 in HL; eye 3.5-3.8 in HL, 1.1-1.3 in snout. Body yellow with one or 2 longitudinal rows of large blotches, most conspicuous at mid-sides; operculum black and silver, gill cavity black; fins fawn, leading edge and margin of dorsal fin charcoal.
D 11. A 9-10. P 15. GR 2-3 + 14-17. Tr above 6-7. L. lat. 53-57.
(voucher: 106 mm SL)

Chlorophthalmus sp 2 cf albatrossis

Body square or rounded in cross-section; head width 1.8-2 in HL. Very large eye, interorbital narrow. Eye 2.5-2.7 in HL, 1.4-1.5 longer than snout which is 3.1-3.9 in HL. Pectoral fin long, subequal to HL, ventral fin much shorter. Body dusky with faint or large oblique blotches along sides; operculum silver-black, gill cavity dark; anus black; leading edge of dorsal fin black, bases of adipose fin and caudal fin black, inner rays of ventral fin black.
D 10-12. A 8-9. P 14-15. GR 3-4 + 17-19. Tr above 7-8. L. lat. 53-56.
(voucher: 112 mm SL)

Chlorophthalmus nigromarginatus

Body square in cross-section; head width 2-2.6 in HL. Snout tip slightly upturned, subequal to eye and 2.8-3.4 in HL. Eye 2.8-3.2 in HL. Body dusky yellow, 2 series of dark blotches along back and sides; operculum dusky, gill cavity dark; black stripping on belly, anus black; leading edge and margin of dorsal fin black, pectoral fin axil black, hind caudal fin margin black.
(voucher: 108 mm SL)

Chlorophthalmus sp 1 cf albatrossis

Body slightly compressed, head width 2-2.2 in HL Snout less than eye diameter, 2.5-3.2 in HL and 1.2-1.4 in eye; eye 1.9-2.6 in HL. Body yellow-fawn, sides crossed by large oblique irregular brown patches; operculum silver-black, gill cavity black, anus black and belly stippled black; caudal fin base and inner ventral fin rays black.
D 10-11, A 8-10. P 15-17. GR 2 + 19-22. Tr above 5. L. lat. 50-58.
(voucher: 91 mm SL)

Chlorophthalmus corniger

Body sub-cylindrical and compressed. Lower jaw ending in two strong, tooth-like projections. Head large, 2.6-3 in SL; eye 2.5-3 in HL. Pectoral fin long, extending past dorsal fin base. Body silvery-grey finely stippled black, traces of broad darker bars across sides; base and inner rays of ventral fin black.; dorsal fins edged black, caudal fin black.
D 10-11. A 9-10. Total GR 22-26. L. lat. 47-48. Tr 3-4.
(voucher: ? mm SL)

Chlorophthalmus vityazi

Body compressed; head width 2-2.3 in HL. Snout slightly depressed, about equal to eye diameter, 3.1-3.4 in HL, 1.1-0.9 in eye. Eye 2.8-3.4 in H L. Body dusky green, silvery below, 2 series of brown blotches along back and sides; operculum silver-black, gill cavity black; anus dark; fins dusky, leading edge and margin of dorsal fin black, hind caudal fin margin dark, black band across ventral fin. On larger specimens, blotches and fin markings become obscure.
D 10-11. A 9-10. P 15-16. GR 3-4 + 1517. Tr above 5-6. L. lat. 51-53.
(vouchers: 142 and 189 mm SL)

PARAULOPIDAE

Cucumber fish -

Benthic fishes. Dorsal fin rays 10-11, anal fin rays 8-11, pectoral fin rays 13-20; pored lateral line scales 40-52. Was previously included in CHLOROPHTHALMIDAE. Mouth terminal, lower jaw protruding little, if at all, in advance of upper jaw, seen as thin edge, if visible at all, around anterior profile of upper jaw in dorsal aspect; jaw teeth in broad bands, overlapping onto lateral surfaces of premaxilla and dentary (as in *Saurida*); dentary rather shallow posteriorly, only posterior half covered laterally by narrow triangular membrane; second infraorbital uniformly broad, third broad anteriorly, tapering posteriorly, second and third infraorbitals cupping eye ventrally; individual body scales sometimes with narrow dark marginal line but not forming narrow dark oblique lines on body.

Two species in this monogeneric family were obtained on the Survey.

REFERENCES: Sato & Nakabo, 2002; Sato & Nakabo, 2003.

Paraulopus brevirostris

Body rounded/square in cross-section; head width 2.1 in HL. Snout short, 3.9-4.1 in HL, 1.2-1.3 in eye diameter. Eye 3-3.1 in HL. Pectoral fin short, 1.5-1.8 in HL, ventral fin very long, equal to or more than HL; anus well behind ventral fin base. Body iridescent pale green with 1 or 2 rows of large yellow blotches along back and sides and 3-4 dusky blotches on lower sides; operculum dusky; gill cavity fawn; breast pale; dorsal and caudal fins tipped brown.
D 11. A 11. P 14. GR 4-5 + 12. Tr. above 3-4. L. lat. 46-48.
(voucher: 126 mm SL)

Paraulopus oblongus

Body rounded in cross-section; head width 1.8-1.9 in HL. Snout short, 3.9-4.1 in HL, 1.3-1.5 in eye diameter. Eye 2.8-2.9 in HL. Body dusky yellow, 2 or 3 rows of dark blotches along back and sides; operculum dark, gill cavity black; breast charcoal; anus pale; black margin to dorsal fin, black tips to ventral fins, b!ack streak along each caudal fin lobe.
D 10. A 8-9. P 18-20. GR 4-5 + 17-19. Tr above 2-3. L. lat. 40-45.
(vouchers: 54 mm and 84 mm SL)

MYCTOPHIDAE

Lanternfishes -

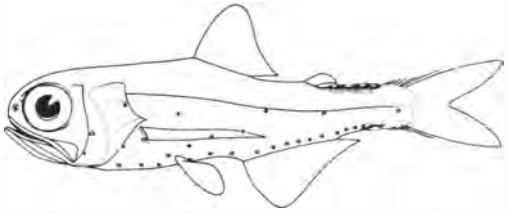
The myctophids are deep-sea pelagic fishes which are extremely abundant in all oceans and perform vertical migration to upper water levels at night.

Lanternfishes have a compressed head and body. The eyes are well-developed and moderately large. The mouth is large, terminal or subterminal with the jaws extending to or well beyond the posterior margin of the eye. Dentition is highly variable but there are no fang-like teeth.

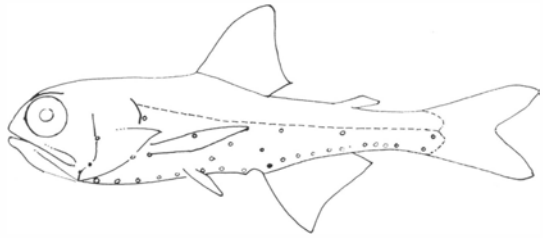
A single dorsal fin is placed well in front of the anal fin origin and a dorsal adipose fin is present. A rudimentary spine is often present at the bases of the first dorsal, first anal, outer-most ventral and upper pectoral fin rays. All but one species have distinct groups of photophores on the head and body, and other luminous organs are present on the head and/or caudal peduncle. The arrangement of the photophores and luminous organs has been shown to be species specific and thus it is one of the most important characters in identification. Of the luminous organ present, the most conspicuous is the supracaudal gland which is also called the "stern chaser". It is thought that this organ may be used as a defensive mechanism, being activated to emit light just as a predator attacks, then extinguished to enable the fish to speed away before the attack is completed.

The name photophore should only be applied to a specific structure which is formed from two modified scales: one consists of a "cup" with a thin, flattened stack of cells, the other forming a biconvex lens on top of the "cup!'. The bluish light emitted by the photophores comes from a chemical reaction in the cells; it lies within the region of maximum absorption of visual pigment in deep-sea fishes.

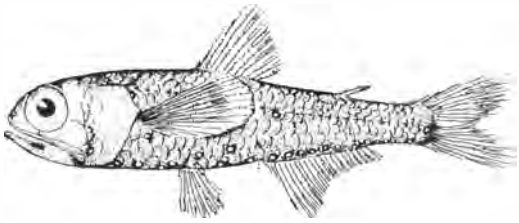
REFERENCES: Paxton & Hulley 1999; https://www.fishbase.ca/Nomenclature/NominalSpeciesList.php?Family=Myctophidae



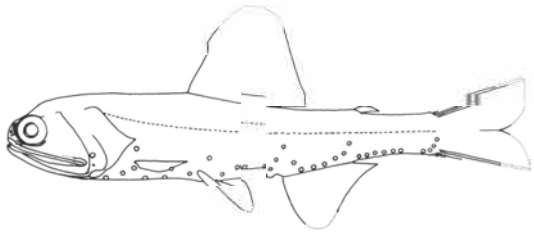
Benthosema fibulatum after Nafpaktitis & Nafpaktitis. 1969



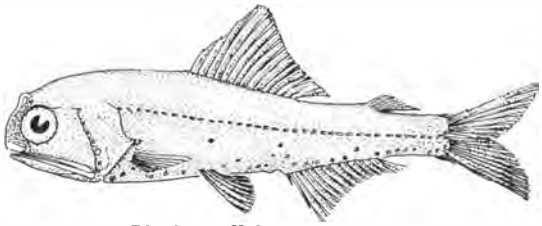
Benthosema pterotum after Evermann & Seale. 1907



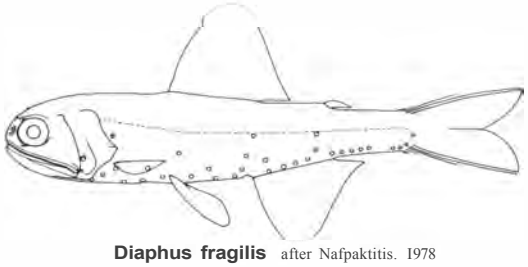
Diaphus chrysorhynchus after Gilbert & Cramer. 1897



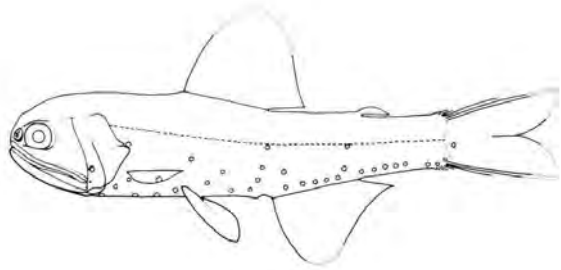
Diaphus coeruleus after Nafpaktitis. 1978



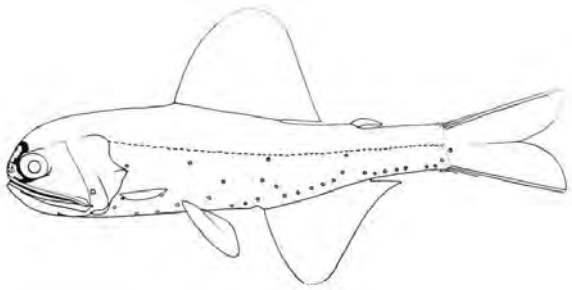
Diaphus effulgens after Goode & Bean. 1896



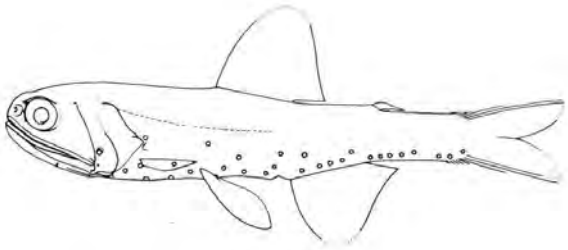
Diaphus fragilis after Nafpaktitis. 1978



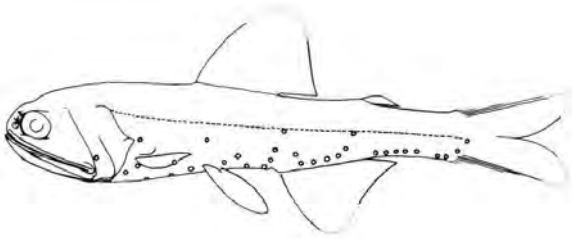
Diaphus garmani after Nafpaktitis. 1978



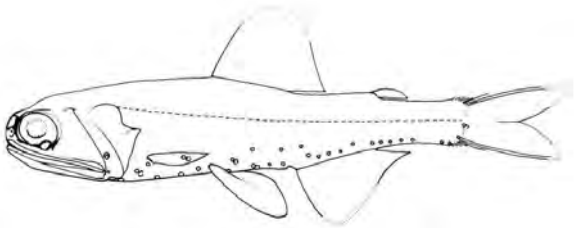
Diaphus lucidus after Nafpaktitis, 1978



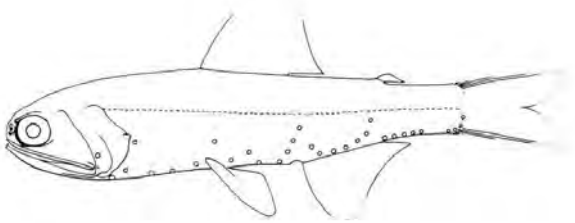
Diaphus signatus after Nafpaktitis. 1978



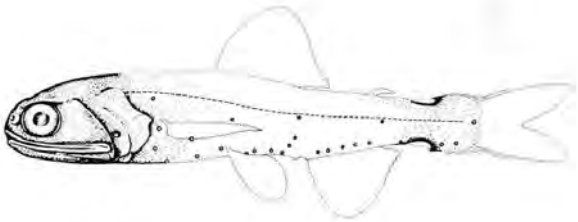
Diaphus splendidus after Nafpaktitis, 1978



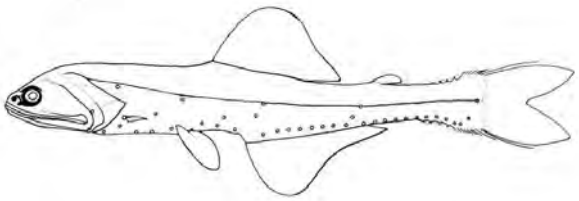
Diaphus suborbitalis after Nafpaktitis. 1978



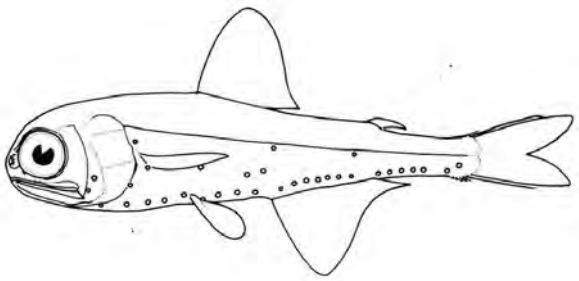
Diaphus watasei after Nafpaktitis. 1978



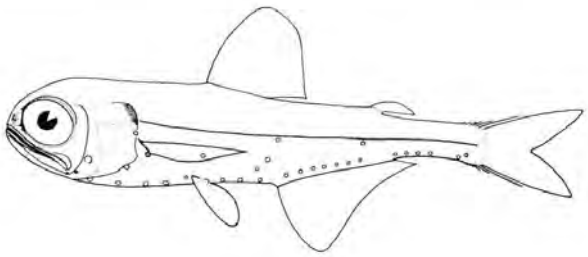
Lampadena luminosa after Nafpaktitis & Nafpaktitis. 1969



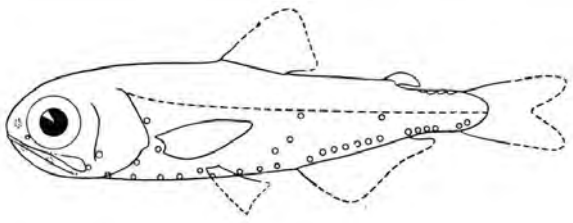
Lampanyctus lineatus after Nafpaktitis & Nafpaktitis. 1969



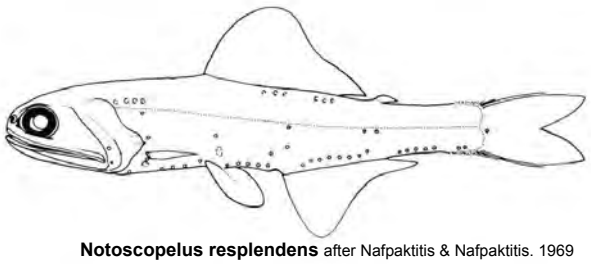
Dasyscopelus asper after Nafpaktitis & Nafpaktitis, 1969



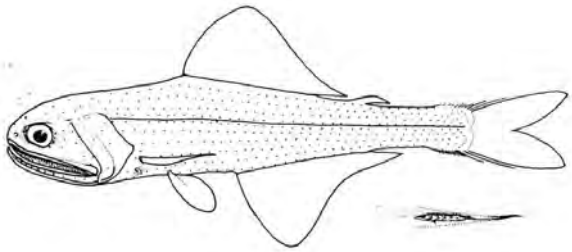
Dasyscopelus brachygnathum after Nafpaktitis & Nafpaktitis. 1969



Myctophum fissunovi after Becker & Borodulina. 1971

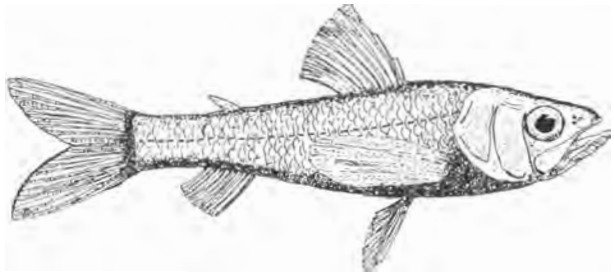


Notoscopelus resplendens after Nafpaktitis & Nafpaktitis. 1969



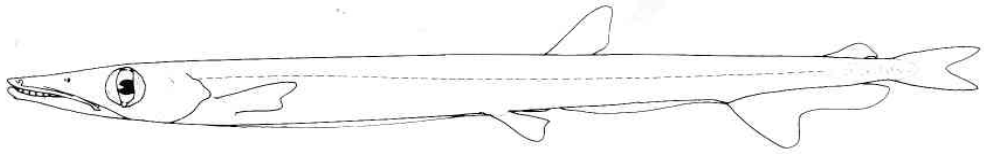
Scopelopsis multipunctatus after Nafpaktitis & Nafpaktitis. 1969

NEOSCOPELIDAE



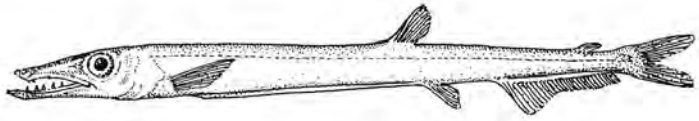
Neoscopelus microchir

PARALEPIDIDAE



Lestrolepis japonica

Lestidium longilucifer



Lestidiops mirabilis after Rofen, 1966

Lestidium sp cf prolixum

Stemonosudis retrodorsalis

NEOSCOPELIDAE

New lanternfishes -

Tropical and subtropical fishes of small to medium size. The family consists of three very different genera: *Scopelengys*, which inhabits deep oceanic midwaters, has small eyes, flabby musculature and a fragile skeleton; *Neoscopelus* which occurs relatively close to land and is benthopelagic, has large eyes, a silvery fusiform body and a strong skeleton; and the monotypic *Solivomer* which is benthopelagic in the Philippine area. Entirely compressed. Supramaxilla long and slender, trilobate rostral cartilage. No subocular shelf. Anal fin origin far posterior to dorsal fin. Some with photophores. Scales cycloid; ctenoid scales present in *Solivomer*. Swim bladder present in all but *Scopelengys*. The last mentioned genus seems to form an intermediate between the other 2. The head and body are compressed; the mouth is large with closely-set villiform teeth in the jaws, the vomer and palatines. The gill rakers are well developed. The dorsal fin lies well forward of the anal fin and a dorsal adipose fin is present. The lateral line is only weakly developed. *Solivomer* has ctenoid scales, the other two genera have large cycloid scales which are easily lost. Only the genus *Neoscopelus* possesses luminous organs and they are arranged linearly along the lower flanks of the body and from the isthmus along the belly to the caudal peduncle. Another row of photophores lies along the periphery of the tongue. The photophores are somewhat oval in shape with their anteroventral margins often indistinct, fading into the surrounding tissue.

One species obtained on the Survey.

REFERENCE: Paxton & Hulley 1999.

Neoscopelus microchir

An adipose dorsal fin present. Scales deciduous. Mid ventral and bilateral rows of photophores on body. Head and side of body dark red, silver-white below.
D_2 12-13. A 11-13.
(voucher: ? mm SL)

PARALEPIDIDAE

Barracudinas -

Moderately to very elongate fishes, slightly compressed. Snout long, jaws pointed ('beak'-like), lower sometimes projecting; mouth large, most teeth small in upper jaw, many long and fang-like in lower jaw; eye moderately large; opercular bones thin; gill rakers reduced to groups of small spines. Body naked or with large and easily lost cycloid scales. No spines in fins; dorsal adipose fin close to base of forked caudal fin; ventral fin midway along body: sometimes adipose fin present before posteriorly-placed anal fin, which is long and concave with 20-50 rays.

Four genera (of the family's eight) and five species were obtained on the Survey.

REFERENCES: Ho & Golani, 2019; Ho, Tsai & Li, 2019; Ho, Russell, Graham & Psomadakis, 2019; Ho, Graham & Russell, 2020.

Lestrolepis japonica

Distance between dorsal and caudal fin origins less than 3 in SL. Snout to anus distance 1.6-1.9 in SL, distance between verticals from dorsal and ventral fins 9.2-12.7 in SL. Body silvery grey or cream, silvery or dark over opercles, tail and belly; 2 close black bands of luminous tissue along belly from isthmus to ventral fin; prominent black spot just before eye.
A 36-41.
(voucher: 174.4 mm SL)

Lestidiops mirabilis

Distance between dorsal and caudal fin origins less than 3 in SL; from snout to anus 1.4-1.5 in SL; ventral fin begins just behind dorsal origin. HL 4-4.2 in SL; body depth 9.5 in SL. Low adipose fin before anal fin. Body very dark, back and top of head with densely-packed black dots, lateral line sections very dark.
A 26-32.
(voucher: ? mm SL)

Lestidium sp. cf prolixum

Ventral fin origin well before dorsal origin and ventral adipose fin present. Distance between snout and anus 1.6-1.7 in SL; predorsal length 1.6 in SL; snout to anal origin 1.3 in SL; HL 5 or more in SL. Body translucent grey-blue, silver over opercles and tail; 3 spots on back before dorsal fin.
A 35-38.
(voucher: 145 mm SL)

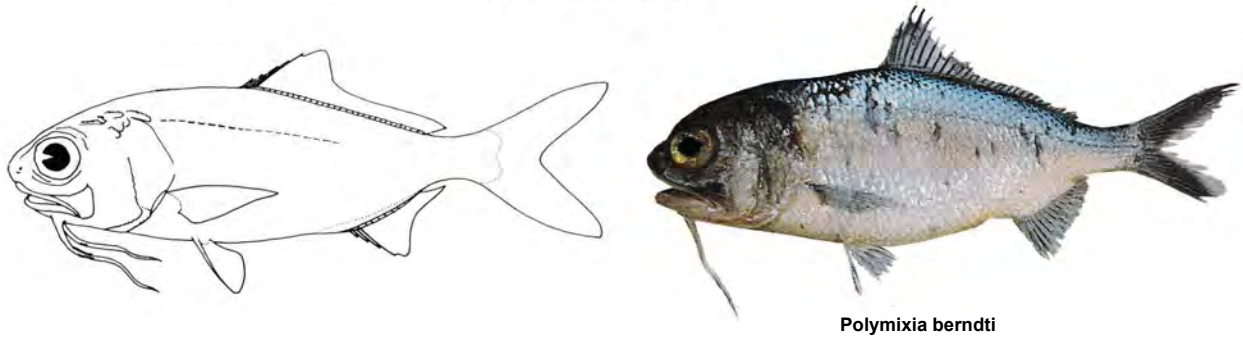
Lestidium longilucifer

Distance between dorsal and caudal fin origins less than 3 in SL; from snout to anus 1.6-1.7 in HL; ventral fin begins under or just behind dorsal origin. HL 4.4 in SL; body depth 12.5 in SL. Translucent grey-blue, silvery or dark over opercles and tail; single black band of luminous tissue along belly from isthmus to ventral fin.
A 26-32.
(voucher: 247 mm SL)

Stemonosudis retrodorsalis

Ventral fin origin well before dorsal fin origin. Ventral adipose fin present. Distance between snout and anus 1.5 in SL; predorsal length 1.3 in SL; snout to anal origin 1.3 in SL; HL 5.3 in SL. Translucent yellow body with 9 saddle-like dark blotches along back, 8 along lower sides before ventral fin.
A 33.
(voucher: 146 mm SL)

POLYMIXIIDAE

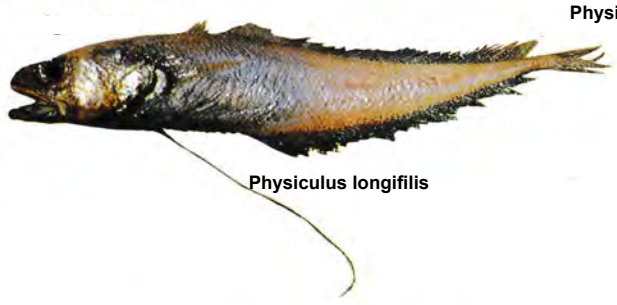


Polymixia berndti

MORIDAE

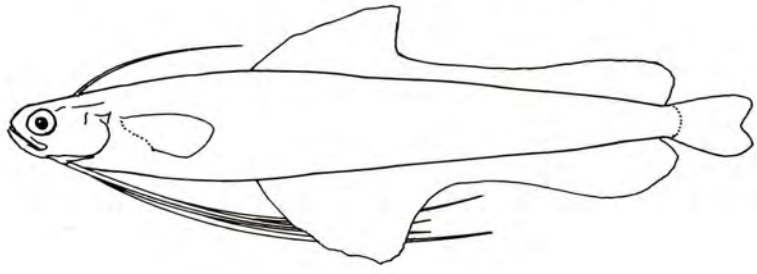
Physiculus sp 1

Physiculus sp 2



Physiculus longifilis

BREGMACEROTIDAE



Bregmaceros sp cf japonicus

Bregmaceros nectabanus

Bregmaceros pseudolanceolatus

POLYMIXIIDAE

Beardfishes -

Body moderately elongate and compressed. Eye large; teeth fine. A pair of fleshy chin barbels present. nearly as long as head. Large strongly ctenoid, firmly-attached scales. Dorsal fin single, continuous, with 4-6 spines and 26-38 rays. Anal fin long-based. Ventral fin with one spine, 6 rays. Caudal fin forked.
One species obtained on the Survey.

REFERENCES: Nakaya et al, 1980; Paxton, 1999a.

Polymixia berndti

Outer ⅓ of soft dorsal fin dusky (never black), edges of dorsal and anal fins white. Dorsal and anal fins high anteriorly. Iridescent violet and white.
D V-VI, 28-30. A IV, 14. L. lat. 32-36. Tr 10-11 + 13-14.
(voucher: 131 mm SL)

MORIDAE

Morid cods -

Body elongate, only a little compressed. Mouth terminal or ventral; head of vomer toothless or with very small teeth; chin barbel may be present; gill openings wide. Scales small and cycloid, easily lost. No spines in fins; one or 2 (rarely 3 dorsal fins; anal fin often in two parts; ventral fin far forward. below head, of one to several rays, some filamentous; caudal fin free from dorsal and anal fins.

About 17 genera in the family of which two were obtained in the Survey area.

REFERENCES: Iwamoto, 1999b; Paulin, 1989; https://www.fishbase.ca/Nomenclature/ScientificNameSearchList.php? – Physiculus; Vinu et al., 2017; Yu & Ho, 2012.

Physiculus sp 1

Head, including gular part, scaled except for area around nostrils. Chin barbel short. Eye 4.2 in HL; interorbital 4.3 in HL. Anus ⅓ distance from anal fin origin to ventral fin base. Ventral fin with 6 rays, outer 3 produced, longest one subequal to HL. Ventral light organ with 2 black dermal windows. All fins pale, some with dusky edges.
D 9; 59. A 65. P 23. Total GR 16.
(voucher: 166 mm SL)

Physiculus longifilis

Head covered with scales except naked gular part. Chin barbel long and slender. Eye 5 in HL; interorbital 4.2 in HL. Anus ¼ distance from anal fin origin to ventral fin base. Ventral fin with 3 rays, outer 2 filamentous, about twice HL. Ventral light organ with 2 black dermal windows. All fins charcoal or black.
D 7; 59. A 61. P 21. Total GR 11.
(voucher: 145 mm SL)

Physiculus sp 2

Snout, suborbital area and gular part naked. Chin barbel slender. Eye 3.7-4 in HL; interorbital 3.3-3.8 in HL. Anus ⅓ distance from anal fin origin to ventral fin base. Ventral fin with 4 or 5 rays, 2nd ray longest, shorter than postorbital head length. Ventral light organ with a round black dermal window. Dorsal and anal fins with dark margins; pectoral and ventral fins dark near base.
D 7-8; 55-57. A 58-61. P 24-26. Total GR 10-12. Tr above 7-9.
(voucher: 120 mm SL)

BREGMACEROTIDAE

Unicorn cods -

Elongate, moderately compressed small fishes up to about 12 cm long. Head with spongy skin; snout short; head of vomer toothed. Gill openings wide. Scales cycloid and easily lost. Two widely separated dorsal fins: first is on nape and consists of one elongate ray; second is long-based, with an extensive depression in its middle; anal fin similar to second dorsal fin. Ventral fin inserted under rear of head and comprising thick rays which extend well past anal fin origin. Caudal fin present.

REFERENCES: Torii, Ozawa & Harold, 2003; Ho, Endo, Lee & Chu. 2020; Torii, Javonillo & Ozawa, 2004; Ho, Choo & Teng, 2011.

Bregmaceros sp cf japonicus

Dorsal fin begins just behind anal fin. Caudal fin emarginate. Body depth 7.6-8 in SL; eye 3.5-4 in HL. Back olive, densely stippled black; lower half of body silvery-white. Dorsal, anal and caudal fin bases stippled black, black spots extending over most of anterior dorsal fin rays; pectoral fin pale.
D 48-57. A 43-50. P 18-20. Scales in row from head to tail about 65. Tr 11-13.
(voucher: 73.5 mm SL)

Bregmaceros pseudolanceolatus

Dorsal fin origin slightly before anal fin. Caudal fin lanceolate (pointed). Back olive, sparsely stippled brown; brown band mid-laterally on caudal peduncle. Base of anterior dorsal fin rays stippled black; outer pectoral fin and all of caudal fin intense black.
(voucher: 67 mm SL)

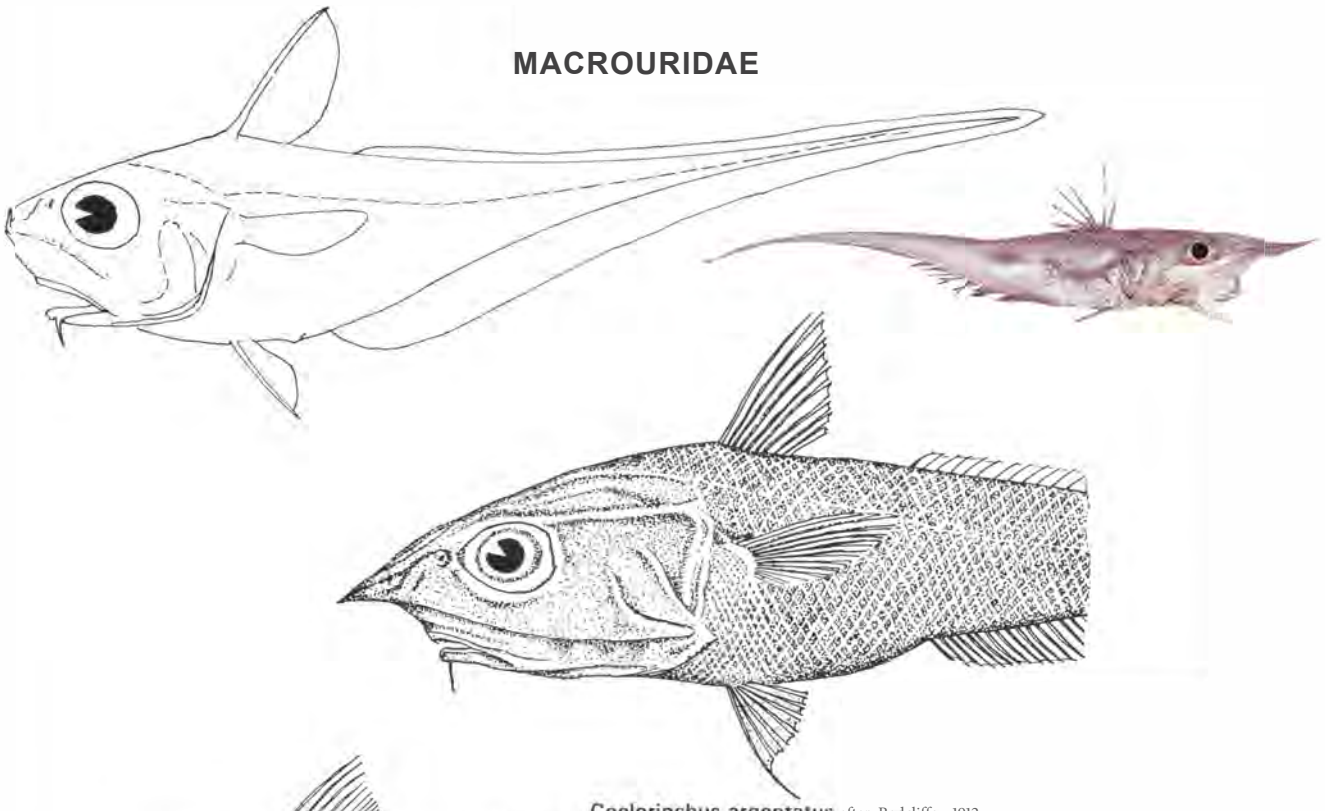
Bregmaceros nectabanus

Dorsal fin begins just behind anal fin; caudal fin emarginate. Body depth 8.7-9 in SL. Eye less than snout length, 3.8-5 in HL; snout 3.3-3.6 in SL. Back dark grey or black, sides sparsely stippled dark brown. Pectoral fin pale; base of dorsal, anal and caudal fins brown.
D 56-63. A 52-58. P 16-21. Scales in row from head to tail 69-75. Tr 13-14.
(voucher: 73 mm SL)

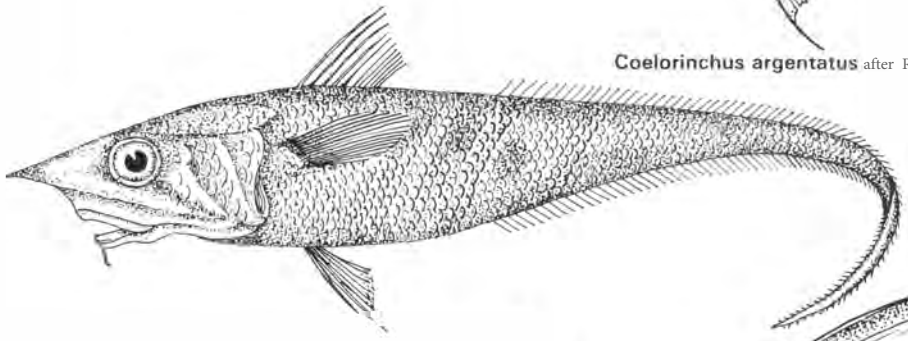
Bregmaceros mcclellandi

Bregmaceros anchovia

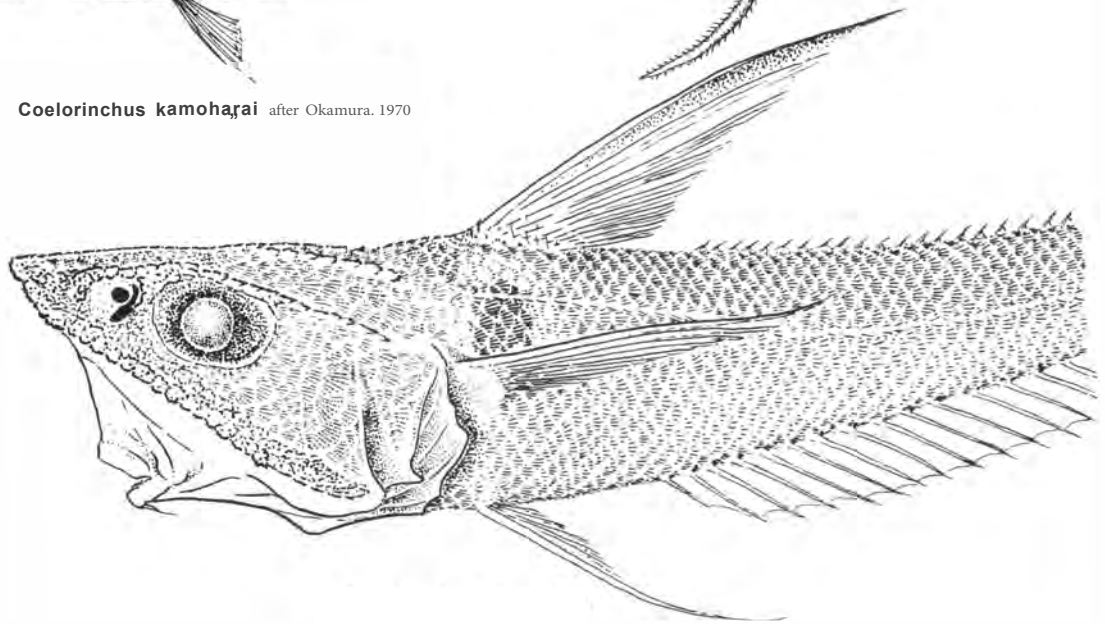
MACROURIDAE



Coelorinchus argentatus after Radcliffe. 1912



Coelorinchus kamoharai after Okamura. 1970



Coelorhinchus maculatus original drawing by T. Arai

Bregmaceros mcclellandi

Dorsal fin begins slightly before anal fin; caudal fin rounded. Body depth 5.6-7.1 in SL. Scales on upper half of body edged black. Anterior dorsal rays, all of pectoral fin and all of caudal fin intensely black.
D 41-57. A 48-68. Scale rows 54-71 between head and tail. Tr 13-16.
(voucher: 77 mm SL)

Bregmaceros anchovia

Caudal fin emarginate; dorsal fin begins just before anal fin. Body depth 6.3-6.7 in SL; eye 3.6-3.8 in HL; snout 3.7-4.8 in HL. Body olive, paler below; brown band along back. Fins dusky basally, anterior dorsal fin rays black; pectoral fin pale.
D 40-55. A 42-55. P 15-18. Scale rows 70-74 between head and tail. Tr 17-18.
(voucher: 67 mm SL)

MACROURIDAE

Rattails; Grenadiers -

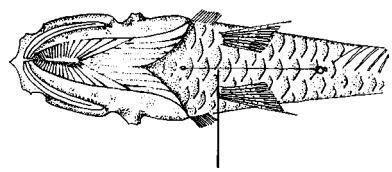
Head large, trunk short and compressed; tail long and strap-like, tapering to a fine point. Often two dorsal fins: first short and high, second long, continuous to tail tip; anal fin similar to second dorsal fin; ventral fin with 5-17 rays usually present on breast or throat, outer ray often produced; caudal fin usually absent. Snout produced, blunt or pointed, stout and often armed with spiny scutes. Mouth terminal to inferior; teeth fine; chin barbel often present; eyes usually large. Scales usually armed, covered with small spines. Ventral light organ on belly in some species (Fig 2).

Ten species in two genera (*Coelorinchus* and *Hymenocephalus*) were obtained on our Survey.

Macrourid descriptions prepared by T. Arai and partly supplemented by PK.

REFERENCES: Iwamoto, 1999a: Iwamoto & Williams, 1999; Iwamoto, Nakayama, Shao & Ho, 2015; Nakayama, Prokofiev & Kawai, 2020.;Schwarzhans, 2014.; Nakayama & Endo, 2017; Nakayama, 2020.

Anterolateral snout margin



Ventral light organ

Coelorinchus argentatus

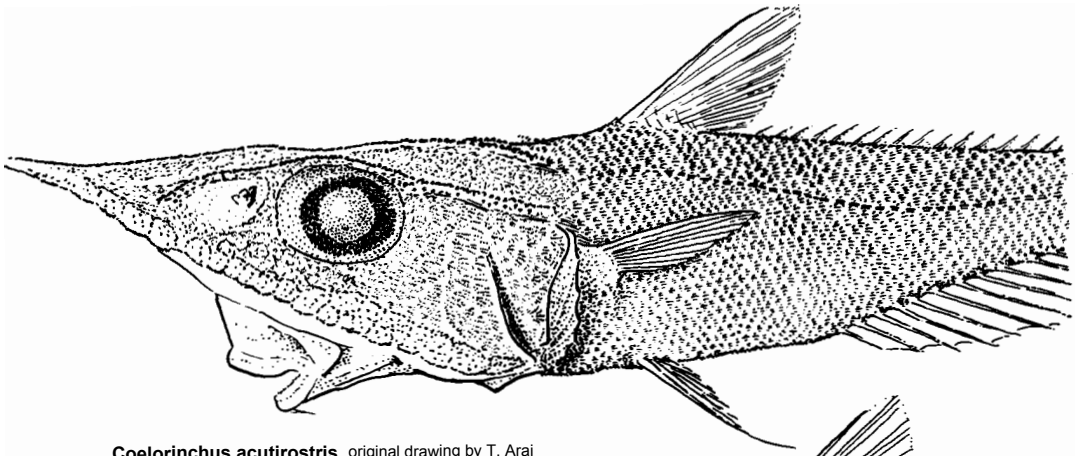
Distinct black stripe along middle of snout; head transparent; 3-4 diffuse dark blotches on lateral line below 1st dorsal fin and before 2nd dorsal fin origin; thin brown band on body below 2nd dorsal fin; thin cross bars on tail. First dorsal fin blackish anteriorly. Snout long, sharply-pointed, 2.2-2.4 in HL. Head with scattered short brown cirri and mostly naked below but for scales along anterolateral snout margins. Broad naked areas dorsally near front of unsupported snout margins. Eye (orbit) 3.7-4 in HL; interorbital 3.2-3.6 in HL; upper jaw length 3.1-3.3 in HL. Close-set teeth on upper jaw in band and on lower jaw in two rows. Anus just before anal fin origin; ventral light organ very long, scaled, from anus to near isthmus, both ends enlarged, its length 1.5-1.8 in HL. Body scale spinules in about 5 diverging rows anteriorly and in quincunx order posteriorly; 1st dorsal fin rays not produced.
D_1 II, 8-10. P 14-17. V 7. Tr above 6-7. Branchiostegal rays 6.
(voucher: 184 mm TL)

Coelorinchus kamoharai

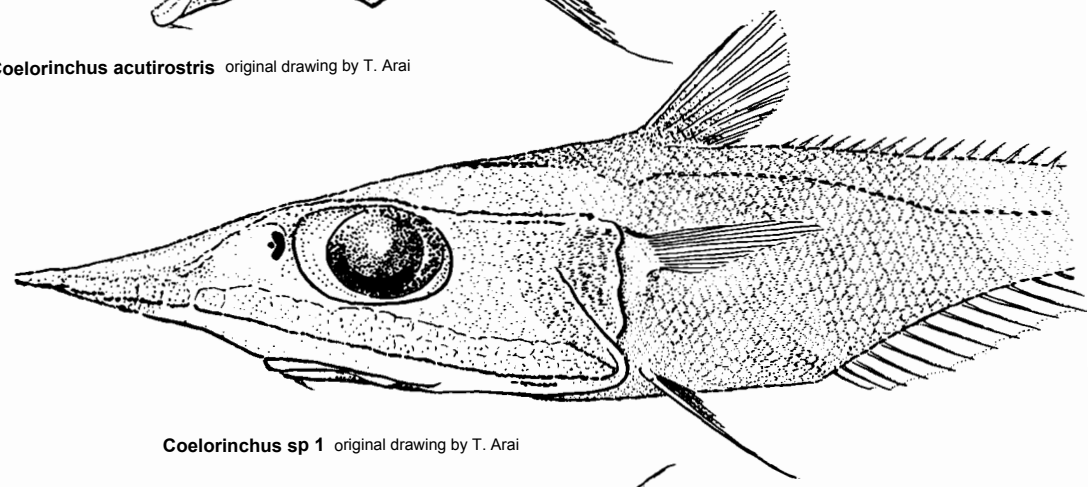
Grey with irregular darker blotches on back below 1st dorsal fin; fins dusky. Snout long, sharply pointed, 2.4-2.7 in HL. Head mostly naked below except for scales along anterolateral margins of snout and with scattered short brown cirri. Broad naked areas dorsally near front of snout margin which are not supported by bone. Eye (orbit) 3.4-4.2 in HL; upper jaw longer than orbit diameter, its length 2.9-3.6 in HL. Body scale spinules few and in quincunx order. Anus immediately before anal fin origin; ventral light organ very long, from anus to near isthmus, slightly enlarged at each end, its length 1.3-1.8 in H L; 1st dorsal fin rays not produced.
D_1 II, 8-10. P 16-20. V 7. Tr above 3-4.
(voucher: 182 mm TL)

Coelorinchus maculatus

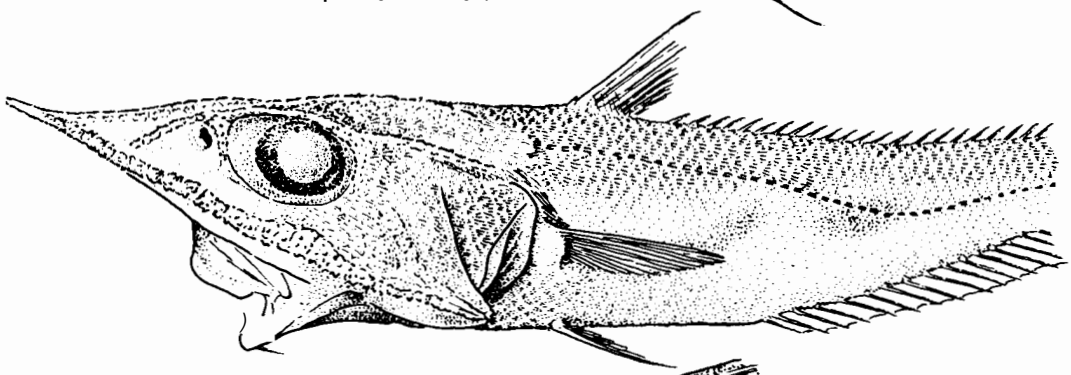
Pale body, distinct large black spot over pectoral fin axil, without saddle marks. Snout broad, short, bluntly pointed, tip a three-cornered 'bump', its length 2.3-2.8 in HL. Head naked below; front snout margins rough and scalloped, supported by narrow bone; naked areas dorsally near front snout margins, small in adults but large in young. Predorsal profile slightly convex. Eye (orbit) 3.4-3.9 in HL, upper jaw length 3.1 - 4.2 in HL. Spinules on body scales arranged in 5 or fewer slightly diverging rows. Anus separated from anal fin origin by 2-3 scale rows; ventral light organ naked, extending from anus to between ventral fin bases, widening anteriorly, its length 2.7-3.6 in HL. Second spine on 1st dorsal fin rounded and produced into a filament.
D_1 II, 8-9. P 14-15. V 7. Branchiostegal rays 6.
(7 specimens, 141-185 mm TL)



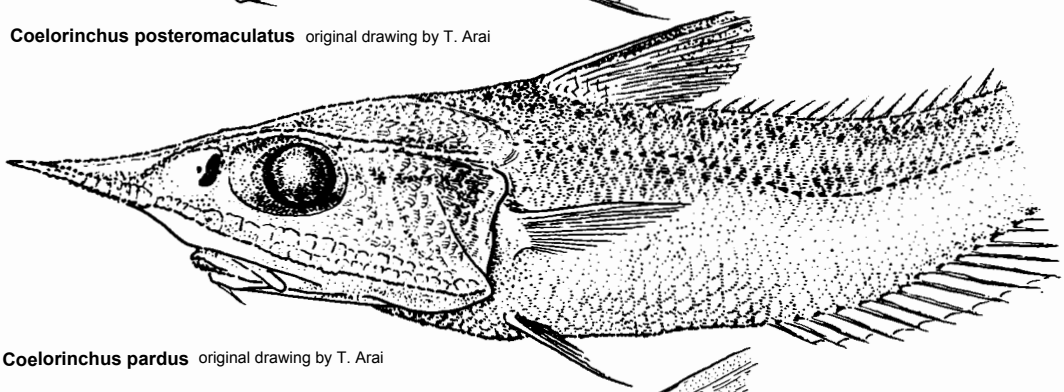
Coelorinchus acutirostris original drawing by T. Arai



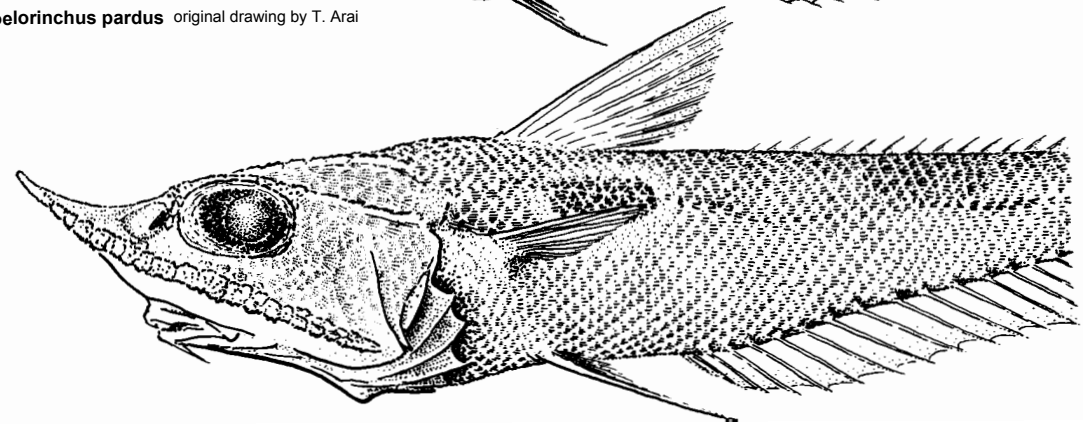
Coelorinchus sp 1 original drawing by T. Arai



Coelorinchus posteromaculatus original drawing by T. Arai



Coelorinchus pardus original drawing by T. Arai



Coelorinchus thurla original drawing by T. Arai

Coelorinchus acutirostris

Body plain light brown. Snout long and sharp, 1.8-2 in HL, its anterolateral margins supported by bone. Head completely naked below; snout scaled above but for 2 naked strips anteriorly. Eye (orbit) 4.3-4.8 in HL; upper jaw length 4.5-7 in HL. Teeth on upper jaw in villiform band and on lower jaw in two rows on sides. Angle of suboperculum acute and without a flap. Body scale spinules arranged in 5-8 diverging rows and without enlarged median keel. Anus just before anal fin origin; ventral light organ long, scaled, extending from isthmus to anus, both ends enlarged, its length about 2.1 in HL. D_1 fin height less than HL without snout.
D_1 II, 8-9. P 16-20. V 7. Tr above 5-6. Branchiostegal rays 6.
(3 specimens, 123-181 mm HL)

Coelorinchus sp 1

Body plain fawn or dusky; distinct black stripe along middle of snout. Head naked below except for scales along anterior snout margins and below preopercular angle. Snout long, slender, pointed, 2.1 in HL; its edges not supported by bone and scaled above except for narrow naked strips anteriorly. Eye 4 in HL; upper jaw long, 3.9 in HL. Teeth on both jaws in villiform bands. Suboperculum with a short acute flap posteroventrally. Body scale spinules arranged in diverging rows. Anus immediately before anal fin origin; ventral light organ very long, scaled, without fossa - visible only as black streak, from anus to isthmus, its length 1.8 in HL. 1st dorsal fin rays not produced.
D_1 II, 9. P 17. V 7. Tr above 5-6. Branchostegal rays 6.
(voucher: 65 mm HL)

Coelorinchus posteromaculatus

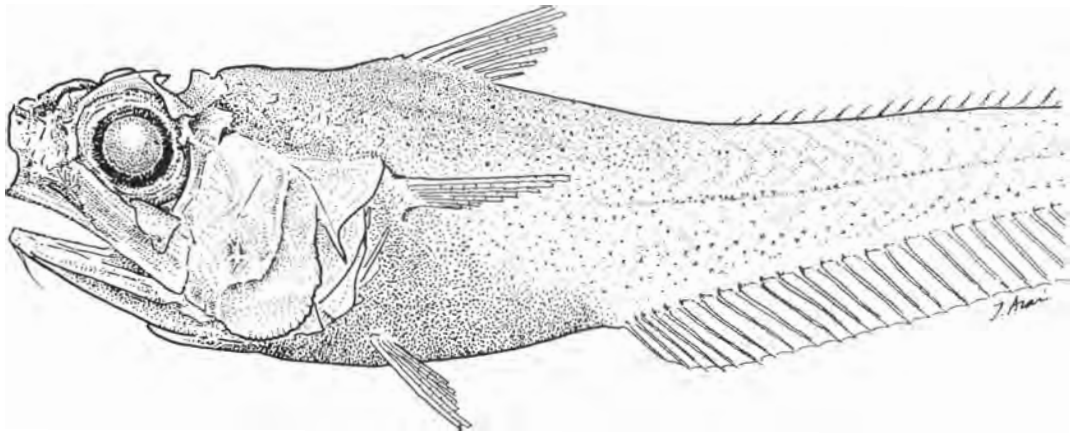
Three distinct dark blotches on body; on lateral line below 1st dorsal, between lateral line and anus, and above front part of anal fin. Snout long, slender, with sharp tip, 2.1 in HL. Head mostly naked below; broad naked areas around nostrils and dorsally near front of unsupported snout margins. Eye (orbit) 4.2-4.3 in HL; upper jaw length 4-4.3 in HL. Body scale spinules arranged in diverging rows. Anus just before anal fin origin; ventral light organ very long, from anus to throat, its ends enlarged, length 1.8-2 in HL; 1st dorsal fin rays not produced.
D_1 II, 10. P 18-19. V 7. Tr above 4.
(voucher: 211 mm TL)

Coelorinchus pardus

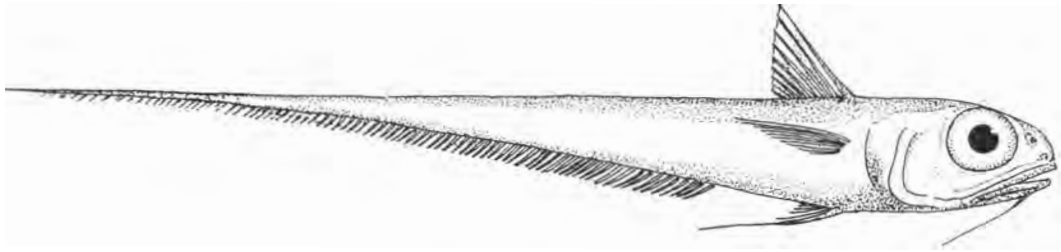
Olive-grey, upper sides with irregular brown blotches, arranged roughly into 2 rows; upper row along dorsal body profile to tail and 3rd blotch in second row slanted forward to below pectoral fin; 1st dorsal fin with brown markings. Snout long and sharply pointed, 2.1-2.3 in HL. Head mostly naked below except for scales along anterolateral snout margins which are not supported by bone. Broad naked areas dorsally near front snout margins. Eye (orbit) 4-4.3 in HL; upper jaw length 3.8-4 in HL. Body scale spinules arranged in parallel rows. Anus just before anal fin origin; ventral light organ very long, scaled, from anus to throat, longer than half HL; 1st dorsal fin rays not produced.
D_1 II, 8-9. P 15-16. V 7. Tr above 5-7.
(3 specimens, 417-185 mm TL)

Coelorinchus thurla

Large oval black blotch surrounded by pale ring on lateral line below 1st dorsal fin, followed by 1 or 2 oblique dark bars on tail; fin edges dark brown. Snout broad and sharply pointed, 2.3-2.4 in HL, its edge supported by bone. Head completely naked below; snout almost completely scaled above but for very narrow naked strips anteriorly. Eye (orbit) 3.8-4 in HL; upper jaw length 4.1-4.3 in HL. Spinules on body scales arranged in 6-10 parallel rows. Anus separate from anal fin origin by 3 or 4 scale rows; ventral light organ long, extending from ventral fin bases almost to anus. No rays of 1st dorsal fin produced.
D_1 II, 7-8. P 16-17. V 7. Tr above 4-5. Branchiostegal rays 6.
(2 specimens, 196-204 mm TL)

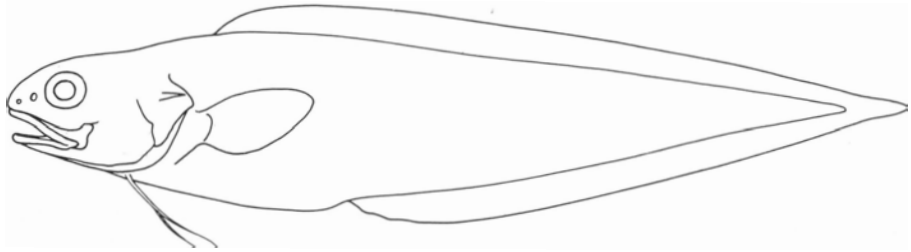


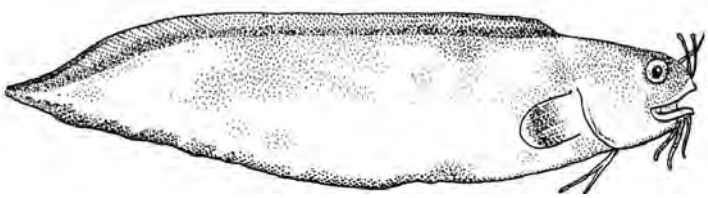
Hymenocephalus heterolepis original drawing by T. Arai



Hymenocephalus longibarbis after Günther. 1887

OPHIDIIDAE





Brotula multibarbata redrawn after Smith, 1965

Glytophidium macropus

Glyptophidium oceanium

Hoplobrotula armata

Source: Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive. Reproduced with permission

Hymenocephalus heterolepis

Plain fawn to brown, covered with tiny black spots; black striations on isthmus and belly. Head covering thin and 'papery', with crests. Chin barbel very short, not reaching vertical through anterior rim of orbit, 9 in HL (5-10%). Snout protrudes slightly beyond mouth, its lower profile almost straight, 3.7-4 in HL (17-20%); eye (orbit) 2.9 in HL (28-33%); interorbital width 3.3 in HL (5-17%). Ventral light organ long, from throat to anus, both ends enlarged like a lens; anus immediately before anal fin. Second dorsal spine smooth; ventral fin not elongate, about twice in HL. interorbital about 3.3 in HL.
P.11-13 V 10-11. GR 22-25

Hymenocephalus longibarbis

Plain fawn, black striations on isthmus and belly, brown stripe along lateral line distinct in adults. Head covering thin and "papery", head crest high and well-developed. Chin barbel very long, 1.7 in HL; eye (orbit) 2.8-3 in HL; interorbital 3.7-4.2 in HL; upper jaw 1.6-1.9 in HL. Gill rakers present on both sides of first gill arch, 3-4 + 16-19 on inner side. Ventral light organ long, from anus to throat, both ends enlarged with lens-like organ, total length 1.2-1.5 in HL; anus immediately before anal fin origin. Second dorsal spine smooth; interdorsal space very wide, 1.1-1.5 in HL; ventral fin produced as a filament, 1.1-1.2 in HL.
D_1 II, 8-10. P 11-16. V 8. Branchiostegal rays 7.
(11 specimens, 89-122 mm TL)

OPHIDIIDAE

Brotulas; Cusk-eels -

Robust and short or elongate and compressed fishes, to about 100 cm length. Supramaxilla present; small, granular teeth; gill openings wide; usually more than seven long gill rakers on first arch; nostrils paired, both well above upper lip; often a sharp spine on upper angle of operculum. Scales present. No spines in fins, dorsal and anal fins long-based, united with caudal fin, fin rays in dorsal fin equal to or longer than anal fin rays; none-2 rays in ventral fin, bases usually close together and placed under gill opening or further forward.

About 50 known genera, of which 7 were obtained on the Survey.

REFERENCES: Nielsen, 1999; Uiblein & Nielsen. 2018; Nielsen, Schwarzhans & Uiblein. 2014.

Brotula multibarbata

Barbels on chin and snout; scales cycloid, small and overlapping; ventral fin base well behind eye. Body and fins reddish brown, paler below, lips and barbels reddish; dorsal, anal and pectoral fin margins black, edged white.
P 22. V 2. GR (long) 4.
(voucher: ? mm SL)

Glyptophidium oceanium

Head large, 4.8 in SL; eye larger than snout; head bones thin; spine on operculum slender, flat and weak. Ventral fin bases below dorsal fin origin, inner ray about twice in HL. Body dusky yellow, silvery and paler below; fins dotted black, margin of dorsal fin dark.
D about 130. A about 100. P 23. V 2. GR (long) 36.
Pseudobranchial filaments 10-12.
(voucher: 174 mm SL)

Glytophidium macropus

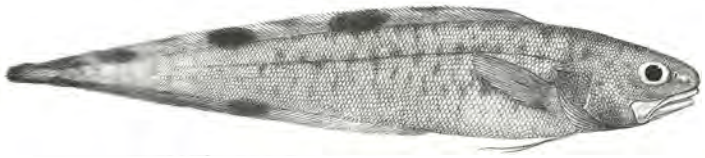
Head large, equal to trunk length and 4 in SL; eye larger than snout; head bones thin; spine on operculum broad, flat and weak. Ventral fin bases below preoperculum, inner ray as long as HL. Head and body dusky yellow, silvery below and finely dotted black ventrally; dorsal and anal fin margins black, pectoral fin dusky.
D 110-120. A about 100. P 23-24. V2. GR (long) 38-40.
Pseudobranchial filaments 5-10.
(voucher: ? mm SL)

Hoplobrotula armata

Short strong spine on operculum, 3 strong spines on angle and lower edge of preoperculum, sometimes a spine on snout; cycloid scales on body; ventral fin rays unequal in length, fin bases below eye; eye large, 4.7-5.1 in HL. Plain yellow or dusky, paler below, mouth black inside, black dots over breast and throat; dorsal and anal fins black or dark grey posteriorly.
D 90-92. A 78. P 20-21. V 2. GR (long) 5.
Pseudobranchial filaments 14-17.
(voucher: ? mm SL)

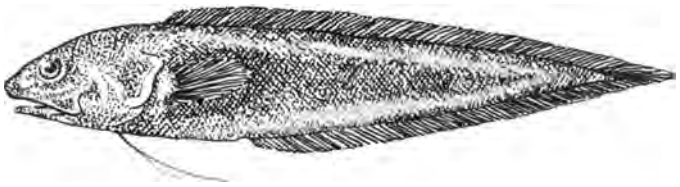
Hypopleuron caninum

Neobythites longipes



Neobythites macrops after Günther, 1887

Neobythites malayanus



Neobythites purus after Radcliffe. 1913

Neobythites lombokensis

Ophidion muraenolepis

Sirembo imberbis

Sirembo jerdoni

Sirembo amaculata

Hypopleuron canium

Jaws equal with some enlarged curved teeth, pair of canines at front of upper jaw; no spines on preoperculum and operculum; HL 5.1-5.4 in SL. Scales small, cycloid, lateral line of larger scales overlaid with smaller scales; ventral fin bases below posterior margin of operculum. Dark brown or fawn, posterior half of body sometimes darker with 10-15 dark cross bands; black dots over pale belly and paired fins, black margin of dorsal and anal fins widening posteriorly.
P 26. V 1. GR (long) 3.
(voucher: 235 mm SL)

Neobythites macrops

Snout equal to eye; opercular spine strong; lateral line distinct; ventral fin bases below preoperculum, inner ray longer. Dusky yellow, many dark crossbars on sides broken into series of dashes; dorsal and anal fins pale, 3-4 large black blotches on dorsal fin, 1-2 on anal, alternating with dark semicircular spots on dark fin margins.
D 102. A 92. P 27. V 2. GR (long) 12. Pseudobranchial filaments 6-7.
(voucher: ? mm SL)

Neobythites purus

Snout longer than eye; operculum spine strong and sharp, one to 3 small spines on preopercular angle; lateral line distinct; ventral fin bases below preoperculum, inner ray longer. Fawn above, paler below, belly and lower sides of head dotted black; fins grey, pectoral and ventral fins pearly-grey, dotted black.
D 87. A 70. P 27. V 2. GR (long) 13-16. Pseudobranchial filaments 5-7.
(voucher: ? mm SL)

Ophidion muraenolepis

Head naked, snout without a spine; body scales elongate, arranged at oblique angles to each other. Ventral fin base below eye, fin rays unequal in length, outer ray much longer. Head and body pale yellow or pinkish cream, sides of head iridescent; dorsal, caudal and sometimes anal fin margins black.
P 23. V 2. GR (long) 4.
(voucher: 155 mm SL)

Sirembo jerdoni

Short spine on operculum, no spine on preoperculum; small cycloid scales cover head and body; ventral fin base below posterior half of eye. Six or 7 oblique scale rows between lateral line and dorsal fin. Head and body yellowish grey crossed by 4 or 5 oblique dark brown bands anteriorly, each connecting with its partner over head and nape; dorsal fin with 3 or 4 dark brown blotches anteriorly followed by dark band, anal fin white with dark band.
A 64-68. P 22-24. V 1. GR (long) 4-5. Pseudobranchial filaments 18-20.
(voucher: 125 mm SL)

Neobythites longiceps

Snout slightly longer than eye; opercular spine strong; lateral line distinct; ventral fin bases below preoperculum, inner ray longer - more than twice HL. Dusky yellow, brown band from snout through eye to below posterior ⅓ of dorsal fin, second band sometimes present from head to mid-sides; large pale-ringed black blotch covering 10-12 rays in mid-length of dorsal fin, dorsal and caudal fins dark brown posteriorly.
D 95. P 26. V 2. GR (long) 10.
Pseudobranchial filaments 7-8.
(voucher: 100 mm SL)

Neobythites malayanus

Snout subequal to eye; opercular spine strong, sometimes weak spine at preoperculum angle. Lateral line distinct; ventral fin bases below preoperculum, inner ray longer-equal to postorbital HL. Tan or dark brown body and fins; black ocellus covering 4-6 fin rays in mid-length of dorsal, followed by broken brown bands along fin; anal and caudal fins dark brown, anal fin with white edge; pectoral fin black.
D 87-95. P 27. V 2. GR (long) 10. Pseudobranchial filaments 3.
(voucher: 175 mm SL)

Neobythites lombokensis

Head and body golden-fawn, silvery over lower head and belly, 2 faint brown bands from snout along body; large pale-ringed, oval black blotch covering about 14 fin rays in mid-length of dorsal fin; anal fin plain brown.
D 91. A 77. P 28. GR (long) 7. Pseudobranchial filaments 2.
(voucher: 95 mm SL)

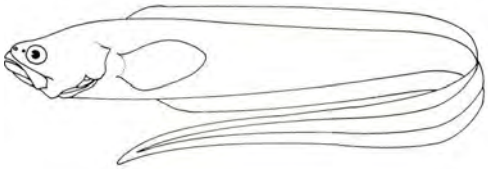
Sirembo imberbis

Short spine on operculum, no spine on preoperculum; small cycloid scales cover head and body; ventral fin base below hind half of eye. Six to 8 oblique scale rows between lateral line and dorsal fin. Head and body olive-golden above, creamy-silver below, 2 or 3 tan or golden bands along sides, broken into spots and dashes; several large dark blotches on outer half of pale dorsal fin, dark brown band along white anal fin.
A 67-73. P 21-25. V 1.
(voucher: ? mm SL)

Sirembo amaculata

Strong pointed spine on operculum, no spine on free edge of operculum; ventral fin bases below operculum, fleshy rays subequal to HL. Pectoral fin entire, on mid-sides, small flap of skin above it; body depth 4.8-5.6 in SL. Head and body fawn, silvery below, with 2 or 3 brown bands from head along upper sides; dorsal and anal fins edged white, smaller individuals with broad brown band along fin bases.
D 94-96. A 71-73. P 25-26. V 2. GR (long) 3-4.
Pseudobranchial filaments 25.
(voucher: 250 mm SL)

CARAPIDAE



Encheliophis gracilis

BATRACHOIDIDAE

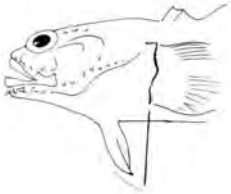
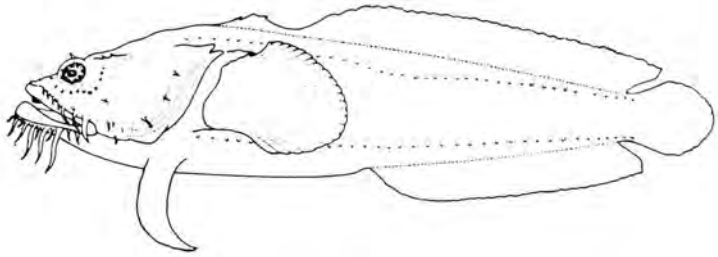


Fig. 1.



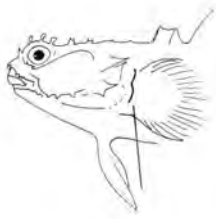


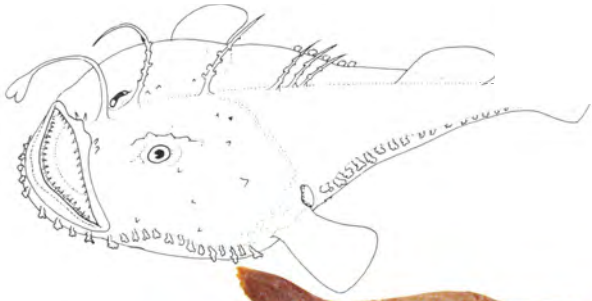
Fig 2

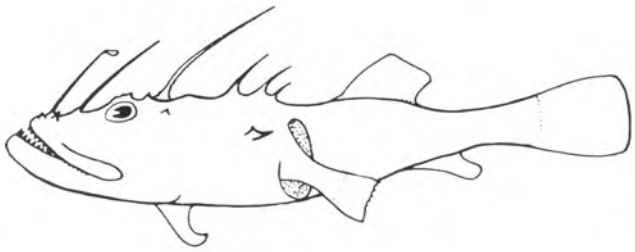
Batrachomoeus occidentalis

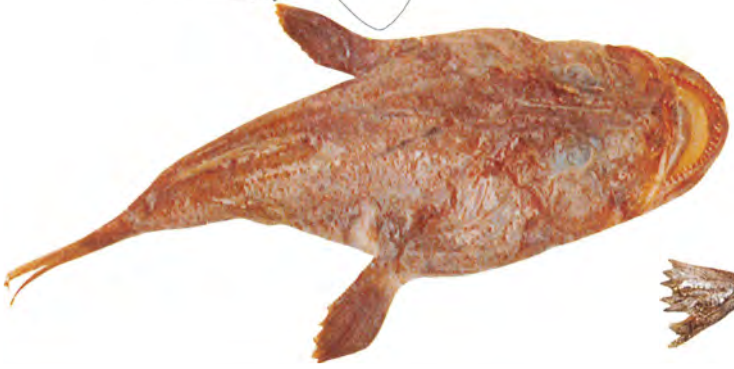
Batrachomoeus trispinosus

Halophryne diemensis

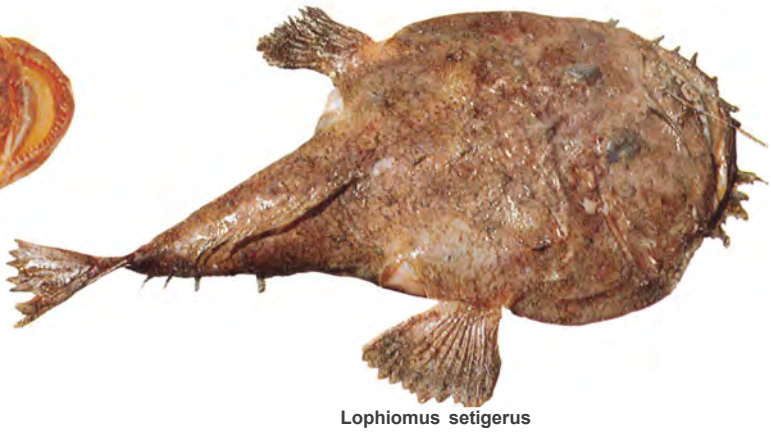
LOPHIIDAE







Lophiodes gracilimanus



Lophiomus setigerus

CARAPIDAE
Pearlfishes -

Body very elongate and slender, tapering posteriorly. Eye large; mouth large and oblique; teeth fine; gill openings wide. No scales, but lateral line present. Dorsal and anal fins very long (anal longer than dorsal); no caudal fin and no ventral fin. Anus close to head. These fishes often live inside sea cucumbers, starfish and the mantle cavity of molluscs.

The Family has eight genera and many species.

REFERENCES: Nielsen et al., 1999; Markle & Olney, 1990.

Encheliophis gracilis

Maxilla hidden by skin and only one row of teeth in jaws, palatines, and vomer. Pectoral fin well developed. Brown, yellowish greenish, spotted black.
(voucher: 172 mm SL)

BATRACHOIDIDAE
Toadfishes - Kokok

Body robust, covered with thick mucus. Head broad and flattened; eyes on top. Mouth large, horizontal, bordered by barbels and skin flaps; teeth strong. Gill opening restricted to side of body; strong spines present on gill cover. First dorsal fin with 2 or 3 solid spines, second dorsal and anal fins long-based and without spines; pectoral fins large, broad-based; ventral fin with one spine and 3-5 soft rays, base well before that of pectoral fins.

Twenty-five genera globally of which two were obtained in the Survey area.

REFERENCES: Hutchins, 1976; Greenfield, 1999; Greenfield, Winterbottom & Collette, 2008.

Batrachomoeus occidentalis

Maxilla extends at least to posterior eye border; gill opening wide (Fig 1); pore present in pectoral fin axil. Anal fin base 1.1-1.3 in HL; head 2.1-2.4 in SL. Dark brown to olive-brown bands across body and head, those on body arranged as 3 or 4 double bands; soft dorsal and anal fin bands oblique and continuous with body bands; 7-8 staggered or checked brown bands across pectoral and caudal fins.
D III, 19-20. A 15-16.
(voucher: 200 mm SL)

Batrachomoeus trispinosus

Maxilla extends at least to posterior eye border; gill opening wide (Fig 1); pore present in pectoral fin axil. Anal fin base 0.9-1 in HL. Irregular dark brown bars, marbling and blotches across head and body; dark brown bands across soft dorsal and anal fins continuous with body bars. Four or 5 distinct brown bars across caudal fin.
D III, 21-33. A 17-20.
(voucher: 65 mm SL)

Halophryne diemensis

Middle orbital tentacle longer than others; gill opening narrow (Fig 2). First dorsal fin spine 1.4-2 in eye diameter. Five to 8 brown bands across body (last 2 joined at mid-sides) and scattered black spots over head and back; fins plain, spotted or barred.
D III, 19-21. A 16-18.
(voucher: ? mm SL)

LOPHIIDAE
Goosefishes -

Head and anterior part of body very depressed and broad, posterior part of body tapered. Mouth very large and wide; teeth long, sharp, depressible; sharp spines on head. Gill opening large, in axil of pectoral fin. No scales but fleshy flaps on smooth, loose skin. Two dorsal fins: the first with up to 3 long individual spines on head and 3 on nape; second with rays, opposite rayed anal fin. First dorsal fin spine in form of an illicium. Pectoral fin strong and broad; ventral fin base before pectoral fin base.

Four genera with 28 species in the family. Members of two genera were obtained on the Survey.

REFERENCE: Caruso, 1999a.

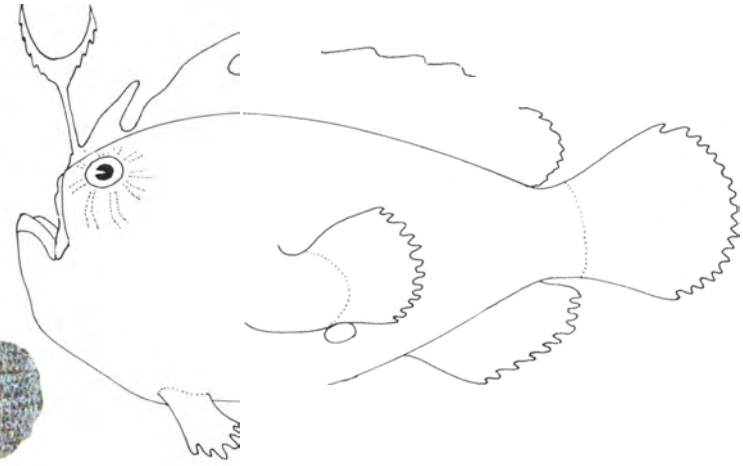
Lophiodes gracilimanus

Second dorsal fin spine very long, reaching 4th or 5th dorsal fin spine when depressed. Gill opening large and extending behind, below and in front of pectoral fin base. Brown above and below; inside of mouth orange-brown. Peritoneum pale.
D_1 3+3 (all well developed); D_2 8. P 14-16. A 6.
(voucher: 187 mm SL)

Lophiomus setigerus

Three to 4 rows of teeth in jaw. Gill opening just to below and behind pectoral fin "elbow". Dusky lilac above, white below; inside of mouth white, tongue and floor of mouth with network of black lines.
D_1 3+3 (only last 2 or 3 connected by membrane);
D_2 8-9. A 6-7. P 21-25.

ANTENNARIIDAE



Antennarius commerson

Antennarius hispidus

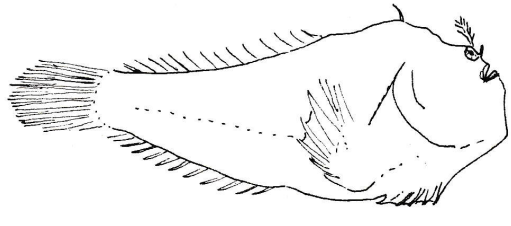
Antennarius pictus

Antennarius striatus

Lophiocharon trisignatus

Tathicarpus butleri

TETRABRACHIIDAE



Tetrabrachium ocellatum

ANTENNARIIDAE

Fishing frogfishes -

Specialised bottom-dwelling small to medium-sized fishes. Body short, bulky and slightly compressed. Head large; mouth large, oblique or vertical; eyes lateral, teeth slender; gill opening pore-like, situated below and behind pectoral fin base. Scales absent, skin loose and flabby, either smooth or with spinules or fleshy filaments. Illicium (modified first dorsal fin spine) long, its tip usually thickened or branched, not depressible; second and third dorsal fin spines well developed and covered by skin; ventral fin with 5 rays; pectoral fin modified and single, with distinct "elbow".

Total genera in the family 15, of which members of three were obtained on the Survey.

REFERENCES: Pietsch, 1999, Pietsch & Arnold, 2020.

Antennarius commerson

Narrow filaments at tip of moderately-long illicium. Dorsal fin rays all branched; all pectoral fin and anal fin rays unbranched; all caudal fin rays branched. Body marbled and speckled with dark marks and with scattered pale red and yellow patches.
D_2 13 (rarely 11 or 12). A 8. P 11 (rarely 10)
(voucher: 190 mm SL)

Antennarius pictus

Illicium nearly twice length of tapered 2nd dorsal spine, posterior membrane which reaches base of 3rd spine, usually covered with spinules; caudal peduncle present. Up to 5 last dorsal rays branched; caudal rays branched, all pectoral rays simple. Three circular dark spots on caudal fin; row of dark spots along soft dorsal fin.
D_2 11-13. A 6-8. P 9-11.

Lophiocharon trisignatus

No caudal peduncle. Illicium slender, its tip simple and much-branched. All soft dorsal and caudal fin rays branched, pectoral fin rays simple. Tan, orange or greenish; caudal fin always with 2 or 3 rows of white ocelli across its middle.
D_2 13. A 7. P 9.
(voucher: 75 mm SL)

Antennarius hispidus

Tip of illicium large, of a clump of filaments. Second dorsal fin spine sub-equal to illicium in length; soft dorsal fin rays simple, last 2 or 3 branched. Anal and caudal fin rays branched; pectoral fin rays simple. Brown streaks radiate over head from eye and spread obliquely across body; fins spotted dark brown.
D_2 12-13. A 7. P 10.
(voucher: 45 mm SL)

Antennarius striatus

Tip of illicium with 2 or 3 simple filaments; second dorsal fin spine noticeably shorter than illicium; soft dorsal fin rays simple, last 2 or 3 branched. Anal and caudal fin rays branched; pectoral fin rays simple. Dark brown streaks spread across head and obliquely over body; fins spotted or striped dark brown.
D_2 12-13. A 6-7. P 10.
(voucher: 80 mm SL)

Tathicarpus butleri

Elongate tubercles and filaments on body, illicium very long, with simple filaments at tip. Soft dorsal, anal and caudal fins high; pectoral fin free of body for most of its length. All fin rays simple except for branched anal fin rays. Dark grey or mauve; distinct olive or black oval patch on side near pectoral fin; anal fin black.
D_2 11. A 7. P 6-8.
(voucher: 55 mm SL)

TETRABRACHIIDAE

Smooth angler fishes -

Head "globular" or rounded in cross-section, prominent hump on nape; body compressed posteriorly. Mouth small, opening dorsally; teeth slender; small eyes dorsally, gill opening pore-like, situated below and behind pectoral fin base. Scales absent, body smooth and firm. Illicium (modified first dorsal fin spine) small, with no cavity to contain it; all dorsal fin spines exposed; ventral fin with 1 spine and 5 rays.

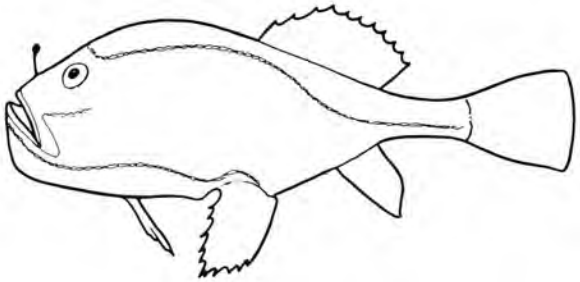
Two genera and two species in the family, of which one was caught in the Survey.

REFERENCES: Pietsch, Johnson & Arnold, 2009; https://www.fishbase.se/summary/Dibrachichthys-melanurus.html

Tetrabrachium ocellatum

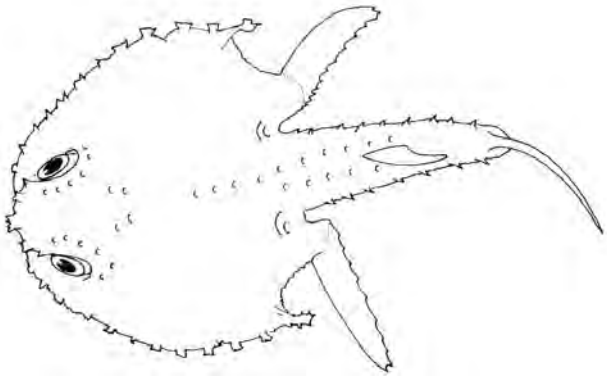
Second dorsal fin spine fringed and large, 3rd very small and on hump of neck. Violet-brown above with many oval white spots extending over soft dorsal fin; body white below.
D I: 1; 1; 16-17. A 11-12. P 4+5 (in 2 parts)

CHAUNACIDAE

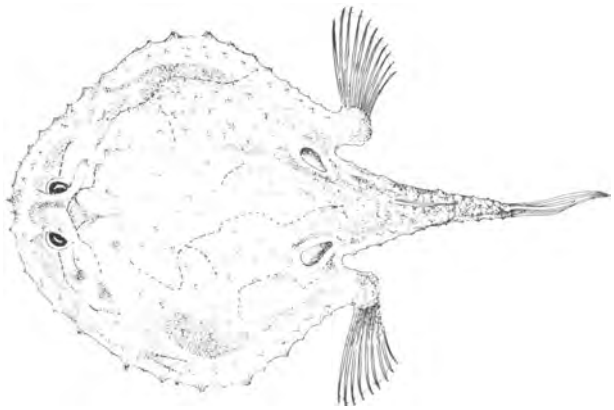


Chaunax gomoni

OGCOCEPHALIDAE



Halieutaea sp 1



Halieutaea coccinea drawing of preserved specimen

Halieutaea fumosa

Halieutaea indica

CHAUNACIDAE

Sea toads -

Body ovate and compressed posteriorly. Head square in cross-section; mouth large, almost vertical; teeth slender. Small pore-like gill opening behind pectoral fin base. Skin soft and flabby, densely covered with fine prickles and scattered with soft flaps of skin. First dorsal spine modified as a short, thick, "fishing rod with a lure" (illicium) depressible into a circular hollow before eyes; second and third dorsal fin spines embedded beneath skin; ventral fin with 1 spine and 4 rays; well-developed pectoral fin with a distinct "elbow".

Two genera with 27 species in the family. One species obtained on the Survey.

REFERENCES: Caruso, 1999b; Ho, Kawai & Satria, 2015.

Chaunax gomoni

Tip of illicium black, illicium fits into a circular groove or hollow before eyes. Belly often inflated. Body deepest in mid-length. HL 2.5 in SL. Body pink, sometimes dusky; usually with large yellow, green and olive spots on dorsal surface. Peritoneum white.
(D I; (I; I;) 11-13. A 5-7. P 12-13.
(voucher: 53 mm SL)

OGCOCEPHALIDAE

Batfishes -

Head extremely depressed and large, rounded or triangular; body short, slender and slightly compressed. Mouth wide, and horizontal; fine teeth in jaws. Skin naked, but well-developed hard plates and spines on upper surface and tail. Gill opening small, above pectoral fin base. Pectoral fin well-developed. Illicium (first dorsal fin) short, thickened and bulbous at its end, depressible into a pit or groove on snout. Second dorsal fin spine embedded beneath skin; 3rd dorsal spine absent. Ventral fin with one spine and 5 rays. Soft dorsal and anal fins small. Colouration and the extent of spination appear to be variable.

10 genera known, of which two were obtained on the Survey:

Malthopsis: esca ovate; disc triangular.
Halieutaea: esca in three lobes; disc rounded; gills three.

REFERENCES: Prokofiev, 2020a; Ho & Shao, 2008; Bradbury, 1999.

Halieutaea sp 1

Sharp spines over dorsal surface, ventral surface covered with fine spinules; disc ovate, distinctly longer than wide, humped behind eyes; eye 1.7 in interorbital, 11.5 in disc length; roof of rostral cavity does not reach disc edge. Dorsal surface rosy with violet patches, ventral surface bright pink, lateral lobes of esca bright crimson; fins plain grey or rosy.
D 5. A4.
(voucher: 65 mm SL)

Halieutaea fumosa

Strong spines and skin filaments scattered on dorsal surface, ventral surface completely smooth; disc slightly wider than long, slightly flattened behind eyes; eye equal to interorbital, 6.5-7 in disc length; roof of rostral cavity does not reach disc edge. Dorsal surface pinkish-fawn, with few thin lines of black spots, disc edge pink, filaments black, ventral surface pale crimson or grey, esca stippled green over dark pink; lining of gill cavity fawn, peritoneum black; fins pink crossed by broad black bands.
D 4-5. A 5. P 12-13.
(voucher: 64.5 mm SL)

Halieutaea coccinea

Well-developed spines over all of dorsal and ventral surfaces; disc slightly wider than long, humped behind eyes; eye 1.6-2 in interorbital, 9 in disc length; root of rostral cavity does not reach disc edge; lateral lobes of esca prominent. Dorsal surface bright pink, sometimes with pattern of fine black lines; ventral surface dark crimson; lining of gill cavity and peritoneum black; lateral lobes of esca dark pink; fin edges dusky.
D 5. A 4. P 14-15.
(voucher: 135.5 mm SL)

Halieutaea indica

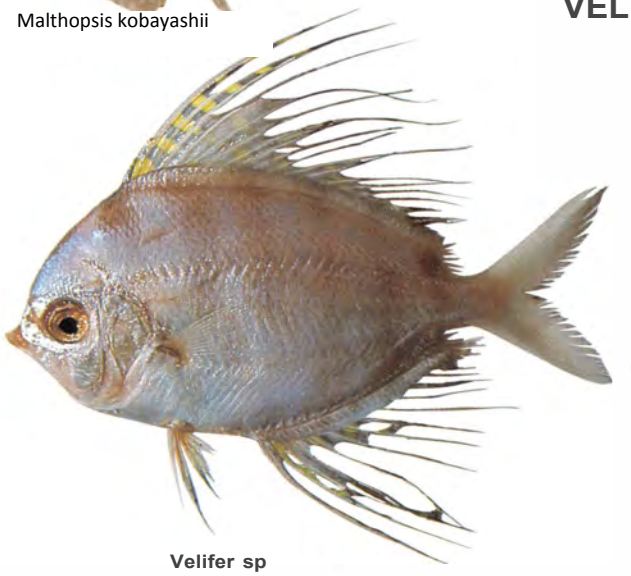
Many strong sharp spines over dorsal surface, ventral surface mostly smooth except for fine spines around ventral fin bases; disc wider than long, slightly flattened behind eyes; eye 1.2 in interorbital, 7.5 in disc length; roof of rostral cavity reaches disc edge. Dorsal surface fawn or dusky pink with wide brown lines encircling gill openings and forming a "U"-shaped marking medially; ventral surface pink, stippled fawn; lining of gill cavity and peritoneum pale; dorsal fin brown, others orange-yellow, barred white.
D 4. A (damaged in voucher). P 12-13.
(voucher: 56 mm SL)

Halieutaea sp 2

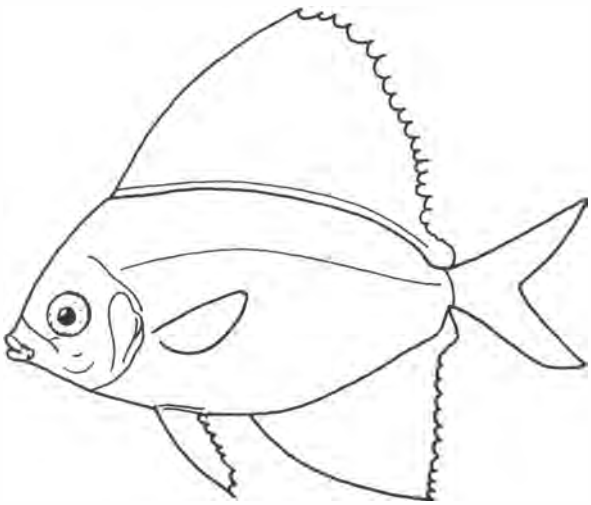
Halieutaea sp 3

Malthopsis kobayashii

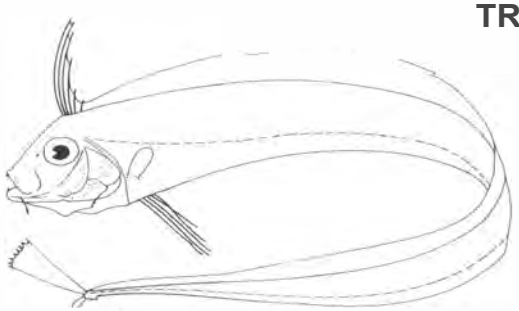
VELIFERIDAE



Velifer sp

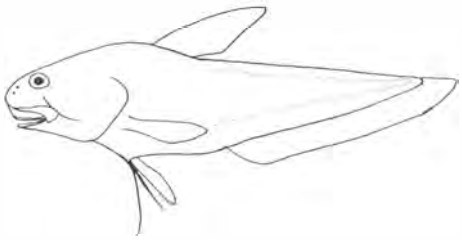


TRACHIPTERIDAE



Desmodema polystictum

ATELEOPODIDAE



Ateleopus javanicus

Halieutaea sp 2

Strong spines cover dorsal surface, ventral surface covered with fine spinules or simple spines; disc much wider than long, flattened behind eyes; eye 1.5-1.7 in interorbital, 8-9 in disc length; roof of rostral cavity ends well behind disc edge. Dorsal and ventral surfaces orange-red, black spots forming pattern of clusters and crescentic lines on dorsal surface; fins orange-red, margins scarlet.
D 4-5. A 4. P 13-14.
(voucher: 161 mm SL)

Malthopsis kobayashii

Disc triangular, snout produced to form a sharp projecting spine; many body plates over dorsal surface, tail, fewer on ventral surface. Esca a single ovate bulb; eye 4-5 in disc length; subopercular spine triangular and with spinules (none antrorse). Dorsal surface violet, fawn or dusky, sometimes with scattered black rings; fins plain. D 5. A 4. P 11-12.
(voucher: 44 mm SL)

Halieutaea sp 3

Many strong sharp spines over dorsal surface, ventral surface smooth except for scattered fine spines around ventral fin bases; disc slightly wider than long, slightly flattened behind eyes; eye 1-2 in interorbital, 8-9 in disc length; roof of rostral cavity does not reach disc edge. Dorsal surface rosy or dusky pink, usually patterned with black spots forming crescentic lines or clusters near disc midline; ventral surface dark crimson; esca dusky; fins pink or red with black margins. Lining of gill cavity pale fawn, peritoneum brown, stippled dark.
D 4-5. A 4. P 13-15.
(voucher: 190 mm SL)

VELIFERIDAE

Veil fins -

Body deep, ovate and compressed. Mouth small and with no teeth. Body scales cycloid and easily lost. Dorsal and anal fins single, long and elevated, of few to many feeble spines and many rays; scaly sheath at their bases. Ventral fin has 8-9 rays, and a scaly axillary process. Caudal fin deeply forked.

Two genera and two known species of which one was caught on the Survey.

REFERENCE: Olney, 1999.

Velifer sp

Maxilla reaches front of eye; scaly sheath along entire dorsal fin base. Iridescent blue-green; back crossed by 6 or 7 dusky bars. Alternating blue and yellow bands along dorsal and anal fins; a large white-ringed black spot posteriorly on dorsal fin. Caudal fin plain.
D 32-36 (total). A 23-27. L. lat. 59-63.
(voucher: 119 mm SL)

TRACHIPTERIDAE

Ribbonfishes –

Very compressed and elongate fishes, tapering posteriorly. Head short and high, profile steep; mouth oblique, protractile; some teeth weak, others fang-like; eye large; head bones strong. Body naked or with easily lost scales; lateral line with tubular and spine-bearing plates. Long dorsal fin begins above or behind eye, a spine at base of each ray; anal fin absent; only upper lobe of caudal fin well-developed and situated at right angles to or on same axis as caudal peduncle; ventral fin of 1-10 rays; pectoral fin short, almost vertical.
Three genera, 10 species in the family.

REFERENCE: Olney, 1999.

Desmodema polystictum

Caudal fin on same axis as caudal peduncle, no lower caudal lobe; tail extremely long; ventral body profile not scalloped; each lateral line scale with pair of spines, rest of body naked (all sizes). Snout length less than eye. Body silvery, reddish above, dusky spots on upper half of body in smaller fish.
Caudal 7-10.
(voucher: 495 mm SL)
(Note: photo of preserved voucher)

ATELEOPODIDAE

Jellynose fishes -

Head large; trunk short; tail long, compressed and tapered. Eye small, mouth inferior, opercular bones hidden by skin; teeth very small or absent. Skin soft, jelly-like, slimy, usually without scales. Fins without spines; dorsal fin single and short, above pectoral fin. Anal fin long and joined to caudal fin. Pectoral fin well-developed; ventral fin with two rays. Gill openings wide.

Four genera with 13 species of which one was collected on the Survey.

REFERENCES: Moore, 1999; Kaga, van Oijen, Kubo & Kitagawa, 2015.

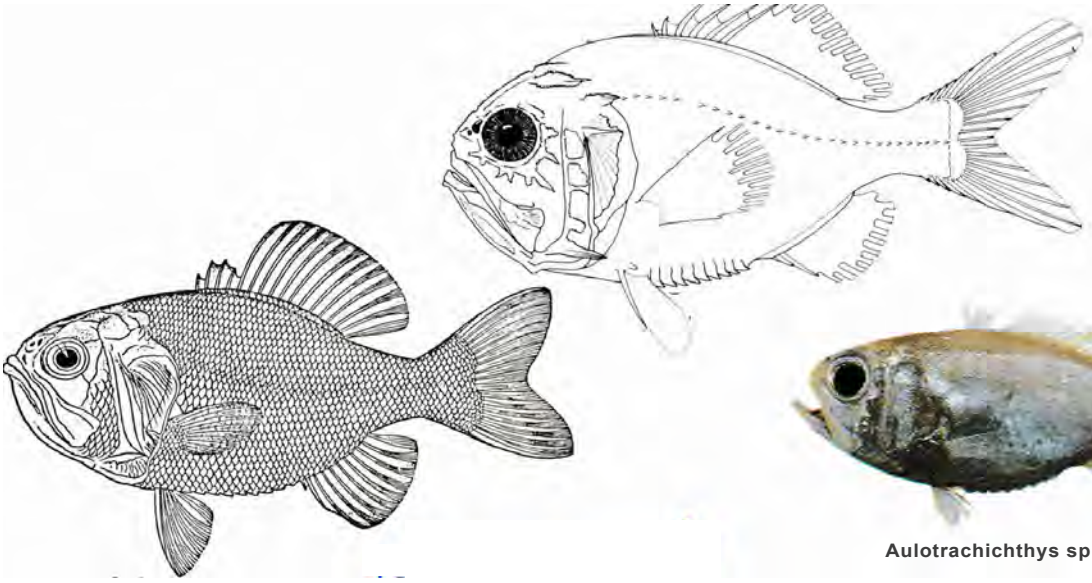
Ateleopus japonicus

Head large; snout projecting and obtuse and bulbous; fine teeth anteriorly in upper jaw, none in lower. HL slightly longer than trunk length, but shorter than single-rayed ventral fin. Tail long and tapered. Eye 12 in HL; dorsal fin height 1.6 in HL; pectoral fin 1.4 in HL. Body depth 11.6 in SL; HL 5.5 in SL. Tan, darker ventrally and fins dark; head orange-brown.
D 8-9. A 115. P 12. C 5. GR 0 + 8 or 9.
(voucher: 444 mm SL)

* MELAMPHAIDAE

(See Species List)

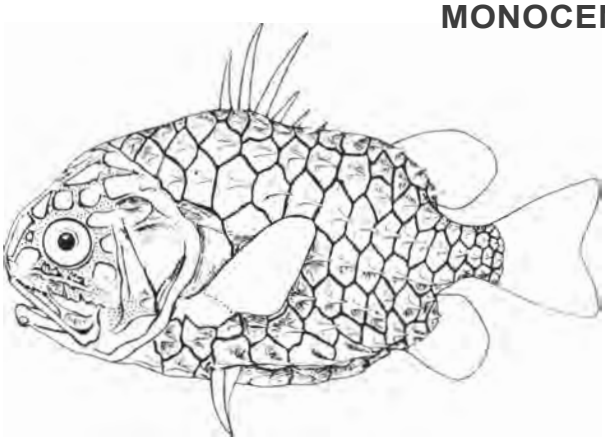
TRACHICHTHYIDAE



Aulotrachichthys latus after Fowler, 1938

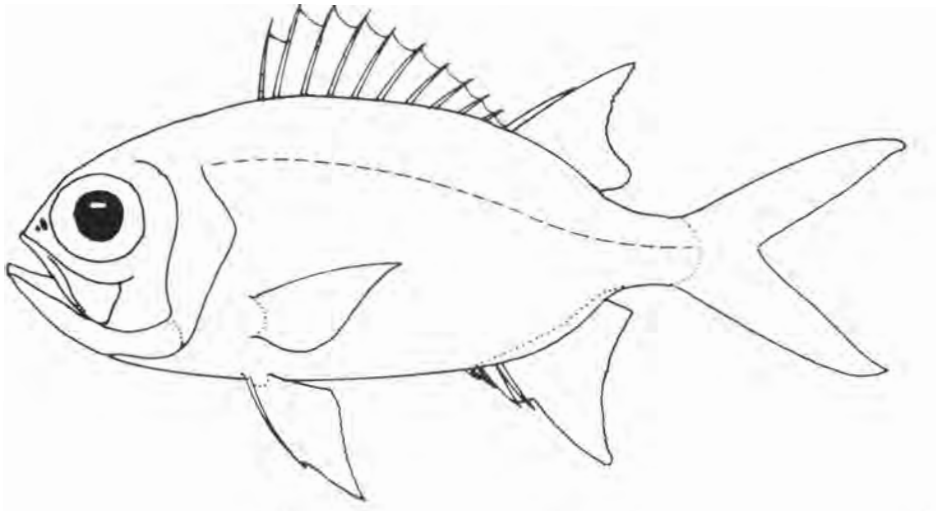
Aulotrachichthys sp

MONOCENTRIDAE



Monocentris japonica

HOLOCENTRIDAE



Sargocentron

Neoniphon

Myripristis

Ostichthys

TRACHICHTHYIDAE

Slimeheads; Roughies -

Small to medium-sized fishes of deeper water. Body ovate and compressed. Head large with mucous cavities covered by skin; strong spines on preoperculum and operculum. Mouth large and oblique, teeth small. Scales ctenoid (rough) and usually a keel of strong scutes along belly. Dorsal fin single, with a few strong spines; anal fin short-based. Caudal fin forked; ventral fin with 1 spine, 6-7 rays.

Family comprises eight genera and 48 known species. Representatives of one genus caught on the Survey.

REFERENCES: Moore & Paxton, 1999. Gomon, 2006.

Aulotrachichthys latus

Scales moderately ctenoid; striated light organ along ventral profile from breast to caudal peduncle. Anus anterior, between ventral fin bases. Seven to 9 scutes present between ventral fin and anal fin origin. Body depth 2.4-2.6 in SL. Body brown, iridescent silvery-grey below.
D III-IV, 15. A II, 9 57-58 scale rows along body. Lower GR 10.
(voucher: ? mm SL)

Aulotrachichthys sp.

Scales moderately ctenoid; striated light organ along ventral profile from breast to caudal peduncle. Anus anterior, between ventral fin bases. Seven to 9 scutes present between ventral fin and anal fin origin. Body depth 2.5-2.7 in SL. Dark grey or tan; fins pale pink.
D IV-V, 13-14. A II-III, 8-9. 59-66 scale rows along body. Lower GR 10-12.
(voucher: 74 mm SL)

MONOCENTRIDAE

Pinecone fishes -

Body deep, compressed. Head large with mucous cavities covered by skin. Mouth large, inferior, teeth fine. Light (phosphorescent) organs under lower jaw. Scales large, heavy and bony, united to form a rigid covering for body. Dorsal fin notched, with 5 or 6 strong spines. One or two spines in anal fin. Ventral fin with one long, strong spine and 3 rays. Caudal fin moderately forked.

Family comprises two genera and four species, one collected in the Survey.

REFERENCE: Paxton, 1999b.

Monocentris japonica

Snout profile rounded; a pair of light organs each side of chin. Suborbital deep, almost equal to eye diameter. Body yellow, scales outlined in black; lower jaw black.
D V-VI, 11-12. A II, 8.
(voucher: 120 mm SL)

HOLOCENTRIDAE

Squirrelfishes, Soldierfishes - Suangi;

Moderately deep-bodied, compressed fishes, mostly associated with shallow coral reefs, but some in deeper waters. Bones of head with highly serrated margins and often long and strong spines. Eye large. Spinous part of dorsal fin (10-13 spines) separated from shorter but higher soft part by a deep notch; anal fin with 4 strong spines (third usually the longest). Scales with rough hind margins. Body and fins often red or red and silver; distinctive marks may include black at hind border of gill opening.

Family comprises eight genera and about 90 species.

REFERENCES: Randall & Greenfield, 1996; Randall & Greenfield, 1999; Greenfield, Randall & Psomadakis, 2017; Randall, 1998.

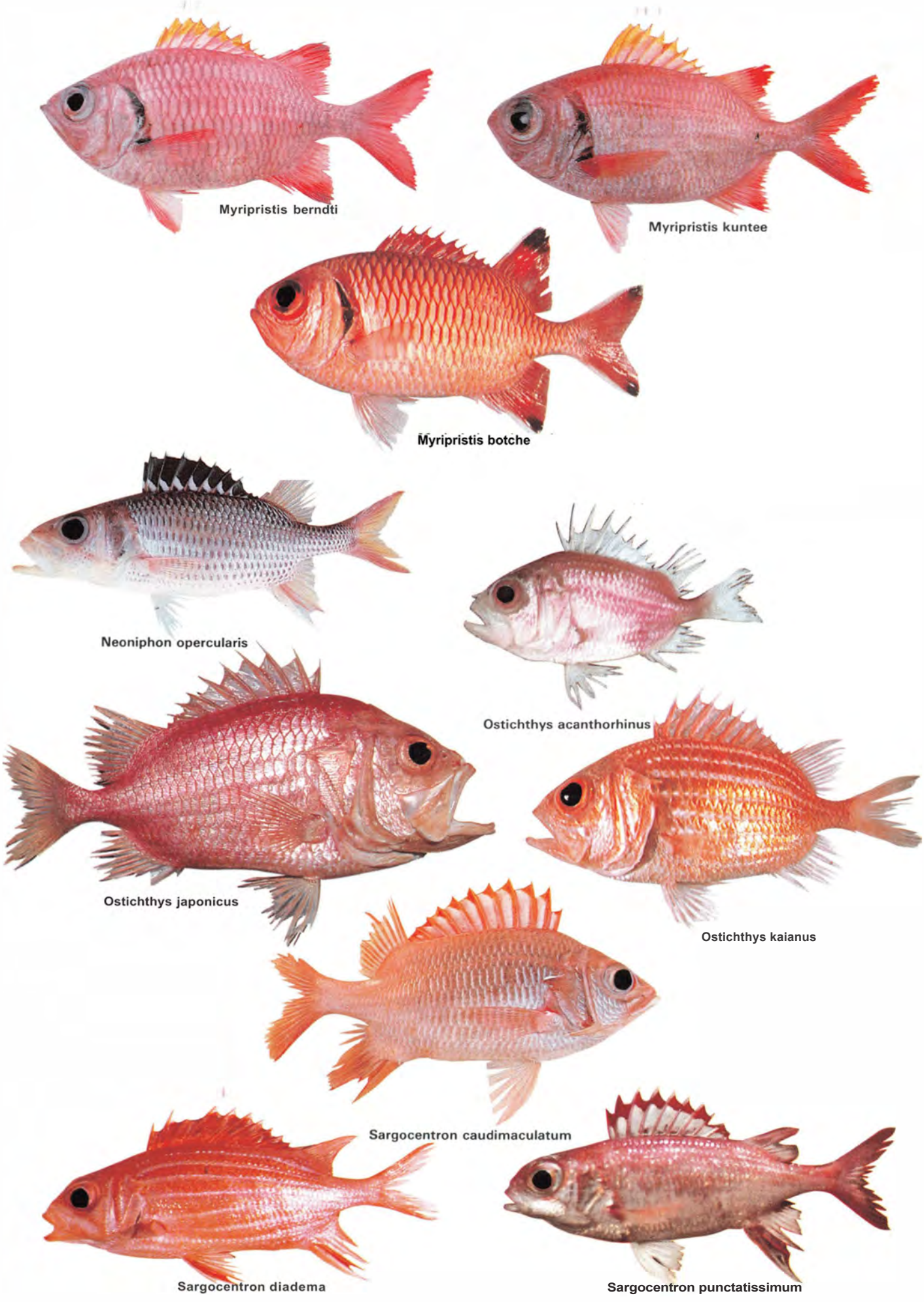
SYNOPSIS OF GENERA

Subfamily Holocentrinae: long, sharp spine at lower angle of preoperculum; anal fin with 7-10 branched fin rays.

Sargocentron: last dorsal fin spine the shortest, not joined to soft part of fin.
Neoniphon (Flammeo of authors): last dorsal fin spine longer than the other one before it, joined to soft part of fin.

Subfamily Myripristinae: lower angle of preoperculum rounded or with very short, broad spine; anal fin with more than 10 branched fin rays.

Myripristis: 11 dorsal fin spines.
Ostichthys: 12-13 dorsal fin spines.


Myripristis berndti
Myripristis kuntee
Myripristis botche
Neoniphon opercularis
Ostichthys acanthorhinus
Ostichthys japonicus
Ostichthys kaianus
Sargocentron caudimaculatum
Sargocentron diadema
Sargocentron punctatissimum

Myripristis berndti

Scales present in pectoral fin axil; vomerine tooth patch triangular with rounded edges; interorbital 4.3-5.2 in HL. Broad orange-yellow band on margin of spinous dorsal fin; soft dorsal and anal fins tipped white; black margin on operculum interrupted.
D_1 XI
(voucher: 150 mm SL)

Myripristis botche

No scales in pectoral fin axil. Margin of spinous dorsal fin red; leading edges of dorsal, anal and caudal fins white, sub-marginally black; black margin on operculum continuous.
D_1 X I.
(voucher A: 230 mm SL) (voucher B: 145 mm SL)

Neoniphon opercularis

Last dorsal spine longer than the second last one. Spinous dorsal fin black with "zig-zag" white band basally; operculum and shoulder region deep red. Body bluish red with scale being black on posterior part; white on belly. Soft dorsal and anal fins with first rays red, last rays yellow. Caudal fin with yellow middle rays, upper and lower margins red.
A_2 9.
(voucher: 205 mm SL)

Ostichthys japonicus

All scales clearly striate. Body and fins plain silvery-red with no distinct markings.
D_1 XIII. Pectoral fin 17 (average). Lower GR 11-14. Tr above 3½.
(voucher: 340 mm SL)

Sargocentron caudimaculatum

Nasal fossa with one or more spines. Silver spots on upper caudal peduncle just behind dorsally-white fin; margin of spinous dorsal fin red. No black markings on fins.
D_1 XI, 14. P 13-14. A. IV, 9.
Tr above 2½. L. lat. 40-43.
(voucher: 160 mm SL)

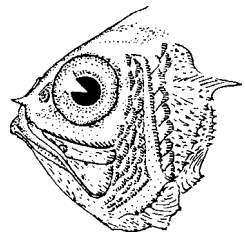
Sargocentron punctatissimum

Nasal fossa without spines. Outer margin of spinous dorsal fin crimson; snout profile steep, convex before eye; body with scattered dark spots; diffuse red band from nape to inner pectoral fin axil.
Tr above 2½. L. lat. 42-45.
D_1 XI, 12-14. P 15. A. IV, 9.
(voucher: 105 mm SL)

Myripristis kuntee

Broad rectangular dark brown or black bar from upper edge of gill opening into pectoral fin axil. Spinous dorsal fin yellow; tips of red soft dorsal, anal and caudal fin lobes white.
D_1 XI, 15-17. Tr above 2½. L. lat. 37-44.
(voucher: ? mm SL)

Ostichthys acanthorhinus



Sharp, forward-directed spine from nasal bone (see fig). Body rosy violet, silvery below; scale centres white, forming faint longitudinal stripes. All fins clear.
D_1 XII. Lower GR 16-18. Tr above 3½.
(voucher: 112 mm SL)

Ostichthys kaianus

Body bright red, scale centres white, forming longitudinal white stripes along body. Fins red without distinctive markings.
D_1 XIII. Pectoral fin 16 (average). L. lat. usually 28. Tr above 2½.
(voucher: 140 mm SL)

Sargocentron diadema

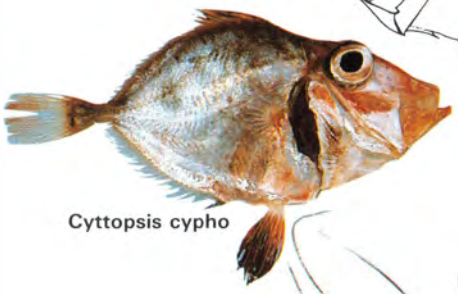
Thin white lines along body over scale row junctions. Oblique white stripe below eye. Leading edges of soft dorsal and anal fins and margins of white caudal fin crimson. First basally, outer ¾ plain brownish red. No spines on nasal fossa.
Tr above 2½.
(voucher: 110 mm SL)

Sargocentron rubrum

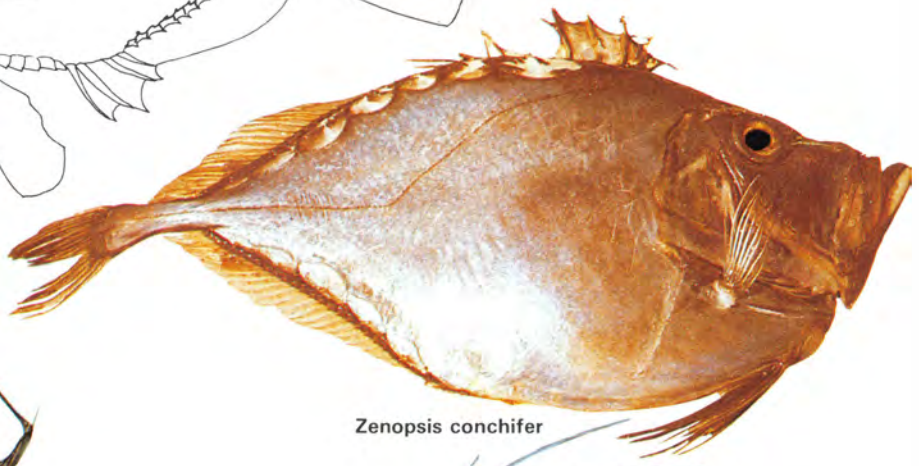
Sargocentron spiniferum

ZEIDAE

See opposite page for explanation on correct classification of **Cyttopsis cypho**



Cyttopsis cypho

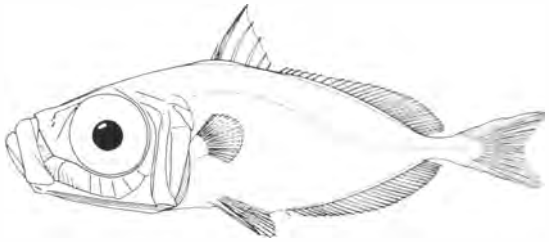


Zenopsis conchifer

Zenopsis nebulosa

Zeus faber

ZENIONTIDAE



Zenion sp.

Sargocentron rubrum

No spines on nasal fossa. White stripe along each body scale row. Dorsal spines red, membrane orange or cream; soft dorsal, anal fins and caudal fins yellow, leading edges and margins crimson. Tips of ventral blackish.
Tr above 2½. L. lat. 34-37. Total GR 14-19. Diagonal rows of scales on cheek 5.
(voucher: 220 mm SL)

Sargocentron spiniferum

Nostril without spines. Spinous dorsal fin uniform deep scarlet, all other fins yellow-orange. Large vertically elongate crimson spot on head behind eye. Inner pectoral fin axil crimson. Tr above 3½. L. lat. 41-47.
D_2 15. A IV, (usually) 10. P 15.
(voucher: 355 mm SL)

ZEIDAE

Dories

Body ovate, very compressed, body depth more than head length. Mouth very large and oblique, upper jaw extendable. Eye moderate; head large, its profile steep. Scales very small or absent. Spines or bucklers often present along dorsal and anal fin bases; row of bony plates always present on belly. Dorsal fin single, deeply notched between spined and rayed portions, 6-10 spines in first part. Anal fin with 1-4 spines; ventral fin with one spine and 6-8 rays. Caudal fin rounded or truncate.

Two genera and six species in the family; three species obtained on the Survey.

REFERENCES: Heemstra, 1980; Heemstra, 1999a; O'Toole & Winterbottom, 2003.

Zenopsis nebulosa

Membrane of spinous dorsal fin produced into short filaments. Twelve to 14 large bucklers along base of spinous and soft dorsal fins, 8-9 along base of anal fin. Two to 3 single and 2-4 paired bucklers along ventral profile before ventral fin and 1 unpaired plus 6-8 paired bucklers behind ventral fin. Body silvery blue or greyish; dark grey or brown blotches scattered over body and fins.
D VIII-X, 27-29. A III, 23-24. V 6-7.
(voucher: 168 mm SL)

Zenopsis conchifer

Spinous dorsal fin membrane produced into short filaments; 1-3 + 4-5 large bucklers along base of spinous and soft dorsal fins, 5-7 along anal fin base; 2-3 bucklers along ventral profile before ventral fin and pairs of bucklers behind. Body silvery-grey, faint blotch above pectoral fin. Spinous dorsal and ventral fins dark brown.
D IX-X, 24-27; A III, 24-26. V 6-7.
(voucher: 485 mm SL)

Zeus faber

Membrane of spinous dorsal fin produced into long filaments behind each spine. Five to 7 bucklers along bases of soft dorsal and anal fins. Head brown or bronze to violet-brown on caudal peduncle. Brown horizontal stripes on body and large black spot on mid-sides.
D X, 23-24. A IV, 21-22. Lower GR 7-10. VI, 6-7.

PARAZENIDAE

Parazen -

Premaxillaries highly protrusible. Lateral lines 2; fused behind soft dorsal fin. Spinous dorsal fin with 8 rays. Second dorsal fin with 26-30 soft rays. A single spine in anal fin; soft rays 31. Pectoral fin rays 15 or 16. Pelvic fin insertion thoracic. A single unbranched pelvic fin ray 1; 6 branched and one unbranched rays in ventral fin. Caudal fin with 11 principal rays. Slightly ctenoid scales. Three genera and four species in the family; one obtained on the Survey.

REFERENCE: Tyler, O'Toole & Winterbottom, 2003, Heemstra, 1999.

Cyttopsis cypho

Head dusky orange, body grey, iridescent; round indistinct spot may be present on lateral line below soft dorsal fin. Ventral fin with orange rays, membrane black. No spine in ventral fin. Scales thin, easily lost; low bucklers along base of soft dorsal and anal fins, row of 4 bucklers along belly.
D VII, 29. A I, 30. L. lat. 55-59. V 9-10.
(voucher: 78 mm SL)

ZENIONTIDAE

Bighead dories -

Body ovate, very compressed, its depth subequal to head length. Mouth moderate or large, almost vertical and protractile (extendable); eye large; head with mucous cavities, most head bones finely serrated. Scales small and ctenoid, none on head; single lateral line. Single dorsal fin with spinous part of 6-7 spines notched from rayed part; anal fin with 0-2 spines; ventral fin with 1 spine and 6 rays; caudal fin truncate or rounded.

REFERENCES: Heemstra, 1980; Heemstra, 1986; Tyler, O'Toole & Winterbottom, 2003.

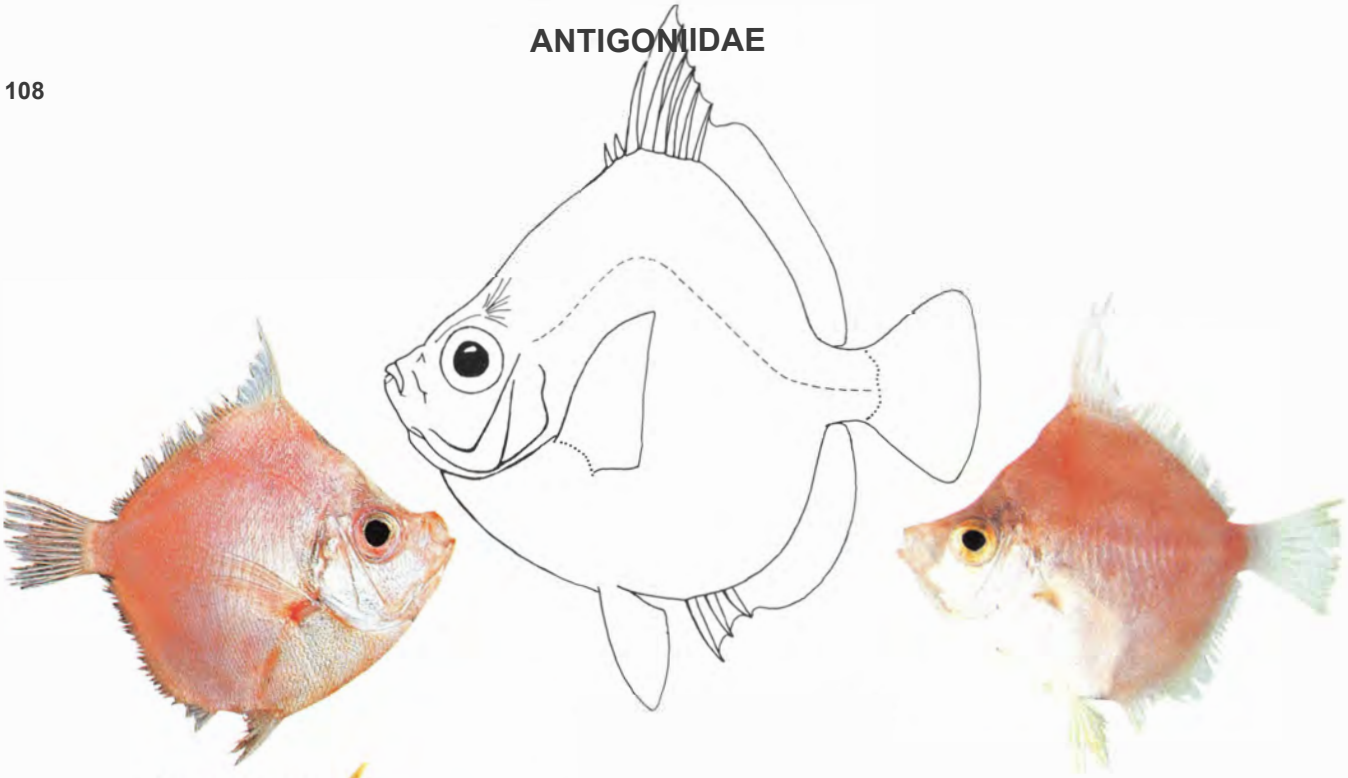
Zenion sp.

Body profiles evenly convex; HL and body depth 2.2-2.5 in SL; eye 1.7-1.9 in HL. Second spine of dorsal and 1st ventral spine strong and serrated; anal spine short; ventral rays shorter than long fin spine; caudal emarginate. Dark reddish blue body, silvery over head; outer half of white spinous dorsal and ventral fins black; black margin on caudal fin.
D VI-VII, 26-27. A I, 22-23. L. lat. 58-60. Lower GR 12.
(voucher: 41 mm SL)

* GRAMMICOLEPIDIDAE

(See Species List)

ANTIGONIIDAE



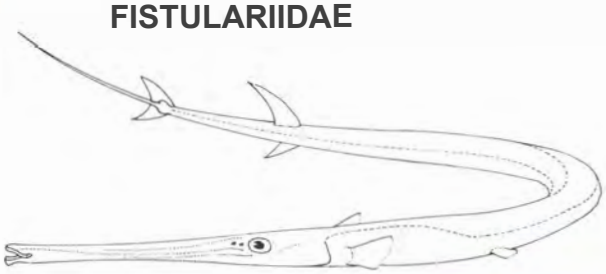
Antigonia capros

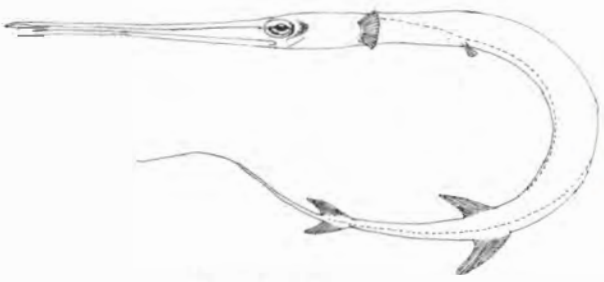
Antigonia rubescens

Antigonia rubicunda

Antigonia malayana

FISTULARIIDAE





Fistularia commersonii redrawing of figure on Fritzche & Thiesfeld, 1999a

Fistularia petimba

CENTRISCIDAE

Centriscus scutatus

ANTIGONIIDAE

Boarfishes -

Very deep and compressed, rhomboid or oval in shape; head profile very steep, concave above eye, ventral profile convex. Mouth protractile, jaw teeth small, none on palate; upper head surface bony and striated; preoperculum and suborbital finely serrated. Small body scales rough and ctenoid, side of head scaly. Dorsal fin single, with 7-9 strong stout spines scarcely notched from soft fin with 26-38 rays; anal fin with 3 spines and 25-35 rays; pectoral pointed; ventral fin with one spine and 5 rays, placed behind pectoral base; caudal fin slight rounded.

Family comprises a single genus and 18 species; four obtained on the Survey.

REFERENCES: Heemstra, 1999b; Parin & Borodulina, 1986; Zehren, 1987; Prokofiev, Psomadakis & Gon, 2020.

Antigonia capros

Predorsal profile steep, mouth oblique, upper jaw length 9.8-13.7 in SL Body depth 0.7-1.1 in SL. Ventral fin origin in level with line drawn from anal origin, ventral spine 2.7-5 in SL. Silvery red body and fins.
D VII-IX, 31-37. A III, 29-34. Pi, 12-14. 46-58 scale rows between head and tail base.
(voucher: 108 mm SL)

Antigonia rubicunda

Predorsal profile moderately steep; mouth nearly vertical, upper jaw length 10.5-12.5 in SL. Body depth 0.9-1.2 in SL. Ventral fin origin above or in level with a horizontal line drawn from anal fin origin, ventral spine 3.3-4.5 in SL. Body and fins red.
D IX, 26-28. A III, 24-26. Pi, 12. 38-47 scale rows between head and tail base.
(voucher: 73 mm)

Antigonia rubescens

Predorsal profile moderately steep, mouth nearly vertical, upper jaw length 7.2-10 in SL. Body depth 1-1.3 in SL. Ventral fin origin in level with or slightly below horizontal line drawn from anal origin; ventral spine 4-5 in SL. Silvery rosy body and fins.
D VIII-IX, 26-29. A III, 24-27. Pi, 12. 48-53 scale rows between head and tail base.
(voucher: 56 mm SL)

Antigonia malayana

Predorsal profile low and angular, ventral profile rounded. Mouth vertical, upper jaw length 7-8.3 in SL. Body depth 1.2-1.5 in SL. Ventral fin origin below or in level with a horizontal line drawn from anal fin origin, ventral spine 5.7-7 in SL. Body orange red, silvery below.
D VIII-XI, 27-29. A III, 26-28. P i, 12-14. 50-60 scale rows between head and tail base.
(voucher: 57 mm SL)

FISTULARIIDAE

Cornetfishes; Flutemouths - Ikan terompet

Small to large fishes, body elongate and depressed, sometimes with a row of elongate bony plates along dorsal and ventral midlines before dorsal and anal fins. Snout long and tubular; teeth small. Body naked, or covered with rows of small spinules; lateral line ossified, sometimes spiny and continued onto caudal fin. Spineless dorsal and anal fins set well back on body, short-based and opposite each other, with 14-17 rays; ventral fin small with 6 rays; caudal fin forked with an elongate filament produced by the middle two fin rays.

There are four species in this monotypic family, of which two were collected on the Survey.

REFERENCE: Fritzsche & Thiesfeld, 1999a.

Fistularia commersonii

No embedded bony plates along midline of back. Upper ridges on snout diverging at about ½ their length from eye. Interorbital space flat. Skin granular in juveniles, adults smooth; no spines on lateral line posteriorly. Body brown-olive above, silvery below; two thin blue stripes or row of blue spots along back.
D 13-15. A 13-15. P 15-17.
(voucher: ? mm SL)

Fistularia petimba

Slender bony plates embedded in skin along midline of back before dorsal fin. Upper ridges on snout parallel, those above and behind eye strongly serrated. Interorbital space concave. Skin granular at all sizes; small sharp spines along posterior part of lateral line. Body pink or red above, silvery below.
D 14-16. A 14-15. P 15-17
(voucher: 411 mm SL)

CENTRISCIDAE

Shrimpfishes -Turik

Body extremely compressed and blade-like, ventral edge sharp. Stiff thin bony plates, fused together, encase body. Snout long and tubular, mouth terminal and toothless, slightly upturned. No lateral line. First dorsal fin spine long, stiff and sharp, placed at the very end of the body, second and third fin spines below it. Rayed dorsal and caudal fins displaced ventrally. Pectoral and ventral fins well-developed.

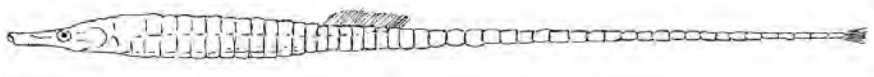
Family with five genera and 12 species; only one obtained on the Survey.

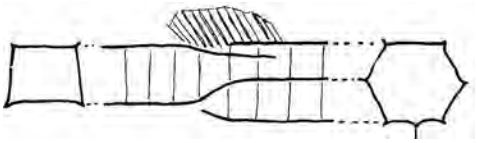
REFERENCE: Fritzsche & Thiesfeld, 1999b.

Centriscus scutatus

Body appears transparent and silvery-yellow with a dark longitudinal stripe and 8-10 vertical bars on lower sides. First dorsal fin spine tip not jointed - fused with body armour. Top of head with longitudinal striations and a groove along interorbital space. Body depth 6.4-6.7 in SL.
D III, 11-12. P 10. A 11-12.
(voucher: 146 mm SL)

SYNGNATHIDAE

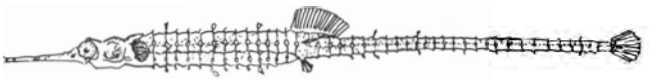




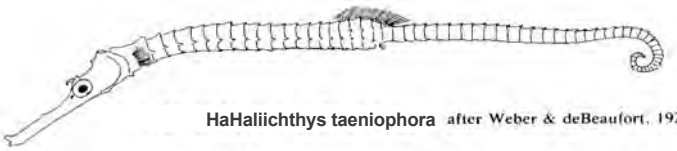
Trunk Cross section

Hippocampus angustus

Hippocampus spinosissimus

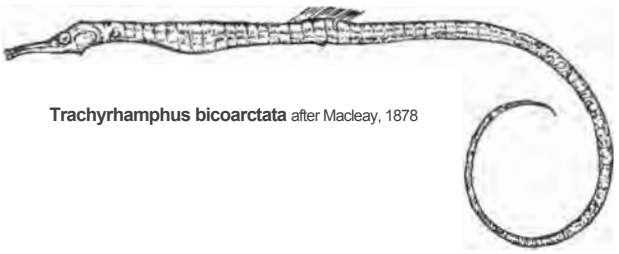


Halicampus macrorhynchus after Smith, 1963



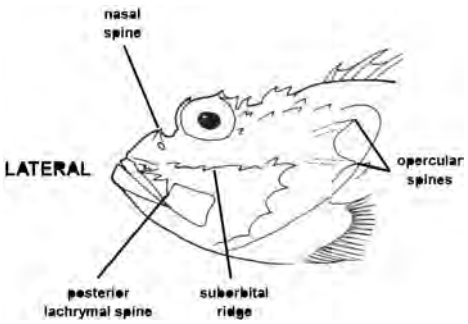
HaHaliichthys taeniophora after Weber & deBeaufort, 1922

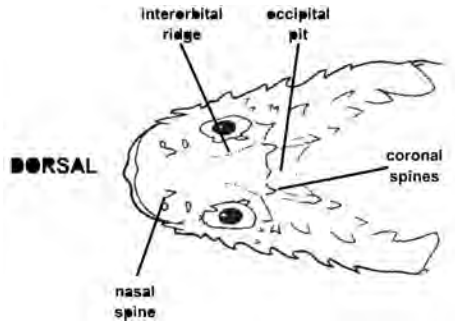
Solegnathus lettiensis after Weber & de Beaufort, 1922



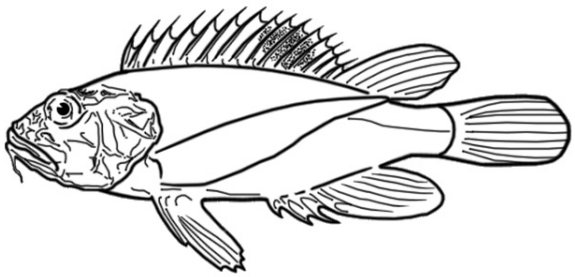
Trachyrhamphus bicoarctata after Macleay, 1878

SCORPAENIFORMES





APISTIDAE



Apistops caloundra

Apistus carinatus

SYNGNATHIDAE

Pipefishes; Seahorses - Tangkur Kuda

Body elongate, slender and encased in a series of connected bony rings. On trunk and tail the rings bear ridges interconnected in several ways. No lateral line. Snout tube-like with small terminal, toothless mouth. Gill opening very small. Fins without spines. Dorsal fin with 15-60 rays; anal fin very small, with 2-6 rays. Pectoral fins well developed; no ventral fins; caudal fin sometimes absent. Tail may be prehensile and used for holding onto objects.

There are 57 genera and 307 known species in this family; we collected six species in five genera.

REFERENCES: Paulus, 1999; Dawson, 1982; Dawson, 1984; Dawson, 1985; Kuiter, 2009; Lourie, Pollom & Foster, 2016; Kuiter, 2001; Lourie, Vincent & Hall, 1999.

Halicampus macrorhynchus

Slender pipefish. All body ridges distinct, margins granular, notched or indented between rings. Snout and head spinose on dorsal profile; often branched cirri on snout, head and dorsally on trunk and tail rings. Superior and inferior ridges of trunk and tail discontinuous. Eye prominent; opercular keel curved upward. Caudal fin present. Body tan, mottled dusky above; about 10 darker bands across trunk and tail.
D 18. A 4. P 19-18. Rings 14 (trunk) + 25-27 (tail).

Haliichthys taeniophorus

Slender pipefish. All body ridges with enlarged spines. Snout long; often branched cirri on snout, head and dorsally on trunk and tail rings. Superior and inferior ridges of trunk and tail discontinuous. Eye prominent; opercular keel curved upward. Tail tip prehensile. Caudal fin present. Body tan, mottled dusky above; about 10 darker bands across trunk and tail.
D 18. A 4. P 19-18. Rings 14 (trunk) + 25-27 (tail).
(voucher: ? mm trunk length)

Hippocampus angustus

A large and slender seahorse. Coronet high and spikey. Colouration variable: whitish, yellow, orange or brownish to greyish. Body patterned with of fine white, yellow, orange or brown scribbly or net-like markings and 5-6 distinctive dark irregular stripes across the snout. Dorsal fin has a narrow dusky submarginal margin band.
D 17-19 (usually 18); P 15-19 (usually 16-17); Rings 11; (trunk) + 32-35 (usually 33-34 (tail).
(voucher: ? mm trunk length)

Hippocampus spinosissimus

Seahorses with a cluster of 5 spines ('coronet') on top of head, the ridge behind it roughed or spined. Body spines well-developed, longest on 1st to 11th trunk rings, and long spines distally on tail. Dorsal fin base elevated. Body reddish-brown, black, or banded.
D 16-20. A 4. P 16-19. Rings 11 (trunk) + 33-37 (tail).
(voucher: 37.5 mm trunk length)

Solegnathus lettiensis

A large pipefish. Body compressed; body surface roughened or tuberculate, superior trunk and tail ridges discontinuous near end of dorsal fin base. No caudal fin; tail tip prehensile, dorsal fin base not elevated, fin placed well back on tail only. Body dusky pink above, yellowish green below; 4-8 dark brown blotches or bars on sides of trunk and tail; sometimes dark line along snout or along back.
D 37-49. A 4. P 22-24. Rings 21-24 (trunk) + 51-56 (tail).

Trachyrhampus biocoarctata

Slender pipefish, mid-length of trunk slightly swollen. Rings vertically striate, edges smooth. Superior and inferior ridges of trunk and tail discontinuous. Eyes not prominent. Short keel on operculum curved upward, with radial lines. Snout short. Caudal fin present and base of dorsal fin slightly elevated. Body mottled pink and brown. Large black spots on snout and underside of head; white spots on trunk, white bars on tail.
D 26-29. A 4. P 16-17. Rings 20-24 (trunk) + 59-63 (tail).
(voucher: ? mm trunk length)

SCORPAENIFORMES

Stonefishes; Scorpionfishes; Firefishes; Waspfishes - Lepu- penganten; Lain; Lepu tembaga

Small to moderate-sized fishes, body robust or compressed. Head large, with spines variously arranged on upper parts and a ridge of bone (suborbital ridge) extending from below eye to preoperculum, usually cirri or fleshy flaps of skin on head and sometimes body. The suborbital ridge is unique to the SCORPAENIFORMES. Scales usually present, rough or smooth, sometimes hidden in skin. A single notched dorsal fin, with 10-17 spines; anal fin with 1-3 spines. Pectoral fin usually large, fan-like; ventral fin with one spine and 1-5 rays; caudal fin rounded or truncate, never forked.

APISTIDAE

Wasp scorpionfishes -

The Apistidae are relatively small fishes reaching to between 15-20 cm TL. One or three free lower pectoral rays and a bilobed swim bladder.
Some authors have placed the waspfishes into an expanded stonefish clade (Synanceiidae) because all of these fish have a lachrymal saber that can project a switch-blade-like mechanism out from underneath their eye.

Three genera with three species of which two were collected on the Survey.

REFERENCE: Poss, 1999a, Smith, Smith & Richardson, 2018.

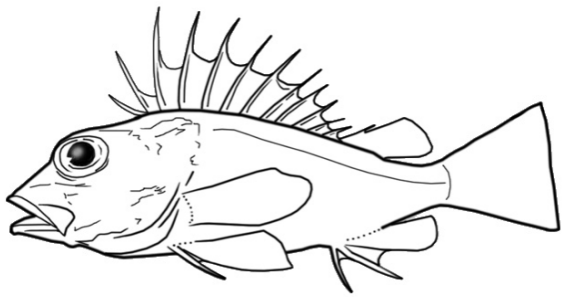
Apistops caloundra

Five chin barbels; body scales cycloid. Pectoral fin very long, lowermost ray free and rod-like, fin reaching as far as anal fin. 1st infraorbital bone moveable. Head and body pale brown, 2 brown streaks along upper sides. Large black white-ringed ocellus over posterior dorsal spines; 3 dark red bands across caudal fin. Inner pectoral fin speckled black above, lower rays bright yellow.
D XIV, 9.
(voucher: 190 mm SL)

Apistus carinatus

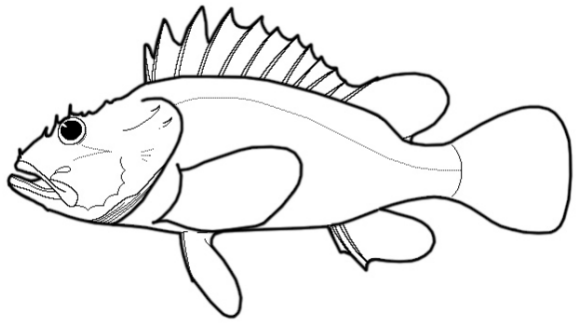
Three chin barbels; body scales with rough edges. Pectoral fin very long, lowermost rays free and rod-like, fin reaching as far as second half of anal fin. 1st infraorbital bone moveable. Head and body fawn, white below. Large black white-ringed ocellus over posterior dorsal fin spines. Inner pectoral fin charcoal, lower rays and near axil orange.
D XV-XVI, 8-10.
(voucher: 115 mm SL)

NEOSEBASTIDAE



Neosebastes occidentalis

SCORPAENIDAE



Brachypterois serrulifer

Dendrochirus brachypterus

Dendrochirus zebra

Ebosia bleekeri

Neomerinthe amplisquamiceps

Neomerinthe megalepis

NEOSEBASTIDAE

Gurnard scorpionfishes

Large eyes. Head fully covered by rough ctenoid scales; strong spines and ridges on head. Thirteen long dorsal fin spines; 6-8 dorsal fin soft rays. Benthic fishes, occurring from shallow depths down to over 500 m on both reef and soft substrata. Their food comprises small fishes and crustaceans.

There are two genera and 18 species in the family; only one was obtained in the Survey.

REFERENCES: Poss, 1999a; Motomura, 2004.

Neosebastes occidentalis

Row of strong, curved spines along suborbital ridge; preopercular and opercular spines strong. Palatine teeth present. Dorsal spines long and strong, longest spine about equal to body depth, interspinous membranes deeply emarginated; deep notch between spinous and soft dorsal fins. Pectoral fin reaching to below last dorsal spine. Body orange, scarlet or dark yellow; soft dorsal and anal fins, caudal fin and upper pectoral fin barred with dark orange or black.
D XIII, 8-9. A III, 5. P. 18-21. L. lat. 32-36.
(voucher: 150 mm SL)

SCORPAENIDAE

Scorpionfishes -

Dorsal fin spines 12-13. Anal fin spines 2-3, lateral line of tubed scales. Typical overlapping scales on body, or scales as small spiny papillae. Skin at gill openings connected to each other or connected to isthmus only narrowly. Bones of cranium strongly or moderately ossified.

25 genera and 230 species in this family; representatives of 12 genera were obtained on the Survey.

REFERENCES: Eschmeyer, 1986; Poss, 1999a; Matsunuma & Motomura, 2014; Motomura, Sakurai, Senou & Ho, 2009; Matsunuma, Motomura & Bogorodsky, 2017; Motomura, Arbsuwan & Musikasinthorn, 2010; Motomura, Causse, Béarez & Mishra, 2015; Motomura & Peristiwady, 2010; Morishita, Kawai & Motomura, 2018; Randall & Eschmeyer, 2001; Wibowo & Motomura, 2019.

Brachypterois serrulifer

Mouth oblique; all head ridges finely serrated including lower jaw. Scales extend over head and chin. Dorsal fin spines very long, longest dorsal - fin soft ray length 20.5–26.2 (av. 23.4)% SL; pectoral fin long, reaching to above anal fin. Body and head dusky red; fins reddish brown with some dark markings, few large dark spots on caudal fin.
D XIII, 10-11. A III, 5-6. P 15-17 (av. 16).
(voucher: 73 mm SL)

Dendrochirus zebra

Dorsal fin spines long, deeper than body depth. Most of pectoral fin rays branched (except for upper 1 to 3), membrane almost to fin edge. Cirrus above eye long. Body scarlet or crimson with vertical bands over head and body, dark patch on operculum. Soft dorsal anal and caudal fins with rows of dark spots; black edge on pectoral fin, large black and white spot on base of inner pectoral fin.
D XIII, 10-11. A III, 6-7. 48-55 scale rows along body.
(voucher: 160 mm SL)

Neomerinthe amplisquamiceps

Snout blunt and head profile rounded; jaws about equal; longitudinal ridge on side of maxilla; palatine teeth present; posterior lachrymal spine strong, directed posteroventrally; 4 spines on suborbital ridge and 4 preopercular spines; simple tentacle above eye. Scales ctenoid, present on nape and opercles. Some pectoral rays branched; 3rd dorsal spine longest. Head and body orange-red, dusky on back. Bark patch over 7th and 10th dorsal spines; caudal fin edged darck, caudal peduncle crossed by a pale, oblique band.
D XII, 9-11. P 19-21.
(voucher: 77 mm SL)

Dendrochirus brachypterus

Dorsal fin spines long, equal to or longer than body depth and much longer than dorsal rays. All except upper 1-3 pectoral fin rays branched, fin membrane almost to fin edge. Three spines on preopercle. Body scarlet or crimson with vertical bands over head and body, 4-7 rows of dark spots over unpaired fins, and rows of distinct dark spots across pectoral fin.
DXII-XIII, 9-10. A III, 5. P 17-18. 40-45 scale rows along body.
(voucher: 110 mm SL)

Ebosia bleekeri

Suborbital finely serrated, a weak ridge along opercle ending in a short spine; 4 spines on preopercle; a crest present behind eye (more obvious in males). Dorsal fin spines very long, soft dorsal and anal fins angular. Body dusky orange; back crossed by 6-7 brown bands; 3-5 rows of large black checks across pectoral fin, and narrow dusky border to head crest.
D XIII, 9. A III, 7. P 15-16.
(voucher: 80 mm SL)

Neomerinthe megalepis

Snout blunt and head profile rounded; lower jaw protruding slightly beyond upper jaw; longitudinal ridge on side of maxilla; palatine teeth present; posterior lachrymal spine strong, directed posteroventrally; 4 spines on suborbital ridge and 4 preopercular spines. Scales ctenoid, present on nape and opercles. Some pectoral rays branched; 4th dorsal spine longest. Simple tentacle above eye. Head and body rosy to fawn, darker on head and back, dark patch over posterior dorsal fin spines; lower pectoral fin red, red checks on upper fin, anal and caudal fin.
D XII, 9-10. P 18-20. L. lat. 22-25
(voucher: 94 mm SL)

Neomerinthe procurva

Neomerinthe erostris

Parascorpaena aurita

Pontinus macrocephalus

Pterois antennata

Pterois paucispinula

Pterois radiata

Pterois russelii

Neomerinthe procurva

Snout blunt and head profile rounded; jaws about equal; longitudinal ridge on side of maxilla; palatine teeth present; posterior lachrymal spine strong, directed posteroventrally; 4 spines on suborbital ridge and 4 preopercular spines. Scales ctenoid, present on nape and opercles. Some pectoral rays branched; 3rd dorsal spine longest. Branched tentacle above eye. Head and body red, darker or dusky above, dark red patch over posterior dorsal fin spines.
D XII, 9-10. P 18-20. L. lat. 23-24
(voucher: 71 mm SL)

Parascorpaena aurita

Teeth on palatines; posterior lachrymal spine directed down- and forward; occipital pit present on upper part of head behind eyes. Body scales cycloid, some on opercular region of head. Upper pectoral fin rays branched. Body dark brown or red-brown; soft dorsal, anal, caudal and pectoral fins densely barred.
D XII, 9-10. A III, 5. P 14-17. 38-45 scale rows between head and tail base.
(voucher: 121 mm SL)

Pterois antennata

Dorsal fin spines long, membrane only at bases. Pectoral fin long, reaching to caudal fin, all of its rays unbranched and mostly free from membrane. Scales on back ctenoid. Head and body scarlet to crimson, crossed by many thin and thick dark bands. A dark bar from eye to preopercular angle; long supraorbital tentacle ringed black; unpaired fins with many series of dark spots; upper and lower axil of pectoral fin with conspicuous white spots.
D XII,10-12. A III, 5-6. P 16-18. 50-54 scale rows along body.
(voucher: 140 mm SL)

Pterois radiata

Dorsal fin spines long, membrane only at base. Pectoral fin long, its rays simple and filamentous, mostly free from membrane. Scales on back ctenoid. Body reddish or dark brown, crossed by 7-8 white lines, usually forked on back and on lower sides. Oblique dark band through eye to operculum; supraorbital tentacle plain red. White spot in upper and lower pectoral fin axils. No spots on soft dorsal anal and caudal fins.
D XII, 10-11. P 16. 50-55 scale rows between head and tail.
(voucher: 105 mm SL)

Neomerinthe erostris

Snout blunt and head profile rounded; longitudinal ridge on side of maxilla; palatine teeth present; posterior lachrymal spine directed posteroventrally; 3 spines on suborbital ridge and 5 preopercular spines. Large, much branched tentacle above eye; no occipital pit. Scales ctenoid, present at nape and opercles. Third dorsal spine longest; some pectoral rays branched. Head and body yellowish red, back dark red, 2 pale patches on body near base of last dorsal spine and last ray. Fins mottled red, brown and olive.
D XII, 9-11. P 18. Total GR 17-19. L. lat. 23-25
(voucher: ? mm SL)

Pontinus macrocephalus

Palatine teeth present; both lachrymal spines directed backwards; 3 or 4 spines on suborbital ridge; second preopercular spine very small or absent. Tentacle over eye sometimes absent but when present, 2-3 times eye diameter. Pectoral fin rays all unbranched (in adults). Body plain red; a dark spot on dorsal fin in juveniles.
D XI+I, 9-10. A III, 5. P 16-17. 45-50 rows of ctenoid scales on body.
(voucher: 180 mm SL)

Pterois paucispinula

Dorsal fin spines long, membrane only at base. Pectoral fin reaches caudal peduncle, membrane extending over half the fin, rays simple. Scales ctenoid on upper sides. Scarlet or reddish brown, rosy below with vertical body bands which may fork on back. Dark crimson band through eye to beyond preopercular angle; pectoral fin with elongate red or charcoal spots.
D XIII, 10. P 18-19. 46-57 scale rows along body.
(voucher: 93 mm SL)

Pterois russelii

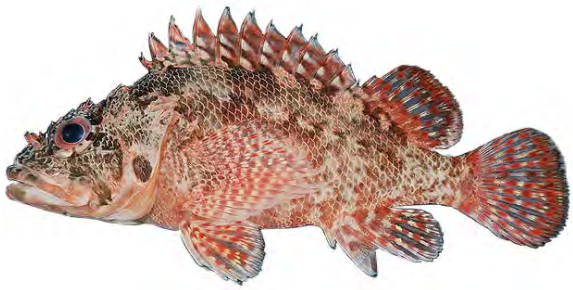
Dorsal fin spines long, membrane only at bases. Pectoral fin long, reaching to above anal fin, all of its rays unbranched. Scales cycloid. Crimson or brownish bands over head and body. Soft dorsal, anal, caudal and pectoral fins plain yellow or red with no trace of spots; alternating rows of black and white spots and checks over ventral fin.
D XIII, 10-11. A III, 6-7. P 13. 65-80 scale rows between head and tail base.
(voucher: 105 mm SL)

Pterois volitans

Rhinopias frondosa

Scorpaena neglecta

Scorpaena onaria



Scorpaenodes evides

Scorpaenodes smithi

Scorpaenopsis neglecta

Scorpaenopsis oxycephalus

Scorpaenopsis venosa

Pterois volitans

Dorsal fin spines long, membrane only at bases. Pectoral fin long, may reach as far as caudal fin, all its rays simple. Scales cycloid. Scarlet, crimson or brownish red bands over head and body. Soft dorsal, anal and caudal fins always with some dark spots at least; other fins crossed by dark bands, white spots often present on inner base of ventral fin.
D XIII, 10-11. P 14. 85-106 scale rows between head and tail base.
(voucher: 300 mm SL)

Scorpaena neglecta

Palatine teeth present; occipital pit present; posterior lachrymal spine directed straight downwards; interorbital space broad and flat. Scales ctenoid; upper pectoral fin rays branched; skin flap present in upper pectoral fin axil. Body rosy or red; pectoral fin densely checked red.
D XII, 9. P 19.
(voucher: 220 mm SL)

Scorpaenodes evides

No palatine teeth; spines present on interorbital and on coronal ridge; head and body scales ctenoid. Body overall mottled rose, pale brown patches on head and upper sides with 3-5 irregular broad bars. Second anal fin spine equal to or more than half HL. Soft dorsal, anal, caudal and pectoral fins finely mottled brown; four dark bars radiate from eye.
D XIII, 9. P 16-19. 42-49 vertical scales rows above lateral line.
(voucher: ? mm SL)

Scorpaenopsis neglecta

Nape humped before dorsal fin; occipital pit present, another pit below eye; interorbital broad, 4-5 in HL; no palatine teeth. Upper opercular spine with 2 points; supraorbital ridge serrated; eye diameter 1.7-2 in snout length. Body dark brown to brownish purple, a white bar sometimes present below dorsal fin, rose on breast and beneath pectoral fin. Fins either completely dark brown, or fin margins banded yellow, pink or orange. Axil of pectoral fin with small black spots, inner fin yellow or orange and along its margin, outer aspect of fin with broad black band along hind margin of outer fin aspect, lower rays crimson.
D XII, 9-10. P 16-18. Tr above 6. Scale series along body 40-47.
(voucher: 85 mm SL)

Scorpaenopsis venosa

Upper opercular spine single, no ridges on suborbital spines. No palatine teeth, nape humped before dorsal fin. Occipital pit deep. Body reddish brown, fins marbled or barred red and brown; ventral and pectoral fins darker, margined yellow or orange. Inner aspect of pectoral fin orange or yellow, axil bluish, a black patch followed by a broad black band along upper hind margin.
D XII, 9. P 15-18. Scale series along body 47-52.
(voucher: 132 mm SL)

Rhinopias frondosa

Body and head strongly compressed. Snout concave, orbits high on head; nasal spines absent. No palatine teeth; head spines reduced. Scales small, cycloid, none on head. Skin flaps over body, fins and lower jaw. Some pectoral fin rays branched. Body, head and fins with dark-edged oblong or round pale spots and blotches; general colouration varying from mostly yellow to red or crimson. Oblong black spot on soft dorsal fin posteriorly.
D XII, 9. P 16. 70-75 scale rows along body.
(voucher: 130 mm SL)

Scorpaena onaria

Palatine teeth present; occipital pit present; posterior lachrymal spine directed obliquely backwards; interorbital space concave; larger specimens possess a knob on front of lower jaw. Scales ctenoid; upper pectoral rays branched. Males display a large black patch over posterior dorsal spines; colour apparently variable with depth of capture, but usually red.
D XII, 9. P 16-17.
(voucher: 145 mm SL)

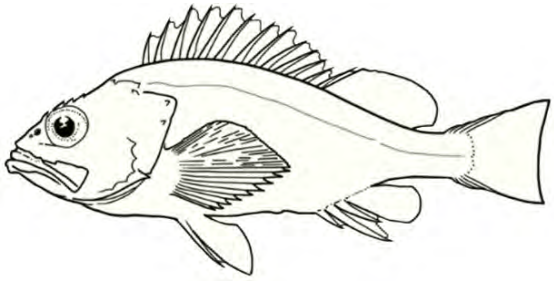
Scorpaenodes smithi

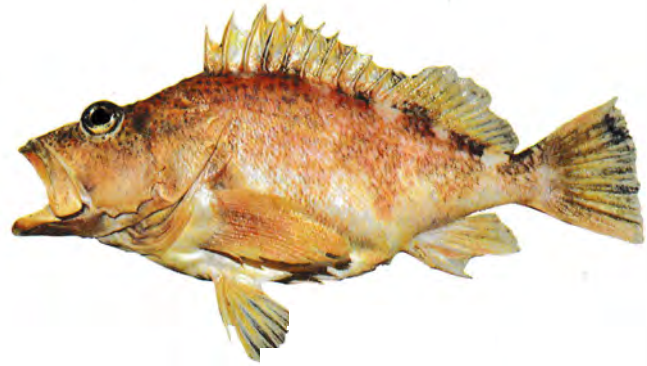
No palatine teeth, coronal ridge and interorbital spines usually absent; usually 3 spines on suborbital ridge; few or no cirri on head and body; scales ctenoid. Second anal spine about equal to ⅓ HL. Body red; 3 darker bars radiate from eye; well-developed darker bars on back; fins with series of red checks.
D XIII, 8-10. P 17-18. Vertical scale rows above L. lat. 38-50.

Scorpaenopsis oxycephala

Upper opercular spine single, no palatine teeth; nape not humped before dorsal fin; occipital pit absent or shallow and another pit below eye; snout very long, 2.7-3 in HL. Dark brown or reddish brown. Lower ventral and pectoral fins blotched rosy; black spot often present between 7th and 9th dorsal spines.
D XII, 9. P 18-20. 59-68 scale rows along body.
(voucher: 192 mm SL)

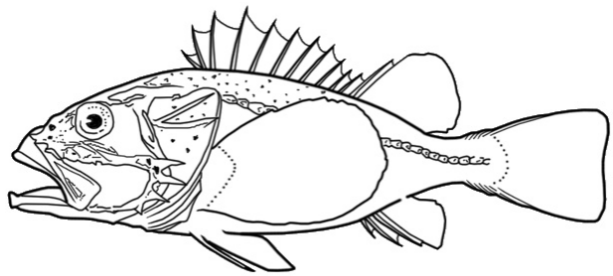
SEBASTIDAE





Sebastiscus vibrantus

SETARCHIDAE



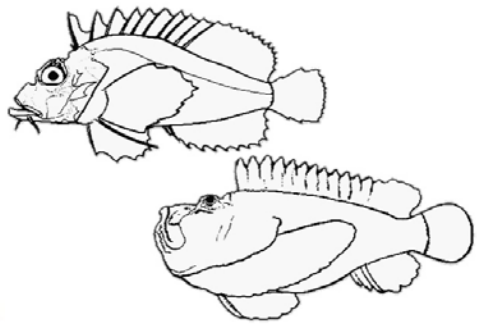
Ectreposebastes imus

Lythrichthys cypho

Lythrichthys dentatus

Setarches guentheri

SYNANCEIIDAE



Erosa erosa

Inimicus cuvieri

SEBASTIDAE

Sea perches -

Dorsal fin spines 12-13; dorsal fin rays 8-9 or 11-13. Body compressed; head usually with ridges and spines; gill membranes free from isthmus. Venom gland in spines of dorsal, anal, and ventral fins.

Seven genera and many species in the family; one collected on the Survey.

REFERENCE: Morishita, Kawai & Motomura, 2018; Poss, 1999a.

Sebastiscus vibrantus

Head profile moderately steep, head bones strong, operculum with 2 distinct ridges, suborbital ridge and lachrymal scarcely spined, spines on nape weakly-developed. Body scales ctenoid, extending onto posterior half of head almost as far as anterior eye margin. Unbranched pectoral rays thick, fin base broad. Body scales ctenoid. Body dusky red or pink, green spots on head; 3 to 5 white patches on back below posterior half of dorsal fin; pectoral fin orange, other fins greenish yellow.
D XII, 11-12. P (usually) 19. GR 23-27.
(voucher: ? mm SL)

SETARCHIDAE

Deep-sea bristly scorpionfishes -

Typical overlapping scales on body, or scales as small spiny papillae; dorsal spines 12-14; lateral line a continuous trough, roofed by thin scale. Skin at gill openings connected to each other or connected to isthmus only narrowly. Bones of cranium fairly weakly ossified.

There are four genera and seven species in this family; three genera were collected during the Survey.

REFERENCES: Poss, 1999a; Wada, Kai & Motomura, 2021.

Ectreposebastes imus

Head large, bones weak. Body deep 2-2.7 in SL; body profile convex. Anterior lachrymal spine shorter than posterior two; all spines on preopercular margin long and strong (see fig). Small scales extend onto top of head; interorbital space two times eye diameter. Body black, charcoal or dusky red; mouth cavity black with orange or red patches; intestine pale. (Note. We obtained both colour forms during Survey but could not relate them to different depth).
D XII, 9-10, A III, 5-7, P 18-20
(voucher: 175 mm SL)

Lythrichthys dentatus

Head large, bones thin; first lachrymal spine reaching upper lip. Teeth in upper jaw widely-spaced, in 1 or 2 rows. Operculum with two distinct ridges, bearing spines; 2nd preopercular spine short or rudimentary. Lateral line a continuous trough roofed by thin scales; belly and breast scales embedded. Six or 7 scale rows between last dorsal fin spine and lateral line. Body depth 29-34% SL, caudal peduncle depth 7.2-9% of SL. Head and body uniform dusky red, finely stippled black. Dorsal fin margin black; mouth and body cavities black.
D XII, 10. A III, 4-5. P 21-24.
(voucher: 76 mm SL).

Lythrichthys cypho

Head large, bones thin; first lacrimal spine reaching upper lip. Teeth in upper jaw densely packed, in 3-6 short rows. Operculum with two distinct ridges, bearing spines; 2nd preopercular spine short or rudimentary. Lateral line a continuous trough roofed by thin scales; belly and breast scales embedded. Eight to 11 scale rows between last dorsal fin spine and lateral line. Body depth 29-44% SL, caudal peduncle depth 7.4-9.4% of SL. Head and body uniform dusky red, finely stippled black. Dorsal fin margin black; mouth and body cavities black.
D XI-XII, 9-11. A III, 5. P 21-24.
(voucher: 53 mm SL).

Setarches guentheri

Head large, bones thin; operculum with two distinct ridges, bearing spines; 2nd preopercular spine well-developed, about equal to or longer than spines above and below it; 1st lachrymal spine not reaching upper lip. Lateral line a continuous trough roofed by thin scales; belly and breast scales not embedded. Eye large, equal to width of interorbital space. Body rosy above; scattered green and charcoal spots over head and back; intestine pale.
D XI-XII, 9-11. A III, 5-6. P 20-24.
(voucher: 93 mm SL)

SYNANCEIIDAE

Stonefishes -

No free pectoral rays; skin glands present, appearing as 'warts' in most species; dorsal fin with 11-17 spines and 4-14 soft rays; anal fin with 2-4 spines and 4-14 soft rays; pelvic fin with one spine and 3-5 soft rays; pectoral fin rays 11-10; vertebrae 23-30. Venom glands present near base of hypodermic-like dorsal fin spines. The neurotoxin of these fishes is the most deadly of fish venoms and can be fatal to humans.

There are nine genera and 37 species in this family; representative of four genera were obtained on the Survey.

REFERENCES: Poss, 1999a; Matsunuma & Motomura, 2018; Inaba & Motomura, 2018.

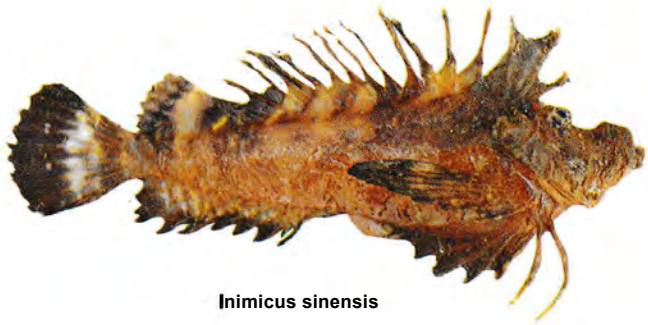
Erosa erosa

Body profile humped at nape before dorsal fin; deep occipital pit. Mouth slightly oblique; eyes on side. Head and body scaleless, but covered with knobs, warts or short papillae. Body dusky orange; 3 or 4 red bands.
D XIV, 5-7. A lll, 4-6. P 14-16.
(voucher: 72 mm SL)

Inimicus cuvieri

Elongate, naked body; snout equal to or longer than postorbital distance. Dorsal fin spines almost free from membrane, except for first three; lowermost two pectoral fin rays rod-like and free from rest of fin. Inner pectoral fin colour plain grey or dark brown.
D XV-XVIII, 5-9. A II-lll, 10-13.
(voucher: 175 mm SL)

Inimicus didactylus



Inimicus sinensis

Minous groeneveldi

Minous pictus

Minous roseus

Minous versicolor

Synanceia verrucosa

Inimicus didactylus

Elongate, naked body; snout longer than or equal to postorbital distance; interorbital space much wider than eye diameter, eye on top of head. Dorsal fin spines almost free from membrane except for first 3. Lowermost 2 pectoral fin rays rod-like and free from rest of fin. Inner pectoral fin Inner pectoral fin colour charcoal or black scattered with cream spots or large patches, always with a broad cream band across fin.
D XV-XVII, 6-9. A II, 9-11.
(voucher: 135 mm SL)

Minous groeneveldi

Body naked. Second lachrymal spine much longer than first. First dorsal spine much shorter than second spine; lowermost pectoral fin ray rod-like and free from rest of fin, moveable. Anterior and posterior lacrimal spines blunt. Large eye moderately low-set on head; head depth about 13.7% SL. Body yellow or fawn, streaked above with broad dark brown blotches extending onto dorsal fin. Caudal fin plain; inner pectoral fin pink or yellow, grey or brown stripes and spots spreading along fin rays to margin.
D XI, 11. A II, 9.
(voucher: 80 mm SL)

Minous roseus

Body naked. Lachrymal spines about equal in length. First dorsal spine much shorter than second spine; lowermost pectoral fin ray rod-like and free from rest of fin, moveable. Anterior and posterior lachrymal spines sharp. Large eye set high on head; head depth about 19-22% SL. Body pink to yellow, brown mottling on back tending to form longitudinal bands. Caudal fin finely barred or pale. Inner pectoral fin bright yellow, axil and rays red of pink, large white spots in axil, the white spots spreading onto breast.
D X-XI, 8-10. A II, 7-9.
(voucher: 77 mm SL)

Inimicus sinensis

Elongate, naked body; snout equal to or longer than postorbital distance. Dorsal fin spines almost free from membrane except for first 3; lowermost two pectoral fin rays rod-like and free from rest of fin. Inner pectoral fin colour dark brown or black with large orange or cream spots, base of rays bright yellow, spotted brown.
D XVI-XVIII, 6-9. A I-II, 10-13.
(voucher: 139 mm SL)

Minous pictus

Body naked. Second lachrymal spine much longer than first. First dorsal spine much shorter than second spine; lowermost pectoral fin ray rod-like and free from rest of fin, moveable. Body dark pink; dorsal fin crossed by diagonal brown bands; caudal fin dark pink. Inner pectoral fin yellow or pink with series of oval tan or brown spots along rays.
D X-XI, 12-13. A II, 10-11. L. lat tubes 17-21.
(voucher: 100 mm SL)

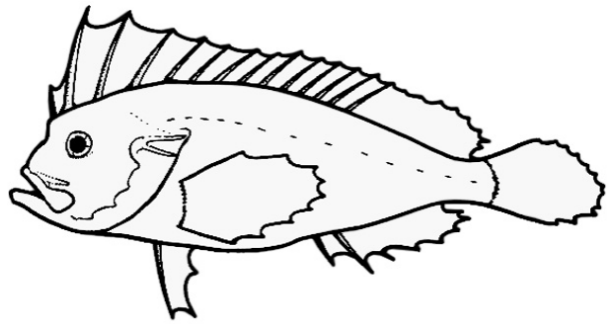
Minous versicolor

Body naked. Second lachrymal spine much longer than first. First dorsal spine equal to or longer than second spine; lowermost pectoral fin ray rod-like and free from rest of fin. Body pink, darker above, dark brown patches over back and dorsal fin. Caudal fin with 3 or 4 brown wavy cross-bands. Inner pectoral fin fawn to charcoal with a few large pink patches.
D XIII-IX, 11-13. A II, 8-10 (spines weak)
(voucher: 100 mm SL)

Synanceia verrucosa

Body variegated and mottled with brown, red, green and yellow. Pectoral, ventral and caudal fins tipped yellow or cream. Body naked, skin thick and warty. Mouth vertical; eyes on top of head, pit between them, occipital pit behind eye, another before eye.
D XII-XIV, 5-7. A III, 4-7. P 17-19.
(voucher: 115 mm SL)

TETRAROGIDAE



Cottapistus cottoides

Neocentropogon aeglefinus

Liocranium pleurostigma

Paracentropogon longispinis

Neocentropogon trimaculatus

Richardsonichthys leucogaster

Snyderina yamanokami

TETRAROGIDAE

Wasp fishes -

Body compressed; head usually with ridges and spines; usually two divergent opercular spines; gill membrane free from isthmus. These fishes are extremely venomous.

There are 17 genera and 43 species in this family, of which representatives of six genera were collected on the Survey.

REFERENCES: Poss, 1999a; Chungthanawong & Motomura, 2021; Motomura, Last & Johnson, 2008; Inaba & Motomura, 2018.

Cottapistus cottoides

Head profile convex, a "hump" on snout. No palatine teeth. Gill rakers elongate; interorbital space two times eye diameter. No scales on head and anterior ⅓ of body; scale series 64-68. Dorsal fin begins above eye, spines of equal length. Dusky pink or orange, scattered spots and 8-9 vague brown bars across back; dorsal fin spines tipped orange.
D XIV-XV,6. V I, 5. Total GR 18-21.
(voucher: ? mm SL)

Liocranium pleurostigma

Head profile steep, slightly concave in front of eye. No palatine teeth. Small scales absent from head and anterior half of body. Dorsal fin origin above eye. Body depth 39-46% SL. Body marbled orange and brown; fins checked brown, orange on pectoral fin. A large indistinct brown blotch behind gill opening, mostly above lateral line.
D XIII-XIV, 8-9. A III, 6. P 13-15. V I 4. L. lat. 40-46
(voucher: 60 mm SL)

Neocentropogon aeglefinus

Head profile oblique; body slender and appears naked, but tiny scales present, embedded in skin. Dorsal fin begins just above hind eye margin, spinous fin membrane deeply emarginate, last dorsal ray connected to top of caudal peduncle. Teeth present on palatines; small "knob" at symphysis of lower jaw. Body charcoal with violet shades. Large dark patch over lateral line origin.
D XIII-XV,6-8. A III,5-6. V I, 5. L. lat. 94-137
(voucher: 95 mm SL)

Neocentropogon trimaculatus

Head profile oblique, body slender and appears naked, but tiny scales present, embedded in skin. Dorsal fin begins just above hind eye margin, spinous fin membrane deeply emarginate. Teeth present on palatines. Tan, orange or yellow, marbled and spotted brown. Dark brown patch over lateral line origin, 3-4 dark bars across back extending onto dorsal fin, dark bars and series of dark checks on caudal fin base. and dark bar on caudal fin base.
D XIII-XV, 6-8. A III,6-8. V. I, 5.
(voucher: ? mm SL)

Paracentropogon longispinis

Head profile steep; dorsal fin begins above eye, spinous fin membrane deeply emarginate. Small scales absent from head and anterior one third of body. Body depth 31-38% SL. Palatine teeth present. Body brown, fawn or mottled. Dark patch may be present on dorsal fin, but nearly always a white spot present above lateral line below middle of spinous dorsal fin.
D XIV-XV, 6-8. A III, 5. P 10-11. V I, 4. L. lat. 19-24
(voucher: ? mm SL)

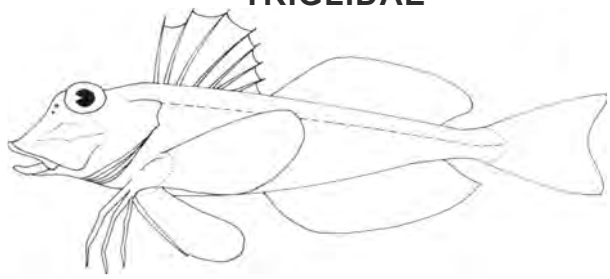
Snyderina yamanokami

Head profile steep and straight; mouth large, lacking palatine teeth. Head and anterior portion of body without scales, scales on remainder of body cycloid and embedded. Body depth 34-42% SL. Dorsal fin begins above anterior half of eye; last dorsal and anal rays attached to caudal peduncle. Body dusky red, spotted and marbled dark brown; fins marbled and checked dark brown or black.
D XIV-XVI, 10-11. A III, 5-6. V I, 5. Scales in longitudinal series 74-95.
(voucher: ? mm SL)

Richardsonichthys leucogaster

Head profile rounded; head and body naked except for scaled lateral line; deep groove on nape at each side of dorsal fin origin. Short cirrus on eye. Palatine teeth present. Dorsal fin begins above eye, membrane of spinous portion deeply emarginated. Body and fins scarlet or orange, nape often pale, green and charcoal patches and checks on back and fins.
D XII-XIV, 5-9. P 13-16. V I, 5.
(voucher: 60 mm SL)

TRIGLIDAE



KEY TO GENERA FOUND ON SURVEY

1a. Scales on body (may be very small): 2
  2a. Large spiny scales along base of spinous and soft dorsal fin **Lepidotrigla**
  2b. Larger, thicker scales along base of spinous dorsal only 3
    3a. Rostral spines on snout longer than eye diameter; distinct nasal spine present. . . . **Parapterygotrigla**
    3b. Rostral spine shorter than eye diameter; no nasal spine ..... **Pterygotrigla**

Lepidotrigla sp 1

Lepidotrigla sp cf japonica

Lepidotrigla spiloptera

Lepidotrigla maculapinna

Lepidotrigla macracaina

Lepidotrigla russelli

Lepidotrigla tanydactyla

Pterygotrigla (Parapterygotrigla) multiocellata.

Lepidotrigla sp cf venusta

Pterygotrigla (Parapterygotrigla) macrorhynchus

TRIGLIDAE

Searobins; Gurnards; Armoured Sea Robins -

Moderate-sized bottom dwelling fishes. Body tapering to slender caudal peduncle. depressed or moderately compressed. Head large and bony. with many ridges and low spines; snout projecting beyond mouth, either as a short groups of spines or as a pair of flat or pointed plates (rostral processes); teeth small or absent; barbels may be present on lower jaw. Body either scaled or encased in bony plates or scutes. Dorsal fin deeply notched or as separate spinous and rayed fins; anal fin opposite soft dorsal and equal to it; pectoral fin large, wing-like, lower 2 or 3 fin rays free and rod-like; caudal fin truncate, emarginate or slightly forked. Predominant colour red; pectoral fins often with distinctive markings.

Nine genera in the family, of which representatives of three were obtained on Survey.

REFERENCES: Gomon, 1987; del Cerro & Lloris, 1997; Richards, 1999; Richards, Yato & Last, 2003; Richards & Yato, 2012 ; Richards & Yato, 2014; Gomon & Kawai, 2018; Gomon & Psomadakis, 2018.

Lepidotrigla sp 1

Pectoral fin reaches to below 3rd-4th dorsal ray, 3.3-4 in SL. Breast naked; a well-developed serrated ridge on preoperculum ending in a low spine. Inner pectoral fin plain charcoal, washed grey-green, sometimes with a pale blue-ringed black patch near base of middle rays; base and lower rays cream-yellow, upper fin rays crimson.
D_2 16. A 16. Tr below 25-27. L. lat. 60-64.
(voucher: 140 mm SL)

Lepidotrigla spiloptera

Pectoral fin moderately long, to below 5th dorsal ray, 3.2-3.4 in SL. Breast naked; well-developed ridge on preoperculum; body scales easily lost. Inner pectoral fin black, entirely covered by scattered moderately-large white spots; base and entire edge orange or crimson.
D_2 15-16. A 15-16. Tr below 20-23. L. lat. 61-62.
(voucher: 97 mm SL)

Lepidotrigla macracaina

Pectoral fin moderately long, to below 4th-6th dorsal ray, 3.2-3.6 in SL. Breast naked; second dorsal spine long, equal to or longer than body depth, its front edge serrated. Inner pectoral fin charcoal or dark green with blue or black spots scattered or in 4-6 rows across fin; fin base and lower rays orange.
D_2 17. A 16-17. Tr below 19-20. L. lat. 64-67.
(voucher: 120 mm SL)

Lepidotrigla tanydactyla

Pectoral fin moderately long, to below 4th-5th dorsal ray, 3.1-3.3 in SL. Breast naked; well-developed ridge on preoperculum. Inner pectoral fin plain black; base and edges dark pink.
D_2 15-16. A 15-16. Tr below 16-17. L. lat. 61-62.
(voucher: 124 mm SL)

Lepidotrigla sp cf venusta

Pectoral fin moderate, to below 6th-7th dorsal ray, 2.4-2.6 in SL. Breast and belly fully scaled. Pectoral fin slender, 5th and 6th rays elongate. Pectoral fin upper portion and hind border dark pink, base and lower rays cream or creamy pink; mid and lower part of fin lime-green with charcoal stippling or small spots within.
D_2 15-16. A 15-16. Tr below 23. L. lat. 59-63.
(voucher: 94 mm SL)

Pterygotrigla (Parapterygotrigla) macrorhynchus

Snout long, 17-22% SL, rostral spine very long and slender, ⅔ HL; about 10 bucklers below first few dorsal spines. Rich brown-red border to second dorsal fin and as a band along mid height of fin. Brown-red streaks on snout, lips, behind eye and on upper margin of caudal fin; first dorsal fin tipped with brown-red.
D_2 13. A 12. P 12+3.
(voucher: 85 mm SL)

Lepidotrigla sp cf japonica

Pectoral fin long, to below 8th-13th dorsal ray, 1.6-2.3 in SL. Breast naked; body scales easily lost. Inner pectoral fin lime-green crossed by 3 or 4 oblique wavy blue lines; oblong black patch over lower rays sometimes with white spots within; base and fin edge pink.
D_2 14-15. A 14-15. Tr below 15-17. L. lat. 54-59.
(voucher: 93 mm SL)

Lepidotrigla maculapinna

Pectoral fin moderate, to below 5th-7th dorsal ray, 2.6-3.3 in SL. Breast naked, body scales firmly attached. Inner pectoral fin membrane plain black sometimes with scattered milky-blue spots, or the rays marked cream; base and lower rays yellow, upper fin edge pink.
D_2 14-15. A 14-15. Tr below 22-26. L. lat. 56-60.
(voucher: 103 mm SL)

Lepidotrigla russelli

Pectoral fin moderately long, to below 3rd-5th dorsal ray, 2.6-2.9 in SL. Breast and belly fully scaled; body scales easily lost. Inner pectoral fin smoky dark green with few diffuse pale blue patches over membrane between upper 2 rays and on lower part of fin; base and lower rays cream; upper edge pink; hind edge slate blue.
D_2 15. A 14. Tr below 17-22. L. lat. 60-64.
(voucher: 115 mm SL)

Pterygotrigla (Parapterygotrigla) multiocellata

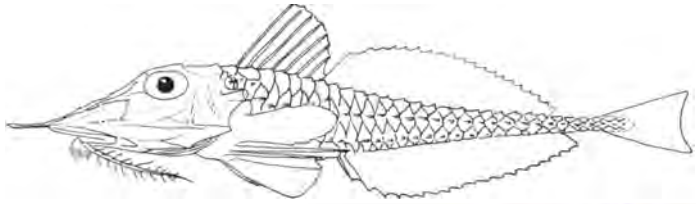
Rostral process broad and long, ½ to ¾ HL. Head and upper sides brownish orange with scattered pale spots anteriorly; orange patch on pectoral fin base, grey or orange streak along lower sides; dorsal and caudal fin margins dark brown.
D_2 11. A 11. P 11 + 3.
(voucher: 204 mm SL)

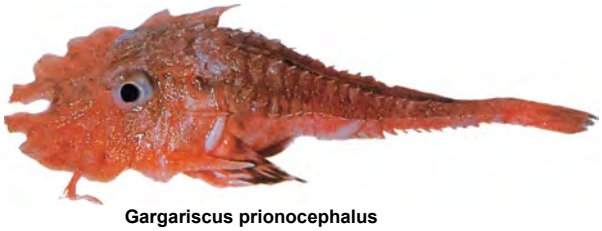
Pterygotrigla (Otohime) draiggoch

Pterygotrigla (Bovitrigla?) leptacanthus

Pterygotrigla (Pterygotrigla) ryukyuensis

PERISTEDIIDAE





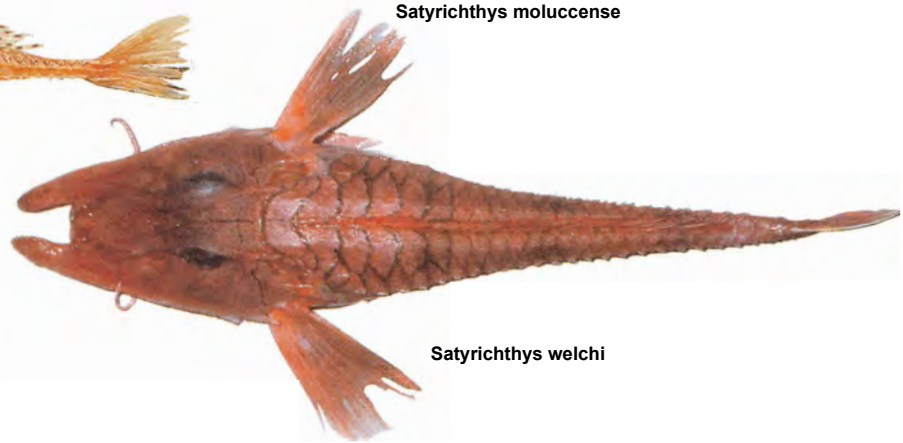
Gargariscus prionocephalus

Peristedion liorhynchus

Satyrichthys laticeps

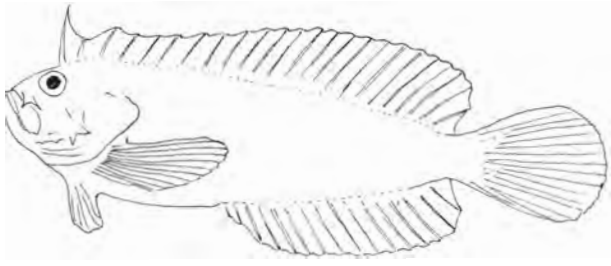
Satyrichthys moluccense

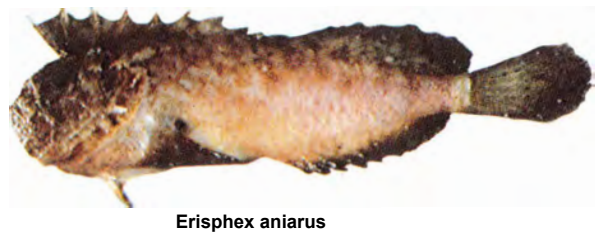
Satyrichthys rieffeli



Satyrichthys welchi

APLOACTINIDAE





Erisphex aniarus

Pterygotrigla (Otohime) draiggoch

Rostral spines, nuchal and humeral spines short, less than eye diameter; opercular spine very long, much longer than eye diameter; bucklers below all of spinous dorsal fin. Inner pectoral fin with large black patch over middle of fin containing smaller white spots. Brown spots over back and soft dorsal fin in juveniles.
P 11-12+3.
(voucher: 92 mm SL)

Pterygotrigla (Pterygotrigla) ryukyuensis

Rostral process triangular, subequal to eye diameter; opercular spine short; nuchal and humeral spines very long, 1-1.5 times eye diameter; bucklers below all of spinous dorsal fin. Inner pectoral fin uniformly tan, base and upper and lower edges pale (preserved colour).
P 11-12 + 3.
(voucher: 120 mm SL)

Pterygotrigla (Bovitrigla?) leptacanthus

Rostral spine subequal to eye diameter; nuchal spine very long, usually longer than eye diameter; humeral and opercular spines short; bucklers only below first few dorsal spines. Inner pectoral fin with large plain black patch near its base; green spots over back and in a row on lower part of soft dorsal fin.
P 16+3, fin 38-41% SL. L. lat more than 70 rows.
(voucher: 107 mm SL)

PERISTEDIIDAE

Armoured gurnards -

Body entirely encased in heavy spine-bearing plates; preorbitals each with a forward projection; pectoral fin with lower two rays free and enlarged; barbels on lower jaw.

There are six genera and 45 species in this family, of which three genera were collected on the Survey.

REFERENCES: Richards, 1999; Kawai, 2013; Ono & Kawai, 2014; Kawai, 2016; Kawai, 2019.

Gargariscus prionocephalus

Suborbital ridge very broad and deeply scalloped, head evenly rounded when viewed from above. Orange-pink markings over head edges; inner pectoral fin pinkish yellow crossed by 3 irregular rows of black checks; anal fin dark with yellowish band along it.
D VI-VII, 15. A 13-14.
(voucher: ? mm SL)

Satyrichthys laticeps

Rostral processes slightly triangular, parallel. Pectoral fin dark brown, upper edge pale. Dark green(?) streaks on head. Three simple lip barbels and 2 or 3 simple chin barbels on each side of lower jaw (from symphysis).
D_2 15-16. A 15-16. Lower GR 15-17. Second row of body scutes 30.
(voucher: 91 mm SL)

Satyrichthys rieffeli

Rostral processes slender, with serrated edges, parallel or converging anteriorly. Many rows of black spots over head back and upper sides along scute edges and in 4-7 row over dorsal fins. One simple lip barbel and 1 or 2 simple chin barbels on each side of lower jaw.
D_2 17. A 16-17. Lower GR 17-19. Second row of body scutes 31-33;
(voucher: 189 mm SL)

Peristedion liorhynchus

Rostral processes short and parallel. Seven to 9 clumps of tentacles along lower jaw between the 2 outer and longer fleshy tentacles. Dark green or brown-green lines mark body along snout, across head and around scutes of back. Ventral fin bright pink; pectoral fin axil dark brown; 2 dark bands across pectoral fin.
D_2 20-22. A 20-22. Dorsal series of scutes 31-33.
(voucher: 184 mm SL)

Satyrichthys moluccense

Rostral processes rectangular, nearly parallel. Plain scarlet or orange above, cream below; dorsal and anal fins with black edges. Two or 3 simple lip barbels and 0-2 simple chin barbels on each side of lower jaw.
D_2 17-18. A 17-18. Lower GR 16. Second row of body scutes 30-32.
(voucher: 145 mm SL)

Satyrichthys welchi

Rostral processes rectangular, serrated and converging anteriorly. Thin black lines over head and around scute edges; black spots on dorsal fin; dorsal and anal fins black edged. Two simple lip barbels and 3-5 small chin barbels on each side of lower jaw.
D_2 17-18. A 17-18. Lower GR 16. Second row of body scutes 32;
(voucher: 310 mm SL)

APLOACTINIDAE

Velvetfishes;

Small to moderate-sized fishes; head large, with ridges, knob-like spines and pits variously. Mouth terminal or lower jaw slightly projecting; teeth small; usually cirri and fleshy papillae on head, sometimes also on body. Scales absent, body covered with small velvet-like villi. Dorsal fin begins above or before eye in most genera, anterior 3-5 spines divergent but connected to remainder of fin in most species. All fin rays unbranched: anal fin spines weak or absent; well- developed pectoral fin; ventral fin with less than 4 fin rays; caudal fin rounded or truncate.

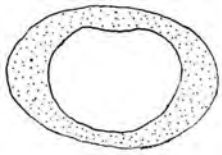
Seventeen genera in the family; representatives of one obtained on the Survey.

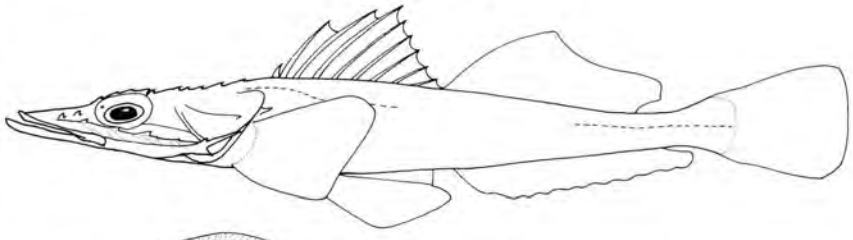
REFERENCES: Poss & Eschmeyer, 1978; Poss, 1999b.

Erisphex aniarus

Head and body naked, thin skin rough and warty. Head profile abrupt; both lachrimal spines sharp, posterior one directed downwards; 4 spines on preopercular margin. Dorsal fin begins above eye, first spine longest; ventral fin begins before pectoral fin base. Body mottled grey-brown.
D X-XII, 12-14. A I, 11-12. VI, 2. L. lat. tubules 13-15.
(voucher: ? mm SL)

PLATYCEPHALIDAE





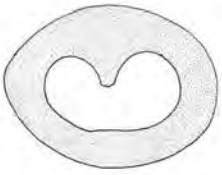


Fig 2

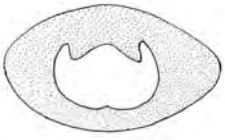


Fig 4

Fig 6

Fig 8

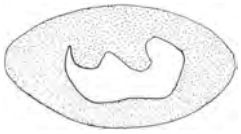


Fig. 3.

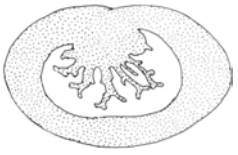


Fig. 5

Iris lappet types

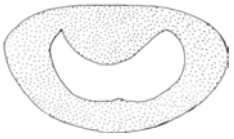


Fig. 7

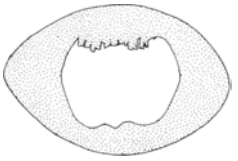


Fig. 9

Cociella punctata (A)

Cociella punctata (B)

Cymbacephalus nematophthalmus

Elates ransonnettii

Grammoplites scaber

Cymbacephalus bosschei

Inegocia harrisii

Inegocia japonica

Onigocia macrocephala

Onigocia sp

PLATYCEPHALIDAE

Flatheads - Anjing

Body elongate; depressed anteriorly, sub-cylindrical and tapered posteriorly. Head with spiny ridges and serrations; mouth large, lower jaw protrudes beyond upper jaw; small isolated spine before first dorsal fin; eye with a lappet on iris; gill openings wide. Usually ctenoid scales on body. Two slightly separated dorsal fins, first with 6-11 spines, second with 11-14 rays; anal fin without spines; ventral fins set well apart. Form of the iris lappet is often distinctive (examples are Figs 1-9). Vomerine teeth usually in two parallel longitudinal bands (Fig 10) but in *Platycephalus*, they fare in a single transverse crescentic band (Fig 11).

Eighteen genera, with 81 species; members of 13 genera were obtained on Survey.

REFERENCES: Knapp, 1987; Knapp, 1996; Imamura, Ida & Moyer, 1995; Imamura, 2003; Imamura, 2008; Gomon & Imamura, 2010; Imamura, 2012; Imamura, 2015; Imamura, 2016; Imamura, 2018; Imamura, 2020; Imamura & Aungtonya, 2020; Imamura & Hoese, 2020; Knapp, 1999.

Cociella punctata (A + B)

Teeth fine; rounded or thin interopercular flap; upper preopercular spine much longer than second; eye 4.2-6 in HL. Iris lappet variable (Figs 5 and 7). Fine black spots over head and back; body either fawn above and cream below or dark and faintly banded above, lower head and body reddish brown. Outer third of spinous dorsal fin dusky to charcoal; caudal fin either faintly barred brown or heavily spotted black.
D_2 11. A 11. P 19-22.
(voucher (A): 193 mm SL)
(voucher (B): 270 mm SL)

Elates ransonnettii

One very long preopercular spine reaching past edge of operculum. Caudal fin emarginate, upper lobe usually with filament. Head and body almost translucent cream, row of mauve blotches along mid-sides.
D VI; 13-14. A 12-14.
(voucher: 150 mm SL)

Inegocia harrisii

Suborbital ridge with 2 spines below eye, sides of head beneath eye bicarinate; iris lappet a half-circle with long, branched cirri (Fig 8); 2 preopercular spines, about equally long: interopercular flap absent or scarcely developed; anterior 10-12 lateral line scales with low spines. Body fawn; caudal fin brown with few dark elongate marks.
D IX; 11. A 11. P 22-25.
(voucher: 150 mm SL)

Onigocia macrocephala

Scales large. Head spiny and "heart"-shaped; one pre-ocular spine present; 15-17 short spines or serrae on suborbital ridge which is deeply indented or with gap below eye; short, branched cirrus on upper eye surface; iris lappet finely branched (Fig 9); no interopercular flap. Body brown, fins tan and barred brown; outer third of spinous dorsal fin charcoal; ventral fin margin white.
D VIII-IX; 11-12. A 12. 35-42 scale rows from head to tail base.
(voucher: 82 mm SL)

Onigocia sp

Scales large. Head spiny and "heart" -shaped; 4 or 5 preocular spines; 19-23 evenly-spaced spines or serrae on suborbital ridge; no cirrus on eye; iris lappet scalloped (Fig 6). Body brown with distinct white band across nape and 2 darker brown bands on caudal peduncle; ventral and pectoral fins edged white.
D VII-IX; 11. A 11. 29-34 scale rows between head and tail base.
(voucher: 80 mm SL)

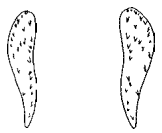


Fig. 10

Fig. 11
arrangements of vomerine teeth

Cymbacephalus nematophthalmus

Deep pit behind eye; 6-9 skin flaps on upper surface of eye, 2nd very long with many flaps. Iris lappet a half-circle with long branches (Fig 8), maxilla reaches past front edge of eye; one spine on suborbital ridge; interopercular flap present. Body dark grey-green crossed by 7 or 8 dark bands. Fins marbled green, yellow and brown; second dorsal and caudal fins crossed by short brown vertical stripes.
D VIII-IX; 11-12. A 11-12.
(voucher: 250 mm SL)

Grammoplites scaber

All lateral line scales with strong spine. Head and body tan, blotched or banded over back and along mid-sides. Outer half of dorsal and ventral fins dark brown; all fins, especially upper caudal fin and lower pectoral fin, closely spotted brown.
D IX; 12. A 12.
(voucher: 178.5 mm SL)

Cymbacephalus bosschei

Eye small, 6-7.2 in HL; iris lappet a very cirrhose half-circle (similar Fig 8). Head ridges almost smooth; single spine present on suborbital ridge; broad, scalloped interopercular flap present. Preopercular spines small and blunt; no lateral line scales with spines. Body pale brown; upper and lower edges of fawn caudal fin dark brown or black.
D IX; 11-12. A 12-13.
(voucher: 250 mm SL)

Inegocia japonica

Two low spines below eye on suborbital ridge; sides of head beneath eye bicarinate; iris lappet a half-circle with long, branched cirri (Fig 8); 2 preopercular spines, subequal; interopercular flap well-developed and acute; anterior 6-8 lateral line scales with low spines. Body fawn; pectoral and dorsal fins crossed by series of brown spots; caudal fin orange, crossed by 4-6 series of distinct black spots.
D IX; 12. A 12. P 19-21.
(voucher: 160 mm SL)

Onigocia spinosa

Platycephalus endrachtensis

Platycephalus westraliae

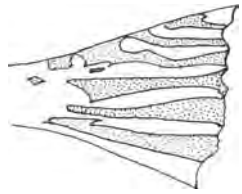


Fig. 14 from A.D. Lewis

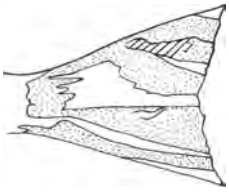


Fig. 12 from Lewis

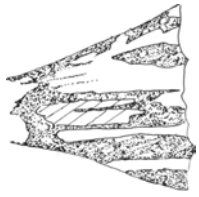


Fig. 13 r,om Lewis

Ratabulus fulviguttatus

Rogadius pristiger

Sorsogona tuberculata

Rogadius welanderi

Insidiator macracanthus

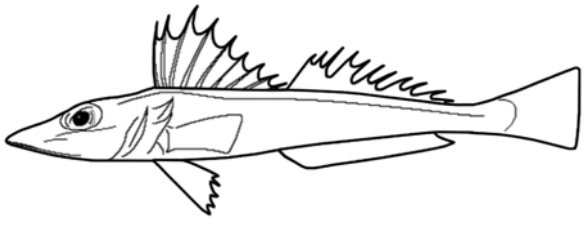
Kumococius rodericensis

Cociella hutchinsi

Rogadius patriciae

Sunagocia otaitensis

BEMBRIDAE



Bembras megacephala

Onigocia spinosa

Scales large. Head spiny and "heart"-shaped; 2-6 preopercular spines; suborbital ridge notched below eye; short branched ocular flap on upper eye; iris lappet finely branched (Fig 6). HL 31-42.5% SL; no interopercular flap. Body brown, nape often cream; lower pectoral and ventral fins dark brown or black with white margins.
D VIII-IX; 11-12. A 11-12. 34-42 scale rows from head to tail base.
(voucher: 76 mm SL)

Platycephalus westraliae

Vomerine teeth fine, in one transverse patch. Head almost smooth; lower preopercular spine longer than upper spine; finger-like interopercular flap; interorbital 0.8-1.3 in eye diameter; iris lappet broad and slightly bilobed (Fig 2); snout length 25.9–27.7% HL. First and last dorsal spines small and separated from others. Distinctive tail markings of 4 black wedge-shaped bands over cream background with bright yellow patch on upper lobe (Fig.12); lower opercular flap spotted brown.
D I+VIII, I, 13. A 13. Lower GR 7-9.
(voucher: 340 mm SL)

Rogadius pristiger

Forward-directed spine on ventral edge of preoperculum; head ridges finely serrated, upper preopercular spine large; one preocular spine. Teeth sharp; iris lappet bilobed (Fig 4). Body brown, nape pale; black bars across pectoral and ventral fins; broad olive band across middle to outer half of caudal fin, preceded proximally by a pale band.
DIX; 10-11. A 11-12. 51-62 scale-rows above lateral line, from head to tail base. Tr above 5-7.
(voucher: 99 mm SL)

Rogadius welanderi

Forward-directed spine on ventral edge of preoperculum slender, only its top visible; head ridges very finely serrated, suborbital ridge not over-hanging cheek; 5 or 6 small preocular spines present; 3 preopercular spines, upper strong, equal to ⅓ eye diameter; no interopercular flap; iris lappet bilobed (Fig 4). Body pale brown, nape cream; fins barred; 6 or 7 charcoal bands across caudal fin.
D IX; 11. A 11. Tr 6-7 + 14-15.
(voucher: 107 mm SL)

Kumococius rodericensis

Upper preopercular spine long and strong, subequal to eye diameter; interropercular flap well-developed; one preocular spine; 5 or 6 spines on suborbital ridge; iris lappet bilobed or scalloped (Fig 3). Pectoral fin hind edge distinctly concave. Body brown; pectoral fin plain brown with blonde (cream) patch in its centre, broad dark margin to caudal fin.
D VIII-IX; 11. A 12.
(voucher: 159 mm SL)

Rogadius patriciae

No forward-directed spine on preoperculum. Suborbital ridge finely serrated, head moderately smooth; 2 or 3 preocular spines; iris lappet bilobed (Fig 3). First of 3 preopercular spines longest, ⅔ eye diameter; interopercular flap scarcely developed. Pectoral fin slightly concave. Body fawn; outer half of spinous dorsal fin black, other fins dotted black; black longitudinal bands and 1 or 2 oblique black blotches on caudal fin.
D IX; 12. A 11. P 21-22. Tr above 6-11.
(voucher: 191 mm SL)

Platycephalus endrachtensis

Vomerine teeth fine, in one transverse patch. Head almost smooth; lower preopercular spine equal to or longer than upper spine; finger-like interopercular flap; interorbital 1.4-2 in eye diameter; iris lappet slightly triangular; snout length 28.5–31.0% HL. Distinctive tail markings of 4 or more black longitudinal bands over white background (Fig14); interopercular flap plain white.
D I+VII-VIII, I, 13. A 13. Lower GR 8-12.
(voucher: 205 mm SL)

Ratabulus fulviguttatus

Teeth on jaws and vomer canine-like and depressible. Snout 30-35% HL; suborbital ridge with many spines; upper preoperculum; spine clearly longer than second; iris lappet simple (Fig 2). Small, free spine between spinous and rayed dorsal fins; caudal fin truncate. Head spotted orange and brown; back spotted orange and green. Outer spinous dorsal fin charcoal; base and outer third of caudal fin black.
D IX, I; 11. A 11-12.
(voucher: 189 mm SL)

Sorsogona tuberculata

Head ridges very finely serrated, suborbital ridge expanded and overhanging cheek; bicarinate; 3-5 preocular spines present; 5 or 6 preopercular spines; upper one strong, equal to half eye diameter; no interopercular flap; iris lappet bilobed, slightly crenulate (Fig 3). Body pale brown, nape pale; lower pectoral fin and outer ventral fin with patches of black, their margins white. D VIII-IX; 11-12. A 11. Tr 5 + 11-12.
(voucher: 81 mm SL)

Insidiator macracanthus

Upper preopercular spine long and strong, equal to eye diameter; lower opercular flap moderately-developed; one preocular spine; about 10 spines on suborbital ridge; iris lappet crenulate or scalloped (similar Fig 3). Hind edge of pectoral fin evenly convex. Body fawn; distinct dark spots on spinous dorsal fin; pectoral fin finely barred brown.
D IX; 12. A 12.
(voucher: 80 mm SL)

Cociella hutchinsi

Suborbital ridge with 2 spines below eye; well-developed striae on temporal region of head; iris lappet a smooth half-circle (Fig 7); two strong preopercular spines, upper one ¾ eye diameter; no ocular flap. HL 36-38% SL; interorbital 4-6.5% HL. Body fawn; spinous dorsal fin with broad dark brown band along its outer third; caudal fin olive with submarginal crescent of distinct charcoal blotches.
D IX; 11-12. A 11. P 21-22. Tr 11-15 + 24-29.
(voucher: 210 mm SL)

Sunagocia otaitensis

Short, fine papillae along edge of both lips; maxilla reaching past front eye margin. Two short preopercular spines present, upper the longer; well developed; rounded interopercular flap; 1 preocular spine. Iris lappet crenulate (Fig 6, 8). Body mottled reddish brown; lips, cheeks and opercles with reddish-brown bars; all fins crossed by series of orange, dull red or black checks, especially distinct on pectoral and ventral fins.
D IX-X; 11-12. A 12. Tr above 4-6. L. lat .57-63.
(voucher: 129 mm SL)

BEMBRIDAE

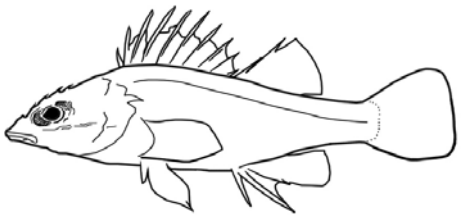
Body elongated and cylindrical; head moderately to strongly depressed; jaws approximately equal in length; no isolated spine before first dorsal fin; ventral fin begins below or before pectoral fin base; large mouth with fine teeth on jaws, vomer and palatines. Family has five genera and 15 species; one obtained on the Survey.

REFERENCES: Poss, 1999c; Imamura & Knapp, 1998.

Bembras megacephala

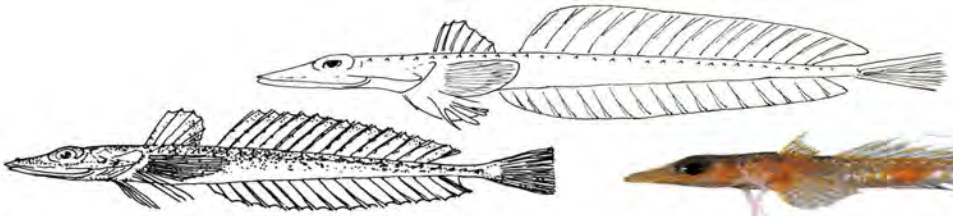
Head convex over eyes and nape; lower jaw not projecting beyond upper jaw. Head and body fawn, pale orange or bright yellow, paler below and scattered with lime-green and charcoal spots. Dorsal fin orangey with charcoal and green spots; pectoral and caudal fins checked dark green; dark grey or brown crescentic band along hind margin of caudal fin.
D IX-XI; 11-12. A 14-15. P 19-20. L. lat. 59-60.
(voucher: 180 mm SL)

PLECTROGENIIDAE



Bembradium sp

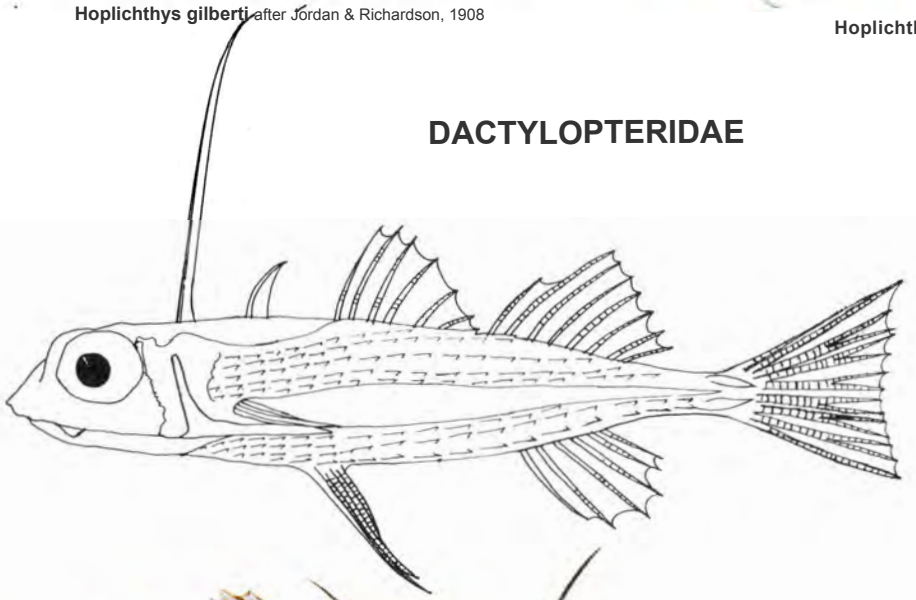
HOPLICHTHYIDAE



Hoplichthys gilberti after Jordan & Richardson, 1908

Hoplichthys imamurai

DACTYLOPTERIDAE



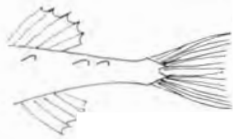
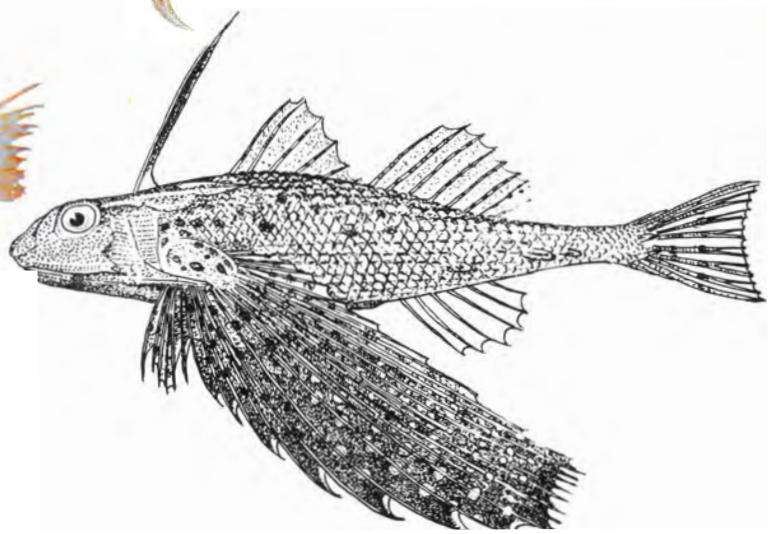


Fig 1

Dactyloptena macracantha

Dactyloptena orientalis

Dactyloptena papilio



Dactyloptena peterseni after Jordan & Richardson., 1980

PLECTROGENIIDAE

Stinger Flatheads -

Body compressed; head usually with spines and ridges; gill membranes free from isthmus; venom gland in dorsal, anal, and pelvic spines.

This family comprises one genus and two (or three?) species.

REFERENCES: Kumar et. al, 2019; Kishomoto, Kawai, Tashiro & Augtonya, 2019.

Bembradium sp

Head convex over eyes and nape; lower jaw not projecting beyond upper jaw; suborbital and supraorbital ridges densely spined, 11-12 short spines on suborbital ridge. Scales large. Lower 10 rays in pectoral fin slightly thickened. Body and fins red or orange-red, pink spots and red margins sometimes visible on fins.
D VIII-IX; 12. A 10-11. P 24-27. L. lat. 27-30.
(voucher: 89 mm SL)

HOPLICHTHYIDAE

Ghost flatheads -

Body elongate, subcylindrical; back and upper sides with bony plates and spiny scutes. Head depressed and broad, with strong spines and ridges. No scales on body. Two dorsal fins: first spinous and short, second rayed; anal fin without spines, about as long as second dorsal fin; lower 3 or 4 pectoral fin rays detached or free from rest of fin; caudal fin rounded or lanceolate.

The family comprises a single genus containing 14 species, two of which were collected on the Survey.

REFERENCES: McGrouther, 1999; Nagano, McGrouther & Yabe, 2013; Nagano, Endo & Yabe, 2013; Nagano, Imamura & Yabe, 2012.

Hoplichthys gilberti

Lateral line spines in one row. No cluster of spines on underside of head behind maxilla. Upper jaw length 3-3.2 in HL; snout approximately equal to eye diameter; interorbital ⅓ of eye diameter. Longest free pectoral ray shorter than longest branched pectoral ray. Body tan with 4 dark cross-bands; first dorsal and pectoral fins dark brown.
D VI, 15. A 16-18.
(voucher: 160 mm SL)

Hoplichthys imamurai

Lateral line scales in one row. A cluster of spines on underside of head behind maxilla; head ridges strongly spined; snout ⅓ of HL; large eye, ¼ of HL; gill rakers long and thin. In males, rays of second dorsal fin produced and filamentous (first, middle and last rays noticeably longer); caudal fin emarginate, upper lobe filamentous. Three broad orange blotches across body and lower caudal fin lobe orange; sometimes black edge to anal fin.
D VI, 15. A 16-17.
(voucher: 141 mm SL)

DACTYLOPTERIDAE

Flying Gurnards -

Body moderately elongate. Head large and blunt, bones on top of head united to form a shield which is produced backward from top of head into a long post-temporal spine and a long spine from preopercular angle. Interorbital broad. Body scales sharply-keeled and scute-like. Two dorsal fins, spinous fin preceded by one or two single free spines; no spines in short anal fin. Pectoral fin enormous and wing-like. Caudal fin lunate or emarginate.

The family comprises two genera and seven species; four were obtained on the Survey.

REFERENCES: Eschmeyer, 1997; Poss & Eschmeyer, 1999; Sato, Endo, Nakabo & Machida, 2003.

Dactyloptena macracantha

Post-temporal spine lies flat against body. Eye 1.2-1.5 in interorbital; t2-4 enlarged scales on lower side of caudal peduncle (Fig 1). Lateral line present, reaching caudal fin. Two single free spines before first dorsal fin, first one much longer than second. Inner pectoral fin usually with one large black blotch midway along fin, sometimes containing cream or yellow spots.
D I, I, V+I, 8-9, P 31-35.
(voucher: 192 mm SL)

Dactyloptena orientalis

Post-temporal spine lies flat against body. Snout blunt; eye 1.4-1.6 in interorbital; 2-4 enlarged scales on lower side of caudal peduncle (Fig 1). Two single free spines before first dorsal fin, second one much shorter. Lateral line absent or obscured. Inner pectoral fin with many olive and charcoal blotches over all of fin, golden bands across caudal fin.
D I, I, V+I, 8. P 32-35.
(voucher: 370 mm SL)

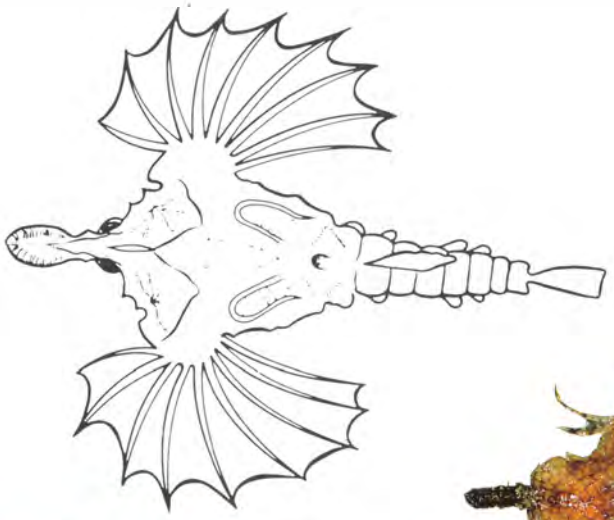
Dactyloptena papilio

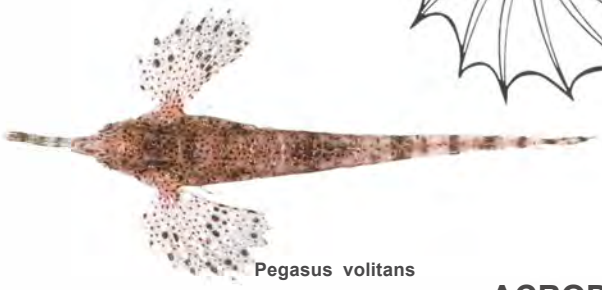
Post-temporal spine elevated above body profile. Snout narrow; eye 2-2.3 in wide interorbital; 5-7 enlarged scales on lower sides of caudal peduncle. Two single free spines before first dorsal fin, second one much shorter than first. Lateral line present, reaching caudal fin. Large black patch containing blue spots near base of inner pectoral fin, rest of fin with dark blotches.
D I, I, V+I, 8. P 28-32.

Dactyloptena peterseni

A single free spine before first dorsal fin. Snout blunt; interorbital moderately wide. Lateral line absent of obscured; 3 enlarged scales on lower sides of caudal peduncle. Body orange-red above with scattered green or brown spots; a large dark green or brown blotch over centre of inner pectoral fin crossed by many pale yellow lines and spots.
D I, VII, 8. P 31-34.
(voucher: ? mm SL)

PEGASIDAE

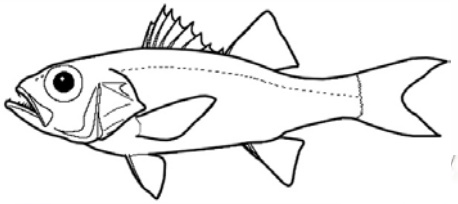




Pegasus volitans

Eurypegasus draconis

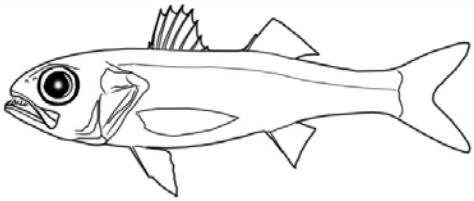
ACROPOMATIDAE



Acropoma leobergi

Doederleinia berycoides

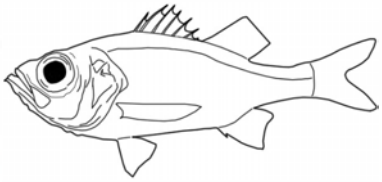
SYNAGROPIDAE



Parascombrops philippinensis

Synagrops japonicus

MALAKICHTHYIDAE



Malakichthys griseus

Malakichthys elegans

PEGASIDAE

Sea moths -

Body very broad and very depressed, encased in bony rings. Snout (rostrum) long and flattened; small· mouth underneath snout; no teeth. Gill cover a single bony plate. Bony body rings fused together anteriorly, tail section quadrangular. Dorsal and anal fins short-based without spines; ventral fin with one spine and 1-3 rays; pectoral fin large. horizontal, with 8-10 unbranched rays.

The family consist of two genera and six species, of which two genera were collected on the Survey.

REFERENCES: Palsson & Pietsch, 1989; Osterhage, Pogonoski, Appleyard & White, 2016.

Pegasus volitans

Tail portion (without caudal fin) as long as or longer than rest of body and with 12 bony rings. Rostrum slender. Body barred dark brown; fins barred and spotted black and violet.
D 5. A 5. P 11.

Eurypegasus draconis

Tail portion (without caudal fin) shorter than rest of body (without snout) and with 8 bony rings. Rostrum short, sides convex. Orange-brown, mottled green. Fins and snout spotted brown and charcoal; snout and tail tips black.
D 5. A 5. P 9-11.
(voucher: ? mm SL)

ACROPOMATIDAE

Lanternbellies -

Body oblong, moderately compressed. Two dorsal fins, first with 7-10 spines; the second with or without a spine and with 8-10 soft rays; anal fin with 2-3 spines and 7-9 soft rays. Seven branchiostegal rays. Opercle with two rounded spines. Lateral line complete. Pelvic fin with one spine and 5 soft rays. Two flat opercular spines; large eye; canine teeth often present. Dorsal fin either deeply notched near end of spinous part or completely separated into spinous and rayed fins. Scales large and easily lost.

These fish are often confused for members of the families APOGONIDAE and SERRANIDAE.

Two genera and seven species in the family; both genera represented in the Survey material. This family was (1984) included with SYNAGROPIDAE and MALAKICHTHYIDAE (q.v.) as family PERCICHTHYIDAE.

REFERENCES: Okamoto & Golani 2017; Okamoto, Williams, Carpenter, Santos & Kimura 2019; Okamoto, Randall & Motomura 2021; Yamanoue & Matsuura, 2007; Ghedotti, Gruber, Barton, Davis & Smith, 2018.

Note: See additional comments in the Species List.

Acropoma leobergi

Dorsal fin divided into two separate fins. Body pink, lower sides silver with scattered dark dots; anus pale.
D VIII; I, 10. A III, 7. GR 5-8 + 15-18. L. lat. 43-45.
(voucher: 89 mm SL)

Doederleinia berycoides

Eye large, 2.7-3.2 in HL; lower preopercular margin strongly serrated; dorsal fin deeply notched. Head and body red, yellow shades on head, deep red over fin edges.
D IX, 10. A III, 6-8. GR 6-9+15-18. L. lat. 41-46.

SYNAGROPIDAE

Splitfin ocean-basses -

Four genera and 17 species in the family; two obtained on the Survey.

REFERENCES: Schwartzhans & Prokofiev, 2017.

Synagrops japonicus

Skin on head "knobby"; preopercular angle and ventral fin spine smooth. Body black or dark brown.
D IX; I, 9. A II, 7. GR (total) 19-23. L. lat. 28-30.
(voucher: ? mm SL)

Parascombrops philippinensis

Front edge of ventral fin spine strongly serrated; strong serrae at preopercular angle. Body dusky mauve above, slivery below; dorsal fin margin black.
D IX, 1, 9. A II, 7. GR (total) 18-20. L. lat. 24.
(voucher: 79 mm SL)

MALAKICHTHYIDAE

Temperate ocean-basses -

Two genera and 15 species in the family; three species collected on the Survey.

REFERENCES: Yamanoue & Matsuura, 2002; Yamanoue & Matsuura, 2004; Yamanoue & Matsuura, 2014.

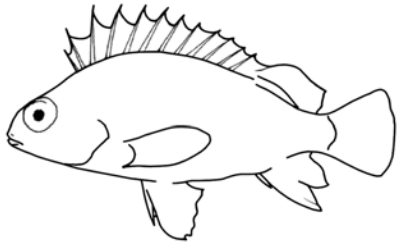
Malakichthys griseus

Chin sharp but no tooth-like spines near symphysis; body depth 3.6-3.7 in SL. Body pinkish fawn, silvery on lower sides; operculum, snout and maxilla metallic silver; edge of spinous dorsal black.
D IX-X, 9-10. A III, 8. GR (total) 30. L. lat. 48-50.
(voucher: 105 mm SL)

Malakichthys elegans

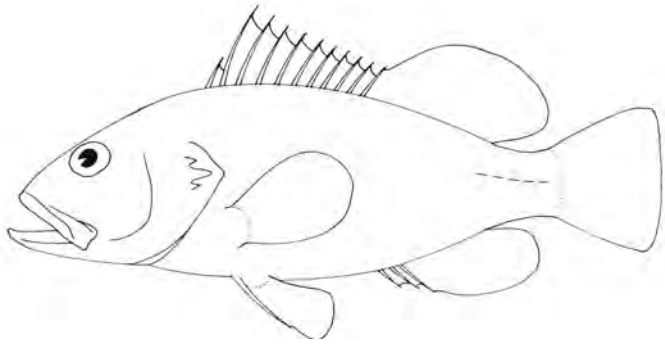
One pair of tooth-like spines on chin near symphysis; body depth 2.9-3.2 in SL. Body pink or fawn, edge of spinous dorsal black.
D IX-X, 10. A III, 7. GR (total) 30-33. L. lat. 50-54.
(voucher: 125 mm SL)

CENTROGENYIDAE

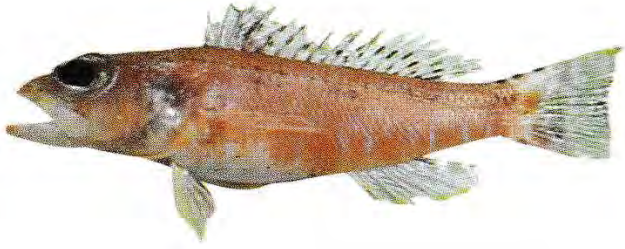


Centrogenys vaigiensis

SERRANIDAE



Subfamily Serraninae



Chelidoperca flavolineata

Chelidoperca stella

Subfamily Ephinephelinae

Aethaloperca rogaa

Anyperodon leucogrammicus

Cephalopholis boenak

Cephalopholis argus

CENTROGENYIDAE

False Scorpionfishes, Prettyfins -

Body short and deep, head large with 2 spines on operculum and 3 or 4 antrorse spines on lower edge of preopercle; no suborbital ridge. All teeth villiform and non-depressible. Dorsal fin begins above mid head length, with XIII-XIV spines; second anal fin spine strong and very long; upper rays of pectoral fin not branched.

This is a monotypic family.

REFERENCE: Gill, 1999a.

Centrogenys vaigensis

Small fish; fringed tentacle on front nostril; scales large and ctenoid; spinous dorsal fin base much longer than soft fin base. Body and fins mottled and blotched dark brown; some alternating white and brown bars on most fins.
D XIII-XIV, 9-11. A III, 5.
(voucher: 60 mm SL)

SERRANIDAE

Groupers; Sea-basses; Rock-cods - Kerapu;

Small to very large fishes, body oblong, moderately compressed and robust. Mouth large, maxilla usually exposed posteriorly and usually with a supramaxilla; jaw teeth villiform or conical, inner teeth often depressible or hinged and usually canine teeth present; preopercular margin serrated; 2 or 3 spines on operculum. Scales usually small, lateral line complete. Single dorsal fin with 14 spines, slightly notched from posterior part of 9-21 rays; anal fin with 3 spines, 5-10 rays; pectoral fin broadly rounded; caudal fin slightly rounded, truncate or lunate, but never forked.

SERRANIDAE comprises three subfamilies and comprises altogether 72 genera and 579 species.
Subfamily Anthiadinae comprises 29 genera and 231 species; individuals belonging to five genera and nine species were collected on the Survey.
Subfamily Epinephelinae comprises 31 genera and 327 species, split among five Tribes. Eight genera and 40 species were collected on the Survey.
Subfamily Serraninae comprises 12 genera and 101 species; we collected two species in one genus, Chelidoperca.

Subfamily Serraninae

Perchlets -

These small, perch-like fishes generally have ten spines in their dorsal fins and seven soft rays in their anal fins; all fin spines are smooth, without serrae. They are generally solitary and inhabit depths from shallow waters down to 500 m over sandy rocky areas or sea-grass beds. Carnivorous, bottom-dwelling fishes. Members of the Serraninae exhibit a diverse expression of sexual patterns.

REFERENCES: Matsunuma & Motomura, 2016; Parenti & Randall, 2020; Matsunuma, Tan & Peristiwady, 2016; Lee, Lee, Matsunuma & Chen, 2019.

Chelidoperca flavolineata

Body rosy, blotched below. Eye surrounded by bright yellow; faint broad yellow band along body to tail base. Two to 3 rows of dark olive checks along dorsal fin, bright yellow bands across caudal fin.
GR (total) 17-19. L. lat. 46-47.
(voucher: 78 mm SL)

Chelidoperca stella

Yellow or pale pink body with iridescent blue spots on lower sides. Maxilla and suborbital bright yellow. Fins violet, marked with yellow, paired fins white with yellow spots.
Total GR. 15-16. L. lat. 35-36.
(voucher: 78 mm SL)

Subfamily Epinephelinae

Groupers, Sea bass -

Dorsal fin with seven to twelve spines, anal fin with three spines. The caudal fin is mostly rounded or truncate, sometimes lunate; seven branchiostegal rays. There are three spines on the operculum, and the tip of the maxilla is exposed. These are demersal fishes inhabiting coral reefs, rocky, muddy or sandy bottoms, and over seagrass beds. They are hermaphrodites and top food-chain predators, feeding mainly on fishes or large crustaceans and cephalopods, and reaching 300 cm in length and 400 kg in weight. Epinephelines are excellent food fishes and commercially important.
REFERENCE: Nelson, J.S. 1994.

Aethaloperca rogaa

Red-brown body and fins, scarlet around lips and inside mouth, prominent bluish white bar often present behind pectoral fin, narrow white edge on caudal fin. Body compressed and deep, depth 2.1-2.5 in SL; ventral fin long, caudal fin truncate; middle dorsal and anal fin rays extended.
D IX, 17-18. A III, 9.

Anyperodon leucogrammicus

Body and head greenish-grey; four white streaks from head along body; orange or red spots over head, body and dorsal fin. Juveniles with broad black midlateral band. Slender fish; no palatine teeth; no large serrae on preoperculum; head fully scaled, pointed.
D XI, 14-15.
(voucher: 175 mm SL)

Cephalopholis boenak

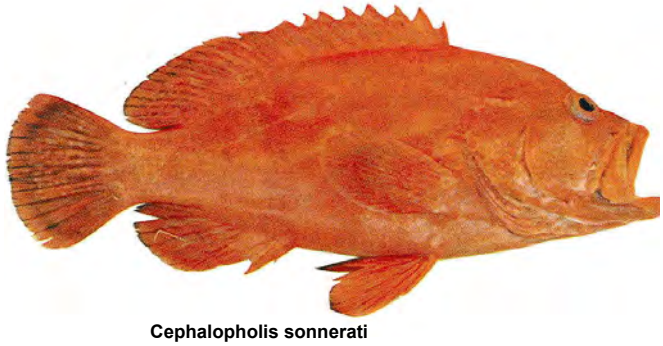
Dark brown or dark tan, sometimes with 8 faint darker cross bands, black spot usually on upper opercular flap; spinous dorsal margin black, white edge to soft dorsal, anal and caudal fins, pectoral fin black.
D IX, 15-17. A III, 8. P 16-17. GR 7 + 14-16. Tr above 10-12.
(voucher 97 mm SL)

Cephalopholis argus

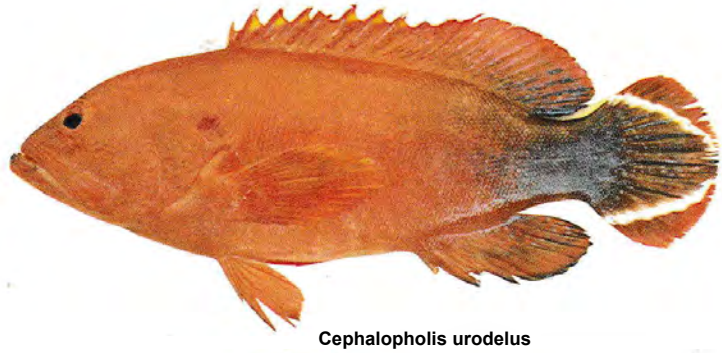
Dark brown becoming brownish orange posteriorly, breast pale, sometimes 5 or 6 dark bars present on posterior half of body; head, body and fins covered with many pale blue, brown-edged spots; edge of unpaired fins white, tips of dorsal spine membranes and outer ⅓ of pectoral fin plain orange. Gill rakers short; axiliary scales present on body.
D IX, 16-17. P 16-17. GR 9-11 + 16-19.
(voucher: 260 mm SL)

Cephalopholis miniata

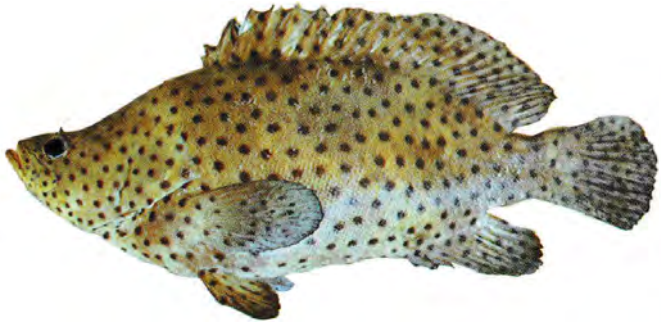
Cephalopholis sexmaculata



Cephalopholis sonnerati



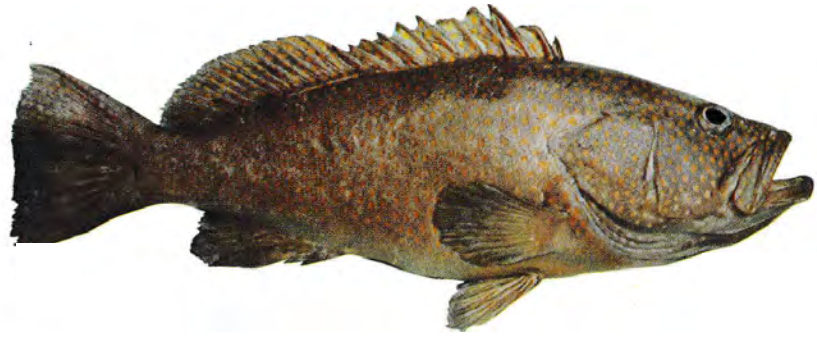
Cephalopholis urodelus



Chromileptes altivelis

Epinephelus amblycephalus

Epinephelus areolatus



Epinephelus bleekeri

Epinephelus cyanopodus

Epinephelus coeruleopunctatus

Cephalopholis miniata

Head, body and fins orange or red, covered with many dark-edged blue spots, spots more dense posteriorly; soft dorsal, anal and caudal fins with blue margin and dark submarginal band; outer half of pectoral fin bright yellow. Longest dorsal spine 3.3-3.5 in HL; 2nd and 3rd anal spines about equal in length; gill rakers long.
D IX, 15. P 17-18. GR 9-11 + 14-17. Tr above 8-10.
(voucher: 225 mm SL)

Cephalopholis sonnerati

Head, body and fins bright red or reddish brown; meshwork of blue line and/or dark red spots over head and front of back; black margin on all except pectoral fins. Ventral fin long, equal to postorbital head length.
D IX, 14-15. P 19. GR 9-10 + 13-14. Tr above 13-15; 100-120 scale rows between head and tail base.
(voucher: 225 mm SL)

Chromileptes altivelis

Dark brown or black moderate-sized spots over pale yellow or green head, body and fins. Body very compressed; head profile deeply concave above eye, convex ("humped") before dorsal fin; no canine teeth.
D X, 17-19.
(voucher: ? mm SL)

Epinephelus areolatus

Body olive or pale brown, head, body and fins covered with round large yellow-green or orange-brown spots or blotches; distinct white hind margin on caudal fin. Membranes of spinous dorsal fin incised; caudal fin emarginate. Caudal peduncle depth 2.9-3.1 in HL.
D XI, 15-17. P 17-18. GR 8-9 + 14-16. L lat. 49-53.
(voucher: 195 mm SL)

Epinephelus cyanopodus

Body, head and fins blue or violet, becoming brownish purple above and covered with large- and smaller scattered irregularly-shaped dark spots. Margin of pectoral fin orange. Body deep, 2.5-2.7 in SL. Caudal fin truncate.
D XI, 16-17. P 17-19. Lower GR 15. L. lat. 65-70.

Cephalopholis sexmaculata

Scarlet or orange-red, many blue spots over head, body and unpaired fins; five or six dark brown squarish blotches along back, first 4 extending onto dorsal fin; blue lines around eye; pectoral and ventral fins bright orange. Longest dorsal spine 2.9-3.2 in HL; gill rakers long.
D IX, 14-15. P 16-18. GR 7-8 + 14-16. Tr above 10.
(voucher: 215 mm SL)

Cephalopholis urodeta

Body and fins red, becoming reddish brown posteriorly; two oblique white bands on caudal fin converge near centre of fin's hind margin, lobes of caudal fin red. Pectoral fin long, equal to head without snout.
D IX, 14-16. P 18. GR 7-10 + 14-15. Tr above 9-10.
(voucher: 150 mm SL)

Epinephelus amblycephalus

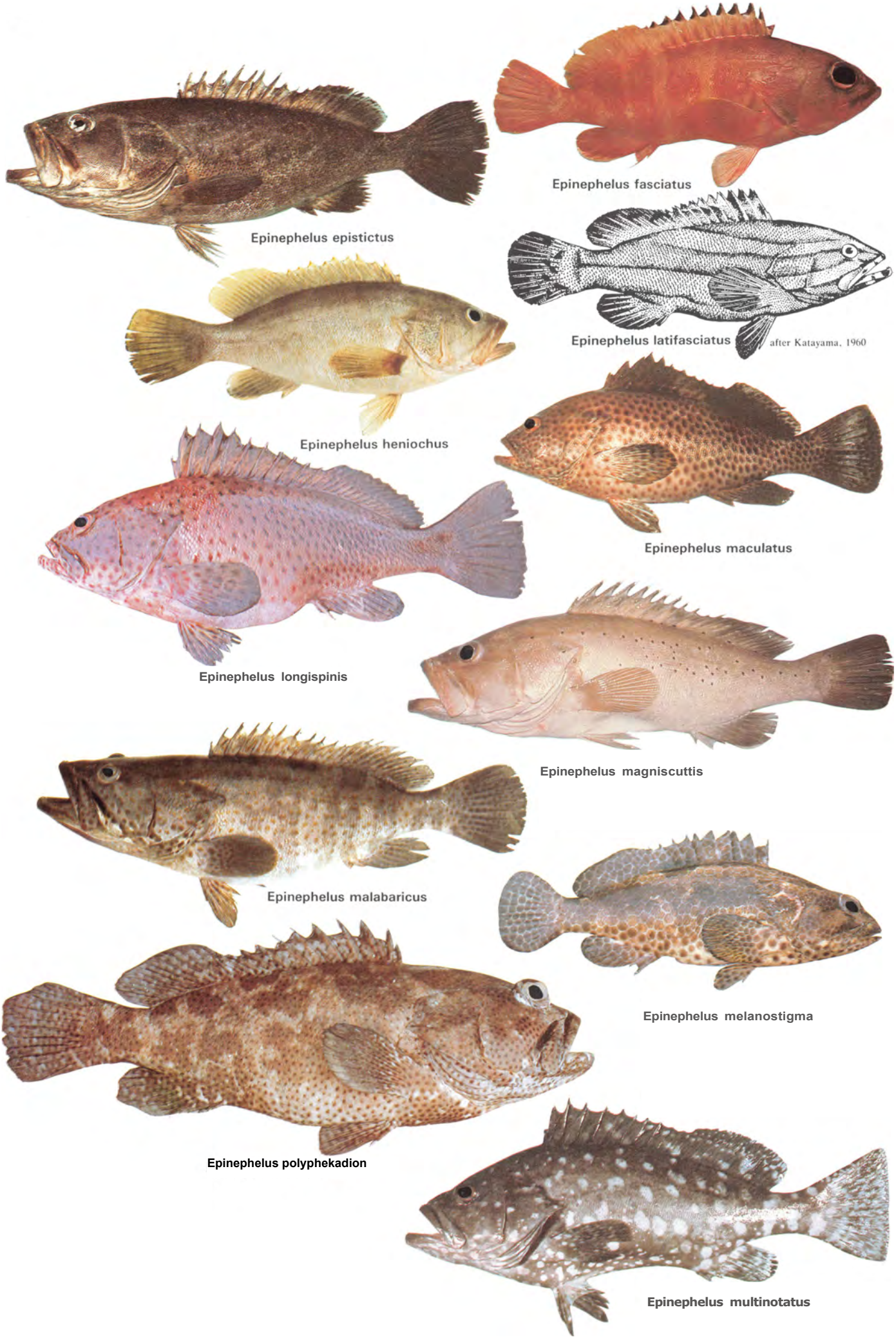
Seven broad brown or dark olive bands across pale body, each edged by series of small black spots: first band from interorbital obliquely through eye, second band as a saddle across nape; maxillary groove bright yellow; fins plain, unpaired fins spotted in young. Pectoral fin much shorter than postorbital head length; caudal fin rounded.
D XI, 15-17. P 19. GR 8 + 14-16. Tr above 14-16.
(voucher: 365 mm SL)

Epinephelus bleekeri

Body and fins brown or dark brown; moderate-sized dark-ringed orange or yellow spots scattered over head, back and sides, dorsal and upper ⅔ of caudal fins. Paired fins plain dark brown; lower ⅔ of caudal fin plain dark brown. Membranes of spinous dorsal fin incised; caudal fin truncate.
D XI, 17-18. P 17. GR 4-6 + 16.
(voucher: 530 mm SL)

Epinephelus coeruleopunctatus

Variegated dark brown or bluish, sometimes broad brown blotches below dorsal fin base; white or pale blue round spots or blotches on back and sides; maxillary groove black. Fins bluish brown. Membranes of spinous dorsal fin incised. Gill rakers very short, subequal to gill filaments; upper opercular border slightly curved. Caudal peduncle short, its length 2.9-3.1 in HL; pectoral fin large and fleshy.
D XI, 15-16. P 18. Lower GR 14-18.
(voucher: 280 mm SL)


Epinephelus epistictus
Epinephelus fasciatus
Epinephelus latifasciatus
after Katayama, 1960
Epinephelus heniochus
Epinephelus maculatus
Epinephelus longispinis
Epinephelus magniscuttis
Epinephelus malabaricus
Epinephelus melanostigma
Epinephelus polyphekadion
Epinephelus multinotatus

Epinephelus epistictus

Brown, pale brown or violet below; irregular rows of dark brown spots on body; in rows in juveniles, becoming smaller, more numerous in adults, absent in large fish; 3 dark bands on head, uppermost from eye to opercular flap, lowermost in maxillary groove. Margins of brown soft dorsal, anal and caudal fins white. Preopercular angle serrated; maxilla doesn't extend much past eye; opercular spines equally spaced.
D XI, 14-15. P usually 17-18. L. lat. 57-69. Lower GR 13-17.
(voucher: 500 mm SL)

Epinephelus heniochus

Body olive-fawn or brown, 3 oblique dark brown lines over head usually apparent; dusky yellow patch around eye and mouth; dorsal fin spines tipped orange or bright yellow; dark brown margin to caudal fin. Preopercular angle prominent; caudal fin truncate or slightly rounded.
D XI, 15. P 17. GR 5-7 + 9-12. Tr above 10-11.
(voucher: 210 mm SL)

Epinephelus longispinis

Body fawn or pale reddish brown, fins dark brown; head, body and fins covered with dark spots which are rounded anteriorly, becoming elongate, vertically slanted and densely crowded posteriorly; crimson spots on lower head and breast. Second and 3rd dorsal fin spines noticeably longer than remainder; caudal fin almost truncate.
D XI, 16-17. P 18.

Epinephelus magniscuttis

Body grey, pale brown on upper head and back; well-spaced brown spots scattered along middle of sides, number increasing in larger fish but spots never extending over front half of head. Unpaired fins greyish green with scattered spots; pectoral fin brown or yellow. Preoperculum strongly angular with large serrae. Caudal fin rounded. Pectoral fin 1.9 in HL.
D XI, 14-15. About 75 scale rows between head and tail base.
(voucher: 360 mm SL)

Epinephelus melanostigma

Body, head and fins covered with brown spots. On upper half of body and head, spots mostly hexagonal and separated by narrow pale lines; on belly, lower sides and head spots rounded and well-separated; large dark brown blotch on back below 7-10th dorsal fin spines, extending onto fin. White edge to soft dorsal, anal and caudal fins. Pectoral fin 1. 7-1.8 in HL.
D XI, 15. P 19. Lower GR 17-18. Scale rows from head to tail base 90-95.
(voucher: 210 mm SL)

Epinephelus multinotatus

Rich brown to bluish grey; head, body and fins covered with large and small cream or grey spots and blotches; black ring around eye; narrow white hind margin on caudal fin. Gill rakers long; caudal fin truncate. Body depth 2.6-2.9 in SL.
D XI, 15-17. P 18. G R 8 + 15-16. Tr above 20-23.
(voucher: 270 mm SL)

Epinephelus fasciatus

Scarlet or brownish red with 5-6 faint broad darker bars across body; 3 diagonal red bars across chest; eye ringed black; triangular black area on membrane behind tip of each dorsal fin spine. Soft dorsal, ventral and outer half of anal fin yellow. Tip of opercular flap much closer to lateral line than to top of pectoral fin base; opercular spines equally spaced from each other, caudal fin rounded.
D XI, 15-17. P 18-20. Lower GR 14-17. L. lat. 52-57.
(voucher: 250 mm SL)

Epinephelus latifasciatus

Pale brown or mauve-grey, with 4 longitudinal, slightly upwardly-curved dark brown lines on head and body, broken into spots in larger fish. Fins yellowish or bluish grey, dorsal, caudal and anal fins with large black spots on their outer halves; dorsal spines tipped black, membranes incised. Maxilla extends well past eye; preopercular angle strong; middle opercular spine nearer to lower than to upper spine.
D XI, 12-14. P 18-19. Lower GR 13-17. L. lat. 58-66.
(voucher: ? mm SL)

Epinephelus maculatus

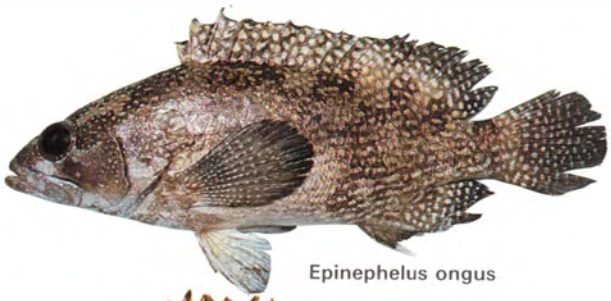
Dark brown spots over tan head, body and all fins, one or 2 large black patches on back below first dorsal base, all fins dark. Gill rakers long; caudal fin slightly rounded.
D XI, 15-16. P 17-18. Tr above 13. GR 8 -10 + 15-17.
(voucher: 350 mm SL)

Epinephelus malabaricus

Yellow to brown; 5-6 oblique double bands across body; orange or brown spots scattered over head, body and fins; maxillary groove dark brown; 3 dark spots on lower operculum; fins brownish yellow, spotted over lower half. Two rows of teeth on side of lower jaw; HL 2.3-2.6 in SL; maxilla ending past hind eye border; anterior L. lat. scales with branched tubules.
D XI, 14-16. P 19-20. Lower GR 15-18. L. lat. 58-64.
(voucher: 430 mm SL)

Epinephelus polyphekadion

Numerous brown spots over body and fins, 5 or 6 dark brown oblique irregular bars over back, first forward from nape, last as distinct saddle over caudal peduncle; dark mark in maxillary groove. Dorsal head profile smoothly curved; maxilla ends approximately below hind eye border, upper edge of operculum convex.
D XI, 14-15. P 16-17. GR 10 + 15-16.
(voucher: 380 mm SL)



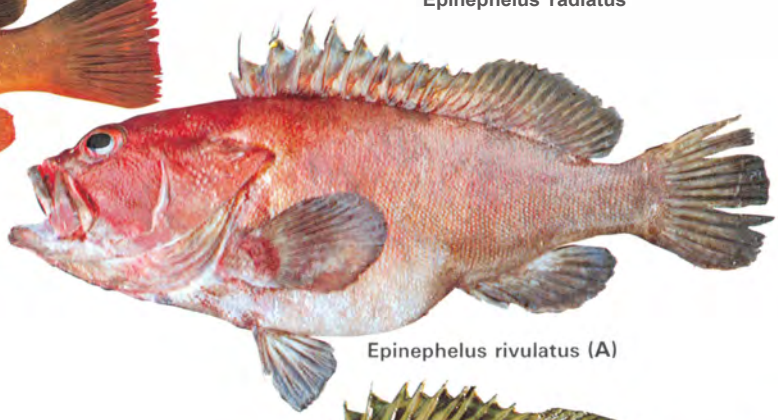
Epinephelus ongus

Epinephelus poecilonotus

Epinephelus quoyanus

Epinephelus radiatus

Epinephelus retouti



Epinephelus rivulatus (A)

Epinephelus rivulatus (B)

Epinephelus sexfasciatus

Epinephelus tauvina

Epinephelus undulosus

Epinephelus stictus.

Epinephelus ongus

Body yellowish brown, darker on head; 5 dark brown bands obliquely across body; small white spots cover head and form into numerous wavy lines of spots along body. Fins dark brown, covered with larger or smaller white spots; edges of unpaired fins white. Gill rakers shorter than gill filaments; 3-4 rows of teeth on side of lower jaw; posterior nostril small and rounded. Pectoral fin 1.5-1.7 in HL; ventral fin 2-2.4 in HL.
D XI, 14-16. A III, 8-9. P 16-18. Lower GR 16-17. L. lat. 49-54.
(voucher: 165 mm SL)

Epinephelus quoyanus

Many moderate to large dark spots or hexagons on body extending over head, body and fins, largely absent from breast and belly; lower sides of body plain; two dark brown bands across breast before pectoral fin, another on its base; margins of pectoral, soft dorsal and caudal fins yellow. Pectoral fin long, 1.2-1.5 in HL.
D XI, 16-18. P 17-18. GR 7-8 + 14-16.
(voucher: 251 mm SL)

Epinephelus retouti

Orangey brown; top of head, back, dorsal and caudal fins greenish; five faint, broad bars across body; triangular bright orange area on membrane behind tip of each dorsal fin spine; soft dorsal and upper caudal fin dark greenish brown. Tip of opercular flap midway between lateral line and top of pectoral fin base; middle opercular spine slightly nearer to lower than to upper spine; caudal fin truncate.
D XI, 16-17. P 19. Lower GR 15. L. lat. 64-71.
(voucher: 310 mm SL)

Epinephelus sexfasciatus

Six broad, slightly oblique dark bands across body, bands as wide as interspaces and sometimes double; scattered pale spots over head and body; 4 to 7 rows of dark spots on soft dorsal, anal and caudal fins; pectoral fin plain fawn or orange. Caudal fin rounded.
D XI, 14-15. P 16. GR 7 + 13-14. Tr above 8-12.
(voucher: 170 mm SL)

Epinephelus undulosus

Body olive to purplish grey with 12-16 thin wavy dark brown lines slanting over head and upper half of body to tail base; yellowish dots on head; narrow black margin on dorsal fin; pectoral fin pale yellow; cream band on anal fin base. Caudal fin truncate; gill rakers elongate.
D XI, 18-19. A III, 8-9. P 18. GR 14 + 20-23. Tr above 20-21.
(voucher: 350 mm SL)

Epinephelus poecilonotus

Body and head pale reddish-brown with pattern of parallel alternating brown lines and rows of spots: those on upper half of body obliquely ascending, those on lower half horizontal. Fins mostly plain, dorsal fin spines tipped black. Preoperculum strongly angular with large serrae; caudal peduncle length 2.3-2.8 in HL. Interspinous membrane of dorsal fin incised, soft dorsal fin outline convex and higher than posterior dorsal spines.
D XI, 14-15. P 17-18. Lower GR 13-14. L. lat. 60-65.

Epinephelus radiatus

Head and body fawn or pale olive. Dark brown lines from eye passing obliquely over head thence upward to back and across caudal peduncle; dark lines enclose white patches and scattered dark brown spots. Unpaired fins fawn; dorsal fin with median band of brown spots; pectoral fin orange. Preoperculum strongly angular, with large serrae; caudal peduncle length 2.5-3.1 in HL.
D XI, 14-15. P 17. Lower Gr 14-17. L. lat. 61-67.
(voucher: 177 mm SL)

Epinephelus rivulatus

Body reddish brown or greenish, more red on head, each scale with small bluish spot, extending over head and fins, sometimes forming close wavy lines; 5-6 dark cross bands, faded in large individuals, first on nape. Blackish brown margin to spinous dorsal fin, other fins unmarked; red or orange bar on pectoral fin base. Two rows of teeth on each side of lower jaw; opercular spines equally spaced from each other; caudal fin rounded, interspinous membrane of dorsal fin incised.
D XI, 17. P 17-18. Lower GR 14. L. lat. 49-53.
(voucher: (A) specimen lost)
(voucher: (B) 150 mm SL)

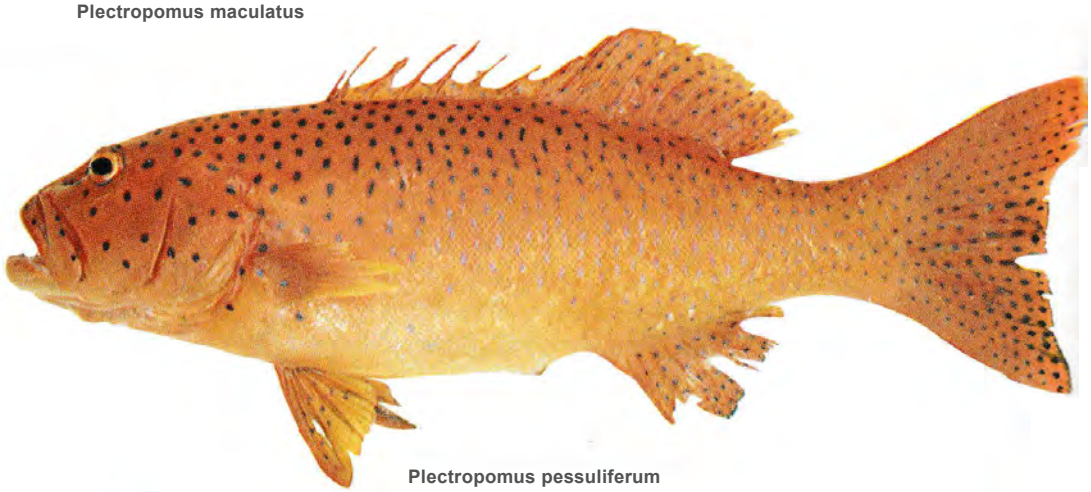
Epinephelus tauvina

Body greenish grey to brown, paler below; 5-6 faint oblique double bands across body; reddish or brown spots scattered over head, body and fins almost to their margins. Large brown blotch at rear base of spinous dorsal fin. 3-4 rows of teeth on side of lower jaw; HL 2.1-2.4 in SL; maxilla extending well past eye.
D XI, 14-16. P 18-19. Lower GR 18-20. L. lat. 67-74.
(voucher: 440 mm SL)

Epinephelus stictus

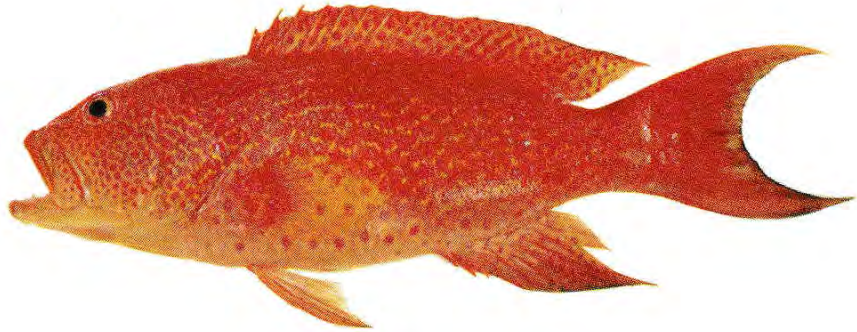
Olive-yellow, white below; top of head and back with many orange-brown spots, more numerous in larger fish; 5-6 faint broad darker bands across body; maxillary groove brown; a thin dark line along base of dorsal fin. Soft dorsal and caudal fin margins dark brown. Caudal fin rounded.
D XI, 16. P 18. Lower GR 15. Scale rows between head and tail base 98-103.

Plectropomus maculatus



Plectropomus pessuliferum

Variola albimarginata



Variola louti

Grammistes sexlineatus

Diploprion bifasciatus

Plectropomus maculatus

Nostrils rounded and of equal size; gill rakers long; hind anal fin margin straight or concave. Caudal fin truncate or with undulate hind margin. Body orange-red; 5-7 elongate blue spots on head becoming smaller and rounded on body posteriorly; no spots on lower sides; one spot on inner pectoral fin base; few spots on dorsal, anal and caudal fins, none on ventral fins.
P 16.
(voucher: 465 mm SL)

Variola albimarginata

Caudal fin deeply lunate; 1-3 large canines at midside of lower jaw. Body and fins crimson with violet wash, covered with small violet and yellow spots. Outer half of pectoral fin yellow; dorsal and anal fin margins brown; narrow white posterior margin and submarginal dark line to caudal fin.
D XI, 13-14. A III, 8. 90-95 scale rows between head and tail base.
(voucher: 265 mm SL)

Diploprion bifasciatus

Preopercular margin strongly serrate; scales ctenoid; body depth 2-2.4 in SL. Dorsal fin deeply notched. Ventral fin long, reaching beyond anus. Two broad black vertical bands across body: first through eye; second over spinous dorsal fin, mid-side of body, ventral fin and anterior half of anal fin. Remainder of body orange-yellow or pale yellow.
D VIII, 13-16. A II, 12-13.

Plectropomus pessuliferus

Nostrils rounded, anterior nostril noticeably smaller than posterior one; gill rakers long. Body orange-red; few blue spots on head, rounded; spots vertically elongate over middle of body remainder rounded, extending densely over dorsal, anal and caudal fins, fewer on ventral fin.
P 16.
(voucher: 380 mm SL)

Variola louti

Caudal fin deeply lunate; 1-3 large canines at midside of lower jaw. Body yellow to orange-red with small yellow spots arranged in irregular rows; fins yellow with many red spots and margins yellow. Posterior margin of caudal fin broadly yellow.
D XI, 13-14. A III, 8. About 110 scale rows between head and tail base.
(voucher: 220 mm SL)

Grammistes sexlineatus

Small fleshy flap on chin. Deep notch between spinous dorsal and dorsal rays. Scales cycloid; preopercular margin smooth. Dark brown or black with 3-8 bright yellow, cream or white stripes along body. Outer part of spinous dorsal fin bright red.
D VII, 13-14. A II, 9.
(voucher: 99 mm SL)

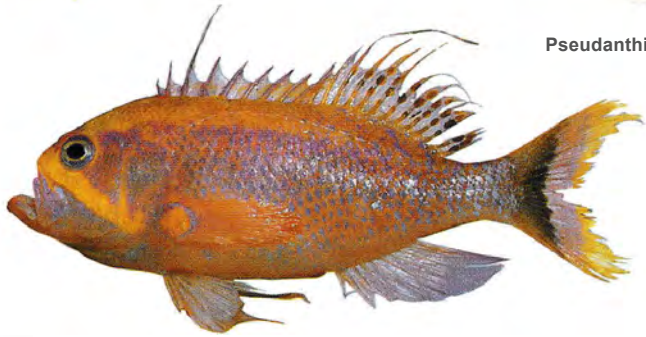
Subfamily Anthiadinae

Pseudanthias gibbosus

Pseudanthias rubrizonatus (male)

Pseudanthias squamipinnis

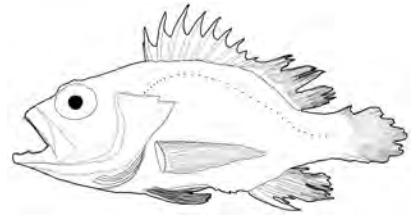
Pseudanthias rubrizonatus (female)



Odontanthias rhodopeplus

Plectranthias japonicus

Selenanthias analis



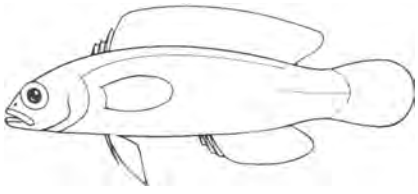
Plectranthias ferrugineus drawing of preserved specimen by Moras 2022

CALLANTHIDAE

Callanthias sp cf australis

Callanthias sp cf japonicus

PSEUDOCHROMIDAE



Pseudochromis steenei

Congrogadus spinifer

Congrogadus subducens

Subfamily Anthiadinae

Butterfly perches -

Compressed, small colourful fishes. Maxilla exposed posteriorly, usually scaled and usually without a supplemental bone; two nostrils close together. Canine and villiform teeth; preopercular margin serrated and operculum with three spines. Lateral line complete, high on sides. Single dorsal fin with 10 spines, 11-21 rays; anal with 3 spines and 6-8 rays.

REFERENCES: Randall, 1996b; Randall & Heemstra, 1999; Parenti & Randall, 2020.

Pseudanthias gibbosus

Third dorsal spine longest; pectoral fin rays branched. Caudal fin crescentric, lobes sometimes produced. Upper head and body orangey-red, lower head and body white, body with longitudinal yellow lines. Females with curved crimson, band from head edge to tail base, purple line from mouth to pectoral fin base, bright yellow white-edge caudal fin. Males with yellow purple-edge band from mouth to pectoral base, caudal fin margined in purple.
D X, 16-17. A III, 7. P 17-18. Lower GR 24-28. L lat. 39-43
(voucher: 105 mm SL)

Pseudanthias squamipinnis

Third dorsal spine produced and flexible; pectoral fin rays branched; vertical fins almost covered with small scales. Caudal fin lunate, lobes sometimes produced. Yellow red-edged band from eye to lower pectoral fin base; blue posterior margin to caudal fin. Males with large ovate red or purple blotch on leading edge of pectoral fin.
D X, 16-17. A III, 6-8. P 15-19. Lower GR 23-28. L. lat. 38-44.
(voucher: 54 mm SL)

Plectranthias japonicus

Predorsal scales reaching forward to nostrils; preoperculum serrated. Pectoral fin rays branched; caudal fin truncate to rounded. Body mostly pink, lower half of head yellow, fins yellow marked with pink. Six or 7 dark orange blotches along back and some on upper sides.
D X, 14-16. A III, 7. P 15-17. Lower GR 10-13. L. lat. 30-35.
(voucher: 79 mm SL)

Selenanthias analis

Scales on maxilla and on throat; gill rakers long, close together. Caudal fin only slightly emarginate. Two orange-yellow oblique bands across head; red patch basally at end of spinous dorsal fin; conspicuous large black patch over posterior anal fin; white filament to upper caudal fin lobe.
D X, 15-17. A 28-33. Lower GR 19-21. L. lat. 36-38.
(voucher: 94 mm SL)

Pseudanthias rubrizonatus

Posterior dorsal and anal rays produced. Caudal fin lunate, lobes produced. Broad red bar across sides below spinous dorsal fin and pearly-pink line from snout to lower pectoral fin base. Red streak across anal fin, dorsal fin deep blue; red streak along anal spines. Caudal fin in female emarginate, lobes tipped red, Dorsal and anal fins red.
D X, 16. A. III, 7. P 18-20. Lower GR 25-28. L lat. 42-47.
(voucher: (A) male, 74 mm SL; (B) female, 54 mm SL)

Odontanthias rhodopeplus

Large and deep-bodied; head fully scaled. Third dorsal spine long and with short filament; anterior dorsal rays long, some with filaments; caudal fin crescentic. Broad oblique yellow band from snout to below pectoral fin base; rows of dark brown checks across dorsal fin rays; base of caudal fin dark brown or black.
D X, 12-13. P 17-18. L. lat. 30-33. Lower GR 27-30.

Plectranthias ferrugineus

Many serrae on upper preopercular margin and 2 antrorse spines on lower margin; 14-16 scales around caudal peduncle. Pectoral fin rays simple; caudal fin emarginate, upper lobe produced. Body densely mottled red and yellow; large red and yellow blotches along back. Fins mainly yellow with some red basally.
D X, 14-16. A III, 7. P 12-15. L. lat. 27-29. Lower GR 16-20.
(voucher: 61 mm SL)

CALLANTHIIDAE

Splendid perches -

Lateral line runs close to dorsal fin base; incomplete, ending on upper side of caudal peduncle. Two opercular spines; preopercular margin smooth or only slightly irregular. Posterior end of maxilla exposed; caniniform teeth in both jaws anteriorly. Single dorsal fin with 11 spines and 9-11 soft rays; 3 spines in anal fin and 9-11 soft rays. No supplemental bone on maxilla; two widely-separated nostrils. Caudal fin usually emarginate. Scale moderate to large.

Two genera and about 18 species in the family, one or two species obtained on the Survey.

REFERENCE: Anderson, Johnson & Baldwin, 2015.

Callanthias sp cf australis

Females and juveniles are uniformly pinkish-red with a red pectoral fin base. Males are deep purple on the head and anterior body, with a reddish rear, a yellow caudal fin with purple lobes, and yellow to brownish dorsal and anal fins with blue margins.

Callanthias sp cf japonicus

Violet wash over top of head and in stripe above pectoral fin; body orange-rosy. Caudal fin violet, central area yellow-orange. Dorsal and anal fins elevated; caudal fin emarginate.

PSEUDOCHROMIDAE

Dotty backs -

Small, oblong fishes with small mouth and conical teeth in jaws. Preopercular margin entire. Body scales ctenoid, cycloid on head. Lateral line either in 2 parts or in one short part on upper body. One continuous dorsal fin, with 1-3 spines, 21-37 branched or unbranched rays. Anal fin with 1-3 spines. Ventral fin beginning before or below pectoral fin base. Caudal fin rounded.
24 genera and 154 species; two genera caught on the Survey.

REFERENCES: Gill & Randall, 1992; Gill, 1999b; Winterbottom, 1995.

Congrogadus spinifer

Gill membranes fused to isthmus; usually 7 pores (rarely 6) in line along preoperculum edge. Dark brown or tan with 3 irregular longitudinal rows of pale yellow spots on body and unpaired fin bases: spots large, equal to or more than eye diameter; yellow-ringed black ocellus on operculum.
D I, 62-64. A 52-54.
(voucher: ? mm SL)

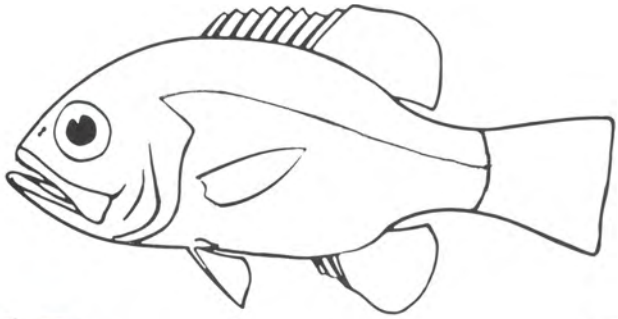
Pseudochromis steenei

Upper edge of operculum with 3-5 short spines. Caudal fin may have filamentous rays. Depth 3.7-4.8 in SL. Predorsal scales 15-22. Front half of back yellow or pale green, dark centres on scales, grey line around eye; posterior half of body dusky pink or violet.
D III, 24-27. A III, 13-14. L. lat 36-37 + 7-11 (in 2 parts).
(voucher: 76 mm SL)

Congrogadus subducens

Gill membranes free from isthmus; usually 6 pores (rarely 7) in line along preoperculum edge. No ventral fins; caudal fin confluent with dorsal and anal fins. Dark brown with 3 to 5 irregular longitudinal rows of cream spots along body and scattered over belly: spots about half eye diameter in size; yellow-ringed black ocellus on operculum.
D 68-76. A 57-66.

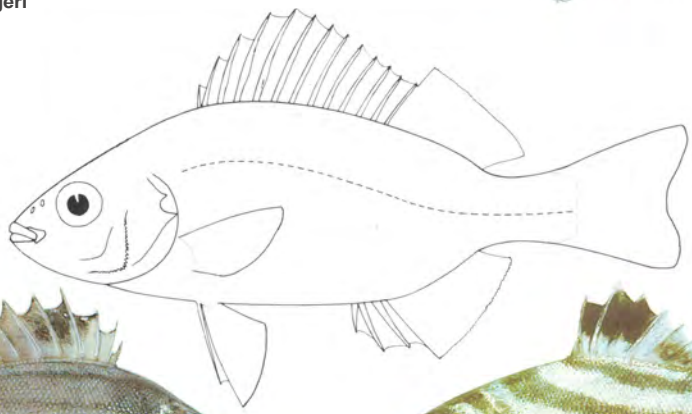
GLAUCOSOMATIDAE



Glaucosoma buergeri

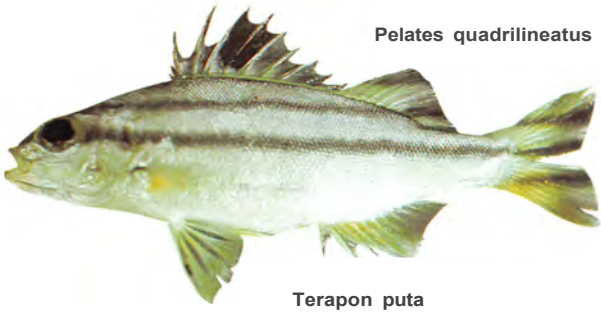
Glaucosoma magnificum

TERAPONTIDAE



Pelates quadrilineatus

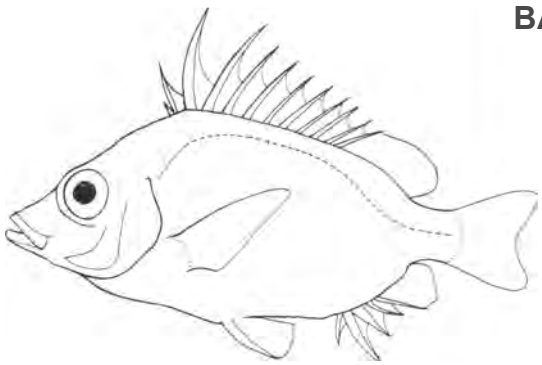
Terapon jarbua



Terapon puta

Terapon theraps

BANJOSIDAE



Banjos banjos brevispinis

GLAUCOSOMATIDAE

Western Australian Jewfish

Body fairly deep, robust and compressed. Head large and scaled, maxilla scaled; mouth large and oblique. Single dorsal fin with 8-12 spines increasing in height posteriorly; soft part of fin higher, with 12-14 rays; anal fin with 3 spines, third spine longest; caudal fin truncate, emarginate or lunate.

A single genus with three species; two obtained on the Survey.

REFERENCE: McKay, 2001b.

Glaucosoma buergeri

Silvery-grey or bronze body; dark bar from above eye to breast, fading with age; about 10 thin dark bands along body, also fading with age. Inside mouth and peritoneum black.
D VIII, 11-12. A III, 9. Lower GR 13-15. L. lat. 49-51. Tr above 12.
(voucher: 250 mm SL)

Glaucosoma magnificum

Some dorsal and anal fin rays, and caudal fin lobes produced into filaments. Silvery body; 3 vertical brown bands on head, fading with age: 1st through black-ringed eye, 2nd along edge of preopercle, 3rd to pectoral fin base. Inside mouth black, peritoneum brown.
D VIII, 14. A III, 12. Lower GR 18. L. lat. 46-48. Tr above 14-16.

TERAPONTIDAE

Terapon perches; Grunters - Kerong-kerong

Small to moderate perch-like fishes with oblong, compressed bodies. Upper jaw reaching beyond middle of eye; preopercular margin sharply serrated; 1 or 2 strong spines on operculum, the lower spine longest. Scales strongly ctenoid. Single dorsal fin with 11-14 strong spines, slightly notched from soft part of fin; anal fin with 3 spines. Caudal fin rounded, truncate or emarginate. Many species often have distinctive dark bands present on body and fins. These fishes often grunt when caught.

Worldwide about 15 genera, of which two were obtained on the Survey.

REFERENCE: Vari, 2001.

Pelates quadrilineatus

Large black blotch behind upper edge of gill opening; 6-8 straight brown stripes along body; black blotch in middle of spinous dorsal fin; caudal fin plain olive, not barred. Lower GR 20-27. L. lat. 66-75. Tr. above 9-12.
(voucher: 87 mm SL)

Terapon puta

Serrations on angle of preoperculum very large; scales small. Three or 4 thin straight brown stripes along body; large black blotch on spinous dorsal fin; caudal fin barred, 2 black bars on soft dorsal fin.
Lower GR 18-24. L. lat. 70-85. Tr. above 10-13.
(voucher: 100 mm SL)

Terapon jarbua

Three or 4 curved dark brown bands along body; large black blotch on spinous dorsal fin; 2 black bars on soft dorsal fin; caudal fin barred, each lobe black tipped.
Lower GR 12-15. L. lat. 70-85. Tr. above 14-16.
(voucher: 145 mm SL)

Terapon theraps

Scales moderate in size. Four straight brown bands along body; large black blotch on spinous dorsal fin and caudal fin with 5 bars.
Lower GR 14-17. Tr. above 6-8. L. lat. 46-56.
(voucher: 125 mm SL)

BANJOSIDAE

Banjosids;

Body fairly deep, compressed. Head profile steep; upper jaw nearly hidden by suborbital bone; no palatine teeth; no spine on hind margin of operculum. Scales present on cheek, but not on upper and front parts of head. Dorsal fin with 10 high, flattened spines, separated from soft part of fin by a deep notch, membrane between spines deeply emarginate; anal fin with 3 spines, the 2nd spine strongest and longest, ventral fin large, its base behind pectoral fin base; caudal fin slightly emarginate.

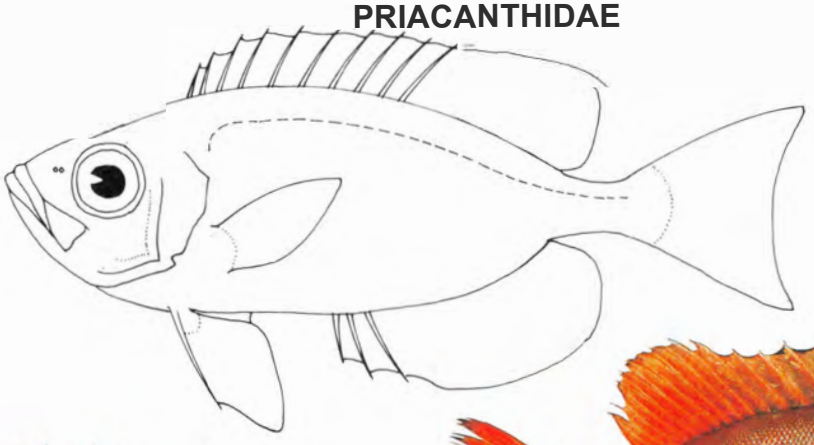
A single genus with three species and two subspecies.

REFERENCE: Matsunuma & Motomura, 2017

Banjos banjos brevispinis

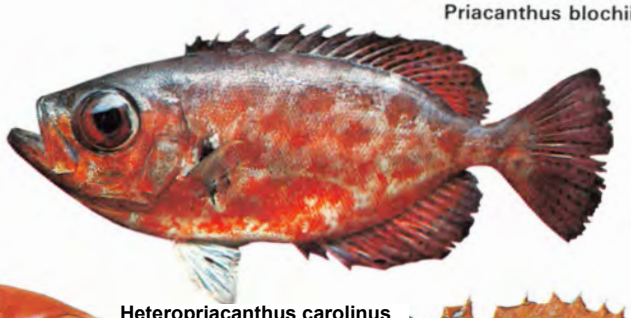
Head 33-39.6% SL; a short, weakly serrated spine at the preopercle angle; least interorbital width 5.8–8.1 (mean 6.8)% of SL; first dorsal-fin spine length 4.5–8.0 (6.1% of SL). Body brownish-green, several darker brown stripes along body, fading with age. Spinous dorsal membrane black or brown, fin tips white; ventral fins black; hind margin of caudal fin with 2 irregular bands of black and white.
D X, 12. A III, 7. L. lat. 48-51. Lower GR 14-16.
(voucher: 71 mm SL)

PRIACANTHIDAE



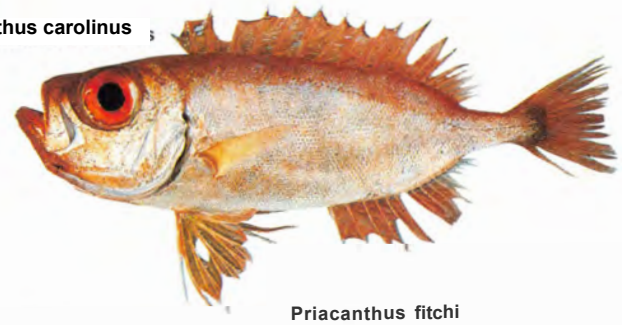
Priacanthus blochii

Cookeolus japonicus



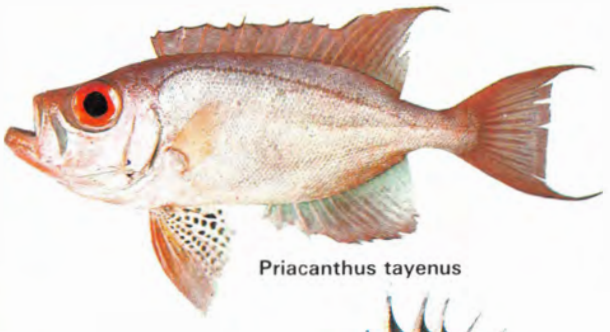
Heteropriacanthus carolinus

Priacanthus hamrur



Priacanthus fitchi

Priacanthus macracanthus



Priacanthus tayenus

Priacanthus saggitarius

Pristigenys niphonia

PRIACANTHIDAE

Bulls Eyes - Gora suangi; Serinding tembakau

Medium-sized fishes with oval to elongate body. A continuous dorsal fin; eyes very large; mouth large and oblique; preoperculum with a more or less developed spine. Dorsal fin with 10 spines and 11-14 rays; anal fin with 3 spines and 12-15 rays; pectoral fin with 16-18 rays. Innermost pectoral fin ray is joined to body by membrane.

Four genera in the family and members of all obtained on the Survey; they can be distinguished as follows:

1. Body profile very deep and broadly ovate, 1.7-1.9 in SL; A III, 10-11 . . . . . **Pristigenys**
1a. Body profile less deep, 2-3.1 in SL; A III, 13-16 2
2. Ventral fin very long, reaching at least onto anal fin . . . . . **Cookeolus**
2a Ventral fin shorter, at most equal to HL 3
3. Posterior portion of preoperculum scaleless; small dark specks om membranes of unpaired fins . . . **Heteropriacanthus**
3a Posterior portion of preoperculum with scales; membranes of unpaired fins plain or with large spots . **Priacanthus**

REFERENCES: Starnes, 1988; Starnes, 1999; Fernandez-Silva & Ho, 2017; Iwatsuki, Matsuda, Starnes, Nakabo & Yoshino, 2012.

Cookeolus japonicus

Body deep, 2-3.1 in SL. Preopercular spine well developed, short and broad in adults, long and slender in juveniles. Membranes between spinous dorsal and anal fins deeply incised. Ventral fin conspicuously enlarged, much longer than head. Ventral, spinous dorsal and edge of caudal fin blackish, other fins red.
(voucher: 152 mm SL)

Heteropriacanthus carolinus

Preopercular spine strong, flat and without scales. First dorsal spine with spinules anteriorly. Dorsal fin low; soft dorsal and anal fins rounded, caudal fin truncate or convex. Body dark red with irregular lighter blotches variably situated on body. Dark spots on soft dorsal, anal fins, and caudal fin. Ventral fin sometimes pale, unpaired fins dark.
Lateral scale rows 81–96
(voucher: 190 mm SL)

Priacanthus macracanthus

Preopercular spine long and narrow. Caudal fin truncate. Body silvery-red to red, fins pinkish to red; dorsal, anal and ventral fins with horizontal rows of dusky yellow-green spots, no black blotch at base of ventral fin, red caudal fin with black margin.
(voucher: 200 mm SL)

Priacanthus saggitarius

Preopercular spine short and broad; caudal fin emarginate or truncate; soft dorsal and anal fins elevated, rounded. Tenth dorsal spine about twice length of 2nd dorsal spine. Body and all fins red except for black membrane between the first and second dorsal fin spines; a distinct dark spot at base of ventral fin.
Lateral scale rows 67-74.
(voucher: 200 mm SL)

Pristigenys niphonia

Body deep, 1.5-2 in SL; spinous dorsal prominent with 4th and 5th spines longest; caudal fin truncate to double-emarginate (adults). Skin very rough to touch. Body pinkish-red; 5 white vertical bands on sides of body in young, fading with age, bands about half width of pupil. Dark membrane to spinous dorsal fin.
Total GR on first arch 27-30.
(voucher: 60 mm SL)

Priacanthus blochii

Preopercular spine very short and broad in adults. Soft dorsal and anal fins rounded, caudal fin convex. Tenth dorsal fin spine 1.5-1.7 longer than 2nd dorsal spine. Body and all fins uniformly red; a distinct black spot at base of ventral fin.
(voucher: 200 mm SL)

Priacanthus hamrur

Preopercular spine short and broad. Caudal fin concave to lunate. Ventral fin red with a dark spot at base. Body and fins mostly uniformly red. Soft dorsal and anal fins with dark or black margins and faint rows of red-orange spots. Caudal fin red with a black edge.
A III, 15-16. Total GR on first arch 24-26.
(voucher: 190 mm SL)

Priacanthus tayenus

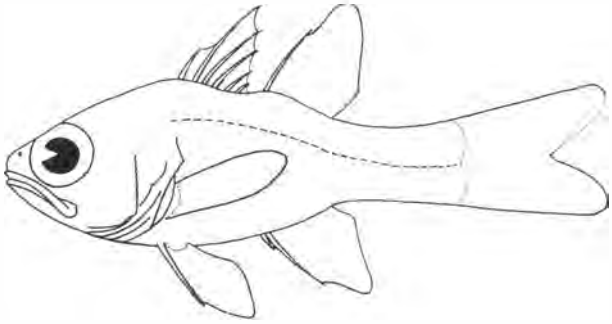
Preopercular spine long and slender. Fourth and 5th dorsal rays produced in young specimen as short filaments; soft dorsal and anal fins with pointed lobes; caudal fin lunate. Body silvery red. Inner ventral fin with numerous purplish-brown large and smaller blotches.
D X, 11-13.
(voucher: 185 mm SL)

Priacanthus fitchi

Preopercular spine long and narrow; caudal fin truncate; body somewhat tapering towards caudal fin. Body silvery orange-red, fins orange; the last 4-5 rays in soft dorsal and anal fins clearly white; no black blotch at base of ventral fin.
(voucher: 145 mm SL)

APOGONIDAE

Fig 1.



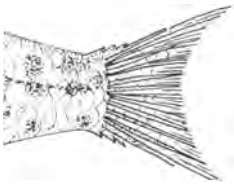


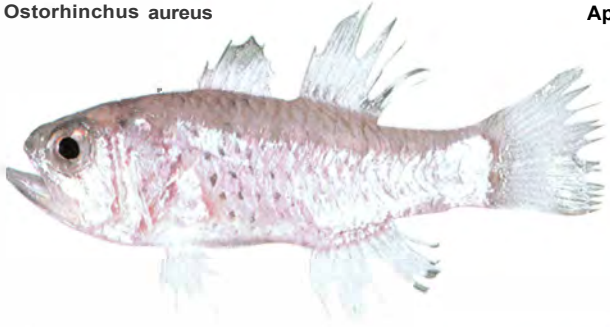
Fig 2.

Ozichthys albimaculosus

Ostorhinchus apogonoides

Ostorhinchus aureus

Apogonichthyoides brevicaudatus



Jaydia carinata

Fibramia lateralis

Apogonichthyoides timorensis

Jaydia smithi

Ostorhinchus hartzfeldii

Ostorhinchus hoevenii

APOGONIDAE

Cardinalfishes - Serinding; Sankarang

Small compressed fishes with a large mouth and head. Teeth usually small and fine, sometimes enlarged as canines; preoperculum double edged; operculum with a pointed flap. Scales usually ctenoid. Two separate dorsal fins, first with 6 -9 strong spines, second with 1 spine and 8-11 rays; anal fin with 2 spines and 8-17 rays. Many species incubate their eggs in their mouth.

There are 40 genera and 357 species in this diverse family; members of 12 genera were obtained on the Survey.

REFERENCES: Baldwin & Johnson, 1999; Fraser, 2006; Fraser & Allen, 2011; Fraser & Randall, 2011; Gon, 1993; Gon & Allen, 2012; Gon, 1997; Mabuchi, Fraser, Song, Azuma & Nishida, 2014; Randall, Lachner & Fraser, 1985; Yoshida, Kawai & Motomura, 2019; Yoshida & Motomura, 2018.

Ozichthys albimaculosus

Preopercular ridge smooth; caudal fin rounded. Head mottled and checked with brown, rows of large distinct yellow or cream spots along body. Brown and yellow checks or yellow spots cover fins; large black yellow-rimmed ocellus on soft dorsal and anal fins near bases.
Seven dorsal fin spines. P 17-19.
(voucher: 67 mm SL)

Ostorhinchus aureus

Preopercular ridge smooth. Head dark brownish-red with thin blue lines from snout to operculum; broad black band around caudal peduncle. Red tips on soft dorsal, anal and caudal fin lobes.
Seven dorsal fin spines. P 13-14.
(voucher: 86 mm SL)

Jaydia carinata

Preopercular margin and ridge entire or crenulate. Caudal fin truncate or rounded. Vertical rows of dark brown checks on side near pectoral fin base, sometimes also along lateral line; large black ocellus at base of last dorsal fin rays (may be rimmed yellow) and black edge to anal fin. Dark brown over outer part of first dorsal fin.
Seven dorsal fin spines. P 15-17. Total formed GR 10-11.
(voucher: 70 mm SL)

Apogonichthyoides timorensis

Eye large, 2.8 in HL. Caudal fin truncate; preopercular ridge smooth, edge truncate. Black band from eye to preopercular angle. Two dark bands across body from base of 1st dorsal and soft dorsal fins, 3rd dark band across caudal peduncle near tail base. Outer part of 1st dorsal fin dark brown; ventral fin pale.
Seven dorsal fin spines. Total formed GR 8-9.
(voucher: 37 mm SL)

Ostorhinchus hartzfeldii

Preoperculum serrated. Broad brown or orange-gold bands along body; pearly blue stripe from head along dorsal profile to tail base, shorter pearly stripes from head ending on mid-body. Distinct black spot at caudal fin base, at least equal to pupil size.
Seven dorsal fin spines. Total formed GR 15-17.

Ostorhinchus apogonoides

Strong curved teeth on sides of both jaws. Caudal fin emarginate, lobes pointed. Snout black or brown; two blue lines from snout through eye to opercular edge. Each gill raker with dusky stripe. Front edge or outer part of first dorsal fin black and narrow black edge to posterior fin margin.
Seven dorsal fin spines. P 14.
(voucher: 80 mm SL)

Apogonoichthyoides brevicaudatus

Preopercular ridge, margin and suborbital edge all serrated. Caudal fin truncate. Seven to 8 dark brown undulating bands from head to tail base; large black, white-washed ocellus sometimes may be present near base of soft dorsal fin and also anal fin, ventral fin dark brown; mouth cavity and gill rakers pale.
Seven dorsal fin spines. P 15-16.
(voucher: 85 mm SL)

Fibramia lateralis

Preopercular ridge smooth, margin serrated. Six dorsal spines. Head and body orange-violet, iridescent over head; diffuse brown bar behind operculum. This black stripe from operculum to tail base ending near a small distinct black spot on caudal peduncle. Front edge of first dorsal fin dark brown; narrow dark band along lower half of soft dorsal and anal fins.
Six dorsal spines.
(voucher: 64 mm SL)

Jaydia smithi

Caudal fin rounded. First dorsal black over outer half; black margin on soft dorsal, anal and caudal fins; black line along mid-height of soft dorsal and anal fins. Black line from eye to preoperculum angle; underside of head and body silvery, densely stippled black; mouth cavity and gill rakers pale.
Seven dorsal spines. Total formed GR 13-17.
(voucher: 80 mm SL)

Ostorhinchus hoevenii

Preopercular ridge smooth; caudal fin slightly emarginate. Body dusky green above, iridescent below. Large black patch on membrane near tips of 3rd and 4th dorsal fin spines and brown spots on fin membrane posteriorly.
Seven dorsal fin spines. P. 12.
(voucher: 51 mm SL)

Ostorhinchus sp 1.

Ostorhinchus moluccensis

Apogonichthyoides atripes

Ostorhinchus nigrocincta

Ostorhinchus novemfasciatus

Jaydia poeciloptera

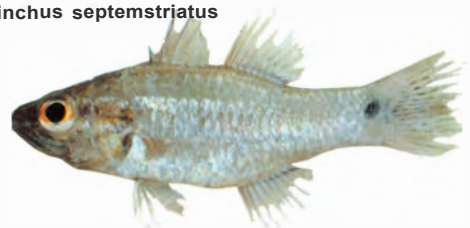
Ostorhinchus fasciatus

Ostorhinchus taeniophorus

Ostorhinchus semilineatus

Ostorhinchus septemstriatus

Ostorhinchus sp. 2



Ostorhinchus chrysopomus

Taeniamia fucata

Cheilodipterus isostigma

Cheilodipterus macrodon

Gymnapogon sagittarius

Ostorhinchus sp 1

Rays of soft dorsal and anal fins long; caudal fin emarginate. Head and body violet with gold and silver sheen, a broad diffuse brown band crossing body from first dorsal base to ventral fin; ventral fin black. Black spot behind bases of soft dorsal and anal fins. Gill rakers and mouth cavity charcoal.
Seven dorsal fin spines. P 15. Total formed GR 17-18.
(voucher: 80 mm SL)

Apogonichthyoides atripes

Preopercular ridge smooth; caudal fin truncate. Large black spot ringed by yellow on side above pectoral fin base; caudal fin pale yellow.
Seven dorsal fin spines. Total formed GR 10-12.
(voucher: 50 mm SL)

Ostorhinchus novemfasciatus

Body width 6.1-6.8 in SL. Five dark brown bands along body from head: first and 5th along body profiles; 2nd from above eye to tail, 3rd through eye to tail, 4th through pectoral fin base to tail. Second, 3rd and 4th bands continue onto caudal fin, 2nd and 4th converging toward 3rd band well beyond caudal fin base. Caudal spot never present. First dorsal and ventral fins transparent.
Seven dorsal fin spines. Total formed GR 19-22.
(voucher: 54 mm SL)

Ostorhinchus fasciatus

Two dark bands along body from head: first from snout above eye to upper caudal peduncle; 2nd through eye to tail and continuing across caudal fin to its margin; 2nd band often over-shaded deep orange or gold.
Seven dorsal fin spines. Total formed GR 14-16.
(voucher: 54 mm SL)

Ostorhinchus semilineatus

Preopercular margin serrated, ridge smooth. Dark brown horizontal stripe from snout to below soft dorsal fin (may be faded posteriorly) and a thinner shorter stripe from above eye. Large black spot at caudal fin base; tip of first dorsal fin black.
Seven dorsal fin spines. Total formed GR 18-19.
(voucher: 70 mm SL)

Ostorhinchus sp 2

Preopercular ridge and margin serrated. Brownish orange band from snout through eye fading posteriorly; second stripe from above eye to below soft dorsal fin. Small conspicuous black spot at base of caudal fin.
Seven dorsal fin spines. Total formed GR 19-21.,

Taeniamia fucata

Yellow band through eye; many vertical narrow orange lines across body. Large diffuse black spot at base of caudal fin.
A II,15-18.
(voucher: ? mm SL)

Cheilodipterus macrodon

About 8 brown horizontal stripes from head to tail; dark brown band from pectoral fin to base to ventral fin base; broad indistinct black band around caudal peduncle at caudal fin base, upper and lower margins of caudal fin black. Soft dorsal, anal and caudal fins red, outer part of first dorsal black.
(voucher: 120 mm SL)

Ostorhinchus moluccensis

Caudal fin emarginate, lobes rounded; preopercular margin finely serrated. Snout dark brown; two broad blue bands from snout through eye to edge of operculum, becoming pale yellow as continue along body. White spot on body posterior to base of soft dorsal fin. Dorsal and caudal fins yellow and iridescent blue; outer part of first dorsal fin black. Gill rakers pale.
Seven dorsal fin spines. P 14.
(voucher: 57 mm SL)

Ostorhinchus nigrocincta

Preopercular ridge and margin finely serrated. Dark brown band from snout through eye to edge of operculum; narrow black band around caudal peduncle at tail base; front margin of first dorsal dark brown; distinct black band near bases of soft dorsal and anal fins; mouth cavity dusky.
Seven dorsal fin spines.
(voucher: 61 mm SL)

Jaydia poeciloptera

Preopercular ridge and margin entire; caudal fin truncate. Outer part of first dorsal fin black; 2-3 irregular brown bands along soft dorsal fin; caudal fin dark. Dark line from eye to preopercular angle; mouth cavity and gill rakers charcoal; 9-10 brown vertical bands on body.
Seven dorsal fin spines. Total formed GR 11-12.

Ostorhinchus taeniophorus

Body width 4.9-6.8 in SL. Five dark brown bands along body from head: first and 5th along body profiles, 2nd from snout above eye to tail, 3rd through eye to caudal fin base where it may form a diffuse oblong spot, 4th through pectoral fin base to tail; middle 3 bands extend onto caudal fin. Operculum black-edged near pectoral fin. First dorsal fin dusky, tipped black; ventral fin margin black.
Seven dorsal fin spines. Total formed GR 12-13.
(voucher: 46 mm SL)

Ostorhinchus septemstriatus

Caudal fin truncate or slightly emarginate. Black line from snout along head midline to first dorsal fin origin; 2nd black line from nape to below first dorsal fin bases; 3rd black line from snout along back to upper caudal fin base; 4th and most prominent band horizontal: from snout to mid-caudal fin base and across fin to margin.
Seven dorsal fin spines. P 15-16.
(voucher: 53 mm SL)

Ostorhinchus chrysopomus

Eye 3.4 in HL; 3rd dorsal spine strong. Preopercular margin serrated, ridge smooth or roughened. Broad dusky orange band along head. Large black spot on caudal peduncle mostly above lateral line, centre of caudal fin checked black. Brown line basally on soft dorsal and anal fins. Dark streak along each gill raker.
Seven dorsal fin spines. Total formed GR 14.
(voucher: 70 mm SL)

Cheilodipterus isostigma

Body slender. Five thin black stripes along body from head to caudal peduncle. Conspicuous black spot at caudal fin base surrounded by yellow.
(voucher: 71 mm SL)

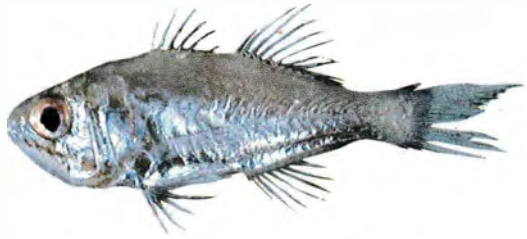
Gymnapogon sagittarius

Caudal fin transparent and moderately forked; head smooth.
D VI; I, 9. A II, 8. 16 pectoral fin rays.
(voucher: 49 mm SL)

Pseudamia gelatinosa

Rhabdamia gracilis

Siphamia fuscolineata

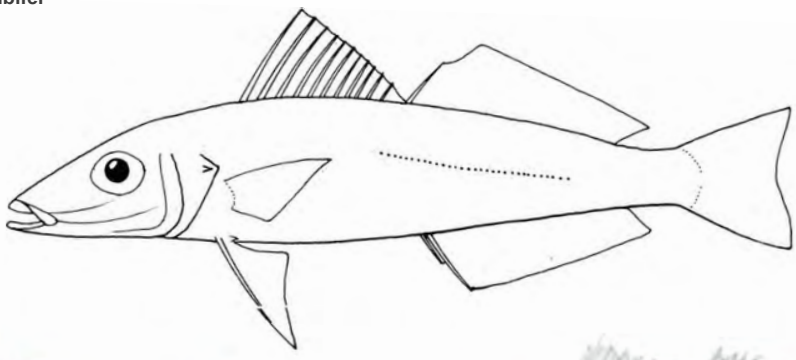


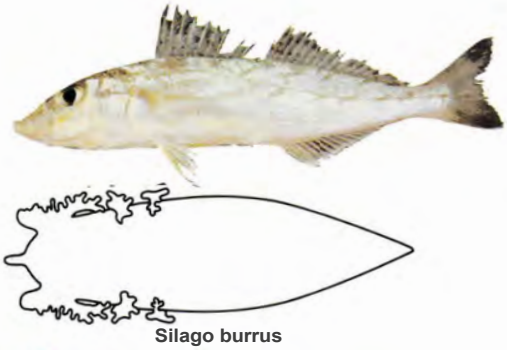
Siphamia roseigaster

Siphamia tubifer

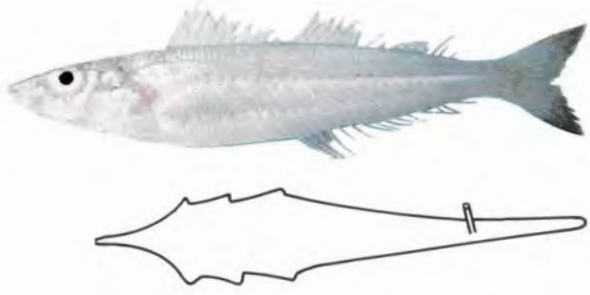
Sphaeramia orbicularis

SILLAGINIDAE

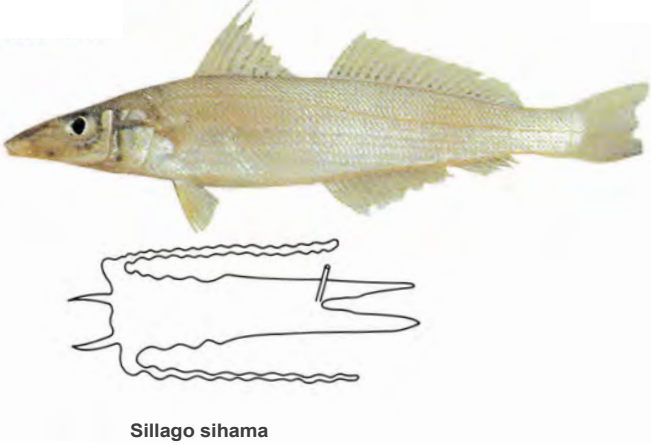




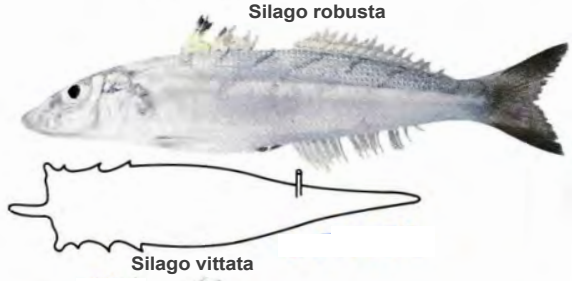
Silago burrus



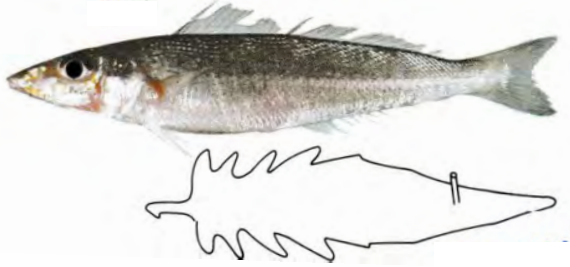
Silago robusta



Sillago sihama



Silago vittata



Silago ingenuua

Pseudamia gelatinosa

Caudal fin rounded. Head and body densely spotted dark brown or black, spots arranged into indistinct stripes along body. Caudal peduncle at caudal fin base black, black extending onto fin.
Six dorsal fin spines. L. lat. about 36.
(voucher: 79 mm SL)

Siphamia fuscolineata

Three broad dark brown bands along body, median one most prominent; body along base of both dorsal fins black. All fins white and translucent.
D VII; I, 9. A II, 8. P 13-15.
(voucher: 40 mm SL)

Siphamia tubifer

Body silvery brown; snout and body with dark brown spots; median body band tan; fins dusky.
D VII; I, 9. A II, 8. P 15-16.
(voucher: 56 mm SL)

Rhabdamia gracilis

Body translucent pink or yellow, sometimes with fine black stripe from operculum to tip of pectoral fin.
A II, 12-13. Lower GR 21.
(voucher: 50 mm SL)

Siphamia roseigaster

Head and body pale yellow or pink without bands or spotting. Fins rosy, dorsal fin margins dusky.
D VI; I, 10; A II, 9-10

Sphaeramia orbicularis

Body depth more than half body length. Dark band across mid-length of body from first dorsal fin base to belly and large dark spots posterior to it.
A II, 9.
(voucher: 49 mm SL)

SILLAGINIDAE

Whiting - Besot; Rejung

Body moderately elongate and tapered posteriorly. Head conical, mouth small; a single small opercular spine. Cycloid scales on head, body scales small and ctenoid. Dorsal fin divided by deep notch separating a spinous part of 9-12 slender spines from second longer part of one spine and 16 -26 rays; two weak spines at beginning of long-based anal fin; ventral fin base about opposite pectoral fin base; caudal fin truncate or slightly emarginate.

Swim bladder drawings and diagnoses partly prepared by R.J. McKay.

Three genera in the family: one genus and seven species obtained on the Survey.

REFERENCE: McKay, 1985; McKay, 1999.

Sillago burrus

Swim bladder as in drawing. Conspicuous dark blotch on pectoral fin base; 7-9 oblique irregular dark blotches along upper sides.
D_2 18-21. A_2 19-20. L. lat. 69-76.
(voucher: 205 mm SL)

Sillago sihama

Swim bladder as in drawing. Body plain silvery yellow or fawn; dorsal and caudal fins may have dark markings.
D_2 20-23. A_2 21-23. L. lat. 66-72.
(voucher: 162 mm SL)

Sillago vittata

Swim bladder as in drawing. Conspicuous dark blotch on pectoral fin base: 9-11 narrow oblique brown streaks on upper sides. Black patches on outer spinous dorsal fin and both caudal fin lobes.
D_2 17-19. A_2 16-18. L. lat. 65-70.
(voucher: 80 mm SL)

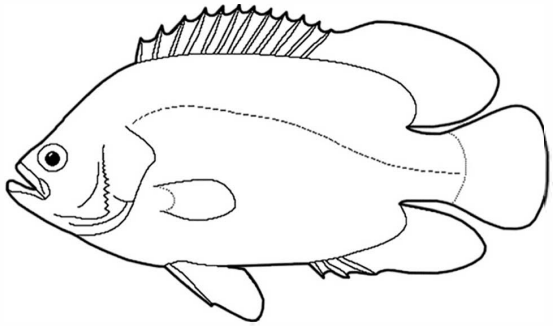
Sillago robusta

Swim bladder as in drawing. Lower caudal fin black. Sharp edge to front base of first dorsal fin spine topped by dark brown spot.
D_2 16-18. A_2 16-19. L. lat. 64-70.
(voucher: 100 mm SL)

Sillago ingenuua

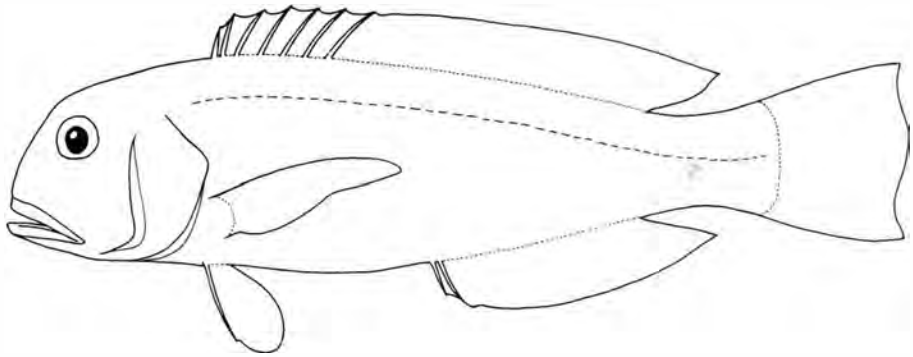
Cheek scales ctenoid; eye 4-5 in HL. Swim bladder as in drawing. Silvery-yellow, fine dark lines on scale edges of back; no markings on body and fins. Snout dusky.
D_2 17. A_2 17+18. L. lat. more than 65.
(voucher: 135 mm SL)

LOBOTIDAE



Hapalogenys dampieriensis

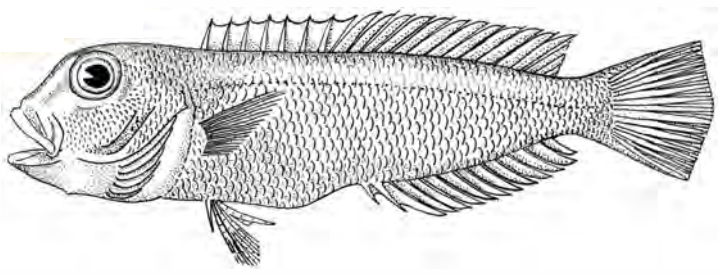
LATILIDAE



Branchiostegus sawakinensis

Branchiostegus australiensis

Branchiostegus gloerfelti



Branchiostegus australiensis drawing of Holotype

LOBOTIDAE

Tripletails; velvetchins

Body compressed, elevated, nape humped. Head short, preoperculum strongly serrate; 1-2 flat spines on upper operculum. Jaw teeth small and conical, no teeth on palate; chin with 6-10 pores and in some species, low and soft papillae or villi. Eleven to 13 spines in dorsal fin, 13-16 soft rays; anal with 3 spines and 8-11 soft rays; antrorse spine hidden by skin precedes the spinous dorsal fin. Caudal fin rounded or almost truncate. Scales ctenoid, rough to touch; 40-70 scales in the lateral line.

Three genera (*Datnioides* Bleeker, *Lobotes* Cuvier, *Hapalogenys* Richardson). One species in the survey area.

REFERENCES: Gill & Leis, 2019; Iwatsuki & Russell, 2006.

Hapalogenys dampieriensis

No scales on maxilla; cluster of very short papillae under symphysis of lower lip; 2nd anal spine very long, about half of HL; ventral fin tip extending just past anus but not reaching to base of 1st anal fin spine. Body rosy brown above, silvery white below; 4-5 well-spaced brown horizontal bands along body originating on nape and head, 3rd to 5th bands often faded, generally narrower than pupil diameter. Fins plain cream or dusky, soft dorsal and anal truncate.
D XI, 13-14. L. lat. 41-45
(voucher: 270 mm SL)

LATILIDAE (= Branchiostegidae)

Deepwater tilefishes -

Body elongate-oval and robust. Head deep and blunt, a predorsal ridge always present, sometimes simply as a raised flap of thick tissue. Jaws slightly oblique, with canine teeth and patches of villiform teeth anteriorly. Preoperculum serrated or smooth on upper limb; opercular spine soft and blunt. Scales on head nearly all cycloid; ctenoid on body. Dorsal and anal fins long-based and continuous; dorsal fin with 6-8 spines, 14-16 rays; anal fin with 2 spines, 11-13 rays. Ventral fin base behind or below pectoral fin base; caudal fin double emarginate, truncate or rounded.

Tilefish generally are found in deep waters, 90 to 500 m depth. They inhabit self-constructed burrows in muddy ground, at around 200 m depths.

Three genera in the family, representatives of one were obtained on Survey.

REFERENCES: Dooley, 1999; Dooley & Kailola, 1988; Dooley & Iwatsuki, 2012.

Branchiostegus sawakinensis

Caudal fin ‘double emarginate’. Usually dark brown or black central spots on scales in 6 or 7 rows between lateral line and pectoral fin base; median predorsal ridge dark brown; a black spot basally on membrane between each dorsal fin element; 2 yellow lines along median caudal fin rays, lower caudal lobe grey with yellow spots.
D VI-VII, 15-16. A II, 12. Total GR 17-21; Tr below 17-20. L. lat. 67-72.
(voucher: 386 mm SL)

Branchiostegus gloerfelti

Caudal fin truncate overall. Jaws reach past a vertical line through front of eye; vertical fins high, 12-13% SL. Median predorsal ridge pale yellow. Body white or yellowish, orange on top of head and upper body; body crossed by about 20 faint violet-brown bars. Operculum dark violet. Vertical fins pale yellow, pectoral and ventral fins orange, caudal fin membrane pale yellow, upper and lower margins dark, grey stripe along middle rays.
D VII, 14-15. A II, 12. Tr below 17. L. lat. 48.

Branchiostegus australiensis

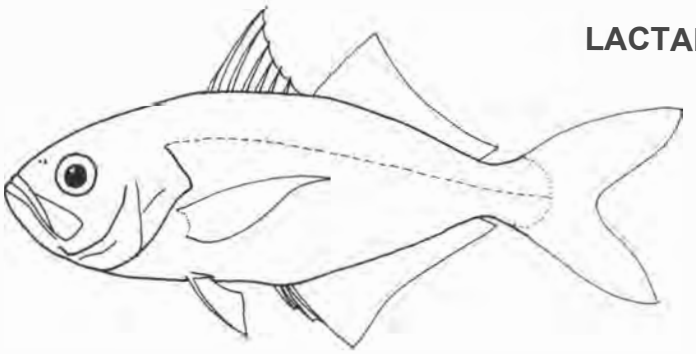
Caudal fin margin ‘double-emarginate’, Jaws reach to below front of eye; preoperculum not indented above angle; Median predorsal ridge dark brown; head dusky orange with snout, top of head and upper body either red or violet, sides and belly silvery white; sometimes up to 20 violet, curved bands across back. Dark blotch on operculum, 2 silver lines from eye across suborbital to upper jaw; unpaired fins clear except dorsal fin with orange blotches basally and thin yellow margin; black upper margin on pectoral and ventral fins. Caudal fin yellow with 2 violet-grey bands along median rays.
D VII, 15. A II, 12. Total GR 22. Tr below 23. L. lat. 48.

MALACANTHIDAE

Malacanthus brevirostris

Malacanthus latovittatus

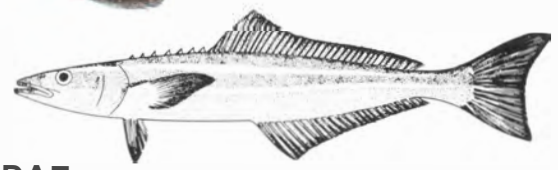
LACTARIIDAE



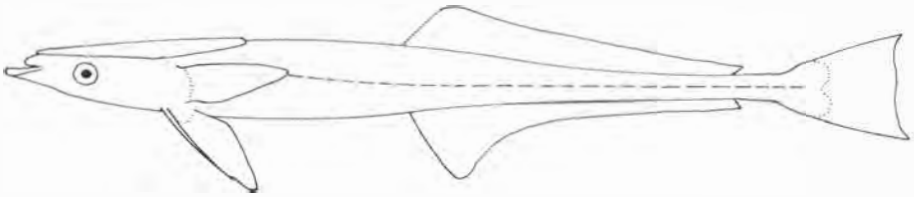
Lactarius lactarius

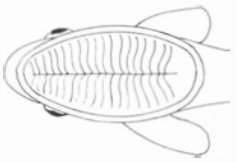
RACHYCENTRIDAE

Rachycentron canadum



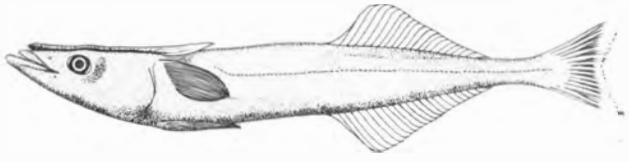
ECHENEIDIDAE





Sucker disc

Echeneis naucrates



Remora remora drawing of preserved specimen

MALACANTHIDAE

Sand tilefishes, blanquillos -

Body elongate and fusiform; snout blunt or rounded. Jaws equal, slightly oblique. Preoperculum serrated or smooth, sometimes with a large spine at angle; operculum with a single, sharp spine. Jaws equal, slightly oblique. Scales on head mostly cycloid, body scales ctenoid. Dorsal and anal fins long and continuous: dorsal with 3-10, and 13-55 rays; anal fin with one or 2 spines, 12-55 rays (more numerous fin elements in Malacanthus spp). Caudal fin falcate with rounded, pointed or elongate (upper) lobes, or truncate.

The shallow water sand tilefishes inhabit 5-100 m depths. They live in self-constructed burrows in sand or rubble bottom.

The family comprises two genera and about 16 nominal species; two species of one genus were collected on the Survey.

REFERENCES: Dooley, 1999; Dooley & Iwatsuki, 2012

Malacanthus brevirostris

Snout short, 2.7-3.4 in HL. Upper head and body pale olive-green; two broad black curved stripes along caudal fin.
D I-IV, 52-60 (usually II, 57). A I, 46-55 (usually I, 51). Total GR, first arch 9-20 (usually 15)
(voucher: ? mm SL)

Malacanthus latovittatus

Snout long, 2.1-2.7 in HL. Head bluish, body olive to violet-blue above; broad black or blue-black band from head to hind caudal fin margin; small white patch on hind lower caudal fin.
D III-IV, 43-47. A I, 37-40. Total GR, first arch 6-14 (usually 9).
(voucher: 225 mm SL)

LACTARIIDAE

False trevallies - Ikan susu

Body moderately deep, compressed. Mouth large, oblique, with canine-like teeth at front of both jaws. Scales on body large, cycloid, easily lost; small scales on soft dorsal and anal fins. Two dorsal fins, the first with 7 or 8 spines, separated from the second fin; anal fin as long as second dorsal fin; caudal fin deeply forked. A single genus with one species.

REFERENCE: Leis, 1999.

Lactarius lactarius

Chin prominent; hind border of operculum pointed. No scutes at end of lateral line; caudal fin forked. Body silvery blue-grey; black blotch on upper operculum.
D VII-VIII; I, 20-22. A III, 25-28.
(voucher: 154 mm SL)

RACHYCENTRIDAE

Cobias - Gabus laut

Body elongate, slender; head broad, depressed, mouth wide. Scales small, embedded in thick skin; no keel or scutes at base of tail. Dorsal fin long, preceded by 6-9 short and broad spines, separate from each other and depressible; anal fin moderately long; caudal fin emarginate.

A single genus and species known.

REFERENCE: Collette, 1999.

Rachycentron canadum

Body above dark brown, pale yellow on lower sides. Two narrow silvery or pale bands along body, fading with age; tips of soft dorsal and anal fins and caudal fin lobes usually white.
D VI-IX, 26-33. A II-III, 23-25.
(voucher: ? mm SL)

ECHENEIDAE

Remoras - Ikan gemi

Body usually elongate, slender (rather stout in some); head depressed. Lower jaw projecting well beyond upper jaw; no opercular spines. Small scales on body. Large oval-shaped sucking disc on top of head, with paired transverse ridges (this is the modified first dorsal fin), second dorsal fin long-based, without spines, beginning well behind midpoint of body; anal fin opposite and similar. The sucker is used to attach to larger fishes, turtles and sea mammals.

Total genera three, of which two were obtained on the Survey area (two species).

REFERENCE: Collette, 1999.

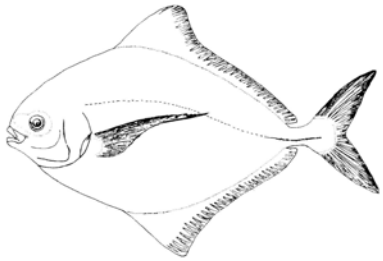
Echeneis naucrates

Body elongate, depth 9-14 times in SL. Sucker disc with 21-28 transverse ridges. Pectoral fin pointed; caudal fin rounded. Broad black band from snout to tail; caudal, dorsal and anal fin tips white in young.
(voucher: 359 mm SL)

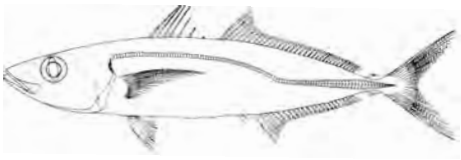
Remora remora

Body stout, depth 5-8 times in SL. Sucker disc with 15-20 transverse ridges, disc not extending beyond tip of pectoral fin; pectoral fin rounded. Body plain brown or grey.
D 21-27. Total GR 28-37.
(voucher: 95 mm SL)

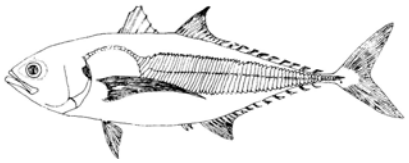
CARANGIDAE



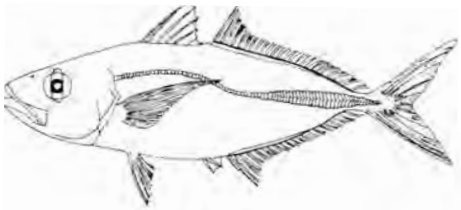
PARASTROMATEUS



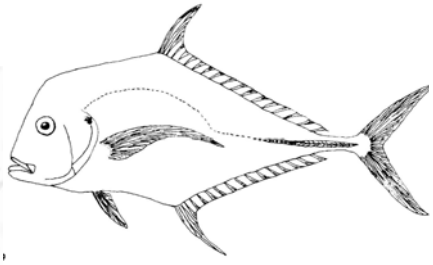
DECAPTERUS



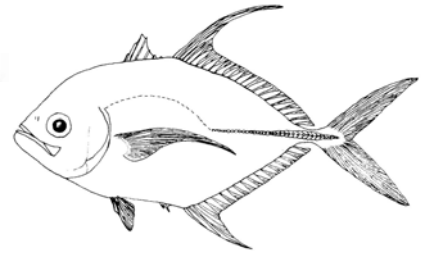
MEGALASPIS



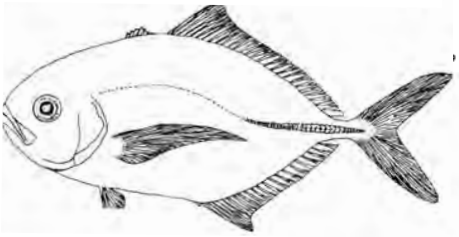
SELAR



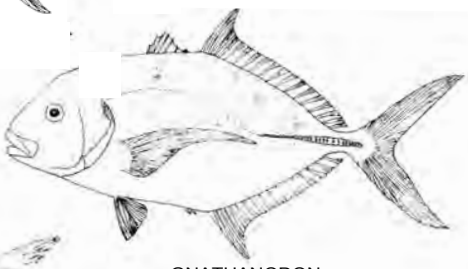
ALECTIS / SCYRIS



AROPUS

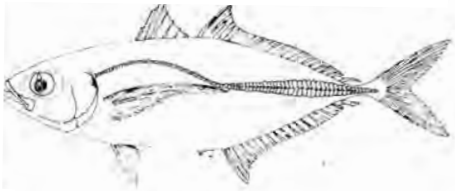


URASPIS

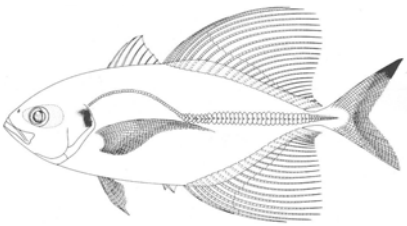


GNATHANODON

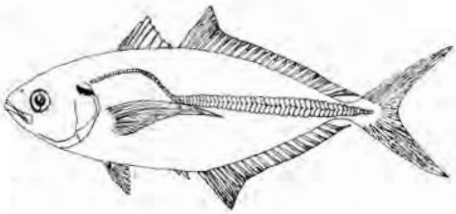
SELAROIDES



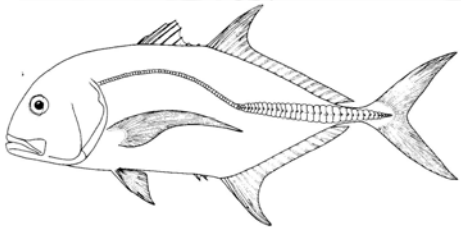
ATULE



PANTOLABUS

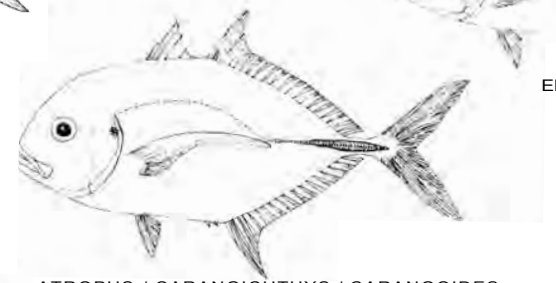


ALEPES



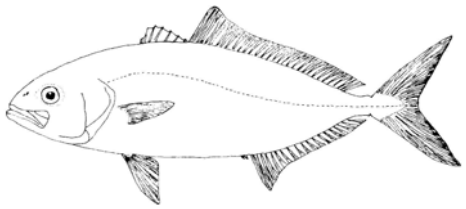
CARANX

ELAGATIS

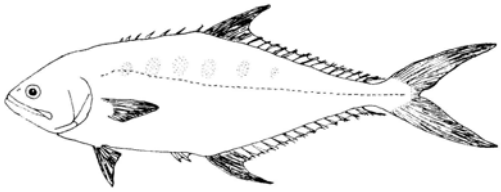


ATROPUS / CARANGICHTHYS / CARANGOIDES
CRATEROGNATHUS / FERDAUIA / FLAVICARANX /
KAIWARINUS / PLATYCARANX / TURRUM

SERIOLINA



SERIOLA



SCOMBEROIDES

CARANGIDAE

Trevallies, Jacks, Scads, Runners, Pilot Fishes - Kuweh, Angara, Selar

A family with extremely variable characters, but all sharing a dorsal fin separated into two parts, first with 7-8 spines (spines may be reduced or completely embedded in the skin), second with 1 spine and 18-43 soft rays. Anal fin with anterior first 1 (*Elagatis* and *Seriolina*) or 2 spines separated from rest of fin by a gap and may become embedded in adults, followed by 1 spine and 15-36 soft rays. Caudal fin always forked. Gill opening large, gill membranes not united. Scales small and cycloid but strongly lanceolate to needle-like in some species. Lateral line arched or elevated anteriorly, straight posteriorly.
Body form ranges from elongate and rounded to deep and strongly compressed; caudal peduncle sometimes with 1 or 2 keels, or dorsal and ventral grooves; snout pointed to blunt; eye small to large; adipose eyelid absent or strongly developed; teeth in rows or bands, either absent or small to minute or enlarged and caniniform; scutes often present on posterior part of lateral line. Colour in general bluish-green on back, silvery below (some species almost completely silvery); bars and spots present in many species.

Representatives of 25 genera were caught during the Survey.

Note. The genus *Carangoides* Bleeker and its related genera (*Alectis* Rafinesque, *Atropus* Oken, *Parastromateus* Bleeker, *Selene* Lacepède, *Ulua* Jordan & Snyder, and *Uraspis* Bleeker) have recently been revised by Kimura et al, 2022. Based on both molecular-phylogenetic results and morphological analyses these 7 genera have been split into 16 genera, of which 10 are new and/or resurrected. As we have not been able to rearrange this family to reflect the changes, we have opted to use the new names first and the 'original' name second in parenthesis.

REFERENCE: Smith-Vaniz, 1999; Kimura, S., S. Takeuchi and T. Yadome 2022.

Synopsis of Genera obtained during the Survey

Ventral fin (absent in adults) distinctly before pectoral fin base . . . . . Parastromateus
A single one-rayed detached finlet behind soft dorsal and anal fins . . . . . Decapterus
Several detached finlets behind soft dorsal and anal fins. . . . . .Megalaspis
Shoulder girdle margin with a furrow ventrally and a large papilla immediately above . . . . . Selar
Body appears to be completely naked, scales (when present) embedded in skin . . . .Alectis & Scyris
Tongue, roof and floor of mouth brilliant white, rest of mouth dark. . . . . Uraspis
No teeth in upper jaw, black opercular spot. Posterior adipose eyelid well-developed . . . . . Selaroides
No teeth in upper jaw, no opercular spot. Lips "fleshy", posterior adipose eyelid poorly developed. . . . . Gnathanodon
Adipose eyelid covers all but central slit of eye, last dorsal and anal ray finlet-like not separated from fin . . . . . Atule
Both jaws with a single row of comb-like teeth, posterior adipose eyelid well-developed . . . . . Alepes
Outer jaw with outer series of canines and an inner band of fine teeth, lower jaw with a single row of teeth . . . . . Caranx
Naked thoracic area very wide, snout short, wide protrusion of upper-jaw symphysis . . . . . .Atropus
Conical teeth on both jaws, whole straight part of lateral line usually covered by scutes . . . . . Carangichthys
Breast completely scaly, second dorsal fin higher than the first, vomerine tooth patch triangular . . . . . .Craterognathus
Naked thoracic area reaching to ventral fin insertion but not extending beyond it. . . . . .Ferdauia
Naked thoracic area very small, placed anteriorly along ventral midline . . . . . .Flavocaranx
Breast completely scaly, second dorsal fin lower than the first, vomerine tooth patch anchor-shaped . . . . . Kaiwarinus
Naked thoracic area very wide, snout long, round and narrow protrusion of upper-jaw symphysis . . . . . Platycaranx
Naked thoracic area very wide, snout long, wide protrusion of upper-jaw symphysis . . . . . .Turrum
A two-rayed finlet detached from soft dorsal and anal fins.. . . . . Elagatis
Maxilla broadly rounded at end, terminating below posterior margin of eye . . . . . Seriolina
Upper lip joint to snout at midline by bridge of skin, semi-detached finlets on soft dorsal and anal fins .. . . . . Scomberoides
Maxilla slightly rounded, terminating below anterior margin of eye; no scutes; anal rays 18-22 . . . . . Seriola
Soft dorsal and anal fin rays greatly extended . . . . . Pantolabus

Alectis ciliaris

Scyris indica

Alepes djedaba

Alepes melanoptera

Alepes apercna

Atule mate

Flavocaranx bajad

Turrum coeruleopinnatum

Alectis ciliaris

Scales minute and embedded, so creating an impression of naked skin. Body diamond-shaped in young, becoming elongate and deep in adults. Head profile broadly rounded; eye diameter nearly equal to suborbital; suborbital narrow. Dorsal spines minute in young and disappear with growth. Soft dorsal and anal fin lobes very long and filamentous in young, falcate in adults. Straight portion of lateral line with 12-30 scutes; paired dorsal keel present on peduncle. Body silvery with metallic blue tinge; fins dusky-grey, black base between 3rd and 6th ray in soft dorsal.
D VII, 18-20. A II; I, 15-17. GR 4-6 + 12-17.
(voucher: 117 mm SL)

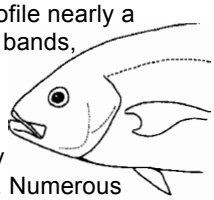
Alepes djedaba

Body rounded. Adipose tissue covers posterior half of eye. Jaws with a single row of numerous, comb-like teeth. Lateral line with 31-36 scales in curved portion and 39-51 scutes in straight part. A dusky blotch on upper edge of operculum; body bluish on back, silvery below; all fins yellowish; membrane of spinous dorsal fin pale to dusky.
D VIII; I, 23-25. A II; I, 18-20. GR 10-14 + 27-33, total 38-47.
(voucher: 220 mm SL)

Alepes apercna

Body oblong, moderately compressed. Dorsal and ventral profiles evenly rounded. Adipose tissue covers posterior half of eye. Jaws with a single row of numerous comb-like teeth. Straight part of lateral line with 48-56 scutes, curved part only half as long. Body bluish green above, whitish below. Spinous dorsal fin membrane distinctly black, other fins pale yellow. Large black spot on upper operculum.
D VIII, I, 23-26. A II; I, 18-21. GR 7-9 + 17-24, total 32-38.
(voucher: 160 mm SL)

Flavocaranx bajad [Carangoides bajad]



Oblong and compressed body; head profile nearly a straight line. Jaws with villiform teeth in bands, vomerine tooth patch a simple triangle. Lateral line gently curved anteriorly followed by straight part with 20-30 scutes. Breast fully scaled. Body brassy silvery above, silvery on sidesand belly. Numerous and conspicuous orange spots on sides.
D VIII; I, 24-26. A II; I, 21-24. GR 7-9 + 18-21.
(voucher: 272 mm SL)

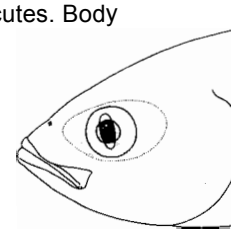
Scyris indica [Alectis indica]

Scales minute and embedded, so creating an impression of naked skin. Body very deep and compressed; head profile nearly angular and body contours in almost straight lines. Eye diameter more than 1½ times in suborbital; suborbital broad. Dorsal spines not visible in adults soft dorsal and anal fin lobes elongated, especially in young. Lateral line anteriorly wavy and strongly curved, straight part with 5-12 scutes. Juveniles with vertical bars on body adults bluish on back, silvery white on belly. Soft dorsal, anal and ventral fins blue, other fins dusky.
D VI; I, 18-20. A II; I, 15-17. GR 8-11 + 21-26

Alepes melanoptera

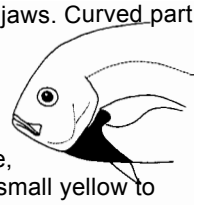
Body oblong, moderately compressed. Dorsal and ventral profiles evenly rounded. Adipose tissue covers posterior half of eye. Jaws with a single row of numerous comb-like teeth. Straight part of lateral line with 48-56 scutes, curved part only half as long. Body bluish green above, whitish below. Spinous dorsal fin membrane distinctly black, other fins pale yellow. Large black spot on upper operculum.
D VIII, I, 23-26. A II; I, 18-21. GR 7-9 + 17-24, total 24-33.
(voucher: 170 mm SL)

Atule mate



Last rays in dorsal and anal fins about twice as large as adjacent rays and resembling a finlet, but still joined to fin. Body somewhat elongate with dorsal and ventral profiles evenly rounded. Adipose tissue covering all of eye but a narrow slit over pupil. Anterior part of lateral line gently curved with 39-57 scales, straight part with 0-10 scales and 38-49 scutes. Body greenish on back, a yellowish-green tinge on sides often with distinct dark bars, silvery-white on belly; black spot on upper operculum margin; soft dorsal yellow with white tip on lobe, caudal fin dark yellow, other fins transparent in dorsal and anal fins sometimes.
D VIII; I, 22-25. A II; 1, 18-21. GR 10-13 + 26-31.
(voucher: 140 mm SL)

Turrum coeruleopinnatum [Carangoides coeruleopinnatus]



Body almost ovate and strongly compressed; head profile steep at level of eye. Bands of villiform teeth in both jaws. Curved part of lateral line longer than straight part, which has 6-26 scutes. Lobe of soft dorsal fin elongate: filamentous in young individuals but shorter with age; anal fin lobe somewhat elongate. Body bluish-grey to dark blue above, greyish silver below, flanks with few to many small yellow to golden spots;' blackarea on edge of operculum indistinct. Anal fin white-tipped and spotted yellow, other fins dusky or yellowish.
D VII; I, 20-23. A II; I, 16-20. GR 5-8 + 15-19.
Note: Juvenile shown on pg 168.
(voucher: 235 mm SL)

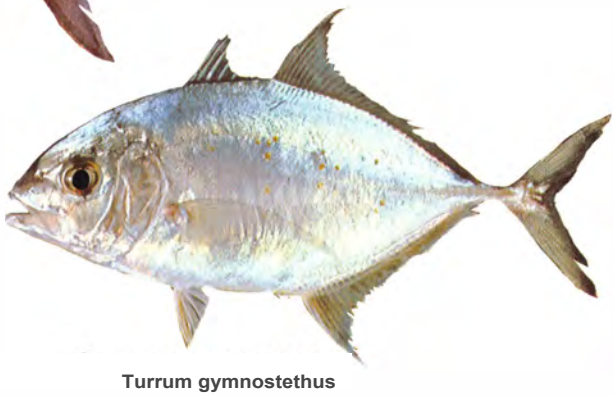
Platycaranx chrysophrys

Carangichthys dinema

Kaiwarinus equula

Ferdauia ferdau

Turrum fulvoguttatum



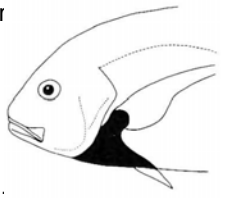
Turrum gymnostethus

Atropus hedlandensis

Carangichthys humerosus

Platycaranx chrysophrys [Carangoides chrysophrys]

Body very compressed and oblong in adults. Tip of snout adults. Tip of snout abruptly vertical. Teeth in both jaws in villiform bands, in larger fishes some outer teeth conical. Naked area from pectoral fin base to br ventral fin. Lateral line moderately curved straight part with 20-37 weak scutes. Body colour highly variable with size but in general silver-blue on back, silver-white below with yellow reflections especially below eye. In large specimen body washed with black. Black spot on edge of operculum, white spots often present at base of anal fin. Fins variable from pale to dusky yellow and even very dark in large adults.



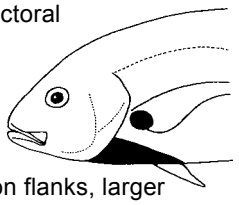
D VIII; I, 18-20. A II; I, 14-17. GR 5-9 + 15-18.
(voucher: 320 mm SL)

Kaiwarinus equula [Carangoides equula]

Body oval and compressed. Head profile a straight line from snout to spinous dorsal. Jaws with narrow bands of small teeth, the outer ones slightly larger. Vomerine tooth patch anchor-shaped. Lateral line moderately arched, curved part noticeably longer than straight portion. Breast fully scaled. Soft dorsal and anal fins yellow with dusky black stripes below fin margins on anterior half.
D VIII; I, 23-25. A II; I, 21-24. GR 7-10 + 18-23, total 27-32.
(voucher: ? mm SL)

Turrum fulvoguttatum [Carangoides fulvoguttatus]

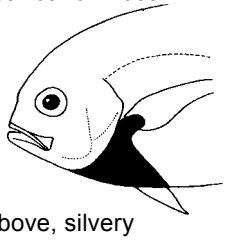
Body elongate, nearly ovate, and compressed. Head profile angular, becoming steeper with age. Villiform teeth in band in both jaws. Naked patch on pectoral base and on breast, sometimes forming one patch. Lateral line in a low arc anteriorly, straight part with 15-21 small scutes. Body green-blue with a metallic tinge, becoming silvery on sides. Many golden or brassy spots on flanks, larger individuals sometimes with 3 irregular black blotches on side. An indistinct dark spot at edge of operculum. Dorsal and anal fins dusky-yellow, caudal olive to dusky with dusky edges, ventral fin whitish.



D VIII; I, 25-30. A II; I, 21-26. GR 6-8 + 17-21.

Atropus hedlandsis [Carangoides hedlandensis]

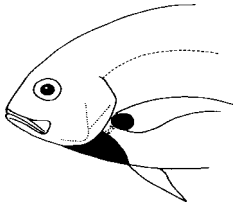
Body deep and compressed. Head profile very steep with a distinct "hump" before eye. Villiform tooth band in both jaws. Lateral line moderately arched, straight part with 17-29 weak scutes. Lobes of soft dorsal and anal fins filamentous; in mature males 3-8 rays of central portion of rayed fins produced into filaments of varying length. Naked area from pectoral fin base to breast and beyond ventral fin. Body greenish-blue above, silvery below; a black spot on edge of operculum. Spinous dorsal with elongated rays and edge of caudal fin blackish, other fins pale to dusky.



D VIII; I, 20-22. A II; I, 16-18. GR 6-11 + 14-17.
Note: Can easily be confused with *C. armatus* (Forsskål) but that species lacks the 'hump' before the eye and has 20-24 lower gill rakers on first arch.
(voucher: 205 mm SL)

Carangichthys dinema [Carangoides dinema]

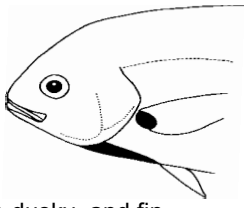
Strongly compressed, body nearly ovate; head profile almost a straight line. Both jaws with bands of small teeth, in upper jaw also an irregular outer series of moderately large teeth. Curved part of lateral line slightly longer than straight portion with 23-30 scutes. Naked patch on pectoral base and short naked patch on breast. Body bluish green above, silvery-white below. A very conspicuous characteristic colour pattern just below soft dorsal fin consisting of alternating dark and silvery blotches. Opercular blotch diffuse. Fins pale to dusky, edge of soft dorsal and upper caudal lobe yellowish, anal fin tips whitish.



Note: Can be confused with *C. oblongus* which has 37-45 scutes in lateral line.
D VIII; I, 17-19. A II; I, 15-17. GR 7-9 + 16-19.

Ferdauia ferdau [Carangoides ferdau)]

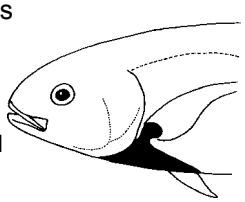
Body oblong, compressed with bluntly rounded snout. Jaws with teeth in villiform bands, becoming indistinct with age. Lateral line only slightly arched anteriorly, straight portion with 10-30 scales followed by 21-37 small scutes. Naked patch on pectoral base and short naked patch on breast. Body with faint dark bars; bluish green above, paler below. Often golden spots on upper sides. Edges and tips of soft dorsal and anal fins dark blue to dusky, and fin margin white. Ventral fin pale.



D VIII; I, 26-34. A II; I, 21-26. GR 7-10 + 17-20.
(voucher: 340 mm SL)

Turrum gymnostethus [Carangoides gymnostethus]

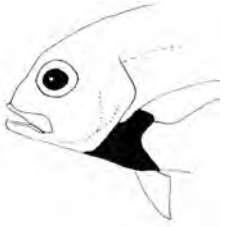
Dorsal profile more convex than ventral; snout rounded. Both jaws with bands of villiform teeth. Naked patch from pectoral base to breast and behind ventral fin. Lateral line moderately arched, straight portion with 14-25 scales followed by 20-31 weak scutes. Soft dorsal and anal fin lobes falcate. Body blue- green on back and sides, white on belly. Ventral and pectoral fins pale, other fins pale greenish to dusky; anal fin with white margin.



D VIII; I, 27-30. A II; I, 23-26. GR 7-9 + 19-22.

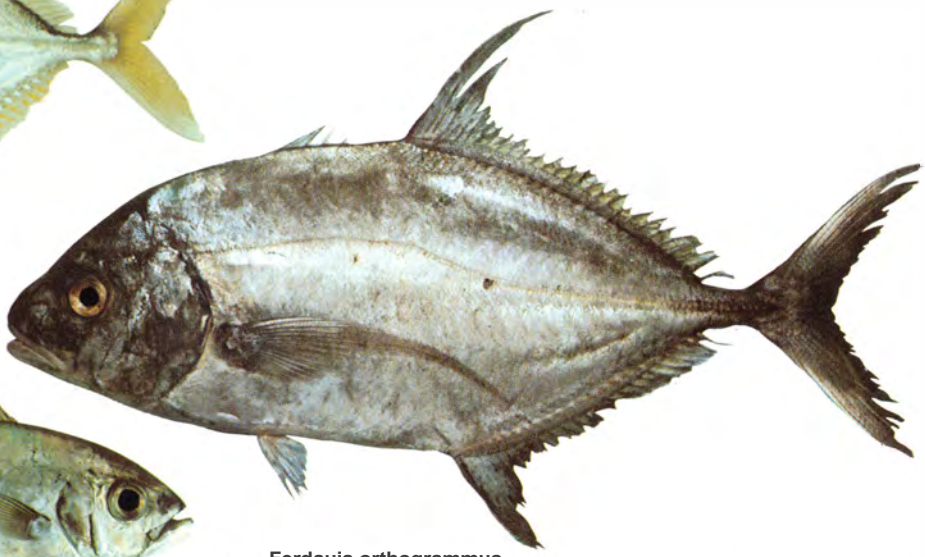
Carangichthys humerosus [Carangoides humerosus]

Body oblong; eye equal to snout. Curvec line nearly as long as straight part which has 26-30 weak to moderate scutes. Breast to pectoral fin base naked. Soft dorsal and anal lobes falcate. Body greenish on back, silvery below; 5-6 faint broad dark bands across back; large black spot on shoulder and pectoral fin axil black. Spinous dorsal black, base of soft dorsal with white spots, caudal fin dusky, other fins white.



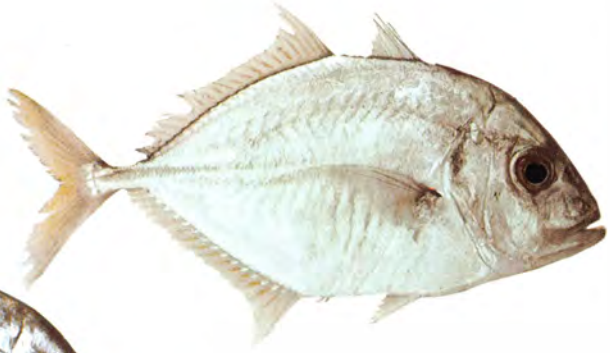
D VIII; I, 19-21. A II; I, 18-19. GR 6-7 + 16-17.
(voucher: 160 mm SL)

Platycaranx malabaricus



Ferdauia orthogrammus

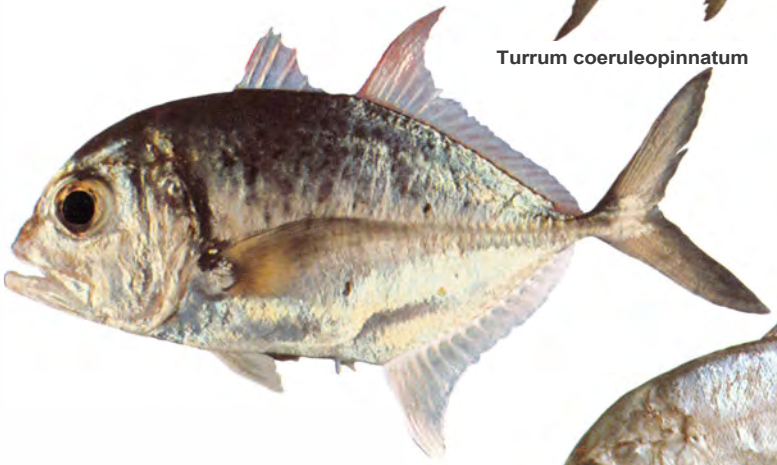
Craterognathus plagiotaenia



Platycaranx talamparoides

Turrum coeruleopinnatum

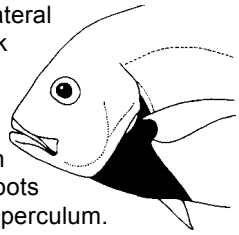
Alepes kleinii



Caranx bucculentus

Caranx ignobilis

Platycaranx malabaricus [Carangoides malabaricus]

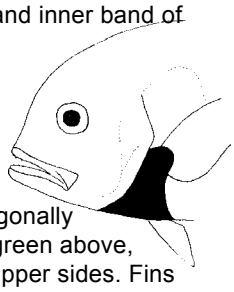


Strongly compressed, almost-ovate; head profile nearly straight. Both jaws with villiform teeth in bands, small conical teeth in front. Curved part of lateral line long, straight part with 19-36 weak scutes. Naked patch from pectoral fin base to breast and beyond ventral fin. Body silvery to blue-grey above, silvery-white below. Fins dusky or with a greenish tinge. Anal fin with white spots at base; small black spot on edge of operculum. Tongue greyish-brown.
D VIII; I, 20-23. A II; I, 17-19. GR 8-12+21-27, total 32- 38.
(voucher: 185 mm SL)

Craterognathus plagiotaenia [Carangoides plagiotaenia]

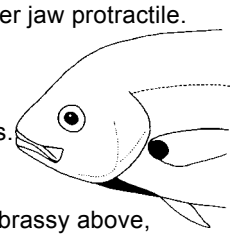
Body very oblong and compressed. Lower jaw enlarged and projecting in front of upper jaw. A narrow band of small teeth in upper jaw, lower jaw with a row of small teeth and a narrow band anteriorly. Lateral line in a low arch anteriorly, straight part with only 11-18 small scutes. Breast completely scaled. Body bluish above, silvery below, occasionally with a few yellow spots on flanks; edge of ventral fin and margin of anal with a narrow white border, pectoral pale, other fins dusky; distinctive black to dark margin on posterior edge of preoperculum.
D VIII; I, 22-24. A II; I, 18-20. GR 8-14 + 19-27.
(voucher: 270 mm SL)

Caranx bucculentus



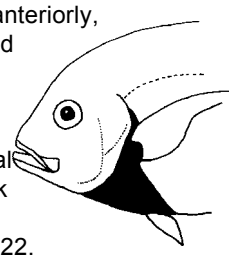
Upper jaw with outer series of canines and inner band of fine teeth; one row of teeth in lower jaw. Body oval, head profile steep in front of eye. Upper jaw reaching past middle of eye. Lateral line strongly arched anteriorly and shorter than straight part which has 35-38 strong, large scutes. Breast naked from pectoral fin base diagonally down to beyond ventral fin. Body olive-green above, silvery below, often with blue spots on upper sides. Fins dusky yellow-green. A black spot on operculum.
D VIII; I, 18-19. A II; I, 16-17. GR 6 +20.
(voucher: ? mm SL)

Ferdauia orthogrammus [Carangoides orthogrammus]



An oblong and compressed species; snout slightly angular and eye low set. Lips fleshy in adult; upper jaw protractile. Both jaws with a narrow band of villiform teeth which become indistinct with age. Lateral line gently curved, straight part with 21-34 scales and 19-31 small scutes. Naked patch on pectoral base and short naked patch on breast. Soft vertical fins falcate anteriorly. Body grey to greenish brassy above, paler below. Flanks with dusky or yellow oval spots, darker at centers. Margin of anal white, ventral fin white; other fins pale brownish to dusky.
D VIII; I, 28-31. A II; I, 24-26. GR 8-10 + 20-23.
(voucher: 320 mm SL)

Platycaranx talamparoides [Carangoides talamparoides]

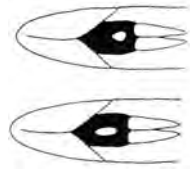


Strongly compressed body; head profile almost straight. Jaws with bands of villiform teeth, some outer conical teeth anteriorly. Lateral line moderately arched anteriorly, straight part with 20-32 weak scutes. Naked patch from pectoral fin base to breast and beyond ventral fin. Body bluish above, silvery-white below; a small black spot on margin of operculum. Fins dusky, caudal fin with central rays dusky-yellow and black distal margin. Tongue white to pale grey.
D VIII; I, 20-23. A II; I, 17-19. GR 6-9 + 19-22.
(voucher: 210 mm SL)

Alepes kleinii

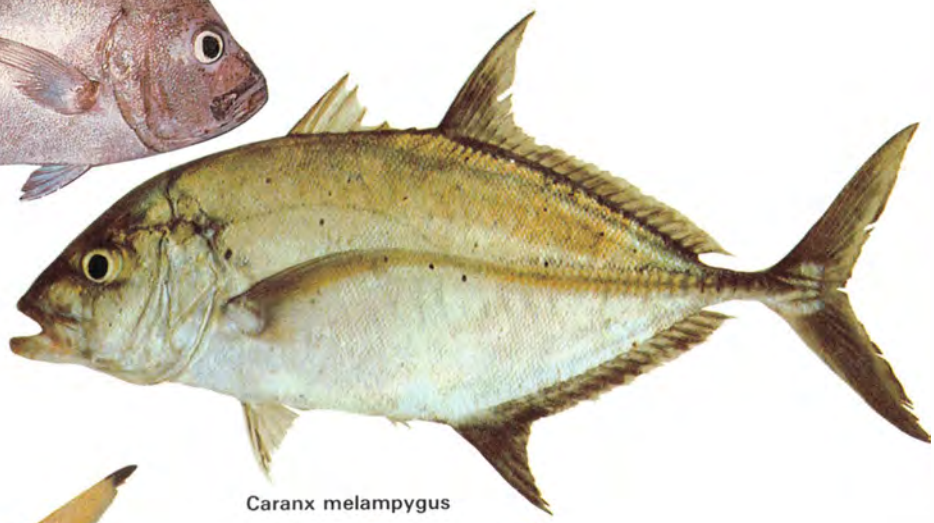
An oblong, very compressed species. Ventral profile much more curved than dorsal profile. Adipose tissue covers posterior half of eye. Upper jaw with 2 irregular rows of short conical teeth anteriorly and blunt teeth posteriorly. Lower jaw with a single row of short conical teeth except 2 rows anteriorly. Lateral line strongly curved anteriorly, straight portion with 35-45 strong, large scutes. Body brownish blue on back, silvery white below. A distinct black blotch at beginning of lateral line. Upper caudal lobe dusky with black edge, other fins yellow. Upper caudal lobe longer than lower.
D VIII; I, 23-26. A II; I, 19-22. GR 10-12 + 27-32.
(voucher: 120 mm SL)

Caranx ignobilis



Upper jaw with outer series of canines and inner band of fine teeth; one row of teeth in lower jaw. Body robust, moderately compressed. Upper jaw reaching to below posterior eye margin. Curved part of lateral line moderately arched and a little longer than the straight part with 26-38 strong scutes. Breast naked ventrally although often a patch of scales present before ventral fin. Body colour very variable from blue above and silver below to dusky or black with many dark spots or blotches, apparently due to sexual dimorphism in specimens larger than 500 mm.
D VIII; I. 18-22. A II; I, 15-17. GR 5-7 + 15-17.
(voucher: 345 mm SL)

Caranx lugubris



Caranx melampygus

Pantolabus radiatus

Caranx heberi

Caranx sexfasciatus

Caranx tille

Decapterus kurroides

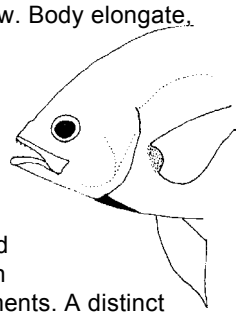
Decapterus macarellus

Caranx lugubris

Upper jaw with outer series of canines and inner band of fine teeth; one row of teeth in lower jaw. A robust deep-bodied species. Head profile steep and with distinct notch before eye, snout blunt. Adipose tissue well-developed on posterior part of eye. Curved and straight parts of lateral line nearly equal in length, the latter with 26-32 strong scutes. Breast fully scaled. Soft dorsal and anal fin lobes falcate, spinous dorsal not high. Body uniformly grey to dark brown, dusky when alive. All fins dark.
D VIII; I, 20-22. A II; I, 16-19. GR 6-8 + 17-22.

Pantolabus radiatus

Upper jaw with outer series of canines and inner band of fine teeth; one row of teeth in lower jaw. Body elongate, snout rounded, profile somewhat concave in front of eye. Upper jaw reaching below anterior part of eye. Lateral line strongly curved anteriorly, straight part about twice in length and with 38-45 moderately strong scutes. Breast fully scaled, but rarely a small naked patch anteriorly. Soft dorsal and anal fins with scaly sheaths at base, in males the rays are produced into filaments. A distinct black spot on edge of operculum. Body blue above, silvery below, sometimes with dark vertical bars on side. Tip of upper caudal lobe black, dorsal and anal fins yellow, other fins white to transparent.



D VIII; I, 23-26. A II, I, 18-20. Total GR 36-41.

Caranx sexfasciatus

Upper jaw with outer series of canines and inner band of fine teeth; one row of teeth in lower jaw. Body rather elongate and moderately compressed. Head profile evenly curved; upper jaw reaching to below posterior border of eye. Adipose eye tissue well-developed reaching to posterior part of pupil. Breast fully scaled. Anterior part of lateral line gently curved, straight part with 29-34 black scutes. Body grey to dusky above, whitish below; small black spot on upper edge of operculum. All fins dusky, lobes of soft dorsal and anal fins with white tips.
D VIII; I, 19-21. A II; I, 14-17. GR 6-8 + 15-19.

Decapterus kurroides

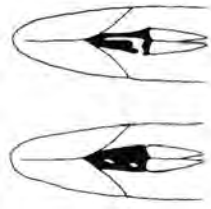
Body slender. Single, 2-rayed, distinctly separate finlet behind dorsal and anal fins. Shoulder girdle with 2 papillae; adipose tissue covers all of eye but for a central slit; scales on top of head reaching to anterior margin of eye. Pectoral fin long, reaching a vertical line from soft dorsal origin. Curved part of lateral line with 42-64 scales and 0-4 scutes, straight part of lateral line with 0-4 scales followed by 30-40 scutes, total of 77-102 elements. Body blue-green above, silvery-white below. A dark blotch on margin of operculum. Caudal fin conspicuously red, spinous dorsal and soft dorsal lobes sometimes dark, other fins dusky to white.
D VIII; I, 28-30. A II; I, 22-26 (incl finlet). GR 9-12 + 26-32.
(voucher: 170 mm SL)

Caranx melampygus

Upper jaw with outer series of canines and inner band of fine teeth; one row of teeth in lower jaw. Body oblong and very compressed. Head profile straight from the pointed snout to above eye. Upper jaw reaching to below anterior part of eye. Adipose eye tissue weakly developed. Lateral line gently curved anteriorly and a little shorter than the straight portion with 30-40 scutes. Soft dorsal and anal fin lobes falcate. Breast fully scaled. Body green-blue above, silvery white below with scattered dark or blue spots on head, back and sides. Tip of dorsal and anal fins white, fins often bright blue or dusky.
D VIII; I, 21-24. A II; I, 17-20. GR 5-9 + 17-21, total 25-29.
(voucher: 280 mm SL)

Caranx heberi

Upper jaw with outer series of canines and inner band of fine teeth; one row of teeth in lower jaw. Body moderately deep; head profile rounded. Upper jaw reaching to below end of pupil. Lateral line gently curved anteriorly, shorter than straight part with 30-40 strong scutes. Breast scalation variable, from fully scaled to small pre-ventral naked patch. Body bronze-blue above, sometimes with dark spots; white below. Dorsal fin dusky, tip of upper caudal lobe black, other fins yellow.



D VIII; I, 19-21. A II; I, 15-17. GR 6-8 + 17-19.
(voucher: ? mm SL)

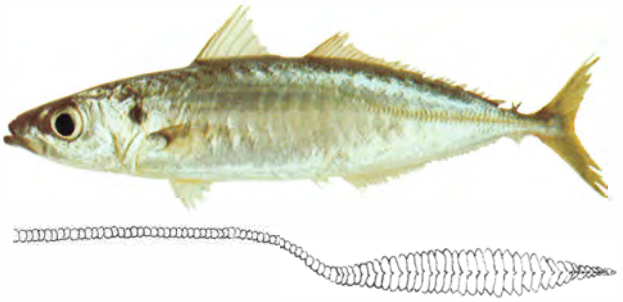
Caranx tille

Upper jaw with outer series of canines and inner band of fine teeth; one row of teeth in lower jaw. Body elongate, slightly compressed. Head profile very steep, ventral body profile nearly a straight line. Upper jaw reaching to below posterior margin of eye. Adipose eye tissue well-developed, covering nearly posterior half of eye. Lateral line slightly curved anteriorly, same length as straight part with 28-37 strong scutes. Breast fully scaled. Prominent black spot at beginning of lateral line. Body green-blue to light brown above, white below. Pectoral fin with black axillary spot; caudal fin dusky; other fins pale.
D VIII; I, 19-21. A II; I, 16-18. GR 6-8 + 15-17.
(voucher: 235 mm SL)

Decapterus macarellus

Body slender and elongate. Single, 2-rayed, distinctly separate finlet behind dorsal and anal fins. Shoulder girdle with 2 papillae; adipose eyelid almost covering eye but for the pupil; scales on top of head reaching to front of pupil. Pectoral fin short, not reaching beyond vertical line from posterior end of spinous dorsal. Curved part of lateral line with 58-75 scales and no scutes, straight part of lateral line with 18-39 scales followed by 24-40 scutes, totaling 110-138. Metallic blue to black above, silvery-white below; a small black spot on margin of operculum; symphysis of upper jaw white. Caudal fin dusky yellow; other fins dusky-white.
D VIII; I, 31-37. A II; I, 27-31. GR 10-13 + 34-41.
(voucher: 280 mm SL)

Decapterus macrosoma



Decapterus russelli

Elagatis bipinnulata

Gnathanodon speciosus

Megalaspis cordyla

Parastromateus niger

Scomberoides commersonnianus

Scomberoides tala

Scomberoides tol

Selar boops

Decapterus macrosoma

Body very elongate and nearly rounded in cross section. Single, 2-rayed, distinctly separate finlet behind dorsal and anal fins. Shoulder girdle with 2 papillae; adipose tissue covers all of eye but for a central slit exposing the pupil; scales on top of head only reaching to posterior part of eye. Pectoral fin short, reaching to below posterior part of spinous dorsal. Lateral line in a low regular arch anteriorly with 58-72 scales, followed by straight part with 14-29 scales and 24-40 scutes, in total 110-126 elements. Body metallic blue above, silvery below; a small black blotch on upper margin of operculum; caudal fin hyaline to dusky, dorsal fin lobe sometimes dark, other fins pale.
D VIII; I, 33-39. A II; I, 27-31. GR 10-21 + 34-38.
(voucher: 160 mm SL)

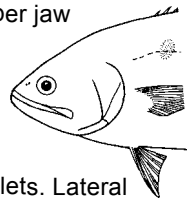
Elagatis bipinnulata

Body fusiform; head and snout pointed; small mouth, upper jaw not reaching to below front of eye. A two-rayed finlet present behind soft dorsal and anal fins. Lateral line curves only slightly. Pectoral fin very short; anal fin base noticeably shorter than soft dorsal fin base. Body dark olive-blue on back, a broad yellow mid-lateral band with two narrow light blue bands on each side of it, belly white. Fins dark with an olive-yellow tinge. Caudal fin deeply forked.
D VI; I, 25-30. A I; I, 18-22.
(voucher: 300 mm SL)

Megalaspis cordyla

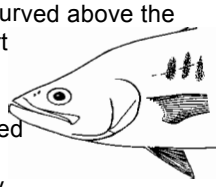
Body elongate and only slightly compressed; hind portion of dorsal and anal fins each comprise 7-10 distinct finlets; caudal peduncle with a medial keel. Adipose eye-tissue covers all but a central slit of eye. Lateral line with a short, strongly curved anterior section and a straight posterior section comprising 51-59 very large scutes. Distinct black spot on edge of operculum. Body dark blue to almost black above, belly white, all fins dusky.
D VIII; I, 18-20. A II; I, 16-17. GR 8-11+18-22.
(voucher: 265 mm SL)

Scomberoides commersonnianus



A very compressed and elongate species. Upper jaw reaching well behind posterior margin of eye. Snout blunt, head profile with a depression above eye. Spinous dorsal of short spines, depressible into a groove; soft dorsal and anal fin bases nearly equal in length, posterior part of both fins comprising semi-detached finlets. Lateral line almost straight, wavy in its anterior portion. Pectoral fin short; lobes of short dorsal and anal fins falcate. Scales partially embedded on mid-body and broadly lanceolate. Body green-bronze above, silvery-golden below. Five to 8 dark round blotches on sides mostly above lateral line. Fins dusky, soft dorsal and anal loves dark brown.
D VI-VII; I, 19-21. A II, 16-19. GR 0-3+7-12, total 8-15.

Scomberoides tol



Very compressed body; head profile concave from the pointed snout to nape. Upper jaw just reaching to below hind margin of eye. Lateral line slightly curved above the short pectoral fin. Spinous dorsal of short spines, depressible into a groove; soft dorsal and anal fin lobes low, posterior part of both fins comprising semi-detached finlets. Six to 8 rounded oval spots oval spots on and above the lateral line. Body blue above, white below. Outer tip of soft dorsal distinctly black. Skin very rough, almost with needle-like scales partially embedded in skin.
D VI-VII; I, 19-21. A II, 18-20. GR 4-7+17-20, total 21-26.
(voucher: 145 mm SL)

Decapterus russelli

Body elongate and slightly compressed. A single, 2-rayed, distinctly separate finlet behind dorsal and anal fins. Shoulder girdle with 2 papillae; adipose tissue well-developed, covering all of eye except for a central slit for pupil; scales on top of head to above pupil. Pectoral fin to or just past a vertical line from soft dorsal origin. Lateral line in a low, regular arch anteriorly with 42-46 scales and 0-4 scutes, followed by 0-4 scales and 30-40 scutes in the straight part, altogether totaling 77-102 elements. Body bluish green above, silvery below; a small black spot on upper margin of operculum; caudal fin dusky brown, other fins hyaline except for dusky outer soft dorsal fin.
D VIII; I, 30-33. A II; I, 25-26. GR 10-14 + 30-33.
(voucher: 230 mm SL)

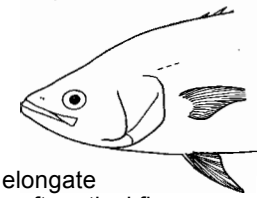
Gnathanodon speciosus

A deep-bodied, compressed species. Head profile rather steep and with slight concavity before eye; adipose eyelid poorly-developed. No teeth in upper jaw, juveniles with few weak teeth in lower jaw; no teeth on vomer and palatine. Breast completely scaled. Younger individuals with a yellow tinge and black vertical bars on side, adults paler and with faint bars on side. Fins yellow, tips of caudal lobes black.
D VII; I, 18-20. A II; I, 15-17. GR 7-9+19-22.
(voucher: 225 mm SL)

Parastromateus niger

Body deep and compressed, body profiles equally convex. Lateral line gently curved anteriorly, posterior straight part with 8-19 weak scutes; pectoral fin falcate, and longer than HL. Mouth small; a single row of small conical teeth in both jaws. Dorsal and anal fin spines become embedded in the skin with growth, lobes of soft dorsal and anal fins broadly rounded. Ventral fin absent in adults. Scales small, extending onto dorsal and anal fins. Body uniformly bluish brown to grey; fins with dark edges.
D IV-V; I, 41-44. A II; I, 35-39.
(voucher: 173 mm SL)

Scomberoides tala



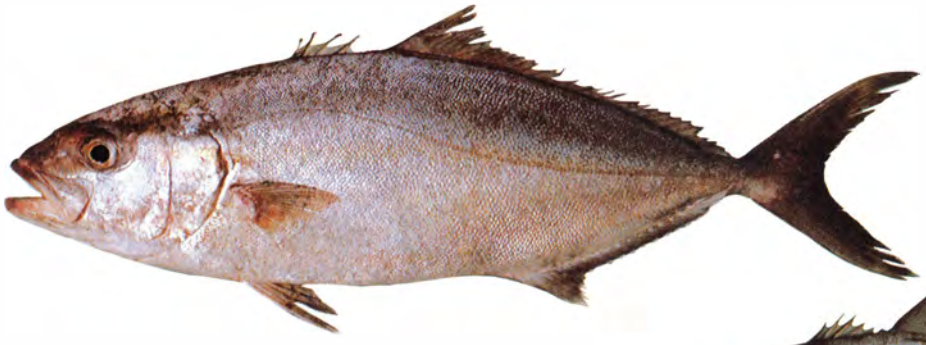
Body very compressed; head profile slightly concave from snout to nape. Upper jaw just reaching to below posterior margin of eye. Lateral line curved only above the short pectoral fin. Spinous dorsal of short spines, depressible into a groove; soft dorsal and anal fin lobes falcate, posterior part of both fins comprising semi-detached finlets. Six to 9 vertically elongate dark spots on and above the lateral line; soft vertical fin lobes dark brown, pectoral yellow, other fins yellow. Body blue above, silver-white below. Skin rough to touch.
D VI-VII; I, 19-21. A II, 16-19. GR 1-3+7-11, total 11-15.
(voucher: 235 mm SL)

Selar boops

Body elongate and moderately compressed. Eye very large, adipose tissue well-developed and covering eye except for pupil. A deep furrow on margin of shoulder girdle and a large papilla immediately above it (see fig). Lateral line with 21-24 pored scales in anterior curved part and 37-46 strong and large scutes in straight part, scutes ⅔ eye diameter. Body bluish bronze on back, silvery-white below, narrow yellow stripe sometimes present from operculum to caudal peduncle.
D VIII; I, 23-25. A II, I, 19-21. GR 8-12 + 25-29.

Selar crumenophthalmus

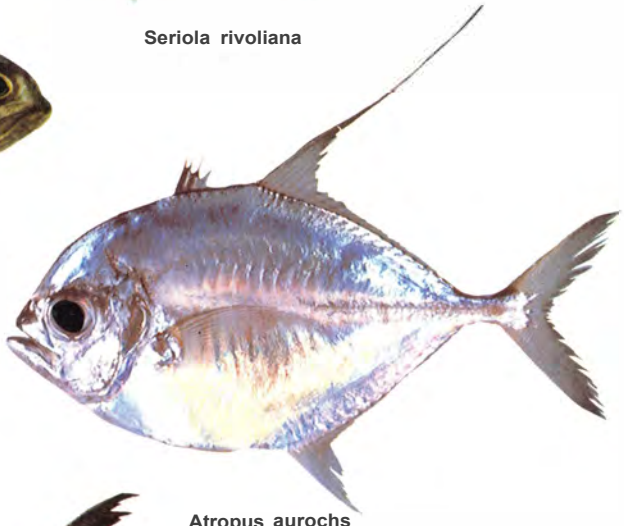
Selaroides leptolepis



Seriola dumerili

Seriola rivoliana

Seriolina nigrofasciata



Atropus aurochs

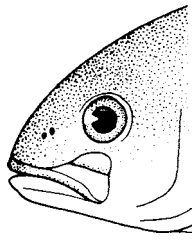
Atropus mentalis

Uraspis uraspis

Selar crumenophthalmus

Body elongate and moderately compressed. Eye very large, adipose tissue well-developed and covering eye except for pupil. Deep furrow on margin of shoulder girdle and large papilla immediately above it. Lateral line with 48-56 pored scales and 0-4 scutes in curved part, followed by 0-11 pored scales and 29-42 scutes in straight part, scutes 2-3 times in eye diameter. Body metallic blue on back, silver-white below, often with a broad dusky yellow band from operculum to upper part of caudal peduncle; fins dusky to transparent.
D VIII; I, 24-27. A II; I, 21-23. GR 9-12 + 27-31.
(voucher: 190 mm SL)

Seriola dumerili

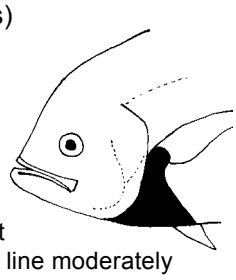


Body elongate and only slightly compressed. Head profile evenly curved. Upper jaw. very broad at end (supra-maxilla) reaching to below middle of eye (see fig.). Teeth minute and in broad bands. Gill rakers (total 18-24) decreasing in numbers with increased body size. Last spine in spinous dorsal and the first two spines in anal fin become covered with skin in larger fishes. Grooves present on caudal peduncle. Lobes of soft dorsal and anal fins low, nearly equal to length of pectoral fin. Body metallic green-blue with a rosy tinge; a dark band from above eye to base of spinous dorsal. Pectoral fin with orange tint, other fins dusky.
D VII; I, 29-35. A II I, 18-22. GR 18-24.
(voucher: 430 mm SL)

Seriolina nigrofasciata

An oblong robust species. Head profile steep; upper jaw broadly rounded at end reaching to below hind margin of eye. Gill rakers knob-like and few. Lateral line gently curved; no scutes. Anal fin base approximately half the length of soft dorsal fin base. Breast fully scaled. Body blue-green to brownish above, creamy below; 5-6 oblique dark irregular bands on sides, fading with age. Fins brown, tips of soft dorsal and anal fin lobes clear white.
D V-VII; I, 31-34. A II; I, 16. Lower GR 5.
(voucher: 270 mm SL)

Atropus mentalis (Ulua mentalis)

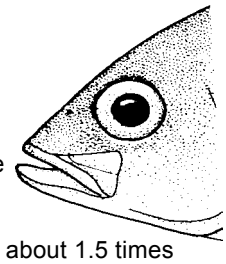


Body very deep and compressed. Head profile strongly arched; lower jaw nearly rectangular in shape and projects in front of upper jaw. Gill rakers numerous, very long and feather-like, extending into mouth alongside the tongue. Tongue without central band of villiform teeth. Lateral line moderately arched anteriorly, straight portion with 29-33 scutes. Soft dorsal lobe falcate. Body blue-green above, silvery-white below; lower jaw white; corner of mouth with a black patch.
D VIII; I, 21-22. A II; I, 17-19. Lower GR 51-61.
(voucher: 315 mm SL)

Selaroides leptolepis

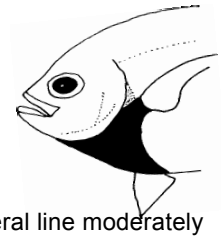
A small, oblong, compressed species with dorsal and ventral profiles evenly curved. Adipose eye tissue well-developed on posterior part of eye. Upper jaw only reaching to below front margin of eye. No teeth in upper jaw, vomer or palatines, a single series of minute teeth in lower jaw. Lateral line only slightly curved. Body bluish green above, white below; a bright yellow band from snout to caudal peduncle; distinct black operculum spot; unpaired fins pale to yellowish.
D VIII; I, 24-26. A II; I, 21-23. GR 10-14+27-32
(voucher: 150 mm SL)

Seriola rivoliana



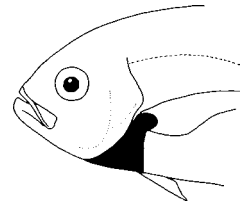
Body elongate and moderately deep. Head profile nearly straight from snout to above eye. Upper jaw very broad at end reaching to below middle of eye (see fig.). Gill rakers well-developed. First anal spines may be reduced in larger fish; soft dorsal lobe about 1.5 times longer than pectoral fin; dorsal and ventral groove on caudal peduncle. Dark band through eye to anterior part of spinous dorsal nearly always present. Body bluish on back; bluish silver below. Fins dusky, tip of anal fin white.
D VII; I, 27-33. A II; I, 18-22 GR 6-9+18-26
(voucher: 250 mm SL)

Atropus aurochs (Ulua aurochs)



Body oval and very compressed. Upper jaw reaching to below middle of eye; lower jaw slightly projecting beyond upper jaw. Tongue with central band of villiform teeth; gill rakers long, feather-like, extending into mouth. Lateral line moderately curved anteriorly, 38--40 weak scutes in straight part. Anterior dorsal rays produced as filaments, lobe of anal fin somewhat elongate. Body silvery-blue above, silvery below. Operculum with a large diffuse black blotch. Caudal fin margin black.
D VIII; I, 20-22. A II; I, 17-18. GR 16-21 + 37-41.

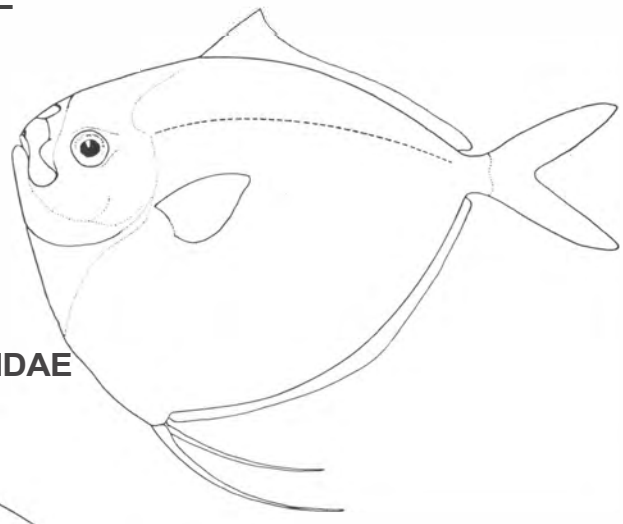
Uraspis uraspis



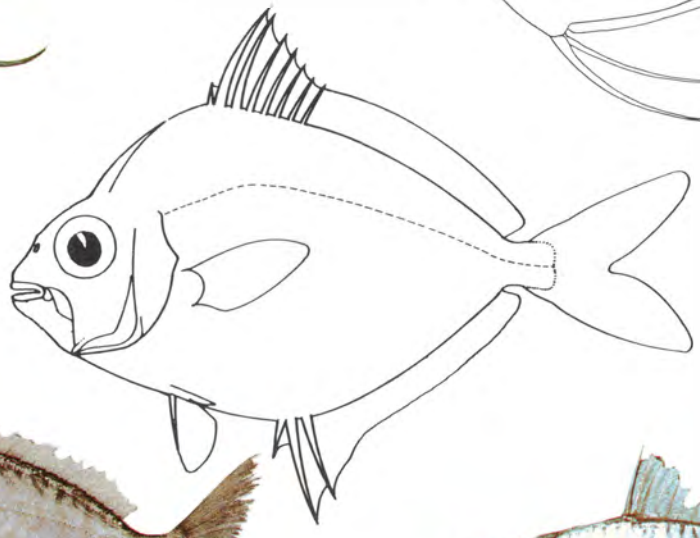
Body oblong and compressed, head profile rounded. Upper jaw reaching to below anterior part of eye. No teeth on vomer or palatines. Curved part of lateral line moderately arched with 61-82 scales, straight portion with 28-32 scutes. Spinous dorsal fin low, soft dorsal and anal fins high, sometimes with elongated lobes. Body metallic blue with darker vertical bands; fins dusky. Tongue, roof and floor of mouth brilliant white, rest black.
D VIII, I, 25-30. A II; I, 17-22. GR 5-7 + 13-16.
(voucher: 175 mm SL)

MENIDAE

Mene maculata



LEIOGNATHIDAE

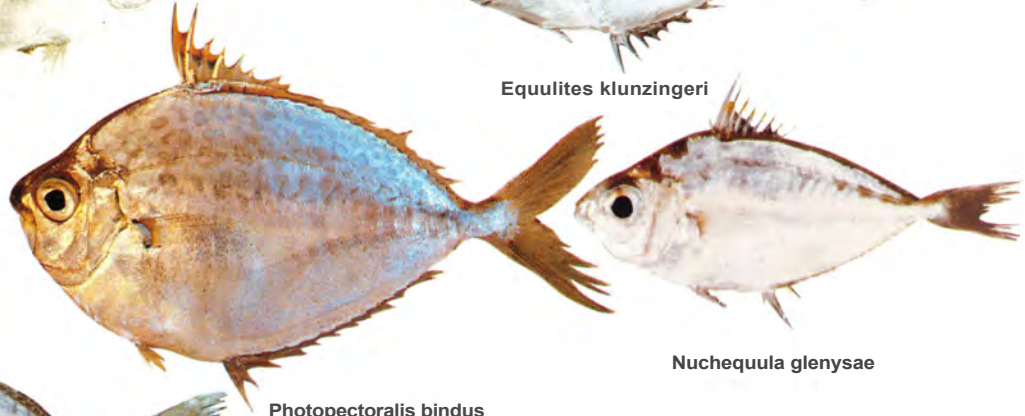


Gazza rhombea

Gazza minuta

Photopectoralis aureus

Equulites klunzingeri



Photopectoralis bindus

Nuchequula glenysae

Nuchequula gerreoides

Equulites elongatus

MENIDAE

Moon fishes - Peperek kodi

Body disc-like, very compressed, with almost straight dorsal profile and a deeply curved and sharp ventral profile; mouth protractile, pointing upward. A single long dorsal fin without spines; anal fin long, beginning close to ventral fin base, fin rays short; first ventral fin ray prolonged in adults.
A single species known.

REFERENCE: Woodland, 2001.

Mene maculata

Body blue-green above, silvery white below; black spots on head and back.
D 43-45. A 30-33.
(voucher: 151 mm SL)

LEIOGNATHIDAE

Ponyfishes - Petah; Caria; Peperek

Small to medium-sized fishes with round to oblong, compressed bodies. Mouth strongly protrusible; at nape a well-developed nuchal spine. Body covered with small cycloid scales except on top of head; there is variable breast scalation, and scales may be present on cheek. Single dorsal fin with 8 spines and 16 rays, anal fin with 3 spines and 14 rays; caudal fin forked. Body usually silvery with different but distinct markings on upper side of body, often characteristic colours on dorsal and anal fins. Ponyfishes are bioluminiscent and in some species luminous organs are visible on throat (light is dispersed to belly from organs forming a ring around throat in which light-emitting bacteria live).

Ten genera and 51 species in the family; representatives of nine genera were obtained on the Survey.

REFERENCES: Chakrabarty & Sparks, 2008; Chakrabarty, Chu, Nahar & Sparks, 2010; Charkraborty, Sparks & Ho, 2010; Jawad, Kimura & Al-Mamry, 2012; Woodland, Premcharoen & Cabanban, 2001; Sparkes & Chakraborty, 2015; Mochizuki & Hayashi, 1989; Yamashita, Kimura & Iwatsuki, 1998; Suzuki & Kimura, 2017; Kimura, Yamashita & Iwatsuki, 2000; Kimura, Kimura & Ikejima, 2007; Kimura, Iro, Peristiwady, Iwatsuki, Yoshino & Dunlop, 2005; Jawad, Kimura & Al-Mamry, 2012.

Gazza rhombea

Mouth with canine-like teeth. Scales covering most of body except below pectoral fin base and abdomen, no scales on cheeks. Tip of ventral fins not reaching anal fin origin. Greatest body depth 34-52% SL. Irregular, narrow dark bands on upper part of body reaching a little below lateral line. Outer part of dorsal spines black, edge of soft dorsal grey, caudal fin margin dusky, all other fins colourless.
(voucher: 133 mm SL)

Photopectoralis aureus

Jaw teeth small and pointed. Scales on breast but not on cheeks. Lateral line incomplete. Black line from front of eye to lower jaw. Body depth 31-45% SL. Dense irregular brown, ring-like markings on upper body, snout tip blackish, also pectoral fin axil; bases of vertical fins darkly spotted. Fins yellow, caudal sometimes dusky, low fins colourless. L. lat. 67-85.
(voucher: 95 mm SL)

Photopectoralis bindus

Scales absent from cheeks, nape and breast; teeth small and villiform; snout short. Lateral line incomplete. A very deep-bodied (more than 50% SL) and compressed species. Males with conspicuous translucent patch in pectoral fin axil. Upper part of body with dark irregular semi-circular and oval markings. Outer half of spinous dorsal bright orange with a black line beneath, anal spines tipped orange; soft dorsal greyish, other fins colourless. L. lat. 45-49.
(voucher: 88 mm SL)

Nuchequula gerreoides

Breast and cheeks naked, anterior part of dorso-lateral surface of body almost completely scaled. Teeth villiform. Lateral line almost complete. Body depth 44.5-49% SL. Second dorsal spine somewhat elongate. Distinct brown blotch across nape; brown on snout; dark irregular lines on upper half of body. Pectoral axil with a clear yellow patch and a second larger one on body below and behind pectoral fin. Distal half of spinous dorsal fin yellow; soft dorsal and anal fins with yellow margins. L. lat. 54-62.
(voucher: 91 mm SL)

Gazza minuta

Mouth with canine-like teeth. No scales on breast to a line from pectoral fin base to anal fin origin; no scales on cheeks. Greatest body depth 28-46.5% SL. Irregular dark brown bands on upper part of body and a row of bluish spots along lateral line. Snout and underside of pectoral fin base with black dots. Edge of spinous dorsal black, soft dorsal and anal fins grey on edges, caudal fin margin dusky.
(voucher: 100 mm SL)

Equulites klunzingeri

Breast and body fully scaled but no scales on cheeks. Teeth villiform. Body depth 30-43% SL; second anal spine never extended. Upper side of body brownish with short oblique and vertical, irregular black lines and blotches which extend below lateral line.
(voucher: 80 mm SL)

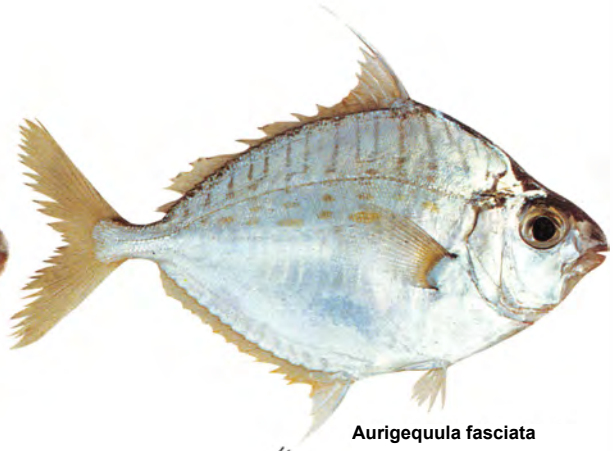
Nuchequula glenysae

Breast and cheek fully scaled. Villiform teeth in jaws, lateral line almost complete. Body depth 35- 42% SL. Unique complicated sensory canals present on the suborbital area, extending to the nape. Grey vertical lines on back not reaching lateral line; distinct brown blotch on nape. Outer half of spinous dorsal black, soft dorsal, anal and caudal fin lobes yellow with grey edges. Pectoral and ventral fins colourless.

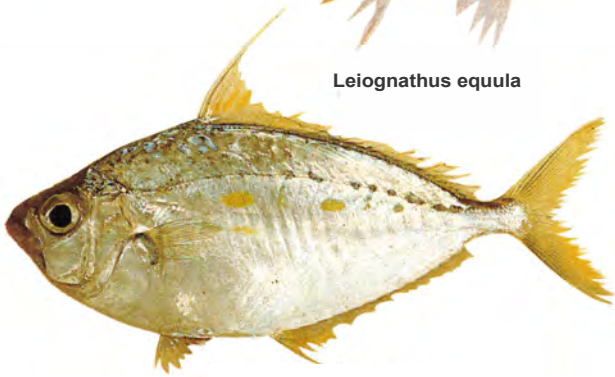
Equulites elongatus

Breast fully scaled but no scales on cheeks. Villiform teeth in jaws. Posterior margin of adipose eyelid deeply incised. Snout pointed and sharp, body very slender, 20-30% SL. Dorsal part dusky with irregular large and small dark blotches extending to below lateral line. The fish photographed is a female (there is a sexually dimorphic pattern of melanophores that occurs below the lateral line in males).
Tr 5-9+9-14. L. lat. 55-59.
(voucher: 63 mm SL)

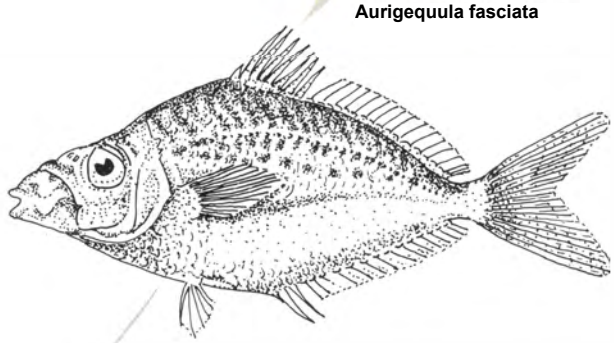
Leiognathus equula



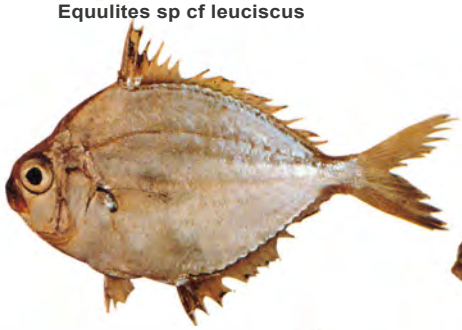
Aurigequula fasciata



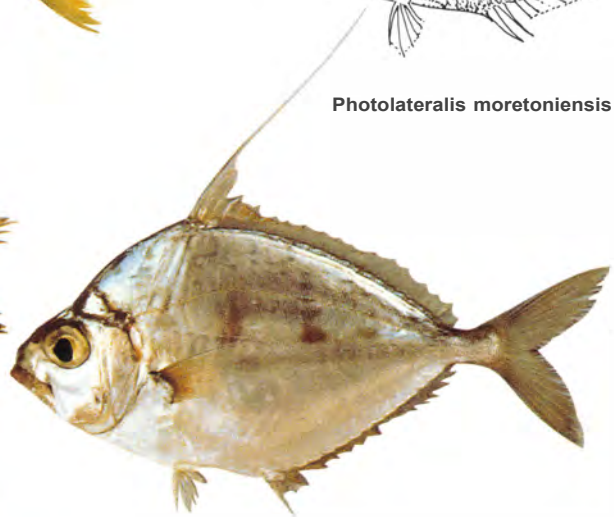
Equulites sp cf leuciscus



Photolateralis moretoniensis after Whitley. 1932



Eubleekeria rapsoni



Aurigequula longispinis

Eubleekeria jonesi

Photolateralis stercorarius

Deveximentum indicium

Deveximentum insidiator

Deveximentum megalolepis

Leiognathus equula

Large scales on breast but these are easily lost, no scales on cheeks. Teeth fine and sharp. Predorsal profile strongly sloping, with pronounced occipital hump. Body depth 1.7-1.9 in SL. Upper side of body with many close-set narrow dusky bars, notably in juveniles. A dark saddle on caudal peduncle; soft dorsal with black margin, caudal edge dusky, all other fins colourless or slightly grey. Membrane between anal fin spines markedly yellow.
(voucher: 155 mm SL)

Equulites sp cf leuciscus

Breast fully scaled but no scales on cheeks. Body depth 38-47% SL. Teeth small and conical. Males with a translucent triangular lateral flank patch. Head naked, body fully scaled. Irregular, sometimes semi-circular markings on back; in large individuals several round to oval yellow marks on body below lateral line. Dorsal and anal fins and caudal lobe with yellow markings. Second dorsal spine extended and second anal spine elongated (often broken in trawled material).
(voucher 108 mm SL)

Eubleekeria rapsoni

Breast, cheek and body fully scaled, scales present before ventral fin insertions. Teeth villiform. Lower margin of inner preopercular ridge serrated. Body deep, 53-57% SL. A dark line below dorsal fin, numerous faint lines on upper side of body; often dark markings on snout, operculum and on flanks. Outer half of spinous dorsal dark to black.
(voucher: 67 mm SL)

Eubleekeria jonesi

Breast fully scaled but no scales on cheeks; area on nape and before dorsal fin scaled except for a semicircular naked area, and no scales before ventral fin insertions. Lower margin of inner preopercular ridge smooth. Body deep, 51-58% SL. Faint vertical lines on upper part of body in adults; juveniles with a few dark blotches above lateral line. Scales on lateral line bright yellow. Outer part of dorsal spines often with a dark blotch, dorsal and anal fin margins yellow, margin of caudal fin dusky.
(voucher: 111 mm SL)

Deveximentum indicium

Mouth directed upwards. No scales on cheek, isthmus and breast; scales very small. Body slender, depth 41-50%. Dark bars on upper side of body narrow and irregular.
P 17-19. GR 5-7+19-22 . L. lat. 87-111.
(voucher: ? mm SL)

Deveximentum megalolepis

Mouth directed upwards; breast, cheek and body fully scaled. A very small fish with almost circular body, body depth 59-63% SL. Lateral line terminates below middle of soft dorsal. Distinct broad metallic blue-green bars on upper side of body extend to mid-side of body; fins yellow.
P 15-16. GR 4-6+15-19. Tr 6-7+13-15. L. lat. 43-49.
(voucher: 42 mm SL)

Aurigequula fasciata

Breast and cheeks without scales. Predorsal profile concave but humped at nape. Teeth villiform. Second dorsal fin spine elongate (often broken in trawled material). Superficially resembles a small *L. equula* but the dark vertical yellow lines on upper part of body are more distinct and well-spaced; horizontal row of large yellow oval blotches below lateral line. Posterior margin of caudal lobes dusky to black, pectoral fin axil and fin bright yellow.
(voucher: 154 mm SL)

Photolateralis moretoniensis

Breast, cheek and body fully scaled; lateral line incomplete, ending opposite last dorsal fin ray. Body depth 30-45% SL. Dense irregular markings on back, markings breaking up into zig-zag lines and blotches below lateral line. A black line below the dorsal fin. All fins colourless. translucent flank stripe in males broken into independent windows.
L. lat. about 38.

Aurigequula longispinis

Breast and cheeks naked. Body deep, 49-60% SL. Three to six distinct greenish-yellow blotches in a row on flanks below lateral line, scattered blotches below dorsal fin. Pectoral fin axil yellow; margins of caudal fin dusky. Second dorsal and anal fin spines greatly elongated.
L. lat, 64-70.
(voucher: 120 mm SL)

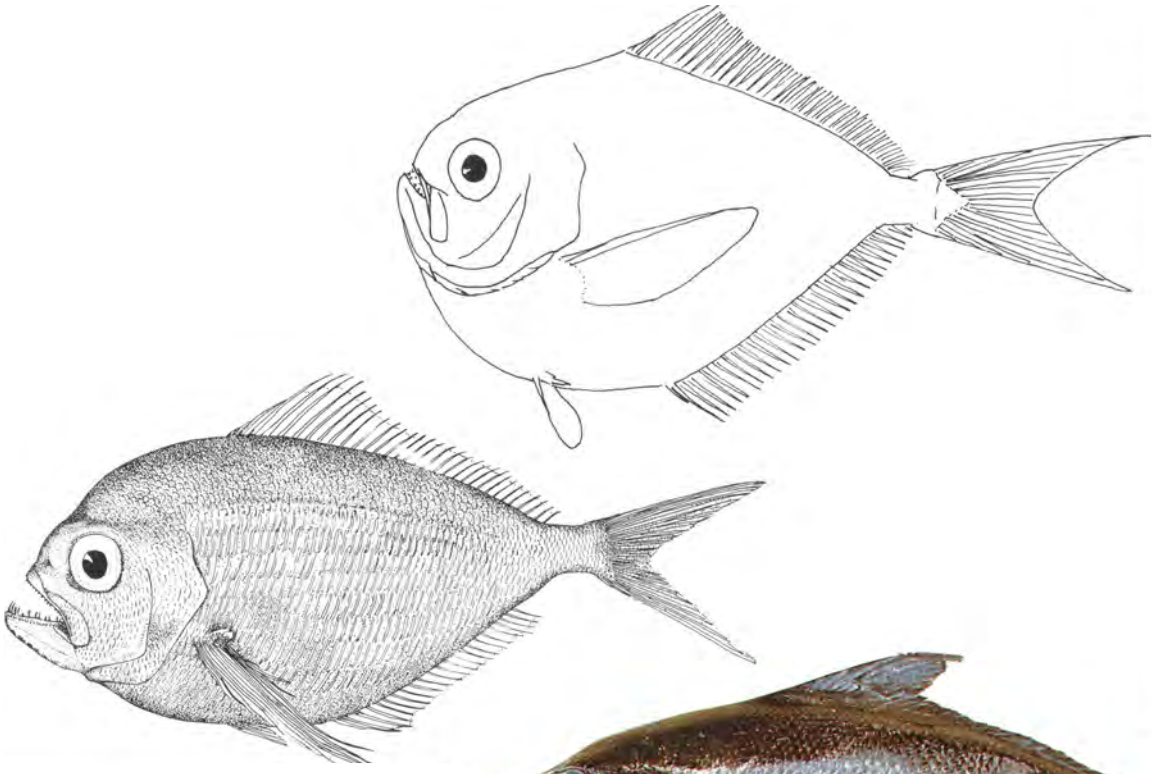
Photolateralis stercorarius

Breast and cheeks with scales. Body slender. Irregular dark lines on upper part of body. Translucent flank stripe in males, broken into independent windows.
L. lat. 42-43.
(voucher: 102 mm SL)

Deveximentum insidiator

Mouth directed upwards; body strongly compressed, ventral profile much more convex than dorsal profile. Scales very small, lateral line incomplete, no scales on cheek, isthmus and breast. Body slender in young, deeper in adults, 40-60% SL. Vertical dark bars on upper side ill-formed, sometimes becoming large blue spots and dashes; fins dull yellow.
P 17-18. GR 5-7+17-22. P 16-17. L. lat. 84-107.
(voucher: 57 mm SL)

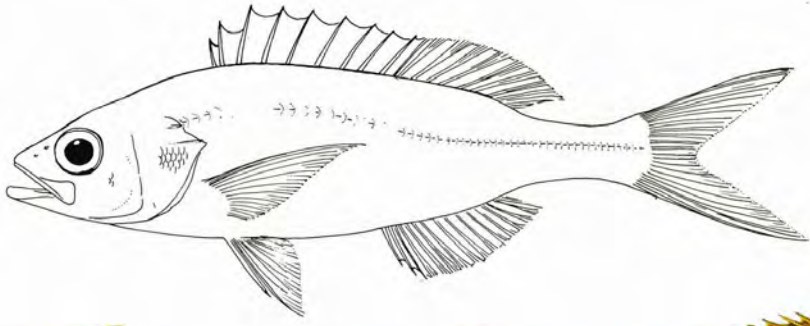
BRAMIDAE



Brama dussumieri drawing of preserved specmen

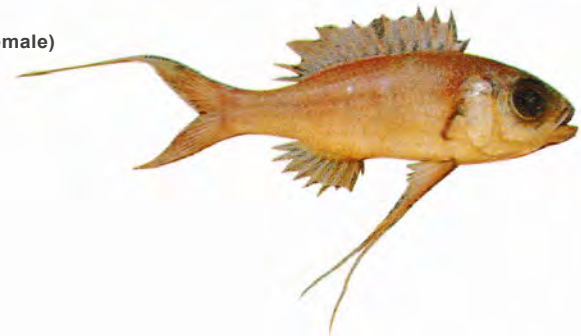
Taractes rubescens

SYMPHYSANODONTIDAE



A. Symphysanodon maunaloae (female)

Symphysanodon typus



B. Symphysanodon maunaloae (male)

BRAMIDAE

Pomfrets -

Body deep, ovoid and compressed; head deep. Scaled maxilla expanded posteriorly. Scales firmly attached, usually each with a median keel or denticle. Dorsal fin single, long-based, sometimes scaled and sometimes wholly depressible. Pectoral fin long; ventral fin with an axillary scale; caudal fin strong and forked.
Oceanic fishes in all oceans. Seven genera with 20 species, two collected in the survey area.

REFERENCES: Last & Moteki, 2001; Ray, Mohapatra & Mohanty, 2018.

Brama dussumieri

Scales extending over vertical fins; head profile rounded at eye level; interorbital convex and relatively narrow; predorsal scales 32-43. Pectoral fin low on sides; anterior rays of anal fin not much differentiated to remaining rays. Lower edges of mandibles (lower jaw bones) touching each other at ventral midline. Body dark grey with silvery-blue iridescence; unpaired fins blackish or charcoal-coloured.
P 19-21. 59-68 scales in longitudinal series.
(voucher: 165 mm SL)

Taractes rubescens

Scales extending over vertical fins. Lower jaw projecting, interorbital broad and almost flat. Strong 'keel' of large scales on caudal peduncle. Pectoral fin long, at least 36% of SL. Body and fins black, paler below; white tip to caudal keel, and edges of pectoral, ventral and caudal fins.
L. lat. 21-23.
(voucher: 540 mm SL)

SYMPHYSANODONTIDAE

Slopefishes -

Small, oblong fishes. Scales ctenoid, extending over head except for snout tip, forming free sheaths at bases of dorsal and anal fins. Mouth large, terminal, slightly upturned; upper jaw notched at symphysis. Teeth small, conical, larger on lower jaw. Dorsal fin single and continuous, with 9 spines. Three spines in anal fin. Ventral fin with large axillary scale. Caudal fin forked. Operculum with 2 flattened spines, lower one more prominent. Gill rakers well-developed.

Family comprises two genera and 13 species; two species obtained in the Survey area.

REFERENCES: Anderson, 1970; Anderson & Springer, 2005.

Symphysanodon maunaloae

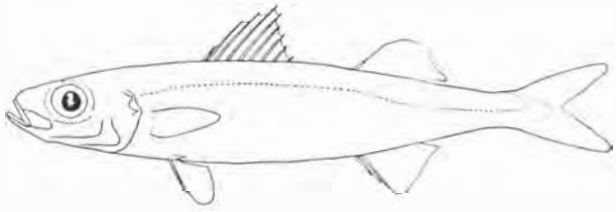
Rosy, darker above; two or 3 dusky cross-bands below dorsal fin, the first from fin origin to above pectoral fin more noticeable. Fins pale, dorsal fin dusky posteriorly. Body depth 3.9-4.7 in SL; least depth of caudal peduncle 10-13% SL; length of 3rd anal fin spine 13-16% SL. First ventral fin ray and caudal fin lobes produced into filaments in males.
D IX, 9-10. A III, 7. Total GR 31-37. P 15-17. Scale rows 42-47.

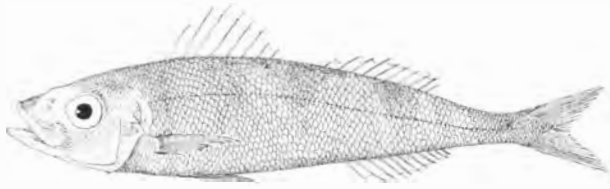
A. Female: (voucher: 131 mm SL)
B. Male: (voucher: 75 mm SL)

Symphysanodon typus

Scarlet-orange, paler below; head and lower caudal fin lobe bright yellow, dorsal fin bright yellow, membrane olive. Body depth 3.4-4.5 in SL; length of anal fin base 15-21% SL. First ray of ventral fin only slightly produced. Caudal fin lobes produced, but apparently not into long filaments.
D IX, 10. A III, 7. P 15-18. Total GR 36-40. Scales in longitudinal series 49-55.
(voucher: ? mm SL)

EMMELICHTHYIDAE

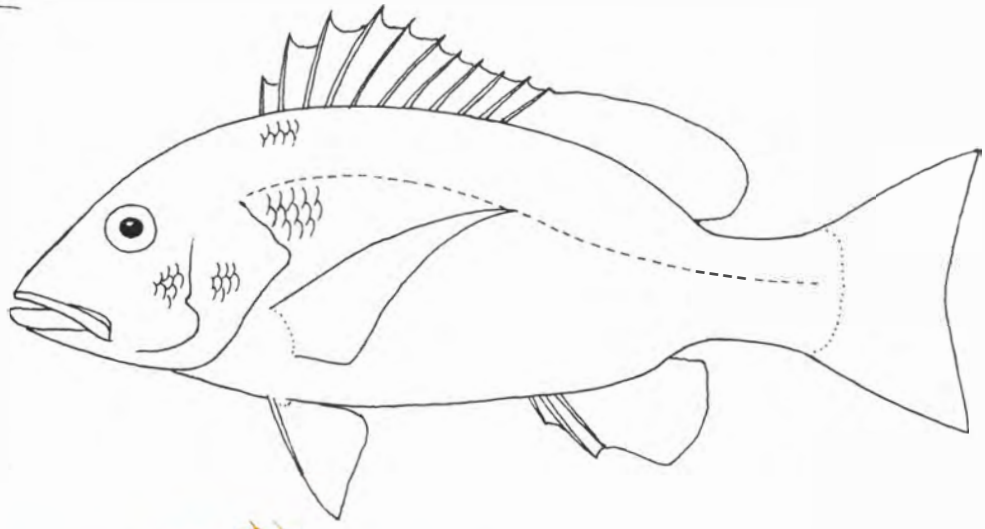




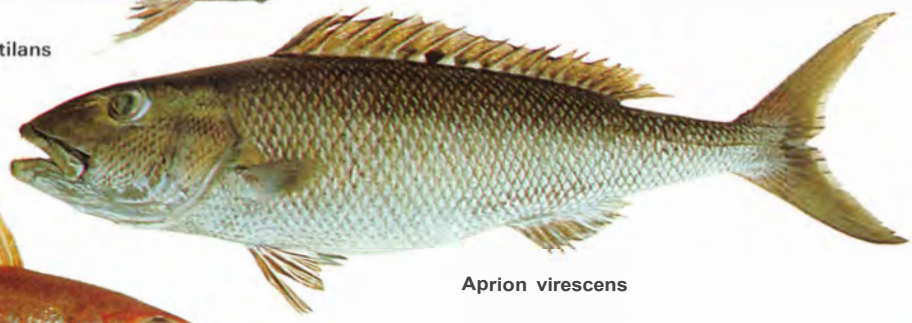
Erythrocles schlegelii

Maxilla scaled

LUTJANIDAE



Aphareus rutilans



Aprion virescens

Etelis carbunculus

Etelis radiosus

EMMELICHTHYIDAE

Bonnet mouths -

Slender fishes. Mouth toothless or almost so, very protractile. Maxillary broad posteriorly, scaled, with well-developed supramaxillary bone; 3 ascending processes from premaxilla. Lower jaw prominent; feeble opercular spines. Gill rakers long and numerous. Dorsal fin continuous, notched or separated into 2 parts of 11-14 spines (posterior ones often low and isolated) and 9-12 rays. Anal fin with three spines, 9 rays. Scaly basal sheath to anal and second dorsal fins; well-developed axillary process to ventral fin. Caudal fin deeply forked, its base scaly.

Family comprises three genera and 18 species; one species from the Survey.

REFERENCE: Carpenter, 2001a.

Erythrocles schlegelii

Body reddish pink, dusky above, silvery-white below and faintly shaded pink. Dorsal, anal and ventral fins pale pink, pectoral and caudal fins pinkish orange. Dorsal fin deeply divided between spinous and rayed parts; length of spinous dorsal fin base shorter than HL. Body depth 3.8-4.5 in SL; HL 3.2-3.6 in SL. Two protuberances ("lumps") on hind border of gill cavity. D XI, 10-12. A III, 9-10. Tr below 15-17. L. lat. 66-72. (voucher: 85 mm SL)

LUTJANIDAE

Snappers; Jobfishes; Sea-perches - Tanda-tanda; Jenaha; Gorara; Kahap

Oblong to deep-bodied, moderately compressed and perch-like fishes. Mouth terminal, small to large, usually some canine teeth in jaws; margin of preoperculum usually serrate. Scales ctenoid, anterior part of head without scales. Single continous dorsal fin, rarely deeply notched, with 9-12 spines and 10-17 branched fin rays; anal fin with 3 spines and 7-11 branched fin rays; ventral fin with an axillary scale; caudal fin truncate to deeply forked.

The family comprises 17 genera and 113 species. Representatives of 11 species were obtained on the Survey.

REFERENCES: Allen & Talbot, 1985; Anderson & Allen, 2001; Iwatsuki, Akazaki & Yoshino, 1993; Randall, Allen & Anderson Jr., 1987.

KEY TO GENERA FOUND ON SURVEY

1a. Dorsal and anal fins not covered by scales and without scaly sheaths at their bases; D X, 10 or 11 . . . . . **2**
2a. Last dorsal and anal fin rays shorter than fin rays immediately before them; D X, 10. . . . . **3**
3a Interorbital space almost flat; upper jaw extending farther toward than lower jaw; upper jaw in adults with thickened fleshy knob at tip; dorsal and anal spines robust .. . . . . **Lipocheilus**
3b Interorbital space distinctly convex; jaws about equal in size; no fleshy knob at tip of upper jaw . . . . . **Paracaesio**
2b. Last dorsal and anal fin rays longer than the rays immediately before them; D X, 11 . . . . . **4**
4a. Dorsal fin deeply notched at junction of spinous and soft portions; maxilla scaled . . . . . **Etelis**
4b. Dorsal fin not deeply notched; no scales on maxilla **5**
5a. Pectoral fin short, about equal to snout in length; deep groove before eye . . . . . **Aprion**
5b. Pectoral fin long, about equal to HL; no groove before eye **6**
6a. Jaw teeth minute, no teeth on palate. . . . . **Aphareus**
6b. Jaw teeth moderate to strong, teeth on palate. . . . . **Pristipomoides**
1b Scales extending onto soft dorsal and anal fin membranes, or present as low scaly sheaths to those fins; D X-XII, 11-17 . . . . . **7**
7a. No teeth on vomer **8**
8a. Deep groove before eye; head profile gently sloping . . . . . **Symphorus**
8b. No groove before eye; head profile almost vertical . . . . . **Symphorichthys**
7b. Teeth on vomer **9**
9a. More than 50 gill rakers on lower half of first gill . . . . . **Macolor**
9b. Less than 25 gill rakers on lower half of first gill arch **10**
10a. Mouth small, jaw teeth small; tip of snout level with middle of eye . . . . . **Pinjalo**
10b. Mouth larger, some jaw teeth canine-like; snout tip usually below level of eye centre . **Lutjanus**

Aphareus rutilans

Body red-brown above, becoming greenish below; body and head with grey or metallic hue. Fins greenish rosy, except for rosy pectoral fin and dark red-brown caudal fin. D X, 11. A III, 8. Lower GR 30-35. (voucher: 560 mm SL)

Aprion virescens

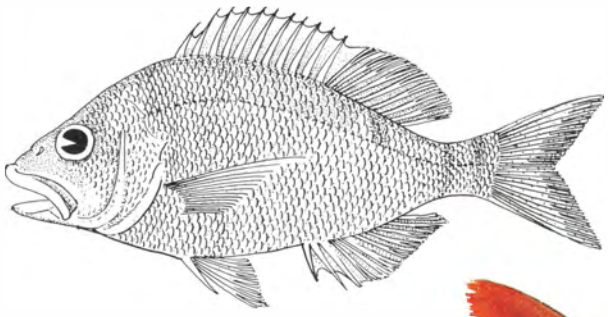
Body olive or dusky green, darker above; fins dusky yellow; violet or yellow blotches basally on membrane of first dorsal fin. Caudal fin deeply forked, lobes pointed. D X, 11. A III, 8. (voucher: 540 mm SL)

Etelis carbunculus

Body red, darker on back, yellow shades on lower sides; unpaired fins red. D X, 11. A III, 8. GR (total) 17-22 (10-13 not counting rudiments). L. lat. 48-50. (voucher: ? mm SL)

Etelis radiosus

Crimson, darker on back, paler below. Fins crimson, maxillary groove dusky. D X, 11. A III, 8. GR (total) 33-36 (30-33, not counting rudiments). L. lat. 50-51. (voucher: ? mm SL)



Lipocheilus carnolabrum drawing after slide (David Cook)

Lutjanus argentimaculatus

Lutjanus bengalensis

Lutjanus bitaeniatus

Lutjanus bohar

Lutjanus boutton

Lutjanus carponotatus

Lutjanus decussatus

Lutjanus erythropterus

Lutjanus fulviflamma

Lipocheilus carnolabrum

Body greenish yellow or golden-olive, darker above; juveniles with 5 diffuse dusky bars on upper body. Fins plain dusky yellow; snout and lips yellowish. No scales on maxilla which ends below middle of eye. Pectoral fin long and falcate, only slightly shorter than HL in adults. Preoperculum slightly notched in adults, otherwise entire.
D X, 10. A III, 8.
(voucher: ? mm SL)

Lutjanus bengalensis

Four pale blue, dark-edged bands from head along upper half of body, longest from snout to caudal peduncle; orange-yellow border on spinous dorsal fin. Notch in preopercular edge well-developed. Scales on top of head begin above eye. Vomerine tooth patch an inverted "V".
D XI-XII, 13-14. Lower GR 18-20.
(voucher: 132 mm SL)

Lutjanus bohar

Body dark brown-red on back, plain red ventrally; pale spot on scales often present and forming rows; juveniles with two larger white spots on back below dorsal fin. Fins red; dorsal and anal fins washed brown; black on outer anal and ventral fins; maxillary groove black. Nostrils in deep groove before eye. Scale rows above lateral line rise obliquely below all of dorsal fin.
D X, 13-14.
(voucher: 500 mm SL)

Lutjanus carponotatus

Seven to 8 yellow bands along body, beginning on head. Fins yellow; black patch in pectoral fin axil. Vomerine tooth patch diamond-shaped or triangular with posterior extension.
D X, 15-16.
(voucher: 252 mm SL)

Lutjanus erythropterus

Body red, grading to white on lower sides; fins orange-red. Juveniles with pale-ringed black spot on upper caudal peduncle. Scale rows rise obliquely above and below lateral line. Head profile convex, eye noticeably below head profile; interorbital broad, 11 in SL. Snout long, 3 in HL.
D XI, 13-14. Tr above 9.
(voucher: 410 mm SL)

Lutjanus argentimaculatus

Red with dark green or brown tints over scales and fins. Strong canine teeth. Scale rows above lateral line parallel to it anteriorly, rising obliquely below posterior part of spinous dorsal fin. Caudal fin truncate.
D X, 14.
(voucher: 620 mm SL)

Lutjanus bitaeniatus

Red body; ventral and anal fins yellow-orange. Predorsal profile straight, snout length more than 2.7 in HL. Vomerine tooth patch a triangle or inverted "V"; preorbital depth equal to interorbital. Notch on preopercular edge weak.
D X, 13-14. A III, 8.
(voucher: 247 mm SL)

Lutjanus boutton

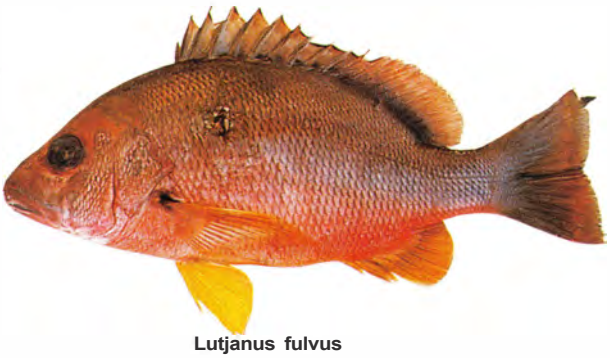
Greenish red on back, sides red with yellow lines. Large brown pale-edged spot across lateral line below soft dorsal fin. Fins yellowish red, caudal fin darker. Scales on top of head begin above eye; vomerine tooth patch triangular or an inverted "V"; preorbital depth more than 5 in HL.
D X-XI, 13-14.

Lutjanus decussatus

Background colour whitish blue; five horizontal broad red-brown stripes along body (lower-most from mouth), upper two stripes crossed by vertical red-brown bars. Large black spot at caudal fin base. Vomerine tooth patch an inverted "V" or triangle.
D X, 13-14.
(voucher: ? mm SL)

Lutjanus fulviflamma

Green, cream or rosy on lower sides of body, darker above. Six or 7 yellow horizontal stripes from head to caudal peduncle. Large diffuse black blotch over lateral line below soft dorsal fin. Fins yellow. Vomerine tooth patch triangular with posterior extension.
D X, 12-13.
(voucher: 130 mm SL)



Lutjanus fulvus

Lutjanus gibbus

Lutjanus johnii

Lutjanus lemniscatus

Lutjanus lunulatus

Lutjanus lutjanus

Lutjanus xanthopinnis

Lutjanus malabaricus

Lutjanus monostigma

Lutjanus quinquelineatus

Lutjanus fulvus

Body rosy or greenish; sometimes golden flecks and lines on head and rosy stripes on body may be present. Dorsal fin margin and caudal fin dusky red. Pectoral, anal and ventral fins yellow to orange; dark brown in pectoral fin axil. Preopercular notch moderately or weakly developed. Vomerine tooth patch in shape of inverted "V".
D X, 13-15.
(voucher: 209 mm SL)

Lutjanus johnii

Silvery mauve-red body, head and lower sides mauve-pink. Rows of brown spots along scale rows; scattered black spots and flecks over upper ⅔ of body. A large black, silvery blotch may be present on lateral line below soft dorsal fin. Scale rows above lateral line parallel to it; scales on head begin above middle of eye. Vomerine tooth patch in shape of an inverted "V".
D X, 13-14.

Lutjanus lunulatus

Body rosy above, white below; a broad, black, crescentic band on caudal fin. Jaws, underside of head, pectoral, ventral and anal fins yellow. Vomerine tooth patch in shape of an inverted "V"; preopercular notch weak.
D X, 13-14.
(voucher: 180 mm SL)

Lutjanus xanthopinnis

Body pinkish brown above shading to white below, yellow-green lines along mid-sides. Pectoral fin bright yellow, other fins greenish-blue. Vomerine tooth patch triangular with posterior extension. Preorbital width ½ to ¾ of vertical eye diameter.
D X, 12-13. Lower GR 9-11.
(voucher: 160 mm SL)

Lutjanus monostigma

Body brownish yellow, pinkish white below and dusky yellow lines along scale rows. Dark brown spot across lateral line below second dorsal fin usually present. Ventral, anal and caudal fins orange. Vomerine tooth patch in shape of an inverted "V"; preopercular notch weak.
D X, 12-13. Tr above 6-7.
(voucher: 300 mm SL)

Lutjanus gibbus

Dark reddish brown or crimson, fins darker. Scale rows above and below lateral line rise obliquely. Preopercular notch deep and strong spur on interoperculum. Caudal fin large and deeply forked, lobes rounded, upper lobe larger than lower.
D X, 13-15.

Lutjanus lemniscatus

Body dark mauve-crimson or greyish, dorsal fin with dark brown margin. Head profile concave above eyes, convex at nape; eye close to head profile and snout long. Scale rows above lateral line rise obliquely. Vomerine tooth patch in shape of an inverted "V"; preopercular notch weak.
D X, 13-14.
(voucher: 490 mm SL)

Lutjanus lutjanus

Body cylindrical; eye large. Fawn to olive above, body dusky white below; horizontal dusky yellow lines along body; band from snout through eye to upper caudal fin base broadest and bright yellow. Vomerine tooth patch triangular with short posterior extension. Preorbital width about half of vertical eye diameter.
D X-XI, 12-13. Lower GR 14-18.
(voucher: 135 mm SL)

Lutjanus malabaricus

Dark brown-red body and fins, yellow marks on snout, narrow brown edge to caudal fin. Soft dorsal and anal fins large and triangular; caudal fin truncate. Head profile concave, eye close to head profile; interorbital narrow, 14-17 in SL. Scale rows of upper ⅔ of body rise obliquely.
D XI, 14-15. A III, 9. Tr above 7-8.
(voucher: 530 mm SL)

Lutjanus quinquelineatus

Bluish-yellow above, body paler below. Five brown-edged blue stripes across head and along body, first ending at anterior soft dorsal fin, 5th passing through pectoral fin base to lower caudal peduncle. Dark blotch may be present below soft dorsal fin. Fins yellow. Snout 3.2-3.4 in HL. Preopercular notch deep.
D X-XI, 13-15.
(voucher: 150 mm SL)

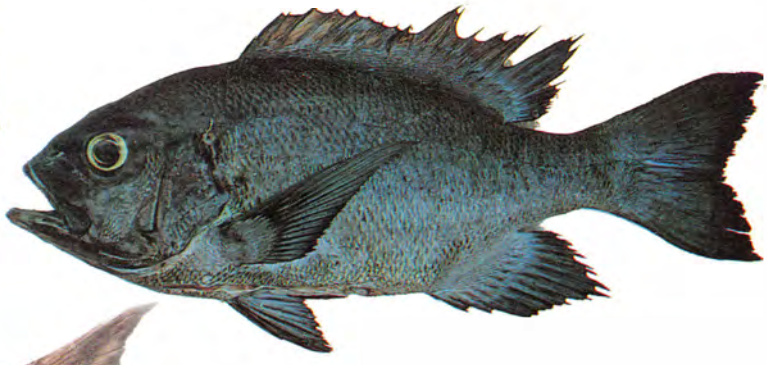
Lutjanus rivulatus

Lutjanus russellii

Lutjanus sebae

Lutjanus timoriensis

Lutjanus vitta

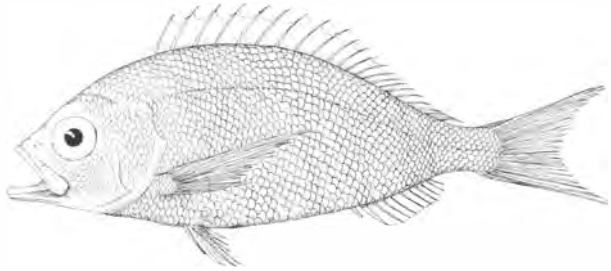


Macolor niger

Paracaesio kusakarii

Paracaesio xanthurus

Pinjalo pinjalo



Pinjalo lewisi drawing of preserved specimen

Lutjanus rivulatus

Olive-green above, cream below. Each body scale with grey or white spot, forming rows; head with many wavy, thin blue lines running horizontally. White spot on lateral line below soft dorsal fin. Body deep, 2.2-2.4 in SL. Soft dorsal and anal fins triangular and extended.
D X, 15-16.
(voucher: 500 mm SL)

Lutjanus sebae

Body dull red, crimson or pink; pearly spots may be present on many scales; fin edges dark. Juveniles with 3 broad dark red-brown diverging bands across body. A deep-bodied fish, its depth 2-2.5 in SL. Soft dorsal and anal fins enlarged and acute. All scale rows rise obliquely; strong spur on interoperculum.
D XI, 15-16. A III, 10-11.
(voucher: 490 mm SL)

Lutjanus vitta

Body rosy green above, paler below. Thin olive or yellow lines along scale rows; broad dark green or brown band from snout through eye to upper caudal fin base. Ventral fin white, other fins yellow, white margin on dorsal and anal fins. Vomerine tooth patch triangular with posterior extension. Preorbital width sub-equal to vertical eye diameter.
D X, 13. Lower GR 12.
(voucher: 225 mm SL)

Paracaesio kusakarii

Maxilla scaled. Body deep, metallic blue or violet-brown, back, top of head and undersides of body with pink hue. Four dark cross-bands may be visible on back. Dorsal fin greenish, yellow posteriorly anal and outer ⅓ of caudal fin yellow.
D X, 10. A III, 8. L. lat. 48-50. Body depth 2.4-2.5 in SL.
(voucher: 450 mm SL)

Pinjalo pinjalo

Pale crimson or rosy, dorsal and caudal fins brownish crimson, edges darker; ventral and anal fins dusky yellow. Scale rows above and below lateral line rise obliquely. Interorbital 3.5-4.1 in HL.
D XI, 14. A III, 10. L. lat. 50-55.
(voucher: 170 mm SL)

Lutjanus russellii

Deep violet-crimson above, scarlet to cream below; 6-8 dusky yellow narrow stripes from head to caudal peduncle: upper ones oblique, lower ones horizontal. Large black blotch mostly above lateral line below soft dorsal fin. Pectoral, ventral and anal fins may be yellow; yellow hind margin to brown caudal fin. Vomerine tooth patch triangular with posterior extension.
DX, 14-15.
(voucher: 230 mm SL)
Note: black spot may be absent in large fish and those from deep water.

Lutjanus trimoriensis

Crimson body and fins, brown over back and on margin of dorsal and caudal fins. Pectoral fin axil black. Soft dorsal and anal fins enlarged and acute.
D XI, 14-15. A III, 8. Lower GR 13.
(voucher: 280 mm SL)

Macolor niger

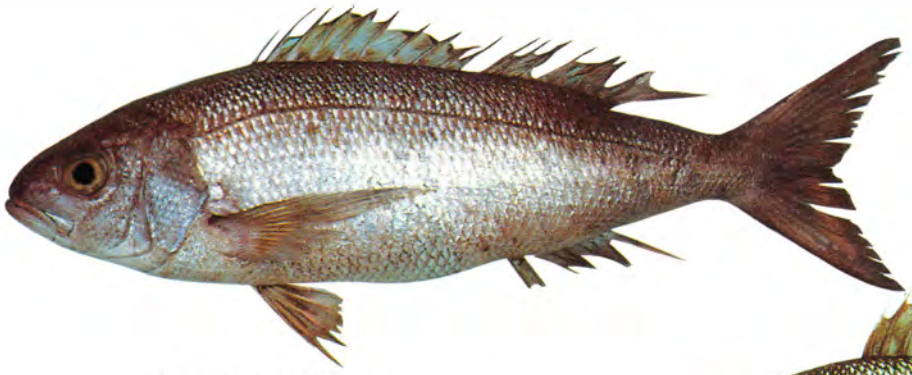
Body and fins black, charcoal or dark olive; juveniles with black and white spots and horizontal bands on sides. Pectoral fin falcate, about as long as head; head profile convex; teeth in jaws conical. Preopercular notch deep, interopercular spur strong. Scales on bases of enlarged and pointed soft dorsal and anal fins; caudal fin lobes rounded, fin slightly forked.
D X, 13-14. A III, 10-11.
(voucher: ? mm SL)

Paracaesio xanthurus

Head and anterior part of body violet-blue, back below dorsal fin and caudal peduncle yellow. Juveniles rosy yellow-green on back, 3 or 4 olive bands across body. Fins dusky yellow, caudal fin bright yellow. Maxilla usually naked. Body depth 2.6-3.1 in SL.
D X, 10. A III, 8.
(voucher: 55 mm SL)

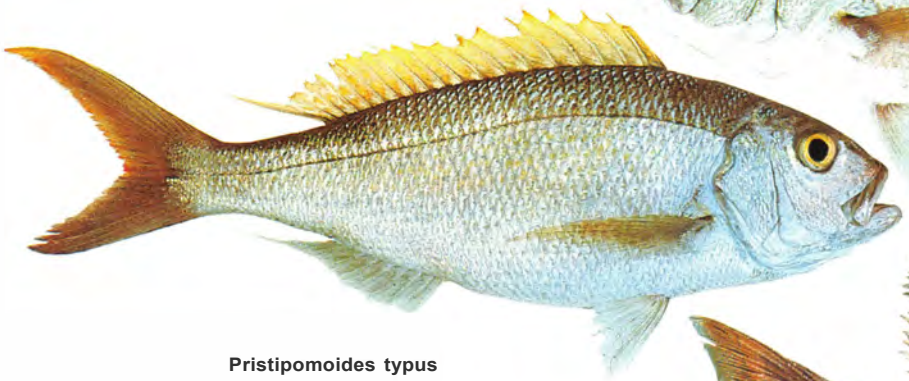
Pinjalo lewisi

Body red, scarlet over head, darker red over back. Pectoral fin axil brown to charcoal and anal fins pink, becoming orange-yellow towards margins; edges of dorsal and caudal fins dark brown or black; pectoral and ventral fins rosy. Scale rows above and below lateral line rise obliquely. Interorbital 3-3.5 in HL.
D XII, 13. A III, 9. L. lat. 49-52.
(voucher: 125 mm SL)



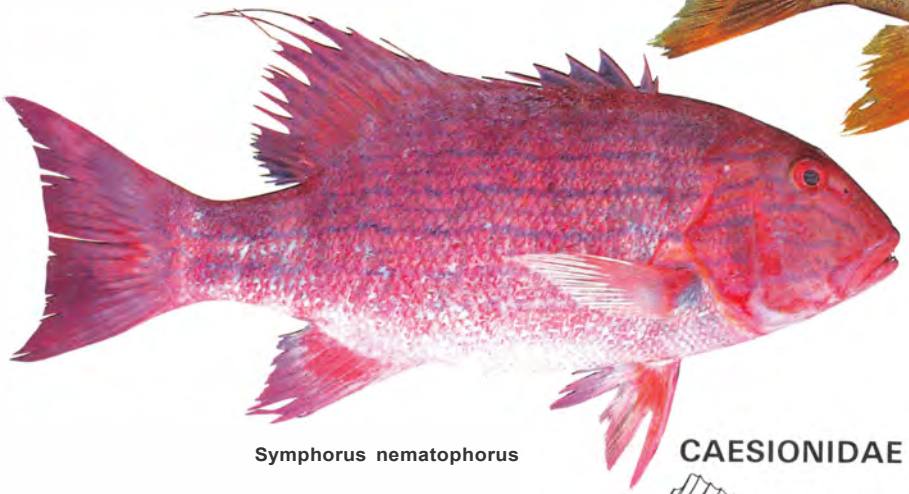
Pristipomoides filamentosus

Pristipomoides multidens



Pristipomoides typus

Symphorichthys spilurus



Symphorus nematophorus

CAESIONIDAE

Caesio caerulaurea

Caesio cuning

Pristipomoides filamentosus

Body violet-rosy, silvery below. Snout and interorbital with narrow yellow lines and small blue spots; blue spots on scales, distinct on back. Dorsal and caudal fins light blue or lavender, margins yellow or orange. Upper jaw 2.4-2.6 in HL. Vomerine tooth patch triangular.
D X, 11. A III, 8. L. lat. 57-63. Total GR 22-26.
(voucher: 495 mm SL)

Pristipomoides typus

Reddish blue, iridescent; suborbital and snout plain; interorbital with many wavy bands running lengthwise. Blue dorsal fin with many vertical wavy yellow lines; caudal fin brown-red, lower lobe pale. Upper caudal fin lobe elongate in juveniles.
D X, 11. A III, 8. Total GR 17-23. L. lat. 48-50.
(voucher: 400 mm SL)

Symphorus nematophorus

Body pale crimson with violet and brown shades; narrow wavy blue longitudinal lines or rows of spots over head and upper ⅔ of body. Head profile convex. Caudal fin emarginate. Anterior dorsal and anal fins rays produced into filaments in juveniles.
D X, 15-16. A III, 9.
(voucher: 450 mm SL)

Pristipomoides multidens

Iridescent pale blue, orange over back. Dorsal fin blue with 3 orange longitudinal bands; caudal fin orange. Two or 3 blue-edged yellow bands across suborbital and snout and many wavy yellow bands across interorbital.
D X, 11. A III, 8. L. lat. 48-50. Total GR 17-23.
(voucher: 420 mm SL)

Symphorichthys spilurus

Head profile steep, convex above. Body brown or yellow above, orange-brown below. Many brown-edged blue bands on upper body; bands horizontal over head and anterior body, oblique below soft dorsal fin. Black or dark brown saddle on upper caudal peduncle; sometimes an orange bar across nape. Anterior dorsal and anal fin rays produced into filaments (in juveniles?).
D X, 14-16. A III, 8-10.
(voucher: 415 mm SL)

CAESIONIDAE

Bananafish; Fusiliers - Pisang-pisang; Lalosi; Ekor kuning

Oval to slender fishes, body moderately compressed. Mouth small, protractile; premaxilla with 1 or 2 distinct, elongate, lateral processes which slip under maxilla and are visible inside mouth; fine teeth (no canines) in jaws (absent in *Dipterygonotus*); preopercular margin entire. Scales small and ctenoid, side of head scaly, maxilla naked. Single dorsal fin with 10-15 slender spines, usually continuous with rayed portion but appearing as two separate parts in *Dipterygonotus*; anal fin with 3 spines; last ray of dorsal and anal fins slightly produced. Scaly process in axil of ventral fin; caudal fin deeply forked.
The colour of caesionids is darker when caught at night, pale areas becoming reddish or blotches appearing.

The family comprises four genera and 23 species; representatives of those four genera were obtained on the Survey.

REFERENCES: Allen & Erdmann, 2006; Carpenter, 1987; Carpenter, 2001b.

Caesio caerulaurea

Distinct black streak along each caudal fin lobe. Back deep blue, shading to white below; a single golden yellow stripe about 3 scales wide and bordered by pale blue, passes just above lateral line from above eye to caudal peduncle where it curves slightly to end at upper caudal base; pectoral fin axil and base black. Body depth 3.2-2.5 in SL. Band of scales above and behind eye usually interrupted by naked gap at middle on predorsal profile; dorsal fin scaled except distally.
D X, 15-(16). A III, 12-(13). P ii, 18-20.
(voucher: 141 mm SL)

Caesio cuning

Body dusky grey blue or dark blue, paler below, broadening yellow band over back from dorsal fin origin covers caudal peduncle and fin; blue lines around eye. Black-edged dorsal fin yellow or bluish yellow; upper pectoral base black. Body depth 2.3-2.5 in SL. Band of scales above and behind eye crosses predorsal profile without gap; scales cover dorsal fin except distally.
D X, 15-(16). A III, 11. P ii, 15-17.
(voucher: 100 mm SL)

Caesio lunaris

Caesio teres

Caesio xanthonota

Dipterygonotus balteatus

Gymnocaesio gymnoptera

Pterocaesio chrysozona

Pterocaesio digramma

Pterocaesio pisang

Pterocaesio tessellata

Caesio lunaris

Each caudal fin lobe with dark brown or black tip. Violet-blue body lacks stripes or blotches; silvery grey on lower sides, caudal fin and peduncle and other fins sometimes yellowish; dark edge on dorsal fin; black upper pectoral base. Body depth 2.4 in SL. Band of scales above and behind eye interrupted at mid-dorsal line by space either naked or with tiny embedded scales; dorsal fin scaled except distally.
D X, 14. A III, 10-11. P ii, 17-18.
(voucher: 200 mm SL)

Caesio xanthonota

Caudal fin plain reddish yellow. Top of head, upper one third of sides and upper caudal peduncle dusky yellow, middle of sides bright blue, lower sides white; black or purple spot on upper pectoral base. Dorsal and anal fins bright yellow. Body depth 2.9-3.4 in SL. Band of scales above and behind eye interrupted by naked gap at middle on predorsal profile; scales cover dorsal fin except distally.
D X, 14-15. A III, 11-12. P ii, 18-20.
(voucher: 200 mm SL)

Gymnocaesio gymnoptera

Tip of each caudal fin lobe reddish brown. Back brownish blue with pale centres on scales; green-yellow stripe from behind eye covers lateral line to caudal fin base, usually pale of bluish horizontal streak below it. Body depth 5-5.5 in SL. No scales on dorsal fin.
D X, 15. A III, 12. P ii, 18-20. L. lat. 65-72.
(voucher: 112 mm SL)

Pterocaesio digramma

Each caudal lobe with dark reddish brown tips. Violet or rosy above, white below, 2 bright yellow stripes along back: first from nape to below dorsal fin base; 2nd from snout through eye, passing horizontal just below lateral line, crossing lateral line opposite end of dorsal fin. Body depth 3.3-3.7 in SL. Scales cover only lower part of dorsal fin.
D X, 14-15. A III, 11-12. P ii, 17-19. Tr above 9.
(voucher: 185 mm SL)

Pterocaesio tessellata

Each caudal lobe with a distinct black tip. Brilliant silvery blue, darker above, scale centres paler blue. Golden yellow stripe about 2 scales wide passes from top of eye and covers lateral line, crosses over lateral line in middle of its length and ends at upper caudal base. Pectoral base plain. Body depth about 3.4-3.7 in SL. Scales cover only lower part of dorsal fin.
D X, 15. A III, 12. P ii, 18-20. L. lat. 69-76.
(voucher: 138 mm SL)

Caesio teres

Usually all of back and caudal peduncle from dorsal fin origin to end of anal fin yellow; in larger fish, yellow restricted to more posterior part. Top of head and sides brilliant blue, lower sides white; black spot on upper pectoral base. Body depth 3.2 in SL. Band of scales above and behind eye interrupted by naked gap at middle on predorsal profile; dorsal fin scaled except distally.
D X, 15. A III, 12. P ii, 18-20
(voucher: 128 mm SL)
(Note: very similar to *C. xanthonota* but always blue on top of head).

Dipterygonotus balteatus

Mostly plain brown or reddish brown above, silvery below, horizontal dusky golden stripe from head to tail base; caudal fin plain translucent or faintly pink. Body depth 4.5-5 in SL. No scales over dorsal fin; spinous and soft dorsal separated from each other by low isolated spines.
D X+V; 9-11. A III, 10. L. lat. 71-77. P ii, 15-17.
(voucher: 74 mm SL)

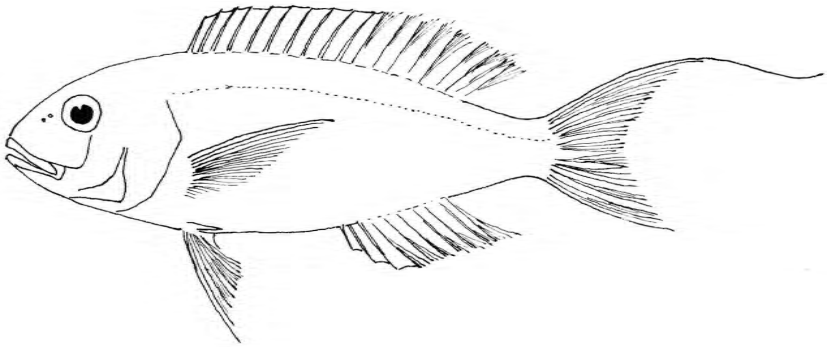
Pterocaesio chrysozona

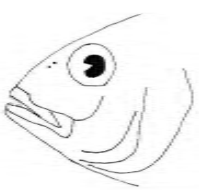
Tip of each caudal lobe dark red or black. Back brown or reddish white below; very broad (anteriorly) yellow gold stripe from eye passes below and adjacent to lateral line to caudal fin base covering lateral line on peduncle; 2nd thin yellow stripe along dorsal profile. Body depth 3.4-3.7 in SL. Scales cover only lower part of dorsal fin.
D X, 15. A III, 12. P ii, 16-18. Tr above 8.
(voucher: ? mm SL)

Pterocaesio pisang

Tip of each caudal lobe dark reddish brown or blackish. Body plain dusky pale red, or fawn. Body depth 3.9-4.1 in SL. Scales cover only basal part of dorsal fin.
D X, 15. A III, (11)-12. P ii, 16-19. L. lat. 65-72.
(voucher: 65 mm SL)

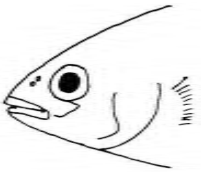
NEMIPTERIDAE



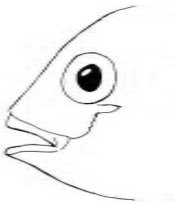


Nemipterus

Parascolopsis



Pentapodus



Scolopsis

Nemipterus balinensis

Nemipterus bathybius

Nemipterus furcosus

Nemipterus hexodon

Nemipterus isacanthus

NEMIPTERIDAE

Threadfin breams; Monocle breams - Juku eja; Jamban; Gurisi; Pasir-Pasir

Small to moderate-sized fishes: body slightly compressed and elongate oval. Mouth terminal with bands of teeth, sometimes outer row enlarged; eye moderate or large; suborbital hind margin entire, serrated or produced into spine below eye. Scales ctenoid, small to moderate, 3-5 rows across cheek. Dorsal fin single with 10 spines and 9 rays; anal fin with 3 spines and 7 rays: pectoral fin with 14-19 rays; ventral fin usually with medium-sized axillary scale; caudal fin forked, lunate or emarginate; sometimes a filament from spinous dorsal fin and/or upper and/or lower caudal fin lobe. Identification based primarily on colouration, which is variable and less obvious after death.

The family contains five genera, all but one (*Scaevius*) represented in Survey material.

KEY TO GENERA FOUND ON SURVEY

	Nemipterus	Pentapodus	Parascolopsis	Scolopsis	Scaevius
Spine below eye	-	-	+ (small)	+	-
Suborbital naked	+	+	+	+	+
Anterior canine teeth present	+	+	-	-	-
Suborbital hind border smooth	+	+	+/-	-	-
Scales on top of head reaching eye lev	+	+	+	+	-
Number of scale rows on cheek	3	4-5	4-5	5-6	5-6

REFERENCES: Russell, 1993; Russell, 2001; Russell & Gloerfelt-Tarp, 1984.

Nemipterus balinensis

Upper part of body pinkish, becoming pearly white below. Two yellow lateral stripes: upper stripe faint and diffuse, from operculum and beneath lateral line to upper caudal base; lower stripe with a golden sheen, narrow, from just above pectoral base to middle of caudal base. Dorsal fin suffused with yellow, its margin sulphur-yellow with a dusky mauve sub-marginal band; caudal fin pinkish yellow, tip of upper lobe and filament a brilliant yellow, fin below edged red; anal fin transparent; pectoral and ventral fins translucent pink; base of ventral fins bright yellow.
(voucher: 117 mm SL)

Nemipterus hexodon

Upper part of body pinkish, silvery white below; 6-8 pale yellow stripes on sides from below lateral line. Blood red, ovoid spot below origin of lateral line, bordered below by bright yellow; double yellow stripe running from isthmus to lower caudal fin base. Dorsal fin translucent, its margin yellow, and a narrow yellow stripe running from base at front of fin backwards to about mid-height of last soft fin rays, this stripe bordered by a translucent narrow pale bluish-white stripe. Caudal fin pink, upper lobe tipped with yellow; anal fin translucent with a narrow yellow stripe running from near base of fin anteriorly to mid-height of posterior fin rays (extending to tip of fin along posterior ray in larger individuals), base of fin pale bluish white; pectoral and ventral fins pale translucent pink; base of ventral fins and axillary scale lemon-yellow.
(voucher: 215 mm SL)

Nemipterus bathybius

Upper part of body pinkish, becoming silvery below. Two yellow lateral stripes: first from operculum and beneath lateral line to upper caudal base; second from behind upper pectoral fin base to middle of caudal base. Dorsal fin pink, edged with yellow and with a median stripe of yellowish undulating lines; caudal fin pink, upper lobe and filament yellow; anal fin transparent but pinkish on outer margin; other fins hyaline; bases of ventral fins bright sulphur-yellow.
(voucher: 131 mm SL)

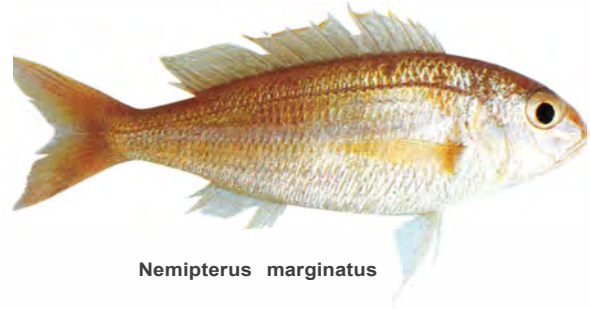
Nemipterus furcosus

Head and body pale iridescent pink, silvery-white below; traces of indistinct yellowish stripes along body, one above and several below lateral line. Back with 9 indistinct blotches extending to just beneath lateral line; third blotch somewhat darker and more distinct and forming a reddish shoulder spot behind origin of lateral line in some individuals. Upper jaw rosy, lower jaw silvery Dorsal fin pale rosy, sometimes with yellowish tinge, its outer margin dark pink; caudal fin pale rosy and with yellow tinge, lower margin of fin white; anal fin bluish white, with row of transparent or faint yellowish spots near base; ventral fins and axillary scales white; pectoral fins rosy.
(voucher: 137 mm SL)

Nemipterus isacanthus

Body pinkish mauve, silvery on lower part of sides and ventral surface; top of head and back yellow, tinged with pink; two broad pale golden stripes along body, the first from beneath origin of lateral line to upper caudal fin base; second from behind pectoral fin base to lower caudal fin base; pale yellow stripe on either side of ventral midline; snout pinkish; yellow teardrop-shaped bar beneath eye, extending obliquely forwards about halfway down suborbital; upper lip yellow; bluish patch on upper part of operculum. Dorsal fin translucent, with narrow, red-edged yellow margin, and narrow yellow sub-medial stripe; caudal fin pink, tip of upper lobe bright yellow, lower lobe tinged yellow; anal fin and ventral fins translucent whitish; pectoral fins translucent pinkish.

Nemipterus japonicus

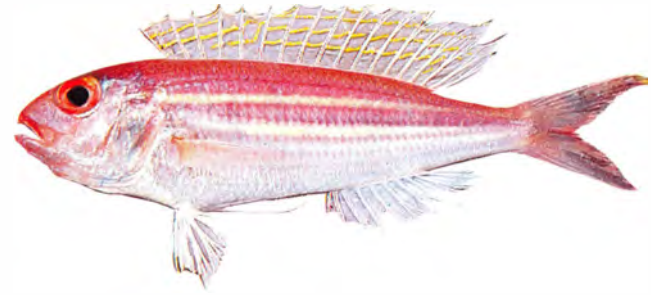


Nemipterus marginatus

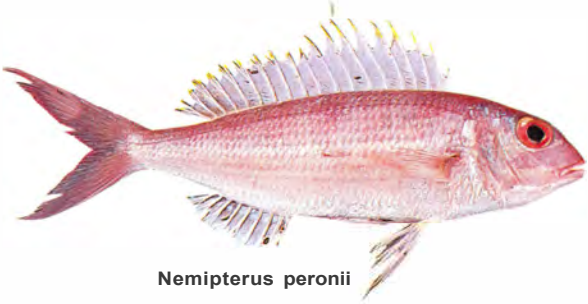
Nemipterus zysron

Nemipterus mesoprion

Nemipterus nematophorus

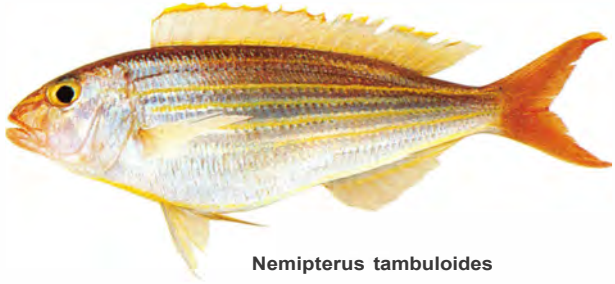


Nemipterus nematopus



Nemipterus peronii

Nemipterus sugillatus



Nemipterus tambuloides

Nemipterus japonicus
Upper part of body pinkish, becoming silvery below; top of head from behind eye with a golden sheen; 11-12 pale golden-yellow stripes along body from behind head to base of caudal fin; a prominent red-suffused yellow blotch below origin of lateral line. Dorsal fin whitish, margin of fin yellow, edged with red; a lemon-yellow stripe running along base of dorsal fin, broadening posteriorly. Caudal fin pink, upper tip and filament yellow; anal fin whitish with pale lemon-yellow broken lines or scribblings over most of it; pectoral fin translucent pinkish; ventral fins whitish with yellow axillary scale.
(voucher: 168 mm SL)

Nemipterus zysron
Upper part of body reddish, silvery below; sides below lateral line with indistinct yellow stripes along the middle of each scale row; head pinkish, suffused with mauve on the snout; yellow stripe in front of eye through nostril, another from upper lip to beneath eye; less distinct golden stripe from behind eye to origin of lateral line then across upper part of operculum to upper base of pectoral fin. Dorsal fin pale yellow with a bright yellow margin (blue in photo), a pale mauve sub-marginal stripe and pale mauve stripe along base of fin; caudal fin pinkish, upper and lower lobes pale yellowish, filament yellow; anal fin pale lilac with a series of elongate yellow spots or yellow stripe along lower ⅓ of fin; pectoral fins pale yellow; ventral fin translucent white, base of fin and axillary scale pale yellow.
(voucher: 90 mm SL)

Nemipterus nematophorus
Upper part of head and body pinkish, silvery-white below; broad golden-yellow stripe beneath lateral line, with distinct gold patch anteriorly beneath origin of lateral line; 3 narrow golden-yellow stripes laterally along ventral half of the body and a double yellow stripe along ventral midline. Dorsal fin translucent pink, its anterior dorsal filament and margin yellow; caudal fin pink, upper tip and filament yellow; anal fin translucent, a faint yellow or orange stripe along fin extending from near base of first spine to middle of last ray, basal part of fin pale bluish-white; pectoral fins pale pink; ventral fins pink, axillary scale lemon-yellow.

Nemipterus peronii
Upper part of body pink, with 7 or 8 indistinct darker pink saddles reaching to or just below the lateral line; lower part of body silvery, with faint golden stripes running along each scale row; a diffuse pale reddish spot below and just behind origin of lateral line. A golden-yellow stripe on snout in front of eye, upper lip yellow, suborbital silvery-mauve. Dorsal fin pale whitish pink, a pale yellow line or series of spots just above base of fin; tips of spinous part of fin reddish-yellow; caudal fin pinkish; anal fin pale whitish-pink suffused pale yellowish over its middle part; ventral fins whitish; pectoral fins translucent. Membrane of spinous dorsal fin emarginate.
(voucher: 191 mm SL)

Nemipterus tambuloides
Upper part of head and body rosy, silvery white on ventral surface; 5 well-defined sulphur-yellow stripes along body, the first beginning above lateral line and following the scale row to posterior of dorsal fin, second running from snout through eye and continuing as a more or less straight line to upper caudal fin base, remaining stripes beginning behind head and following each scale row to caudal fin base. Dorsal fin translucent pink with yellow margin and bluish grey infra-marginal stripe and a narrow sulphur-yellow stripe running along base of dorsal fin; caudal fin bright rosy, tip of upper lobe sulphur-yellow; anal fin translucent bluish white with pale yellow stripe near base of fin bent posteriorly and extending to tip of last anal ray; pectoral fins pale pink; ventral fins pale yellow, spine and first ray bluish-grey.
(voucher: 231 mm SL)

Nemipterus marginatus
Upper part of body rosy, silvery-white below; head with a narrow yellow stripe from below nostrils to eye, another from middle of upper jaw to eye. Broad yellowish-orange stripe, divided above pectoral fin, runs along body from below origin of lateral line to upper part of caudal peduncle, this stripe with a reddish spot near its origin; a second yellowish-orange stripe from above base of pectoral fin to lower part of caudal peduncle. Dorsal fin pale blue with a yellow margin and broad yellow median stripe which divides into three posteriorly; caudal fin and its filament red, its median rays yellowish; anal fin pale blue with 2 narrow yellow stripes; ventral fins pink; pectoral fins translucent.
(voucher: 101 mm SL)

Nemipterus mesoprion
Upper part of head and body pinkish, silvery-white below; back with indistinct golden stripe beneath dorsal fin; red shoulder spot beneath third to fifth lateral line scales; golden stripe beneath lateral line extending from shoulder spot to upper caudal fin base; a second golden stripe, broader and tapering posteriorly, from base of pectoral fin to mid-caudal fin base. Head with oblique golden yellow stripe from beneath eye to middle of upper jaw, and less distinct oblique yellow stripe from anterior of eye to near tip of snout; upper lip pale mauve; operculum with golden reflections. Spinous dorsal fin with red margin, rayed part of fin with yellow margin, base of fin pale mauve; anterior part of dorsal fin with broad pale yellow stripe which divides into 3 or 4 narrow yellow stripes posteriorly; caudal fin pinkish, upper and lower margins tinged yellow; anal fin pale bluish white, with two yellow stripes; pectoral fins pale pink; first two rays of ventral fins pink, other rays hyaline.
(voucher: 144 mm SL)

Nemipterus nematopus
Head and body pinkish, paling to pearly-white below; two distinct sulphur-yellow almost horizontal stripes beneath lateral line: first from below origin of lateral line to upper caudal-fin base, second from above pectoral fin base to middle of caudal fin base; sometimes 1 or 2 less distinct, narrow, yellow stripes present beneath mid-lateral stripe. Dorsal fin translucent, with narrow yellow margin and 3 to 4 narrow yellow stripes (number varies between younger and older individuals). Caudal fin pinkish, upper tip bright sulphur-yellow; anal fin translucent, lacking stripes; ventral fins pale white, anterior-most spine and axillary scale yellow; pectoral fins translucent pink.
(voucher: 152 mm SL)

Nemipterus sugillatus
Body silvery pink with bluish iridescent tinge, darker above; 5 pale golden-yellow stripes on sides beneath lateral line; ventral surface silvery-white with broad lemon-yellow double stripe along ventral midline. Head with golden iridescent reflections, ovoid, pinkish-mauve blotch extending from beneath eye to upper part of operculum; eye pinkish silver; upper lip yellow. Dorsal fin pale pink, with broad yellow margin edged below by red, a greyish mauve sub-marginal stripe on posterior half of fin; caudal fin pink, upper tip yellow; anal fin translucent pink with reddish margin and narrow yellow sub-marginal stripe; narrow yellow stripe just above base of anal fin, extending to tip of last fin ray; ventral fins pinkish, with bright yellow stripe along second ray from base to tip of fin; pectoral fins pinkish; peritoneum silvery-white.
(voucher: 195 mm SL)

Nemipterus gracilis

Nemipterus balinensoides

Nemipterus thosaporni

Parascolopsis inermis

Parascolopsis eriomma

Parascolopsis tanyactis

Parascolopsis tosensis

Pentapodus caninus

Parascolopsis qantasi

Pentapodus emeryii

Nemipterus gracilis

Body pinkish above with silvery blue reflections, silvery below; scale rows on body with pale yellow stripes: 2 rows above lateral line, 5 rows below; head pinkish mauve with golden reflections, faint yellow stripe through nostrils, and golden yellow stripe from upper lip to below eye (continued across preoperculum and operculum in larger individuals); snout with violet reflections; lips yellow or reddish yellow; upper and middle part of operculum pale yellow. Dorsal fin pink with narrow yellow margin and pinkish-red sub-margin and broad median stripe of pale yellow (stripe broken along its length by a series of pale mauve spots or continuous pale mauve line); caudal fin pink, upper lobe yellowish, its tip reddish; anal fin transparent with faint, broken yellowish stripe near base which extends onto posterior rays to tip of fin; pectoral fins transparent; ventral fins are whitish, base of fins lemon-yellow.
(voucher: 143 mm SL)

Nemipterus thosaporni

Body pinkish, silvery below; 2 narrow golden yellow stripes on sides, the first from above upper preopercular margin to upper caudal fin base, second from behind upper opercular margin, extending to middle of caudal fin base; cheeks and operculum tinged bluish gold. Dorsal fin pale pinkish yellow with bright yellow margin and pale dusky sub-marginal stripe; caudal pinkish, upper tip bright yellow; anal fin translucent; pectoral fins pale pink; ventral fins translucent, yellow stripe extending down second soft ray, axillary scale yellow.
(voucher: ? mm SL)

Parascolopsis eriomma

Body rosy above, silvery below; yellow band from head to upper caudal fin base; brown, oval patch at beginning of lateral line, axil of pectoral fin black. Dorsal fin pink, margin red; pectoral fin yellow, caudal fin yellow or pink. Head scales reach forward to above eyes; posterior suborbital margin serrated, small spine at its upper corner; no scales on lower limb of preoperculum.
P ii, 14-15. L. lat. 34-36. Total GR 17-19.
(voucher: 165 mm SL)

Parascolopsis tosensis

Body rosy yellow, violet over back; 3 indistinct broad rosy bars across back and one on caudal peduncle; sometimes 2 pale green longitudinal bands below lateral line; fins silvery white, yellow band from base of anterior of dorsal fin to outer middle of soft rays. Head scales reach forward to between front eye margin and posterior nostrils; posterior suborbital margin serrated; no scales on lower limb of preoperculum.
P ii, 12. L. lat. 35. Total GR 10.
(voucher: 93 mm SL)

Parascolopsis qantasi

Body brownish pink above, violet-pink below, pale blue lines along scale rows on lower sides. Pectoral fin base covered by dark brown blotch; dorsal and caudal fins pale blue crossed by many oblique yellow lines and black checks along fin elements. Head scales reach forward to above eyes. Lower limb of preoperculum naked.
P ii, 14. L. lat. 34-35. Total GR 12-14.
(voucher: 78 mm SL)

Nemipterus balinensoides

Upper part of body pale silvery-rose, silvery below; 2 or 3 pale yellow stripes along sides, the first just below lateral line, second from behind pectoral fin base to caudal fin, third (often indistinct) from below pectoral fin base to lower part of caudal peduncle; a distinct golden-yellow spot, edged red above and below, just above upper pectoral fin base at beginning of second stripe; operculum silvery. Dorsal fin pinkish, edged with greenish yellow, an indefinite greenish yellow stripe at base of fin; caudal fin pale yellowish pink, upper tip dark pink in some individuals; anal fin translucent whitish; pectoral fins rosy; ventral fins pale yellow.
(voucher: 98 mm SL)

Parascolopsis inermis

Body pale pinkish violet, paler below; four broad dark red bars across back extending two-thirds across body: first from nape, 2nd below mid-dorsal fin, 3rd across caudal peduncle, 4th across caudal fin base. Dorsal, caudal and pectoral fins yellow, red spots and lines scattered over unpaired fins. Head scales reach forward to above eyes; posterior suborbital margin serrated, small spine at upper corner; lower limb of preoperculum without scales.
P ii, 14. L. lat. 35. Total GR 9-10.
(voucher: 127 mm SL)

Parascolopsis tanyactis

Body rosy violet, silvery below; dark edges to some scales on middle of sides, 3 red-brown bars across back: first extending in width from nape to 4th dorsal spine, 2nd from 8th to 11th spine, 3rd on caudal peduncle. Dark brown band between eyes; fins rosy, black blotches basally on dorsal fin between first to 4th spine, 8th spine to first ray, and 5th to 7th ray. Head scales reach forward to above eyes; posterior margin of suborbital smooth. Lower limb of preoperculum naked.
P ii, 14-15. L. lat. 35-38. Total GR 8-10.
(voucher: 142 mm SL)

Pentapodus caninus

Body violet blue, darker above; narrow yellow line above lateral line from eye to upper caudal peduncle, broad yellow band mid-laterally from eye to caudal fin base; narrow blue line from upper lip passes under eye and across operculum. Fins pink, caudal fin edged darker. Head scales reach forward to just before anterior nostrils; scales on lower limb of preoperculum; caudal fin tips very acute, upper lobe distinctly longer than lower.
P ii, 13-15. L. lat. 43-47.
(voucher: 60 mm SL)

Pentapodus emeryii

Body violet or blue-brown above, paler below; narrow yellow lines above lateral line from eye to upper caudal peduncle, broader greenish yellow band mid-laterally from eye to upper caudal fin base. Most fins pinkish yellow, caudal fin violet, central area yellow. Head scales reach forward to level of posterior nostrils; scales on lower limb of preoperculum. Both lobes of caudal fin produced into long filaments (at least in adults).
P ii, 14-15. L. lat. 51-55.
(voucher: 136 mm SL)

Pentapodus nagasakiensis

Pentapodus porosus

Pentapodus setosus

Pentapodus trivittatus

Pentapodus vitta

Scolopsis affinis

Scolopsis aurata

Scolopsis bilineata

Scolopsis ciliata

Scolopsis margaritifera

Scolopsis lineata

Pentapodus nagasakiensis

Body dusky yellow above, pale or white below; upper lip blue; pearly pale blue or yellow band from snout, through lower part of eye to caudal fin base. Fins pale blue or pink. Head scales reach forward to between eye and posterior nostrils; no scales on lower limb of preoperculum. Eye diameter more than or equal to snout length; body slender, depth 3.9-4.5 in SL. Caudal fin moderately forked.
P ii, 13-15. L. lat. 44-47.
(voucher: 82 mm SL)

Pentapodus setosus

Back brown; two blue bands across snout; broad dusky orange band mid-laterally from eye to tail base; broad yellow-green band behind eye sloping upward to upper caudal peduncle and ending in a black spot; blue line from yellow band joining a blue line from anal fin in a horizontal "V" behind black spot. Blue line along dorsal fin base; caudal fin pink, filament dusky. Head scales reach forward to between eye and posterior nostrils; no scales on lower limb of preoperculum. Upper caudal fin lobe produced into long filament.
P ii, 14-15. L. lat. 46-48.
(voucher: 63 mm SL)

Pentapodus vitta

Two broad, blue-edged brown bands along body: first from eyes along back midline to caudal peduncle, second from snout, through eye to upper caudal fin base; lower half of body pinkish white. Fins pale pink or translucent. Head scales reach forward to or before anterior nostrils; no scales on lower limb of preoperculum; caudal fin lobes equal in length.
P ii, 14-15. L. lat. 45-50.
(voucher: 109 mm SL)

Scolopsis aurata

Body silvery blue, dusky over top of head and back; broad horizontal yellow band from eye to tail base, narrow blue band between eyes. Caudal fin golden yellow, other fins pale yellowish blue. Head scales reach forward to level of front eye margin, front border of scale patch squarish; temporal region scaled and scales on lower limb of preoperculum.
P ii, 15-16. L. lat. 46-48. Tr above 4.
(voucher: 180 mm SL)

Scolopsis ciliata

Body orange-olive above, silvery grey below; conspicuous short yellow band on back beneath dorsal fin, usually row of yellow spots on sides from pectoral fin to tail base. Fins orange-yellow, upper and lower edges of caudal fin red. Upper external margin of maxilla roughened or denticulate; small forward-directed spine present below eye.
P ii, 14-16. L. lat. 41-43.
(voucher: 108 mm SL)

Scolopsis margaritifera

Dark olive or bluish above, rosy cream below; 2 pearly bands on snout; centre of each scale with pale spot - pearly-white on back, yellow or orange on sides - forming longitudinal and vertically diagonal lines. Fins dusky yellow, red over lower caudal fin lobe. Head scales reach to or almost to posterior nostrils, temporal region scaled. Body depth 2.4-2.8 in SL.
P ii, 14-15. L. lat. 35-39.
(voucher: 151 mm SL)

Pentapodus porosus

Three blue bands across snout, spaces between them yellow; 2 yellow bands from eye to upper and lower parts of pectoral fin base; prominent yellow band from eye slants upward on body, ending in black spot on upper caudal peduncle; narrow blue band along dorsal fin base, blue line bordering yellow body band arching in horizontal "V" behind black peduncle spot, continuing towards anal fin. Fins pale blue or yellow. Head scales almost reach to level of posterior nostrils; no scales on lower limb of preoperculum. Body depth 3-3.7 in SL.
P ii, 14-15. L. lat. 46-48.

Pentapodus trivittatus

Body olive brown above, silvery white below. Narrow white band along predorsal profile to dorsal fin origin; white band from eye to upper caudal peduncle; white horizontal band from eye to caudal fin base, broadest behind pectoral fin. White band across snout between eyes. Black bar across pectoral fin base; fins translucent. Head scales reach forward to or before front of eye; scales on lower limb of preoperculum.
P ii, 13-15. L. lat. 42-46.
(voucher: 60 mm SL)

Scolopsis affinis

Top of head and back dusky grey or fawn, lower sides silvery white; broad brown yellow-edged band from snout through eye to tail base; thin bluish white line from upper lip to below eye. Fins pale yellow, dorsal spines and caudal fin margin pale blue. Head scales reaching forward to level of posterior nostrils; temporal region scaled. Scales present on bony opercular ridge and lower limb of preoperculum.
P ii, 14-16. L. lat. 43-46. Tr above 4-5.
(voucher: 107 mm SL)

Scolopsis bilineata

Body dusky olive above, pearly white below; 2-3 narrow yellow lines from snout and eye to front part of dorsal fin, conspicuous broad white, reddish brown-edged band from mouth to base of soft dorsal fin; pale patch on back below posterior dorsal rays. Spinous dorsal fin yellow or orange, outer anterior half of soft dorsal fin scarlet or black, remainder white; anterior half of anal fin dark red or black, remainder white; outer margins of ventral and caudal fins red. Head scales reach forward to anterior nostrils; small forward directed spine present below eye; pectoral fin reaches opposite anus. Body depth 2.5-3 in SL.
P ii, 14-16. L. lat. 43-47.

Scolopsis lineata

Body dark olive-brown above, silvery white below; 3 horizontal pale yellow bands on upper body: along dorsal profile, from top of eye to end of dorsal fin, from operculum to below dorsal fins; in larger fish, white vertical bars are visible between these bands. Fins white or dusky, young fish with white spot anteriorly on dorsal fin, pectoral fin pink. Head scales reach forward to anterior eye margin; snout length less than eye diameter.
P ii, 12-15. L. lat. 40-46. Tr above 3.
(voucher: 155 mm SL)

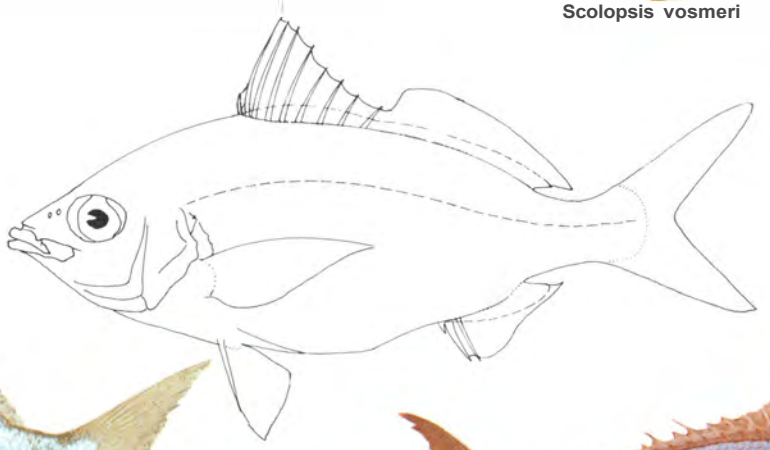
Scolopsis monogramma

Scolopsis taenioptera

Scolopsis trilineata

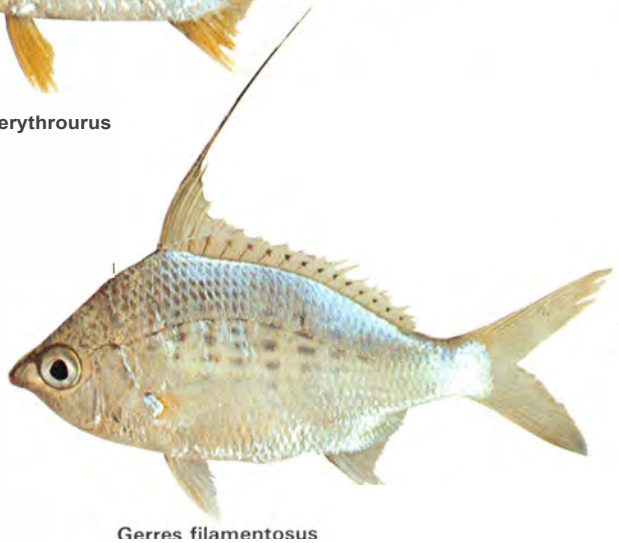
Scolopsis vosmeri

GERREIDAE



Gerres erythrourus

Gerres longirostris



Gerres filamentosus

Gerres oyena

Pentaprion longimanus

Scolopsis monogramma

Body fawn above, white below; thin brown lines on back anteriorly; broad brown and broad yellow horizontal band mid-laterally below lateral line; 3 blue bands on snout between eyes, blue band behind eye on preoperculum, curved blue band from eye to pectoral fin base, yellow interspace between all bands. Brown bar on pectoral fin base. Unpaired fins dark yellow, their edges blue. Head scales reach forward to between front of eyes and posterior nostrils, front border of scale patch curved; temporal region scaled; scales on lower limb of preoperculum.
P ii, 15-17. L. lat 46-49. Tr above 5-6.

Scolopsis trilineata

Body dusky grey or blue above, silvery white below, with pale blue centres on lateral scales. Five pale blue or yellowish white lines from eye over back: first two above eye before dorsal fin, 3rd curving to nape, along back to beneath dorsal fin, 4th broader, curving up to end of dorsal fin, 5th above pectoral fin, joining 4th band at about level of lateral line; 3 bluish white bands on snout. Fins pale blue or grey. Head scales reach forward to above eyes; snout length about equal to eye diameter.
P ii, 13-14. L. lat. 41-44.
(voucher: 77 mm SL)

Scolopsis taenioptera

Body dusky olive or yellow above, white below; blue and yellow lines on scale rows run obliquely on sides, horizontally on caudal peduncle; blue band across snout, another from upper lip to lower edge of eye; a scarlet and a white spot on upper pectoral fin base. Fins yellow; blue band along mid-height of dorsal fin, caudal fin with blue spot at upper base, bright yellow tip to upper fin lobe. Head scales reach forward to between front eye margin and posterior nostrils; no scales on lower limb of preoperculum.
P ii, 15-16. L. lat. 45-48.
(voucher: 150 mm SL)

Scolopsis vosmeri

Body either brownish and tinged red, or violet, or dark olive brown; broad vertical white bar across nape and operculum; usually horizontal white band below lateral line from head ending about opposite mid-dorsal fin; dark spots on scales on back and sides; operculuum membrane crimson or scarlet. Fins grey or orange, edges often red. Pectoral fins not reaching to level of anus. Head scales reaching to anterior nostrils; small forward-directed spine present below eye.
P ii, 15-17. L. lat. 39-45.
(voucher: 124 mm SL)

GERREIDAE

Mojarras; Silver biddies - Kapas

Silvery, small fishes; body oblong and compressed. Mouth can be extended into a downward-pointed tube. Scales large, thin and easily lost, covering head and body and forming a sheath along dorsal and anal fin bases. A single continuous dorsal fin of 9 spines and 10 rays; dorsal and anal fin spines weak. Pectoral fin long and pointed; a long scale-like process in axil of ventral fin. Caudal fin deeply forked.

Eight genera, members of two collected on the Survey. They are distinguished as follows:
Pentaprion - A V-VI, 12-13; ***Gerres*** **-** A II-IV, 7-10

REFERENCES: Chakraborty, Venugopal, Hidaka & Iwatsuki, 2006; Iwatsuki, Kimura, Kishimoto & Yoshino, 1996; Iwatsuki, Kimura & Yoshino, 1999a; Iwatsuki, Kimura & Yoshino 1999b; Iwatsuki, Kimura, Yoshino & Schaefer, 2001; Woodland, 2001a;

Gerres erythrourus

Predorsal scales 17-20, not extending to nostril level. Body deep, 2-2.2 in SL. Pectoral fin reaches anal fin origin or further; 2nd dorsal fin spine longer than HL without snout; second anal fin spine robust and strong. Body silvery, dark spots on scales forming longitudinal lines along body; dorsal fin black-edged and with row of black spots at mid-height of fin; ventral fin yellow; anal fin and lower lobe of caudal fin tipped white.
D IX, 10. A III, 7. L. lat 32-38 (to caudal fin base). Tr 6-6.5 +9.5-11.5
(voucher: 73 mm SL)

Gerres filamentosus

Predorsal scales 13-22, not extending to nostril level. Second dorsal fin spine produced into a filament, its length about equal to body depth. Body depth 2-2.8 in SL. Pectoral fin reaches anal fin origin or farther. Seven to 8 vertical bars of brown blotches or checks over sides; a row of brown checks along mid-dorsal fin and second dorsal fin spine dark brown.
D IX, 10. A III, 7-9. L. lat. 43-46 to caudal fin base. Tr 5-5.5 above.
(voucher: 111 mm SL)

Gerres longirostris

Predorsal scales 22-24, not extending to nostril level. Body slender, 2.1-2.3 in SL. Pectoral fin reaches anal fin origin or further; 2nd dorsal fin spine shorter than HL without snout; 2nd anal fin spine robust and strong. Caudal fin deeply forked. Dusky above, silvery white below; sometimes up to ten dusky bars along upper body; dorsal fin margined in black; dorsal and caudal fins dusky yellow, a broad dark posterior margin to caudal fin.
D IX, 10. A III, 7. L. lat 43-46 (to caudal fin base).
(voucher: 240 mm SL)

Gerres oyena

Predorsal scales 15-20, not extending to nostril level. Body slender, 3-3.3 in SL. Pectoral fin barely reaches anal fin origin. Body silvery white, dusky above; spinous dorsal fin margin black, and row of dusky checks along base of dorsal fin; ventral and anal fins yellow.
D IX, 10. A III, 7-9. 37-40. L. lat. 37-40 to caudal base. Tr above 3-4.
(vouchers: 147 and mm SL)

Pentaprion longimanus

Body silvery, pale pink or grey when scales lost. Body soft and flabby; anal fin base longer than soft dorsal fin base. Body depth 2.6-2.8 in SL. Silvery white with a silver stripe from snout, through eye to tail base; fins dusky yellow.
D IX-X, 12-15. A V-VI, 12-14. L. lat. 44-46 to caudal fin base.
(voucher: 86 mm SL

HAEMULIDAE

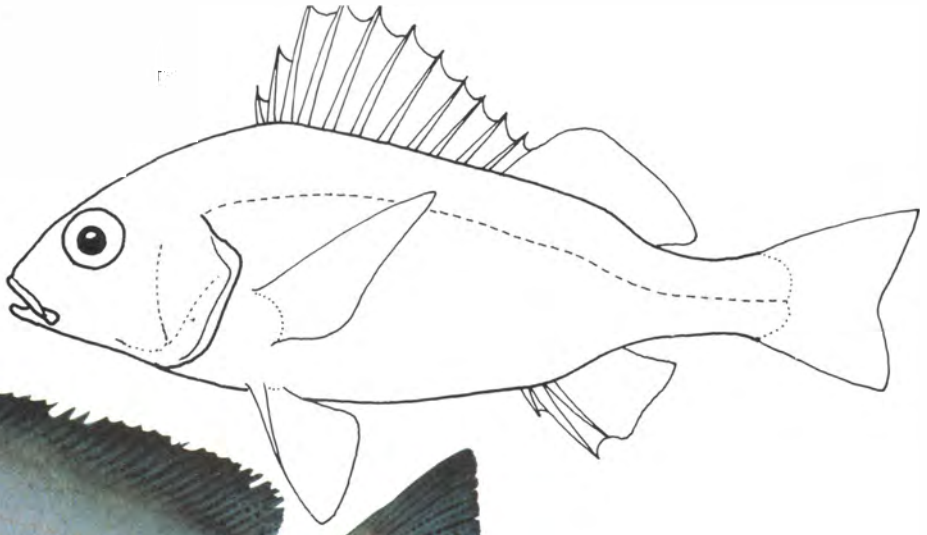
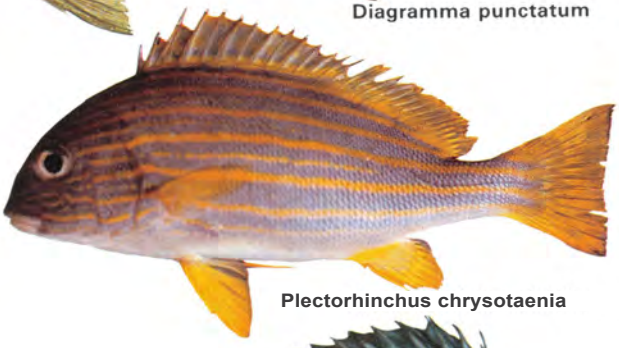


Diagramma pictum

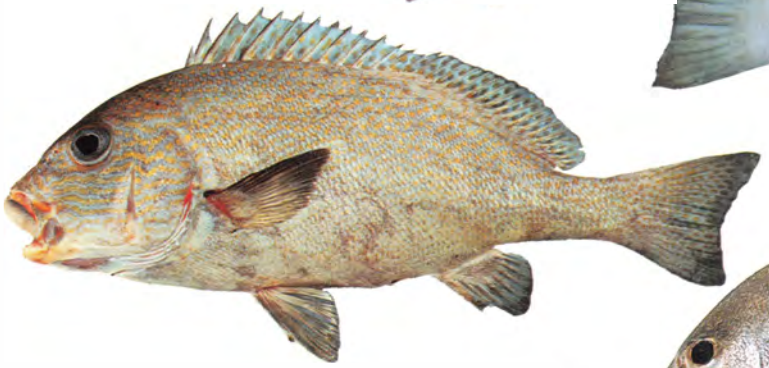
Diagramma punctatum



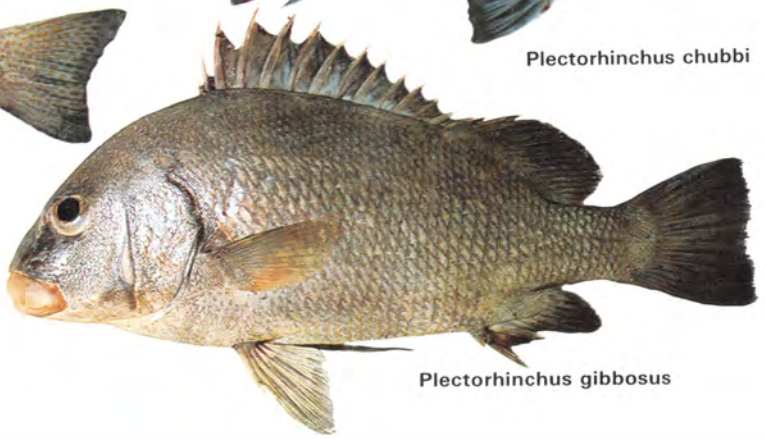
Plectorhinchus chrysotaenia

Plectorhinchus chaetodontoides

Plectorhinchus chubbi



Plectorhinchus flavomaculatus



Plectorhinchus gibbosus

HAEMULIDAE

Grunts; Sweetlips - Popondok; Gerot-gerot; Gaji; Raja; Kaci

Moderate-sized fishes with oblong, well-compressed bodies and convex head profile. Lips thick, partly hidden by suborbital; bands of pointed teeth in jaws; preoperculum margin serrated; cheeks, operculum, most of head and suborbital scaled. Longitudinal groove and/or 2-6 pores on chin. Scales moderate to small, ctenoid. Single dorsal fin with 9-15 strong spines, 12-26 rays; 3 spines in anal fin, the second often very strong; scaly axillary process at ventral fin base; caudal fin truncate or emarginate. Colour variable at different ages. Many species "grunt" when caught.

Nineteen genera in the family, representatives of three obtained on the Survey.

REFERENCES: Johnson, Randall & Chenoweth, 2001; McKay, 2001a; Parenti, 2019; Randall & Johnson, 2000.

KEY TO GENERA FOUND ON SURVEY

A. Central longitudinal groove behind chin, 2 pores on chin behind lower lip (Fig 1) . . . . . Pomadasys

AA. No groove behind chin, 6 pores on chin (Fig 2) . . . . . .B

B. 9-10 dorsal spines, 21-26 rays in dorsal fin; soft dorsal fin base longer than spinous base . . . . . .Diagramma

BB.11 or more dorsal fin spines; fewer tahn 22 rays in dorsal fin; soft dorsal fin-base subequal or shorter than spinous fin-base . . . . . .Plectorhinchus

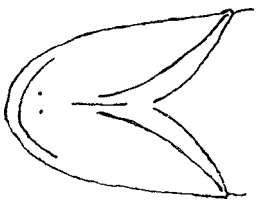


Fig 1

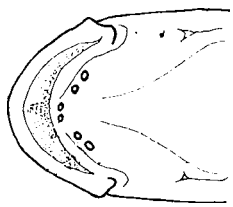


Fig 2

Diagramma pictum

Body with orange spots on head, body and fins fading with age to plain grey-blue, sometimes with darker spots in large individuals; dark brown or black spots on soft dorsal and caudal fins. Head profile moderately steep; dorsal fin spines highest anteriorly, 2nd spine longest and twice or more the length of first spine.
D IX-X, 20-25. L. lat. 57- 74. Total GR (first arch) 19-23.

Plectorhinchus chaetodonoides

Body of adults brown, tending yellow over back and head; dark brown spots densely cover the back, sides and all fins except the uniform dark brown pectoral fins; throat and lower half of body plain brown; brown margin to unpaired fins. Lips broad and fleshy. Soft dorsal fin height almost equal to its base; caudal fin emarginate.
D XI-XII, 18-20. L. lat. 52-59. Lower GR (first arch) 27-32.

Plectorhinchus flavomaculatus

Upper head, back and sides of adults greyish green; orange yellow wavy horizontal lines on head become thinner and oblique on body, breaking into spots on back and over caudal peduncle; red mark on pectoral fin base and on edge operculum. Yellow-brown wavy lines and spots on dorsal fin, numerous dark brown spots on caudal.
D XII-XIII, 19-22. L. lat. 53-60. Lower GR (first arch) 16-19; total 26-34.

Diagramma punctatum

Body green-grey with bright yellow or bronze spots and/or lines on head, extending onto back, breast and upper caudal peduncle; scales of adults with small bronze centres, forming rows; 4-6 rows of olive-orange spots along dorsal, many similar spots on caudal fin, caudal fin tips yellow Dorsal fin spines highest anteriorly, 2nd spine longest and at least twice length of first and equal to 3rd spine.
D IX-X, 22-25. L. lat. 55-64. Total GR (first arch) 20-23
(voucher: 335 mm SL)

Plectorhinchus chrysotaenia

Dark violet-blue body, paler ventrally; 7 or 8 golden orange horizontal bands, narrower than space between them, along head and body; fins plain bright yellow, spinous dorsal sometimes grey.
D XII-XIII, 18-21. L. lat. 53-58. Total GR (first arch) 28-33.
(voucher: 210 mm SL)

Plectorhinchus chubbi

Body of adults plain dark grey or dusky blue, with faint dark patches on back; black edge on operculum; fins dark blue or charcoal. Head profile bluntly convex; lips thicken with age; 3rd or 4th dorsal spine longest.
D XI-XII, 15-17. A III, 7-8. L. lat. 65 (average). Lower GR (first arch) 21-23.
(voucher: 320 mm SL)

Plectorhinchus gibbosus

Adults plain reddish brown to dull green or grey, bronze sheen on lower head and body; fins charcoal. Lips thick, swollen, yellow in larger fish. Dorsal fin deeply notched between spined and rayed portions, spines strong.
D XIII-XIV, 15-17. L. lat. 46-55. Lower GR (first arch) 17-19.
(voucher: 334 mm SL)

Plectorhinchus lineatus

Plectorhinchus lessonii

Plectorhinchus albovittatus

Plectorhinchus vittatus

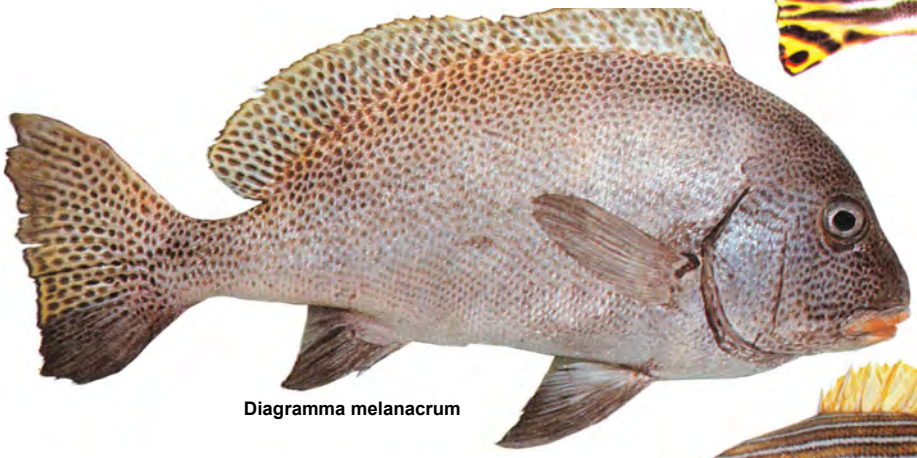
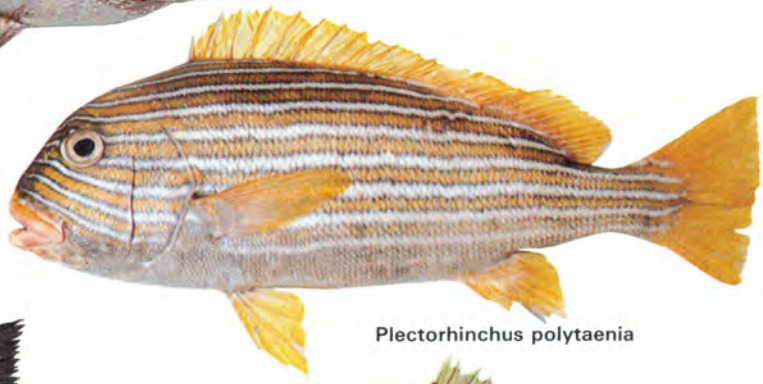


Diagramma melanacrum

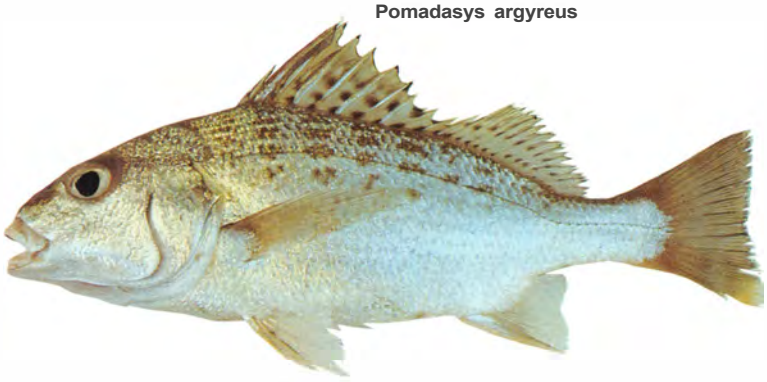


Plectorhinchus polytaenia

Pomadasys argenteus

Pomadasys argyreus

Pomadasys furcatus



Pomadasys kaakan

Plectorhinchus lineatus

Oblique dark brown or black bands over upper two-thirds of body and head, becoming close together and very oblique in adults, background colour pale blue or fawn; scarlet patches around mouth and on pectoral fin base. Paired fins yellow, remainder covered with large dark spots.
D XII-XIII, 18-20. L. lat. 54-58. Total GR (first arch) 26-30.
(voucher: 275 mm SL)

Plectorhinchus albovittatus

Body of adults plain dark blue-brown or grey with scarlet or crimson line around mouth and along preopercular edge; outer anterior part of soft dorsal fin with large black patch, anal and paired fins dark grey; lobes of caudal fin black, especially lower lobe. Lips swollen in large fish; caudal fin distinctly emarginate.
D XII-XIII, 16-20. L. lat. 54-56. Lower GR (first arch) 26-31.
(voucher: 125 mm SL)

Diagramma melanacrum

Lower 1.4-1.3 of caudal fin black. Body and fins grey-blue, bronze sheen on upper back below dorsal fin; black or brown spots densely cover head, body, dorsal and caudal fins, spots fading and becoming smaller on lower sides; ventral, anal, and opercular membrane black. Ventral fins reach to or beyond anus; 3rd or 4th dorsal fin spine longest, 1st dorsal fin spines 1.7-2.3 times in length of 2nd spine; caudal peduncle depth 2-2.2 in its length, caudal fin truncate.
D X-XI, 22-24. L. lat. 55-57. Lower GR (first arch) 22.
(voucher: 407 mm SL)

Pomadasys argenteus

Many scattered black spots cover upper two-thirds of body, no spots on head; body otherwise silvery grey; bronze sheen to lower head and breast. Fins plain except dorsal, with 2-4 rows of dark spots, more prominent on membrane between spines. Dorsal fin deeply notched. Eye diameter much less than snout length.
D XII, 13-15. A 7-8. L. lat. 45-52. Total GR 17-20.
(voucher: 225 mm SL)

Pomadasys furcatus

Six to.10 dark brown horizontal double lines along back and sides, becoming single posteriorly. Fins plain silvery violet, narrow black margin on spinous dorsal and dusky outer half of caudal and anal fins; pale median band along soft dorsal fin. Row of small scales behind each ray of dorsal and anal fins.
D XIII, 14-16. A III, 8-9. Tr above. L. lat. 52-54. 25-26 scales around caudal peduncle.
(voucher: 135 mm SL)

Plectorhinchus lessonii

Five to 7 dark blue-brown bands along body, much broader than pale blue space between them, bands meeting at an angle on nape and front of head and running down snout; large distinct black blotch on pectoral fin base. Broad dark blotches and bands over unpaired yellow fins, close together and oblique on caudal fin.
D XII-XIII, 18-22. L. lat. 54-58. Total GR (first arch) 19-22.
(voucher: 135 mm SL)

Plectorhinchus vittatus

Four to 6 black or dark brown horizontal bands along body, broader than white space between them and continuous around front of head to other side; opercular edge, pectoral base and ventral fin axil red. Fins bright yellow, dorsal and caudal with broad brown, longitudinal bands, caudal fin bands oblique on lobes.
D XII-XIV, 17-21. Lower GR (first arch) 21-22.
(voucher: 180 mm SL)

Plectorhinchus polytaenia

Body pale orange-fawn with 7-9 brown-edged, pale blue horizontal bands, nearly as broad as space between them, over body and head; bands ascend slightly on head. Fins usually plain yellow, soft dorsal, pectoral and caudal striped in young.
D XII-XIII, 19-22. L. lat. 54-60. Total GR (first arch) 26-29).
(voucher: 400 mm SL)

Pomadasys argyreus

Plain silvery green or grey body and all fins, back and head bronze; large dark brown blotch on upper operculum. Preoperculum margin serrated.
D XII, 13. A III, 7. L. lat. 44-50. Tr 6-8+ 9, 18-20 scales around caudal peduncle.
(voucher: 190 mm SL)

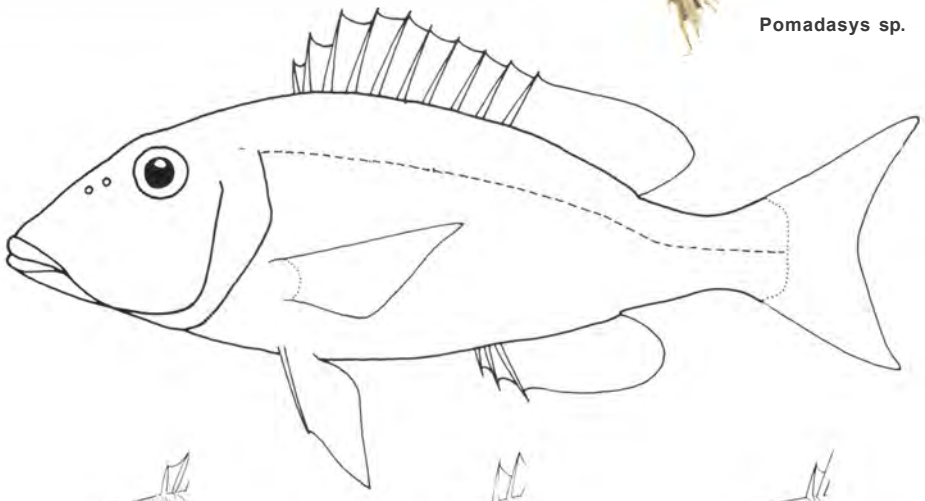
Pomadasys kaakan

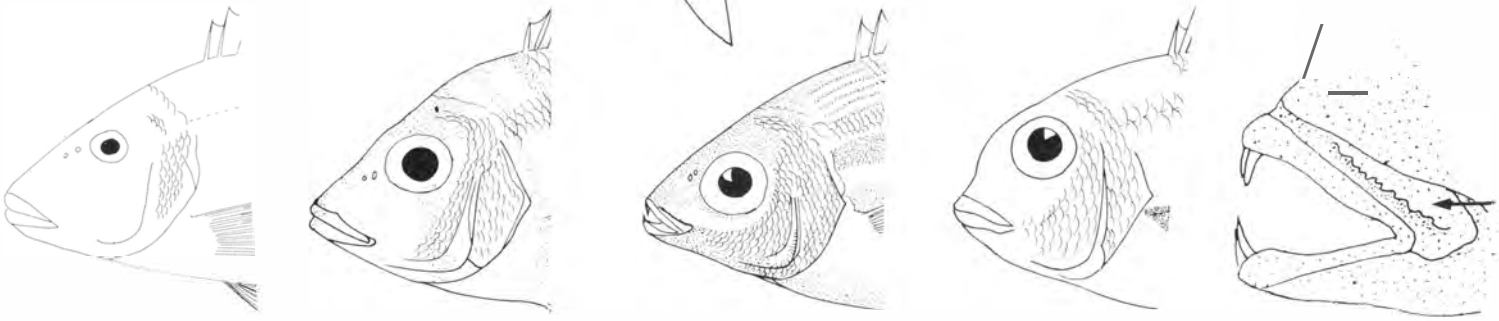
Eight to 12 vertical bars of black checks over upper sides, spots arranged into blotches or grouped in pairs, bars faded in larger fish; 3-4 conspicuous rows of black spots along dorsal fin; ventral, anal and lower lobe of caudal fin dark yellow. Eye diameter less than snout length; second dorsal spine longest, dorsal fin deeply notched, last spine 1.5-2 times length of second-last (penultimate) spine.
D XII, 14. A III, 7. Tr 7-9+9. 20 scales around caudal peduncle.
(voucher: 200 mm SL)

Pomadasys maculatus

LETHRINIDAE

Pomadasys sp.





Lethrinus | Gymnocranius | Gnathodentex | Monotaxis | Wattsia

Gnathodentex aureolineatus

Gymnocranius elongatus

Gymnocranius griseus

Gymnocranius grandoculis

Pomadasys maculatus

Silvery green, broad wedge-shaped black band across nape to just below lateral line; usually about four larger and smaller bands across back above lateral line, ending opposite end of dorsal fin. Fins yellow, large black blotch on dorsal fin anteriorly.
D XII, 13-15. A III, 7. L. lat. 49-55. 22-25 scales around caudal peduncle.
(voucher: 150 mm SL)

Pomadasys sp

Body silvery, green or violet over head and back; 5-6 vertical broad bars of black blotches over upper sides, dispersing into irregular rows with age; 2-3 rows of black spots on dorsal fin, sometimes faded; lower caudal fin lobe, anal and ventral fins grey or dull white. Eye about equal to snout length; dorsal fin not deeply notched, last two spines about equally long.
D XII, 13-14. A III, 7-8.
(voucher: 237 mm SL)

LETHRINIDAE

Emperors - Asuan; Lentjam; Ketamba

Oblong, moderately compressed perch-like fishes with a large head. Lips often thick and fleshy; maxilla concealed, without supplementary bone, mostly slipping below preorbital bone. Gill rakers short and knob-like. A single continuous dorsal fin with 10 spines and 9-10 rays, at most a slight notch between the two parts; anal fin with 3 spines and 8-10 rays; pectoral fins moderately long and pointed with 13-15 rays; ventral fins with an axillary process. Caudal fin emarginate to forked. Scales finely ctenoid and moderate in size.

The family comprises five genera, all of which were obtained on the Survey.

SYNOPSIS OF GENERA FOUND ON SURVEY

Lethrinus Head naked except for gill cover; 9 dorsal fin rays, 8 anal fin rays.

Gymnocranius Cheek with 4-5 rows of scales; maxilla surface smooth; 10 dorsal fin rays; 10 anal fin rays.

Wattsia Cheek with 5 rows of scales; maxilla with a strongly denticulated longitudinal ridge; 10 dorsal fin rays; 10 anal fin rays; caudal fin lobes rounded.

Gnathodentex Cheek with 6 rows of scales; maxilla with a strongly denticulated longitudinal ridge; each jaw with a narrow band of villiform teeth, an outer series of conical teeth, 4 canines at front of upper jaw and 6 at front of lower jaw; 10 dorsal fin rays; 9 anal fin rays; caudal fin lobes pointed.

Monotaxis Cheek with 5 rows of scales; maxilla with a strongly denticulated longitudinal ridge; canines and a broad patch of small teeth in jaws anteriorly, followed by a series of 6 or 7 round, flat molars on each side; 10 dorsal fin rays; 9 anal fin rays; inner surface of pectoral fin base scaled.

REFERENCE: Carpenter, 2001d.

Gnathodentex aureolineatus

Body oblong, its depth 2.7 times in SL. Head profile straight or at most slightly convex; two close-set round nasal openings. Caudal fin forked with pointed tips. Brown or green above, paler below; body with pale blue longitudinal stripes on side and a prominent yellow blotch with a pale blue centre below last few dorsal fin rays; head with a silvery stripe curving behind and below eye; fins reddish, particularly margins.
P 15. L. lat. 68-74.
(voucher: 160 mm SL)

Gymnocranius griseus

Eye 2.8-3.2 in HL; suborbital 3.7-4 in HL. Lower edge of eye slightly above a line drawn from upper lip to caudal fork. Cheek with 4 transverse series of scales. Body depth 1.9-2.2 in SL. Anal fin base 2.1-2.5 times longer than longest anal ray; caudal fin moderately forked, median rays slightly longer than eye diameter. Body silvery, grey-blue above, crossed by about 5-8 dark bars, dark bar below eye. Fins olive yellow, front edge of ventral fin blue, hind margin of caudal fin orange. Sometimes wavy blue lines and spots on snout and operculum.
P 14. L. lat. 46-48.
(voucher: 190 mm SL)

Gymnocranius elongatus

Eye 2.6-2.8 in HL; suborbital 4.7-5.1 in HL. Lower edge of eye touching a line drawn from upper lip to caudal fin fork. Cheek with 4-6 transverse scale rows. Body depth 2.2-2.4 in SL. Anal fin base about 2.3 times longer than longest anal fin ray; caudal fin deeply forked, median rays less than eye diameter. Body silvery, fawn above, crossed by about 8 dark bars. Fins orange-yellow, hind margin and tips of caudal fin scarlet.
P 14. L. lat. 46-48.
(voucher: 220 mm SL)

Gymnocranius grandoculis

Eye 2.8-3.2 in HL; suborbital 3.7-4 in HL. Lower edge of eye slightly above a line drawn from upper lip to caudal fork. Cheek with 4 transverse series of scales. Body depth 1.9-2.2 in SL. Anal fin base 2.1-2.5 times longer than longest anal ray; caudal fin moderately forked, median rays slightly longer than eye diameter. Body silvery, grey-blue above, crossed by about 5-8 dark bars, dark bar below eye. Fins olive yellow, front edge of ventral fin blue, hind margin of caudal fin orange. Sometimes wavy blue lines and spots on snout and operculum.
P 14. L. lat. 48.
(voucher: 420 mm SL)

Gymnocranius sp.

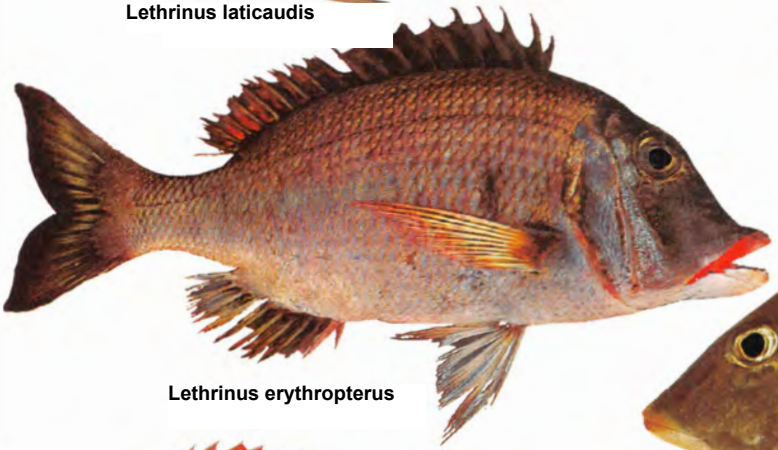
Lethrinus nebulosus

Lethrinus conchyliatus

Lethrinus microdon

Lethrinus laticaudis

Lethrinus harak



Lethrinus erythropterus

Lethrinus lentjan

Lethrinus atkinsoni

Gymnocranius sp.

Eye large, touching the very convex head profile; teeth conical in front of each jaw, a short row of molariform teeth on sides posteriorly, with band of fine teeth within. Four scale rows across preoperculum; middle caudal fin rays equal to eye diameter. Body blue-green, darker above, silvery below. Eye silvery white above and behind, broad silvery margin on preoperculum; black bar across pectoral fin base. Dorsal, anal and ventral fins yellow, margins orange; olive caudal fin with dark brown margin before narrow scarlet edge.
D X, 10. A III, 10 (9?). GR 2 + 5. Tr 5 + 18. L. lat. 50-51.
(voucher: 195 mm SL)

Lethrinus conchyliatus

HL greater than body depth; profile indented on snout, distinctly humped just before eye. Inner surface of pectoral fin base naked; naked patch above pectoral fin base. Body reddish, bright red marks on margins above and below lips, on margin of operculum and on pectoral fin base. Fins dark red.
(voucher: 285 mm SL)

Lethrinus laticaudis

HL slightly less than body depth; profile somewhat abrupt, concave on snout and a pronounced hump commencing level with posterior edge of eye and extending almost to first dorsal spine; lateral jaw teeth conical; 5½ scale rows between lateral line and base of 5th dorsal fin spine. Inner surface of pectoral fin base scaled. Body with a dark square blotch occasionally present between middle of pectoral fin and lateral line; head with short blue lines radiating from eye, 3-5 lines connecting eyes across interorbital and round pale blue spots scattered over cheeks and snout; median fins with wavy maroon bands forming a chequered pattern.

Lethrinus erythropterus

HL less than body depth, profile humped above eye. Distinct molars in jaws laterally; inner base of pectoral fin scaled. 4½ scale rows between lateral line and base of 5th dorsal fin spine. Yellowish-brown above, paler below; a red stripe from eye to tip of snout, red on upper lip and continuing in a line backward from corner of mouth; margin of operculum red; a red spot on upper pectoral fin base; fins red.
L. lat. 44-46.

Lethrinus atkinsoni

Head profile steep and blunt. Lateral teeth in jaws rounded or molariform; body depth greatest just behind head, much greater than HL. 4½ scale rows between lateral line and base of 5th dorsal fin spine. Inner surface of pectoral fin base scaled. Body olive-grey above, paler below; head brownish green with bronze reflection on cheek, upper lip yellowish red, bright red at gape; caudal fin yellow to dark yellow with red margin, other fins reddish.

Lethrinus nebulosus

HL slightly less than body depth; profile straight or nearly so. Inner surface of pectoral fin base densely scaled; 5½ scale rows between lateral line and base of 5th dorsal fin spine. About 5 indistinct yellow longitudinal stripes on side; head with a brown streak from eye to jaw angle, 2-3 short blue lines radiating from eye and elongate pale blue spots scattered over cheeks and snout; fins pale yellow, margin of soft dorsal fin and lobes of caudal fin bright red to pale pink.

Lethrinus microdon

Head - especially the snout - extremely long, much longer than body depth; its profile straight or nearly so. Lateral jaw teeth conical. Inner surface of pectoral fin base naked. 4½ scale rows between lateral line and base of 5th dorsal fin spine. Greenish-blue above, lighter below; conspicuously red on margin above and below lips. Three broad bluish bands starting from eye widening across to tip of snout. Dorsal fin mottled with red and orange blotches on dusky background; caudal dusky with red tinge; anal mottled red over green; ventral and pectoral dusky with red tinge.
(voucher: 320 mm SL)

Lethrinus harak

HL less than body depth; profile straight or slightly convex on snout, conspicuously humped above eye. Inner surface of pectoral fin base fully scaled. Body olive-green above, lighter below with a large, black, oblong patch surrounded by a golden ring below lateral line adjacent to tip of pectoral fin; head often with blue spots on cheek and between nostrils, lips and throat red; fins red with white margins. 5½ scale rows between lateral line and base of 5th dorsal fin spine.
(voucher: ? mm SL)

Lethrinus lentjan

HL less than body depth; profile straight or nearly so. Lateral teeth in jaws molariform or rounded. Inner surface of pectoral fin base with a few scales or naked. 5½ scale rows between lateral line and base of 5th dorsal fin spine. Body green grey above, lighter below; head brownish mauve or purple, with a bright red spot on margin of operculum and usually another on pectoral fin base. Median fins mauve, mottled with orange, other fins yellow orange with a pinkish hue.
(voucher: 256 mm SL)

Lethrinus miniatus

Lethrinus genivittatus

Lethrinus ornatus

Lethrinus rubrioperculatus

Lethrinus semicinctus

Lethrinus variegatus

Lethrinus sp.

Monotaxis grandoculis

Wattsia mossambica

Lethrinus miniatus

HL slightly less than body depth; profile straight above mouth, humped above eye. Inner base of pectoral fin scaled. Head with 2 bright red oblong patches on top of eyeball, an orange-red line often extending between nostrils and cheek; a bright red area on margin of preoperculum, pectoral fin base and ventral fin axil; fins reddish, margin of soft dorsal fin and (often) lobes of caudal fin bright red.
(voucher: 320 mm SL)

Lethrinus genivittatus

HL slightly less than body depth; profile slightly humped above eye; 4 tusk-like canine teeth at front of mouth, directed backwards at about 45°. Inner base of pectoral fin scaled. Second dorsal fin spine produced into a filament, contained 1.2-2.4 times in head length. Body with 3-4 yellow longitudinal streaks on side (conspicuous in young) and a prominent black blotch about size of eye between lateral line and middle of pectoral fin.

Lethrinus rubrioperculatus

HL greater than body depth; profile convex before eye. Eye near head profile; interorbital space flat or slightly convex. Inner surface of pectoral fin base naked. Caudal fin lunate, upper lobe slightly produced. Bright red spot on margin of operculum; sometimes red markings on margin of upper and lower lips; fins pale to bright reddish orange, some with red margins.
(voucher: 218 mm SL)

Lethrinus variegatus

HL about equal to body depth; profile convex or humped above nostrils. Inner surface of pectoral fin base naked. Body usually with a reticulated pattern enclosing white blotches and black variegated spots; caudal fin pink, other fins yellowish.
(voucher: 230 mm SL)

Monotaxis grandoculis

Body moderately deep, 2.2-2.4 times in SL. Head profile abrupt, strongly convex in front of eye. Bluish-grey above, paler below (in small specimens, body with 4 wide dark crossbars); head with yellow or orange area over and around eye, a narrow vertical dark band through eye; lips; yellow median fins yellowish-orange, brighter at tips; bases of soft dorsal and anal fins sometimes with three irregular dark spots.
(voucher: 335 mm SL)

Lethrinus ornatus

HL much less than body depth, profile convex above eye. Inner base of pectoral fin scaled. Body pale green-yellow, with 5-6 bright yellow longitudinal stripes on side; margins of preoperculum and operculum and area above eye bright red; caudal fin red, other fins yellowish-red, often tipped with red.
(voucher: 150 mm SL)

Lethrinus semicinctus

HL slightly greater than body depth; profile convex above eye. Inner surface of pectoral fin base naked. Body with 7-8 diffuse cross-bars and a dark blotch below lateral line adjacent to tip of pectoral fin; fins pinkish-red.
(voucher: 170 mm SL)

Lethrinus sp

Body shape similar to *L. rubrioperculatus* and *L. variegatus.* Bright red spot on margin of operculum; entire margin of preoperculum bright red.
(voucher: 274 mm SL)

Wattsia mossambica

Body deep, roughly square, its depth 1.9-2.2 in SL. Head profile convex on snout, indented above eye; 2 close-set nasal openings, the posterior one slit-like, ending close to eye. Caudal fin slightly forked with broadly rounded lobes. Head, body and fins yellowish; indistinct crossbars on body.

SPARIDAE

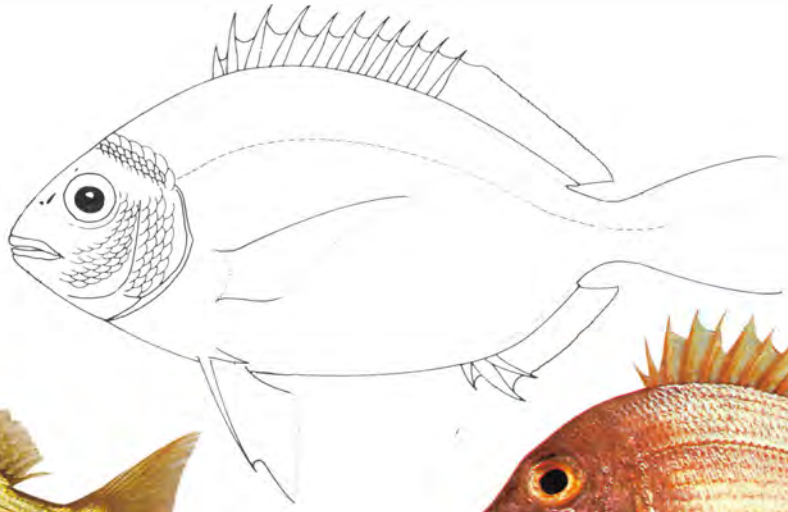
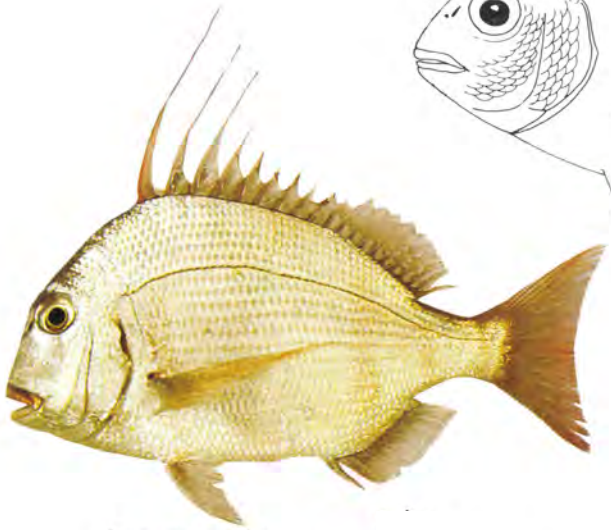
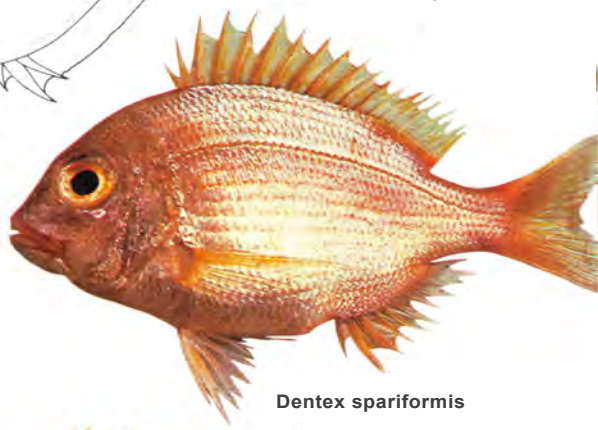


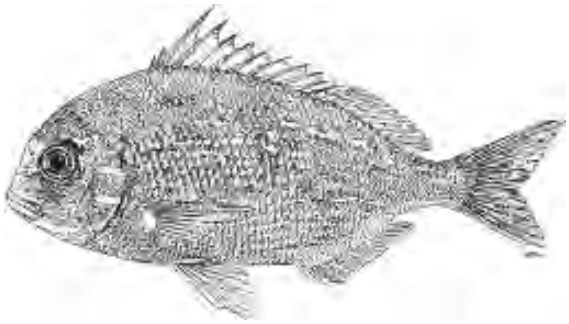
Fig. 1



Argyrops bleekeri



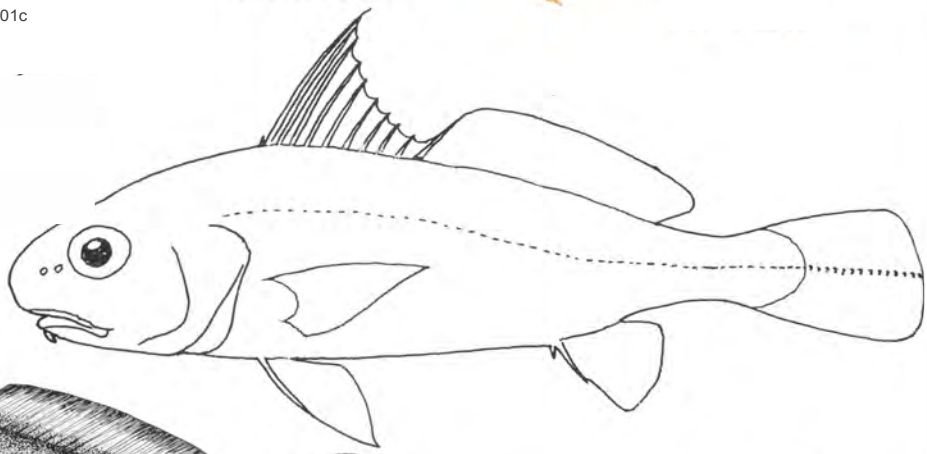
Dentex spariformis

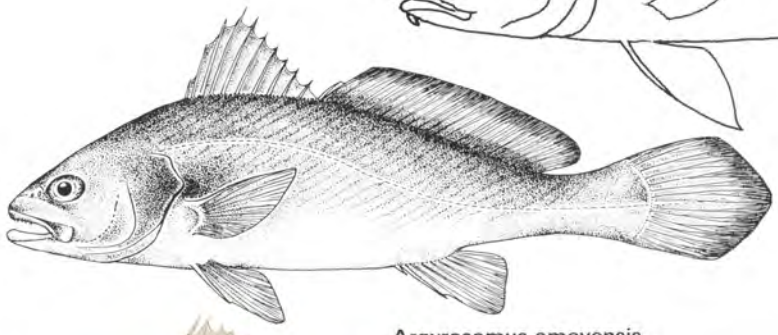


Evynnis tumifrons redrawn from Carpenter, 2001c

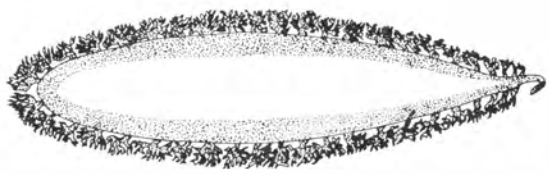
Pagrus auratus

SCIAENIDAE





Argyrosomus amoyensis



Atrobucca brevis

SPARIDAE

Seabreams; Porgies - Abat; Bekukung

Body oblong, usually deep and compressed; head large, predorsal profile often steep. Mouth small, upper jaw reaching no further than middle of eye; teeth well-developed and differentiated into conical or incisor-like teeth in front, rounded, molar-like teeth behind, usually no teeth on palate; no scales on broad suborbital, preoperculum scaled, margin smooth. Scales cycloid or weakly ctenoid. Single unnotched dorsal fin with 10-15 stout spines, 9-17 rays, first 2 spines sometimes very short, other anterior spines occasionally produced or filamentous; anal fin with 3 stout spines, 7-16 rays; pectoral fin usually long and pointed; ventral fin with axillary scale; caudal fin emarginate or forked.

Thirty-eight genera in the family; representatives of four were obtained on the Survey.

REFERENCES: Carpenter, 2001c; Iwatsuki, Akazaki & Taniguchi, 2007; Iwatsuki,Newman & Russell, 2015; Iwatsuki & Heemstra, 2018; Tabata & Taniguchi, 2000; Paulin, 1990.

Argyrops bleekeri

Two rows of molar-like teeth along sides of each jaw. First dorsal spine very small, 2nd-6th spines much elongated and flattened in juveniles to 30 cm SL, shorter in adults; head profile steep; eye diameter clearly less than suborbital depth; hind margin of upper jaw reaches a vertical behind eye. Body brilliant silvery pink or pale yellow, traces of 5 dark bars on back (distinct in juveniles), opercular edge red. Fins pink, dorsal and caudal edges red.
D X-XI, 10-11. A III, 8-9. P 14-16. Lower GR 9-11. L. lat. 52-54.
(voucher: 240 mm SL)

Dentex spariformis

Head profile oblique, bulging at level of eye in large fish. Eye large, 2.4-3.4 in HL; interorbital scales reach almost to level of anterior margin of eye; a row of sharp conical teeth in both jaws (no molars); preopercular margin scaled. No elongated spines in dorsal fin; 2nd anal spine only slightly longer than 3rd. Body light pinkish-red, silvery, three orange blotches sometimes present on back; nape golden; eye color pinkish-gold; fins rosy-yellow.
D XII, 10. A III, 8. P 15-16. Lower GR 10.
(voucher: 100 mm SL)

Evynnis tumifrons

Head profile convex. Body depth more than 2.1 in SL; jaws with few canines in front, low molars on sides and conical teeth on vomer; interorbital scaly; no scales on preopercular flange. First and 2nd dorsal fin spines much shorter than 3rd and 4th spines which are extended; 4th spine less than twice in length of 5th spine. Body and head silvery pink, crimson or red above, rows of pale but distinct blue-green dots along scale rows; operculum margin reddish. Fins dark pink or red, dorsal filaments and caudal fin red.
D XII, 10. A III, 9 P 15. Lower GR 12-13.

Pagrus auratus

Head profile evenly convex; two rows of molariform teeth in sides of jaws, 3 pair of canine-like teeth at front of lower jaw; interorbital scaly. No elongated spines in dorsal fin, 1st spine length 4.7-8.3 in HL; body depth 2 or more in SL. Body brilliant red-orange, small blue-green spots scattered over upper half of body, white streak along belly, iridescent markings around eye. Fins orange-red.
D XII, 10. A III, 8. P15. Tr 6-7 + 15-16. Lower GR 9-11.

SCIAENIDAE

Jewfishes, Croakers, Drums - Kekemek, Gelama, Krot

Oblong, compressed and robust fish. Mouth large and oblique, jaws equal or mouth inferior to an overhanging snout; chin and snout with conspicuous pores, and sometimes one or more barbels. No teeth on roof of mouth. Well-developed cavities under outer head bones. Scales thin, covering head except for snout tip. Lateral line continuous to end of caudal fin. Single dorsal fin long, and deeply notched between last and second last spines; 6-13 spines and 20-35 soft rays. Anal fin with one or 2 spines and 5-12 rays. Caudal fin either truncate, rounded or wedge-shaped. Upper bony edge of operculum deeply indented, or forked, and a bony flap above gill opening. Otolith shape is diverse within the family. The swim bladder of sciaenids (which is used as a resonating chamber) has a variety of shapes and appendages characteristic of different genera.

Representatives of seven genera were obtained during the Survey (68 recognised genera in the family).

REFERENCES: Sasaki, 2001; Sasaki & Kailola, 1988; Sasaki, 1999; Chao et al., 2019; Sasaki & Kailola, 1991.

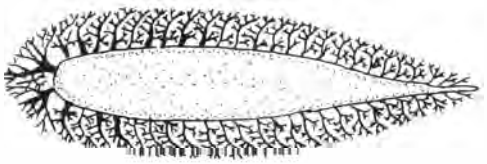
Argyrosomus amoyensis

Swim bladder carrot-shaped; 22-29 pairs of branching appendages not entering head and set obliquely along bladder, edges of each overlapping. Jaws equal, some teeth enlarged, those in lower jaw strong and widely-spaced; 3 pairs of small pores on chin, anterior pair separated by symphysis. Caudal fin wedge-shaped. Upper body with faint oblique rows of small spots; margin of spinous dorsal fin dusky, each soft dorsal ray with dark spot at its base. Second anal spine 13.5-14.5 in SL, pectoral fin 5.1-5.9 in SL; interorbital 16.7-18.9 in SL. Eye 4.5-7.7 in HL and lower jaw length 1.9-2.1 in HL.
D X, I, 25-27. A II, 17. Lower GR 8.
(voucher: ? mm SL)

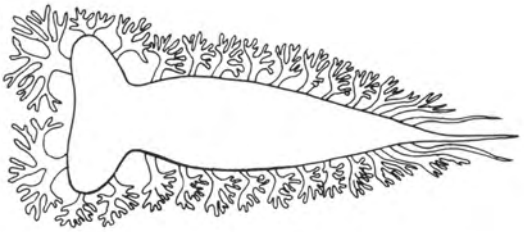
Atrobucca brevis

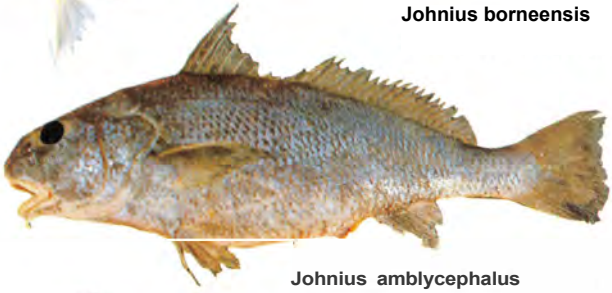
Swim bladder carrot-shaped; 24-29 pairs of branching appendages not entering head and set obliquely along bladder, edges of each overlapping and with well-developed dorsal limbs. Jaws equal, some teeth enlarged, those in lower jaw strong and widely-spaced; 3 pairs of small pores on chin, anterior pair separated by symphysis. Caudal fin wedge-shaped. Body brown or copper-coloured and iridescent mauve, lower body pale orange or whitish; mouth grey, gill cavity dark brown or black; fins dusky orange, spinous dorsal and caudal fins edged black. Second anal spine 13.3-15.2 in SL; pectoral fin 4.2-5 in SL; interorbital 13.3-14.7 in SL. Eye 4.1-4.5 in HL.
D X, I, 29-32. A II, 7. Lower GR 10-11.
(voucher: 197 mm SL)

Atrobucca nibe

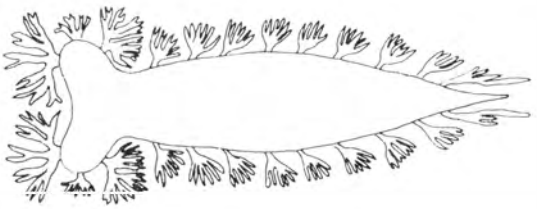


Johnius borneensis

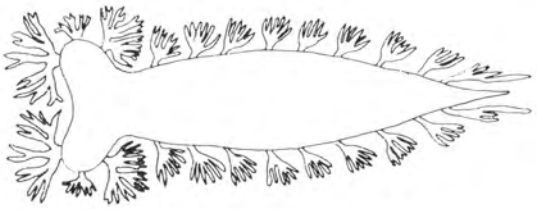


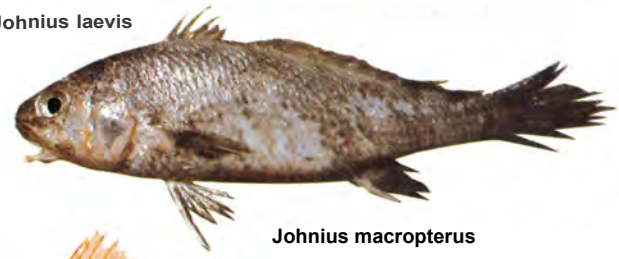


Johnius amblycephalus

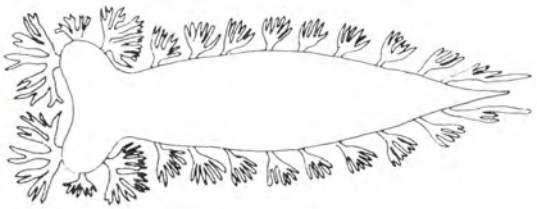


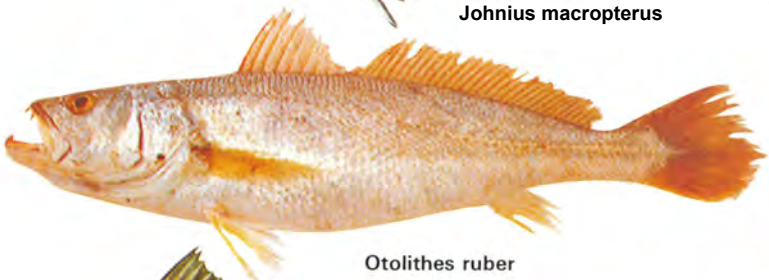
Johnius laevis



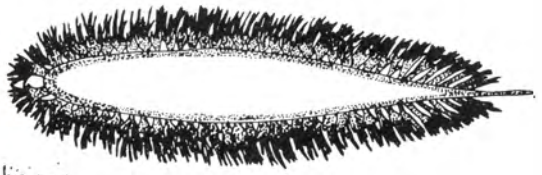


Johnius macropterus

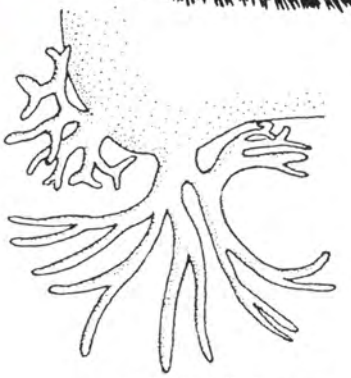




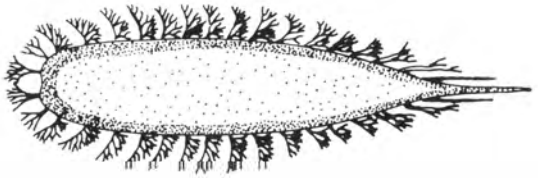
Otolithes ruber



Nibea soldado



Pennahia macrocephalus



Atrobucca nibe

Swim bladder carrot-shaped; 24-30 pairs of branching appendages not entering head and set obliquely along bladder, edges overlapping; dorsal and ventral appendage limbs well-marked. Jaws equal, some teeth enlarged, sharp and needle-like; 3 pairs of small pores on chin, anterior pair separated by symphysis. Caudal fin wedge-shaped. Violet-brown and silvery, paler below; mouth and gill cavity dark brown or black; fins brown. Second anal spine 11.8-15.4 in SL; pectoral fin 3.6-4 in SL; interorbital 11.9-13 in SL. Eye 3.8-4.4 in HL and lower jaw length 1.8-1.9 in HL.
D IX-X, I, 27-33. A II, 7. Lower GR 9-12.
(voucher: 194 mm SL)

Johnius borneensis

Swim bladder hammer-shaped, with 14-15 branching appendages along it. Jaws equal, snout rounded; teeth in both jaws noticeably sharp, well-spaced and conical, those in inner row of lower jaw enlarged; 3 pairs of pores on chin, first pair separated by a groove. Body scales ctenoid. Caudal fin wedge- shaped. Body iridescent dusky mauve above, silvery white below, often 2 brown stripes along middle of sides; outer ⅔ of spinous dorsal fin dark brown or black. Second anal spine 11.1-15.4 in SL (24-42% HL). Interorbital 3.6-4.2 in HL; eye diameter 3.6-4 in HL; lower jaw length 1.9-2.3 in HL.
D IX-X, I, 29-31. A II, 7. Lower GR 9-12.
(voucher: 105 mm SL)

Johnius amblycephalus

Swim bladder hammer-shaped, with 14-15 pairs of branching appendages along it. Barbel on chin; snout blunt, mouth ventral (inferior); teeth small and all of same size in lower jaw, stronger but not widely-spaced in upper jaw. Body scales cycloid. Leading edge of spinous dorsal fin elevated; caudal fin wedge-shaped in juveniles, truncate or "S"-shaped in adults. Head and upper ⅔ body iridescent brown, remainder orange-white; black edge to spinous dorsal. Barbel length 2.8-5 in eye diameter; second anal spine 3.3-4.6 in HL; eye diameter about 4.3 in HL; lower jaw length about 1.8 in HL.
D X, I, 23-26. A II, 7. Lower GR 6-10.
(voucher: 205 mm SL)

Johnius laevis

Swim bladder hammer-shaped, with 11-13 branched appendages along it. Snout projecting over inferior mouth; teeth small and all of same size in lower jaw, stronger but not widely-spaced in upper jaw. Head scales cycloid, body scales ctenoid. Caudal fin wedge-shaped or rounded. Head and upper body dusky iridescent mauve or bronze, lower part of body silvery-white, dusky blotch on operculum; fins yellow, black margins to dorsal and caudal fins. Second anal spine 7.1-9.1 in SL. Interorbital 3.6-4.3 in HL; eye 3-4 in HL and lower jaw length 2.2-2.8 in HL.
D IX-X, I, 30-32. A II, 7-8. Lower GR 11-12.
(voucher: 100 mm SL)

Johnius macropterus

Swim bladder hammer-shaped, with 13-15 pairs of branching appendages along it. Blunt barbel on chin; snout blunt, mouth inferior, teeth small and all of same size in lower jaw, stronger but not widely-spaced in upper jaw. Body scales ctenoid. Caudal fin wedge-shaped. Iridescent brown body, violet above; fins dark brown. Barbel length 4.3-7.1 in eye diameter; second anal spine 2.5-3.2 in HL; eye diameter 4.1-4.9 in HL; lower jaw length 2.4-2.9 in HL.
D X, I, 28-33. A II, 7-8. Lower GR 10-12.
(voucher: 88 mm SL)

Otolithes ruber

Strong outstanding pairs of canine teeth in both jaws; lower jaw projecting. Swim bladder carrot-shaped; 30-40 pairs of appendages set obliquely along bladder in fold of tissue beside it; posterior branches bud-like. Chin pores very small (or absent) separated by symphysis. Most scales cycloid. Caudal fin wedge-shaped. Anal fin begins behind middle of soft dorsal fin. Silvery or golden overall, blue-brown above. Second anal spine 17.9-28.6 in SL. Eye 4.3-7.7 in HL and interorbital 4-5 in HL.
D IX-X, I, 27-30. A II, 7-8. Lower GR 8-11.

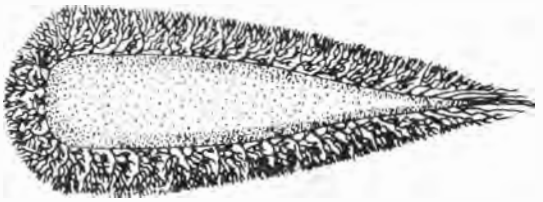
Nibea soldado

Swim bladder carrot-shaped with 15-21 branching appendages along it; first appendage partly entering head, and no well-developed dorsal limbs to appendages. Snout rounded, moderately acute; jaws equal; inner row of teeth in lower jaw strong and enlarged; 3 pairs of pores on chin, first pair close together and joined by a groove. Body scales ctenoid (coarse and rough). Caudal fin wedge-shaped. Iridescent greenish yellow, brown over back; brown narrow oblique stripes cross upper ⅔ of body; fins dark. Second anal spine 6.9-8.7 in SL (38-64% SL), pectoral fin 4.3-5 in SL. Eye 4.9-5.7 in HL, lower jaw 2.3-2.6 in HL.
D IX-X, I, 27-33. A II, 7-8. Lower GR 5-7. Tr above 8-13.
(voucher: 205 mm SL)

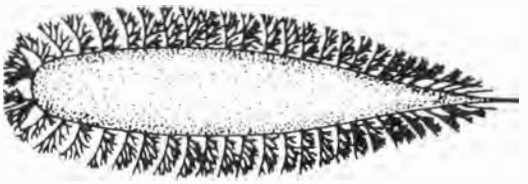
Pennahia macrocephalus

Swim bladder carrot-shaped, 18 pairs of wing-like appendages positioned in one plane along it, branching posteriorly, and none entering head; dorsal limbs of appendages scarcely branched. Jaws equal, some teeth enlarged but not true canines; 3 pairs of small, indistinct pores on chin separated by symphysis; gill rakers slender. Scales on head and anterior portion of body cycloid, remainder ctenoid. Caudal fin slightly wedge-shaped. Body silvery-blue, silvery, darker above, brown patch on operculum; black spot on tip of lower jaw, another on pectoral fin base; mouth charcoal coloured. Second anal spine 9.5-15.2 in SL; pectoral fin length 3.6-4.1 in SL; interorbital 10.1-12.3 in SL; eye 4-5 in HL and lower jaw length 1.9-2 in HL.
D IX-XI, I, 27-30. A II, 7-9. Lower GR 11-13.
(voucher: 121 mm SL)

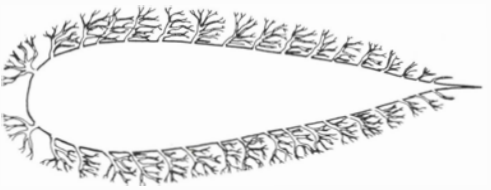
Pennahia anea



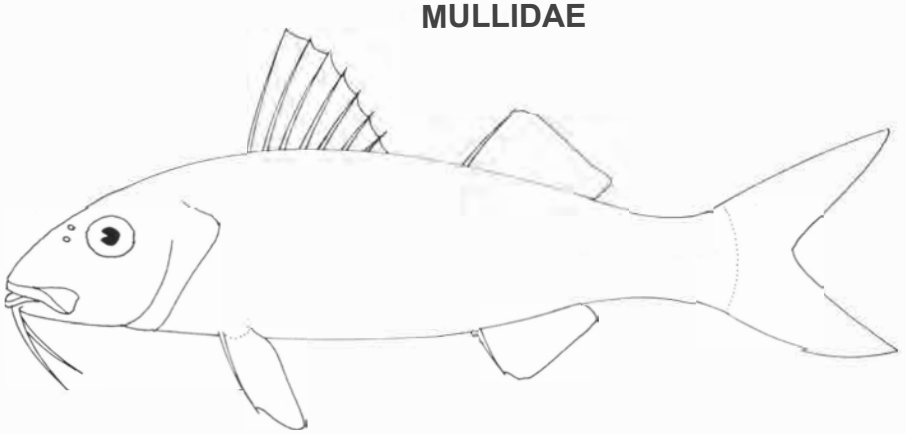
Pennahia pawak



Protonibea diacanthus



MULLIDAE



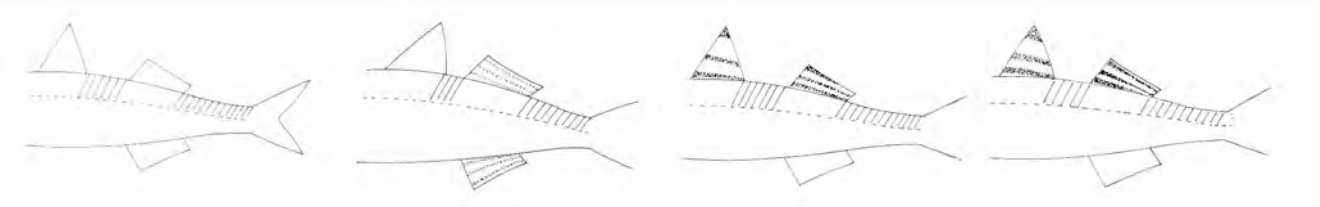


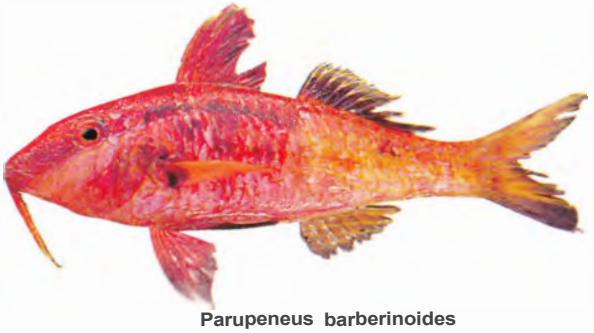
Fig 1
Mulloidichthys

Fig 2
Parupeneus

Fig 3
Upeneus

Fig 4
Upeneus

Mulloidichthys flavolineatus



Parupeneus barberinoides

Pennahia anea

Swim bladder carrot-shaped, 17-21 pairs of wing-like appendages positioned in one plane along it, branching posteriorly, and none entering head; dorsal limbs of appendages scarcely branched. Jaws equal, some teeth enlarged, upper jaw extending backwards to below hind margin of eye; 2 pairs of small, indistinct pores on chin, separated by symphysis; gill rakers slender. Scales on head and lower sides cycloid, elsewhere ctenoid. Caudal fin truncate, upper and lower lobes angular. Bronze head and body, bluish above, silvery below; large brown patch on operculum. Second anal spine 9.1-14 in SL; pectoral fin length 3.8-4.5 in SL; interorbital 9.7-11.6 in SL. Eye 3.6-4.5 in HL and lower jaw length 1.7-1.9 in HL.
D IX-X, I, 22-24. A II, 7-9. Lower GR 9-12.
(voucher: 210 mm SL)

Pennahia pawak

Swim bladder carrot-shaped, 24-27 pairs of wing-like appendages positioned in one lane along it, most branching posteriorly, and none entering head; dorsal limbs of appendages scarcely branched. Jaws equal, some teeth enlarged, upper jaw extending backwards to below middle of eye; 3 pairs of small, indistinct pores on chin separated by symphysis. Scales on head cycloid, elsewhere ctenoid. Caudal fin a short wedge shape. Body bronze, greenish brown above, silvery white below, large black blotch on operculum. Dorsal fin margin dark brown, and a large black blotch over posterior dorsal spines. Second anal spine 12.5-13.3 in SL; pectoral fin length 4.3 in SL; interorbital 11.1-11.2 in SL. Eye 3.9-5 in HL and lower jaw length 1.9-2 in HL.
D X, I, 23-25. A II, 7. Lower GR 7-9.
(voucher: 115 mm SL)

Protonibea diacanthus

Swim bladder carrot-shaped with about 20 branching appendages along it, first one not entering head. Jaws equal; outer row of teeth in lower jaw larger than remainder; 3 pairs of pores on chin, median pair on symphysis, joined by groove. Scales on snout and suborbital cycloid, elsewhere ctenoid. Caudal fin wedge-shaped. Body fawn or dusky yellow, darker above and crossed by 5 broad oblique brown bands, most apparent on back; dark brown spots scattered over upper half of head, body, dorsal and caudal fins; lower half of caudal fin; all other fins dark brown. Second anal spine 9.1-10.5 in SL, pectoral fin 4.3-5.6 in SL. Eye 4.5-5.6 in HL; lower jaw length 1.9-2.1 in HL.
D X-XI, I, 22-25. A II, 7-8. Lower GR 6-8.
(voucher: 313 mm SL)

MULLIDAE

Goatfishes - Biji nangka karang; Janggot Kunir; Kuniran

Oblong, slightly compressed fishes, underside of head and belly flat. Two long, simple and fleshy barbels on chin. Scales ctenoid. Two widely separated dorsal fins, first with 6-8 spines, second with one spine and 8-9 rays. Anal fin with one or 2 spines and 6 or 7 rays. Caudal fin forked. Ventral fin with a scaly axillary process. Proportions of eye, snout and barbel length change with age. Colouration varies with day and night, depth of water, and life or death. For example, fishes coloured orange, yellow or grey in shallow water are frequently crimson, violet or dark brown when captured from deeper water. Colours also change rapidly on capture and soon fade. Such variability is frequently the cause of errors in identification.

The family comprises six genera of which representatives of three were collected during the Survey. They can be distinguished as follows:

Mulloidichthys
Band of fine teeth in jaws and none on vomer and palatines; 5 scale rows between first and second dorsal fins and 12 along upper caudal peduncle. Fins plain. (Fig 1)

Parupeneus
One row of blunt, conical teeth in jaws and none on vomer and palatines; 2-3 scale rows between first and second dorsal fins and 8-9 along upper caudal peduncle. Second dorsal and anal fins always striped. (Fig 2)

Upeneus
Band of fine teeth in jaws; very fine teeth on vomer and palatines. Four or 5-7 scale rows between first and second dorsal fins and 10 or 12 along upper caudal peduncle. First and second dorsal fins often striped. (Figs 3 and 4)

REFERENCES: Randall, 2001b; Randall, 2004; Uiblein & Heemstra, 2010; Uiblein et al, 2018; Uiblein, Hoang & Gledhill, 2017; Uiblein & McGrouther, 2012.

Mulloidichthys flavolineatus

Snout long, maxilla ends well before eye. Eye 3.3-5 in HL. Yellow band from eye to caudal fin base. Sometimes a dark spot on sides below lateral line and above pectoral fin. Head and back dark brown to crimson. Barbels blue, tips orange. Fins pale. Peritoneum dark brown or black.
Lower GR 18-22 on first arch. L. lat. 34-38.
(voucher: 165 mm SL)

Parupeneus barberinoides

Barbels extend past preopercular margin. Reddish brown on lower front half of body, yellow over hind half. Two black bands from snout: first to base of soft dorsal fin, second through eye. Black spot below posterior of second dorsal fin on or above lateral line. Barbels scarlet or bright orange. Second dorsal and anal fins with blue and yellow bands. Peritoneum pale.
P 15-16. Total GR 27-31.

Parupeneus barberinus

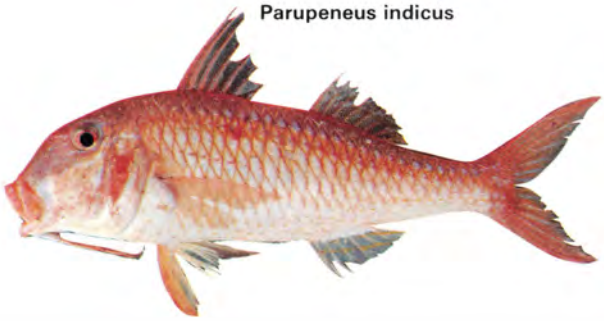
Parupeneus crassilabris

Parupeneus chrysopleuron

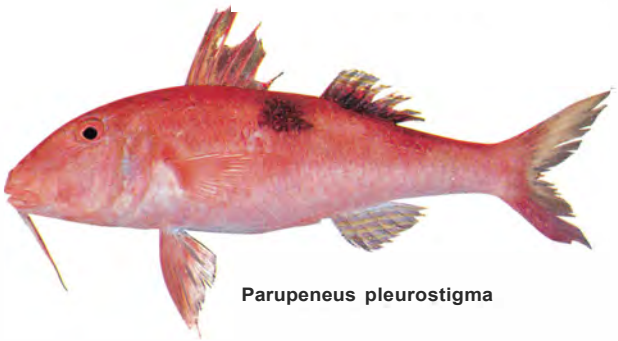
Parupeneus cyclostomus

Parupeneus indicus

Parupeneus macronemus



Parupeneus heptacantha



Parupeneus pleurostigma

Parupeneus rubescens

Parupeneus jansenii

Parupeneus multifasciatus

Parupeneus barberinus

Second dorsal fin spine flexible near tip. Last rays of second dorsal and anal fins about equal in length the penultimate ray(s). Barbels about equal to snout-plus-eye distance and ending opposite hind eye margin. Dark brown or red band, edged yellow, from snout through eye to end of second dorsal fin base. Oval black spot on caudal peduncle near tail base centred on lateral line. Blue and yellow lines over cheek and lower sides, second dorsal and anal fin barred yellow. Peritoneum dark brown or black. Barbels cream.
P 16-18. Total GR 26-31.
(voucher: 120 mm SL)

Parupeneus chrysopleuron

Barbels long, almost reaching opercular margin. Bright red head and body. Bright yellow band from eye to upper caudal peduncle. Blue lines around eye; barbels pale yellow or white. Peritoneum silvery pale.
P 15-16. Total GR 21-23.
(voucher: ? mm SL)

Parupeneus indicus

Barbels extend beyond preopercular margin. Large oblong yellow patch about 7 scales long, mostly above lateral line, below second dorsal fin or interdorsal space. Large black spot on mid-length of caudal peduncle. Blue lines across head; barbels crimson or pink, tips white. Peritoneum dusky in young, dark brown in adults.
P 15-17. Total GR 24-27.
(voucher: 250 mm SL)

Parupeneus heptacantha

Barbels extend past preoperculum; posterior end of maxilla convex. Body depth 3-3.6 in SL. Bright red spot 1-2 scales wide below lateral line and above mid-length of pectoral fin. Blue horizontal stripes on head; back with pearly blue spots or broad mauve band. Barbels pale pink; second dorsal and anal fins with alternating pale blue and yellow lines. Peritoneum dark brown.
P 15-17. Total GR 23-25.
(voucher: 200 mm SL)

Parupeneus rubescens

Two or 3 convex olive or yellow bands extend from head to below second dorsal fin base. Large pale yellow area ('saddle') behind second dorsal fin followed by dark brown or black saddle on upper caudal peduncle. Barbels pale. Peritoneum dusky. Second dorsal fin spine tip flexible. Barbels long, extending beyond operculum.
P 15-16. Total Gr 29-31.
(voucher: 110 mm SL)

Parupeneus jansenii

Barbels extend beyond preoperculum; posterior end of maxilla convex. Body depth 3.6-4.4 in SL. First dorsal fin spine flexible near tip. Body pink, a yellow band from eye along lateral line, ending above line near caudal fin base; peritoneum pale.
P 15-16. Total GR 23.
(voucher: 100 mm SL)

Parupeneus crassilabris

Barbels fleshy, extend to eye or operculum; tip of second dorsal fin spine stiffened. Body depth 2.7-3.4 in SL. Two to 5 black bars or saddles across back, most prominent below each dorsal fin and over upper caudal peduncle. Body red, mauve above. Barbels dark purple or black, tips yellow. Second dorsal and anal fins with oblique yellow bars, last rays may be black. Blue lines around eye, black mark behind eye. Peritoneum pale.
P 15-16. Total GR. 34-42.
(voucher: 230 mm SL)

Parupeneus cyclostomus

Snout long, head profile steep and straight; barbels long, extending beyond head; eye relatively small in large specimens. Second dorsal fin spine tip flexible. Body plain, changing with depth of capture (from grey through orange to violet-pink). Blue and yellow lines radiate from eye; oblong cream or pale yellow saddle on caudal peduncle behind second dorsal fin. Barbels tipped yellow. Peritoneum pale. P 16-17. Total GR 27-32.
(voucher: 325 mm SL)

Parupeneus macronemus

Second dorsal fin spine stiffened at tip. Last ray of second dorsal and anal fins very long. Barbels longer than snout-plus-eye distance, almost reaching preopercular margin. Dark brown horizontal band from snout through eye to below second dorsal fin; black spot on middle of caudal peduncle diffuse and mostly above lateral line; pale yellow saddle on caudal peduncle. Second dorsal fin with black stripe along base and pink or violet stripes. Peritoneum pale. Barbels pale brown.
P 15-17. Total GR 31-33.
(voucher: 130 mm SL)

Parupeneus pleurostigma

Barbels scarcely reach preopercular margin. Round black spot about 4 scales wide, across lateral line below interdorsal space and a large oblong yellow patch below second dorsal fin. Barbels pale. Four narrow yellow longitudinal lines on anal fin. Peritoneum pale.
P 15-17. Total GR 28-32.
(voucher: ? mm SL)

Parupeneus multifasciatus

Barbels long, reaching beyond opercular edge; soft dorsal and anal fins pointed. Body depth 3.2-3.7 in SL. Last 1 or 2 rays of soft dorsal and anal fins longer than penultimate rays. Body reddish, back crossed by 4 or 5 broad dusky bars, the last two (below soft dorsal fin; across caudal peduncle) being obvious and persistent. Soft dorsal and anal fins with alternating blue-green and yellow longitudinal stripes, posterior rays of soft dorsal fin dark brown or black, pectoral fin yellow.
D VIII, 9. A I, 6. P 15-17. Total GR 36-41. L. lat. 27-28. Tr 3+8-9.

Upeneus australiae

Upeneus torres

Upeneus quadrilineatus

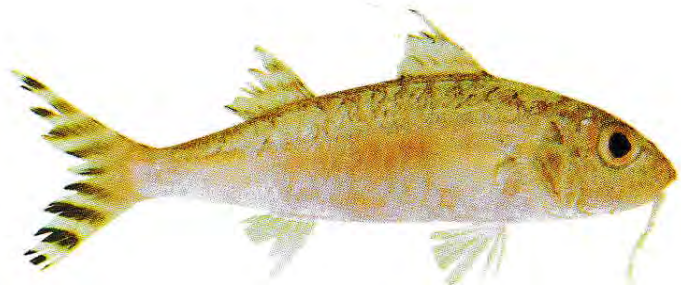
Upeneus moluccensis

Upeneus sundaicus

Upeneus sulphureus

Upeneus vittatus

Upeneus tragula



Upeneus subvittatus

Upeneus guttatus

Upeneus australiae

First dorsal fin spine longest. Gold band from eye to caudal peduncle. Barbels white. Both dorsals, ventral and anal fins white crossed by 3-4 orange to crimson oblique bands. Upper caudal fin lobe crossed by 4-5 crimson bands; lower lobe crossed by 7-8 bands, tipped dark brown. Peritoneum pale or slightly dusky.
D_1 VIII. P 12-14. L. lat. 29-31. Total GR 27-29.

Upeneus quadrilineatus

First dorsal fin spine minute. Four horizontal yellow bands from head to caudal peduncle; bright lemon-yellow band along ventral profile from ventral fin base to end of anal fin. Dorsal fins pink, crossed by 2 yellow bars, tips dark brown. Ventral, anal and pectoral fins pale. Caudal fin lobe crossed by 5-6 oblique brown-red bands; lower lobe of caudal fin plain, outer margin broadly edged dark brown. Peritoneum dusky. Barbels pink.
D_1 VIII. P 15. L. lat. 36-38. Total GR 25-27.
(voucher: 130 mm SL)

Upeneus sundaicus

First dorsal fin spine minute. Olive-yellow horizontal band from eye to caudal peduncle. Dorsal fins blotched crimson; ventral, anal and pectoral fins plain white and pink. Caudal fin crimson with green rays and broad dark brown margin to lower lobe. Barbels bright yellow or orange. Peritoneum pale.
D_1 VIII. P 14. L. lat. 34-38. Total GR 18-20.
(voucher: 163 mm SL)

Upeneus vittatus

First dorsal fin spine minute. Four to 5 dusky yellow or orange horizontal stripes from head to below second dorsal fin or to tail base. Brownish red bars across both dorsal fins, tips of fins black. Pectoral, ventral and anal fins plain yellow or pink. Caudal fin crossed by dark brown or crimson oblique bands: 4-5 on upper lobe, 2-3 on lower lobe, lowermost very broad. Barbels white. Peritoneum dusky.
D_1 VIII. P 15-17. L. lat. 32-35. Total GR 26-31.
(voucher: 150 mm SL)

Upeneus subvittatus

Barbels ⅔ of HL. First dorsal fin spine minute. Four to 5 horizontal stripes along sides reaching to caudal peduncle. Dorsal fins with brownish-red bars, tips black. Three to 4 dark bands across upper caudal fin lobe, 5 across lower (none broader or darker than the others). Peritoneum black or dark brown.
D_1 VIII. P 16-17. L. lat. 36. Total GR 24-25.
(voucher: 130 mm SL)

Upeneus torres

First dorsal fin spine longest. Barbels pale yellow or white. Two or 3 orange bars across dorsal fins; pectoral, ventral and anal fins pale. Upper caudal fin lobe crossed by 3-5 oblique bars; lower lobe plain dusky orange with pale margin. Peritoneum dusky.
D_1 VII. P 13-14. L. lat. 28-30. Total GR 23-27.
(voucher: 113 mm SL)

Upeneus moluccensis

First dorsal fin spine minute, 2nd longest. Bright yellow horizontal band through eye to caudal fin base. Barbels white or pink. Dorsal fins crossed by 3-4 orange or red bars; anal, ventral and pectoral fins pale. Upper lobe of caudal fin with 5-6 orange-black bars, lower lobe plain yellow with dark margin. Peritoneum dusky.
D_1 VIII. P 15-18. L. lat. 33-36. Total GR 27-31.
(voucher: 130 mm SL)

Upeneus sulphureus

First dorsal fin spine minute. Two orange-yellow horizontal bands from head to caudal peduncle. Both dorsal fins crossed by 2-3 olive bars, tips of fins black or dark brown. Anal, ventral and pectoral fins pale. Caudal fin plain dull yellow - hind margin dusky, lower lobe tipped white. Peritoneum dusky. Barbels white.
D_1 VIII. P 15-18. L. lat. 34-37. Total GR 26-32.
(voucher: 115 mm SL)

Upeneus tragula

Third or 4th dorsal fin spine longest, first spine minute. Barbels do not reach preopercular margin. Many orange-brown spots over head and body; red or yellow band from eye to caudal fin base. Barbels white or pale yellow. Peritoneum pale. Both dorsals, anal and ventral fins crossed by red bars or rows of blotches. Brown or red crossbars on caudal fin, 4-6 on upper lobe, 5-8 on lower lobe.
D_1 VIII. P 14-15. L. lat. 29-31. Total GR 21-25.
(voucher: 110 mm SL)

Upeneus guttatus

First dorsal fin spine longest. Barbels bright yellow. Both dorsal fins and ventral fin with 2-3 orange-pink bars or blotches. Pectoral and anal fins pale. Both caudal fin lobes crossed by orange bars and with inner hind margin brown or reddish. Three to 5 bars on upper caudal fin lobe, 5-6 on lower lobe. Peritoneum silvery with scattered dark spots.
D_1 VII. P 12-13. L. lat. 30-31. Total GR 25.
(voucher: 115 mm SL)

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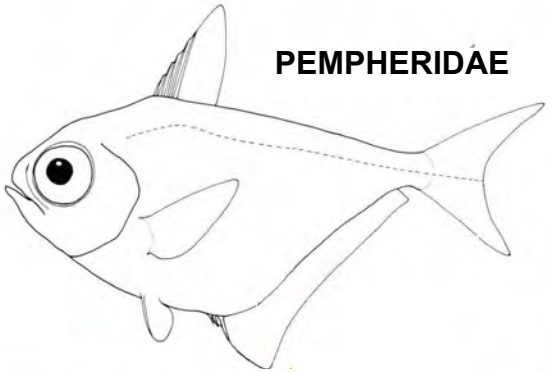
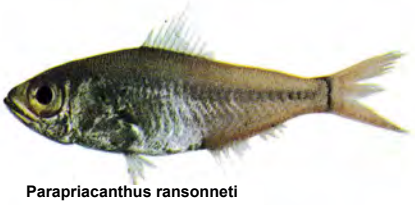
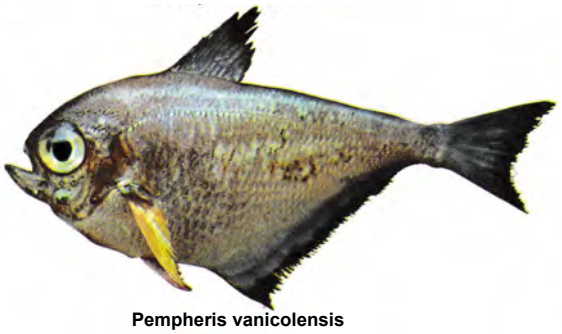




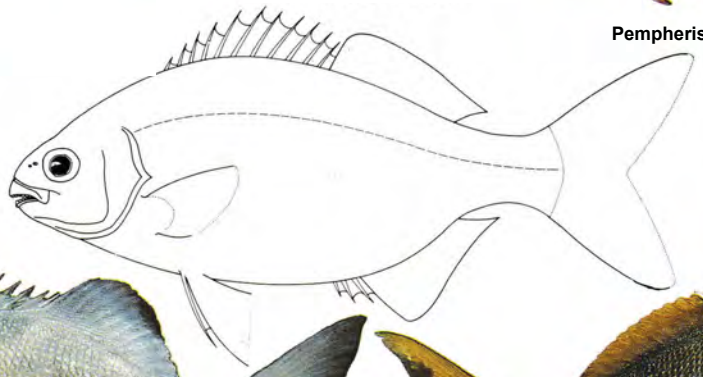
Parapriacanthus ransonneti

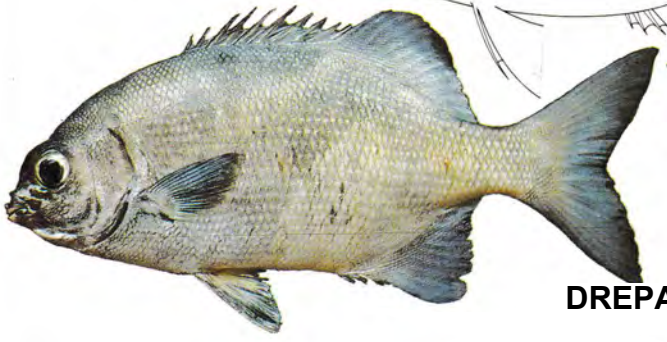


Pempheris vanicolensis

Pempheris molucca

KYPHOSIDAE

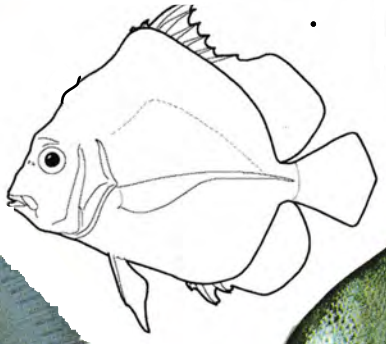


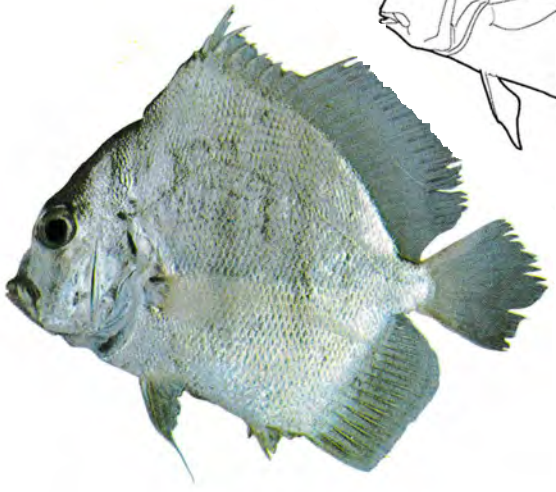


Kyphosus cinerascens

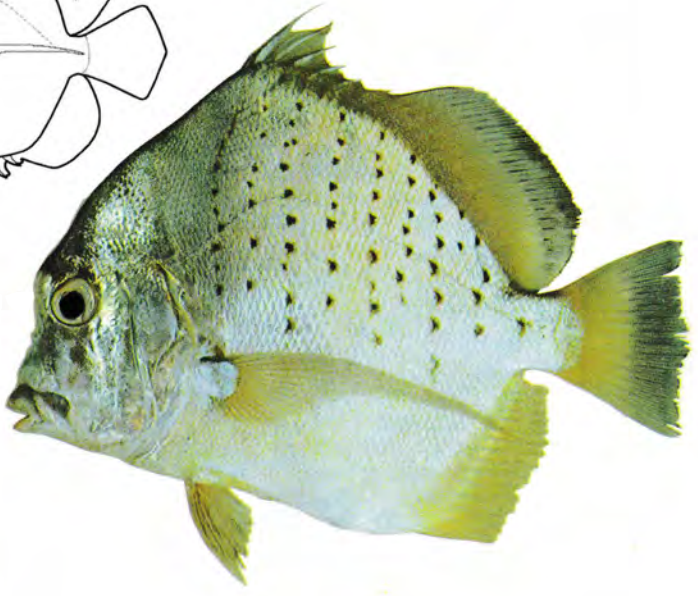
Kyphosus vaigiensis

DREPANEIDAE





Drepane longimana



Drepane punctata

PEMPHERIDAE

Sweepers; Bullseyes - Mada-mada; Sasila

Small fishes; body elongate - oval and very compressed. Head blunt; mouth oblique, maxilla moderately short and exposed posteriorly; teeth small; eye large, without adipose lid; preorbital smooth; no opercular spine, gill rakers long. Scales continue onto most of head and anal fin (*Pempheris*); lateral line tubules short and wide, extending onto caudal fin. Dorsal fin high and short-based, beginning before middle of body, with 4-7 graduated spines; anal fin longer, usually with 3 spines, rays decreasing in length posteriorly; ventral fin below pectoral fin; caudal fin forked or emarginated; luminous organs present in many species.

Two genera and 80 species in the family, three species obtained on the Survey.

REFERENCES: Mooi, 2001; Mooi & Jubb, 1996; Randall, 2011.

The 2 genera are distinguished thus:

Parapriacanthus: - anal fin naked; less than 30 rays in anal fin; body elongate.

Pempheris - scales on anal fin basally; 30 or more rays in anal fin; body deep.

Pempheris molucca

Body violet brown, iridescent below pectoral base plain; unpaired fins reddish, front of dorsal fin brown. Head depth more than HL; interorbital space flattened; jaw teeth strong, conical anteriorly. Scales cycloid and easily lost, up to 10 concealed scales below each surface scale on belly; ventral fin with axillary scale.
D VI, 8-10. A III, 41. L. lat. about 64-66.
(voucher: 113 mm SL)

Parapriacanthus ransonneti

Body greenish yellow, pinkish posteriorly, dark edges and dots on scales anteriorly, lower head and sides metallic violet or charcoal; black line across base of caudal fin. Scales absent from throat; ventral fin with axillary scale. Internal luminous organ present.
D V-VI, 8-10. A III, 18-24. L. lat. 60-79. Lower GR 14-19.
(voucher: 46 mm SL)

Pempheris vanicolensis

Body dusky blue-green above, yellowish below; pectoral fin base plain; pectoral bright yellow, outer 1/3 of dorsal, anal and caudal fins charcoal. Head depth more than HL; interorbital space convex; jaw teeth small, close together, larger teeth anteriorly in upper jaw. Scales cycloid, easily lost, up to 10 concealed scales below each surface scale on belly; ventral fin with axillary scale.
D VI, 8-10. A III, 39-44. L. lat. 53-62. Tr above 5-6.
(voucher: 121 mm SL)

KYPHOSIDAE

Rudderfishes; Drummers - Kakap lodi

Body oval, robust and compressed. Mouth small, horizontal outer row of strong incisors in both jaws; scaled or unscaled maxilla exposed or concealed by suborbital bones; preoperculum and suborbital finely serrated, operculum with one or 2 spines. Scales ctenoid and regularly arranged, covering most of head and soft unpaired fins; low scaly sheath for dorsal and anal spines. Single dorsal fin with 10 or more depressible spines and 12-16 rays; anal fin with 3 spines; scaly process in axil of ventral fin; caudal fin emarginated or forked.

Family comprises two genera and 16 species; two species were obtained on the Survey.

REFERENCE: Sakai, 2001.

Kyphosus cinerascens

Length of soft dorsal fin base distinctly shorter than spinous dorsal fin base; anterior dorsal rays longer than longest dorsal spine; caudal fin deeply emarginate. Body dark olive blue with silvery line along each scale row and silver band below eye; fins dark blue or charcoal.
D XI, 12. A III, 11-12. L. lat. 48-56. GR 26-31.
(voucher: 233 mm SL)

Kyphosus vaigiensis

Length of soft dorsal fin base equal to or longer than spinous dorsal fin base; anterior dorsal rays slightly shorter than longest dorsal spine; caudal fin deeply emarginate. Eye 3-3.6 in HL. Body silvery blue with golden line along each scale row and silvery band below eye; fins dusky golden or fawn.
D X-XI, 14-15. A III, 12-13. L. lat. 51-55. GR 29-34.

DREPANEIDAE

Sicklefishes - Gebel; Gampret gebel

Body deep and laterally compressed; head profile steep. Mouth markedly protractile; maxillae exposed distally. Spinous portion of dorsal fin with 13-14 spines, distinct from soft-rayed portion with 19-22 soft rays; anal fin with three spines and 17-19 soft rays; pectoral fins longer than head, falcate; 24 vertebrae. Caudal fin truncate.

One genus and three species in the family, of which two were obtained on our Survey.

REFERENCE: Heemstra, 2001a.

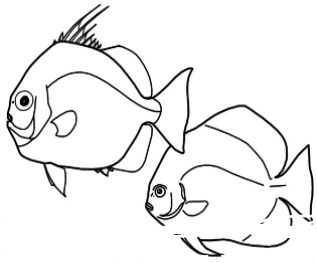
Drepane longimana

Body silvery-blue, dusky above; 4-9 vertical grey bars on upper sides; fin margins dusky. Mouth protractile into a downward-pointed tube; maxilla exposed posteriorly; predorsal body profile indented at nape. Pectoral fin very long and falcate, reaching well over anal fin.
D VIII-IX, 19-23. A III, 17-19.
(voucher: 105 mm SL)

Drepane punctata

Body silvery green, dusky above; 4 -10 vertical rows of dark brown spots on upper sides; fin margins dusky. Mouth protractile into a downward-pointed tube; maxilla exposed posteriorly; predorsal body profile evenly convex at nape. Pectoral fin very long and falcate, reaching well over anal fin.
D IX, 19-22. A III, 17-18.
(voucher: 205 mm SL)

EPHIPPIDAE



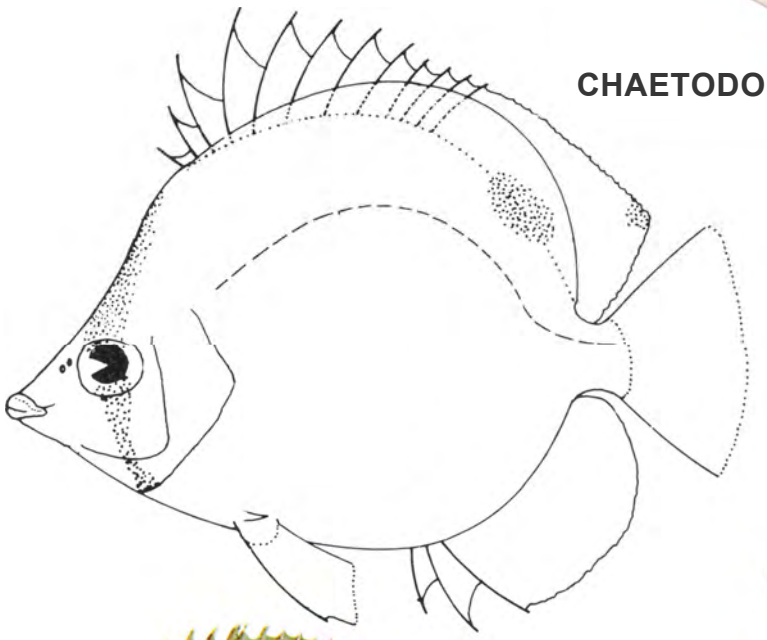
Ephippus orbis

Platax batavianus

Platax teira

Zabidius novemaculeatus

CHAETODONTIDAE



Chaetodon aureofasciatus

Chaetodon assarius

Chaetodon baronessa

EPHIPPIDAE

Batfishes, Spadefishes -

Deep-bodied fishes with an oval compressed body, a small terminal mouth, a single long-based dorsal fin consisting of a low spinous part followed soft rays, long pelvic fins inserted below the small pectoral fins and a slightly concave tail. The dorsal fin spines are low, and the anterior dorsal and anal fin rays are long. The head and body are covered in small scales, the dorsal profile is steep, and the lateral line runs from the gill cover to the tail base.

There are eight genera and 15 species in this family; we obtained five species in three genera on the Survey.

REFERENCE: Heemstra, 2001c.

Ephippus orbis

Body outline almost circular. Maxilla hidden posteriorly and mouth not protractile. Spinous and soft dorsal fins separated by notch, 3rd to 5th spines longest and flexible; pectoral fin short and rounded. Body silvery-blue with 4 or 5 faint charcoal or dark blue bars across it reaching to ventral profile; fin margins dusky.
D IX, 19-20. A III, 15-16.
(voucher: 125 mm SL)

Platax teira

Body silvery blue, dusky above, crossed by 3 black vertical bands (faded in adults): first through eye to throat, second 1.5 times eye diameter, through pectoral fin base, 3rd between tips of dorsal and anal fins; ventral fin dark brown. Maxilla hidden posteriorly; predorsal profile evenly convex; body depth 0.9-1 in SL. Scales on predorsal reach as far as eyes. Dorsal fin spines grade into elevated anterior fin rays.
D V, 30-33. A III, 23-24. L. lat. 56-66. Tr above arch of L. lat. 25-28.
(voucher: 100 mm SL)

Platax batavianus

Two or 3 black cross bands (faded in adults) on silvery, dusky green body: first as broad as eye passes through eye to throat, 2nd through pectoral fin base to ventral fin; fins yellowish, dusky basally, ventral fin charcoal. Maxilla hidden posteriorly; predorsal body profile angular, concave above and below eye; body depth 1.3-1.7 in SL. Middle tooth cusp larger than side cusps. Scales on predorsal reach as far as eyes. Dorsal fin spines grade into elevated anterior fin rays, posterior spines longest.
D VI-VII, 28-32. A III, 19-23. L. lat. 64-75. Tr above arch of L. lat. 18-20.
(voucher: 375 mm SL)

Zabidius novemaculeatus

Body silvery pinkish brown, head and shoulder crossed by faint dark brown oblique bands: first through eye to breast, 2nd from nape through pectoral base. Maxilla hidden posteriorly; predorsal profile convex; body depth 1.3-1.4 in SL. Scales on predorsal reach as far as posterior nostrils. Dorsal fin spines grade into elevated anterior fin rays, anterior spines exposed, posterior spines longest.
D IX, 28-29. A III, 20-22. L. lat. 46-48.
(voucher: 145 mm SL)

CHAETODONTIDAE

Butterflyfishes - Kepe kepe; Kiper laut; Banera

Very colourful small fishes. Body deep, oval and very compressed. Mouth small, snout usually pointed; teeth very fine, bristle-like; preoperculum evenly rounded or angular. Scales ctenoid, extending over most of head and over dorsal and anal fins. Rayed sections of vertical fins usually higher than spined sections; dorsal fin single, continuous, with strong spines; ventral fin axillary scale present; caudal fin rounded to emarginate.

Twelve genera and more than 130 species are known; representatives of six genera collected on the Survey.

REFERENCES: Pyle, 2001a: Allen & Swainston, 1988; Myers, 1991; Kuiter, 2004.

Chaetodon assarius

Broad black band from nape through eye; 4-6 vertical lines of brown spots below anterior dorsal fin; brown-orange band over caudal peduncle continued as broad black or brown band along base of anal fin; a white-edge black ocellus on soft dorsal fin. Soft dorsal and anal fins blunt or rounded; caudal fin margin sometimes black. body oval.
D XIII, 21-22. A III, 18-19. L. lat. 35-41.
(voucher: 145 mm SL)

Chaetodon baronessa

Body and fins blue or violet, shaded brown; head cream, crossed by 3 brown bands, middle through eye; 4th band, through pectoral fin base; 16-20 cream angular narrow bands cross body. Yellow submarginal band posteriorly in dorsal fin continues across caudal peduncle into anal fin; caudal fin brown, its hind margin yellow. Body angular to rounded; snout pointed; lateral line incomplete; soft vertical fins high and somewhat angular.
D XI-XII, 23-26. A III, 20-22. L. lat. 24-30.
(voucher: 81 mm SL)

Chaetodon aureofasciatus

Body and fins yellow or olive-yellow, pale anteriorly. Blue-edged orange band from nape through eye; a second short band from below anterior dorsal fin, through pectoral fin base to breast. Body rounded; snout blunt; soft dorsal and anal fins rounded; lateral line incomplete.
D X-XI, 20-22. A III, 16-18. L. lat. 38-42.
(voucher: 125 mm SL)

Chaetodon citrinellus

Chaetodon decussatus

Chaetodon ephippium

Chaetodon guentheri

Chaetodon melannotus

Chaetodon kleinii

Chaetodon selene

Roa australis

Chaetodon trifascialis

Chelmon marginalis

Chaetodon citrinellus

Body lemon or white; broad yellow-edged black band through eye to isthmus; rows of violet and orange spots along scale rows; broad black margin to soft dorsal fin and anal fin; vertical fins otherwise pale yellow, caudal fin white. Body oval; snout pointed; lateral line incomplete.
D XIII-XIV, 20-22. A III, 16-17. L. lat. 36-42.
(voucher: 44 mm SL)

Chaetodon ephippium

Large black saddle, margined by white, over soft dorsal fin and upper posterior part of body; 5-6 horizontal blue or violet stripes on lower sides of body. Snout and throat orange; orange also on margin of spinous dorsal, caudal and anal fins; ventral fin bright yellow. Short filament on soft dorsal fin. Snout pointed, body oval.
D XII-XIV, 21-24. A III, 20-22. L. lat. 33-40.
(voucher: 105 mm SL)

Chaetodon kleinii

Posterior half of body dusky orange, shading to cream anteriorly. Rows of violet or pearly spots along scale rows; a broad light brown band across body from spinous dorsal fin sometimes present, also a dark brown or black band from nape through eye onto chest; ventral fins dark brown; white margin to caudal fin. Narrow black edge on soft dorsal and anal fins. Body oval; snout pointed.
D XIII-XIV, 20-23. A III, 17-20. L. lat. 33-41.
(voucher: 48 mm SL)

Roa australis

Body white, brown band from nape through eye; two broad, brown-edged yellow bands across body: 1st from below anterior dorsal fin, 2nd from below last ⅓ of dorsal fin. Brown band across caudal peduncle distally. Membrane between 1st and 2nd dorsal fin spines black; round black ocellus on soft dorsal fin; ventral fin dark brown. Body oval; dorsal fin spines strong and long; snout acute; caudal peduncle depth 7.2-8.3 in SL.
D XI, 20-23. A III, 16-19. L. lat. 41-49.
(voucher: 120 mm SL)

Chaetodon trifascialis

White body with broad yellow-edged black band through eye; white body crossed by many angular oblique dark lines. Broad black band from soft dorsal and soft anal fins of juveniles fades out with growth. All fins bright yellow except black, yellow-margined caudal. Soft dorsal and anal fins angular.
D XIII-XV, 14-16. A IV-V, 13-15. L. lat. 22-29.
(voucher: 90 mm SL)

Chaetodon decussatus

Broad black band from nape through eye; soft dorsal and anal fins, caudal peduncle and posterior part of body black. Diverging oblique lines over anterior ⅔ of body; about 6 on back towards head, 11-12 from lateral line towards anal fin; two black bands on yellow caudal fin; sub-terminal yellow line along anal fin. Body oval; soft dorsal and anal fins angular.
D XIII, 24-25. A III, 20-21. L. lat. 36-41.
(voucher: 70 mm SL)

Chaetodon guentheri

Body white to pale violet, dorsal and anal fins and posterior part of body bright yellow. Black band from nape through eye; rows of violet or brown spots along scale rows. Ventral and caudal fins pale; white edge and sub-marginal black line on soft dorsal and anal fins. Black spots may be present on soft dorsal fin. Body oval; snout pointed.
D XIII, 21-22. A III, 18. P 14. L. lat. 39-40.
(voucher: 82 mm SL)

Chaetodon melannotus

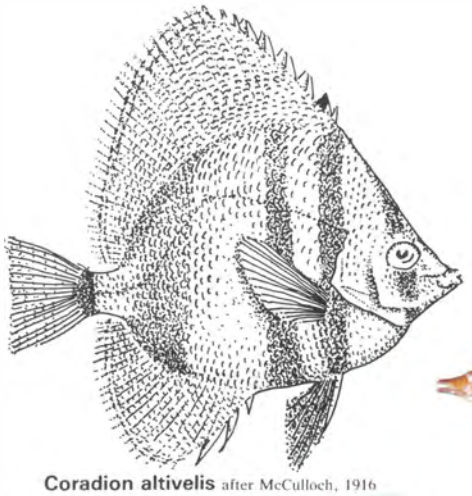
Body white with narrow dark diagonal lines along scale rows from head to dorsal fin. Head and all fins yellow; back and dorsal fin posteriorly dark brown. Black band from nape through eye; broken black band across peduncle and black spot at base of anterior anal fin rays. Snout pointed; body oval.
D XII-XIII, 18-21. A III, 16-18. P 14-15. L. lat. 33-39.
(voucher: 100 mm SL)

Chaetodon selene

Body dull white or grey; oblique golden or brown oblique lines along scale rows, broken into spots on upper anterior part of back. A yellow-edged black band through eye from dorsal fin origin, and crescent-shaped black band along dorsal fin base continuing across caudal peduncle and along posterior half of anal fin base. Fins yellow. Body oval; snout pointed.
D XII, 20-22. A III, 18-19. L. lat. 31-36.
(voucher: 150 mm SL)

Chelmon marginalis

Lateral line complete, ending at caudal fin base. Snout long, tubular, 1.7-2.1 in HL; pectoral fins rounded. Body white, two brown-edged orange bands anteriorly: one through eye, one through edge of operculum. Broad yellow band between soft dorsal and anal fins, yellow band around caudal peduncle. Two orange bands on ventral fin; soft dorsal and anal fins yellow, margined orange and with a blue sub-marginal band.
D IX, 29-31. A III, 21-22. L. lat. 46-57.
(voucher: 150 mm SL)

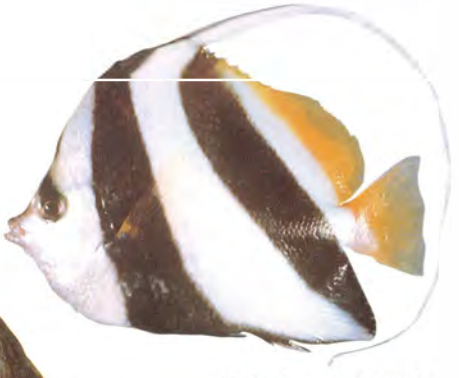


Coradion altivelis after McCulloch, 1916

Chelmon muelleri

Coradion chrysozonus

Heniochus acuminatus



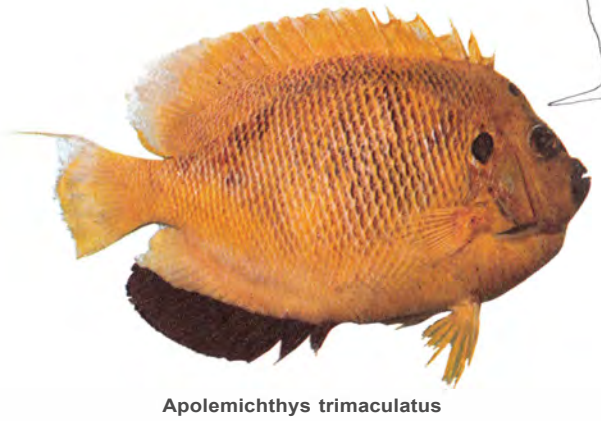
Heniochus diphreutes

Heniochus chrysostomus

POMACANTHIDAE

Heniochus singularius

Parachaetodon ocellatus



Apolemichthys trimaculatus

Chaetodontoplus duboulayi

Chelmon muelleri

Lateral line complete, ending at caudal fin base. Snout long, tubular, 2.6-3 in HL. Pectoral fin rounded. Body white anteriorly, fawn or dusky orange posteriorly. Five-6 brown bands across body: 1st through eye, last over caudal peduncle. Dorsal and anal fin spines orange, soft dorsal and anal fins brown with blue submarginal stripe; ventral fins dark brown.
D IX, 26. A III, 18-21. L. lat. 49-50.
(voucher: 110 mm SL)

Coradion chrysozonus

Lateral line complete, ending at caudal fin base. Snout short; soft dorsal fin rounded (not elevated); pectoral fin rounded. Body white with 5 yellow bands across, anterior ones dark brown ventrally: 1st band from nape through eye to isthmus; 2nd and 3rd bands close together, from spinous dorsal fin to belly; 4th band between soft dorsal and anal fins; 5th band dark brown, on caudal peduncle. Black ocellus on middle of soft dorsal fin.
D IX, 28-30. A III, 19-21. L. lat. 48-52.
(voucher: ? mm SL)

Heniochus chrysostomus

Lateral line complete, ending at caudal fin base. Fourth dorsal fin spine elongate and banner-like, Body white crossed by 3 broad oblique dark bands: 1st broad, from interorbital and nape through eye, over opercles, pectoral fin base and covering all of ventral fin; 2nd from mid-spinous dorsal fin to cover posterior of anal fin; 3rd over posterior of dorsal fin and most of caudal fin. Black stripe along head profile ends at upper lip; top of snout and mouth yellow.
D XII-XIII, 21-22. A III, 17-18. L. lat. 57-61.
(voucher: 93 mm SL)

Heniochus singularius

Lateral line complete, ending at caudal fin base. Fourth dorsal fin spine elongate. Bony protuberances on nape obvious. Body crossed by two broad dark oblique bands separated by a broad pale interspace: 1st band begins on anterior dorsal spines, crosses body to include pectoral fin base and all of ventral fin; 2nd begins on posterior dorsal spines and crosses body to end over distal third of anal fin. Black band around snout and black band through eye, meeting its fellow under head. Posterior ⅔ of dorsal fin and most of caudal fin bright yellow.
D XI-XII, 25-27. A III, 17-18. L. lat. 53-64.
(voucher: 205 mm SL)

Coradion altivelis

Lateral line complete, ending at caudal fin base. Snout short. Soft dorsal fin elevated; pectoral fin rounded. White with 5 bands across body: 1st through eye, meeting its fellow on nape; 2nd and 3rd bands from spinous dorsal fin to belly; 4th broad, between rayed dorsal and anal fins; 5th on caudal peduncle. First 3 and last bands dark, 4th band orange-yellow. Narrow blue line below margin of soft dorsal and anal fins, (black spot on soft dorsal in juveniles).
D VIII, 31-33. A III, 20-22.

Heniochus acuminatus

Lateral line complete, ending at caudal fin base. Fourth dorsal fin spine elongate and filamentous; anal fin angular. Two broad black bands across body: 1st from anterior dorsal fin spine to extend over ventral fin; 2nd from mid-dorsal fin to extend over anal fin. Snout black above and black bar across interorbital. Outer half of soft dorsal fin and caudal fin yellow.
D XI (rarely XII), 24-27. A III, 17-19. L. lat. 47-54.

Heniochus diphreutes

Lateral line complete, ending at caudal fin base. Fourth dorsal fin spine elongate and filamentous; anal fin rounded. Two broad black bands across body: 1st from anterior dorsal fin spines extends over ventral fins; 2nd from mid-dorsal fin to extend over posterior anal fin. Top of snout black; black bar across interorbital. Outer half of soft dorsal fin and caudal fin yellow; anal fin spines dusky or fawn.
D XII (rarely XIII), 23-25. A III, 17-19. L. lat. 46-54.
(voucher: 165 mm SL)

Parachaetodon ocellatus

Lateral line incomplete, ending about opposite last dorsal fin rays. Snout short; anterior soft dorsal fin elevated. Body white with 5 brown or brown-edged yellow slightly oblique bands crossing body; 1st through eye, last across caudal peduncle; 4th band has black ocellus over dorsal fin portion.
D VI, 28-30. A III, 18-20. L. lat. 39-46.

POMACANTHIDAE

Angelfishes - Ikan kambing

Body deep, oval and compressed. Mouth small; teeth fine and slender; preoperculum with strong spine at angle. Rayed sections of vertical fins higher than spined sections; dorsal fin single, continuous, with strong spines; ventral fin axillary scale absent; caudal fin rounded to slightly emarginate. Scales ctenoid, small, extending over most of head and thickly over dorsal and anal fins. Colourful fishes; juveniles often coloured differently to the adults.

Eight genera and 91 species in the family, only three genera and eight species recorded on the Survey.

REFERENCES: Myers, 1991; Allen & Swainston, 1988; Pyle, 2001b.

Apolemichthys trimaculatus

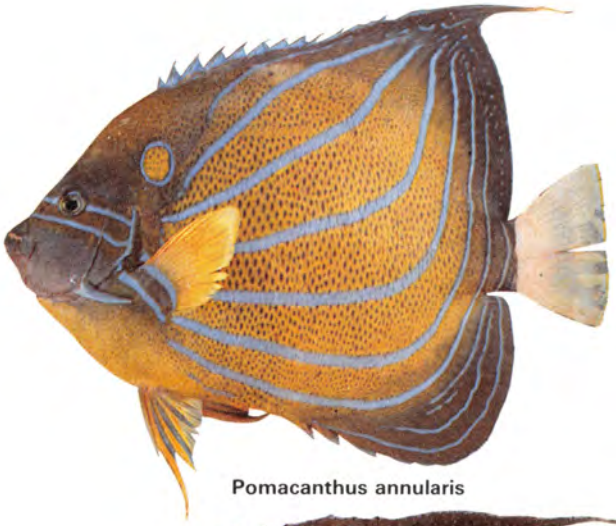
Body and all fins except anal fin bright yellow, more or less checked by brown scale margins. Outer half of anal fin black, lower half white or yellow. Black, yellow-ringed ocellus each side of nape, another at lateral line origin. Cheek scales small and irregular; lateral line incomplete; caudal fin truncate with short filament from upper corner.
D XIV, 17-18. A III, 17-18.
(voucher: 144 mm SL)

Chaetodontoplus duboulayi

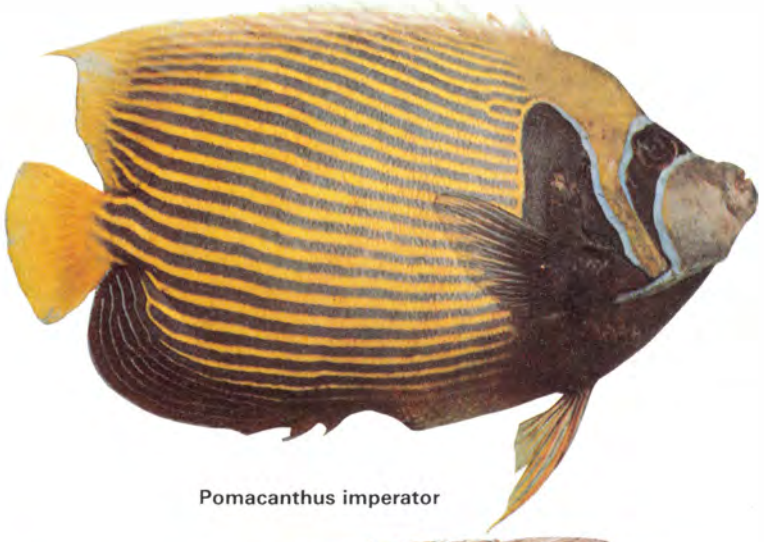
Body dark blue; many thin wavy white lines or spots follow scale rows and dark blue-brown dorsal and anal fins covered with wavy light blue longitudinal lines. Snout bright yellow; violet band from nape through eye to isthmus; broad white bar across operculum; broad yellow band across body from anterior of spinous dorsal fin to belly. Broad yellow crescent along back below dorsal fin. Caudal and ventral fins yellow. Caudal fin rounded, upper and lower lobes slightly produced.
D XI, 22. A III, 19.

Chaetodontoplus melanosoma

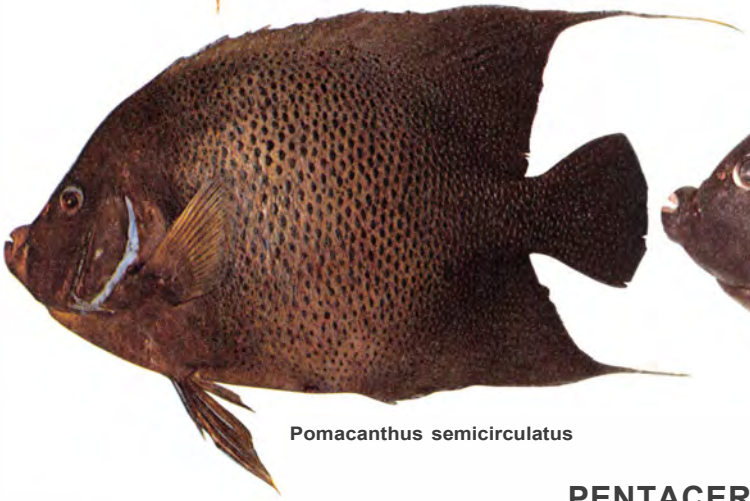
Chaetodontoplus personifer



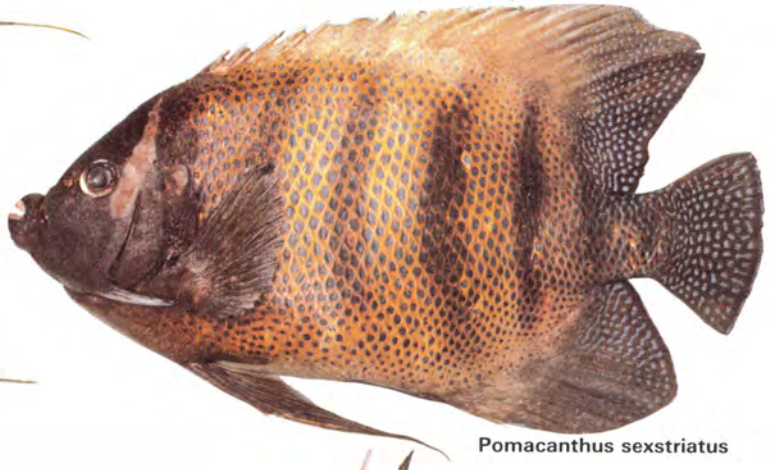
Pomacanthus annularis



Pomacanthus imperator

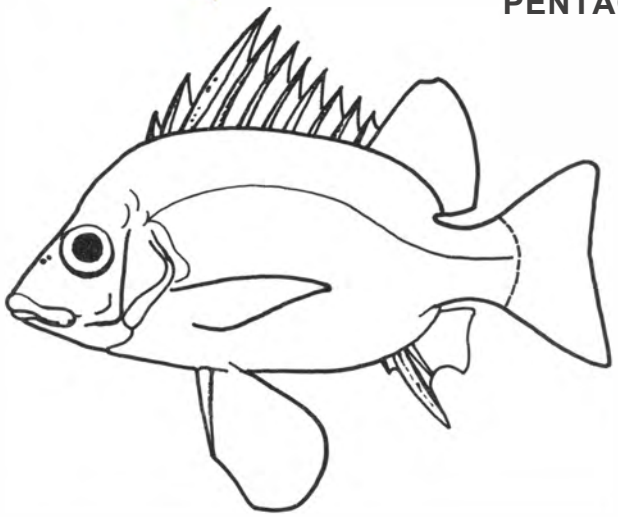


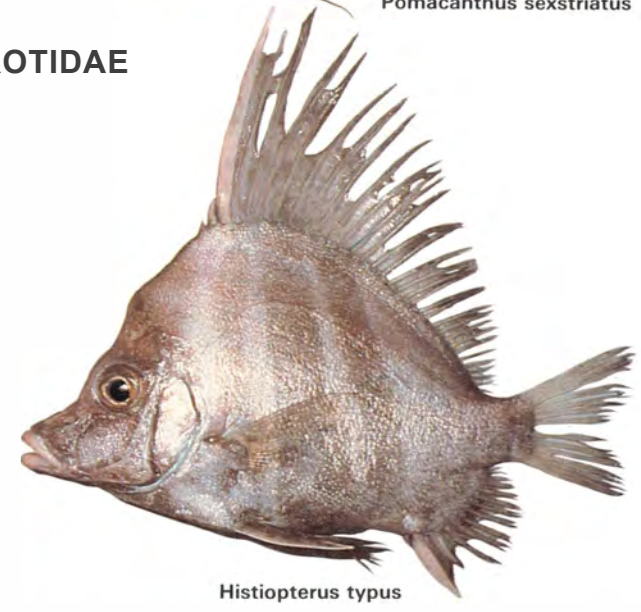
Pomacanthus semicirculatus



Pomacanthus sexstriatus

PENTACEROTIDAE





Histiopterus typus

Chaetodontoplus melanosoma

Body and fins dark brown or charcoal. Head pale blue or grey, same colour extending over back to below middle of soft dorsal fin. Snout, nape and cheeks patched yellow or orange. Orange or yellow margin to soft dorsal and soft anal fins; yellow caudal fin crossed by black band. Caudal fin rounded.
D XIII, 17-18. A III, 18.
(voucher: 75 mm SL)

Pomacanthus annularis

Body dark orange-brown. Distinct brown-edged dark blue stripes across body: 2 horizontal stripes below eye, 6 or 7 on body curving upward towards and onto soft dorsal fin. A yellow, blue ringed ocellus at lateral line origin. Dorsal and anal fins brown with blue stripes; ventral and pectoral fins yellow, caudal fin pale yellow with greyish margin. Soft dorsal fin angular and produced in adults.
D XIII, 21-22. A III, 20-21.

Pomacanthus semicirculatus

Head and body orange, tan, grey or greenish, darkening posteriorly. Black or dark blue spots on scales; white spots over dark soft dorsal, soft anal and caudal fins. Eye ringed blue; blue line along preopercular and opercular edges. All fins except pectoral fin, margined blue, pectoral fin yellow. Soft dorsal and anal fins angular but produced in adults.
D XIII, 20-23. A III, 18-21.
(voucher: 290 mm SL)

Chaetodontoplus personifer

Body and vertical fins dark brown to blackish. Broad pale blue or white band from nape to breast; head blue, sometimes with scattered yellow spots; nape and snout yellow; ventral and caudal fins yellow, also margin of pectoral fin. Caudal fin slightly rounded.
D XIII, 17-19. A III, 19.
(voucher: 215 mm SL)

Pomacanthus imperator

Body tan or yellow with many broad blue or mauve bands, rising upwards posteriorly. Broad curved, blue-edged black band through eye, another from lateral line widening ventrally to cover breast and paired fin bases. Snout and cheek pale. Outer third of dorsal fin yellow or orange; caudal fin bright yellow; mauve lines along dark anal fin. Soft dorsal fin angular and produced in adults.
D XIII-XIV, 18-21. A III, 18-21.
(voucher: 290 mm SL)

Pomacanthus sexstriatus

Body and anterior dorsal fin pale yellowish brown. A dark spot on each scale and 5 or 6 dark vertical bands across body. Head dark brown, blue vertical lines over snout and nape, a distinct white or yellow bar behind eye. Blue margin to dorsal fin and blue spots or lines over brown soft dorsal, anal and caudal fins; soft dorsal and soft anal fins angular.
D XIII, 18-20. A III, 18-19.
(voucher: 360 mm SL)

PENTACEROTIDAE

Armourheads -

Body oblong to elevated and triangular, strongly compressed. Head covered by exposed, rough, striated bones, sometimes with horns; snout prominent, concave before nape. Mouth small with bands of small teeth; sometimes barbels on chin; preoperculum serrated. Body scales small, ctenoid, present also on cheek and temporal region. Single dorsal fin with 4-15 strong spines notched from rayed part or graduating into it; 2-6 strong anal spines; pectoral fin long and pointed; large ventral fin; caudal emarginate.

Seven genera in the family, representatives of one collected on the Survey.

REFERENCE: Heemstra, 2001b.

Histiopterus typus

Body dusky yellow or grey, crossed by 3 broad brown bands below front part of dorsal fin; ventral fin dark brown (juveniles with large blotches over body and fins). Dorsal fin high, evenly convex, base of spinous part much shorter than soft part, spines graduating into high anterior rays; 3rd dorsal spine longest. Body depth 1.3-1.6 in SL, predorsal profile steep; vomer without teeth.
D IV, 23-29. A III, 8-11. Lower GR 14-16.
(voucher: 240 mm SL)

POMACENTRIDAE

Abudefduf bengalensis

Abudefduf vaigiensis

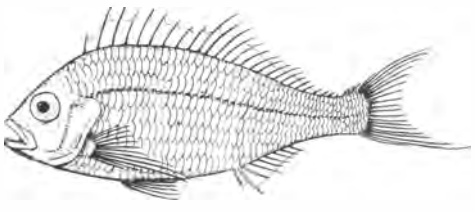
Chromis sahulensis

Pristotis obtusirostris

CIRRHITIDAE

Cirrhitichthys aprinus

Cirrhitichthys aureus



Cyprinocirrhites polyactis drawing of preserved specimen

Paracirrhites forsteri

POMACENTRIDAE

Damselfishes - Gemutu; Asan

Body ovate and compressed. Mouth small, teeth fine. One nostril (rarely 2) on each side of snout. Scales ctenoid, usually extending onto fins. Lateral line in 2 parts: upper ends below soft dorsal fin rays, lower ends on caudal peduncle or is incomplete (to end of dorsal fin rays). One continuous dorsal fin, spinous part with 9-14 spines, longer than rayed part. Anal fin with 2 spines. Caudal fin forked. Brightly coloured small fishes, their usual habitat being coral reefs.

A very speciose family comprising 29 genera and more than 400 species; only four species collected on the Survey.

REFERENCES: Allen, 1991; Allen, 2001; Allen & Swainston, 1988; Allen & Allen, 2021.

Abudefduf bengalensis

Six to 7 narrow vertical black bands across pale body, last one at base of caudal fin. Fins pale. Hind edge of preoperculum smooth. One row of teeth in jaws. Tips of caudal fin lobes rounded.
D XIII, 14-15. A II, 13-15. L. lat. 20-21. Tr above 3-3½.
(voucher: 150 mm SL)

Abudefduf vaigiensis

Five broad, vertical black bars across body. Head and back yellowish or fawn; fins pale. Hind edge of preoperculum smooth. One row of teeth in jaws. Tips of caudal fin lobes pointed.
D XIII, 12-13. A II, 11-13. L. lat. 20-21. Tr above 3-3½.
(voucher: 115 mm SL)

Chromis sahulensis

Body dusky yellow-pink; bright olive-yellow streak along each caudal fin lobe; axil of pectoral fin black; white spot on upper caudal peduncle behind soft dorsal fin. Upper and lower edge of caudal fin base with 2 small projecting spine-like rays. Eye 2.9-3.5 in HL, body depth 2-2.5 in SL. Soft dorsal and anal fin margins pointed.
D XIII-XIV, 10-12. A II, 9-10. L. lat. 17-19.
(voucher: 40 mm SL)

Pristotis obtusirostris

Back dusky olive or fawn, fading to pearly white ventrally. Black spot on upper pectoral fin base and black edge on dorsal fin. Margin of preoperculum and subopercular serrated; one row of teeth in jaws.
D XIII, 12-13. A II, 12-14. L. lat. 19-20.
(voucher: 80 mm SL)

CIRRHITIDAE

Hawkfishes

Body oblong and compressed. Mouth moderate; fine teeth and row of short canines in jaws. Scales ctenoid or cycloid, extending over cheek and operculum. Dorsal fin single, continuous, with 10 spines and 11-17 soft rays. One or more cirri on dorsal fin membrane near tip of each spine. Anal fin with 5-7 soft rays. Pectoral fin with 14 rays, lower 5-8 rays unbranched, thickened and longer than upper branched rays. Caudal fin rounded to lunate.

There are 12 genera in the family, and representatives of three were obtained on the Survey.

REFERENCES: Allen & Swainston, 1988; Randall, 2001c.

Cirrhitichthys aprinus

About 7 irregular-shaped brown to rosy-red bars on side, 1st from beginning of dorsal fin and crossing opercles, last across caudal peduncle near fin base. Bars darken and continue across dorsal fin; dark brown blotches on soft dorsal fin. First ray of soft dorsal fin produced into a filament. Scales on cheek, none on interorbital. Body depth 2.4-2. 7 in SL. Lower 6 pectoral fin rays unbranched and thickened.
D X, 12. Lower 6 pectoral fin rays unbranched. L. lat. 41-43. Tr above 3.
(voucher: 66 mm SL)

Cyprinocirrhites polyactis

Body and head orange-yellow above, white below. Caudal fin deeply lunate, both lobes long. Dorsal fin edged brown, and rows of dark brown checks across caudal and anal fins. First ray of soft dorsal fin produced into a short filament. Lower 6 pectoral fin rays unbranched and thicker than rays above them.
D X, 16-17. A III, 6-7. L. lat. 46-49. Tr above 3.
(voucher: 70 mm SL)

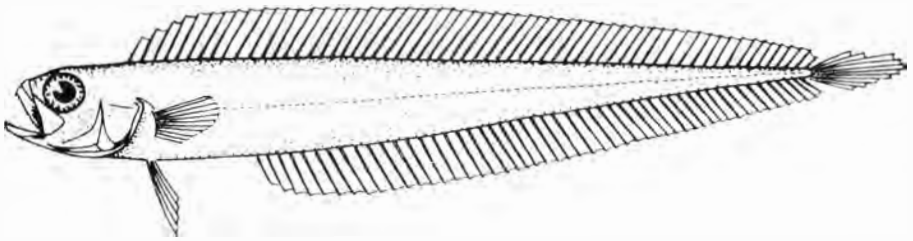
Cirrhitichthys aureus

Body yellow-orange with 4-5 dusky vertical bars on back. First ray of soft dorsal fin produced into a filament. Fins plain yellow. Scales on cheek, none on interorbital. Body depth 2.2-2.5 in SL. Lower 7 (rarely 6) pectoral fin rays unbranched and thickened. Interspinous membrane deeply emarginate.
D X, 12. A III, 6. L. lat. 40-44. Tr above 3.
(voucher: 84 mm SL)

Paracirrhites forsteri

Body red-brown above, pale yellow or white below. Head, pectoral fin base and breast covered with brown or black spots. A broad blackish band on upper sides from below mid-spinous dorsal fin to mid-caudal fin base, yellow band below it. Scales on cheek and before nostrils. Body depth 2.6-2.8 in SL Lower 7 pectoral fin rays unbranched; single cirrus on each interdorsal membrane..
D X, 11. A III, 6. L. lat. 45-49. Tr above 5.
(voucher: 115 mm SL)

CEPOLIDAE



Acanthocepola abbreviata

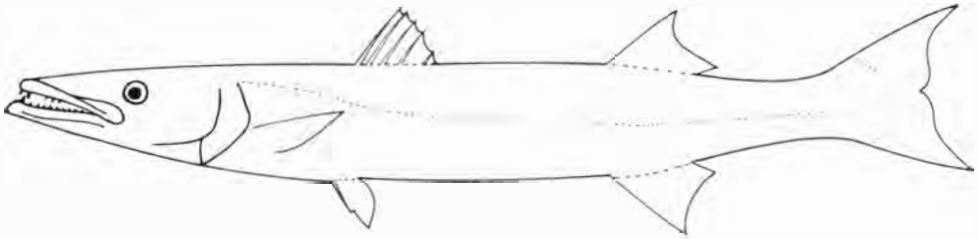
Acanthocepola krusensternii

Cepola schlegelii

Owstonia sibogae

Owstonia nudibucca

SPHYRAENIDAE



Sphyraena barracuda

Sphyraena flavicauda

Sphyraena forsteri

CEPOLIDAE

Bandfishes -

Small to medium-sized, compressed fishes, moderately to very elongate body tapering to tail. Head short, snout blunt; mouth large and oblique, teeth slender; maxilla broad posteriorly. Scales cycloid or with crenulate margins; lateral line high on body, close to dorsal fin base. Dorsal and anal fins long and continuous, sometimes united with caudal fin; dorsal with none to 4 flexible spines and 21-89 rays; anal fin with no to 1 spine, 13-102 rays; ventral fin with one spine and 5 rays, first ray sometimes unbranched; caudal fin moderately long and pointed.

Three of the four recognised genera were collected on the Survey, falling into two groups:

Cepola* and *Acanthocepola - dorsal and anal fins joined to caudal fin; scales very small.
Owstonia - caudal fin separate; scales moderately-large.

REFERENCES: Smith-Vaniz, 2001b; Smith-Vaniz & Johnson, 2016.

Acanthocepola abbreviata

Body silvery red, head and belly paler; orange cross bands sometimes present on sides; fins brilliant dark red. Dark stripe in premaxillary groove and narrow black edge on caudal and anal fins. Strong spine on angle of preoperculum, 3 or 4 along lower limb; cheeks scaly. HL 6.5-8.4 in SL, eye 2.7-3.5 in HL. Scales slightly increase in size posteriorly; middle caudal fin rays branched.
D 68-74. A 72-75, GR 18 + 30-32.
(voucher: 293 mm SL)

Cepola schlegelii

Head and body deep red or rosy, white on lower head and belly; fin membranes greenish yellow, faintly rosy, rays reddish; black premaxillary groove. Preoperculum margin smooth, without spines. HL 9-11 in SL; central caudal fin rays filamentous. Scales very small.
D III, 65. A 62. Total GR about 54.
(voucher: 410 mm SL)

Owstonia nudibucca

Body and fins plain dark red; usually 3 dark brown patches over anterior dorsal fin membrane; black premaxillary groove. Lateral line of each side united across nape, line ending at last dorsal fin ray. Scales cycloid, moderately small; no scales on cheeks, some on upper operculum. Caudal fin lanceolate. HL 3.2-4 in SL; body depth 4.4-5.8 in SL.
D III, 20-21. A II, 14. 38-42 oblique scale rows between head and tail base.
(voucher: 146 mm SL)

Acanthocepola krusensternii

Bright rosy or silvery orange-red body, head and belly paler; fins red, narrow black edge on caudal and anal fins; dark line in premaxillary groove. Preoperculum with strong spine at angle, 4 to 8 along lower limb; cheeks scaly. HL 8-10.4 in SL; eye 2.9-3 in HL. Scales increase noticeably in size posteriorly; caudal fin rays segmented [not branched].
D 80-92. A 78-92. GR 15-16 + 24-27.
(voucher: 185 mm SL)

Owstonia sibogae

Body rosy with areas of pale yellow, maxilla, side of head and pectoral base iridescent; premaxillary groove black. Fins greenish yellow, dorsal and anal fins iridescent violet. Lateral line arched from its origin to dorsal base, not united before fin with line of other side and continues along fin base to last ray. Scales large and thin, margin crenulate; cheek scale rows 3. Caudal fin lanceolate, its middle ray extended. HL 3.8-5.2 in SL; body depth 3.9-6.4 in SL.
D IV, 23-24. A II, 15-17. 27-30 oblique scale rows between head and tail base.
(voucher: 98 mm SL)

SPHYRAENIDAE

Barracudas; Seapikes - Senuk; Alu-alu; Tancak

Moderate to large-sized fishes, carnivorous and fast-swimming. Body elongate, slightly compressed or sub-cylindrical. Mouth large, lower jaw longer. Teeth strong and fang-like, of unequal size. Gill rakers few or absent. Scales small and cycloid; lateral line nearly straight and well-developed. Two well-separated dorsal fins, first with 5 spines. Anal fin opposite second dorsal fin. Caudal fin forked.

Six of the 15 species in the single genus were collected on the Survey.

REFERENCES: Morishita & Motomura, 2020; Morishita, Miki, Wada, Itou & Motomura, 2020; Senou, 2001; Doiuchi & Nakabo, 2005.

Sphyraena barracuda

Blue-grey on back, lower sides silvery, short oblique bars on upper sides, several diffuse dark blotches on lower sides, especially posteriorly. Fins dusky yellow, tips of second dorsal, anal and caudal fins white especially apparent on black caudal fin. Preopercular edge rounded. No gill rakers, first gill arch almost smooth.
D V; I, 9. A II, 7-8. P 13-14. L. lat. 75-90.
(voucher: ? mm SL)

Sphyraena flavicauda

Dusky green above, silvery below; sometimes longitudinal brown stripes present on sides. Fins pale yellow, caudal fin margin dark brown. Preopercular edge rectangular. Two or 3 gill rakers on first gill arch. Pectoral fin does not reach to opposite first dorsal fin origin; first dorsal fin begins behind level of ventral fin origin.
D V; I, 8-9. A II, 8-9. P 13-15. L. lat. 80-90.
(voucher: 185 mm SL)

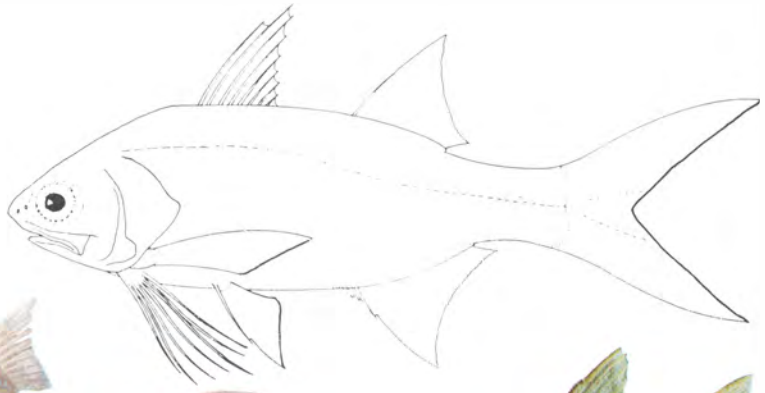
Sphyraena forsteri

Body plain, back olive brown, sometimes marbled with brown; lower sides silvery white. Fins yellow, outer half of second dorsal, anal and caudal fins brown. Axil of pectoral fin dark brown; dark blotch underneath pectoral fin base. Preopercular edge rounded. No gill rakers but lower gill arch with spiny tubercles or platelets. Eye very large.
D V; I, 8-9. A II, 8-9. P 14-15. L. lat. 110-133
(voucher: 330 mm SL)

Sphyraena pinguis

Sphyraena putnamae

POLYNEMIDAE



Filimanus perplexa

Polydactylus microstomus

Polydactylus multiradiatus

Polydactylus nigripinnis

Polydactylus plebeius

Polydactylus sextarius

Filimanus xanthonema

Sphyraena pinguis

Olive-brown above, silvery white below. Two dusky yellow stripes along mid-sides from head to tail base. Fins yellow or pale, second dorsal, anal and caudal fins edged brown. Preopercular edge rectangular. Two or 3 gill rakers on first gill arch. Pectoral fin reaches past vertical from first dorsal fin origin; first dorsal fin begins behind level of ventral fin origin.
D V; I, 9. A II, 7-8. P 13-15. L. lat. 80-90.
(voucher: 195 mm SL)

Sphyraena putnamae

Dark blue to brown above, silvery blue below; mid-sides with row of about 15 dark crescentic vertical bars. Dorsal and anal fins yellow, pectoral and caudal fins dark brown or black. Preopercular edge obliquely rounded. No gill rakers, first gill arch almost smooth. First dorsal fin begins behind level of ventral fin origin; last dorsal ray longer than penultimate ray; caudal fin forked.
D V; I, 9. A II, 8-9. P 12-15. L. lat. 125-135.
(voucher: 235 mm SL)

POLYNEMIDAE

Threadfins - Kurau; Laos; Sumbal

Moderate-sized fishes. Body oblong and compressed. Snout blunt and conical, projecting beyond large mouth; small, fine teeth in jaws and on palatines, sometimes on vomer; eye with thick adipose tissue. Scales ctenoid and large, extending over head and median fins; lateral line continued onto caudal fin. Two widely separated dorsal fins, the first with 7 or 8 weak spines; anal fin with 2 or 3 spines; pectoral fin base either mid-lateral or low on sides, fin divided into two parts: upper normal, lower with 3 or more free filamentous rays; ventral fin abdominal; caudal fin deeply forked.

Representatives of two of the eight known genera were obtained on the Survey.

REFERENCES: Feltes, 1991; Feltes, 2001; Motomura & Iwatsuki, 2001; Motomura, Iwatsuki & Yoshino, 2001.

Filimanus perplexa

Fawn above; fins dusky, pectoral fin pale. Unpaired fins brown or black, pectoral fin filaments black. Snout projects only slightly beyond oblique mouth; premaxillary tooth bands well-separated at symphysis. Pectoral fin and its filaments long, filaments extending onto caudal fin. Pectoral fin with 7 filaments. Body depth 2.9-3.3 in SL.
D VIII; I, 10-11. A III, 13-15. L. lat. 49-51.
(voucher: 110 mm SL)

Polydactylus multiradiatus

Body golden-yellow, yellowish fins finely dotted black, pectoral fin black in centre, at least. Free pectoral fin rays do not reach past anal fin origin; nearly all pectoral fin rays unbranched; pectoral fin with 6 or 7 filaments. Anal fin base length greater than length of caudal peduncle.
D VIII; I,13-15. A III, 14-18. Total GR 28-32. L. lat. 52-59.
(voucher: 115 mm SL)

Polydactylus plebeius

Golden olive, white below, scale rows on back with narrow brown stripes; fins dusky. Pectoral fin rays unbranched, free filaments reaching end of ventral fin. Eye large, 3.5 to more than 5 in HL. Pectoral fin with 5 filaments.
D VIII; I, 13-14. A II-III, 11-12. P 14-18. Total GR 19-28. L. lat. 59-67.
(voucher: 172 mm SL)

Filimanus xanthonema

Plain dusky yellow, silvery below; fins yellow, finely dotted black on edges and black over most of pectoral fin. Snout prominent; premaxillary tooth bands well-separated at symphysis. Pectoral fin rays unbranched, free pectoral fin rays extending to about anal fin origin. Pectoral fin with 6 filaments. Body depth 2.8-3.7 in SL.
D VIII; I,11-12. A III, 10-12. L. lat. 43-52.
(voucher: 135 mm SL)

Polydactylus microstomus

Dusky yellow, oblong black blotch over beginning of lateral lines; pectoral fin dusky yellow. Distance between spinous and rayed dorsal fins less than HL. Almost all pectoral fin rays branched, free rays not reaching past ventral fins. Pectoral fin with 5 filaments.
D VIII; I,12-13. A II-III, 12-14. L. lat. 42-50.
(voucher: 158 mm SL)

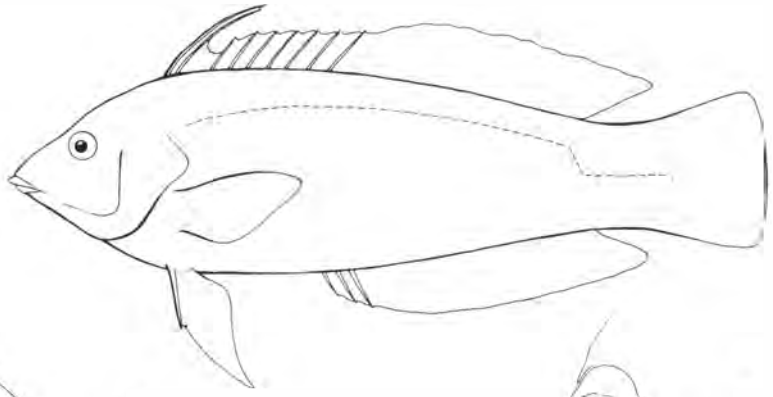
Polydactylus nigripinnis

Golden, fine black dots over head, back and most fins; pectoral fin black. Posterior margin of preoperculum entire and covered by scales; free pectoral fin rays reach end of ventral fin; pectoral fin long, nearly to anal fin origin, its rays unbranched. Pectoral fin with 6 filaments.
D VIII; I,12-14. A III, 13. Total GR 25-27. L. lat. 45-51

Polydactylus sextarius

Olive-yellow above, oblong black blotch over beginning of lateral line; fins dusky orange. Free pectoral fin rays extend nearly to end of ventral fins, pectoral fin rays nearly all branched. Pectoral fin with 6 filaments.
D VIII; I, 12-14. A II-III, 12-13. L. lat. 42-50.

LABRIDAE



Examples of dentition

Bodianus bilunulatus

Anampses lennardi

Oxycheilinus bimaculatus

Bodianus solatus

Cheilinus trilobatus

Oxycheilinus orientalis

Choerodon anchorago

Cheilio inermis

LABRIDAE

Wrasses - Lamboso; Gigi anjing; Koja; Kenari; Nuri-nuri

Elongate oval and compressed fishes, occasionally elongate and cylindrical. Mouth protrusible; jaw teeth mostly separate from each other, teeth usually jutting outwards; pharyngeal teeth often present. Scales small or large, cycloid; lateral line either continuous, often bent downwards abruptly below posterior dorsal rays or interrupted, 2nd section along mid-height of caudal peduncle; cheek either naked, partly or well-scaled; preopercular margin smooth to serrate. Single dorsal fin, first part with 8-21 spines; anal fin with 4-6 spines; caudal fin rounded, truncate, emarginate or lunate. This family is characterised by its members being various in size, shape and colour. Most species change color and sex with growth, and females are able to change sex.

A large family of colourful fishes with 70 genera of which members of 36 were collected on the Survey.

REFERENCES: Allen, Erdmann & Yusmalinda, 2016; Allen & Swainston, 1988; Fukui, 2018; Gomon, 1987; Gomon, 2006; Gomon, 2017; Parenti & Randall, 2011; Randall, 1996a; Randall, 1999; Randall, 2013a; Randall, 2013b; Randall, 2000; Randall & Yamakawa, 1988; Russell, 1985;Tea, Frable & Gill, 2018; Westneat, 2001.

Anampses lennardi

Blue with wavy longitudinal bright yellow bands arranged irregularly over head and body (female) or pale yellow only on scale edges, large purplish area over anterior half of body (male); caudal fin either blue with yellow streaks (male) or bright yellow with blue margins (female); black spot on base of mid-dorsal fin (male). Two prominent flattened teeth at front of each jaw, horizontal and turned forward to form lateral cutting edge; head naked. Lateral line continuous; body depth 2.6-2.8 in SL.
D IX, 12. L. lat. 27-28. Total GR 19-21.
(voucher: 175 mm SL)

Bodianus solatus

Body orange-red, many yellow spots on crimson head and most of body. Broad vertical yellow band from above tip of pectoral fin onto base of dorsal fin, followed by large dark brown or black patch; Spinous portion of dorsal fin charcoal, other fins golden or orangey, caudal fin dark, the upper and lower margins red. Upper lip not covered when mouth closed; scales on cheek, preopercular edge naked; scaly sheath along bases of vertical fins; lateral line continuous; lobes of truncate caudal fin often produced.
D XII, 10-11. L. lat. 33.
(voucher: 180 mm SL)

Oxycheilinus orientalis

Orange-red body and fins, blue wavy lines over head and dark-edged yellow spots scattered over opercles and lower sides; dark spot between first 2 dorsal spines, unpaired fin margins dark red or purple; dusky patch near origin of lateral line. Lateral line interrupted; low scaly sheath along dorsal and anal bases. Fin spines rigid, 3rd anal spine longer than 2nd. Body depth 3.4-3.8 in SL, less than HL; snout pronounced.
D IX, 10. A III, 8. L. lat. about 23.
(voucher: 99 mm SL)

Cheilio inermis

Green or yellowish body, variable in markings; often dusky or brown over upper half, blackish spots along mid-sides. Body elongate and cylindrical, the depth 5.5-8 in SL; head pointed, row of scales on preoperculum, few on upper operculum. Lateral line continuous.
D IX, 12-13. L. lat. 45-48.
(voucher: 136 mm SL)

Bodianus bilunulatus

Large oval, black blotch below soft portion of dorsal fin and dorsally on caudal peduncle, extending below lateral line; red stripes along junctions of scale rows; head above cream, lower jaw and chin violet red interrupted by 2 broad, cream longitudinal bands. Black spot between first 2 dorsal fin spines. Upper lip not hidden when mouth closed; prominent canines in jaws; scales on cheek, preopercular edge naked. Lateral line continuous. Caudal fin truncate. Scaly sheath along bases of vertical fins.
D XII, 10-11. L. lat. 33-35.
(voucher: 235 mm SL)

Oxycheilinus bimaculatus

Overall rosy orange body, blue lines over head; many blue spots and wavy lines in irregular rows along unpaired fins; small dark brown or dark green blotch behind eye, another larger one behind pectoral fin extending over lateral line. Lateral line interrupted. Scaly sheath along dorsal and anal fin bases. Fin spines rigid, 3rd anal spine longer than 2nd; upper and middle caudal rays produced into filaments in males. Body depth 2.5-3.2 in SL, less than HL.
D IX, 10-11. A III, 8-9. L. lat. 19 to 22.

Cheilinus trilobatus

Body bluish grey, many red spots and lines over head, pink or reddish vertical lines on body scales, 4 broad diffuse brown bars across back; fins green or blue with rosy spots and lines on dorsal and anal. Lateral line interrupted, lower preoperculum border naked; well-developed scaly sheath along dorsal and anal fin bases. Fin spines rigid, 3rd anal spine longer than 2nd. Caudal fin rounded, the lobes produced in males. Body depth 2.3-2.6 in SL, equal to or greater than HL.
D IX, 10-11. A III, 8. L. lat. 20-22.
(voucher: 200 mm SL)

Choerodon anchorago

Dark olive brown or bluish above, pale below; pale saddle over upper caudal peduncle, and a broad cream or orange band over side near pectoral fin; chin and lower jaw white, head above mouth covered with orange dots; pectoral base blackish. Suborbital covers upper lip when mouth closed, scales on cheek small and embedded. Body depth 2.4-2.5 in SL: lateral line continuous.
D XIII, 7. A III, 9. P ii, 13.
(voucher: 211 mm SL)

Choerodon cephalotes

Choerodon monostigma

Choerodon robustus

Choerodon schoenleinii

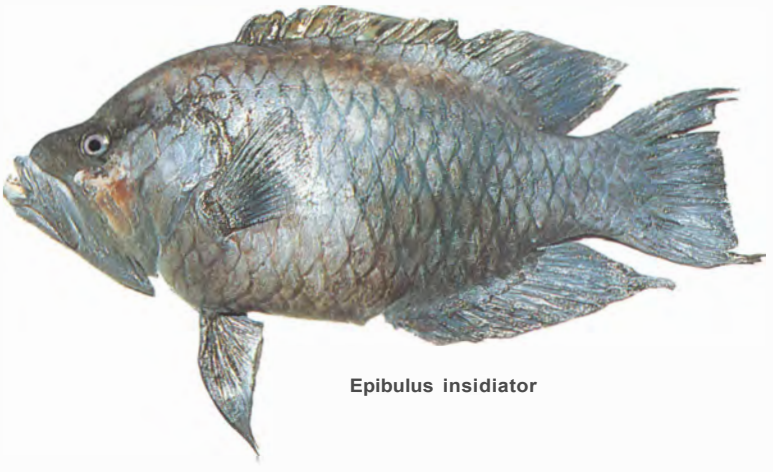
Choerodon vitta

Choerodon zamboangae

Choerodon cauteroma

Choerodon sugillatum

Cirrhilabrus filamentosus



Epibulus insidiator

Choerodon cephalotes

Forehead and snout crossed by alternating purple and orange stripes, teeth blue, many orange spots on side of head, blue lines around eye; body olive-brown with vertical blue lines on scales, sometimes a dusky oblique patch between pectoral and mid-dorsal fin; caudal fin rounded or wedge-shaped, crossed by many wavy blue and yellow lines; dorsal with median dark brown band. Seven to 8 rows of small scales across cheek, 1-3 scales on suboperculum, predorsal scales not reaching eye; suborbital conceals upper lip when mouth closed; numerous pores over upper half of head. Lateral line continuous.
D XIII, 7. A III, 10. P ii, 16-17.
(voucher: 250 mm SL)

Choerodon robustus

Most of head and back dark orange or brown; darker brown or orange band from upper pectoral base to base of last dorsal rays, bordered below on mid-side with a broad oblique white or pale patch on mid-sides; short blue lines through eye, chin blue, distinct blue line along lower opercular margin; blue band along anal fin. Predorsal scales not quite reaching hind border of eye; cheek scaly; suborbital covers lip when mouth closed. Lateral line continuous.
D XII, 8. A III, 10. P ii, 14. 5-8 predorsal scales.

Choerodon vitta

Body dusky olive above, pale pink or violet below; blue patches and yellow lines over head, horizontal orange red band from below eye to caudal fin base where it expands into darker blotch; caudal fin lobes dark yellow or orange. Seven or 8 scale rows across cheek, 1-2 scales on suboperculum; predorsal scales reach to above middle of eye; upper lip covered by suborbital when mouth closed; 2nd pair of canine teeth in each jaw curved strongly backwards. Body depth 2.7-2.9 in SL; lateral line continuous. Caudal fin emarginate.
D XIII, 7. A III, 10. P ii, 14-15.
(voucher: ? mm SL)

Choerodon cauteroma

Yellow body, dusky above with violet blue scale centres which run together on caudal peduncle to form 6 or 7 horizontal streaks. Several curved violet and yellow lines pass from eye over head, chin barred blue; dusky streak from snout to lower pectoral base and distinct dusky patch above lateral line below 6th dorsal fin spine. Fins yellow with violet markings, dark spot between 1st and 3rd dorsal spines. Four or 5 rows of scales across cheek, 3-5 scales on suboperculum, predorsal scales do not reach eye. Many pores on upper half of head, suborbital covers upper lip when mouth closed. Lateral line continuous; caudal fin truncate or emarginate.
D XIII, 7. A III, 10. P ii, 14-15.
(voucher: 270 mm SL)

Cirrhilabrus filamentosus

Body rosy shading to violet on lower sides and caudal peduncle; blue-brown bar across pectoral base; caudal fin violet with yellow spots, other fins yellow, tips of filaments and fin margins violet. One row of scales on cheek; preoperculum serrate. Lateral line interrupted. Anterior ventral rays and posterior dorsal fin spines produced, the dorsal filament reaching caudal fin margin.
D XI, 10. L. lat. 26.
(voucher: 74 mm SL)

Choerodon monostigma

Body rosy, cream below; 3-4 faint broad dusky bars across, back, red patch often present just below lateral line origin; 3 purple lines on head around eye, along upper lip, across snout from eye. Unpaired fins pale orange with violet markings, prominent large purplish brown spot over membrane between 11th and 13th dorsal spines. Four to 6 scale rows across cheek, 3-4 scales on suboperculum; predorsal scales extend forward to above middle of eye; upper lip covered by suborbital when mouth closed; 2nd pair of canine teeth in each jaw straight or slightly curved. Body depth 2.3-2.6 in SL; lateral line continuous.
D XIII, 7. A III, 10. P ii, 14.
(voucher: 118 mm SL)

Choerodon schoenleinii

Body olive-green with blue scale centres forming horizontal rows on back; blue lines through eye and over cheek, head pores marked white, underside of head contrastingly yellow or pale orange, teeth blue. A prominent small dark spot on back at base of last dorsal spine. Six-8 scale rows across cheek, 3-5 scales on suboperculum, predorsal scales not reaching eye. Numerous pores over upper half of head, upper lip covered by deep suborbital when mouth closed. Lateral line continuous.
D XIII, 7. A III, 10. P ii, 16-17.

Choerodon zamboangae

Back and top of head to below last dorsal spine brownish red; operculum and pectoral base to upper caudal peduncle scarlet or crimson, rest of body pale violet or pink. Violet lines around eye and along lips; dorsal and anal fins bluish with 1 or 2 yellow bands. Predorsal scales almost reaching eye; 6 scale rows across cheek, upper lip concealed by suborbital when mouth closed. Lateral line continuous; lower pectoral rays not produced; caudal fin truncate.
D XII, 8. A III, 9-10. P ii, 14.
(voucher: 190 mm SL)

Choerodon sugillatum

Olive above, pale below, red band passes from snout through eye to upper caudal peduncle, broad blue bar across pectoral fin base; distinct vertically oval spot above pectoral fin, its anterior part violet, posterior part charcoal. Predorsal scales not reaching eye; 4 or 5 scale rows across cheek; suborbital covers upper lip when mouth closed. Pectoral fin margin concave, lower rays slightly to distinctly longer than rays immediately above them; caudal fin truncate.
D XII, 8. A III, 8-10. P ii, 14-15.
(voucher: 100 mm SL)

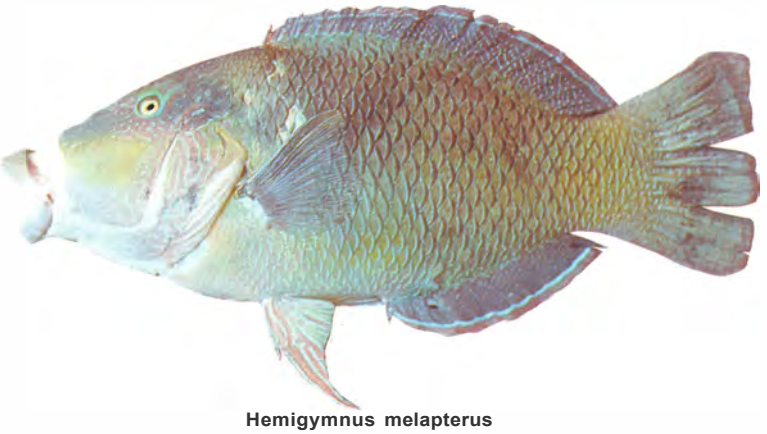
Epibulus insidiator

Dark reddish brown, tan or yellowish body and fins. Jaws very protractile, extendable into a tube; very long lower jaw bones reach back behind gill membranes when mouth closed. Lateral line interrupted. Soft dorsal and anal fins angular; tips of truncate caudal fin produced in adults.
D IX, 10-11. A III, 8-9. L. lat. 20-26.
(voucher: 245 mm SL)

Halichoeres hartzfeldii

Halichoeres margaritaceus

Halichoeres nebulosus



Hemigymnus melapterus

Hologymnosus rhodonotus.

Labroides dimidiatus

Novaculichthys taeniourus

Leptojulis cyanopleura

Pseudodax moluccanus

Pteragogus flagellifer

Halichoeres hartzfeldii

Body blue with curved pale bands over head and a very broad, blue-edged dusky yellow band from eye to caudal fin base; basal half of dorsal and anal fins pinkish, broad yellow band over outer half; no black ocelli on dorsal fin; black spot in pectoral axil. Side of head naked; lateral line continuous, bent downwards posteriorly; breast scales smaller than other body scales. Two canine teeth at front of each jaw. No basal scale sheath over unpaired fins, anterior dorsal spines shorter than posterior ones.
D IX, 11. P 13. Total GR about 20.
(voucher: 120 mm SL)

Halichoeres nebulosus

Back dusky, about 5-6 vertical dusky violet or brown blotches on pale lower side posteriorly; curved yellow or violet brown bands through eye, the 2 most prominent passing over and behind pectoral base; black spot on upper operculum and black ocellus over anterior dorsal rays. Side of head naked, 10-14 suborbital pores; lateral line continuous, bent downwards posteriorly; breast scales smaller than body scales. Two large canine teeth at front of each jaw.
D IX, II. P usually 14. Total GR 17-21.
(voucher: 77 mm SL)

Hologymnosus rhodonotus

Upper head and body dark rosy, lower portion bluish white, posterior half of body shading to yellow; snout and cheeks violet, oblong yellow patch each side of chin, yellow streak below eye and iridescent blue-green spot with posterior black margin on opercular flap. Fins shaded blue, violet or pink with contrasting bands and margins, caudal margin white. Body compressed, the depth 3.8-4.5 in SL. No canine teeth at corner of mouth. Scales small, none on cheek; lateral line continuous, bent downwards posteriorly. Dorsal spines flexible; ventral fin 1.9-2.1 in HL; caudal rounded or truncate.
D IX, 12. A III, 12. L. lat. 91-94.

Leptojulis cyanopleura

Dusky blue above, pale below, 2 horizontal yellow bands over head: upper broader, passing through eye to caudal fin base, continuing over fin to margin; lower band often replaced by brown (initial phase) or broken yellow, appearing as spots on midlateral scales. Band of yellow spots along dorsal fin base; oblique yellow bands on upper and lower caudal lobes. Side of head naked; lateral line continuous, bent downwards posteriorly; breast scales smaller than scales on sides. Four large canines at front of each jaw, 2nd pair curved backwards (at least in adults). Body depth 4-4.55 in SL; ventral fin 2-2.5 in HL.
D IX, 11. A III, II. Total GR 19-22.
(voucher: ? mm SL)

Pseudodax moluccanus

Brilliant crimson, shaded with blue or purple over sides of head and body and with reddish brown spot on each scale; black spot on upper pectoral base; caudal fin dark blue, its base crossed by broad cream band. Lips thick; each jaw with protruding anterior pair of large curved, flattened teeth followed along sides by cutting plate of fused, sharp teeth. Cheek scaled, preopercular margin smooth or crenulate; lateral line continuous.
D XI, 12. A III, 14. L. lat. 31-32.
(voucher: 125 mm SL)

Halichoeres margaritaceus

Dusky green, paler below; 2 distinct brown bands from snout, upper branching behind eye and running along dorsal fin base, lower broader, passing through eye along mid-side to caudal fin base; one or 2 black ocelli often present on spinous portion of dorsal fin. Side of head naked; lateral line continuous, bent downwards posteriorly; breast scales smaller than other body scales. Two canine teeth at front of each jaw. No basal scale sheath over unpaired fins, anterior dorsal spines longer than posterior ones.
D IX, 12. P 13-14. Total GR about 20.
(voucher: 35 mm SL)

Hemigymnus melapterus

Bluish green body, darker blue or brownish over posterior half; pale blue and violet lines and spots around eye, over operculum and over ventral and unpaired fins. Brown margin and pale blue sub-marginal band on dorsal and anal fins. Lips very thick and fleshy, the lower bilobate; pair of large horizontal canine teeth at front of each jaw; band of small, partly embedded scales on cheek. Lateral line continuous, bent downwards posteriorly.
D IX, 10-11. Lower GR 19-21.
(voucher: 300 mm SL)

Labroides dimidiatus

Usually pale or dark blue with black midlateral band, narrower over head, becoming very broad posteriorly and covering most of caudal fin. Mouth small; lower lip bilobed the 2 thickened half lips separated by deep median "U" - shaped notch. Side of head scaly, nape naked. Body compressed and slender, depth 3.5-4.4 in SL; lateral line continuous, abruptly curved posteriorly.
D IX, 11-12. L. lat. 48-52.
(voucher: 92 mm SL)

Novaculichthys taeniourus

Head cream with 4 brown lines radiating from eye, body olive or brown, scale centres white; unpaired fins olive, barred brown; white or yellow bar across base of dark caudal fin. Head naked except for few rudimentary scales near eye; head profile not steep. Body compressed, the depth 2.8-3.2 in SL. Lateral line interrupted. First 2 dorsal spines flexible, remainder strong, membrane between all spines connected near tips.
D IX, 12-13. A III, 12-14. P(total) 13.
(voucher: 69 mm SL)

Pteragogus flagellifer

Dusky reddish, often with greenish spots along lower sides and violet shading; cheek crossed by vertical red band from eye and wavy green lines; usually brown blotches along bases of unpaired fins. Large scales on opercles, preopercular margin serrate; nape humped or convex (male). Lateral line continuous, bent downwards posteriorly. Membrane between anterior dorsal spines produced into filaments (sometimes long in males).
D IX, 11. L. lat. 22-25. Total GR 11.
(voucher: 90 mm SL)

Stethojulis interrupta

Choerodon typus

Iniistius dea

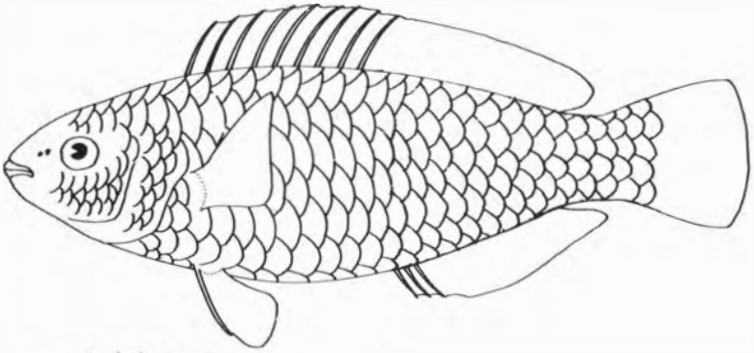
Iniistius opalus

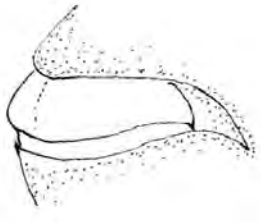
Iniistius pavo

Iniistius pentadactylus

SCARIDAE

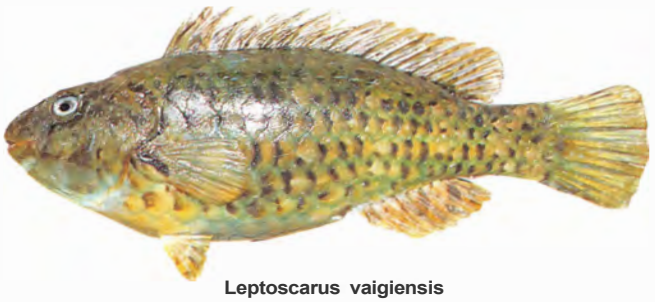
Calotomus dentition





Scarus dentition

Calotomus spinidens



Leptoscarus vaigiensis

Stethojulis interrupta

Olive brown above, paler below, dark line from snout through eye to caudal fin base; brown spot on each scale on lower side forming rows (females) or 4 blue lines on body (1st below dorsal base) (males). No canine teeth anteriorly in jaws. Head naked; lateral line continuous, bent downwards posteriorly; scales on breast as large as those on sides. Body depth 3.9-4.4 in SL.
D IX, 11. P ii, 12-13. Total GR usually 21-22.
(voucher: 52 mm SL)

Iniistius dea

Head and body dusky red; a median bright blue line from chin to dorsal origin; blue-edged black spot above 6th or 7th lateral line scale. Head sharply keeled, distinct shallow groove across cheek from mouth; a few small scales near eye. Body compressed; lateral line interrupted. First 2 dorsal spines flexible, almost separated from the following shorter, stronger spines.
D II + VII, 12. A III, 11-12. L. lat. 25-27.
(voucher: 180 mm SL)

Iniistius pavo

Pale bluish or olive red body, crossed by 3 broad indistinct dusky bars, large white or cream patch near pectoral fin; white-edged black spot above 7th or 8th lateral line scale. Blue submarginal line along unpaired fins, 2 black spots may be present on soft dorsal. Head sharply keeled, naked but for few small scales near eye. Body compressed, lateral line interrupted. First 2 dorsal spines flexible, separated from following shorter, stronger spines.
D II + VII, 12-13. A III, 12-13. L. lat. 25-27.
(voucher: 220 mm SL)

Choerodon typus

Body dusky green with a pale blue margin of each scale forming many oblique wavy lines across body; yellow markings on head, 2 brown-edged blue lines on snout, blue line from mouth to beyond lateral line origin. Fins green or yellow, anal and caudal fins crossed by many slightly wavy, oblique, pale blue lines. Thin, compressed upper lip covered by suborbital when mouth closed. Body slender; lateral line continuous. No scales over bases of dorsal and anal fins, posterior rays of each produced and longer than adjacent rays; posterior edge of pectoral fin not produced.
D XII, 7-8. A III, 10. L. lat. 27.
(voucher: 103 mm SL)

Iniistius opalus

Upper two-thirds of body olive or green, lower third pinkish; distinct patch of purple or red spots on operculum, blue scribbles on chin, rosy area around eye; about 2 rows of purplish red spots along lower side between pectoral fin and caudal base. Fins greenish blue. Head keeled, 32.9–36% SL; band of small scales on cheek . Body compressed, its depth 33.5–39.2% SL; lateral line interrupted. First 2 dorsal spines separated from the remainder of fin, all spines equally long.
D II + VII, 12. A III, (11)12 (13). L. lat. 22-25. Tr below 9 (10).

Iniistius pentadactylus

Black blotch on olive body near pectoral fin tip, followed below by large reddish patch; about 5 red spots along anterior lateral line scales; median red or bright blue line from chin to dorsal fin origin. Head keeled, about 8 rows of small scales across cheek to level of corner of mouth. Body compressed, lateral line interrupted. First 2 dorsal spines flexible, removed from following shorter, stronger spines but connected to them by low membrane.
D II + VII, 12. A III, 12-13. L. lat. 25-26.
(voucher: 76 mm SL)

SCARIDAE

Parrotfishes - Kakatua

Elongate-oval and compressed fishes. Mouth fixed and blunt, "beak-like" teeth in each jaw either fused completely into solid hard plate, having a median division partly fused with some teeth free, or fused together but individual and clearly marked; canine-like teeth may be present posteriorly; pavement-like teeth on pharyngeal bones. Gill membranes broadly attached to throat. Scales very large, cycloid; lateral line interrupted or bent downwards below posterior dorsal fin; 1-4 rows of scales on cheek below eye; often strands of mucus over body. Dorsal fin single, with 9 spines and 10 rays; anal fin with 3 spines and 9 rays; caudal fin rounded to slightly emarginate. The normally bright colours of these fishes usually change with age and sex.

Family comprises 10 genera and 100 species; three genera represented in the Survey material.

***Scarus*:** Two to 4 rows of cheek scales below eye
***Calotomus*, *Leptoscarus*:** One row of cheek scales below eye.

REFERENCES: Allen & Swainston,1988; Bellwood, 2001; Bruce & Randall, 1985.

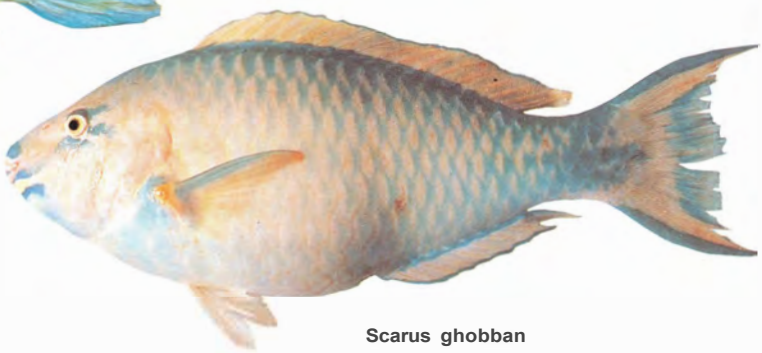
Calotomus spinidens

Conical or flattened teeth in upper jaw, in one row at front of bony ridge and in irregular row of one to several inside bony ridge; some teeth canine-like and curving outward in larger fish. HL 2.9-3 in SL; body depth 2.9-3.1 in SL.
Dusky blue violet above, paler below, few scattered yellow spots on back, orange spots on each scale on lower sides, many small black spots above pectoral fin base; black blotch over anterior dorsal spines basally.
L. lat. 23. Four predorsal scales.
(voucher: 98 mm SL)

Leptoscarus vaigiensis

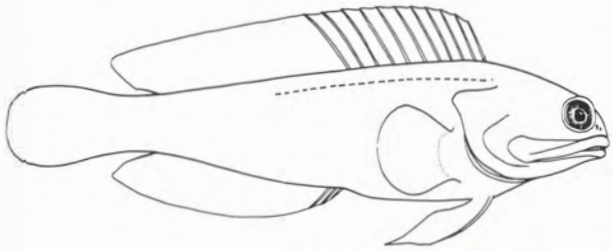
Teeth small, fused into dental plates, individual rows apparent on lower jaw plate, few projecting canine teeth in upper jaw (males). HL 2.6-3.4 in SL; body depth 2.8-3.8 in SL. Green body, dusky above, mottled pattern of dark brown and yellow scales on sides.
L. lat.17-18 + 7-8. Three-4 predorsal scales.
(voucher: 210 mm SL)

Scarus rivulatus



Scarus ghobban

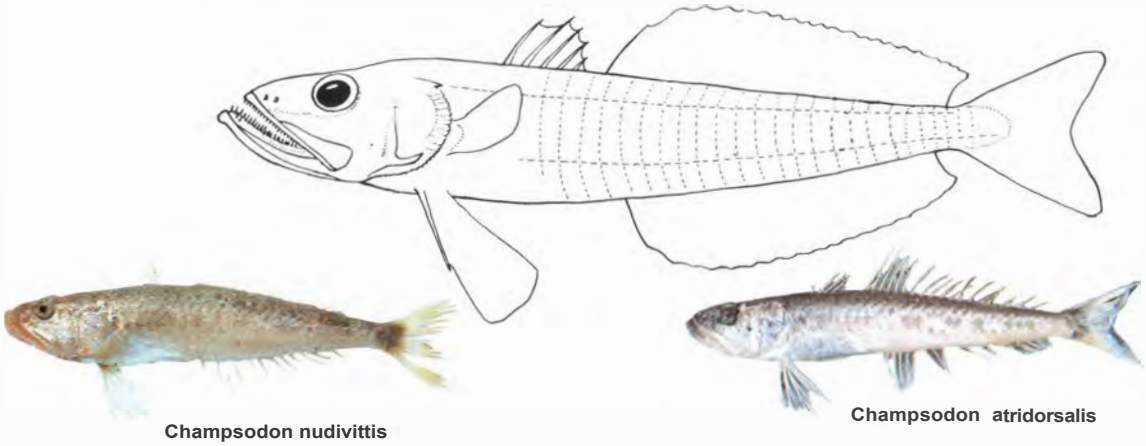
OPISTOGNATHIDAE



Opistognathus castelnaui

Opistognathus latitabundus

CHAMPSODONTIDAE



Champsodon nudivittis

Champsodon atridorsalis

Champsodon vorax

Champsodon longipinnis

Scarus rivulatus

Body mostly blue or green; red and dark green lines forming network over head anteriorly, reddish patch over side of head; teeth white. Edge of dorsal and anal fins blue or green; submarginal orange band and broad median green band on dorsal fin, base reddish brown. Pectoral and ventral fins edged blue, followed by red streak over first rays. Usually 3 (sometimes 2) scale rows on cheek.
P ii, 12. Six-7 predorsal scales. Total GR about 28.
(voucher: 265 mm SL)

Scarus ghobban

Background colour pinkish orange, blue marks on scale centres often forming 5 vertical bars over back and upper sides; head mostly orangey pink, with blue wavy lines around mouth and through eye, blue spots sometimes on cheek. Unpaired fins pinkish with blue margins, narrow on dorsal and anal; blue band along anal fin base; upper pectoral fin rays blue, base orange. Three scale rows on cheek.
P ii, 13 (rarely ii, 12). Five-6 predorsal scales. Total GR 43-48.

OPISTOGNATHIDAE

Jawfishes -

Oblong-elongate fishes with tapering body. Head large and blunt; mouth very large and protractile; broad maxilla exposed and sometimes produced posteriorly; jaw teeth coarse, sharp and curved, no teeth on palatine; eye well forward on head. Scales small and cycloid, none on head; lateral line high on body, ending below middle of dorsal fin. Single, continuous dorsal fin with 9-12 weak spines begins just behind head; anal fin with 2 spines; pectoral fin rounded, its base vertical and situated behind ventral fin base; caudal fin rounded.

Four genera in the family; representative of one caught on the Survey.

REFERENCES: Smith-Vaniz, 2001a; Smith-Vaniz, 2004.

Opistognathus castelnaui

Maxilla long, turned upward posteriorly, reaching beyond operculum margin; several rows of teeth anteriorly in jaws. Body depth 5.3-6 in SL. Brown body, fins with darker shadings, 2 irregular dark bands along middle of sides, 8 large dark blotches along basal third of dorsal fin. Hind margin of maxilla white.
D XI, 14. P 16. About 130 scale rows between head and tail base.
(voucher: 180 mm SL)

Opistognathus latitabundus

Maxilla truncate posteriorly, not reaching preopercular margin; one or 2 rows of teeth anteriorly in jaws; body depth about 3.1 in SL. Body rosy brown above, head dark, undersides cream; 6 large pale-ringed black blotches along back, 5 more blotches along basal third of dorsal fin; unpaired fins dark grey, dorsal fin cream above blotches, margin dark brown. Mouth cavity, operculum and maxillary groove black.
D XII, 18. P 20-21. GR 23-24. About 80 scale rows between head and tail base.
(voucher: 195 mm SL)

CHAMPSODONTIDAE

Gapers, Sabre gills -

Small fishes with elongate, slightly compressed bodies. Mouth very large, oblique, lower jaw prominent; jaw teeth fine, some longer and depressible; eye high on head, usually with a short cirrus; angle of preoperculum ends in a long slender spine; gill openings wide. Scales small, ctenoid and granular; 2 indistinct lateral lines with transverse branches. Two well-separated dorsal fins, first with 4-5 spines, second dorsal and anal fins long-based, each with 16-20 rays; anal fin with one spine, 17-20 rays; pectoral fin small; ventral fin large, its origin before pectoral fin base; caudal fin forked.

Family comprises a single genus and 13 species; four obtained on the Survey.

REFERENCES: Nemeth, 1994; Nemeth, 2001.

Champsodon nudivittis

Outer part of first dorsal and caudal fins stippled brown; dusky base on caudal fin. Double notch at front of premaxilla; maxilla extends well past eye; eye 4.8-5.2 in HL. Chin and breast naked; ventral margin of pupil indented.
D V; 19-20. A 17-18. Lower GR 9-10.
(voucher: 68 mm SL)

Champsodon atridorsalis

Body with blotches mid-laterally and dusky blotch at tail base; outer third of spinous dorsal fin black. Double notch at front of premaxilla; maxilla extends well past eye; eye 4.2-5 in SL. Patch of scales on breast; ventral margin of pupil indented. Ventral fin does not reach anus.
D V; 20. A 18. Lower GR 9-10.
(voucher: 69 mm SL)

Champsodon vorax

Outer part of first dorsal and caudal fin lobes faintly dusky; chin, back and caudal fin base brown. Premaxilla evenly curved at symphysis (not notched); maxilla ends opposite hind margin of eye. Patch of scales on breast; ventral fin does not reach anus.
D V; 21. A 19. Lower GR 11-12.
(voucher: 115 mm SL)

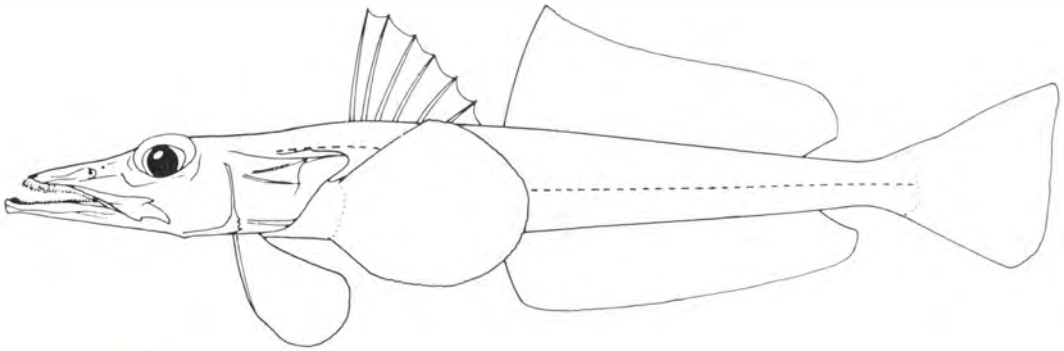
Champsodon longipinnis

Outer part of first dorsal and upper caudal fin lobe black; dark patch at base of caudal fin. Shallow double notch at front of premaxilla. Belly and sides scaled; ventral fin reaches anus.
D V; 21-22. A 18-19. P 14-16. Lower GR 11-13.
(voucher: 112 mm SL)

* CHIASMODONTIDAE

(See Species List)

BEMBROPIDAE



Bembrops platyrhynchus

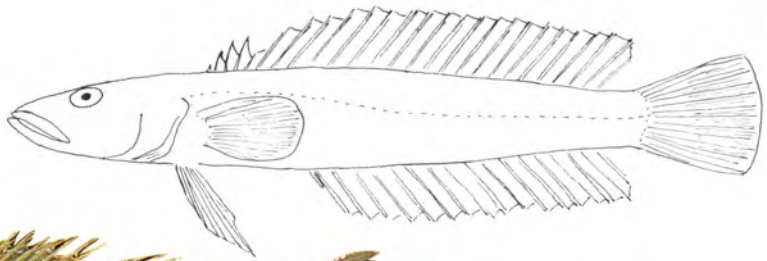
Bembrops curvatura

Bembrops filiferus

Bembrops philippinus

Chrionema chlorotaenia

PINGUIPEDIDAE



Parapercis alboguttata

Ryukyupercis gushikeni

Parapercis muronis

BEMBROPIDAE

Duckbill flatheads -

Body elongate and head moderately depressed. Mouth large, lower jaw projecting past upper jaw. Eyes large and interorbital space narrow. Operculum with 2 spines. Spinous dorsal fin separated from soft dorsal fin, with 2-6 or 8-9 spines; 13-23 elements in soft dorsal fin. Ventral fin inserted well before pectoral fin base. Anal fin with 15-29 soft rays. Caudal fin rounded to emarginate. Anterior lateral line scales with prominent ridge on each scale.

Two genera in the family, representatives of which were collected on this Survey: *Bembrops,* with a flap of skin on end of the maxilla, and *Chrionema*, lacking a skin flap on the maxilla.

REFERENCES: Nelson, 2001; Banon, Garabana, Armesto & Munoz, 2001.

Bembrops platyrhynchus

First dorsal fin spine not filamentous; lateral line descends gradually; eye about equal to snout. Scales on back edged dark brown forming a network pattern; first dorsal fin not black anteriorly.
D_2 14-15. P 25-27. L. lat. 54-58.
(voucher: 211 mm SL)

Bembrops filiferus

Maxilla with tentacle on its posterior margin. First dorsal fin with short filament; lateral line descends gradually; eye 1.5 in snout length. Nine to 13 dark patches along lower sides; filament and first spines of spinous dorsal fin black; black spot on upper base of caudal fin.
D VI; 14-15. P 25-27. L. lat. 61-69.
(voucher: 188 mm SL)

Chrionema chlorotaenia

Hind margin of maxilla truncate and lacking a tentacle; scales on snout reach only to just before eye. Tooth band in upper jaw wholly black; yellow spots before eyes and on operculum; yellow bars across body.
D VI; 15-16. A 26. P 22-24. L. lat. 75-82.
(voucher: 164 mm SL)

Bembrops curvatura

Maxilla with tentacle on its posterior margin. First dorsal spine not filamentous; lateral line abruptly descends at level of pectoral fin; eye about equal to snout. Dusky green above, lower sides yellow with dusky blotches; peritoneum fawn with scattered black dots. Spinous dorsal membrane black, black spot on upper base of caudal fin.
D_2 13-14. P 24-25. L. lat. 43-46.
(voucher: 93 mm SL)

Bembrops philippinus

Maxilla with tentacle on its posterior margin. First dorsal spine with filament; lateral line descends gradually; eye slightly less than snout length. Four to 8 blotches along lower sides; distinct black markings on first dorsal fin; black ocellus on upper base of caudal fin.
D_2 14-15. P 26-27. L. lat. 54-57.
(voucher: 93 mm SL)

* HEMEROCOETIDAE

(See Species List)

PINGUIPEDIDAE

Grubfishes -

Body elongate and nearly cylindrical. Mouth slightly oblique, lips thickened; sometimes an outer row of enlarged canine teeth at front of lower jaw. Eyes large, ovate and near top of head; operculum with one or 2 spines. Body and most of head scaled; lateral line almost straight. Dorsal fin with short spined section of 2-8 spines usually notched from long rayed section of 18-28 rays; anal fin long-based; ventral fin begins below or slightly before broad-based and rounded pectoral fin; caudal fin rounded, truncate or with one or both lobes produced.

Family comprises seven genera and 93 species; eight representatives of two genera were obtained on the Survey.

REFERENCES: Imamura & Yoshino, 2007; Johnson & Motomura, 2017; Johnson & Worthington-Wilmer, 2018; Randall, 2001d.

Parapercis alboguttata

Lower half of body with alternately narrow and broad pinkish red bars over white background. Caudal and soft dorsal fins checked yellow and black; charcoal patch on upper caudal fin base. No palatine teeth; 6 canines in lower jaw; middle dorsal fin spine longest.
D V, 22. P 17-19. A 19. Total GR 19-23.
(voucher: ? mm SL)

Parapercis muronis

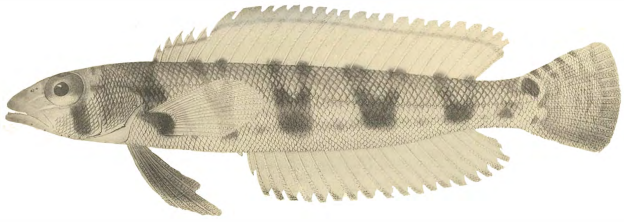
Five distinct orange-brown bars across upper half of body, a paler bar across nape, short bar or spot at upper caudal fin base. Four to 5 vertical bands across caudal fin. Palatine teeth present; 8 canines in front of lower jaw; posterior dorsal spines longest.
D V, 23-24. P 19-21. Total GR 11-15. L. lat. 53-58.
(voucher: 92 mm SL)

Ryukyupercis gushikeni

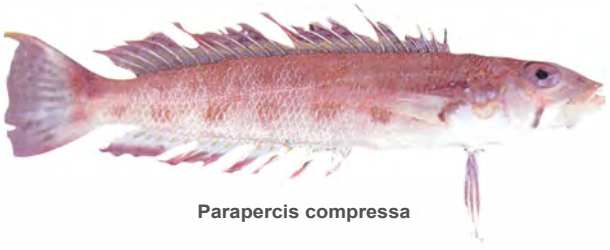
Six to 9 brown lines along upper half of body. Many rays of soft dorsal and pectoral fins produced into filaments and upper caudal fin tip produced. No iris lappet.
D VI, 20. P 23-24. Total GR 16-17.
(voucher: 200 mm SL)

Parapercis striolata

Parapercis nebulosa

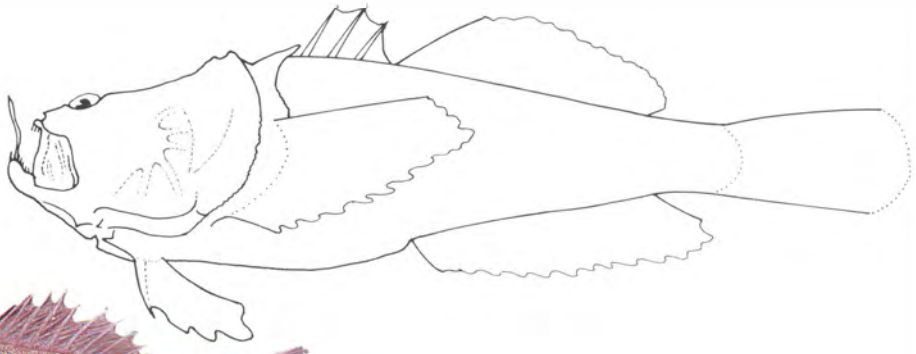


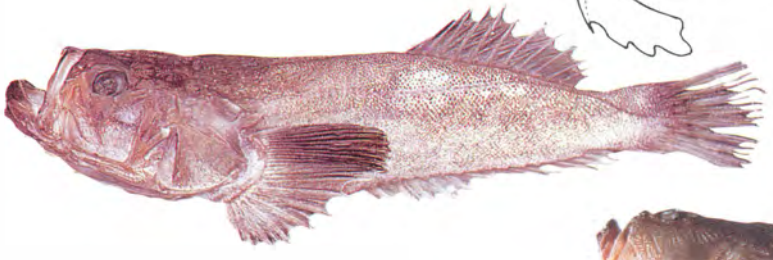
Parapercis sexfasciata Tanaka, 1912



Parapercis compressa

URANOSCOPIDAE





Xenocephalus australiensis

Ichthyscopus fasciatus

Ichthyscopus insperatus

Uranoscopus bicinctus

Uranoscopus cognatus

Uranoscopus kaianus

Parapercis striolata

Staggered ("zig-zag") dark brown lines along upper half of body; snout and pectoral fin bright yellow; most of spinous dorsal fin black; 5-8 fine black bars on upper half of caudal fin. Palatine teeth present, 6 canines at front of lower jaw.
D V, 23. P 18-19. Total GR 11-18. L. lat. 64.
(voucher: 130 mm SL)

Parapercis sexfasciata

Four to five large "V" -shaped dark brown bars over upper sides; large brown spot on pectoral base and large black spot over caudal fin base.
D V, 22-24. P 16-17. Total GR 13-19.
(voucher: ? mm SL)

Parapercis nebulosa

Body orange-pink above, white below. Six to 7 broad red bars across body; usually 3 dark blue lines across interorbital; spinous dorsal fin black, pectoral fin rays white, membrane black, fin margin pink.
D V, 22. P 16-18. Total GR 17-21. L. lat. 68-76.
(voucher: 113 mm SL)

Parapercis compressa

Conspicuous dark bar below eye slanting across cheek and another across pectoral fin base; a cream band from head to tail base interrupts 7 or 8 vertical body bands; dark patch on upper caudal fin base and remainder of fin vertically checked. Upper caudal fin lobe produced into a filament.
D V, 21. P 17. Total GR 14-16.
(voucher: 85 mm SL)

URANOSCOPIDAE

Stargazers

Moderately elongate, robust fishes. Head large, "square", flattened above. Mouth large, opening almost vertically, lips fringed. Eyes practically on top of head which is often covered by bony plates. Pointed teeth in rows on jaws, and often a fringed flap of skin emanating from inside lower jaw. Body naked or scaled, scales cycloid and often embedded anteriorly. Lateral line high on body. One or 2 dorsal fins: when present, first dorsal fin with weak spines; soft dorsal and anal fins long. Pectoral fin broad; ventral fin placed well before pectoral fin base (on isthmus) and their bases close to each other. Caudal fin rounded or truncate. Usually a strong spine on "shoulder" above pectoral fin base which may be venomous.

Eight genera in family of which members of three were caught on the Survey. Note: refer to the comment for this family in the Species List.

REFERENCES: Fricke, 2018; Gomon & Johnson, 1999; Kishimoto, 2001; Prokofiev, 2020b; Prokofiev, 2021; Kishimoto, 1987.

Xenocephalus australiensis

Body and fins brown. Spinous dorsal absent, soft dorsal fin placed well back on body. Humeral spine short; body scaled; lower jaw projecting and bony circular groove on chin. Predorsal area scaled or naked. Ninth to 11th pectoral fin rays longest.
D 13-14. A 17. P 20-24. Scale rows 84-94 between head and tail base.
(voucher: 210 mm SL)

Ichthyscopus insperatus

Ten to 12 double narrow brown bands across nape and back extending onto dorsal fin; 2 or 3 brown bands across caudal fin; broad oblique band on pectoral fin. Spinous dorsal fin absent. Humeral spine hidden in fringed flap of thin skin. Body without scales. Third to 4th pectoral fin ray longest.
D 17-19. A 17-18. P 13-14.
(voucher: 220 mm SL)

Uranoscopus cognatus

Brown above, finely mottled and stippled dark brown. Pectoral and caudal fins orange-brown; spinous dorsal fin black, base of first and last spine white. Humeral spine strong, exposed. Short black cirrus on eye; flap of tissue along inside of lower jaw short and broad. Nape naked. Preoperculum with four spines on lower border. Sixth to 9th pectoral fin rays longest, fin border truncate above longest rays. Two pair of preventral spines plus anterior bucklers.
D III, 13. A 13. P 18. Scale rows 57 between head and tail bucklers.
(voucher: 125 mm SL)

Ichthyscopus fasciatus

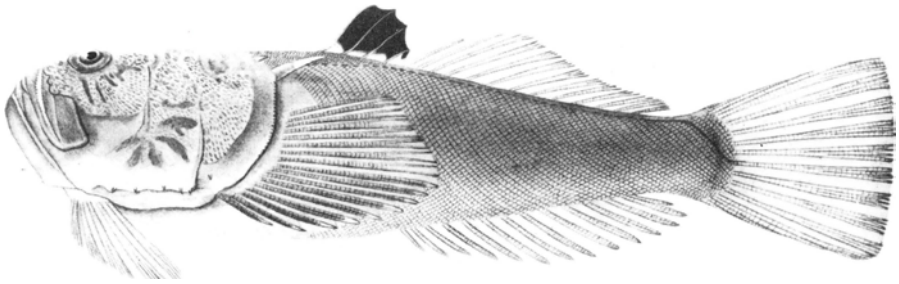
Six broad dark bands across nape and back extending onto dorsal fin. Pectoral fin orange but base and outer margin white. Spinous dorsal fin absent. Humeral spine hidden in fringed flap of thick skin. Scales present. Fourth to 5th pectoral fin rays longest, fin rounded.
D 20-21. A 17-18. P 15-16. Scale rows about 60 between head and tail base.
(voucher: 200 mm SL)

Uranoscopus bicinctus

Back and top of head variegated and spotted with dark brown forming large pale patches; 3 broad diffuse bands over upper body: behind eyes, below spinous dorsal fin and below posterior of soft dorsal fin. Humeral spine strong, exposed. Flap of tissue along inside of lower jaw forms a long filament. Nape naked. Preoperculum with 4 spines on lower border. Eighth to 9th pectoral fin ray longest, fin rounded. One pair of preventral spines plus anterior bucklers.
D III-IV, 13. A 13. P 17. 54 scale rows between head and tail base.
(voucher: 115 mm SL)

Uranoscopus kaianus

Upper head and body finely variegated reddish brown. Spinous dorsal fin black, base of first and last spines white; yellow pectoral fin crossed by diffuse brown band; tissue inside lower jaw speckled brown. Humeral spine strong, exposed. Scales over half of nape; flap of tissue along inside of lower jaw broad and slightly rounded. Preoperculum with 7 spines on lower border. Eighth to 11th pectoral fin rays longest, hind fin border emarginate above them. One pair of preventral spines plus anterior bucklers.
D IV 13. A 13. P 17-18. Scale rows 53-55 between head and tail base.
(voucher: 182 mm SL)



Uranoscopus oligolepis after Tanaka. 1912

Uranoscopus sp cf brunneus

Uranoscopus sp cf japonicus

Uranoscopus sp cf affinis

Uranoscopus sp cf arafurensis

Uranoscopus sp cf kishimotoi

Uranoscopus oligolepis

Plain olive brown over upper head and back. Spinous dorsal fin black but base of entire fin white. Pectoral fin dusky olive, lower border yellow-orange. Humeral spine strong, exposed. Nape naked. Flap of tissue along inside of lower jaw forming a very long filament. Preoperculum with 4 spines on lower border. Ninth to 10th pectoral fin ray longest, hind fin border emarginate above it. One pair of preventral spines plus anterior bucklers.
D III-IV, 12. A 13. P 17-18. Scale rows 47-51 between head and tail base.
(voucher: ? mm SL)

Uranoscopus sp cf japonicus

Olive brown or mauve above, head and back anteriorly covered with round white or cream spots. Spinous dorsal fin white basally, remainder black; pectoral fin yellow, charcoal above. Humeral spine strong, exposed. Nape naked; flap of tissue along inside of lower jaw with moderate to long, fringed filament. Preoperculum with 4 spines on lower border. Seventh to 8th pectoral fin ray longest, fin rounded. One pair of preventral spines plus anterior bucklers.
D IV, 13. A 13. P 17. Scale rows 55-56 between head and tail base.
(voucher: 130 mm SL)

Uranoscopus sp cf arafurensis

Upper head and back finely variegated dark brown. Spinous dorsal fin black except for white base to fourth spine. Pectoral fin orange. Humeral spine strong, exposed. Flap of tissue along inside of lower jaw broad and slightly rounded. Preoperculum with five spines on lower border. Embedded scales on nape. Ninth to 10th pectoral fin ray longest, hind fin border emarginate above them. One pair of preventral spines plus anterior bucklers.
D IV, 14. A 13. P 19. Scale rows about 53 between head and tail base.
(voucher: 137 mm SL)

Uranoscopus sp cf brunneus

Plain olive brown over upper head and back. Spinous dorsal fin black; pectoral fin dark brown, margins orange. Humeral spine strong, exposed. Embedded scales on nape; flap of tissue along inside of lower jaw rectangular, with broad irregular branching tip. Preoperculum with 4 spines on lower border. Ninth to 11th pectoral fin ray longest, hind fin border deeply emarginate above them. One pair of preventral spines plus anterior bucklers.
D IV, 12-13. A 13. P 18. Scale rows 51-52 between head and tail base.
(voucher: 175 mm SL)

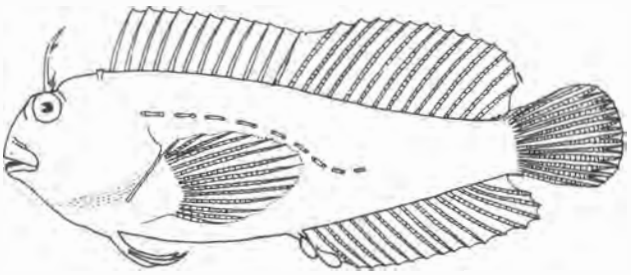
Uranoscopus sp cf affinis

Fine dark grey lines over upper head and back. Spinous dorsal fin black, base of most spines white; lower pectoral fin yellow, edge white. Humeral spine strong, exposed. Embedded scales over posterior half of nape; flap of tissue along inside of lower jaw broad and triangular. Preoperculum with 4-6 spines on lower border. Eighth to 9th pectoral fin ray longest, fin slightly rounded. One pair of preventral spines plus anterior bucklers.
D IV, 13. P 18. Scale rows about 51 between head and tail base.
(voucher: 51 mm SL)

Uranoscopus sp cf kishimotoi

Upper head and body brown with numerous irregular pale spots; darker brown areas over sides of head and below spinous dorsal fin black; pectoral fin yellow-fawn. Humeral spine strong and exposed. Soft dorsal and caudal fins dusky. Flap of tissue along inside of lower jaw broad and slightly rounded or produced into a short filament. Nape naked. Preoperculum with 4 or 5 spines on lower border. Seventh to 9th pectoral fin ray longest, fin rounded. One pair of preventral scutes plus anterior bucklers.
D IV, 13. A 13. P 17-18. Scale rows 54-55 between head and tail base.
(voucher: 96 mm SL)

BLENNIIDAE



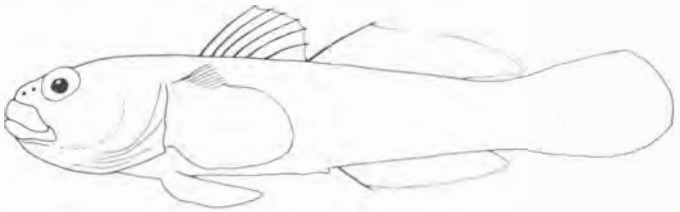
Xiphasia setifer

AMMODYTIDAE

Bleekeria viridianguilla

Bleekeria mitsukurii

GOBIIDAE



Oxyurichthys ophthalmonema

Obliquogobius yamadai

BLENNIIDAE

Blennies -

Body oval-elongate or very elongate, compressed. Head blunt; mouth small; teeth usually small ("comb-like") and movable or fixed; often canine teeth present posteriorly in jaw(s). Tentacle-like cirri may be present on head and nape; gill openings restricted to sides and sometimes small. Long dorsal fin usually with anterior portion of flexible spines continuous with or separated by notch from rayed portion, sometimes spines absent; anal fin long, usually with 2 spines anteriorly; caudal fin free of or united with dorsal and anal fins, its rays simple or branched; pectoral fin rays simple; ventral fin before pectoral fin base, with hidden spine and 2-4 rays.

A large family of 58 genera and more than 400 species. One species collected on the Survey.

REFERENCES: Allen & Swainston, 1988; Springer, 2001.

Xiphasia setifer

Body elongate and eel-like, depth 28-56 in SL. Teeth fixed, slender; very long canine posteriorly in lower jaw; gill membranes broadly united with throat, gill opening a small pore on side. Dorsal fin begins above eye; caudal fin united with dorsal and anal fins, its central rays elongated. Dusky green or grey, back and dorsal fin base crossed by about 25 broad dark brown bands; 2 black spots anteriorly on dorsal fin, first one smaller.
D 125-129. A 110-116. C fin with 10 segmented rays
(voucher: ? mm SL)

AMMODYTIDAE

Sandlances -

Small to moderate-sized fishes. Body very elongate, almost cylindrical; mouth large, protractile, lower jaw projecting beyond upper jaw; no teeth. Scales cycloid and very small, or absent; lateral line high on sides. Anus at or behind middle of body. No spines in fins; single dorsal fin long, with 40-69 rays; anal fin half length of dorsal fin, with 14-36 rays; pectoral fin low on sides; ventral fins present or absent; caudal fin forked. Gill membranes separate.

There are seven genera in the family; we collected two representatives of one genus, *Bleekeria*, on the Survey.

REFERENCES: Psomadakis, Yoshinaga, Wah & Ida, 2021; Varsha, Sethulakshmi, Ida, Randall & Joshi, 2019.

Bleekeria viridianguilla

Body fawn; violet band along back and yellow band along ventral profile to anus; violet streak from snout tip through eye, chin blue. Dorsal fin bright yellow, base violet, pectoral and anal fins yellow; yellow sub-marginal band on violet-blue caudal fin. Scales small. No ventral fins; dorsal fin height equal to or higher than body depth; depth less than 9% SL.
D 40-42. A 14-16. L. lat. 108-121.
(voucher: 145 mm SL)

Bleekeria mitsukurii

Body blue or violet brown with many scattered yellow spots and crescentic bars on back and sides, snout and chin yellow, one or 2 curved blue bands below eye. Fins brownish violet or yellow. Scales small. Ventral fins present, length equal to eye diameter; dorsal fin height ½ to ⅔ body depth; depth greater than 9% SL.
D 42. A 15. L. lat. 115
(voucher: 120 mm SL)

GOBIIDAE

Gobies - Belosoh

Small to medium-sized fishes with elongate-oval, compressed or almost cyclindrical body. Head rounded; mouth usually large, teeth in one or more rows; eyes moderately separated or close together on top of head; gill openings moderate to wide, membranes connected to isthmus. Head partly or completely naked, usually with rows of sensory pores; no lateral line; scales rarely absent. Two dorsal fins: first with up to 8 flexible spines; second with one spine and 8 to many rays, fins connected with each other or completely separated, base of second fin much longer than upper length of caudal peduncle; anal fin with one feeble spine; ventral fins fully or partly united by membrane along inner margins more or less into a cup-like disc.

Bottom-living fishes found from marine to freshwater habitats. This is the largest family of fishes with nearly 200 genera. Only two species were trawled on our Survey and their descriptions were prepared by H.K. Larson.

REFERENCES: Larson & Murdy, 2001; Pezold & Larson, 2015; Shibukawa & Aonuma, 2007.

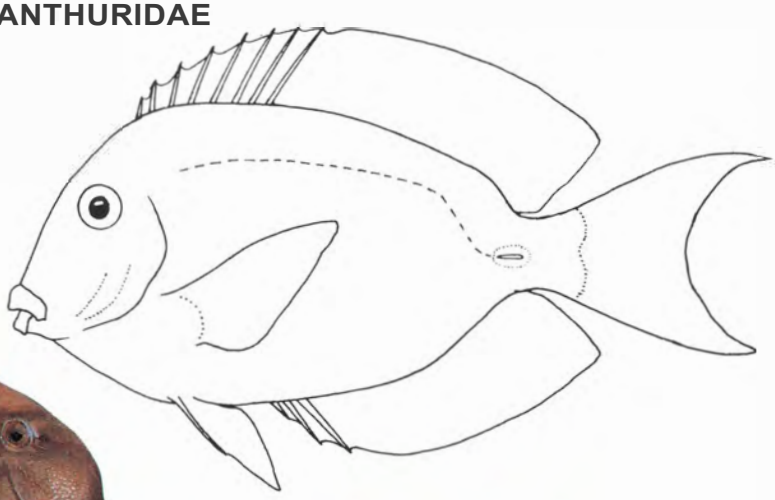
Oxyurichthys ophthalmonema

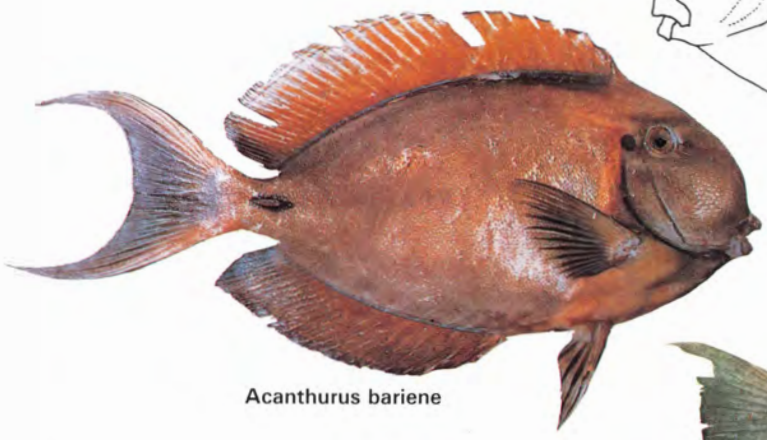
Eyes rather close together, interorbital space about equal to eye; elongate tentacle on each eye. Fleshy raised crests on nape from dorsal fin origin. Ventral fins cuplike. Scales on upper half of body each with round black spot; soft dorsal fin and upper half of caudal fin speckled with fine black spots; pectoral fin spotted
D_2 13-14. A 14. L. lat. 36-63.
(voucher: 88 mm SL)

Obliquogobius yamadai

Head large; large eyes very close together and very narrow interorbital space. Ventral fins cuplike, with frenum joining pelvic spines; no scales on midline of predorsal. Sides of body and head with 7-9 narrow yellow bars; distinct black spot on middle of caudal peduncle.
D_2 9-10. A I, 9-II. L. lat. 22-24.
(voucher: 40 mm SL)

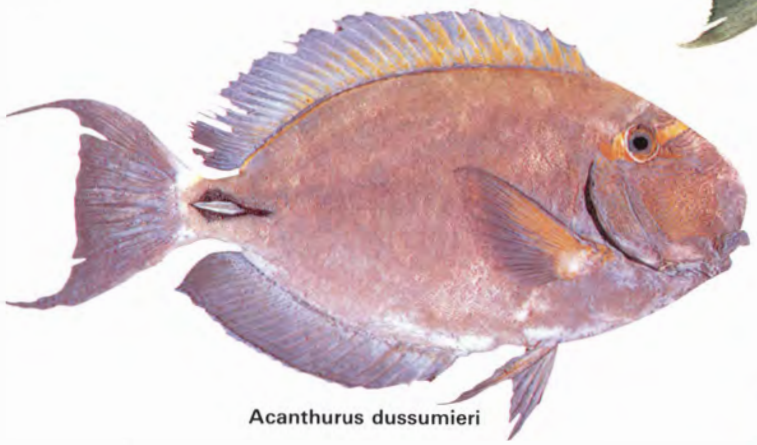
ACANTHURIDAE





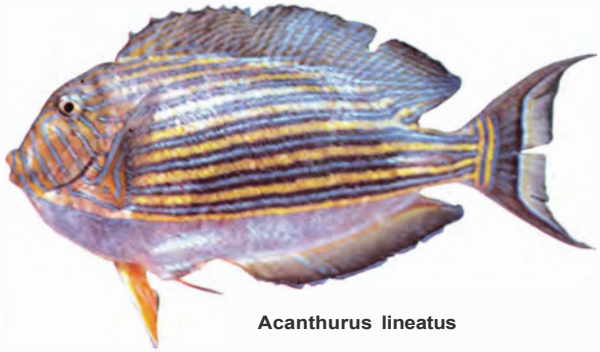
Acanthurus bariene

Acanthurus mata

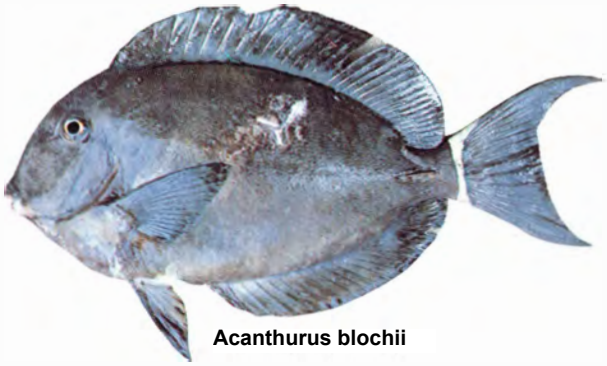


Acanthurus dussumieri

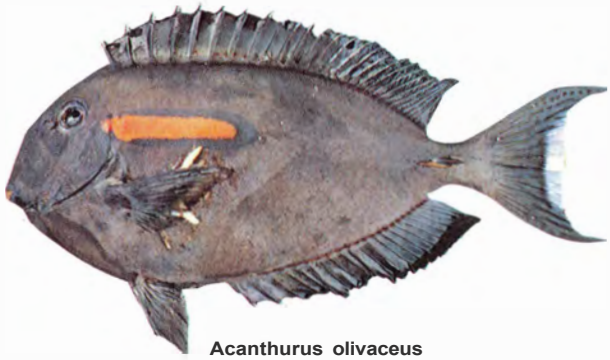
Acanthurus grammoptilus



Acanthurus lineatus



Acanthurus blochii



Acanthurus olivaceus

ACANTHURIDAE

Surgeonfishes; Unicornfishes - Butana; Greon; Gajam

Body oval and slightly elongated; moderately to very compressed. Head profile straight or convex, eye high on head; mouth small, small and sharp teeth in a single row, close-set; gill openings do not extend to underside of head. A single continuous dorsal fin with 4-9 spines, 19-31 rays; anal fin with 2-3 spines and 19-36 rays. Caudal fin emarginated to lunate. Usually a strong erectile spine or 1-2 bony, sharp-edged plates on caudal peduncle. The family comprises six genera, and 84 species. Representatives of two genera obtained during the Survey. They are distinguished as follows:

A. 3 anal spines; erectile spine in groove on peduncle . . . . . .Acanthurus

B. 2 anal spines; one or two bony plate on caudal peduncle . . . . . .Naso

REFERENCES: Johnson, 2002; Randall, 2001a; Randall, 2001f, Randall, 2001g.

Acanthurus bariene

Head and body orange-brown. Round black spot at upper end of gill opening; blue line along back below dorsal fin. Dorsal and anal fins edged blue; caudal fin dark blue, upper and lower margins and base orange-tan. Caudal spine surrounded by black or dark brown patch. Forehead humped in large males, snout not protruding.
D IX, 26-28. A III, 25-26. GR on posterior of gill arch 22-24.

Acanthurus dussumieri

Pale brown with many narrow purple or dark brown wavy longitudinal lines or scribbles over head and upper ⅔ of body. Orange band through eye to head edge, also across interorbital; opercular membrane black; caudal spine in white groove with black edges. Caudal fin orange-brown basally and over upper and lower margins, centre of fin dark blue with many small black spots. Outer ⅓ of pectoral fin pale brown.
D VIII-IX, 25-27. A III, 24-26. GR on posterior of gill arch 23-27.

Acanthurus lineatus

Upper ⅔ of body with black and blue longitudinal bands bordered with yellow, strongly marked off by pale grey or cream lower part of body, same band running obliquely across head. Blue and brown lines along dorsal fin; black edge on dorsal and anal fins; pale blue crescent on dark caudal fin; ventral fins orange. Caudal fin lobes produced.
D IX, 27-30. A III, 25-28. GR on first arch 14-17.
(voucher: 180 mm SL)

Acanthurus olivaceus

Head and body brown. Conspicuous oblong orange patch, edged with dark blue or purple, extending from upper edge of operculum to above pectoral fin tip. Fins brown, pectoral fin cream at margin; white and dark spots over rest of fin. White caudal crescent on caudal fin margined in black.
D IX, 23-25. A III, 22-24. P 16-17.
(voucher: 165 mm SL)

Acanthurus mata

Body dark olive, grey or brown; narrow longitudinal blue lines on side of head and body; wide yellow band from front of eye to upper edge of operculum. Many small teeth in jaws; snout short, its length 6.6 to 7 in SL.
D IX, 24-26. A III, 23-24.
(voucher: 320 mm SL)

Acanthurus grammoptilus

Body dark violet-brown, orange spots and scribblings on head and orange patch behind eye. Caudal peduncle spine in a large black patch; cream or white band around caudal peduncle at caudal fin base and margin narrowly white. Outer half of pectoral fin yellow; dorsal and anal fins striped yellow and blue.
D VIII-IX, 25-26. A III, 23-24. GR on posterior of gill arch 21-23.
(voucher: 180 mm SL)

Acanthurus blochii

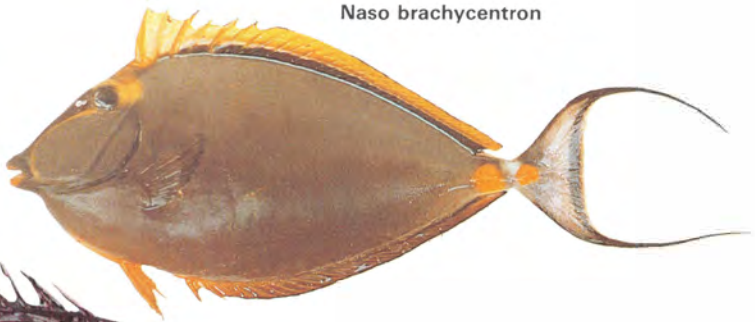
Head and body bluish brown; yellow patch behind eye; caudal peduncle spine in a dark brown patch; distinct white band around base of caudal fin. Dorsal and anal fins with 6-9 narrow dark blue horizontal lines; and an irregular yellow spot nearly as large as the eye just behind the eye; opercular membrane black. Pectoral fin brown or blue.
D IX, 25-27. A III, 24-25. GR on posterior of gill arch 23-26.
(voucher: 175 mm SL)

Acanthurus tennentii

Acanthurus xanthopterus

Naso thynnoides

Naso brachycentron

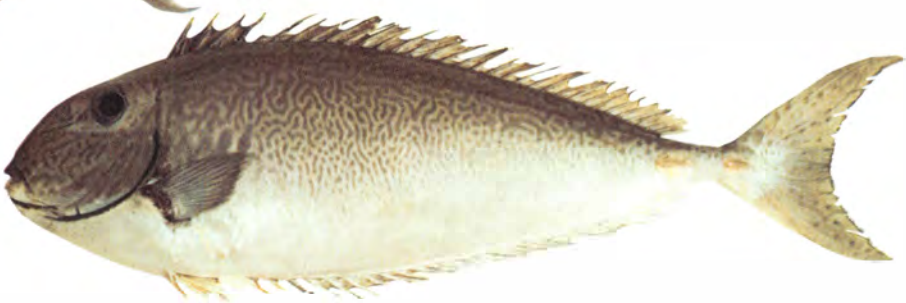


Naso lituratus

Naso lopezi

Naso mcdadei

Naso unicornis



Naso reticulatus

Acanthurus tennentii

Head and body brown. Black "U"-shaped band or 2 parallel black bands placed horizontally on side behind gill opening; and above pectoral fin; black area around caudal peduncle spine. Fins brown, hind margin of dorsal fin orange and an orange line along dorsal fin base. Broad dorsal white crescent over central posterior margin of caudal fin.
D IX, 23-24. A III, 22-23. P 16. GR on posterior of gill arch 25.

Naso thynnoides

Body olive-brown or grey-mauve, often with many narrow vertical dark bars across middle of body. Oblique yellow lines may be present on dorsal and anal fins; caudal fin margin yellow. Dorsal and ventral profiles evenly curved. Keel on caudal peduncle rounded.
D IV, 28-30. A II, 27-29.

Naso lopezi

Snout evenly convex or curved, without "horn" or hump. Body slender, depth 2.8-3.3 in SL. Upper half of head and body dark brown or with moderate dark brown or blue spots; lower half of head and body plain light grey. Fins dark blue or brown. Caudal fin emarginated.
D V, 29-31. A II, 28-30.

Naso unicornis

Forehead with a long conical "horn" in front of eyes; snout below "horn" long, distance from snout tip to "horn" -base 2-4 times the distance from "horn"- base to eye. Upper and lower lobes of caudal fin produced into short filaments. Body brown, darker on back, pale orange to fawn on lower sides. Blue lines on dorsal and anal fins; caudal fin plain brown, yellow-brown on proximal half; caudal bucklers blue.
D V-VI, 27-31. A II, 27-29.

Acanthurus xanthopterus

Body plain orange-brown or blue-grey; base of caudal fin with faint or very distinct white band; caudal peduncle spine in a dusky patch. Outer part of pectoral fin yellow; dorsal and anal fins with 4-6 alternating yellow and blue longitudinal bands. Eye in a yellow patch.
D VIII-IV, 25-27. A III, 23-25. GR on posterior of gill arch 17-22.
(voucher: 138 mm SL)

Naso brachycentron

Forehead of males with long conical "horn" in front of eyes (as a hump in females), its axis passing through the eye; snout below "horn" long. Dorsal body profile distinctly humped above anal fin origin. Charcoal or dark grey above, pale fawn below; blue or brown spots may be present on back or particularly along mid-line of body.
D IV-V, 29-30. A II, 27-28.
(voucher: 460 mm SL)

Naso lituratus

Body olive-brown; orange or yellow line around eye; orange lips and orange caudal peduncle plates. Blue line along back dorsal fin. Dorsal, anal and ventral fins bright orange. Upper and lower caudal fin lobes produced into filaments in adult males.
D VI-VII, 27-30. A II, 28-30.

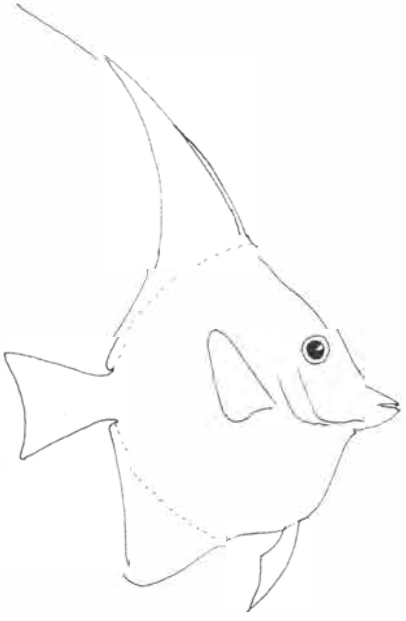
Naso mcdadei

Snout swollen in front of eyes in to a large, convex hump. Dorsal body profile distinctly humped above anal fin origin. Body grey, back olive-brown and finely spotted dark brown; spots extend over dorsal, caudal and pectoral fins; caudal fin truncate.
D V, 27-29. A II, 26-27.
(voucher: 445 mm SL)

Naso reticulatus

Snout evenly convex or curved, without "horn" or convex hump. Head and body brownish grey, upper ⅔ covered with small brown spots or short wavy reticulated lines. Brown spots over emarginated caudal fin. Black margins to preoperculum and operculum, black band on chin. Bucklers on peduncle pink. Body ovate, depth 2.2 to 2.9 in SL. Eye 2.4 to 3.6 in HL
D VI, 29-31. A II, 26-30. Lower GR 10-12.
(voucher: 410 mm SL)

ZANCLIDAE

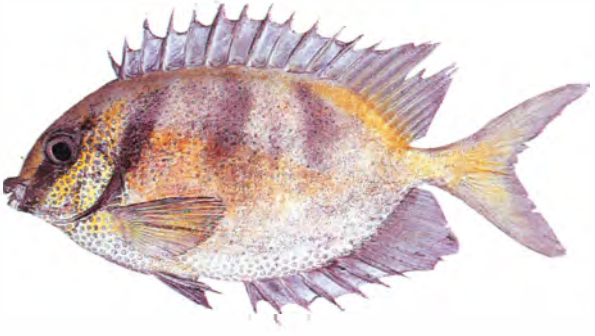


Zanclus cornutus

SIGANIDAE

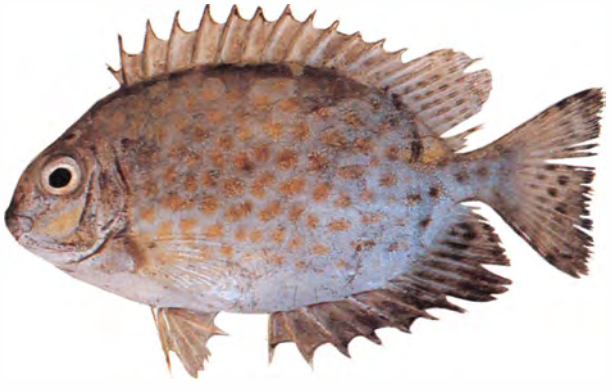
Siganus argenteus

Siganus canaliculatus



Siganus corallinus

Siganus fuscescens



Siganus guttatus

Siganus punctatus

ZANCLIDAE

Moorish Idols -

Body almost orbicular and very compressed; minute ctenoid scales, appears naked. One dorsal fin with 7 spines of which the third is produced into a long filament; 3 anal spines; caudal fin emarginate. Gill opening a short slit. Snout extended into a short thick tube and mouth small; teeth numerous, elongate and bristle like.

This family is monotypic (containing only a single species).

REFERENCE: Randall, 2001e.

Zanclus cornutus

Third dorsal spine filamentous; snout tubular. Spine at corner of mouth in juveniles; pointed "horns" in front of eye in adults. Two broad black bands across body; one over nape and posterior half of head to ventral profile, the other from soft dorsal fin to tip of medial anal fin; filamentous dorsal spine white; caudal fin black with white margin.
D VI-VII, 39-42. A III, 31-37.
(voucher: 63 mm SL)

SIGANIDAE

Rabbitfishes; Spinefeet - Beronang; Masadar

Very compressed, oval body. Mouth small, teeth small and close together; gill opening restricted to side; side of head scaly. Body appears naked but covered with small, cycloid scales. Single dorsal fin with 13 spines, an antrorse (forward-directed) spine at fin origin, and 10 rays; anal fin with 7 spines and 9 rays; ventral fin with 2 spines separated by 3 rays, inner spine connected to body by membrane; caudal fin truncate to lunate. All fin spines strong and very sharp; they can inflict poisonous stings. Identification often difficult because of colour variability in many species and "fright" patterning of dark blotches and bars adopted on capture.

The family comprises a single genus, *Siganus*. Eight of the 29 known species were obtained on the Survey. Diagnoses were partly prepared from information supplied by D.J. Woodland.

REFERENCES: Woodland, 1990; Woodland, 2001c; Woodland & Anderson, 2004.

Siganus argenteus

Body blue above to silvery below with yellow spots above and either yellow spots or streaks on lower sides; 2-4 diagonal brown bands across membranes of ventral, spinous dorsal and anal fins, caudal fin barred brown. Eye low on head, 3.5-4 in HL; body slender, its depth 2.5-4 in SL. Soft dorsal and anal fins low, caudal fin deeply forked, length of median rays 2-3 times in longest rays.
P ii, 16. Lower GR 17-20.
(voucher: ? mm SL)

Siganus canaliculatus

Grey green above to silvery below, covered with numerous (up to 300) pale spots on sides arranged into horizontal rows (about 3 rows above lateral line); fins marbled with brown, sometimes absent from caudal fin. Eye low on head, 3-3.9 in HL; body depth 2.4- 2.8 in SL. Rounded soft dorsal and anal fins low, caudal fin emarginate, forked in larger fish.
P ii, 14.
(voucher: 178 mm SL)

Siganus corallinus

Yellow to yellowish with many small, blue ocelli covering head and most of body; ocelli extend onto fin spines but membranes plain. Head profile evenly rounded (convex), eye high on head, 3-4 in HL; body depth 1.7-2.3 in SL. Soft dorsal and anal fins angular, caudal fin emarginated in young, becoming deeply forked in adults.
P ii, 14. Lower GR 18.
(voucher: 175 mm SL)

Siganus fuscescens

Sandy brown to green above, becoming silvery below, with a golden sheen on side; very many (500-600) pearly spots arranged on sides into horizontal rows (about 6 rows above lateral line); fins marbled and spotted brown; often a dark patch below lateral line origin. Nape slightly concave above eye; eye low on head, 2.8-3.5 in HL; body depth 2.3-2.9 in SL. Rounded soft dorsal and anal fins low, caudal fin emarginate, forked in larger fish.
P ii, 14.
(voucher: 98 mm SL)

Siganus guttatus

Blue grey above to silvery below; pupil-sized golden orange spots over side (not head), closer together and "honey-combed" on nape; large yellow patch on body below posterior base of soft dorsal fin; soft portion of unpaired fins with rows of dark spots; soft vertical fins and caudal fin often margined in brown. Head profile slightly concave on nape; body depth 1.8-2.3 in SL. Rayed portion of dorsal and anal fins little higher than spinous portions; caudal fin truncate, emarginate in larger fish.
P ii, 13-14. Tr above 18-20.
(voucher: 90 mm SL)

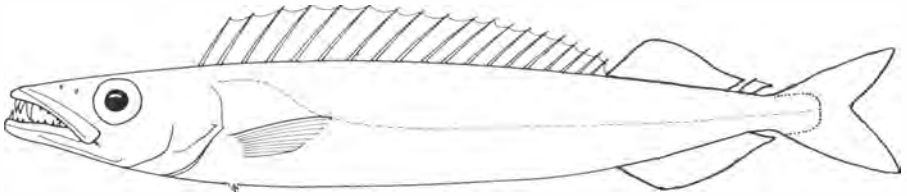
Siganus punctatus

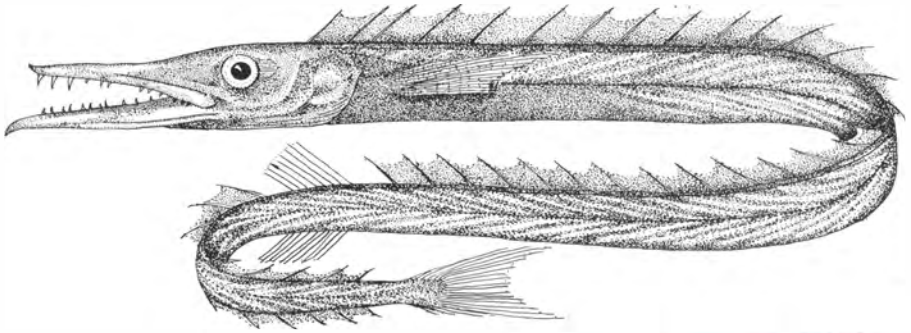
Entire head and body covered with small golden spots equal to or smaller than pupil in size, background colour and fins dark brown or blue grey, median soft fins spotted. Head profile almost straight; eye 3.1-3.6 in HL; body depth 1.8-2.2 in SL. Soft dorsal and anal fins angular; caudal fin emarginated to deeply forked in larger fish.
P ii, 14-15. Tr above 20-24. Lower GR 16.
(voucher: 245 mm SL)

Siganus spinus

Siganus virgatus

GEMPYLIDAE





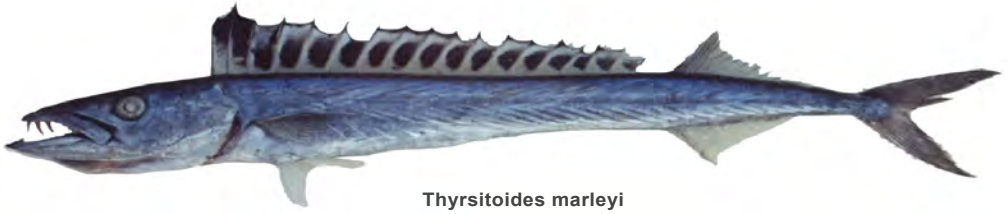
Gempylus serpens drawing of preserved specimen

Lepidocybium flavobrunneum

Neoepinnula orientalis

Promethichthys prometheus

Rexea prometheoides



Thyrsitoides marleyi

Siganus spinus

Many pale blue or cream wavy bands form network over grey brown head and body, bands becoming vertical and very distinct on caudal peduncle; pale hyaline to yellow unpaired soft fins with dark or light bars and spots; posterior half of caudal fin yellow. Head profile concave on nape; body depth 2.4-2.8 in HL. Caudal fin emarginate, truncate in larger fish. Scales absent from area between ventral fin bases.
P ii, 14-15. Tr above 17-18. Lower GR 13-17.
(voucher: 85 mm SL)

Siganus virgatus

Brown band from nape to chin, 2nd brown band from dorsal fin to pectoral fin base, each paralleled by silvery or golden band; blue wavy lines over front of head and small dark blue spots on back; caudal fin yellow. Head profile convex; body depth 1.9-2.2 in SL. Soft dorsal and anal fins angular, caudal fin truncate or emarginate.
P ii, 14. Tr above 18-24.
(voucher: 145 mm SL)

GEMPYLIDAE

Snake mackerels -

Elongate or oblong fishes of moderate to large size, compressed. Mouth large; maxilla exposed posteriorly; teeth sharp, anterior teeth very large and fang-like. Scales moderate and spined, small or absent; lateral line weak or moderately developed, sometimes double, its shape often diagnostic. Dorsal fin divided into a long based spinous part and a short rayed part; finlets often present behind dorsal and anal fins; pectoral fin short and set low on body; ventral fin well-developed, absent or rudimentary; caudal fin forked.

About 16 genera in the family, members of six were obtained on the Survey.

REFERENCES: Nakamura & Parin, 1993; Nakamura & Parin, 2001a; Parin, 1989.

Gempylus serpens

Body and fins plain brown or blackish brown, fin margins dark. Body very elongate, its depth 14-20 in SL; spinous dorsal fin long. Two almost straight lateral lines, upper ending opposite soft dorsal fin origin, lower ending at tail base. Five to 7 small finlets behind each of soft dorsal and anal fins; ventral fin very small, consisting of a spine and 4 to 5 minute rays.
D XXVIII-XXXII; I, 12+6. A II; I, 10-11 +5-7.
(voucher: 429 mm SL)

Neoepinnula orientalis

Body dark bluish green; mouth and gill cavities black; first dorsal fin charcoal. Body robust, depth 3.9-4.2 in SL. Two distinct lateral lines originating together at upper edge of gill opening, upper line running close to dorsal profile, lower running along ventral profile. Well-developed ventral fins present, with one spine and 5 rays, beginning beneath mid-pectoral fin. One to 3 teeth on each side of vomer. Dorsal fin spines flexible, no finlets behind unpaired fins.
D XVI; I, 19-20. A III, 19-20.
(voucher: 196 mm SL)

Rexea prometheoides

Body iridescent dark grey-blue above, silvery grey below. Black spot over membrane between first 3 dorsal spines, fin margin black. Body moderately long, its depth 5-6 in SL; naked except for elongate patch of scales from middle of spinous dorsal fin to caudal peduncle. Two distinct lateral lines, upper from operculum along dorsal profile ending below posterior ⅓ of soft dorsal fin, lower line branching off upper line below 4th to 5th dorsal spine, running along sides and mid-sides. Base of first dorsal fin 2.2-2.6 longer than base of second dorsal fin + finlets. Ventral fin present as a short spine (no rays) in young, absent in adults; 2 small finlets present behind each unpaired fin.
D XVIII; II, 14-17 + 2. A I, 12-15 + 2.
(voucher: 120 mm SL)

Lepidocybium flavobrunneum

Body dark metallic blue-brown, fins dark. Single lateral line indistinct, greatly undulating and reaching nearly to both back and belly. A broad keel on each side of caudal peduncle, bordered posteriorly by two small keels on each side. Five to 6 small finlets behind soft dorsal and anal fins; caudal fin deeply forked or lunate.
D VIII-XII; 16-18 + 5-6. A 13-15 + 4-5.
(voucher: 325 mm SL)

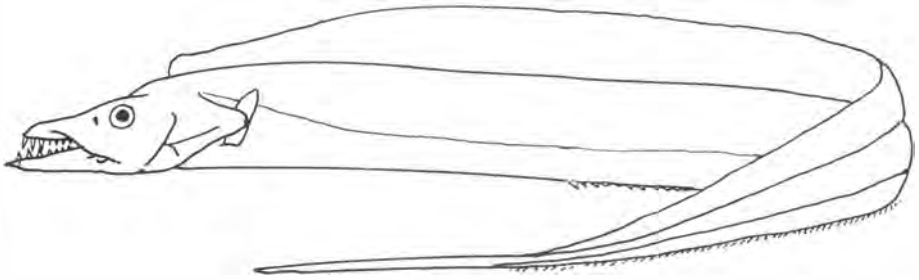
Promethichthys prometheus

Body dark metallic copper brown or dark blue; fins dark brown or charcoal. Body moderately long, its depth 5-7 in SL. One lateral line bending abruptly down near pectoral fin and continuing along mid-height of body. Two small finlets behind each of soft dorsal and anal fins; ventral fin reduced to a single spine and becoming shorter with age.
D XVII-XVII; 19-20 + 2. A II, 14 + 2.
(voucher: 190 mm SL)

Thyrsitoides marleyi

Body metallic grey-brown above, silvery below; large black blotches on membrane between each dorsal fin spine. Body slender, its depth 9-12 in SL. Two distinct lateral lines, upper running close to dorsal profile, lower branching from first below anterior dorsal spines and running along mid-sides. Long, strong spines in dorsal fin, anterior ones longest; ventral fin well-developed with one spine and 5 rays, situated below pectoral fin; caudal fin deeply forked.
D XVII-XIX, 12 + 5-6. A 13 + 4-6.
(voucher: 425 mm SL)

TRICHIURIDAE

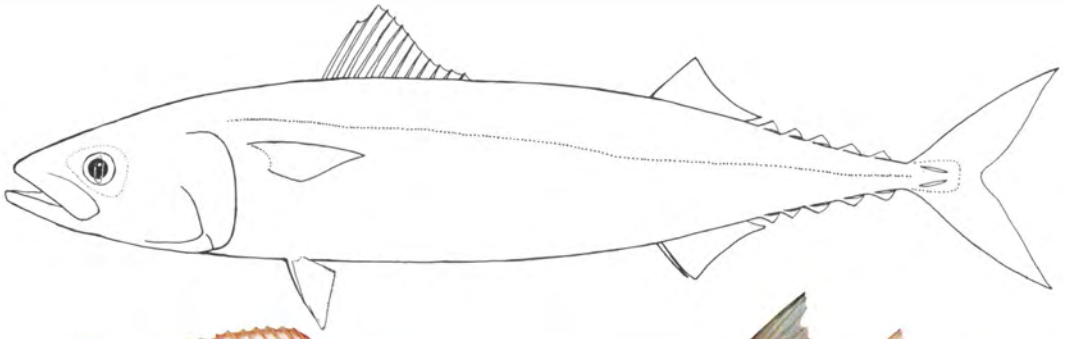


Benthodesmus vityazi

Tentoriceps cristatus

Trichiurus lepturus

SCOMBRIDAE



Gymnosarda unicolor

Rastrelliger brachysoma

Rastrelliger kanagurta

Sarda orientalis

TRICHIURIDAE

Cutlassfishes; Hair-tails; Ribbon fishes - Layur; Jogor

Body very elongate and compressed, tapering posteriorly. Body naked, silvery skin easily rubbed off. Lateral line single. Mouth large, jaws pointed. Teeth sharp, some very large and fang-like. Dorsal fin very long and continuous, soft-rayed part usually longer than the spinous part, sometimes marked off by notch; no finlets; and anal fin long, elements often short and embedded. Pectoral fins small, low on body; ventral fins very small, scale-like or absent. Caudal fin present or absent. Moderate sized fishes of shallow (e.g. *Trichiurus*) or deep (e.g. *Benthodesmus)* waters.

Ten genera in the family of which three were represented in the Survey.

REFERENCES: Nakamura & Parin, 1993; Nakamura & Parin, 2001b.

Benthodesmus vityazi

Body strongly compressed and elongate, ribbon-like. Caudal fin present, forked. Notch in dorsal fin between spined and rayed parts of dorsal fin about half length of rayed dorsal fin. Ventral fin scale-like, situated immediately behind vertical line drawn from pectoral fin base. Only posterior ⅓ of anal fin visible, remainder covered by skin. Snout and chin charcoal coloured.
D (total) 134. A (total) 83. GR 5 + 1 + 7.
(voucher: 770 mm SL)

Trichiurus lepturus

Body strongly compressed and elongate, ribbon-like, tapering to a point; no caudal fin. Lower border of gill cover concave; fangs in jaws with barbs. Dorsal fin begins just behind head; ventral fin absent. Tiny anal fin spines just breaking through, or buried in ventral skin.
D (total) 133-138.
(voucher: 360 mm SL)

Tentoriceps cristatus

Body strongly compressed and elongate, ribbon-like, tapering to a point; no caudal fin. Depth 20-24 in SL. Upper head profile strongly convex, forming a crest; lower border of gill cover convex; lower jaw strongly projecting. Dorsal fin begins just behind head; ventral fins present, scale-like; pectoral fin short, not reaching lateral line.
D (total) 126-144.
(voucher: 335 mm SL)

SCOMBRIDAE

Mackerels; Tunas - Tongkol; Tenggiri

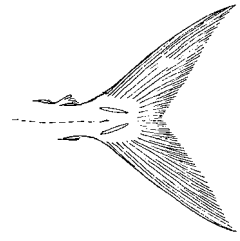
Body robust and fusiform, either covered with small to moderate-sized cycloid scales, or an area behind head and around pectoral fin covered with large thick scales, rest of body naked or finely-scaled. Snout pointed; adipose eyelid may be developed; mouth large, teeth sharp. Two dorsal fins, finlets present behind soft rayed dorsal fin and anal fin; ventral fin with 6 rays; caudal fin deeply forked. Caudal peduncle strong and tapered, with at least 2 lateral keels.

This circumglobal family comprises 15 genera and 54 species. Individuals belonging to five genera were obtained on the Survey, although others were taken at the surface by the net, or trolled, and are considered outside the scope of this book.

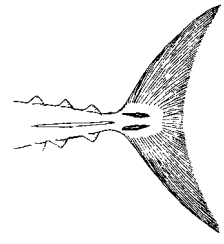
REFERENCES: Collette, 2001; Collette & Nauen, 1983.

KEY TO GENERA

1a. Only 2 small keels on side of caudal peduncle, 5 dorsal and 5 anal finlets, adipose eyelid present.
- 2a. Anal spine strong; short, wavy lines on back; fine teeth on roof of mouth . . . . . **Scomber**
- 2b. Anal spine weak; spots on back; no teeth on roof of mouth . . . . . **Rastrelliger**



1b. Large keel plus 2 small keels on side of caudal peduncle, 6-10 dorsal and anal finlets, no adipose eyelid.
- 3a. Jaw teeth strong, triangular, single lateral line; at least some gill rakers present; snout much shorter than rest of head. . . . . **Scomberomorus**
- 3b. Jaw teeth conical; 8-21 gill rakers on first arch
  - 4a. Narrow dark stripes along back, none on lowed sides; upper jaw at least to hind border of eye; no teeth on tongue . . . . . **Sarda**
  - 4b. No stripes along back; first dorsal fin lower than second; 2 patches of teeth on tongue; swim bladder present . . . . . **Gymnosarda**



Gymnosarda unicolor

Body plain silvery blue, back grey. Teeth in jaws conspicuous. Interorbital 2.5-3.1 in HL.
Total GR 11-14 (first arch). 13-15 spines in dorsal fin. P 25-28.

Rastrelliger kanagurta

Two rows of small dark spots below dorsal fin bases and dark or golden longitudinal streaks on back. A black spot on body below pectoral fin. Body moderately deep, depth 4.3-5.2 in FL. Intestine short, 1.3-1.7 in SL when extended; gill rakers very long, visible when mouth is open.
Lower GR 32-46. 8-11 dorsal fin spines.
(voucher: ? mm SL)

Rastrelliger brachysoma

Broad row of dark brown spots along blue-green back; black edge on first dorsal fin. Body very deep, depth 3.7-4.3 in FL. Intestine very long, 3-3.4 times SL when extended; gill rakers very long, visible when mouth is open.
Lower GR 30-48. 8-11 dorsal fin spines.
(voucher: 155 mm SL)

Sarda orientalis

Five to 10 narrow, dark stripes along upper part of body. Narrow supramaxilla.
Total GR 8-13 (first arch). 17-19 spines in dorsal fin.
P 23-25.

Scomberomorus commerson

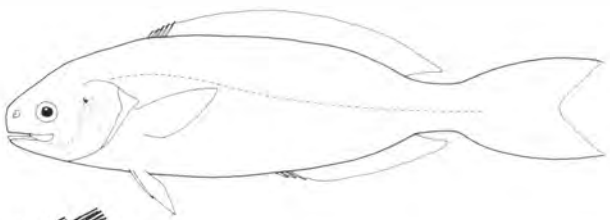
Scomber australasicus

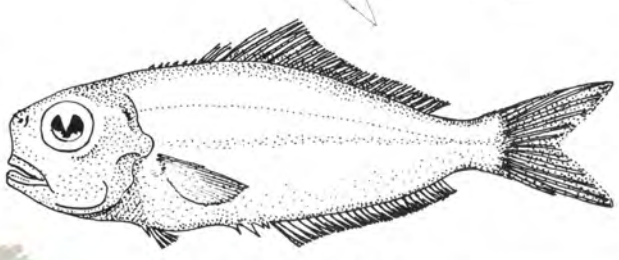
Scomberomorus munroi

Scomberomorus guttatus

Scomberomorus queenslandicus

CENTROLOPHIDAE





Psenopsis obscura after Haedrich, 1967

Psenopsis humerosus

Psenopsis sp.

Scomber australasicus

Body slender. Fine teeth on vomer and palatines. Wavy dark oblique lines and zigzags over back; fine spots and short wavy lines extend over mid-sides towards belly. First and second dorsal fins well-separated; anal fin origin opposite fourth dorsal fin ray.
Lower GR 24-28. 10-13 dorsal fin spines.
(voucher: 215 mm SL)

Scomberomorus guttatus

Sides with many spots about equal in size to pupil of eye. Spinous dorsal fin uniformly dark. Body depth less than or equal to HL. Lateral line slightly undulated; anterior part with supplementary branches.
Total GR 8-14 (first arch). 15-18 dorsal fin spines.

Scomberomorus queenslandicus

Middle to lower sides with diffuse rounded blotches as large as or larger than eye diameter, arranged into roughly 3 rows; spinous dorsal fin blackish blue except for white area between 6th and last few spines. Lateral line gently descending.
Total GR 3-9 (first arch). 16-18 dorsal fin spines.
(voucher: 200 mm SL)

Scomberomorus commerson

Sides below lateral line with many wavy dark vertical bars increasing in number with size and broken into irregular patches posteriorly; spinous dorsal fin blackish blue, posterior half white in smaller individuals. Lateral line with deep dip below second dorsal fin or below 2nd to 5th dorsal finlets. Fine serrations along tooth margins.
Total GR 1-8 (first arch). 14-18 dorsal fin spines.

Scomberomorus munroi

Band of rounded spots smaller than eye diameter, arranged into 4-5 irregular rows along middle of sides; spinous dorsal fin almost entirely blackish blue. Two loops to the intestine.
Total GR 10-12 (first arch). 20-22 dorsal fin spines.
(voucher: 380 mm SL)

STROMATEOID FISHES (SUBORDER STROMATEOIDEI)

Oval or oblong benthopelagic fishes usually characterised by having muscular sac-like outgrowths in gullet behind last gill arch (visible only with dissection). Moderately compressed. Scales cycloid, easily lost; head mostly scaled, though scales often concealed. Gill openings wide. Mouth small to moderate, terminal or slightly inferior, teeth small or fine; snout "puffy" or fleshy. Dorsal fin single: either continuous with reduced spines, or deeply notched between spinous and rayed parts. Pectoral and anal fins well-developed though sometimes small, reduced with age or absent; caudal fin forked. Ventral fin well-developed or absent.
Representatives of four families were collected during the Survey.

CENTROLOPHIDAE

Ruffes; Raftfishes -

Single, continuous dorsal fin with 9 spines or less; first 5 spines weak, remainder strong; spines in anterior part, longest spine not longer than half of longest soft ray; 25-40 dorsal fin rays. Fifteen to 30 rays in anal fin. Ventral fins present; dorsal and anal fin bases of unequal length. Scales easily lost. Teeth in jaws conical and simple, none on vomer and palatines..

Family comprises seven genera; representatives of one genus were obtained on the Survey.

REFERENCES: Parin & Piotrovsky, 2004; Haedrich, 1967; McDowall, 2001; Ochai & Mori, 1965.

Psenopsis humerosus

Body depth about 50% SL; eye 2.4-4.8 in HL. Dorsal fin spines graduate slightly to fin rays. Ventral fin origin just under pectoral fin origin. Silvery-grey, charcoal above; large diffuse charcoal shoulder blotch. Fins fawn; dorsal and anal fin margins dark brown.
D V-VII, 27-32. A III, 25-29. P 20-23. GR 5-6 + 12-13.

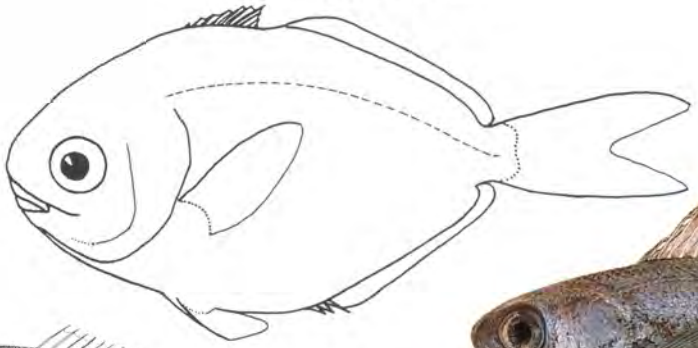
Psenopsis sp.

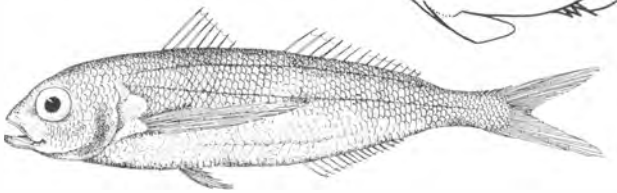
Body depth about 45% SL; eye 3.4-3.7 in HL. Dorsal fin spines graduate slightly to fin rays. Ventral fin origin before or just under pectoral fin origin. Dark metallic green-charcoal body and fins; dark blotch on shoulder.
D V-VII, 26-29. A II-III, 25-27. P 18-20. GR 5-6 + 15-16.

Psenopsis obscura

Body depth 32-40% SL; eye 3.3 in HL. Dorsal fin spines graduate slightly to dorsal fin rays. Snout deep and truncated. Ventral fin origin before or just under pectoral fin origin. Metallic blue-green on back, silvery fawn on lower sides. Dark blotch on shoulder. Fins pale yellow, stippled dark brown.
D VI-VII, 29. A III, 26-27. P 17-20. GR 5 + 15.
(voucher: ? mm SL)

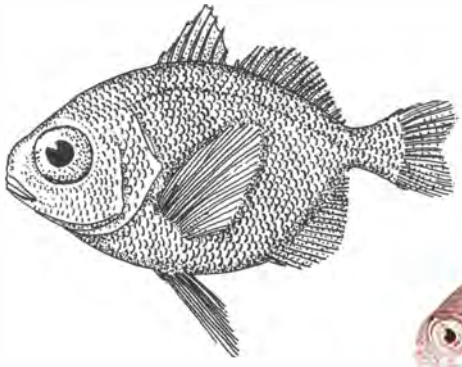
NOMEIDAE



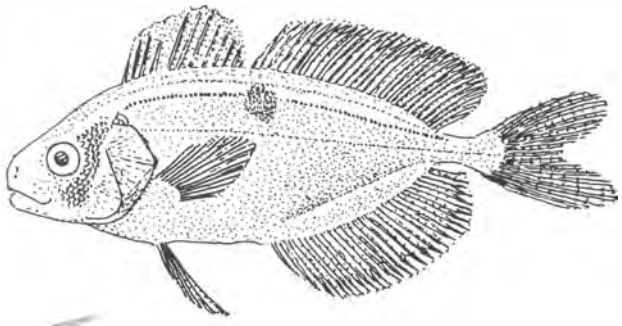


Cubiceps pauciradiatus

Cubiceps whiteleggii



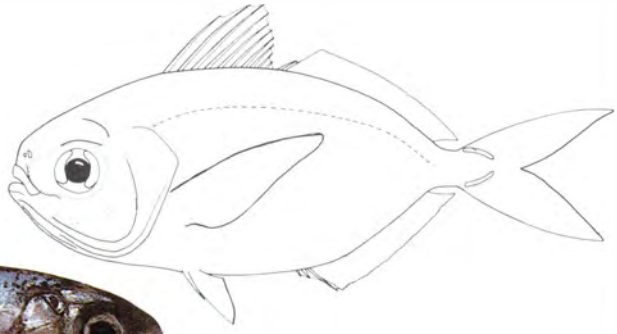
Psenes arafurensis after Günther, 1889



Psenes pellucidus after Haedrich, 1967

Psenes sp cf cyanophrys

ARIOMMATIDAE



Ariomma brevimanus

Ariomma parini

Ariomma indica

NOMEIDAE

Eyebrow fishes; Cube heads

One dorsal fin with a deep notch distinctly separating the spined and rayed portions. Spines of first dorsal fin slender, about 10-11, moderately long, and fold into a groove; dorsal rays more than 15 dorsal fin rays. Anal fin with 1-3 spines; more than 15 rays. Mouth small, maxilla barely reaching eye; teeth small and conical, on jaws and vomer and sometimes on palatines. Scales cycloid, thin, easily lost. Caudal peduncle compressed, without lateral keels; least depth of peduncle more than 5% (20 times in) SL; caudal fin deeply forked, pectoral fin lengthen with growth.

Three genera in the family, two represented on the Survey.

REFERENCES: Parin & Piotrovsky, 2004; Haedrich, 1967; Last, 2001.

Cubiceps pauciradiatus

Body depth 22-30% SL. Spinous dorsal fin begins behind origin of pectoral fin origin; ventral fin begins behind pectoral fin base. Pectoral fin longer than HL. Scales on top of head extend forward of eyes. Teeth small; on palatines knobby and in a single row, in broad patch on vomer and tongue. Body brown or tan, paler ventrally.
D X-XI, I, 16-18. A II, 14-16. P 17-19. GR 7-9 + 16-19.
(voucher: 107 mm SL)

Psenes arafurensis

Body depth 40% SL. Spinous dorsal fin begins before or above pectoral fin origin; ventral fin begins below pectoral fin base and reaches well past anal fin origin. Scales on top of head do not extend forward of eyes. Lower jaw teeth long and knife-like. Body brown, barred and mottled posteriorly and over dorsal and anal fins; ventral fins dark brown.
D X-XI, 1-11, 18-21. A III, 20-22. P 18-22. GR 7-9 + 16-17.

Psenes sp cf cyanophrys

Body depth 40% SL. Spinous dorsal fin begins before pectoral fin origin; ventral fin begins opposite pectoral fin origin and reaches well past beginning of anal fin. Scales on top of head do not extend forward of eyes. Lower jaw teeth long and knife-like. Plain brown, all but pectoral fin dusky on margins.
D X-XI, 1, 21-23. A III, 20-21. GR 8 + 15.
(voucher: 71 mm SL)

Cubiceps whiteleggii

Body depth 25-30% SL. Spinous dorsal fin begins behind origin of pectoral fin; ventral fin begins below or behind pectoral fin base. Scales on top of head extend forward of eyes. Teeth fine and sharp, in one row on vomer, palatines and tongue. Pectoral fin about equal to HL. Dark metallic blue-grey head bones; dorsal, anal and ventral fins with a pinkish brown sheen.
D X-XI, I, 17-20. A III, 17-19. P 18-20. GR 9 + 16-18.
(voucher: 116 mm SL)

Psenes pellucidus

Body depth 30-35% SL. Spinous dorsal fin begins before pectoral fin origin; ventral fin begins below pectoral fin base and reaches past anal fin origin (in very young individuals). Scales on top of head do not extend forward of eyes. Lower jaw teeth long and knife-like. Body soft or flabby. Plain brown; dorsal, anal and ventral fins darker.
D IX-XII, 1-11, 27-32. A III, 26-31. P 18-20. GR 8-9 + 15-17.
(voucher: 147 mm SL)

ARIOMMATIDAE

One dorsal fin, distinctly separated into spinous and soft-rayed portions: dorsal spines slender, moderately long, about 10-11 and fold into a groove; dorsal fin rays 13-16. Anal fin with 3 spines, 13-16 rays. No teeth on vomer and palatines. Eye large. Scales cycloid, thin, easily lost. Caudal peduncle square in cross-section, with very low lateral keels, least depth less than 20 times in SL.

The family comprises a single genus and seven species, of which three were obtained on the Survey.

REFERENCES: Parin & Piotrovsky, 2004; Haedrich, 1967; Last, 2001.

Ariomma brevimanus

Body depth 25-30% SL. Eye less than 3.6 in HL. Pectoral fin short, about half HL and reaching only halfway to anal fin origin. Scales on top of head extend forward only to above hind edge of eye. Dark metallic blue-charcoal; fins dark green-grey or brown.
D X-XI, I, 15. A III, 13-14. P 22-25. GR 9 + 20.
(voucher: 135 mm SL)

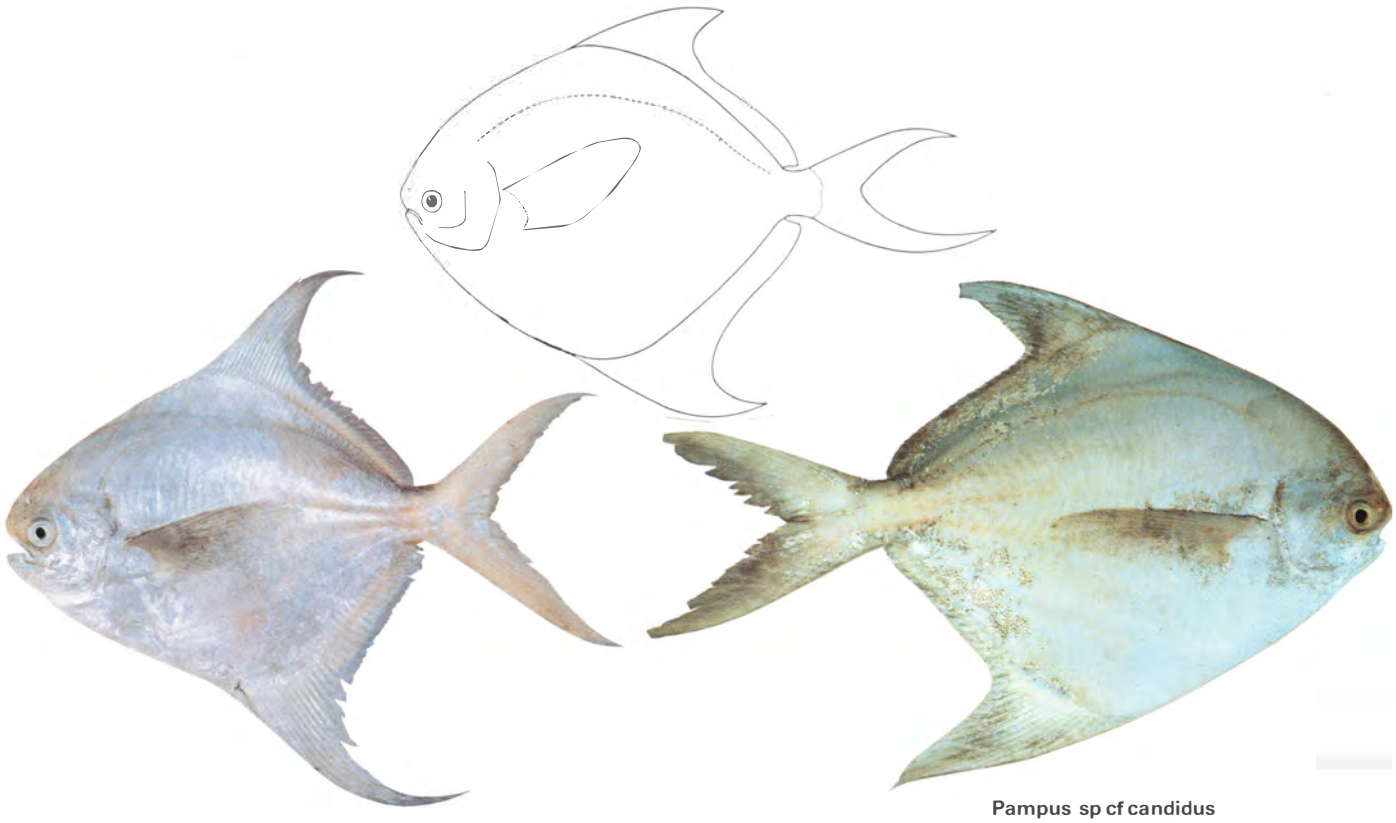
Ariomma parini

Body depth about 30% SL. Pectoral fin moderate, not quite reaching anal fin origin and equals HL without snout. Scales on top of head reaching forward to above fron of eye. Eye 3.1-3.3 in HL. Dark metallic blue-charcoal head, body and fins; spinous dorsal fin very dark.
D X, I, 16. A III, 14. P 19. GR (total) 26-29. L. lat. 47-50.
(voucher: 128 mm SL)

Ariomma indica

Body depth 40% or more of SL. Pectoral fin long, reaching past anal fin origin and longer than HL. Posterior teeth in lower jaw three-cusped, remainder simple. Head iridescent blue-mauve, body fawn, fins dusky olive.
D X-XI, I, 14-15. P 21-23. GR 7 + 14-16.
(voucher: 145 mm SL)

STROMATEIDAE



Pampus argenteus

Pampus sp cf candidus

CALLIONYMIDAE

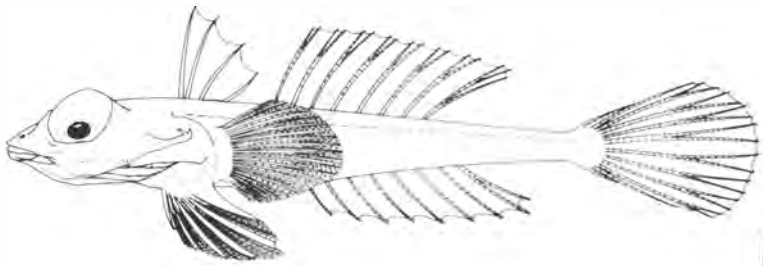


Fig. 1

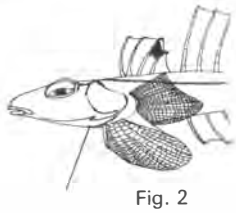


Fig. 2

Fig. 3

Callionymus meridionalis

Callionymus moretonensis

Callionymus semeiophor

Callionymus superbus

STROMATEIDAE

White pomfrets - Bawal Putih

One continuous dorsal fin. No spines or 2-10 small blade-like spines before dorsal fin rays; 15-30 rays in anal fin. Ventral fins may be present in juveniles, never in adults. Dorsal and anal fin bases about equal in length. Teeth in jaws compressed with or without cusps. Dorsal and anal fins may be produced into high curving lobes.

The family comprises three genera with 17 species, of which members of one genus was obtained on the Survey.

REFERENCES: Parin & Piotrovsky, 2004; Haedrich, 1967; Last, 2001; Radhakrishnan et al, 2019; Roul et al. 2021

Pampus argenteus

Body compressed and muscular. Maxilla ends under eye. Ventral fin never present. Dorsal and anal fins high anteriorly, falcate, their tips produced. Caudal fin deeply forked, tips sharp, lower lobe slightly longer. Flat, blade-like spines present in first part of dorsal and anal fins. Body and fins iridescent blue-grey, back and fin margins dusky.
D V-X, 38-43. A V-VII, 34-43. P 24-27. GR 2-3 + 8-10.
(voucher: 127 mm SL)

Pampus sp cf candidus

Body compressed and muscular. Maxilla ends under eye. Ventral fin never present. Dorsal and anal fins elevated anteriorly but not produced into falcate lobes. Caudal fin forked, tips blunt. Body and fins bluish green, back and fin margins dusky. No spines before unpaired fins.
D 41-44. A 39-42.
(voucher: 223 mm SL)

CALLIONYMIDAE

Dragonets -

Small fishes with depressed head and trunk. Mouth small and protractile; small, fine teeth in jaws; eye large; well-developed spine on preoperculum with barbs along margin(s), sometimes one at its base; no opercular nor subopercular spine. Gill opening a small pore near top of head or on upper sides; gill membranes united to isthmus. No scales; lateral line well-developed. Usually two dorsal fins, first of 1-4 (usually 4) flexible spines, second of 6-11 rays; anal fin with 4-10 rays; last anal and dorsal rays always divided at base, other rays branched or simple. Ventral fin large, its base before base of large pectoral fin, last ray usually connected to it by a broad membrane.

A diverse family with nearly all species sexually dichromatic; 20 genera and 196 recognised species ; 16 species in three genera were obtained on the Survey.

KEY TO GENERA FOUND ON SURVEY

A. Spine and first ray of ventral fin separated from rest of fin (Fig 1) . . . . . **Dactylopus**

AA. No detached ray or spine in ventral fin . . . . . **B**

B. Gill opening near top of head; membrane behind last dorsal spine well-developed; antrorse spine at base of preopercular spine (Fig 2) . . . . . **Callionymus**

BB. Gill opening sub-lateral; membrane behind last dorsal spine small or absent; no antrorse spine at base of preopercular spine (Fig 3) . . . . . **Synchiropus**

REFERENCES: Fricke, 2001a; Fricke & Quang, 2018; Nakabo, 1987; Tea & Gill, 2016.

Callionymus meridionalis

Eye 2.7-3.3 in HL. Snout 2.5-2.9 in HL. Smooth area behind eye. First dorsal fin spine produced and filamentous (longer filament in male than females), median rays of convex caudal fin with short filaments (male). Row of brown blotches along side, cheek and breast barred dark brown. First dorsal white, with small black spots {male) or 2nd to 4th membranes completely black (female); anal fin black with narrow white margin (male) or plain white with narrow dusky margin (female); black spots over upper half of caudal fin, lower half brown.
D IV; 9. A 9. P (total)19-22.
(voucher: 108 mm SL)

Callionymus semeiophor

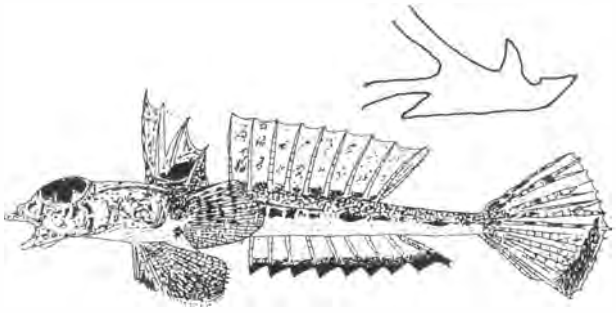
Preopercular spine with short, upcurved tip. Eye about 2.2 in HL. Snout 3.8-3.9 in HL. First dorsal high, 1st spine filamentous (male), 2nd dorsal and anal fin margins convex (male) or straight (female), convex caudal fin with 2 median rays produced into short filaments. Upper half of body pale brown, row of dark grey blotches on side; a small black spot on 1st membrane of 1st dorsal fin, and a large blotch on 2nd to 4th membrane (male), dark brown blotch on 3rd and 4th membrane (female); vertical dark streaks (male) or median dusky line (female) on 2nd dorsal; outer half of anal fin black; no distinct markings on caudal fin.
D IV; 9. A 9. P (total)19-21
(voucher: 113 mm SL)

Callionymus moretonensis

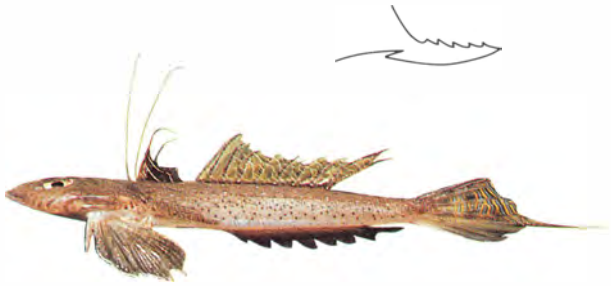
Main tip of preopercular spine about 2.5- 3 times longer than largest point on its side. Eye 2-2.5 in HL. Snout 3.1-3.7 in HL. First dorsal spine long and filamentous (adults), margin of second dorsal fin straight, median 2 rays of convex caudal fin produced into short filaments. Upper half of body fawn, white spots on back partly edged dark brown, row of brown spots along side; black blotch on 3rd membrane of 1st dorsal; second dorsal fin with a dark margin and 2 or 3 rows white spots; black margin on anal fin, broad curved black band on lower part of caudal fin.
D IV; 9. A (8)-9. P (total) 19-24.
(voucher: 88 mm SL)

Callionymus superbus

Eye 2.5-3.5 in HL. Snout 2.4-2.7 in HL. Caudal fin long, median rays produced into filaments, fin length subequal to body length (male); shorter, not filamentous (female), 1st to 3rd dorsal spines filamentous (male); 1st and 2nd membrane of 1st dorsal fin alternately banded white and dark (male); with a distal black blotch on 3rd membrane (female), dark brown margin on anal, broad dark brown bars across caudal fin, lower fin dark.
D IV; 9. A 8. P (total)18-20.
(voucher: 88 mm SL)



Callionymus whiteheadi from Ficke



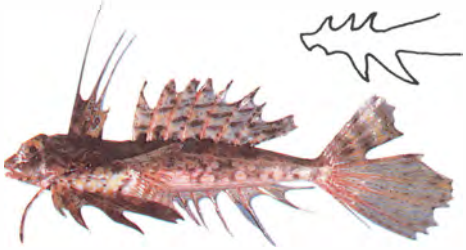
Callionymus filamentosus

Callionymus goodladi

Callionymus grossi

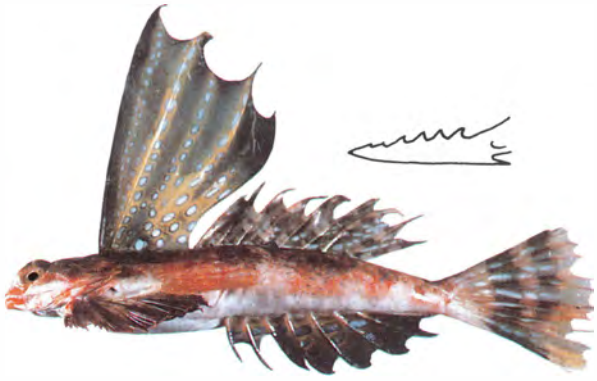
Callionymus australis

Callionymus japonicus



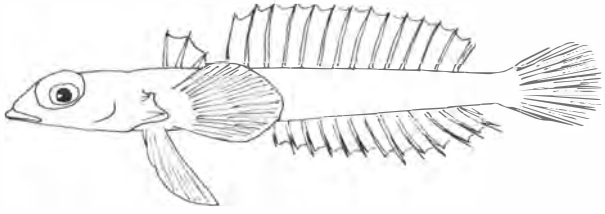
Dactylopus dactylopus

Synchiropus altivelis



Synchiropus rameus

DRACONETTIDAE



Centrodraco rubellus

Callionymus whiteheadi

Eye 2.2-2.3 in HL. Snout 3.8-4.1 in HL. Second dorsal and anal fin margins straight; caudal fin convex, without filaments. Upper half of body marbled olive green; large black-edged white spots on operculum, dark patch on upper pectoral base, black blotches in row along side; large black blotch on 3rd membrane of 1st dorsal fin, basal row of black spots on 2nd dorsal, black margin on anal fin, lower part of caudal fin blackish distally.
D IV; 9. A 9. P (total) 18-21.

Callionymus goodladi

Preopercular spine with 7-13 serrae along inner margin. Eye 3.5-4.2 in HL. Snout 2.3-2.7 in HL. Predorsal length 3.0-3.6 in SL (from 1st dorsal); length 1st dorsal base 1.4-1.9 in HL; ventral fin length 0.8-0.9 in HL. First dorsal spine long with very long filament; rays of lower caudal fin longer than those of upper fin. Row of dark blotches along side; black blotch covering outer part of 3rd dorsal spine; dark margin on anal fin (female).
D IV; 8. A 7. P (total)19-20.

Callionymus japonicus

Preopercular spine with 6-13 serrae along inner margin. Eyes 2.6-3.5 in HL; snout 2.4-3.0 in HL; 2 rough bony patches above and behind eye. First 2 dorsal spines produced and filamentous (male), caudal fin very long, median rays produced (much more in male) but never filamentous, the fin equal to or more than body length. First dorsal with dark brown streaks, black blotch(es) on 3rd membrane, black margin on anal fin (broader in male), caudal fin crossed by dark brown bars, lower part of fin black; large black spot on breast (male).
D IV, 9. A 8. P (total)18-23.
(voucher: 155 mm SL)

Synchiropus altivelis

Eye 2.4-3.5 in HL. Snout 3.0-4.1 in HL. Gill-opening located behind or at the origin of 1st dorsal fin. Either first dorsal spine (female) or first 2 dorsal rays (male) elongated or filamentous; upper and lower halves of caudal fin usually symmetrical. Upper head and back dusky orange or rosy. Fins hyaline or pale blue, edges at least orange; about 3 rows of orange spots on soft dorsal fin and often across caudal fin.
D IV; 8. A 7. P (total) 17-22.
(voucher: ? mm SL)

Callionymus filamentosus

First dorsal spine produced into filament and detached from rest of fin (male) connected with 2nd spine and not filamentous (female); median rays of pointed caudal fin filamentous (male). Pearly and dark brown spots over upper ⅔ of body, dark bars across cheek, dusky patch on pectoral base; 2nd to 4th membranes of first dorsal black with white streaks or with some large, white-edged black ocelli (males), female with large black ocellus on 3rd membrane. Second dorsal, caudal and ventral fins spotted with brown (in males also with blue).
D IV (I + III male); 9. A 9. P (total)17-21.
(voucher: 74 mm SL)

Callionymus grossi

Preopercular spine with 7-18 serrae along inner margin. Eye 2.6-4.1 in HL. Snout 2.4-3.4 in HL. Predorsal length 3.8-4.9 in SL (from 1st dorsal); length of 1st dorsal base 0.8-0.9 in HL. High 1st dorsal fin, 1st spine with long filament (both sexes); rays of lower caudal fin longer than those of upper fin. Row of dark blotches along side; alternating oblique dark and white bands on 1st dorsal; anal fin plain.
D IV; 9. A 7-9. P (total)16-19.

Callionymus australis

Preopercular spine with 5-7 serrae along inner margin. Eye 2.3-3 in HL; snout 2.4-3.7 in HL; 2 rough, bony patches above and behind eye. First spine of dorsal fin elongate and filamentous (longer in male); caudal fin very long, median rays filamentous, fin 0.8-1.05 in SL (male), 1.5-2 in SL (female). Row of dark spots along side; breast with a black blotch (male); first dorsal fin with a black blotch on 3rd membrane and dark margin (female) narrow black margin on anal fin, charcoal bars and black and lower margin on caudal fin.
D IV; 9. A 8. P (total):19-21.

Dactylopus dactylopus

Eye 2.6-3.5 in HL. Snout 2.8-3.6 in HL. Spinous dorsal high, beginning before gill opening; usually all dorsal rays divided. Body olive above, marbled reddish brown and blue; soft dorsal and upper caudal fins barred with charcoal; blue-ringed ocellus on spinous dorsal membrane; ventral spotted dark blue.
D IV; 8. A 7. P(total)18-22.
(voucher: 195 mm SL)

Synchiropus rameus

Antrorse basal spine on preoperculum well-developed; 4-11 spines on dorsal main spine. Eye 2.3-3.3 in HL. Snout 3.2-3.9 in HL. Spinous dorsal fin very high; caudal fin truncate. Head and back marbled olive; side of head and body with 5 or 6 broad reddish brown crossbands; row of blue spots or dashes on spinous dorsal (vertically) and anal fins, 2 distinct dark crossbands on caudal fin which is not filamentous in males.
D IV; 8. A 7. P (total) 18-21.
(voucher: 110 mm SL)

DRACONETTIDAE

Slope Dragonets -

Small, elongate and rounded. No scales but grooved lateral line. Snout pointed and eye large; strong spine on operculum and preoperculum. Two dorsal fins, first with 3 spines. All but last dorsal and anal rays simple.

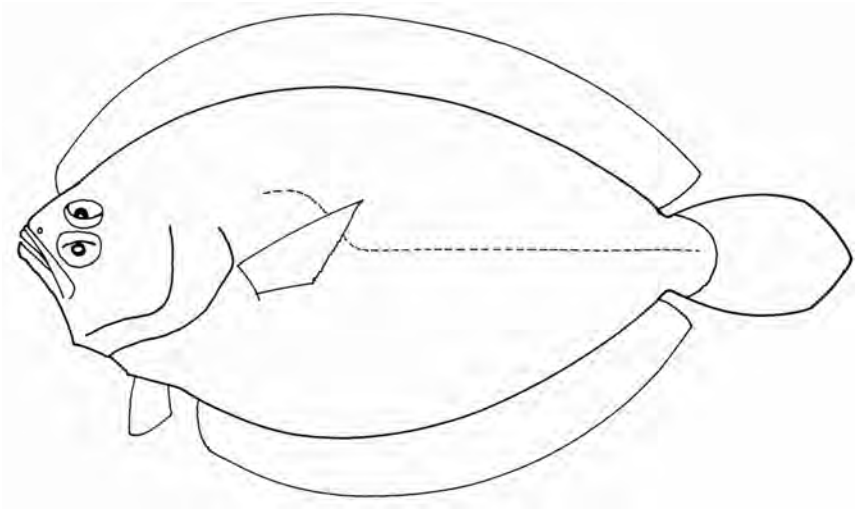
The family comprises two genera and 15 species.

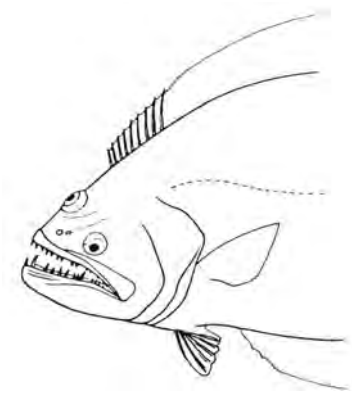
REFERENCE: Fricke, 1992; Fricke, 2001b.

Centrodraco rubellus

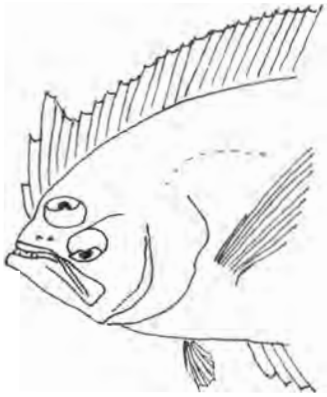
Body pink with yellow blotches; dark spots and lines on body, notably on caudal peduncle and near pectoral fin; dark streak along upper caudal fin rays. First dorsal spine strong and sharp, filamentous in males; second dorsal fin rays lack filaments
D III, 13-15. A 13-14. P 26.
(voucher: 98 mm SL)

PLEURONECTIFORMES

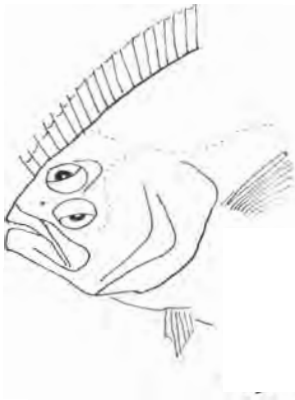




PSETTODIDAE
Six elements i ventral fin (1 spine, 5 rays); dorsal fin begins behind head; anterior dorsal and anal rays spinous; eyes on right or left sides.



CITHARIDAE
Six elements in ventral fin (1 spine, 5 rays); dorsal fin begins above eyes; no spinous rays in dorsal and anal fins; eyes on right or left sides; anus opens on eyed side.



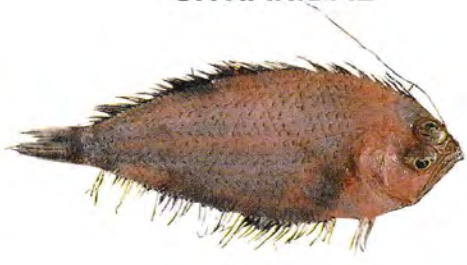
PARALICHTHYIDAE
Eyes on left side; preoperculum margin visible; chin prominent; ventral fins short-based and symmetrically placed on either side of midventral line; lateral line present below lower eye and a supratemporal branch, running upward to anterior part of dorsal fin.

BOTHIDAE
Eyes on left side; preoperculum margin visible; chin prominent; ventral fin of blind side above midventral line.

PSETTODIDAE

Psettodes erumei

CITHARIDAE



Branchypleura novaezeelandiae

PLEURONECTIFORMES

Flatfishes - Order

Soles; Flounders; Halibut - Kalankan;

A distinct group of fishes in which the adults are not bilaterally symmetrical, as an adaptation to life close to the bottom. Young flatfishes have normal symmetrical form and swim upright, an eye on each side of the head. Early in development one eye migrates across the nape to lie next to the eye on the other side and the dorsal fin moves further forward onto the head (not in *Psettodes*). The fish then lies and swims on the eyeless (blind) side which usually lacks pigment; eyed side is pigmented with colours that blend with the fish's surroundings. Flatfishes are grouped into dextral (both eyes on right hand side of body) or sinistral (both eyes on left hand side of body). though some species exhibit both aspects. Body oval and strongly compressed. Head asymmetrical, mouth usually protractile; teeth small, sometimes lacking or present only on blind side, sometimes strong and sharp; preoperculum edge free or concealed; operculum well-developed; gill opening wide. Scales of various types, lateral line well-developed and sometimes more than one. Dorsal and anal fins long, free from or continuous with caudal fin; pectoral fins often unequally developed, sometimes rudimentary or absent; ventral fins variously developed or unequal, united with each other; urinogenital papilla on anal fin. Except in PSETTODIDAE and CITHARIDAE, all fins lack spines. Sometimes there are spines on head or pectoral rays may be extended in males.

About 13 recognised families, of which nine recorded on this Survey.

REFERENCES:

Bothidae - Amaoka & Arai, 1998; Amaoka & Ho, 2019; Hensley & Amaoka, 2001; Hensley, 2005; Norman, 1934; Voronina et al, 2020.

Citharidae - Hensley, 2001b.

Cynoglossidae - Chapleau & Renaud, 1993; Chapleau, Renaud & Kailola, 1991; Endo & Sakaji, 2008; Menon, 1977; Munroe, 2001b; Wang, Munroe & Kong, 2018; Yokogawa, Endo & Sakai, 2008.

Paralichthyidae - Amaoka & Hensley, 2001; Hensley & Amaoka, 2001.

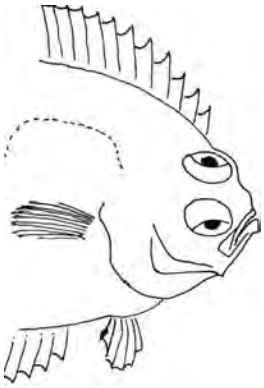
Poecilopsettidae - Allan & Swainston, 1988; Hensley, 2001c.

Psettodidae - Hensley, 2001a.

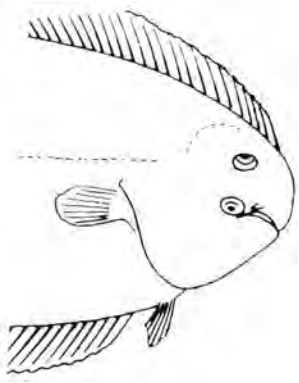
Rhombosoleidae - Allan & Swainston, 1988; Sakamoto, 1984.

Samaridae - Hensley, 2001c; Nelson, 1994.

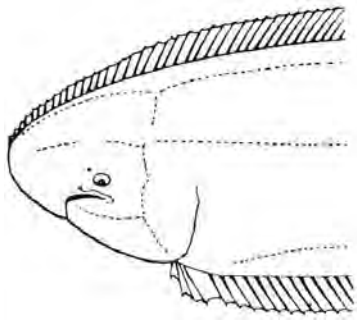
Soleidae - Allan & Swainston, 1988; Munroe, 2001a; Randall & Desoutter-Meniger, 2007; Randall & Johnson, 2007a.



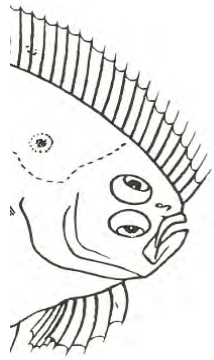
POECILOPSETTIDAE
Eyes on right side; preoperculum margin visible; chin usually prominent.



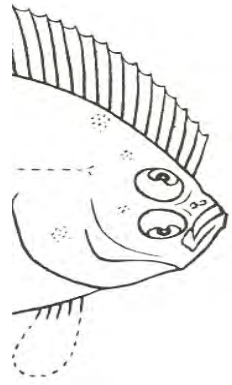
SOLEIDAE
Eyes on right side; preoperculum margin hidden by skin and scales; chin not prominent.



CYNOGLOSSIDAE
Eyes on left side; preoperculum margin hidden by skin and scales; chin not prominent.



RHOMBOSOLEIDAE
Eyes on right side; asymmetrical pelvic fins.



SAMARIDAE
Origin of dorsal fin in front of eyes; lateral line well developed or rudimentary; pelvic fins symmetrical; postcleithra absent.

PSETTODIDAE

Psettodes erumei

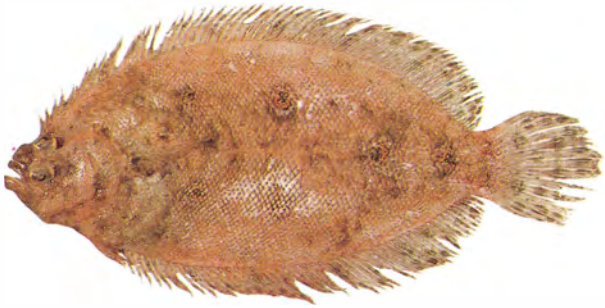
Eyed side plain brown or dark green, sometimes with broad crossbands and scattered white spots. White edge on caudal fin. Mouth large, teeth strong. Upper eye near dorsal profile and in front of lower eye. Caudal fin wedge-shaped.
D 49-56. A 34-44.
(voucher: 225 mm SL)

CITHARIDAE

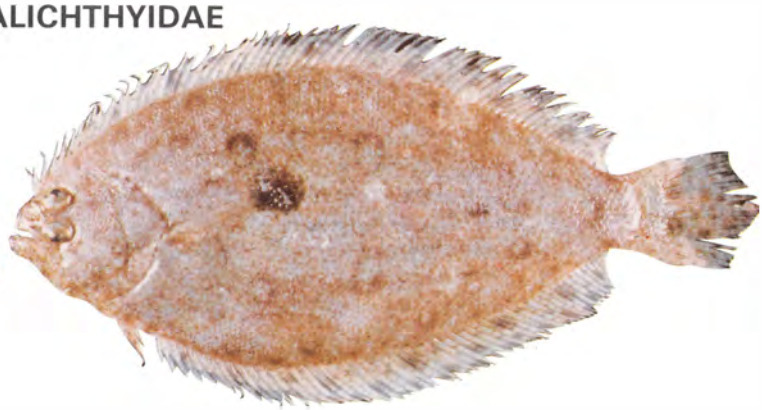
Brachypleura novaezeelandiae

Eyed side mottled pale brown with about 3 rows of dark near fin bases, small dark spots on fins. Mouth large, maxilla 1.8-2 in HL: gill rakers long. Scales easily lost, none on front third of head; lateral line distinctly curved above pectoral fin. Anterior dorsal fin rays filamentous in male; both ventral fins short based, that of eyed side well before ventral fin on blind side.
D 65-74. A 41-49. L. lat . 29-25. C 13-14 branched rays.
(voucher: 80 mm SL)

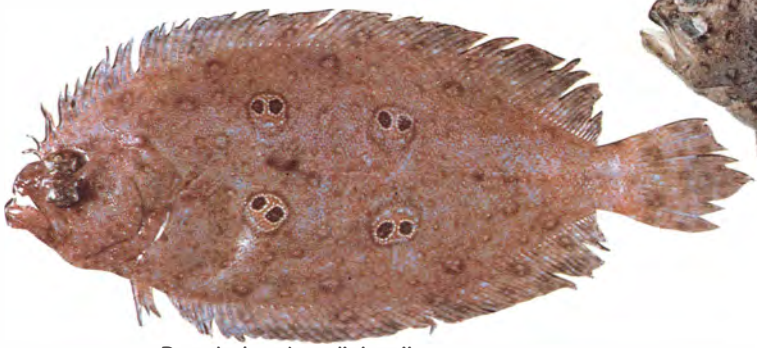
PARALICHTHYIDAE



Pseudorhombus argus

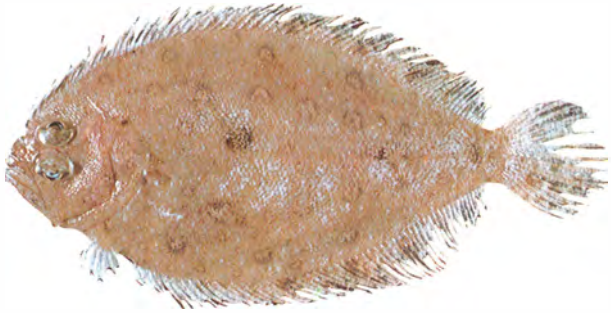


Pseudorhombus arsius

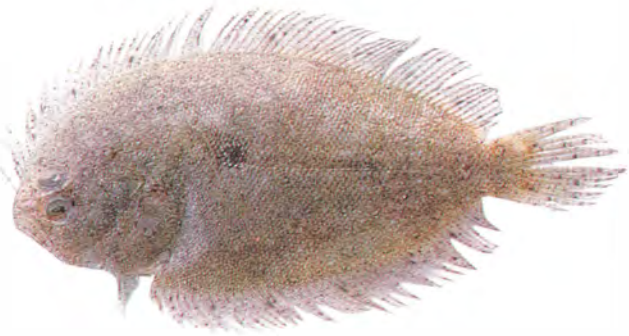


Pseudorhombus diplospilus

Pseudorhombus dupliciocellatus



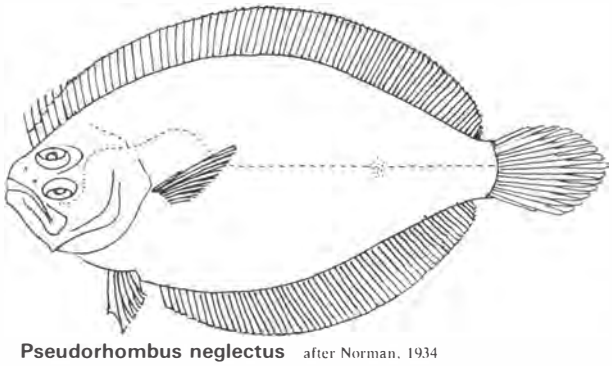
Pseudorhombus elevatus



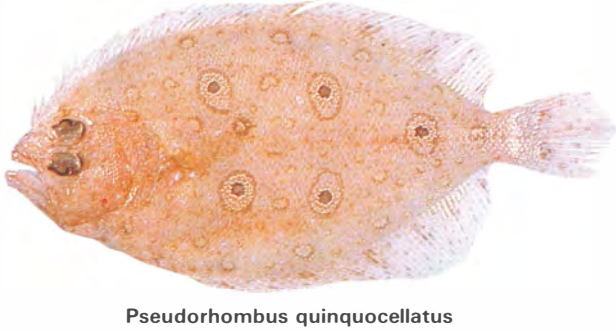
Pseudorhombus javanicus

Pseudorhombus jenynsii

Pseudorhombus malayanus



Pseudorhombus neglectus after Norman, 1934



Pseudorhombus quinquocellatus

PARALICHTHYIDAE

Pseudorhombus argus

Five black double ocelli on body, ringed with yellow spots - 2 above, 2 below, 1 posteriorly on lateral line. Teeth small, close together; eye 4-4.5 in HL. Dorsal fin begins behind nostrils (blind side) or above or slightly before front of eye (eyed side).
D 68-69. A 51-54. Lower GR 10-16, (slender).
(voucher: 220 mm SL)

Pseudorhombus diplospilus

Body brown, large double black ocelli on body ringed with yellow spots - 2 above and 2 below lateral line. Two dark spots on proximal part of caudal fin. Dorsal fin begins just behind posterior nostril (blind side); head profile notched; 4-10 strong canine teeth anteriorly in both jaws; gill rakers short, broad and with spiny margins. Body depth 2.4-2.6 in SL. Scales ctenoid on eyed side, cycloid on blind side.
D 75-79. A 59-64. L. lat. 82-98.
(voucher: 231 mm SL)

Pseudorhombus elevatus

Four to 5 rows of dark rings along body; large dark blotch on lateral line at beginning of straight part, sometimes 1 or 2 more on line posteriorly; unpaired fins with regularly-spaced dark blotches. Dorsal fin begins above or in front of front nostril (blind side); a notch in head profile before eyes; teeth small; body depth 1.7-2 in SL. All scales ctenoid on eyed side.
D 66-76. A 51-58.
(voucher: 115 mm SL)

Pseudorhombus jenynsii

Five or 6 black double or single ocelli on body, densely ringed with yellow spots - 2 above, 2 below, 1 or 2 posteriorly on lateral line. Dorsal fin begins behind nostrils (blind side), and above or just before anterior eye (eyed side); notch before upper eye. Teeth small, close together; eye 4.3-6.8 in HL.
D 67-74. A 51-60. Lower Gr 7-10, (short and broad).
(voucher: 270 mm SL)

Pseudorhombus neglectus

Pale brown, finely spotted dark brown; 2 white-ringed dark blotches on lateral line - one at beginning of straight part and one in middle of straight part. Dorsal fin begins just before upper eyed (eyed side), behind nostrils (blind side); teeth small; upper head profile almost straight. Eye 3.7-4.2 in SL. Scales cycloid on blind side, ctenoid on eyed side. Depth 1.9-2.1.
D 72-75, A 56-59. Lower GR 9-12, (short and broad).
(voucher: ? mm SL)

Pseudorhombus arsius

Brown with dark spots and rings; large dark blotch on lateral line at beginning of straight part, sometimes 1 or 2 smaller blotches on line posteriorly. Dorsal fin begins just before nostrils (blind side) or over space between nostrils; teeth strong, widely spaced, 6-13 on blind side of lower jaw; maxilla 2.2-2.6 in HL.
D 72-80. A 54-62. L. lat. 67-80. Lower GR 8-15.
(voucher: 270 mm SL)

Pseudorhombus dupliciocellatus

Large double black ocelli on body ringed with yellow spots and black ring - 2 above, 2 below and 1 on lateral line posteriorly, sometimes last one missing or first one above lateral line missing; regular series of dark spots on vertical fins. Dorsal fin begins above posterior nostril (blind side); head profile notched; 13-22 teeth on blind side of lower jaw (not caniniform); gill rakers short, broad, with spiny margins. Body depth 2-2.4 in SL.
D 73-78. A 56-63. L. lat. 73-84.
(voucher: 230 mm SL)

Pseudorhombus javanicus

Brown body and fins ringed and finely spotted dark brown; round black blotch ringed with white spots at beginning of straight part of lateral line, sometimes another on line posteriorly. Dorsal fin begins before nostrils (blind side); upper head profile evenly convex; teeth small; cycloid scales posteriorly on eyed side; ctenoid scales anteriorly. Body depth 2.1-2.4 in SL.
D 69-76. A 50-56.
(voucher: 108 mm SL)

Pseudorhombus malayanus

Body plain brown; dark blotch at beginning of straight part of lateral line. Body depth 1.7-2 in SL; head 3.1-3.3 in SL; eye 3.8-6.4 in HL. Body scales ctenoid on both sides.
D 72-74. A 58-59. L. lat. 70-78.
(voucher: 180 mm SL)

Pseudorhombus quinquocellatus

Five dark brown single ocelli on body, ringed with yellow spots and brown line - 2 above, 2 below, 1 posteriorly on lateral line. Teeth strong, widely spaced, 12-14 on blind side of lower jaw. Strong canine teeth anteriorly in both jaws. Caudal peduncle twice longer than deep. Dorsal fin begins above nostrils (blind side) and before upper eye (eyed side). Sharp spine projects horizontally before anal fin origin. HL 3-3.3 in SL.
D 68-73. A 52-56.
(voucher: 140 mm SL)

Pseudorhombus spinosus

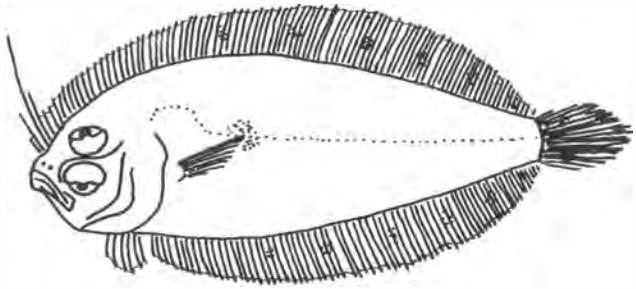
Pseudorhombus triocellatus

Pseudorhombus megalops

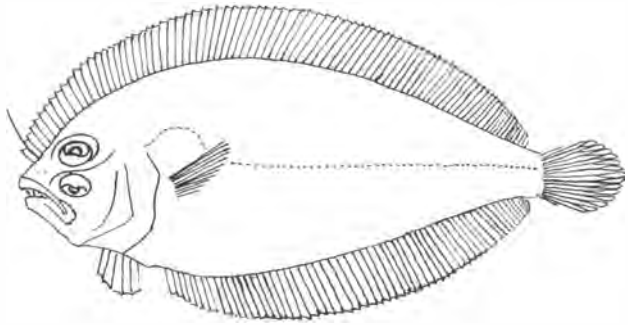
BOTHIDAE

Arnoglossus dalgleishi

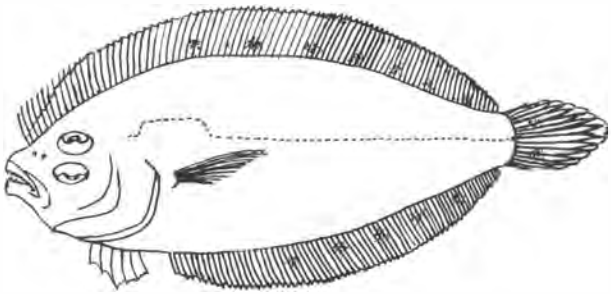
Arnoglossus debilis



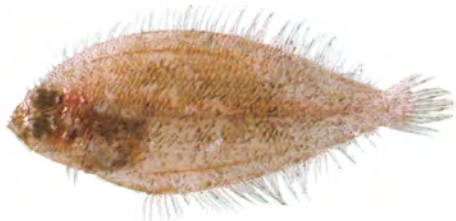
Arnoglossus elongatus after Norman, 1934



Arnoglossus japonicus after Norman, 1934



Arnoglossus polyspilus after Norman, 1934



Arnoglossus waitei

Asterorhombus intermedius

Bothus myriaster

Pseudorhombus spinosus

Body fawn; three large black ocelli on body, ringed yellow - 1 above and 2 below lateral line. Fins speckled brown. Dorsal fin begins before nostrils (blind side); head profile evenly convex above eyes (no notch); gill rakers short, broad, with spiny margins.
D 72-76. A 57. L. lat. 75-83.
(voucher: 170 mm SL)

Pseudorhombus triocellatus

Three large black ocelli on body, ringed cream and black - one above, one below, one on lateral line posteriorly (triangularly arranged). Body deep, depth 1.4-1.6 in SL. Anterior dorsal fin rays long and free from membrane, longest ½ to ⅔ HL. Scales mostly cycloid on blind side.
D 65-70. A 49-52. Lower GR 20-25, slender. L. lat. 63-69.
(voucher: ? mm SL)

Pseudorhombus megalops

Dark blotches and fine spots over tan or brown body and fins and about 5 rows of black or brown rings along body; a yellow-edged black ocellus on ventral fin of eyed side. Ctenoid scales on blind side. Dorsal fin begins above or before nostrils (blind side); teeth moderately strong, 12-18 on blind side of lower jaw; maxilla 2.1-2.3 in HL, reaches to below middle of eye; eye 3.4-3.9 in HL; head 3.2 in SL; body depth 2.1-2.2 in SL. Caudal peduncle twice longer than deep. Sharp spine projects horizontally before anal fin origin.
D 67-70. A 50-54. L. lat. 74-76. Lower GR 16.
(voucher: 133 mm SL)

BOTHIDAE

Arnoglossus dalgleishi

Eyes separated by bony ridge; lower jaw teeth strong and widely spaced, front teeth of upper jaw larger than those at sides; maxilla long, twice in HL and reaching hind part of lower eye. Body depth 2.4-2.8 in SL; eye 3.9-4.4 in HL. Scales feebly ctenoid on eyed side. Body grey-brown, dark spots on dorsal, anal and caudal fins.
D 99-108. A 77-83. L. lat. 63-86. Lower GR 9, (slender).
(voucher: ? mm SL)

Arnoglossus elongatus

Eyes separated by bony ridge; lateral teeth of both jaws small, close together, front teeth of upper jaw only slightly larger; maxilla 2.2-2.5 in HL; body depth 2.7-3 in SL; eye 3-3.1 in HL. Second to 4th dorsal fin rays may be produced. Body fawn, dark spots on body and fins; sometimes a blotch on straight part of lateral line anteriorly.
D 100-108. A 78-83. L. lat. 64-66. Lower GR 8-9, slender.
(voucher: 81 mm SL)

Arnoglossus polyspilus

Eyes separated by bony ridge; lower jaw teeth strong and spaced, front teeth of upper jaw larger than those at sides; maxilla 2.3-2.6 in HL; eye 3.2-4 in HL; body depth 2.4-2.9 in SL. Scales on eyed side feebly ctenoid. Body fawn; row of dark brown blotches on dorsal and anal fins, two blotches on caudal fin base.
D 101-114. A 80-89. L. lat. 70-75. Lower GR 8-9, (slender).

Asterorhombus intermedius

Interorbital narrow and convex, ¼ to ⅓ eye diameter; gill rakers short and broad with spiny margins; body depth 2-2.4 in SL. Scales feebly ctenoid on eyed side. First dorsal fin ray thicker and slightly longer than following rays. About 5 rows of dark brown blotches along body; fins with many dark brown spots.
D 77-86. A 56-64. L. lat. 45-50. Lower GR 7-9.
(voucher: 100 mm SL)

Arnoglossus debilis

Eyes separated by bony ridge; lower jaw teeth strong and spaced, front teeth of upper jaw larger than those at sides; upper and lower body profiles evenly convex (no "hump" behind eyes); eye 3.4-3.5 in HL. Scales cycloid on eyed side. Dark olive-brown, fins and body marbled and spotted darker.
D 112-115. A 90-95. L. lat. 87-98. Lower GR 10-11, (slender).
(voucher: 144 mm SL)

Arnoglossus japonicus

Eyes separated by bony ridge; lower jaw teeth strong and spaced, front teeth of upper jaw larger than those at sides; maxilla reaches to below middle of eye, 2-2.2 in HL. Scales cycloid on eyed side. Brown fins and body mottled and spotted darker.
D 97-99. A 74-83. L. lat. 63-64. Lower GR 7-8, short and pointed.

Arnoglossus waitei

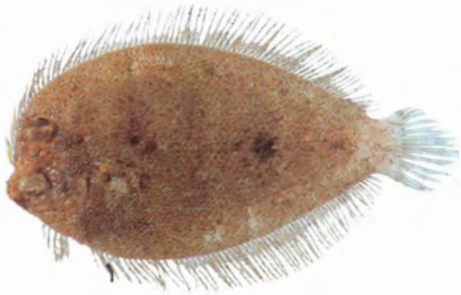
Eyes separated by bony ridge; lateral teeth of both jaws small, close together, front teeth of upper jaw only slightly larger; maxilla 2.6-3.3 in HL; eye 2.8-3.4 in HL; body depth 2.2-2.5 in SL. Scales on eyed side cycloid or feebly ctenoid. Body brown, mottled; dark spots on dorsal, anal and caudal fins, sometimes a dark bar or 2 dark blotches near base of caudal fin.
D 95-107. A 74-81. L. lat. 49-54. Lower GR 7-9, (slender).
(voucher: 83 mm SL)

Bothus myriaster

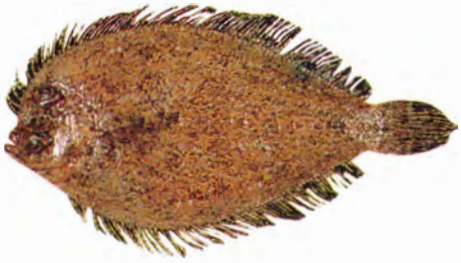
Interorbital concave and very broad, twice eye diameter; lower eye well before upper eye; (male with spine on snout and chin and pectoral fin rays produced); maxilla 3.8 in HL. Scales on eyed side cycloid (ctenoid at edges), none on membrane between operculum and pectoral fin base. Body pale or dark brown with scattered spots; 2 dark blotches on straight part of lateral line, pale band across mid caudal fin. Blind side white anteriorly, barred across middle, dark brown posteriorly.
D 87-97. A 61-73. L. lat. 104. Lower GR 6.
(voucher: 144 mm SL)

Bothus pantherinus

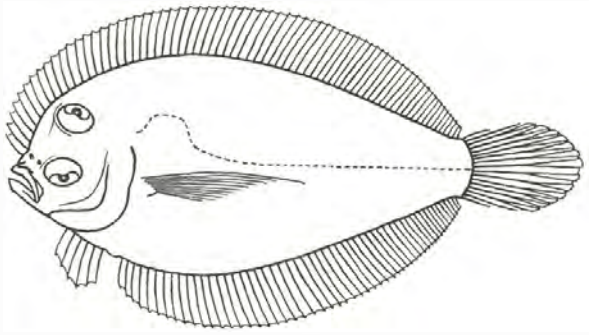
Chascanopsetta lugubris



Crossorhombus azureus



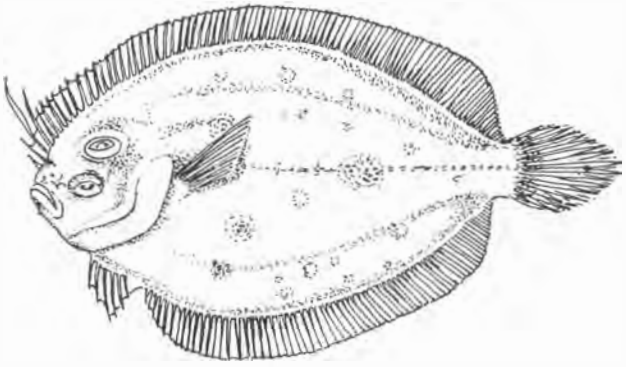
Engyprosopon grandisquama



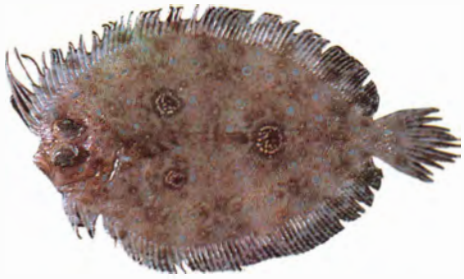
Engyprosopon maldivense after Norman, 1934

Engyprosopon latifrons

Engyprosopon osculus



Grammatobothus pennatus after Norman, 1926



Grammatobothus polyophthalmus

Kamoharaia megastoma

Bothus pantherinus

Interorbital concave and broad, equal to or slightly less than eye diameter; lower eye well before upper eye; (male with one or more spines on snout); maxilla 2.8-3.3 in HL. Scales on eyed side ctenoid, none on membrane between operculum and pectoral fin base. First ray of ventral fin of eyed side below anterior half of lower eye; upper pectoral fin rays elongate in males. Either tan or dark brown, body covered with spots and rings; at least one large dark blotch on middle of straight part of lateral line. D 84-97. A 61-73. L. lat. 74-90. Lower GR 6-8.
(voucher: 129 mm SL)

Crossorhombus azureus

Interorbital concave, equal to or slightly less than eye diameter; (male with one or more spines on snout); maxilla 3.6-4.1 in HL. Scales on eyed side with strong, elongate ctenii, scales also covering completely membrane between operculum and pectoral fin base. First ray of ventral fin of eyed side below anterior half of lower eye. Body and fins spotted olive, orange and brown, one or more dark brown blotches on lateral line; anterior edge of dorsal fin bright orange-yellow; caudal fin margin often dark brown.
D 84-92. A 64-74. P 11-14 (upper ray never produced). L. lat. 52-62.
(voucher: 112 mm SL)

Engyprosopon maldivense

Interorbital concave, less than eye diameter; eye 3 in HL; maxilla small, 2.4-2.6 in HL. Pectoral fin on eyed side as long as head, upper ray produced in males. Scales on eyed side feebly ctenoid, also completely covering membrane between operculum and pectoral fin base. Body pale brown and lightly spotted; fins plain.
D 70-76. A 53-58. L. lat. About 40. Lower GR 8-9.
(voucher: 87 mm SL)

Engyprosopon osculus

Interorbital concave, ¼ to ¾ of eye diameter (less in females); maxilla 4.0 in HL; eye 4.2 in HL. Scales on eyed side feebly ctenoid, also covering completely membrane between operculum and pectoral fin base. . First ray of ventral fin of eyed side below anterior half of lower eye; pectoral fin elongate. Body tan; many black spots over body and fins; 2 conspicuous black spots in middle of upper and lower caudal fin margins.
D 94-95. A 74. L. lat. 45-48. Lower GR 6-7.
(voucher: 77 mm SL)

Grammatobothus polyophthalmus

Interorbital narrow and concave; lateral line well-developed on both sides of body. Second to 10th dorsal fin rays produced, longest ⅔ to ¾ HL. Body depth 1.5-1.8 in SL. Brown with pale blue and brown spots; three large black and yellow ocelli on body forming a triangle: 2 above and below pectoral fin, another on middle of straight part of lateral line; broad dark and pale bars across pectoral fin. D 80-86. A 64-69. L. lat. 77-82.
(voucher: 219 mm SL)

Chascanopsetta lugubris

Huge mouth, upper jaw more than half HL, extending well past lower eye; all teeth small, slender and curved (not forming a continuous cutting edge); gill rakers often absent. Body slender. Dorsal fin begins on snout, anterior rays mostly free from membrane; pectoral fin 1.5-1.9 in HL. Body and fins covered with many dark brown spots.
D 111-124. A 76-88.
(voucher: 210 mm SL)

Engyprosopon grandisquama

Interorbital concave, ½ to 1½ times eye diameter (less in females); maxilla (eyed side) 2-2.5 in HL; eye 2.6-4 in HL; (male with spine on snout), an orbital spine above each eye. Body depth 1.6-1.9 in SL. Scales on eyed side feebly ctenoid, also covering membrane between operculum and pectoral fin base. First ray of ventral fin of eyed side below anterior half of lower eye. Body tan to dark brown, mottled and spotted; fine spots on dorsal and anal fins; 2 conspicuous black spots in middle of upper and lower caudal fin margins.
D 79-89. A 59-68. L. lat. 36-48. Lower GR 5-7.
(voucher: 89 mm SL)

Engyprosopon latifrons

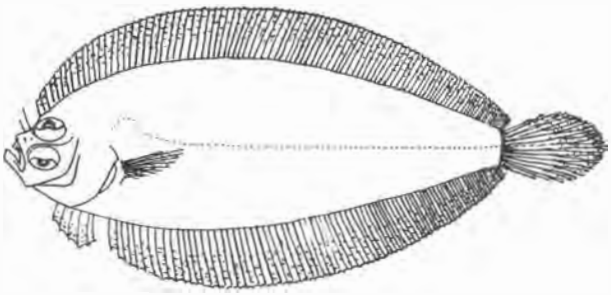
Interorbital concave, ½ to 1¼ times eye diameter (less in females); maxilla 2.4-2.8 in HL; eye 2.7-3.3 in HL; body depth 1.9-2.2 in SL; (male with spine on snout and rays of ventral fin on eyed side produced.) Scales on eyed side feebly ctenoid, also covering completely membrane between operculum and pectoral fin base. First ray of ventral fin of eyed side below anterior half of lower eye; pectoral fin elongate Body brown, dark markings on fins.
D 80-87. A 59-67. L. lat. 38-41. Lower GR 6-8, serrated.
(voucher: ? mm SL)

Grammatobothus pennatus

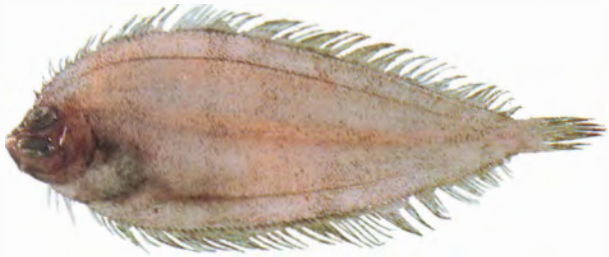
Interorbital narrow and concave; lateral line well-developed on both sides of body. Third and sometimes 4th dorsal fin rays produced and slightly thickened; upper pectoral fin ray sometimes produced. Body depth 1.8-2 in SL. Pale brown with scattered brown spots; large dark brown ocellus on middle of straight part of lateral line, 2 others above and below pectoral fin, the three of them forming a triangle. Fins blotched and marked dark brown, pectoral fin barred.
D 87-91. A 71-76. L. lat. 79-84

Kamoharaia megastoma

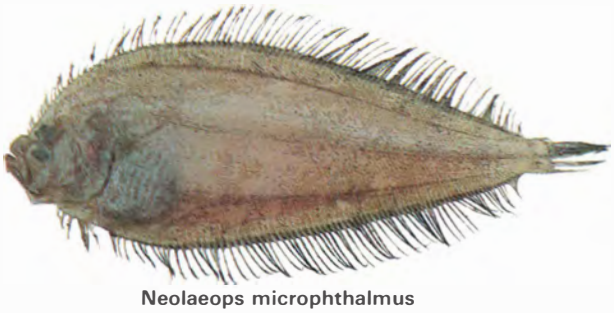
Huge mouth, lower jaw much longer than HL; 8-10 strong curved teeth at tip (symphysis) of each jaw, posterior jaw teeth forming an unbroken cutting edge, gill rakers short Dorsal fin begins on snout, rays of dorsal and anal fins long, anterior dorsal fin rays mostly free from membrane; pectoral fin equal to HL. Four or 5 rows of dark blotches along brown body.
D 109-112. A 84-86.



Laeops guentheri after Norman. 1934

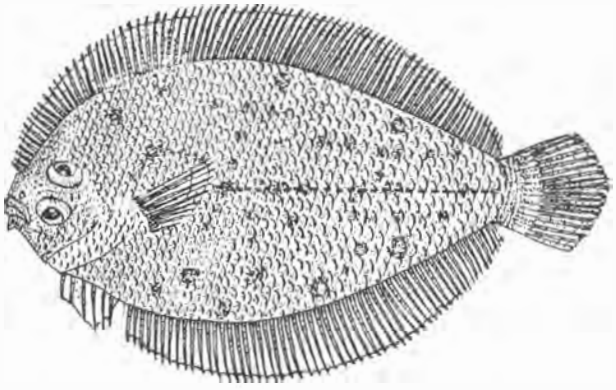


Laeops parviceps

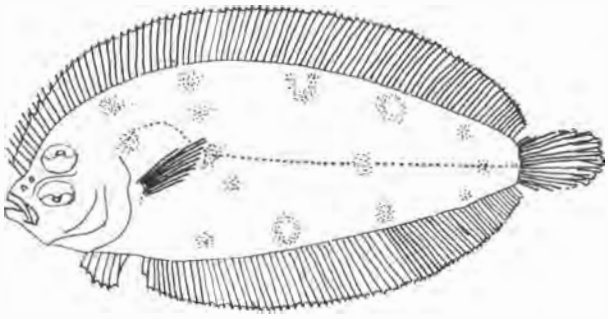


Neolaeops microphthalmus

Parabothus kiensis



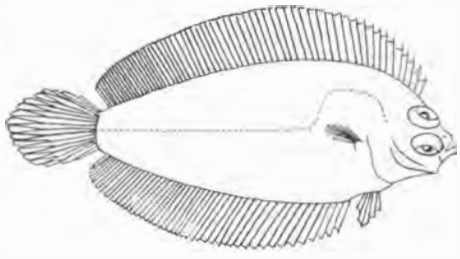
Psettina gigantea after ,Amaoka, 1963



Psettina iijimae after Norman. 1934

POECILOPSETTIDAE

Poecilopsetta colorata



Poecilopsetta praelonga after Norman. 1934

RHOMBOSOLEIDAE

Psammodiscus ocellatus

Laeops guentheri

Mouth small, maxilla almost reaching front border of eye, 4.1-4.6 in HL; fine teeth present only on blind side of both jaws. Upper body profile a little convex behind eyes; body depth 2.5-3 in SL; head 4.4-5 in SL. First two dorsal fin rays slightly separated from rest of fin; pectoral fin much less than HL. Plain brown, fin edges darker.
D 97-102. A 77-84. Lower GR 6-9.
(voucher: 91 mm SL)

Neolaeops microphthalmus

Eyes separated by bony ridge; lower jaw teeth strong and spaced, front teeth of upper jaw more widely spaced. Upper body profile strongly convex from before eyes, which are 4-5.3 in HL. HL 4.6-5.7 in SL. Scales cycloid on eyed side. Body plain olive-brown, fins darker.
D 106-110. A 83-87. L. lat. 85-110. Lower GR 8-10, (short and pointed).
(voucher: 157 mm SL)

Psettina gigantea

Eyes separated by bony ridge. Interorbital very narrow, scaled, much less than eye diameter; maxilla 2.9-3.2 in HL; eye 3.2 in HL; head 3.3-4.3 in SL. Scales on eyed side with elongate ctenii. Body grey-brown, with scattered spots on body, also along upper and lower margins of body; fine spots on fins.
D 90-103. A 72-83. P 9-11, blind side. L. lat. 56-62. Lower GR 6-8.

Laeops parviceps

Mouth small, maxilla ending opposite front eye border, 3.8-4.4 in HL; fine teeth present only on blind side of both jaws. Upper body profile nearly straight behind eyes; body depth 2.6 in SL; head 5.2-5.3 in SL. First two dorsal fin rays slightly separated from rest of fin; pectoral fin much less than HL. Plain brown, fin edges darker; first two dorsal fin rays white.
D 95-104. A 83-86. Lower GR 6-9.
(voucher: 99 mm SL)

Parabothus kiensis

Interorbital concave, much less than eye diameter; maxilla 2.9-3.1 in HL; lower eye slightly to considerably before upper eye; scales on eyed side ctenoid, only partly covering membrane between operculum and pectoral fin base. First ray of ventral fin of eyed side below posterior margin of lower eye, ventral fin not elongate. Body depth 2.4-2.6 in SL; head 3.4-3.5 in SL. Body fawn, 4 rows of orange spots along body; fins stippled dark brown; a dark brown line along centre of caudal fin.
D 113-116. A 89-95. L. lat. 86-92.
(voucher: 140 mm SL)

Psettina iijimae

Eyes separated by bony ridge. Interorbital very narrow and bony, much less than eye diameter; head profile distinctly notched before eyes; maxilla 2.8-3.8 in HL; eye 3-3.3 in HL; head 3.8-4.4 in SL. Scales on eyed side with elongate ctenii. Body brown with dark spots and rings, most prominent along lateral line and upper and lower body margins, extending onto fins; pectoral fin barred dark brown.
D 80-93. A 65-73. P 8-12, blind side. L. lat. 53-63. Lower GR 4-6.

POECILOPSETTIDAE

Poecilopsetta colorata

Eyes narrowly separated by a ridge, without tentacle; maxilla 3-3.8 in HL. Body depth 1.9-2.6 in SL; HL 3.3-4.2 in SL; lateral line developed only on eyed side. Dorsal fin begins above eye; both ventral fins short-based; middle rays of right pectoral fin branched. Eyed side brown, pectoral fin dark brown or with large dark spot, conspicuous black spot on upper and on lower caudal fin margins; juveniles yellow with 4 or 5 well-spaced longitudinal rows of black blotches along both sides of body.
D 56-61. A 46-50. P 8-12. L. lat. 90-105.
(voucher: 100 mm SL)

Poecilopsetta praelonga

Eyes adjacent, without tentacle; maxilla 3.4-3.7 in HL; eye 2.5-3 in HL. Body depth 3.8-4 in SL; HL 3.7-4 in SL; lateral line developed only on eyed side. Dorsal fin begins above eye on eyed side; both ventral fins short-based; all pectoral fin rays simple. Yellowish brown; fins brown, pectoral fin margin dark; juveniles yellow with 4 or 5 well-spaced longitudinal rows of black blotches along both sides of body.
D 59-65. A 50-54. P 8-10. L. lat. 90-95.

RHOMBOSOLEIDAE

Psammodiscus ocellatus

Eyed side of body freckled and marbled olive, black and green over tan background; 3-4 ocelli: 2 above anteriorly, 2 below lateral line; fins spotted like body. Lateral line equally developed on both sides of body, distinctly curved above pectoral fin on eyed side with single branch towards head. Dorsal fin begins before nostrils of blind side; ventral fin bases of unequal length, fin on eyed side longer, free from anal fin.
D 60-68. A 46-52. P 10-12. Lower GR 15-18.
(voucher: 60 mm SL)

SAMARIDAE

Samaris cristatus

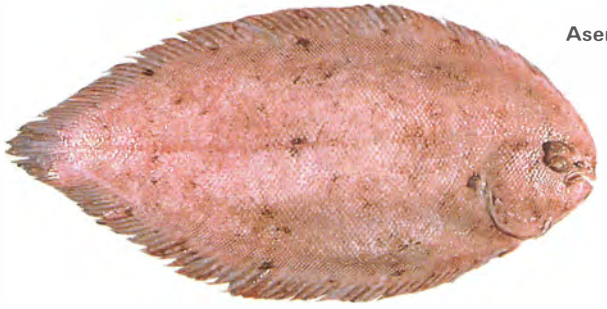
Samariscus huysmani

SOLEIDAE

Aesopia cornuta (A)

Aesopia cornuta (B)

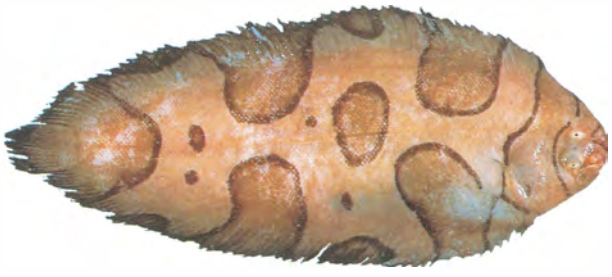
Aseraggodes cyaneus



Dexillus muelleri

Pardachirus pavoninus

Zebrias cancellatus



Brachirus annularis

Zebrias craticulus

Zebrias quagga

SAMARIDAE

Samaris cristatus

Mouth small, maxilla 2.6-3.2 in HL; straight lateral line present only on eyed side. Dorsal fin begins just before eye, its anterior 13-15 rays filamentous and long; pectoral fin long, present only on eyed side; ventral fin bases rather elongate, rays produced and tips expanded, first ray free; all caudal rays simple. Eyed side mottled pale brown with about 3 of rows dark blotches (1st and 3rd along body profiles); row of blotches along dorsal and anal fin bases, several rows across caudal fin.
D 75-85. A 49-58. L. lat. 70-80.

Samariscus huysmani

Mouth small, maxilla 2-2.5 in HL, eye 3.6-4 in HL. Body depth 2.2-2.8 in SL; HL 4-4.7 in SL; lateral line nearly straight, absent from blind side. Dorsal fin begins before eyes, rays not produced; pectoral fin slightly longer (1.1 than HL), no fin on blind side; both ventral fin bases slightly elongate, rays not produced; middle caudal fin rays branched. Eyed side grey-brown or fawn, mottled darker, row of 5 indistinct dark spots or rings along upper profile, 4 along lower; fins mottled, outer part of dusky pectoral fins dark brown.
D 68-78. A 55-59. L. lat. 70-76.
(voucher: 89 mm SL)

SOLEIDAE

Aesopia cornuta

First dorsal fin ray thickened and prolonged. Scales cycloid or feebly ctenoid, in form of short papillae on blind side of head. Dorsal and anal fins united with caudal fin; pectoral fin very short and broad; ventral fin free from anal fin. Body and fins pale orange, crossed by 13-dark brown bands which may be divided; banded caudal fin yellow.
D 1 + 68-79. A 55-64
(voucher: (A) 150 mm SL. (B) 130 mm SL)

Dexillus muelleri

Scales ctenoid, in form of short papillae on blind side of head, in honeycomb pattern; eyes contiguous; lower lip fringed. Dorsal and anal fins united with caudal fin; pectoral fins short, right fin longer than left one, ventral fin free from anal fin. Body depth 1.8-1.9 in SL. Body plain brown, scattered with clumps of dark brown filaments; unpaired fins mottled brown, right pectoral fin black.
D 61-70. A 48-57.
(voucher: 230 mm SL)

Zebrias cancellatus

Scales ctenoid; papillae on blind side of head; eye close together, interorbital naked. Dorsal and anal fins united with caudal fin; membrane between anterior dorsal rays only slightly emarginate; pectoral fin short and broad, ventral fin free from anal fin. Fawn body and fins crossed by 14-19 dark brown single or double bands which tend to curve posteriorly; fin margins white.
D 71-81. A 64-70. L. lat. 110-130.
(voucher: 230 mm SL)

Zebrias craticulus

Scales strongly ctenoid, short papillae on blind side of head. Eyes close together; interorbital scaleless. Dorsal and anal fins united with caudal fin, first 2-4 rays of dorsal almost free of fin membrane; pectoral fin short and broad; ventral fin free from anal fin. Fawn body and fins crossed by 20-25 dark-edged brown bands, narrower on head; pale space between bands often with dark line or row of spots.
D 73-79. A 62-68. L. lat. 86-90.
(voucher: 130 mm SL)

Aseraggodes cyaneus

Eyes separated, upper eye slightly before the lower one; scales ctenoid; low papillae on blind side of head. Dorsal and anal fins free from caudal fin; pectoral fins absent; both ventral fins free from anal fin, their bases short and symmetrical. Body and fins plain dark brown with 3 rows of indistinct darker blotches along body,
D 73-82. A 53-57. L. lat. 73-80.
(voucher: 83 mm SL)

Pardachirus pavoninus

Eyes separated by scaled interorbital; scales feebly ctenoid. Dorsal and anal fins free from caudal fin; an open pore at base of each dorsal and anal ray. No pectoral fins; ventral fin bases unequal, the right fin often joined to anal fin. Tan or reddish-brown, body and fins covered with cream spots which often have dark brown central spot and dark brown border.
D 63-71. A 49-54.
(voucher: 119 mm SL)

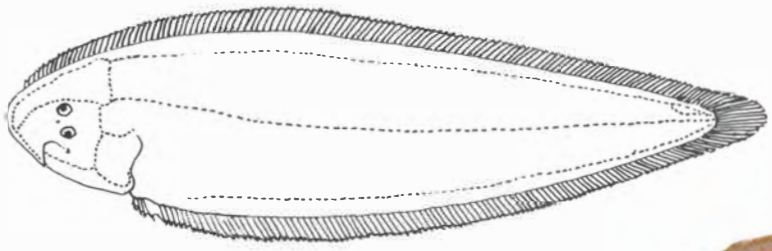
Brachirus annularis

Eyes small and separated by scaled interorbital; body scales ctenoid. Dorsal and anal fins united with caudal fin; pectoral fins small but well-developed; ventral fin free from anal fin. Body depth more than 2.5 in SL. Pale orange-fawn, with 5-7 large and 6-8 smaller fawn, brown-edged irregular patches extending over head, body and fins.
D 71. A 59.
(voucher: 130 mm SL)

Zebrias quagga

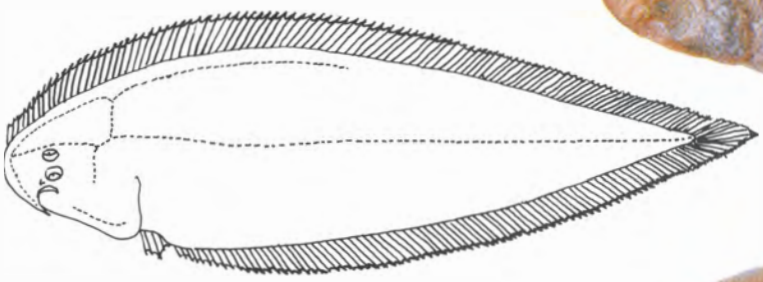
Eyes not separated, each with short tentacle on its inner margin. Scales strongly ctenoid, short papillae on blind side of snout. Dorsal and anal fins united with caudal fin; pectoral fin short and broad; ventral fin free from anal fin. Body and fins cream, crossed by 9-12 single or double brown bands which bend at body edges before continuing over fins; dark blotches on pale caudal fin.
D 60-75. A 50-62.
(voucher: 120 mm SL)

CYNOGLOSSIDAE



Cynoglossus abbreviatus after Menon. 1977

Cynoglossus arel

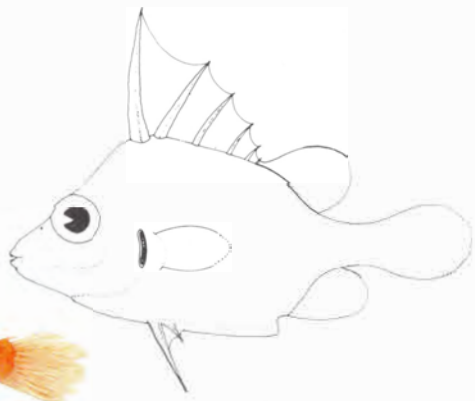


Cynoglossus kopsi after Chen & Weng. 1965

Paraplagusia longirostris

Paraplagusia bilineata

TRIACANTHODIDAE



Atrophacanthus japonicus

Halimochirurgus centriscoides

Macrorhamphosodes platycheilus

Tydemania navigatoris

Triacanthodes ethiops

CYNOGLOSSIDAE

Tonguesoles -

Cynoglossus abbreviatus

Three lateral lines on eyed side, none on blind side. Eyes separated by scaly space, and about level; corner of mouth about midway between snout tip and gill opening. Ctenoid scales on both sides of body. Body depth 4-4.7 in SL. Eyed side brown with darker brown blotches; fins dark.
Tr between upper 2 lateral lines 18-23. C 8-9

Cynoglossus kopsi

Two (or 3) lateral lines on eyed side, upper one often incomplete; none on blind side. Eyes not separated by scaly space; corner of mouth nearer snout tip than gill opening, below middle of eye. Ctenoid scales on both sides of body. Eye 5-8 in HL. Eyed side tan, mottled darker brown; fins dark.
Tr between upper 2 lateral lines 7-12. C 10.
(voucher: ? mm SL)

Paraplagusia bilineata

Lips on eyed side fringed with branched papillae. Scales ctenoid on blind side of body. Two or 3 lateral lines on eyed side. Body olive-green or brown on eyed side, sometimes with pale spots; fins fawn with narrow white margins.
Tr above 16-19 scales.
D 100-114. A 81-88.
(voucher: 270 mm SL)

Cynoglossus arel

Two lateral lines on eyed side, none on blind side. Eyes separated by narrow scaly space; corner of mouth midway between snout tip and gill opening. Scales ctenoid on eyed side, cycloid on blind side. Eyed side tan, fins brown.
C 10. L. lat. 56-70. Tr between lateral lines 7-9.
(voucher: 280 mm SL)

Paraplagusia longirostris

Lips on eyed side fringed with simple papillae. Only one nostril on eyed side. Two lateral lines on eyed side, none on blind side. Corner of mouth much nearer to gill opening than to rather pointed snout. Eyed side reddish brown, fins brown with narrow white margins.
Tr between lateral lines 15-16.
D 133-141. A 102-112.
(voucher: 258 mm SL)

TRIACANTHODIDAE

Spikefishes -

Small to moderate-sized fishes with compressed body, either moderately ovate or elongate. Mouth small, at end of short or long, tubular snout; teeth few, usually small and conical, sometimes absent; eye large; gill opening a short slit before pectoral fin base: nostrils in scaleless area before eyes. Caudal peduncle slender, deeper than wide at caudal fin base. Scales very small, each with a vertical row of spinules, skin rough to touch. First dorsal fin with 6 spines, decreasing noticeably in length posteriorly, separated or deeply notched from much shorter-based soft fin with 12-18 rays; no spines, 11-16 rays in anal fin; a prominent, strong spine and one or 2 small rays in ventral fin; caudal fin truncate to rounded.

Eleven genera in the family, single members of five obtained on the Survey.

REFERENCES: Matsuura, 2001a; Tyler, 1968.

Atrophacanthus japonicus

Snout short and blunt, always less than eye diameter; head profile straight or slightly convex. One row of teeth in jaws. First dorsal spine reaches tip of 4th when depressed, last 3 spines very short, 5th and 6th usually buried beneath skin. Body orange pink, silvery white over belly and lower head.
D_2 14. A 14.
(voucher: 48 mm SL)

Macrorhamphosodes platycheilus

Snout straight, very long and tubular; mouth usually twisted to right or left and about twice as wide as snout immediately behind it. Gill opening long, length 2-2.5 in eye diameter. Body brownish pink above, white below.
D_2 12-13. A 12-13. P 11-13.
(voucher: 95 mm SL)

Tydemania navigatoris

Snout short and blunt, slightly less than eye diameter; lips large, swollen and spongy to touch; teeth in jaws wider than thick, their tips truncated. Last 3 dorsal spines very small, usually buried beneath skin. Body dusky orange-pink above, cream below.
D_2 14-15. A 15.
(voucher: 72 mm SL)

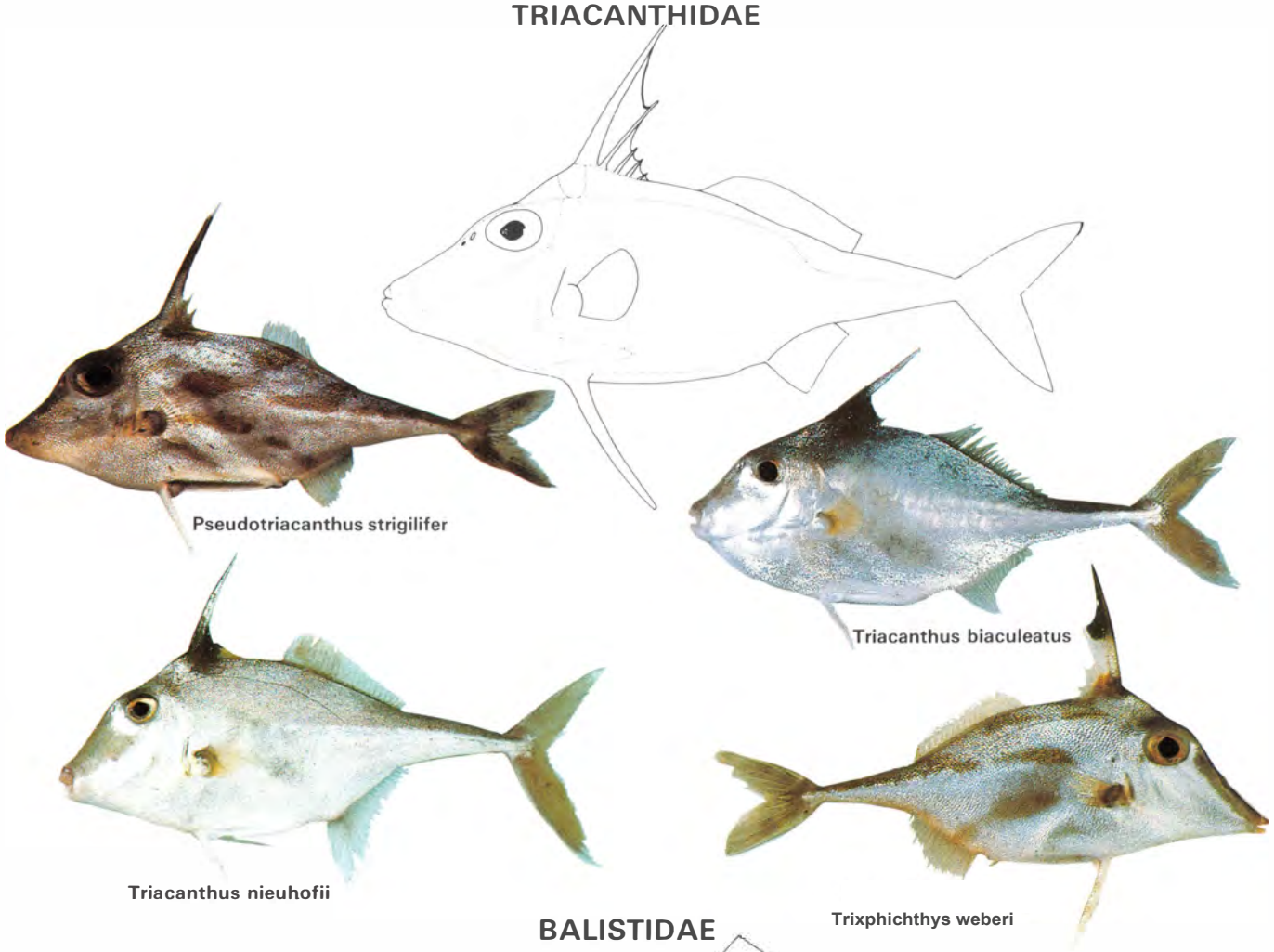
Halimochirurgus centriscoides

Snout upturned, very long and tubular; mouth not twisted, only slightly wider than snout immediately behind it. Gill opening long, length about 1.5 in eye diameter. Body rosy orange with 1 to 3 dark stripes along back.
D_2 13. A 11:-12. P 12-14.
(voucher: 119 mm SL)

Triacanthodes ethiops

Snout blunt, about equal to eye diameter; greatest length of scaleless area 3.7-5.8 in eye diameter around nostrils. Usually 2 rows of conical teeth in jaws; interorbital flat or slightly concave, body depth 1.8-2.4 in SL. Body dark pink above, silvery violet below; 3 diverging darker bands along body from eye; to end of soft dorsal base, to end of anal base, to anus.
D_2 15-16. A 14-15.
(voucher: 60 mm SL)

TRIACANTHIDAE



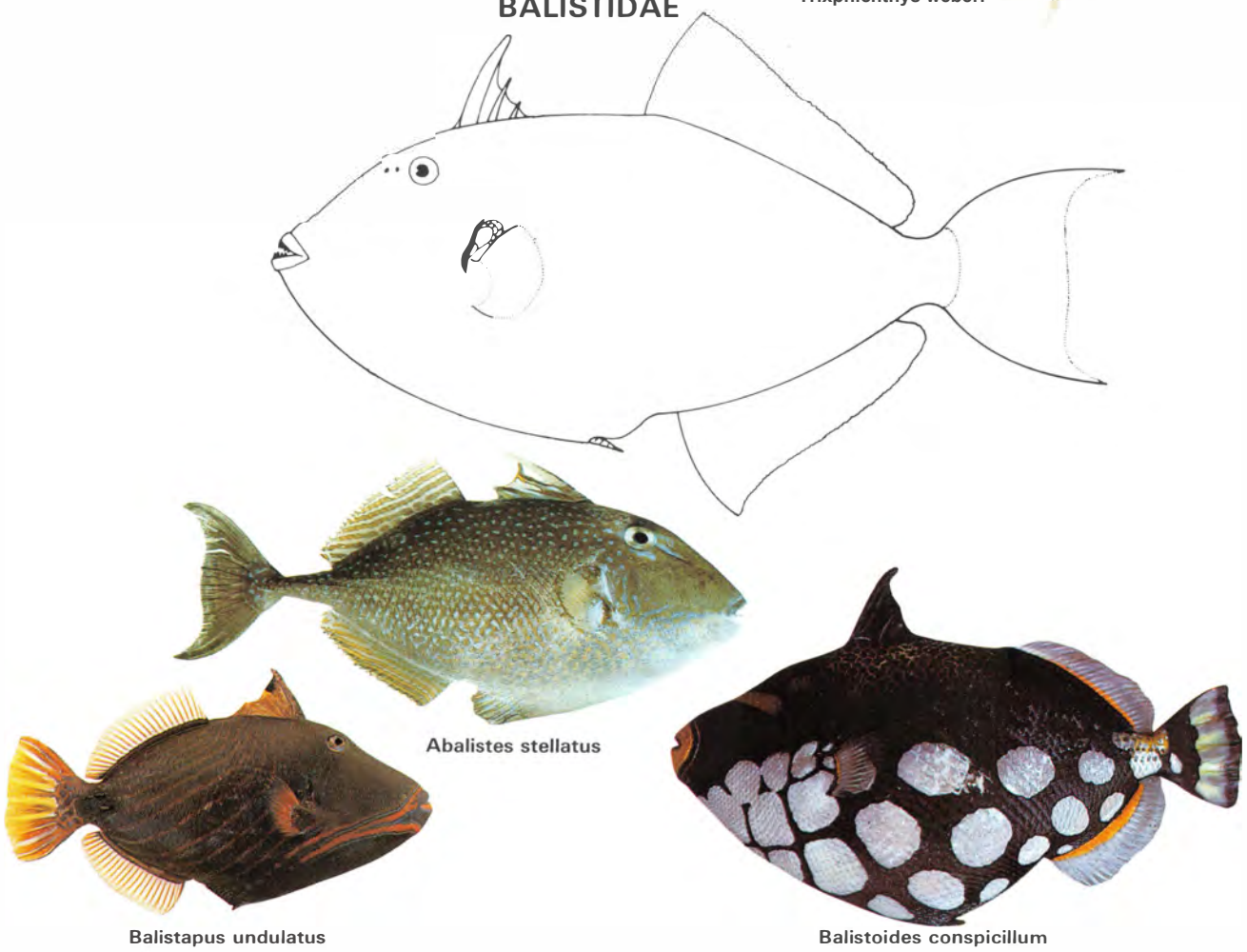
Pseudotriacanthus strigilifer

Triacanthus biaculeatus

Triacanthus nieuhofii

Trixphichthys weberi

BALISTIDAE



Abalistes stellatus

Balistapus undulatus

Balistoides conspicillum

TRIACANTHIDAE

Tripodfishes -

Moderate-sized fishes with compressed ovate body tapered posteriorly. Mouth small, snout prominent, teeth strong, in 2 rows, inner row molar-like; eye moderately large; gill opening a short slit before pectoral fin base. Caudal peduncle indented before fin base where peduncle is wider than deep. Scales very small, each with ridges, skin rough to touch. First dorsal fin with 5 spines, the first very long and strong, widely separated from much longer-based soft dorsal fin with 20-26 rays; no spines, 13-22 rays in anal fin; prominent, strong spine and one or 2 small rays in ventral fin; caudal fin deeply forked.

Four genera in the family, representatives of three wereobtained on our survey.

REFERENCES: Matsuura, 2001b; de Beaufort & Briggs, 1962.

Pseudotriacanthus strigilifer

Bony pelvis broad anteriorly between ventral fin bases, tapering to point posteriorly. Length of 2nd dorsal spine more than half length of first spine; base of anal fin 1.8-2.3 in soft dorsal fin base. Body grey, dark silvery above, pale below, oblong golden or orange blotches on sides; lower ⅓ to ½ of first dorsal fin pale, outer portion black.
D_2 20-24. A 13-17. P 12-15.
(voucher: 105 mm SL)

Triacanthus nieuhofii

Bony pelvis almost as wide anteriorly between ventral fin bases as near its rounded tip; postorbital distance 10-14 in SL; snout short, 4.9-6.4 in SL. Head profile concave above eye, convex before first dorsal fin base. Body plain silvery yellowish blue; black patch on back below first dorsal fin; membrane between first two dorsal spines black, dark brown between 2nd and 3rd spines, pale over remaining membrane and spine tips.
D_2 22-26. A 18-21. P 14-16. Total GR 14-19.
(voucher: 205 mm SL)

Triacanthus biaculeatus

Bony pelvis almost as wide anteriorly between ventral fin bases as near its rounded tip; postorbital distance 10-14 in SL; snout short, 4.9-6.4 in SL. Profile from eyes to first dorsal fin base almost straight. Plain silvery yellowish blue body, dusky area below first dorsal fin and on caudal peduncle. First dorsal fin black, outer ⅓ or tips of first 3 or 4 spines white.
D_2 21-26. A 17-22. P 12-16. Total GR 12-18.
(voucher: 290 mm SL)

Trixiphichthys weberi

Bony pelvis almost as wide anteriorly between ventral fin bases as near its rounded tip; snout concave and long, 3.6-4.7 in SL; postorbital distance short, 0.6 of eye diameter. Silvery blue body, orange blotch on base of and below first dorsal fin, dusky golden elongate blotches in roughly 3 bands along body; outer ⅓ of first dorsal fin black, remainder white.
D_2 22-25. A 17-19. 13-15. Total GR 15-19.
(voucher: 120 mm SL)

BALISTIDAE

Triggerfishes - Pakol

Small or medium-sized fishes; body deep, elongate oval and compressed. Mouth small, teeth heavy and sharp - 8 in outer series, inner row of 6 or more in upper jaw; gill opening a short slit before pectoral fin base. Scales thickened, large and bony, usually covering entire body, their edges meeting; scales above and behind gill opening usually enlarged; tubercles, spines or ridges may be present on body posteriorly. Two well-separated dorsal fins, first with 3 spines, 2nd spine more than half length of first and capable of locking it into an erect position; second dorsal and anal fin similar and opposite, all rays branched; pectoral fin rounded; no ventral fin, pelvis strong and movable, supporting small skin flap and with a short stout spine at its tip; caudal fin rounded to lunate, tips sometimes produced.

Representatives of 10 genera were obtained on our Survey.

REFERENCES: Matsuura & Yoshino, 2004; Matsuura, 2001c; Myers, 1991.

Abalistes stellatus

Deep groove before eye; teeth uneven and notched; caudal peduncle depressed (wider than deep). Third dorsal spine well-developed; tips of caudal fin produced. Many pale blue-green spots and dashes along body and over head; 3 large cream blotches often present on back; unpaired fins banded yellow, green and brown.
D_2 26-27. A 23-26.
(voucher: 275 mm SL)

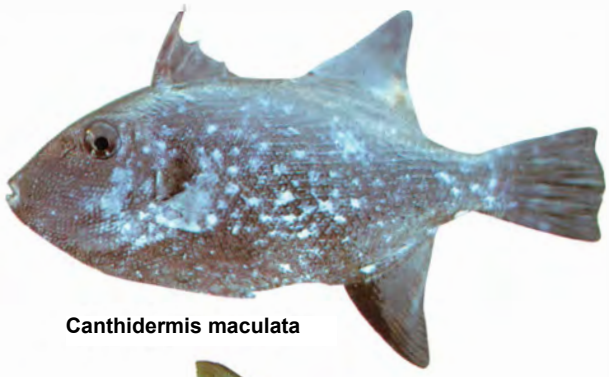
Balistoides conspicillum

Deep groove before eye; head profile straight or slightly convex; cheek almost entirely scaled; enlarged scales above pectoral fin base; 3-4 rows of short spines on caudal peduncle. Black or dark brown body, large white or yellow spots over lower half, mouth ringed orange and yellow; orange line along bases of anal and soft dorsal fins; black margin to caudal fin.
D_2 25-27. A 20-22. Tr 27-31 from soft dorsal fin origin.

Balistapus undulatus

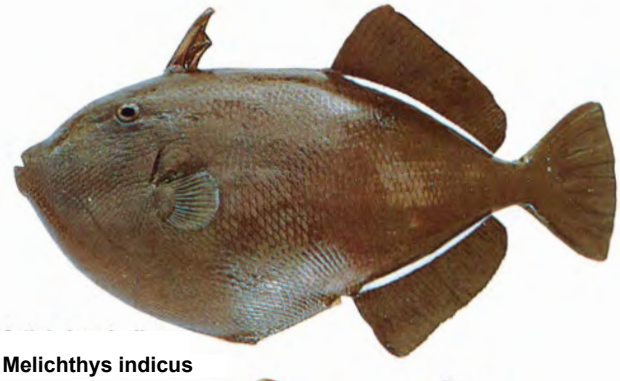
Cheek completely scaled and no groove before eye; enlarged scales above pectoral fin base; 6 large spines in 2 rows on caudal peduncle; 3rd dorsal fin spine well-developed. Body dark green or brown; many narrow oblique orange-yellow lines from back to anal and caudal fins, 2 or 3 broad orange bands from mouth to ventral flap. Fins orange or bright yellow.
D_2 25-27. A 22-24.
(voucher: 175 mm SL)

Balistoides viridescens



Canthidermis maculata

Odonus niger



Melichthys indicus

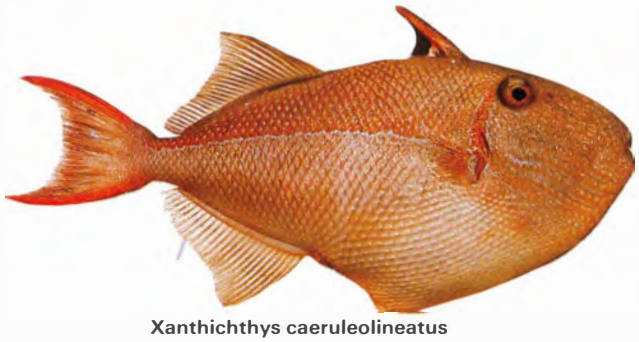
Pseudobalistes fuscus

Pseudobalistes flavimarginatus

Rhinecanthus aculeatus

Sufflamen fraenatum

Xanthichtys lineopunctatus



Xanthichthys caeruleolineatus

Balistoides viridescens

Deep groove before eye; head profile straight of slightly convex; cheek almost entirely scaled; enlarged scales above pectoral fin base; 5-6 rows of short spines on caudal peduncle. Third dorsal spine well-developed. Body yellowish green, a dark spot in centre of each scale; curved dark green band containing pale line extends over snout tip and upper lip; dark wedge-shaped bar passes through eye. Fins yellow, margins and often bases dark green, brown or blotched blue.
D_2 24-26. A 23-24. Tr 17-20 from soft dorsal origin.
(voucher: 305 mm SL)

Melichthys indicus

Deep groove before eye; teeth white; cheek almost entirely scaled. Body scales posteriorly only slightly ridged, those above pectoral fin base much enlarged. Upper and lower body profiles distinctly convex. Third dorsal spine very small; caudal fin truncate. Body and fins black; distinct white or pale blue band along bases of soft dorsal and anal fins, sometimes narrow white margin on caudal fin; pale oblique streak may be present on cheek.
D_2 30-35. A 27-30. Scale rows along head 27-31.
(voucher: 210 mm SL)

Pseudobalistes flavimarginatus

Groove before eye; cheek naked anteriorly and small posterior cheek scales sometimes lost with age, 4-6 rows of small spines on and just before caudal peduncle; much-enlarged scales above pectoral fin base. Tips of caudal fin produced in adults. Body dark blue-grey, violet or brown, chin and breast orange or rosy; dark spots on scale centres. Unpaired fin margins pale green and dark band submarginally.
D_2 26-27. A 22-24. Tr from soft dorsal origin 19-21.

Rhinecanthus aculeatus

Cheek completely scaled and no groove before eye; enlarged scales above pectoral fin base; caudal peduncle noticeably compressed. Third dorsal spine very small; caudal truncate. Body grey-green above, brown patches over back and tail; 4 oblique cream bands from middle of sides to anal fin base. Broad brown and thin blue lines across interorbital continue through eye to pectoral fin base; blue line around mouth; orange band to pectoral base. Peduncle spines black.
D_2 24-25. A 21-23.
(voucher: 205 mm SL)

Xanthichthys caeruleolineatus

Groove before eye; cheek scales larger than body scales fused into rows between which are 5 or 6 prominent long, naked grooves; scales immediately behind gill opening not larger than other body scales; 5-6 oblique grooves on cheek. Third dorsal spine very small. Body orange-brown above, grey-brown below; pale blue line from pectoral fin base to upper base of caudal fin; orange band from eye to pectoral fin base. Outer membrane of first dorsal fin black; upper and lower caudal fin margins reddish brown.
D_2 26-27. A 23-25.
(voucher: 220 mm SL)

Canthidermis maculata

Deep groove before eye; scales immediately behind gill opening not larger than other body scales; low ridge along most body scales. Third dorsal spine well-developed; soft dorsal and anal fins elevated anteriorly, giving wedge-shape to fins. Body dark blue or brown, sometimes black; irregular-shaped pale blue or white spots and blotches scattered over head, body and fins.
D_2 25-29. A 24-26.
(voucher: 130 mm SL)

Odonus niger

Deep groove before eye; 2 teeth at side of upper jaw enlarged. Scales on posterior part of body very large, those along middle of body and caudal peduncle with low ridge. Soft dorsal and anal fins higher anteriorly, caudal fin lunate, tips very long. Body and fins dark bluish - brown or black, often margined pale blue or white; teeth red; hind caudal edge white.
D_2 33-36. A 30.
(voucher: 285 mm SL)

Pseudobalistes fuscus

Groove before eye; cheek naked anteriorly, and small posterior cheek scales arranged into raised horizontal rows; no spines on caudal peduncle; enlarged scales above pectoral fin base. Soft dorsal and anal fins elvated anteriorly; tips of caudal produced in adults. Body brown or dusky yellow, dark wavy lines and spots on heads forming bands across interorbital. Fin margins blue.
D_2 24-27. A 22-26. Tr from soft dorsal origin 24-31.
(voucher: 310 mm SL)

Sufflamen fraenatum

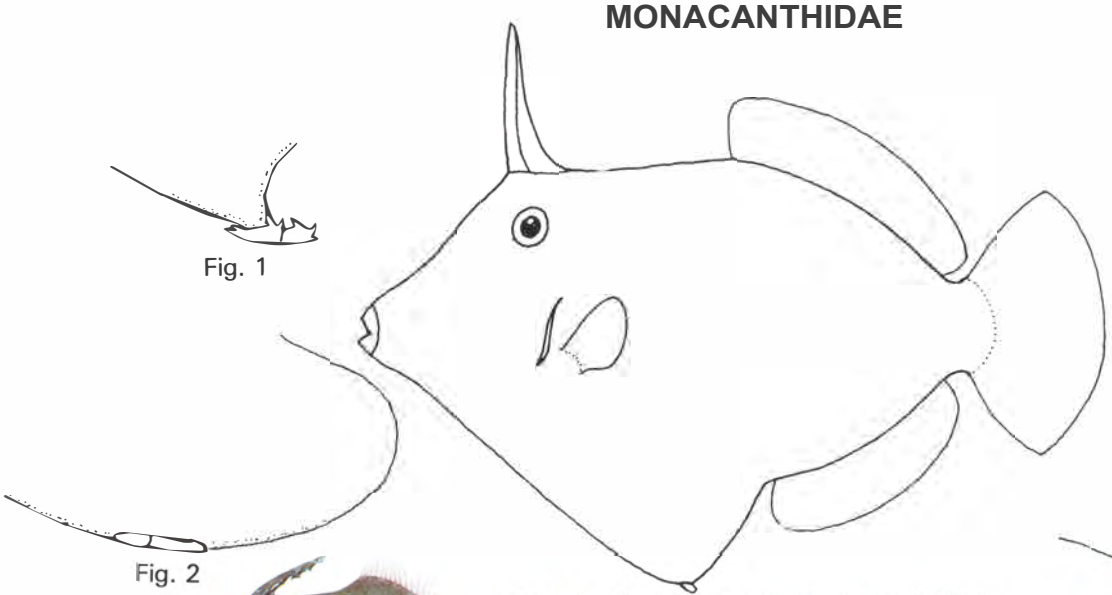
Groove before eye; head profiles straight; scales on middle of cheeks rectangular and larger than body scales; enlarged scales above pectoral fin base; scales on middle of body and caudal peduncle with rows of short, blunt tubercles. Body and fins plain yellow brown to dark brown; orange band around mouth more or less developed and oblique orange band from mouth towards pectoral base present in males.
D_2 28-30. A 25-27.
(voucher: 210 mm SL)

Xanthichthys lineopunctatus

Groove before eye; cheek scales larger than body scales and fused into rows with 3 long and 2 shorter prominent naked grooves in between; scales immediately behind gill opening not larger than other body scales; 3 oblique grooves on cheek. Third dorsal spine very small. Body olive or grey, naked cheek grooves brown; thin brown lines along scales rows on upper half of body, dark brown spots along scale rows of lower half of body. Dark brown band along bases of soft unpaired fins; all caudal fin margins reddish brown, orange crescent over hind part of fin.
D_2 27-29. A 25-27. Scale rows between gill opening and caudal base 44-50.
(voucher: 199 mm SL)

MONACANTHIDAE

Fig. 1



Examples of ventral fin rudiments and ventral flaps

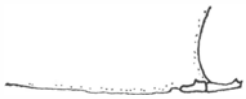
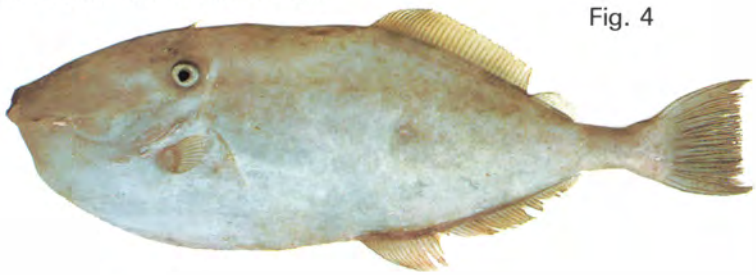


Fig. 3

Fig. 2

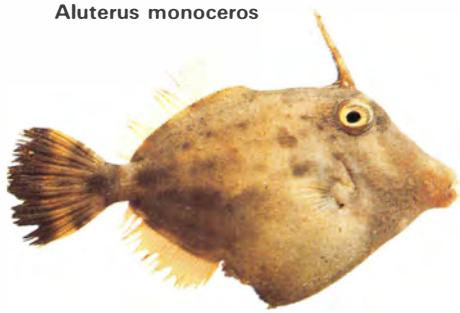
Fig. 4

Acreichthys tomentosus



Aluterus monoceros

Aluterus scriptus

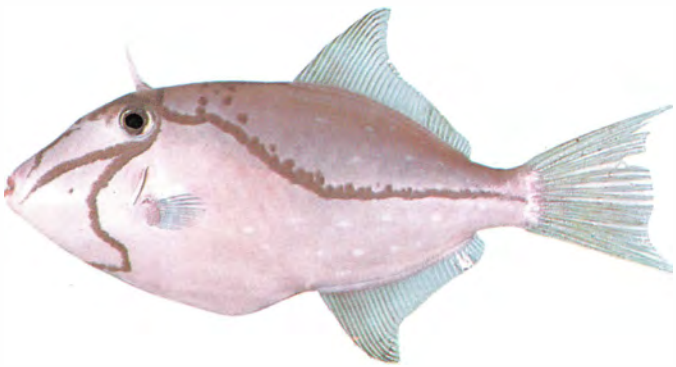


Cantherhines fronticinctus

Anacanthus barbatus

Cantherhines pardalis

Chaetodermis penicilligerus



Eubalichthys caeruleoguttatus

Monacanthus chinensis

MONACANTHIDAE

Leatherjackets; Filefishes - Bulusan babi; Hayam

Small, strongly compressed fishes; body usually elongate oval or almost rounded (elongate in *Anacanthus*). Mouth small with outer row of 6 strong teeth, usually an inner row of 4 teeth in upper jaw; gill opening a small slit above or before pectoral fin base. Scales small with one or more fine spinules sometimes forming bristles on caudal peduncle, skin furry or prickly to touch. Two well-separated dorsal fins: first of two spines (2nd rudimentary) placed above or before eye; soft dorsal and anal fins equal and opposite, all rays simple. No ventral fin, pelvis strong, usually supporting triangular skin flap ("ventral flap") and usually with fixed or movable bony process ("ventral fin rudiment") before or at its tip; caudal fin rounded, often large and sometimes with filament from upper rays.

About 30 genera, of which members of 11 were obtained on the Survey.

REFERENCES: Hutchins, 2001; Randall, 2011; Gill & Hutchins, 2002; Hutchins, 1997.

Acreichthys tomentosus

First dorsal spine and movable ventral fin rudiment at tip of pelvis strong and stout, their spines or barbs prominent (fig 1). Edges of all internal upper jaw teeth notched; patch of bristles on caudal peduncle in adult males. Distinct broad brown-edged white concave band from gill opening to middle of sides, sometimes another faint band sloping from eye towards soft dorsal fin; remainder of body dark green or brown, scattered pale skin filaments over anterior half of body. Caudal fin with 2 or 3 brown cross-bands.
D_2 27-30. A 26-29.
(voucher: 60 mm SL)

Aluterus scriptus

First dorsal spine slender, placed above eye; snout profile concave; body elongate oval; no ventral flap. Caudal fin rounded, longer than HL. Body and caudal fin brown with black, blueish and white spots and short stripes; other fins blue-green.
D_2 45-47. A 48-49
(voucher: 370 mm SL)

Anacanthus barbatus

Body very elongate, depth 10-11 in SL. Fleshy barbel on lower jaw; mouth opens dorsally. First dorsal spine short and weak; caudal fin long, wedge-shaped. Green or brown body with cream mid-lateral band and spotted ventral flap.
D_2 48-50. A 58-62.

Cantherhines pardalis

Body ovate, depth 2.1-2.4 in SL; first dorsal spine placed above front half of eye, rounded anteriorly and depressible into deep groove on back. Ventral flap moderate, ventral fin rudiment at end of pelvis and not movable; caudal peduncle depth 1.6-2 in caudal fin length. Body either pale or greenish blue, covered by many oblique orange bands on head and closely-spaced orange spots on body, or plain dark brown; caudal peduncle usually with white spot behind both soft dorsal and anal fins. Fins orange, caudal dark.
D_2 32-36. A 29-32. P 12-14.
(voucher: 168 mm SL)

Eubalichthys caeruleoguttatus

Body ovate, depth 1.7-2.7 in SL; first dorsal spine short (1.8-3.2 in HL) originating above eye; ventral flap small, ventral fin rudiment placed just before hind end of pelvis (fig 4). Dorsal and anal fins elevated anteriorly, caudal fin long, rounded or with produced lobes. Body either fawn with prominent brown stripe following lateral line or fawn with longitudinal rows of elongate blue spots on head and body, or a combination of both.
D_2 35-39. A 34-37.
(voucher: 260 mm SL)

Aluterus monoceros

First dorsal spine slender, placed above eye; snout profile convex; body ovate; no ventral flap; caudal fin shorter than HL, lobes produced with age. Body green-olive, darker above, often with dark brown spots and/or white reticulations; caudal fin dark brown.
D_2 48-50. A 50-51.
(voucher: 500 mm SL)

Cantherhines fronticinctus

Body ovate, depth 2-2.3 in SL; first dorsal spine 1.1-1.4 in HL, placed above front half of eye, rounded anteriorly and depressible into deep groove on back. Ventral flap moderate, ventral fin rudiment not movable and at end of pelvis; caudal peduncle depth 2-2.6 in caudal fin length. Two prominent dark brown bands across interorbital; body mottled brown or green, a dark blotch at pectoral fin base, 3 blotches on bases of dorsal and anal fins and pale band around caudal peduncle.
D_2 33-36. A 31-32. P 12-13.
(voucher: 76 mm SL)

Chaetodermis penicilligerus

Skin roughened; long skin filaments, some branched, scattered over head and body; ventral fin rudiment at tip of pelvis movable. Teeth in upper jaw often protrude from mouth; first dorsal spine irregularly-shaped and often twisted. Caudal fin large, wedge-shaped. Body pale or dark brown with thin longitudinal dark brown lines from mouth to tail base; body blotched brown, 2 black blotches above pectoral fin. Rows of small dark spots along unpaired fins, dark patches and dark margin on caudal fin.
D_2 25-26. A 23-24.

Monacanthus chinensis

Ventral flap very large and ‘fan’ -shaped, extending well past end of pelvis in adults; movable ventral fin rudiment at tip of pelvis elongate and tapering (fig 2); 4-6 spines on caudal peduncle, in two rows; caudal fin rounded, slightly longer than HL, its upper rays sometimes produced into a filament. Violet-cream or fawn body with patches of blue or dark brown spots forming 2 prominent oblique bands across sides; blue, brown and yellow spots radiate from eye, covering ventral flap and forming network on anal fin; margin of yellow caudal fin with blue lines and charcoal band.
D_2 28-30. A 27-30.
(voucher: ? mm SL)

Arotrolepis filicauda

Paramonacanthus oblongus

Pseudalutarius nasicornis

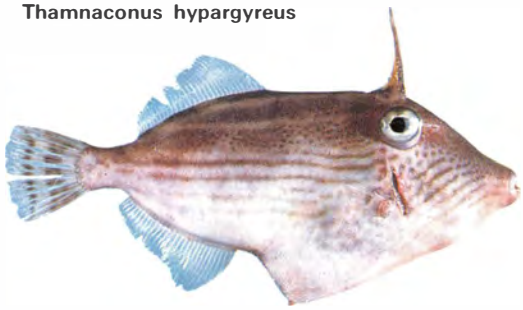
Pseudomonacanthus elongatus

Pseudomonacanthus macrurus

Pseudomonacanthus peroni

Thamnaconus hypargyreus

Thamnaconus modestoides



Thamnaconus striatus

Thamnaconus tessellatus

Arotrolepis filicauda

Elongate and slender movable ventral fin rudiment at tip of pelvis (fig 3). Body depth 1.7-2.3 in SL. First dorsal spine slender, originating over posterior half of eye; dorsal and anal fins evenly convex; rounded caudal fin slightly less than HL, upper 2 rays often produced into filament. Body fawn above, paler below, snout and cheeks faintly yellow; scattered yellow to brown patches and spots on sides, forming lines along back, brown blotch below soft dorsal fin. Rows of yellow spots on soft dorsal and anal fins, 3-6 vertical or oblique rows of black spots on caudal fin.
D_2 35-38. A 35-38.
(voucher: 143 mm SL)

Pseudalutarius nasicornis

First dorsal spine long, originates on snout before eye; no ventral flap; body ovate, more convex on ventral profile; caudal fin slightly rounded. Body fawn above, dusky yellow below; 2 broad horizontal brown bands from head to upper tail base: first following soft dorsal fin base; second along mid-sides; yellow bar across base of brown caudal fin.
D_2 46-49. A 45-46.
(voucher: 110 mm SL)

Pseudomonacanthus macrurus

Ventral fin rudiment at tip of pelvis not movable but pelvis itself very movable; ventral flap large. Gill opening almost entirely below eye. First dorsal spine placed above posterior half of eye; caudal fin rounded, equal to HL. Body yellowish brown to pale brown, covered with small, crowded dark brown spots much smaller than pupil; network of dark lines on ventral flap; 2 or 3 dark bands across chin; dark brown square blotches on base of anal fin; caudal fin with broad brown band and dark brown border.
D_2 29-31. A 27-30.
(voucher: 145 mm SL)

Thamnaconus hypargyreus

Ventral fin rudiment at tip of pelvis not movable; HL less than body depth; ventral flap of medium size; soft dorsal and anal fins noticeably higher anteriorly and dorsal spine elevated; caudal fin rounded, shorter than (1.5-1.7 in) HL. Body violet-brown or dusky above, creamy violet below, upper two-thirds of body and lower part of head with scattered olive or dusky orange spots smaller than pupil, some elongate; blue wavy lines over snout and around eyes (males). Fins plain, hind margin of caudal fin with dark brown bar.
D_2 33-36. A 32-34.
(voucher: ? mm SL)

Thamnaconus striatus

Ventral fin rudiment at tip of pelvis not movable; HL less than body depth; ventral flap of medium size; soft dorsal and anal fins noticeably higher anteriorly; caudal fin rounded, shorter than (1.5 in) HL. Body tan or yellowish violet above, cream below; 2 broad horizontal bands containing dark brown spots along back to upper caudal peduncle and many thin brown horizontal lines along lower sides; brown lines slanting across cheeks, brown spots on snout, near eye and on ventral flap; 2 broad dark brown bands across white caudal fin.
D_2 31-34. A 31-33.
(voucher: 160 mm SL)

Paramonacanthus oblongus

Elongate and slender movable ventral fin rudiment at tip of pelvis (fig 3). Body moderately slender, depth 1.5-2.7 in SL. First dorsal spine slender, originating over posterior half of eye; dorsal and anal fins elevated anteriorly (much higher in male); rounded caudal fin much less than HL, upper ray produced into filament (adult male). Fawn or grey-green body with yellow patches on snout, dusky spots and vague patches over head and sides; either 3 or 4 dusky brown bands from head to tail base (male) or indistinct oblique band from pectoral fin base to soft dorsal fin. Two or 3 brown bands across pale caudal fin.
D_2 25-29. A 25-29. P 10-12.
(voucher: 102 mm SL)

Pseudomonacanthus elongatus

Ventral fin rudiment at tip of pelvis not movable but pelvis itself very movable; ventral flap large. Gill opening situated before eye and first dorsal spine placed above front half of eye; caudal fin rounded and short, its length always less than HL. Body fawn above, bluish yellow below, densely covered with dusky orange or fawn spots, narrow interspace forming a network; 4 broad bands, formed by darker spots, from head to tail base; 2 broad dark bands across caudal fin.
D_2 30. A 30.
(voucher: 230 mm SL)

Pseudomonocanthus peroni

Ventral fin rudiment at tip of pelvis not movable but pelvis itself very movable; ventral flap large. Gill opening situated below eye. First dorsal spine placed above posterior half of eye; caudal fin rounded and long, slightly to much longer than HL. Body bluish cream or fawn above, paler below, sparsely or densely covered with dark brown spots as large as pupil; dark brown blotch on throat. Caudal fin densely spotted dark brown, often 2 black blotches near base on upper and lower rays.
D_2 32-33. A 30.
(voucher: 210 mm SL)

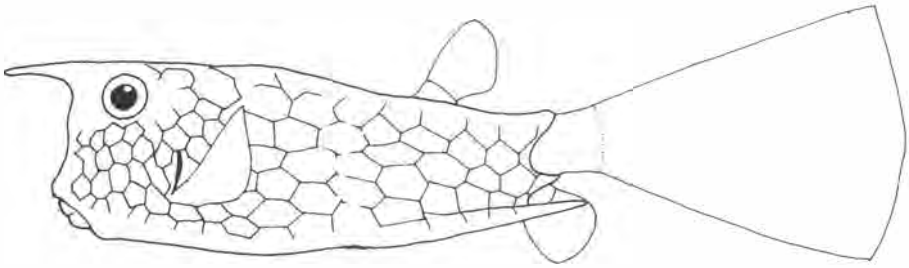
Thamnaconus modestoides

Ventral fin rudiment at tip of pelvis not movable; HL less than body depth; ventral flap of small to medium size; soft dorsal and anal fins noticeably higher anteriorly; caudal fin rounded, less than (1.2-1.3 in) HL. Body plain grey or purplish brown, yellow below; faint dark lines along body; fins plain dusky green or blue, spinous dorsal membrane yellow in male.
D_2 36-37. A 35-36.
(voucher: 262 mm SL)

Thamnaconus tesselatus

Ventral fin rudiment at tip of pelvis not movable; ventral flap of small to medium size. HL less than body depth; soft dorsal and anal fins noticeably higher anteriorly and dorsal spine elevated; caudal fin rounded, shorter than (1.3-1.4 in) HL. Body violet brown above, fawn below, densely covered with dark brown spots slightly smaller than pupil. Fins plain yellow or brown.
D_2 34-37. A 31-34.
(voucher: 190 mm SL)

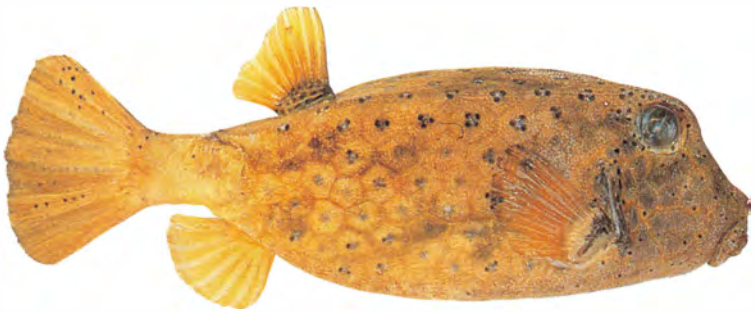
OSTRACIIDAE



Lactoria cornuta

Lactoria diaphana

Lactoria fornasini



Ostracion cubicum

Ostracion nasus

Ostracion rhinorhynchos

Tetrosomus gibbosus

Tetrosomus reipublicae

OSTRACIIDAE

Boxfishes; Cowfishes - Bentel tanduk; Buntel kotak

Body short and robust, either triangular, square or pentagonal in cross-section. Large hexagonal bony plates fused together form a rigid box-like carapace almost completely encasing the body: only jaws, fin bases and caudal peduncle free, covered with smooth skin. Mouth small, upper jaw non-protusible; about 10 teeth in each jaw; gill opening a slit before pectoral fin. No fin spines; dorsal and anal fins short-based, placed posteriorly, dorsal fin rays 9-13, anal fin rays 9-13. Caudal fin rounded or truncate; no ventral fin. Background colouration varies in these fishes and spines on ridges diminish with age.

Seven genera in the family of which representatives of three were collected on the Survey.

REFERENCES: Matsuura, 2001d; de Beaufort & Briggs, 1962; Randall, 1972.

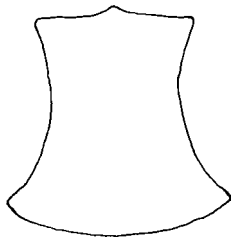


Fig 1

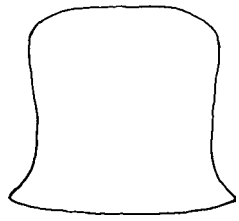


Fig 2

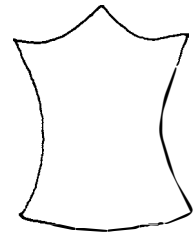


Fig 3

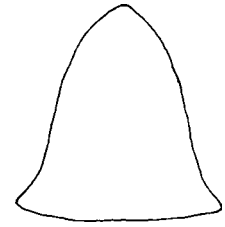


Fig 4

Lactoria cornuta

Body 5-cornered in cross-sector (Fig 1), dorsal ridge low; dorso-lateral ridge ends in long, sharp spine before eye and beyond snout, ventro-lateral ridge ends in strong spine posteriorly. Caudal fin very long, truncate, length increasing with age. Brown or olive, spotted blue; brown spots on caudal peduncle and fin; sometimes black ring around mouth.
(voucher: 200 mm SL)

Lactoria diaphana

Body 5-cornered in cross section (Fig 1): short strong horizontal spine above eye from dorso-lateral ridge, ventro-lateral ridge ends in spine posteriorly; small, strong spine on median ridge before dorsal fin. Ventral ridges best developed, ventral surface slightly convex. Body fawn, sometimes with large brown blotches, lower half pale orange or translucent.
(voucher: 203 mm SL)

Lactoria fornasini

Body 4- or 5-cornered in cross-section (Fig 1); large flat triangular spine on middle of dorsal ridge; strong spine above eye from dorso-lateral ridge and strong spine at posterior end of ventro-lateral ridge. Body brown, with darker streaks and blotches; ventral surface pale; lips red.
(voucher: 78 mm SL)

Ostracion cubicum

Body square in cross-section (Fig 2), broader ventrally, back convex. No spines on body. Brownish yellow in colour, most body plates with black-edged blue ocellus or cluster of black spots with white centre; black spots more crowded on head, also present on fin bases and tail.
(voucher: 140 mm SL)

Ostracion nasus

Body 5-cornered in cross-section (Fig 3), ridges moderately sharp-edged but without spines, median dorsal ridge distinct; snout projects beyond mouth. Anal fin begins behind dorsal fin. Pale green, orange or grey body with scattered larger or smaller brown spots, one on each plate; spots extending onto caudal peduncle and fin.

Ostracion rhinorhynchos

Body 5-cornered in cross-section (Fig 3), ridges moderately sharp-edged but without spines, median dorsal ridge low; snout projects well beyond mouth. Anal fin begins below dorsal fin. Brown, violet or dull orange with many dark spots, several on each plate, spots extending onto caudal peduncle and basal half of fins. Fins and lips orange or yellow-grey.

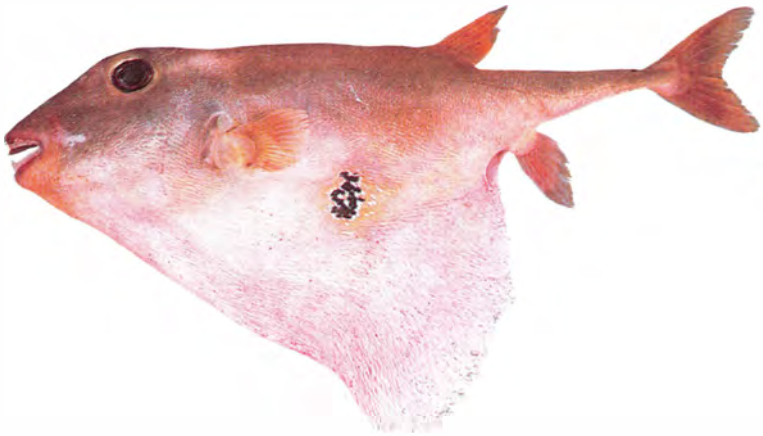
Tetrosomus gibbosus

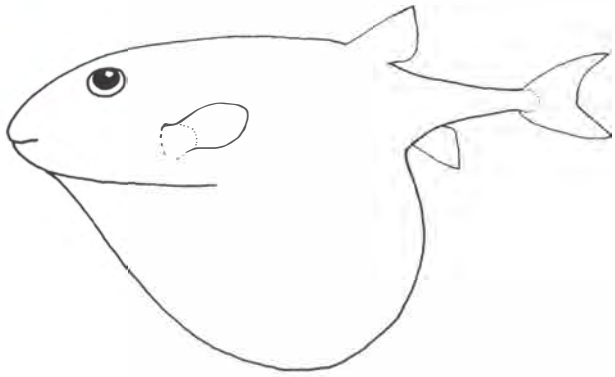
Body roughly 3-cornered or triangular in cross-section (Fig 4); large, triangular, flattened spine on dorsal ridge, short upward-pointing spine above eye and 4 or 5 short, strong, backward-pointing spines along ventro-lateral ridge. Olive, grey-blue or brown body with black blotches on lower sides, base of dorsal spine, caudal peduncle, dorsal and anal fin bases.
(voucher: 125 mm SL)

Tetrosomus reipublicae

Body 3-cornered or triangular in cross-section (Fig 4); dorsal fin with 2 short and stout, spines, 2 or 3 spines along ventro-lateral ridge, sometimes a short spine above eye; spines smaller in adults. Body fawn or brown with pale blue spots and curving lines, spots extending onto caudal peduncle and caudal fin.
(voucher: 150 mm SL)

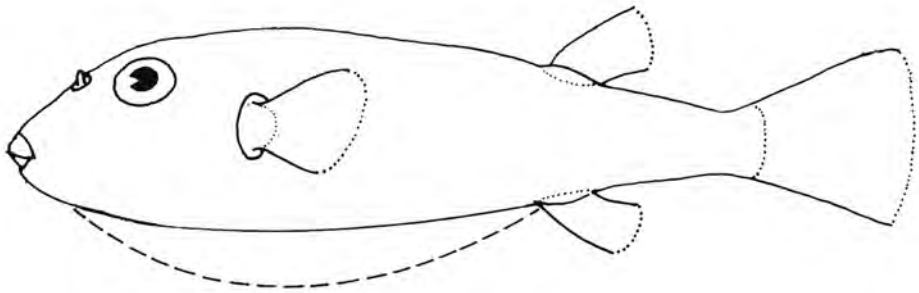
TRIODONTIDAE





Triodon macropterus

TETRAODONTIDAE



Tooth plate

Feroxodon multistriatus

Tylerius spinosissimus

Arothron hispidus

Arothron immaculatus

Arothron manilensis

TRIODONTIDAE

Three toothed pufferfish -

Body sub-cylindrical and compressed, caudal peduncle tapered. Mouth wide, teeth fused into plates united with jaws into a 'beak', only upper jaw with median gap; gill opening a slit before pectoral fin; interorbital flat or concave. Scales spiny. First dorsal fin rudimentary (flexible spines in groove) or absent; soft dorsal behind middle of body, before anal fin; no ventral fin, pelvis long and strong, supporting very large ventral flap; caudal fin forked.

This family is monotypic (only one genus and species in the family).

REFERENCE: Matsuura, 2001e.

Triodon macropterus

Snout profile straight; eye 3.5-4.6 in HL. Ventral flap very large, expanded and sac-like. Dusky olive to reddish above, paler below, large black patch on upper part of ventral flap; fins plain, margins dusky.
D_2 10-11. A 9-10.
(voucher: 550 mm SL)

TETRAODONTIDAE

Puffers; Pufferfishes - Buntel; Loi; Pita-pita

Oval and compressed or ovate and robust. Belly can be inflated. Body naked or completely or partly covered with spinules. Lateral line absent or present, single or double; if double the lower with raised skin ridges. Teeth fused into bony plates in each jaw, divided into 2 by a median division. Fins lack spines; soft dorsal fin short and placed posteriorly, opposite anal fin; pectoral fin well-developed; no ventral fin. Caudal fin rounded, truncate or emarginate. Gill opening reduced, located just in front of pectoral fin base. Nostrils either single, double or as two short tentacles.

Twenty-eight genera in the family, of which members of nine genera were obtained on the Survey.

REFERENCES: Su, Hardy & Tyler, 1986; Matsuura, 2001f; Matsuura, 2014; Matsuura, 2016; Matsuura, 1994; Randall, Bogorodsky & Rose, 2012; Williams, Delrieu-Trottin & Planes, 2012; Randall, Williams & Rocha, 2008; Allen & Randall, 1977; Hardy, 1983; Hardy, 1989; Hardy, 1985; Hardy, 1984; Randall, Williams & Rocha, 2008.

Fig 1

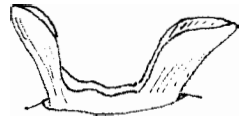


Fig 2

Fig 3

Feroxodon multistriatus

Chin prominent. Nostril a papilla with 2 openings (Fig 3); spinules scattered over back, sides and belly. Caudal fin truncate. Numerous oblique brown bands cross upper head and body, breaking up into moderately large spots on yellow belly, lower sides and caudal peduncle. Fins yellow, broad olive-brown margin to caudal fin.
D 10-11. A 9. P 16-17.
(voucher: ? mm SL)

Arothron hispidus

Body round in cross-section; nostril a pair of short thick tentacles (Fig 1); lateral line single, not branched above anal fin. Upper sides brown, snout, back, sides and caudal fin covered with white spots. Eye and gill opening surrounded by brown, white or yellow lines; brown, curved lines extend onto lower sides. Gill opening and pectoral fin base black. Dorsal and anal fins dark brown.
D 10. A 10-11.

Arothron manilensis

Body round in cross-section; nostril a pair of short thick tentacles (Fig 1); lateral line single, not branched above anal fin. Body brownish-yellow on back, white on belly. Narrow orange-brown longitudinal lines over entire body, those on slides curled around pectoral fin base. Caudal fin margin dark.
(voucher: 190 mm SL)

Tylerius spinosissimus

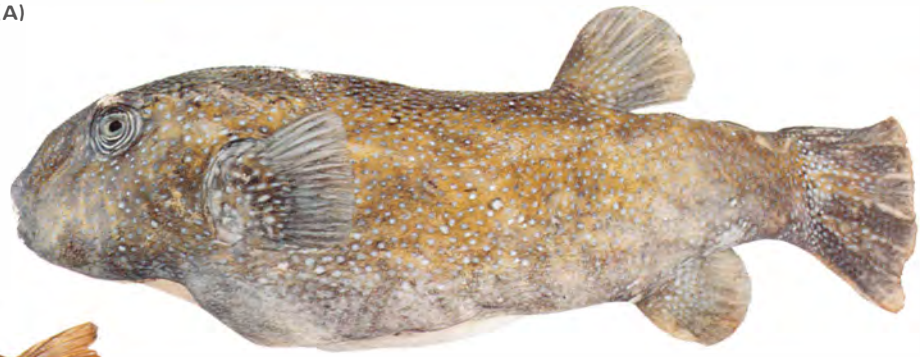
Nostril a papilla with 2 openings (Fig 3). Body densely spined except for chin, fin bases and end of caudal peduncle. Caudal fin truncate or slightly emarginate. Fawn or brown above, marbled dark brown and occasionally spotted grey; lower sides and belly plain white or speckled brown. Fins pale, caudal fin brown posteriorly.
D 8-10. A 7. P 15-16.
(voucher: 55 mm SL)

Arothron immaculatus

Body round in cross-section; nostril as pair of short thick tentacles (Fig 1); lateral line single, not branched above anal fin. Dusky olive above, grey or white below. Gill opening and pectoral fin base dark brown; hind, upper and lower margins of caudal fin brown or black, other fins plain.
D 9-10. A 8-10.
(voucher: 100 mm SL)

Arothron stellatus (A)

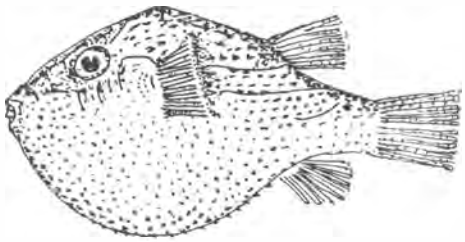
Arothron stellatus (B)



Arothron caeruleopunctatus.

Canthigaster compressa

Canthigaster axiologus



Canthigaster investigatoris ;after Annandak & Jenkin,1910

Canthigaster rivulata

Chelonodontops patoca

Lagocephalus cheesemanii

Lagocephalus inermis

Lagocephalus lagocephalus

Arothron stellatus

Body round in cross-section; nostril a pair of short thick tentacles (Fig 1); lateral line single, not branched above anal fin. Few or many black or dark brown spots over fawn or yellow-green upper half of body, belly and underside of head white. Gill opening black or with large black spots; anus ringed black. Black spots on dorsal and anal fins; sometimes caudal fin spotted or dorsal fin plain. Lower half of body white or cream, bright yellow or orange. In 'aerostaticus' form, lower half of body yellow-orange and crossed by broad, oblique dark brown or black lines.
D 10-11. A 10-12.
(voucher A : 295 mm SL)
(voucher B : 77 mm SL)

Canthigaster compressa

Body slightly compressed, depth 2.4- 3.1 in SL. Interorbital 2.9-3.8 in HL. Back ridged; nostril not easily seen. Body tan, dark grey or reddish, covered with close network of pale blue - as lines on upper body, forming spots on lower body (our specimen in a phase where only pale blue spots present). Large black ocellus on dorsal fin base; caudal fin crossed by many vertical rows of pale blue lines and spots. Brown line from chin to anus.
D 8-10. A 8-9. P 15-18
(voucher: 68 mm SL)

Canthigaster investigatoris

Body slightly compressed, depth 2.8 in SL. Interorbital 4 times in HL. Back ridged; nostril not easily seen. Several narrow dark lines cross snout and interorbital; lines extend horizontally from pectoral fin to upper caudal peduncle.
D 9-10. A 10. P 15.
(voucher: ? mm SL)

Chelonodontops patoca

Nostril an opening surrounded by raised rim produced into 2 skin flaps (Fig 2. Two lateral lines, intersecting above anal fin. Body naked except for patch of spinules along back, another patch on belly. Upper head and body charcoal-orange or dark olive with large blue-white spots. Bright yellow band from chin below pectoral fin to caudal peduncle; spines in belly patch tinted yellow. Fins plain – dusky yellow, white or dark brown.
D 9-11. A 8-10
(voucher: 170 mm SL)

Lagocephalus inermis

Body round in cross-section; nostril a raised papilla with 2 openings (Fig 3); eye high on head. Caudal fin truncate or slightly emarginate. Body naked except for patch of small spines ventrally, extending from chin to anus. Caudal peduncle deeper than wide. Sides silvery yellow, belly and underside of head white. Pectoral fin bright yellow; caudal fin tipped white; back dusky green. Gill opening black.
D 12. A 11-12.
(voucher: 151 mm SL)

Arothron caeruleopunctatus

Body round in cross section; nostril a pair of short thick tentacles (Fig 1), lateral line single, not branched above anal fin. Scattered small cream or bluish spots over head, gill opening, sides and back and bases of dorsal, anal, pectoral and caudal fins. Eye ringed white.

Canthigaster axiologus

Body slightly compressed, depth 2.6- 2.9 in SL. Interorbital 3.7-4.4 in HL. Back ridged; nostril not easily seen. Four broad dark brown bars across upper body to mid-sides, more oblique posteriorly: first over interorbital; 2nd and 3rd over back; last over caudal peduncle. Orange and blue lines radiate from eye; bright blue and orange or yellow spots and lines around mouth, lower sides, along the edges of the dark brown bars, and scattered or in vertical rows on caudal fin.
D 9-10. A 10. P 17.
(voucher: 104 mm SL)

Canthigaster rivulata

Body slightly compressed, depth 2.6-3 in SL. Interorbital 3-4 in HL. Back ridged; nostril not easily seen. Two brown lines run parallel from pectoral fin region to caudal fin base, joining each other in an arch before fin base. Upper body covered with network of brown lines and pale spots; orange and brown lines radiate from eye; spots over lower head and sides. Dark blotch at dorsal fin base, and at upper and lower caudal fin base. Caudal fin with horizontal or vertical yellow and blue lines. Blue line from chin to anus.
D 9-10. A 9-10. P 16-18.
(voucher: 90 mm SL)

Lagocephalus cheesemanii

Body round in cross section; nostril a raised papilla with 2 openings (Fig 3); eye high on head. Caudal fin double emarginate; pectoral fin hind border oblique. Body naked except for patch of spinules from above eye to halfway before dorsal fin and another patch ventrally from throat to halfway along belly. Caudal peduncle about as wide as deep. Back and upper head dark green to dark brown; sides golden-yellow, lower half of body silvery white. Dorsal fin dark brown; pectoral fin dark green, lower tip yellow; caudal fin dark green or brown with broad triangular yellow tips; anal fin yellow.
D 13. A 12.
(voucher: 143 mm SL)

Lagocephalus lagocephalus

Body round in cross-section and elongate; nostril a raised papilla with 2 openings (Fig 3); eye high on head. Caudal fin emarginate; caudal peduncle about as deep as wide. Body naked except for patch of well-separated moderately strong spinules from chin to anus. Upper body bluish black, sides and belly silvery white, sometimes small black spots below pectoral fin. Fins dark except for white lower rays of pectoral fin.
D 13-16. A 12-13.
(voucher: 192 mm SL)

Lagocephalus lunaris

Lagocephalus sceleratus

Lagocephalus spadiceus

Torquigener brevipinnis

Sphoeroides pachygaster

Torquigener parcuspinus

Torquigener pallimaculatus

Torquigener tuberculiferus

Torquigener gloerfelti

Javichthys kailolae

Lagocephalus lunaris

Body round in cross-section, nostril a raised papilla with 2 openings (Fig 3); eye high on head. Caudal fin moderately emarginate Body naked except for patch of spinules on back from above eye to ¾ or all the way to dorsal fin and another patch ventrally from throat to halfway along belly. Caudal peduncle deeper than wide. Top of head and back tan or green, sides silvery pale yellow; caudal fin tan, edged white.
D 12-13. A 10-11.
(voucher: 88 mm SL)

Lagocephalus spadiceus

Body round in cross-section; nostril a raised papilla with 2 openings (Fig 3); eye high on head. Caudal fin slightly lunate. Body naked except for patch of spinules on back from eye to halfway before dorsal fin and another patch ventrally from throat to halfway along belly. Caudal peduncle deeper than wide. Three broad brown bands across back; sides yellow, underside of head and body white. Dorsal and pectoral fins yellow, caudal fin dusky, tips white. Anal fin white.
D 11-15. A 10-12.
(voucher: 140 mm SL)

Torquigener brevipinnis

Nostril a raised papilla with 2 openings (Fig 3); chin distinct. Caudal fin truncate; eye free from body skin except dorsally; caudal peduncle length about 4 in SL. Moderately strong spinules cover dorsal surface to dorsal fin and ventral surface from chin to anus. Upper head and sides tan. White vertical lines on cheek, oval pale blue or white spots and grey lines on back; a brown line from above pectoral fin horizontally to tail base. Caudal fin barred dark brown, other fins pale.
D 8. A 7.
(voucher: 52 mm SL)

Torquigener parcuspinus

Nostril a raised papilla with 2 openings (Fig 3); chin distinct. Caudal fin truncate; eye free from body skin except dorsally; caudal peduncle length 4-4.6 in SL. Body spinules strong, densely covering dorsal and ventral body surfaces, less dense on sides, scarcely overlapping gill opening. A double row of spines enclosed in papillae along upper lateral line, no papillae around spines of lower lateral line. Back and head dark, green or brown or with network of dark lines and numerous grey or cream spots; dark spots on cheek and around mouth. Fins yellow or dusky.
D 9. A6.
(voucher: 55 mm SL)

Torquigener gloerfelti

Nostril a raised papilla with 2 openings (fig 3); chin distinct. Caudal fin truncate; eye free from body skin except dorsally, 3.4-3.6 in HL. Caudal peduncle length 3.4-4.1 in SL. Spines on dorsal surface moderately sparse; up to 12 spines protruding from fleshy papillae, overlapping gill opening from its front border. Back and head with network of irregularly- shaped brown spots over pale background; scattered large red-brown spots over sides posteriorly.
D 8-9. A 6-7. P 15-16.
(voucher: 154 mm SL)

Lagocephalus sceleratus

Body almost square in cross section and very elongate; nostril a raised papilla with 2 openings (Fig 3); eye high on head. Caudal fin moderately lunate; caudal peduncle wider than deep. Body naked but for patch of spinules on back from head to dorsal fin and another patch ventrally from chin to anus. Back mottled green and dark brown. Conspicuous silver ring around eye and broad silver band from mouth to tail base. Lower half of body silvery white.
D 10. A 9.
(voucher: 96 mm SL)

Sphoeroides pachygaster

Nostril a papilla with 2 openings (Fig 3); eye free from body skin except dorsally. Raised skin fold along lower sides of caudal peduncle. Caudal fin truncate. Body completely smooth with no spinules. Anal fin entirely behind dorsal fin. Dark grey or bluish with vague pale patches. Fins yellow or dusky.
D 8-9. A 7-9. P 15-16.
(voucher: 98 mm SL)

Torquigener pallimaculatus

Nostril a raised papilla with 2 openings (Fig 3); chin distinct. Caudal fin truncate; eye free from body skin except dorsally; caudal peduncle length 3.2-3.6 in SL. Short spinules on back, sides and ventrally to about level of dorsal fin (dense on back); lower half of gill opening edge with several papillae. Back with orange-brown large and small spots and large grey spots surrounded by spots. Larger spots scattered over lower sides.
D 8-10. A 7-8.
(voucher: 100 mm SL)

Torquigener tuberculiferus

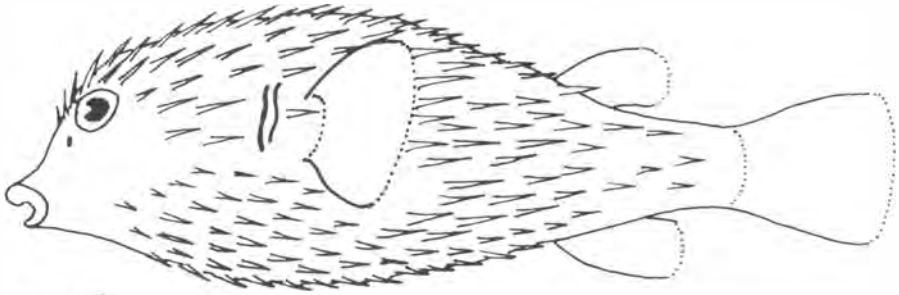
Nostril a raised papilla with 2 openings (Fig 3); chin distinct. Caudal fin truncate; eye free from body skin except dorsally, 3.3-4.6 in HL. Caudal peduncle length 3.4-3.7 in SL. Body densely spined dorsally, ventrally and laterally to level of dorsal fin; lower front margin of gill opening with prominent papillae each partly concealing long slightly curved spine. Upper ⅔ of body with clusters of reddish brown spots, lower body pale; several oblique grey bands extend from back down and forward to middle of sides; large brown blotches on side posteriorly; fins brown.
D 8-10. A 7-8.
(voucher: 95 mm SL)

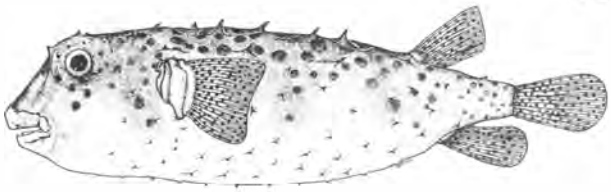
Javichthys kailolae

Nostril a raised papilla with 2 openings (fig 3); caudal fin truncate or slightly emarginate; eye free from body skin except dorsally, its upper border in level with dorsal profile, 3.1-3.3 in HL. Body spines short and few; caudal peduncle slender, its length 3.6-3.7 in SL; top of pectoral fin base below lower eye margin. Body olive, mottled dark brown above, white below, fins plain, dorsal and caudal fins dusky or brown.
D 8-9. A 6. P 16-17.
(voucher: 59 mm SL)

DIODONTIDAE

Tooth plate

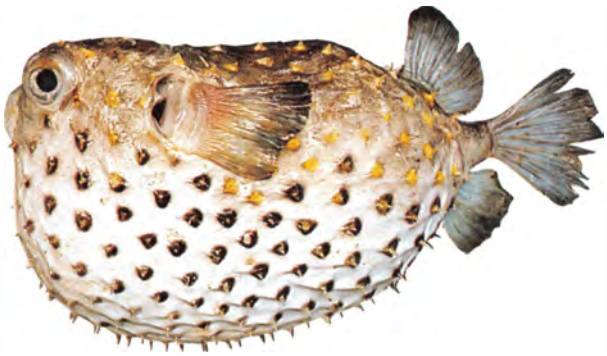


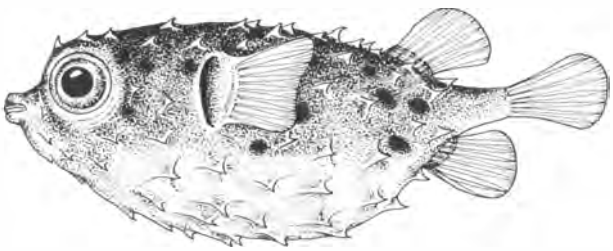


Chilomycterus reticulatus (A) after Leis, 1978

Cyclichthys hardenbergi

Chilomycterus reticulatus (B)





Cyclichthys orbicularis after Leis, 1978

Cyclichthys spilostylus

Diodon holocanthus

Diodon hystrix

Lophodiodon calori

Tragulichthys jaculiferus

DIODONTIDAE

Porcupinefishes - Buntel duren

Short and rounded, ovate fishes, capable of inflating their bodies by swallowing water or air. Naked skin with large strong, 2- or 3-rooted spines, some erectile and slender, others fixed and stout. Teeth in both jaws fused into a single undivided plate; nostrils tubular or as double tentacle. No spines in dorsal and anal fins which have few rays (9-13) and are placed well back on body; large pectoral fin with broad base opposite wide gill opening; no ventral fins; caudal fin rounded.

About seven genera in the family, representatives of five obtained on the Survey.

REFERENCE: Leis, 2001.

Chilomycterus reticulatus

Most body spines 3-rooted, fixed and short; one or 2 small spines on dorsal surface of caudal peduncle. Head and back dark green or brown, white below; in smaller individuals, spots cover upper ⅔ of body and extend over dorsal, anal and caudal fins, in larger individuals spots cluster into 3 or 4 broad vertical patches and spots fade from fin bases; pectoral fin pale.
D 11-12. A 12-13. P 21. C 10.
(voucher: (B) 270 mm SL)
(voucher: (A) drawing)

Cyclichthys orbicularis

Head and body spines fixed and short (except 1 movable spine near corner of mouth); all spines 3-rooted and none on dorsal surface of caudal peduncle; a small erectile spine below corner of mouth, another in pectoral axil; usually 3 spines above eye, 1 between nostrils. Head and back dark green or grey, white below; clusters of black spots grouped into 3 or 4 blotches on sides of head and body (not associated with spine bases); yellow fins checked brown.
D 10-12. A 10-12. P 19-20. C 9.

Diodon holocanthus

All body spines erectile and 2-rooted; spines on forehead twice as long as eye, and longer than other body spines. Head and back yellow-orange or grey, finely stippled with variable number of black spots (not associated with spine bases), several large rich-brown patches on top of head and over back, including dorsal fin base. Basal ⅓ of the yellowish dorsal and caudal fins spotted black. Deep yellow spots at spine bases on mid-sides of body.
D 13-15. A 13-15. P 20-24.
(voucher: 185 mm SL)

Lophodiodon calori

Body spines short, fixed and 3-rooted; on head, spines 2-rooted and erectile, those on snout directed towards mouth when depressed. Head and body brown or dusky violet above, white below; a broad black vertical bar through eye to below corner of mouth; 3 large dark patches with yellow spots along lower side of body; dorsal fin base black; fins pale.
D 12. A 12. P 22-24.
(voucher: 280 mm SL)

Cyclichthys hardenbergi

Head and body spines fixed and short; all spines 3-rooted; no spines on dorsal surface of caudal peduncle; usually 2 spines above eye, none or 1 spine on interorbital space, 2 spines between nostrils. Head and back olive or fawn, white below; some spine bases black; fins plain.
D 11-13. A 10-12. P 17-20. C 9.
(voucher: 120 mm SL)

Cyclichthys spilostylus

Head and body spines fixed and short; all spines 3-rooted except on head where some have 4 roots; 3 spines above eye, one spine between nostrils; no spines on dorsal surface of caudal peduncle. Head and body olive brown above, white below; spines on back with yellow spots on their bases, black spots on spine bases on sides and belly; fins plain brown or fawn.
D 12-13. A 11-12. P 21-22. C9
(voucher: 210 mm SL)

Diodon hystrix

All body spines 2-rooted and erectile; spines on forehead 1-1.5 times eye diameter, shorter than spines on sides of body. Dorsal and anal fins rounded in adults. Head and body dusky above and white below and covered with black or dark brown spots which are smaller than eye diameter; faint dusky bars across head and back; dorsal, caudal, pectoral and sometimes anal fin spotted in adults.
D 14-17. A 14-16. P 22-25 (rarely 21).
(voucher: 315 mm SL)

Tragulichthys jaculiferus

Body spines fixed and mostly 3-rooted; 2 or more very long and erectile spines in pectoral fin axil; spines on sides longest, arising near bases of unpaired fins and reaching over caudal preduncle. Head and body fawn or olive above, white below; 3 or 4 rounded spots on sides - one between eye and gill opening, others above and behind pectoral fin; fins plain.
D 12. A 12. P 21-22. C 9.
(voucher: 50 mm SL)

ABBREVIATIONS USED:

PJPW	Peter J.P. Whitehead
PK	Patricia Kailola
TGT	Thomas Gloerfelt-Tarp

These abbreviations prefix either
1) the specimen caught and photographed in the field and indicate its collector, or
2) the identifier of the voucher.

Note also that the association "TGT(PJPW)" accompanies numbered vouchers collected on Area A cruises, during which PJPW was guest taxonomist.

AMS	**Australian Museum, Sydney**
ANSP	**Academy of Natural Sciences of Drexel University, Philadelphia**
BMNH	**Natural History Museum, London (the 'old' abbreviation (BMNH) is retained as of 2022)**
BPBM	**Bishop Museum, Honolulu, Hawaii.**
CAS	**California Academy of Sciences, San Francisco**
CSIRO	**Commonwealth Scientific and Industrial Research Organisation, Hobart**
CUMZ	**Chulalongkorn University Museum of Natural History, Bangkok**
GMBL	**Grice Marine Laboratory, Charleston**
IORD	**Ocean Research Institute, University of Tokyo**
LACM	**Natural History Museum of Los Angeles County**
LPPL	**Lembaga Penelitian Perikanan Laut, Jakarta**
NMNZ	**Museum of New Zealand Te Papa Tongarewa, Wellington (the specimen identification NMNZ is retained)**
NMV	**Museum Victoria, Melbourne**
NSMT	**National Museum of Nature and Science, Tokyo**
NTM	**Museum and Art Gallery of the Northern Territory, Darwin**
QM	**Queensland Museum, Brisbane**
RUSI	**South African Institute for Aquatic Biodiversity (SAIAB) Grahamstown. (formerly J.L.B. Smith Institute of Ichthyology)**
SDSU	**San Diego State University, San Diego**
SMNS	**Staatliches Museum für Naturkunde in Stuttgart**
UMMZ	**University of Michigan, Museum of Zoology, Ann Arbor**
USNM	**U.S. National Museum of Natural History, Washington D.C.**
WAM	**Western Australian Museum Boola Bardip, Perth**
WAMRL	**Western Australian Marine Research Laboratories, North Beach**
ZMH	**Zoologisches Museum Hamburg**
ZMUC	**Zoological Museum, University of Copenhagen**

The authors have followed Fricke, R., Eschmeyer, W. N. & Van der Laan, R. (eds) 2022. ESCHMEYER'S CATALOG OF FISHES: GENERA, SPECIES, REFERENCES. (http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp). Electronic version accessed 30 06 2022.

CHIMAERIDAE

(A) Chimaera ogilbyi Waite, 1898
det. B. Finucci, W. White, J. Kemper & G. Naylor. CSIRO CA1262 10° 02'S., 130° 03'E. Areas B?, C.

(B) Our juvenile specimen from Area B. NMNZ P.015090 (TGT1743) from 08° 58'S., 116° 34'E. was sent to G. Hardy. Additional material is WAM P.26207-004 18° 42'S., 117° 40'E.

CLUPEIDAE

Amblygaster leiogaster (Valenciennes, 1847)
det P. Whitehead on photo. Specimen lost, no field number. Comparative material is NTM S.13583-008 from Arafura Sea. Areas A, B.

Amblygaster sirm (Walbaum, 1792)
det. TGT. NTM S.11000-005 (TGT2382) 01° 20'S., 98° 35'E. Areas A, B, C.

Anodontostoma chacunda (Hamilton, 1822)
det. by P. Whitehead on photo. No figure voucher. Comparative material is AMS I. 21841-010 from 11° 50'S., 134° 48'E. Areas (B), C.

Escualosa thoracata (Valenciennes, 1847)
det. T. Wongratana. NTM S.10992-010 (TGT3083) 08° 57'S., 116° 28'E. Area B.

Herklotsichthys koningsbergeri (Weber & de Beaufort, 1912)
det. P. Whitehead. CSIRO CA2292 15° 31'S., 124° 02'E. Area C. *H. maccullochi* (Whitley) is a synonym.

Herklotsichthys quadrimaculatus (Rüppell, 1837)
det. P. Whitehead on photo. BMNH 1984.1.2.1 (no field number). Conspecific Survey material determined by T. Wongratana: NTM S.10733-033 (TGT1229) from 08° 46'S., 115° 10'E. Area B.

Herklotsichthys lippa (Whitley, 1931)
det. T. Wongratana on photo. Specimen lost (no field number). Conspecific material determined by I.S.R. Munro e.g. CA2333 from 15° 45'S., 112° 46'E. Area C.

Hilsa kelee (Cuvier, 1829)
det. T. Wongratana. NTM S.10733-041 (TGT1291) 08° 46'S., 115° 10'E. Areas A, B.

Sardinella brachysoma Bleeker, 1852
det. T. Wongratana. NTM S.10733-023 (TGT1228) 08° 46'S., 115° 10'E. Areas A, B.

Sardinella fimbriata (Valenciennes, 1847)
No figure voucher. P. Whitehead determined our Survey material (BMNH 1984.1.1.10 from 07° 47'S., 109° 08'E.). Area A.

Sardinella gibbosa (Bleeker, 1849)
det. T. Wongratana. NTM S.10733-024 (TGT2110) 08° 46'S., 115° 10'E. Areas A, B, C.

Sardinella lemuru Bleeker, 1853 / **Sardinella aurita** Valenciennes, 1847
det. T. Wongratana. NTM S.10733-032 (TGT1255) 08° 46'S., 115° 10'E. Areas A, B. This species occurs seasonally in great numbers in Bali. Stern et al (2017) suggest that *S. lemuru* is part of a single cosmopolitan species for which *S. aurita* is the most senior name.

DUSSUMIERIIDAE

***Dussumieria acuta** Valenciennes, 1847
No figure voucher. P. Whitehead dertermined our Survey material (BMNH 1984.1.1.9 (no field number)). *Diagnosis*: body deep, depth 22%-28% SL, lower GR. count less than 26; many radiating striae on posterior portion of scales. Area A? Hata et al (2020) distinguish this species from the very similar and sympatric *D. albulina* (Fowler, 1934). Examination of the BMNH material is needed.

Dussumieria elopsoides Bleeker, 1849
det. TGT. CUMZ 2527.3.20.4 (TGT2348) 01° 34'30"S., 98° 44'E. Areas A, B, C.

PRISTIGASTERIDAE

Ilisha melastoma (Bloch & Schneider, 1801)
No figure voucher. P Whitehead determined our material. (BMNH 1984.1.1.11, (no field number)). Area A.

Ilisha lunula Kailola, 1986
det. PK. CSIRO B.2104 14° 08'S., 128° 34'E. Area C. Paratype.

Opisthopterus tardoore (Cuvier, 1829)
det. TGT. NTM S.11031-001 (TGT2618) 08° 42'S., 115° 05'E. Areas A, B.

Pellona ditchela Valenciennes, 1847
det. T. Wongratana. NTM S.10734-020 (TGT1226) 08° 10'S., 114° 54'E. Areas A, B, C.

ENGRAULIDAE

Setipinna tenuifilis (Valenciennes, 1848)
det. P. Whitehead. CSIRO CA1541 13° 25'S., 126° 19'E. Areas A, B, C.

Encrasicholina heteroloba (Rüppell, 1837)
det. P. Whitehead. CUMZ 2527.3.20.5 (TGT2216) 08° 59'S., 116° 13'E. Areas A, B.

Stolephorus balinensis (Bleeker, 1849)
det. H. Hata. NTM S.10733-034 (TGT2114) 08° 46'S., 115° 10'E. Areas A, B, C

***Encrasicholina punctifer** Fowler, 1938
No figure voucher. det. J.B. Hutchins . WAM P.26275-001 from 16° 30'S., 121° 44'E. Area C. *Diagnosis*: Anal fin begins just behind dorsal fin; maxilla truncate posteriorly, its length 5-6 in SL; lower GR 24-26.

Stolephorus baweanensis Hardenberg, 1933
det. H. Hata. CUMZ 2527.3.20.7 (TGT2212) 06° 20'S., 109° 10'E. Area A.

Thryssa baelama (Fabricius, 1775)
No figure voucher. det. P. Whitehead. (e.g. BMNH 1984.1.1.1 from 08° 04'S., 110° 18'E.). Area A. (Note: the status of *Thryssa* Cuvier as the correct generic name is discussed by Kottelat (2013) and Fricke, Eschmeyer, & Van der Laan (2022).

Thryssa encrasicholoides (Bleeker, 1852)
det. T. Wongratana NTM S.10733-036 (TGT1237) 08° 46'S., 115° 10'E. Area B.

Thryssa hamiltonii (Gray, 1835)
det. P. Whitehead. CSIRO CA2332 11° 53'S., 131° 15'E. Area C.

Thryssa mystax (Bloch & Schneider, 1801)
det. T. Wongratana. NTM S.10733-038 (TGT1026) 08° 46'S., 115° 10'E. Areas A, B.

Thryssa setirostris (Broussonet, 1782)
det. TGT & PK. LPPL JIF3 (TGT2171) 08° 46'S., 115° 10'E. Areas A, B, C.

CHIROCENTRIDAE

Chirocentrus dorab (Fabricius, 1775)
det. TGT. LPPL JIF4 (TGT2222) 06° 13'S., 105° 44'E. Areas A, B, C.

ELOPIDAE

Elops machnata (Fabricius, 1775)
det. TGT. LPPL JIF1 (TGT1086) 08° 46'S., 115° 10'E. Area B. Note: *Elops hawaiensis* Regan 2009 also occurs in the Survey area.

MEGALOPIDAE

Megalops cyprinoides (Broussonet, 1782)
det. TGT. Specimen lost. (TGT1190) 08° 47'S., 118° 48'E. Areas B, C.

ALBULIDAE

Albula argentea (Forster, 1801)
No figure voucher. det. J. Johnson. QM I.20700 (TGT2128) from 08° 46'S., 115° 10'E. Photo of New Guinea specimen (PK2) Areas B, C.

NEMICHTHYIDAE

Avocettina infans (Günther, 1878)
No figure voucher. det. J.G. Nielsen (e.g. BMNH 1984.1.1.1 (TGT (PJPW) 810) from 08° 43'S., 114° 15'E.). Area A.

Nemichthys curvirostris (Strömman, 1896)
No figure voucher. det. D. Bray (AMS 1.21714-004 from 22° 12'S., 112° 53'E.). Area C.

Nemichthys scolopaceus Richardson, 1848
No figure voucher. det. J.G. Nielsen. (e.g. NTM S.10755-001 (TGT (PJPW) 811) from 08° 43'S., 114° 15'E.). Areas A, C.

MURAENIDAE

Gymnothorax cribroris Whitley, 1932
det. P.H.J. Castle. CSIRO CA2794 from 20° 08'S., 117° 03'E. Area C.

Gymnothorax minor (Temminck & Schlegel, 1846)
det. D.G. Smith. CSIRO CA1696 from 19° 48'S., 117° 01'E. Areas B, C.

***Gymnothorax thyrsoideus** (Richardson, 1845)
No figure voucher. det. J.B. Hutchins. WAM P.26298-001 from 18° 03'S., 121° 01'E. Area C. *Diagnosis*: Light brown body, finely mottled darker and lighter, snout and lower jaw white; many teeth in inner row of maxillary band, no long and fang-like teeth.

Gymnothorax longinquus (Whitley, 1948)
det. E. Böhlke. AMS 1.21943-017 11° 24'S., 134° 54'E. Area C.

Gymnothorax pseudothyrsoideus (Bleeker, 1853)
det. J. McCosker. CSIRO CA1488 from 19° 50'S., 116° 01'E. Area C.

Gymnothorax mccoskeri Smith & Böhlke, 1997
det. D.G. Smith & E. Böhlke. CSIRO CA1489 from 17° 47'S., 121° 41'E. Area C. Holotype.

Strophidon sathete (Hamilton, 1822)
det. PK. LPPL JIF2 (no field number). Area B. Drawing of preserved specimen. *Thyrsoidea macrura* (Bleeker) is a synonym.

SYNAPHOBRANCHIDAE

Dysomma anguillare Barnard, 1923
det. P.H.J. Castle. NTM S.10745-001 (TGT1895) 08° 27'S., 117° 47'E. Area B

CONGRIDAE

Ariosoma meeki (Jordan & Snyder, 1900)
No figure voucher. Our material (e.g. BMNH 1984.1.1.3 from 08° 56'S., 116° 24'E.). det. PK based on Karmovskaya 2018 who determined that *meeki* Jordan & Snyder is the correct name for the *Ariosoma* with two black patches on the posterior eye margin. Areas A, B, C.

Ariosoma mauritianum (Pappenheim, 1914)
No figure voucher. Our material (e.g. CSIRO CA2721 from 20° 01'S., 115° 57'E.) determined by P.H.J. Castle. Area C. Additional material from Area C is AMS I.22821-055.

Bathymyrus smithi Castle, 1968
No figure voucher. Our material (e.g. BMNH 1984.1.1.4 (PJPW135) from 08° 45'S., 114° 17'E.) determined by P.H.J. Castle. Area A.

Blachea xenobranchialis Karrer & Smith, 1980
No figure voucher. Our specimen (WAM P.26270-005 from 15° 30'S., 120° 58'E.) determined by P.H.J. Castle. Area C.

Diploconger polystigmatus Kotthaus, 1968
det. P.H.J. Castle & D.G. Smith. CSIRO CA1694 from 20° 03'S., 116° 10'E. Area C. Drawing of preserved specimen.

Gnathophis nasutus Karmovskaya & Paxton 2000
det. E. Karmovskaya & J.R. Paxton. CSIRO CA2720 from 19° 40'S., 116° 10'E. Drawing of a preserved specimen (e.g. AMS 1.22866-001 from 20° 03'S., 115° 57'E.). Area C. Paratype.

Heteroconger tricia Castle & Randall, 1999
No figure voucher. P.H.J. Castle determined our material (NMNZ P.015177 (TGT1623) possibly from southern Flores (08° 52'S., 121° 30'E.)). Area B. Holotype. (A duplicate specimen is NTM S.11012-001. Paratype.). Drawing of preserved specimen from Castle & Randall, 1999.

Lumiconger arafura Castle & Paxton, 1984
det. P.H.J. Castle. CSIRO CA2879 from 12° 34'S., 128° 27'E. Area C. Paratype.

Parabathymyrus macrophthalmus Kamohara, 1938
No figure voucher. Our specimen BMNH 1984.4.11.11 (no field number) determined by P.H.J. Castle. Area B.

Bathycongrus guttulatus (Günther, 1887)
No figure voucher. Our material BMNH 1984.1.1.5 (no field number) determined by P.H.J. Castle. Area A.

Macrocephenchelys brevirostris (Chen & Weng, 1967)
No figure voucher. Our material determined by P.H.J. Castle NMNZ P.015178 (TGT1894) from 08° 27'S., 117° 47'E. Area B.

Uroconger lepturus (Richardson, 1845)
No figure voucher. Our material (e.g. NTM S.10751-001 (TGT1677) from 08° 30'S., 117° 46'E.) determined by P.H.J. Castle. Areas A, B.

Gavialiceps javanicus Karmovskaya, 1993
No figure voucher. det. E. Karmovskaya. BMNH 1984.1.1.6 and 1984.1.1.7 (PJPW136) from 08° 45'S., 114° 17'E. Area A. Paratypes.

MURAENESOCIDAE

Muraenesox bagio (Hamilton, 1822)
No figure voucher. PK determined our material (e.g. CSIRO CA1088 from 13° 38'S., 124° 30'E.). Area A.

Muraenesox cinereus (Forsskål, 1775)
det TGT. LPPL JIF9 (TGT2476) 00° 04'S., 99° 01'E. Areas A, B, C.

Oxyconger leptognathus (Bleeker, 1858)
No figure voucher. P.H.J. Castle determined our material (e.g. CSIRO CA2709 from 19° 34'S., 116° 09'E.). Area C.

NETTASTOMATIDAE

Nettenchelys gephyra Castle & Smith, 1981
No figure voucher. Our material determined by P.H.J. Castle (AMS I.22852-001 (TGT1893) from 08° 27'S., 117° 47'E.). Area B.

Saurenchelys sp.
No figure voucher. det. P.H.J. Castle. CSIRO CA1558 from 12° 42'S., 136° 54'E. Area B. Drawing of preserved specimen.

OPHICHTHIDAE

Ophichthus urolophus (Temminck & Schlegel, 1846).
No figure voucher. det. PK & TGT (e.g. NTM S.10750-001 (TGT1444) from 08° 56'S., 116° 24'E.). Area B.

Pisodonophis cancrivorus (Richardson, 1848)
No figure voucher. det. P.H.J. Castle. BMNH 1984.1.1.8 (PJPW 63) 08° 52'S., 115° 01'E. Area A.

ARGENTINIDAE

Glossanodon australis Kobyliansky, 1998
det. PK. NTM S.10760-005 (TGT1716) 08° 58'S., 116° 34'E. Areas A, B. Drawing of preserved specimen.

*** Glossanodon pseudolineatus** Kobyliansky, 1998
No figure voucher. Our material determined by G. Moore. WAM P.26193-003 from 19° 17'S., 116° 16'E. Area C. *Diagnosis*: dorsal fin begins before ventral fin origin; anus much closer to anal fin base than to ventral fin base; maxilla broad posteriorly, ending well before eye. D 10. A 9-10. P 16. Total GR. 23-26. Mouth slightly upturned; eye equal to snout length. About 7 dark blotches in midlateral row along yellowish body; 2 dark patches on base of caudal fin; mouth, gill cavity and abdomen shaded dark grey or black, overwashed silver.

*** Glossanodon sp.**
No figure voucher. Two specimens LACM43541-1 (TGT1670) 08° 30'S., 117° 46'E and LACM 43542-2 (TGT3202B) 09° 01'S., 116° 18'E) remain unidentified. Based on Kobyliansky (1988) and information provided originally by D.M. Cohen, they are closest to *G. mildredae* Cohen & Atsaides, 1969. Unfortunately, no information is available on these specimens.

* BATHYLAGIDAE

*** Bathylagoides argyrogaster** (Norman, 1930)
No figure voucher. Our material determined by D.M. Cohen. BMNH 1984.1.1.12 (TGT (PJPW)204) from 08° 43'S., 114°15'E. Area A. *Diagnosis* (family): Small to medium-sized fish from deep water. Body robust, elongate or slender; eyes large (not tubular), interorbital space more than half the depth of caudal peduncle. (Parietal bones do not meet in midline; supraorbital bone present). Scales thin, deciduous; lateral line present. Dorsal fin with more that 13 rays; caudal fin forked.(Similar to ARGENTINIDAE). Bathylagus is the only genus (Cohen 1964). *Diagnosis* (species): D. 12. A. 13-16. V.8. About 38 scales in longitudinal series. Dorsal fin origin nearer to caudal fin than to end of snout; adipose fin present. Body depth 4.6-5.5 in SL, head 3.8-4.2 in SL; eye 2.5-2.8 in HL. Brownish above, silvery below; operculum silvery black. REFERENCES: Kobyliansky, 1985; Kobyliansky, 1990; Paxton & Cohen, 1999.

STERNOPTYCHIDAE

Argyripnus pharos Harold & Lancaster, 2003
No figure voucher. det. A. S. Harold. AMS I. 24338-002 (TGT1676) from 08° 30'S., 117° 46'E. Area B. Paratype.
We use the photo of the preserved specimen, Holotype, BMNH 1986.9.22.41.

Maurolicus javanicus Parin & Kobyliansky, 1993
No figure voucher. det. N.V. Parin. AMS I. 24316-006. (00° 04' S, 97° 55' E.). Photo supplied and taken by Dr. Glenn Moore, Western Australia Museum, from conspecific specimen from 31° 87' S., 115° 21' E. WAM P.32519-006. Area A. Holotype.

Polyipnus soelae Harold, 1994
det. M. Aizawa. AMS I. 24318-002 (TGT2533) 01° 25'S., 100° 19'E. Area A.

Polyipnus triphanos Schultz, 1938
No figure voucher. Our material determined by PK based on Harold, 1994. AMS I. 24338-001 (TGT1672 in part) 08° 30'S., 117° 46'E. Area B.

ALEPOCEPHALIDAE

Microphotolepis schmidti (Angel & Verrier, 1931)
det. N. Merrett. BMNH 1984.1.1.15 (PJPW126) 08° 45'S., 114° 17'E. Area A. *M. multipunctata* Sazonov & Parin is a synonym.

Xenodermichthys copei (Gill, 1884)
No figure voucher. Our specimens determined by N. Merrett (e.g. BMNH 1984.1.1.16 (PJPW117) from 03° 45'S., 114° 17'E.). Area A.

PHOSICHTHYIDAE

Phollichthys mauli (Poll, 1953)
No figure voucher. Our juvenile specimens determined by J. Badcock. BMNH 1984.1.1.13 (PJPW 2031) 03° 43'S., 114° 15'E. Area A.

Polymetme corythaeola (Alcock, 1898)
No figure voucher. Our material determined by N. Merrett. (BMNH 1984.1.1.14 (PJPW 205) 03° 45'S., 114° 16'E.). Area A.

GONOSTOMATIDAE

Manducus greyae (Johnson, 1970)
No figure voucher. Our specimen determined by J. Badcock. BMNH 1984.1.1.17 (TGT (PJPW) 839) from 03° 43'S., 114° 15'E. Area A.

Sigmops elongatus (Günther, 1878)
det. J. Badcock. BMNH 1984.1.1.18 (TGT (PJPW) 818a) 08° 43'S., 114° 15'E. Area A.

STOMIIDAE (includes former CHAULIODONTIDAE and MELANOSTOMIDAE)

Subfamily Astronesthinae

Astronesthes chrysophekadion (Bleeker, 1849)
No figure voucher. R. Gibbs determined our material (e.g. USNM 264976 (TGT1926) 08° 32'S., 114° 30'E.). Areas A, B.

Astronesthes cyanea (Brauer, 1902)
No figure voucher. R. Gibbs determined our material (e.g. BMNH 1984.1.1.20 (TGT (PJPW) 841 in part) 03° 43'S., 114° 15'E.). Area A.

Astronesthes indica Brauer, 1902
No figure voucher. R. Gibbs determined our material (e.g. BMNH 1984.1.1.21 (TGT (PJPW) 817) 03° 43'S., 114° 15'E.). Area A.

Astronesthes martensii Klunzinger, 1871
det. R. Gibbs. BMNH 1984.1.1.22 (TGT (PJPW) 774) 08° 32'S., 114° 30'E. Areas A, B.

Astronesthes splendida Brauer, 1902
No figure voucher. R. Gibbs determined our material BMNH 1984.4.11.4 (TGT1925) 08° 32'S., 114° 30'E. Area A.

Subfamily Chauliodontinae

Chauliodus sloani Bloch & Schneider, 1801
det. R. Gibbs. BMNH 1984.1.1.28 (PJPW115) 08° 45'S., 114° 17'E. Area A

Subfamily Melanostomiinae

Echiostoma barbatum Lowe, 1843
No figure voucher. R. Gibbs determined our material (BMNH 1984.4.11.6 (TGT1933) 08° 32'S., 114° 30'E.). Area A.

Eustomias bifilis Gibbs, 1960
No figure voucher. R. Gibbs determined our material (BMNH 1984.4.11.5 (TGT1932) 03° 32'S., 114° 30'E.). Area A.

***Leptostomias sp.**
No figure voucher. R. Gibbs determined our material (a damaged specimen). BMNH 1984.1.1.24 (PJPW2024) 08°45'S. 114°45'S. Area A. Three species of *Leptostomias* Gilbert are known in the general Survey area: *L. gladiator* Zugmayer, *L. gracilis* Regan & Trewavas, and *L. macronema* Gilbert.

Melanostomias macrophotus Regan & Trewavas, 1930
det. R. Gibbs. BMNH 1984.1.1.25 (PJPW 42 in part) 03° 45'S., 114° 17'E. Area A.

***Melanostomias sp**
No figure voucher. Our damaged specimens determined by R. Gibbs (e.g. BMNH 1984.1.1.26 (PJPW 2019) 03°45'S., 114° 17'E.). Area A. There are more than 20 known species of *Melanostomias* Brauer. Harold (1999) listed nine species from the Western and Central Pacific; the type locality for one of them, *M. valdiviae* Brauer, 1902, is off the west coast of Sumatra (Survey area A)

Photonectes albipennis (Döderlein, 1882)
No figure voucher. Our material determined by R. Gibbs (e.g. BMNH 1984.1.1.27 (PJPW 42 in part) 08° 45'S., 114° 17'E.). Area A.

***Photonectes sp.**
No figure voucher. Our material determined by R. Gibbs (e.g. BMNH 1989.4.6.86 (TGT (PJPW) 815) 08° 45'S., 114°15'E.). Area A. Members of the genus *Photonectes* Günther are easily recognised among stomiid fishes by the combination of the scaleless body and the protruding, curved lower jaw bearing a single row of teeth (Prokofiev & Klepadlo, 2019). It comprises about 22 valid species (ibid).

Subfamily Stominae

Stomias nebulosus Alcock, 1889
det. R. Gibbs. BMNH 1984.1.1.23 (PJPW116) 08° 45'S, 114° 17'E. Area A.

CHANIDAE

Chanos chanos (Fabricius, 1775)
det. TGT. LPPL JIF8 (TGT1088) 08° 46'S., 115° 10'E. Area B.

ARIIDAE

Plicofollis tonggol (Bleeker, 1846)
det. PK. NTM S. 10733-030 (TGT2121) 08° 46'S., 115° 10'E. Area B. [Note: This name has seniority over *P. crossocheilus* (Bleeker, 1846)].

Arius maculatus (Thunberg, 1792)
det. PK. NTM S. 11030-002 (TGT2202) 06° 13'S., 105° 44'E. Area A.

Netuma thalassina (Rüppell, 1837)
det. PK. LPPL JIF201 (TGT2217) 06° 13'S., 105° 44'E. Areas A, B, C.

Netuma bilineata (Valenciennes, 1840)
det. PK. LPPL JIF 202 (TGT2250) 06° 25'S., 105° 34'E. Areas A, B, C.

PLOTOSIDAE

Euristhmus lepturus (Gnther, 1864)
det. PK. CSIRO CA1092 14° 09'S., 128° 19'E. Area C.

Euristhmus nudiceps (Gnther, 1880)
det. PK. CSIRO CA1821 13° 16'S., 127° 05'E. Area C.

Plotosus lineatus (Thunberg, 1787)
det. PK. LPPL JIF8 (TGT3020) 08° 43'S., 115° 16'E. Areas B, C. This species has been called *Plotosus anguillaris* (Bloch).

AULOPIDAE

Hime diactithrix (Prokofiev, 2008)
det. M. Gomon. AMS 1.22807-034 18° 32'S., 118° 17'E. Area C. Sexual dimorphism is apparent, the shape of the dorsal fin in the male (voucher spec.) being diagnostic.

SYNODONTIDAE

Subfamily Synodontinae

Synodus hoshinonis Tanaka, 1917
det. R. Cressey. USNM 264322 (TGT2535) 03° 45'S., 101° 54'E. Area A, C.

Synodus indicus (Day, 1873)
det. R. Cressey. USNM 264332 (TGT2602) 08° 33'S., 114° 31'E. Areas A, B, C.

Synodus jaculum Russell & Cressey, 1979
det. R. Cressey. NTM S.10744-003 (TGT940) 08° 30'S., 116° 42'E. Areas B. C.

Synodus kaianus (Günther, 1880)
No figure voucher. Our material (e.g. NTM S.10760-001 (TGT1724) from 08° 58'S., 116° 34'E.) determined by R. Cressey. Areas B, C.

Synodus macrocephalus Cressey, 1981
det. R. Cressey. USNM 235455 (TGT3092) 08° 57'S., 116° 28'E. Areas A, B.

Synodus macrops Tanaka, 1917
det. R. Cressey. USNM 235456 (TGT3215) 09° 01'S., 116° 18'E. Areas B, C.

Synodus oculeus Cressey, 1981
det. B. C. Russell. NTM S.10743-002 (TGT3162) 08° 27'S., 117° 47'E. Area B.

Synodus rubromarmoratus Russell & Cressey, 1979
No figure voucher. Our material determined by R. Cressey (e.g. USNM 264327 (TGT2281B) from 05° 13'S., 105° 44'E.). Areas A, B.

Synodus sageneus Waite, 1905
det. PK. AMS 1.22831-040 20° 00'S., 117° 16'E. Area C.

Synodus tectus Cressey, 1981
det. R. Cressey. NTM S.10740-002 (TGT1632) 08° 57'S., 116° 17'E. Area B.

Synodus usitatus Cressey, 1981
No figure voucher. Our specimen determined by R. Cressey (BMNH 1984.1.1.29 (TGT(PJPW)380) from 04° 23'S., 102° 17'E.). Area A.

Synodus variegatus (Lacepéde, 1803)
det. R. Cressey. NTM S.10748-016 (TGT3036) 08° 43'S., 115° 16'E. Conspecific material is NTM S.10758-001 (TGT1877) from 08° 58'S., 116° 13'E. Areas B, C.

Trachinocephalus trachinus (Temminck & Schlegel, 1846)
det. PK. LPPL JIF5 (TGT2361) 01° 59'S., 99° 26'E. Areas A, B, C.

Subfamily Harpadontinae

Harpadon microchir Günther, 1878
det. R.J. Schmitz. BMNH 1984.1.1.30 (PJPW133) 08° 43'S., 114° 15'E. Area A.

Harpadon nehereus (Hamilton, 1822)
det. R.J. Schmitz. BMNH 1984.1.1.31 (TGT (PJPW) 502) 07° 52'S., 109° 04'E. Area A.

Harpadon translucens Saville-Kent, 1889
det. CSIRO. CSIRO CA2704 13° 25'S., 126° 19'E. Area C.

Harpadon mortenseni Hardenberg, 1933
det. PK. BMNH 1984.1.1.32 (TGT (PJPW) 812) 08° 43'S., 114° 15'E. Area A.

Harpadon sp cf nehereus Hamilton, 1822
det. PK. Specimen lost. (TGT1553 from 08º 17'S., 119º 45'E.). Area B.

Saurida gracilis (Quoy & Gaimard, 1824)
det. R. Waples. NTM S.10733-021 (TGT1077) 08° 46'S., 115° 10'E. Areas B, C.

Saurida longimanus Norman, 1939
det. TGT & PK. NTM S.10761-005 (TGT3164) 08° 27'S., 117° 47'E. Areas B, C.

Saurida micropectoralis Shindo & Yamada, 1972
det. R. Cressey. BMNH 1984.1.1.33 (TGT1325) 08° 46'S., 118° 17'E. Areas A, B, C.

Saurida nebulosa Valenciennes, 1850
det. H.K. Larson. NTM S.10749-001 (TGT1805) 08° 48'S., 116° 43'E. Area B.

Saurida tumbil (Bloch, 1795)
det. TGT & PK. LPPL JIF6 (TGT2384) 01° 20'S., 98° 35'E. Areas A, B, C.

Saurida macrolepis Tanaka, 1917
det. TGT & PK. LPPL JIF7 (TGT2248) 06° 25'S., 105° 34'E. Conspecific material at USNM 264323 (TGT2541) 03° 45'S., 101° 54'E. Areas A, B, C.

Saurida wanieso Shindo & Yamada, 1972.
det. TGT & PK. NTM S.11029-002 (TGT2253) 05° 13'15"S., 105° 44'E. Area A.

Saurida elongata (Temminck & Schlegel, 1846)
det. PK. CSIRO CA2956 19° 10'S., 117° 49'E. Area C. Area C.

CHLOROPHTHALMIDAE

Chlorophthalmus acutifrons Hiyama, 1940
det. M. Gomon. NTM S.10760-011 (TGT 1723) 08° 58'S., 116° 34'E. Area B.

Chlorophthalmus sp. 1 cf albatrossis Jordan & Starks, 1904
det. M. Gomon. WAM P.26270-019 15° 30'S., 120° 58'E. Areas A, B, C.

Chlorophthalmus sp. 2 cf albatrossis Jordan & Starks, 1904
det. M. Gomon. NTM S.10998-012 (TGT2534) 01° 25'S., 100° 19'E. Area A.

Chlorophthalmus corniger Alcock, 1894
No figure voucher. Our material determined by D.M. Cohen (BMNH 1984.1.1.34 from 08° 43'S., 114° 15'E.). Area A. *C. bicornis* Norman is a synonym.

Chlorophthalmus vityazi Kobyliansky, 2013
det. M. Gomon. NTM S.10998-014 (TGT2511) 01° 25'S., 100° 19'E. Conspecific material at NTM S.10760-012 (TGT1728) 08° 58'S., 116° 34'E. Areas A, B, C.

Chlorophthalmus nigromarginatus Kamohara, 1953
det. M. Gomon. AMS 1.21835-007 09° 21'S., 133° 12'E. Area C.

PARAULOPIDAE

Paraulopus oblongus (Kamohara, 1953)
det. PK. NTM S.10760-014 (TGT1722) 08° 58'S., 116° 34'E. Area B. Conspecific material is NTM S.10998-015 (TGT2513) det. M. Gomon. 01° 25'S., 100° 19'E. Area A.

Paraulopus brevirostris (Fourmanoir, 1981)
det. M. Gomon. NTM S.10752-012 (TGT3216) 09° 01'S., 116° 34'E. Areas B, C.

MYCTOPHIDAE

Benthosema fibulatum (Gilbert & Cramer, 1897)
No figure voucher. Our material determined by J. Paxton, N. Merrett & J. Badcock (e.g. BMNH 1984.1.1.35 (PJPW212) from 08° 45'S., 114° 15'E.). Area A.

Benthosema pterotum (Alcock, 1890)
No figure voucher. Our material determined by J. Paxton & J. Badcock (e.g. AMS 1.24316-001 (no field number)). Area A.

Diaphus chrysorhynchus Gilbert & Cramer, 1897
No figure voucher. Our material (e.g. AMS 1.24311-001 (TGT3204A) from 09° 01'S., 116° 18'E.). determined by J. Paxton. Area B.

Diaphus coeruleus (Klunzinger, 1871)
No figure voucher. Our material (e.g. BMNH 1984.1.1.36 (PJPW 29) from 08° 49'S., 114° 27'E.). determined by P.A. Hulley & J. Paxton. Areas A, B.

Diaphus effulgens (Goode & Bean, 1896)
No figure voucher. J. Paxton determined our material (AMS I. 24312-001 (TGT1747) from 08° 58'S., 116° 34'E.). Area B.

Diaphus fragilis Tåning, 1928
No figure voucher. J. Paxton determined our material (AMS I. 24313-002 (TGT1690) from 08° 32'S., 115° 53'E.). Area B.

Diaphus garmani Gilbert, 1906
No figure voucher. Our material determined by J. Paxton, J. Badcock & P.A. Hulley (e.g. BMNH 1984.1.1.37 (TGT1690 in part) from 08° 32'S., 115° 53'E.). Areas A, B.

Diaphus lucidus (Goode & Bean, 1896)
No figure voucher. Our material determined by N. Merrett, J. Paxton & J. Badcock (e.g. BMNH 1984.1.1.38 (PJPW 120 in part) from 08° 45'S., 114° 17'E.). Area A.

Diaphus signatus Gilbert, 1908
No figure voucher. Our material determined by P.A. Hulley (BMNH 1984.1.1.39 (no field number) from 08° 45'S., 114° 17'E.). Area A.

Diaphus splendidus (Brauer, 1904)
No figure voucher. Our material determined by J. Paxton (AMS I. 24316-002 (no field number)). Area A.

Diaphus suborbitalis Weber, 1913
No figure voucher. Our material determined by N. Merrett, J. Paxton & J. Badcock (e.g. BMNH 1984.1.1.40 (PJPW 141 in part) from 08° 45'S., 114° 17'E.). Area A.

Diaphus watasei Jordan & Starks, 1904
No figure voucher. Our material determined by J. Paxton, J.B. Hutchins & J. Badcock (e.g. WAM P.26270-007 from 15° 30'S., 120° 58'E.). Areas A, C.

***Diaphus sp. A.**
No figure voucher. J. Paxton determined our material (AMS I.24314-001 (TGT3204B) from 09° 01'S., 116° 18'E.). Area B.

***Diaphus sp. B.**
No figure voucher. J. Paxton determined our material (AMS I. 24314-002 (TGT3204) 09° 01'S., 116° 18'E.). Area B.

***Diaphus sp. C.**
No figure voucher. Our material determined by J. Paxton (AMS I. 24338-003 (TGT1678) from 08° 30'S., 117° 46'E.). Area B.

Lampadena luminosa (Garman, 1899)
No figure voucher. N. Merrett determined our material (BMNH 1984.1.1.41 (PJPW120 in part) from 08° 45'S., 114° 12'E.). Area A.

Lampanyctus lineatus Taning, 1928
No figure voucher. J. Badcock & J. Paxton determined our material (e.g. BMNH 1984.1.1.42 (TGT (PJPW) 818b) from 08° 43'S., 114° 15'E.). Area A.

Dasyscopelus asper (Richardson, 1845)
No figure voucher. J. Badcock determined our material (BMNH 1984.1.1.43 (TGT (PJPW) 436) from 05° 56'S., 104°22'E.). Area A.

Dasyscopelus brachygnathos (Bleeker, 1856)
No figure voucher. J. Paxton & N. Merrett determined our material (e.g. BMNH 1984.1.1.44 (PJPW 120 in part) from 08° 45'S., 114° 17'E.). Area A.

Myctophum fissunovi Becker & Borodulina, 1971
No figure voucher. P.A. Hulley determined our material (e.g. BMNH 1984.1.1.45 (PJPW 141 in part) from 08° 45'S., 114° 17'E.). Area A.

Notoscopelus resplendens (Richardson, 1845)
No figure voucher. J. Paxton & N. Merrett determined our material (e.g. BMNH 1984.1.1.46 (PJPW 120 in part) from 08° 45'S., 114° 17'E.). Area A.

Scopelopsis multipunctatus Brauer, 1906
No figure voucher. Our material determined by J. Badcock, N. Merrett & J. Paxton (e.g. BMNH 1984.1.1.47 (PJPW 120 in part) from 08° 45'S., 114° 17'E.). Area A.

NEOSCOPELIDAE

Neoscopelus microchir Matsubara, 1943.
det. P.A. Hulley & PK. NTM S. 10998-016 (TGT2532) 01º 25'S., 100º 19'E. Areas A, C.

PARALEPIDIDAE

Lestrolepis japonica (Tanaka, 1908)
det. H. Ho & PK. BMNH 1984.1.1.49 (PJPW43) 08° 45'S., 114° 17'E. Areas A, B.

Lestidium longilucifer Ho, Graham & Russell 2020
det. H. Ho. BMNH 1984.1.1.48 (no field number). Area A.

Lestidiops mirabilis (Ege, 1933)
No figure voucher. Our specimen (BMNH 1984.1.1.50 (PJPW211) from 08° 45'S., 114°17'E.) determined by A. Post. Area A.

Lestidium sp. cf prolixum Harry, 1953
det. H. Ho & PK. BMNH 1984.1.1.51 (TGT (PJPW780)) 08° 32'S., 114° 30'E. Area A.

Stemonosudis retrodorsalis Ho, Russell, Graham & Psomadakis, 2019
det. H. Ho. BMNH 1981.11.30:1 (PJPW113) 08° 44'S., 114° 16'E. Area A. Paratype.

POLYMIXIIDAE

Polymixia berndti Gilbert, 1905
det. PK. NTM S.10760-010 (TGT1741) 08° 58'S., 116° 34'E. Areas A, B, C.

MORIDAE

Dr T. Arai received specimens of our Physiculus species in 1983 and assigned NSMT catalogue numbers to them. When undertaking our revision however, we were informed by the NSMT fish collection manager that Dr Arai (who has passed away) did not deposit the specimens in the NSMT collection.

***Lepidion sp cf inosimae** Günther, 1887
No figure voucher. PK determined our material (BMNH 1984.1.1.55 and 1984.1.1.56 (TGT(PJPW) 448 and 508) from 08° 02'S., 109° 03'E.). Area A. There are eight known species of *Lepidion* Swainson*;* and in the absence of our examining the BMNH specimens we suggest that they could be of *L. inosimae* (Günther, 1887). That species has been recorded from the northwestern Indian Ocean (Vinu et al, 2016), southern Japan, New Zealand, southeastern Australia, New Caledonia, Papua New Guinea (Fricke et al., 2019) and Hawaii (Mundy et al., 2005). *Diagnosis*: The genus *Lepidion* Swainson is characterised by an elongated first dorsal ray, the ventral fin comprised of several rays, and an emarginate anal fin. [*L. inosimae* diagnosis*:* A species of *Lepidion* with more than 200 oblique scale rows in longitudinal series, and teeth on vomer in a rounded patch: Paulin & Roberts, 1997].

Physiculus sp. 1
det. PK. NSMT P.22055 (TGT1729) from 08° 58'S., 116° 34'E. Area B.

***Physiculus roseus** Alcock, 1891
No figure voucher. Survey material determined by D.M. Cohen (WAM P.26209-011 from 18° 18'S., 118° 08'E.). Area C. *Diagnosis:* First ray of dorsal fin prolonged. Life colour uniform rose-red. Anus ⅓ to ⅖ distance from anal fin origin to ventral fin base. 7 rays in ventral fin. Ventral light organ with 2 black dermal windows. Snout mostly scaled. Chin barbel stout. Eye ¼ to ⅓ of HL; interorbital ⅕ HL. D. 6-7; 63-65. Lower GR 13-15.

Physiculus sp. 2
det. PK. NSMT P.22058 (TGT3208) from 09° 01 'S., 116° 18'E. Area B.

Physiculus longifilis Weber, 1913
det. PK. based on Paulin, 1989. NSMT P.22054 (TGT1661) from 08° 30'S., 117° 46'E. Area B.

BREGMACEROTIDAE

Bregmaceros sp cf japonicus Tanaka, 1908
det T. Ozawa & PK. CSIRO CA1139 12° 27'S., 124° 27'E. Areas B, C. *B. japonicus* Tanaka and *B. atlanticus* (Goode & Bean) are distinguished from other *Bregmaceros* spp by the nearly uniform dark pigmentation over much of the body (Torii et al. 2003:43).

Bregmaceros nectabanus Whitley, 1941
det. H-C. Ho. NTM S.10998-003 (TGT2521) 01° 25'S., 100° 19'E. Area A.

Bregmaceros pseudolanceolatus Torii, Javonillo & Ozawa, 2004
det. H-C. Ho. CSIRO CA1101 14° 00'S., 128° 24'E. Areas B, C.

Bregmaceros mcclellandi Thompson, 1840
det. T. Ozawa & PK. NTM S.11016-001 (TGT2477) 00° 04'S., 99° 01'E. Areas A, C.

Bregmaceros anchovia Ho, Endo & Lee, 2020
det. H-C. Ho. NTM S.10824-005 (TGT2375) 01° 59'S., ·99° 26'E. Area A. Paratype.

MACROURIDAE

Coelorinchus argentatus Smith & Radcliffe, 1912
No figure voucher. Our material (e.g. WAM P.26270-015 from 15° 30'S., 120° 58'E.) determined by T. Iwamoto. Areas A, C.

Coelorinchus kamoharai Matsubara, 1943
No figure voucher. Our specimen determined by T. Iwamoto (BMNH 1984.1.1.58 (TGT (PJPW) 481) from 07° 55'S., 109° 42'E.). Area A.

Coelorinchus maculatus Gilbert & Hubbs, 1920
det. T. Arai & PK. WAM P.21650-001 (in part) 13° 28'S., 123° 09'E. Drawing of preserved specimen by T. Arai. Area C.

Coelorinchus acutirostris Smith & Radcliffe, 1912
det. T. Iwamoto. WAM P.26209-003 18° 18'S., 118° 08'E. Drawing of preserved specimen by T. Arai. Area C.

Coelorinchus sp. 1
det. N. Nakayama. CSIRO CA1134 10° 27'S., 119° 57'E. Area C. Drawing of preserved specimen by T. Arai.

Coelorinchus posteromaculatus Nakayama, Prokofiev & Kawai, 2020
det. N. Nakayama. NSMT-P 22052 (TGT1458) from 08° 58'S., 116° 05'E. Area B. Drawing of preserved specimen by T. Arai. Holotype: AMS I.44527-001 from 08º 97'S., 116º 08'E. 66.4 mm HL. 211+ mm TL.

Coelorinchus pardus Iwamoto & Williams, 1999
det. T. Iwamoto. NSMT-P 23029 from 09° 32'S., 133° 10'E. Area C. Drawing of preserved specimen by T. Arai.

Coelorinchus thurla Iwamoto & Williams, 1999
det. T. Iwamoto. WAM P.26270-016 15° 30'S., 150° 58'E. Drawing of preserved specimen by T. Arai. Area C. Paratype.

Hymenocephalus heterolepis (Alcock, 1889)
det. T. Iwamoto. BMNH 1984.1.1.59 (TGT (PJPW) 461) 07° 55'S., 109° 42'E. Specimen missing. Area A. Drawing of preserved specimen by T. Arai.

Hymenocephalus longibarbis (Günther, 1887)
No figure voucher. Our material determined by T. Arai (WAM P.25395-002 from 17° 30'S., 119° 00'E.). Area C.

OPHIDIIDAE

Brotula multibarbata Temminck & Schlegel, 1846
No figure voucher. Specimen determined by J.B. Hutchins (WAM P.26263-002 from 17° 56'S., 119° 56'E.). Area C.

Glytophidium macropus Alcock, 1894
det. J.G. Nielsen. ZMUC P77737 (TGT1448) 08° 56'S., 116° 24'E. Area B.

Glyptophidium oceanium Smith & Radcliffe, 1913
det. J.G. Nielsen. ZMUC P77751 (TGT2518) 01° 25'S., 100° 19'E. Areas A, C.

Hoplobrotula armata (Temminck & Schlegel, 1846)
No figure voucher. Our material determined by J.G. Nielsen (e.g. CSIRO CA3730 from 09° 09'S., 131° 48'E.).. Area C.

Hypopleuron caninum Smith & Radcliffe, 1913
det. J.G. Nielsen. ZMUC P77752 (TGT2519) 01° 25'S., 100° 19'E. Area A.

Neobythites longipes Smith & Radcliffe, 1913
det. J.G. Nielsen. ZMUC P77740 (TGT1718) 08° 58'S., 116° 34'E. Area B.

Neobythites macrops Günther, 1887
No figure voucher. Our material (BMNH 1983.1.1.57 (TGT(PJPW)453) from 07° 55'S., 109° 42'E.) determined by J.G. Nielsen. Area A.

Neobythites malayanus Weber, 1913
det. J.G. Nielsen. ZMUC P77742 (TGT1897) 08° 27'S., 117° 47'E. Area B.

Neobythites purus Smith & Radcliffe, 1913
No figure voucher. Our material (ZMUC P77757 from 9° 09'S., 131° 48'E.) determined by J.G. Nielsen. Area C.

***Neobythites neocaledoniensis** Nielsen, 1997
Our specimen (ZMUC P77743 (TGT1684) from 08° 32'S., 115° 53'E.) identified by J.G. Nielsen. Area B. *Diagnosis*: Body dusky yellow, fins darker with no distinct ocelli or bands. Snout equals eye diameter; opercular spine strong; two preopercular spines; lateral line distinct. D 103. A 87. P 26. V 2. GR (long) 11. Pseudobranchial filaments 4.

Neobythites lombokensis Uiblein & Nielsen, 2018
det. J.G. Nielsen. ZMUC P77744 (TGT1717) 08° 58'S., 116° 34'E. Area B. Holotype.

Ophidion muraenolepis Günther, 1880
det. J.G. Nielsen. ZMUC P77747 (TGT3188) 09° 01'S., 116° 18'E. Areas B, C.

Sirembo imberbis (Temminck & Schlegel, 1846)
det. PK. CSIRO CA1103 12° 21'S., 129° 02'E. Area C.

Sirembo jerdoni (Day, 1888)
det. J.G. Nielsen. ZMUC P77746 (TGT2468) 00° 04'S., 99° 01'E. Areas A, B, C.

Sirembo amaculata (Cohen & Nielsen, 1982)
det. J.N. Nielsen. AMS I.22805-020 18° 28'S., 118° 15'E. Area C.

CARAPIDAE

Encheliophis gracilis (Bleeker, 1856)
det. PK. CSIRO CA2309 20° 45'S., 115° 59'E. Area C.

***Onuxodon margaritiferae** (Rendahl, 1921)
No figure voucher. J.B. Hutchins determined our Survey material (e.g. WAM P.26188-030 from 20° 21'S., 115° 53'E.). Area C. *Diagnosis*: body very compressed, moderately deep. The maxillary is not hidden by skin and there are 2 or more rows of jaw teeth (anterior ones caninoid) separated by a wide gap anteriorly. Colour: translucent pink, tail tip black.

BATRACHOIDIDAE

Batrachomoeus occidentalis Hutchins, 1976
det. J.B. Hutchins. CSIRO CA1819 18° 29'S., 119° 20'E. Area C.

Batrachomoeus trispinosus (Günther, 1861)
det. J.B. Hutchins. CSIRO B.3860 11° 29'S., 134° 25'E. Area C.

Halophryne diemensis (LeSueur, 1824)
det. J.B. Hutchins. CSIRO CA1774 20° 09'S., 116° 07'E. Area C.

***Halophryne ocellatus** Hutchins, 1974
Survey specimens determined by J.B. Hutchins (e.g. WAM P.26191-001 from 20° 09'S., 116° 31'E.). Area C. *Diagnosis:* Many small ocelli on the body; no skin ridges on the head and anterior body portion.

LOPHIIDAE

Lophiodes gracilimanus (Alcock, 1899)
det. J.H. Caruso. BMNH 1984.1.1.53 (no field number). Area A.

***Lophiodes mutilus (**Alcock, 1894)
No figure voucher. Our specimen BMNH 1984.1.1.54 (PJPW2035) probably from southern Java, determined by J.H. Caruso. Area A. *Diagnosis*: Illicium pale; peritoneum black. Third dorsal fin spine reaches soft dorsal fin at least; less than 6 spines in spinous dorsal fin; pectoral fin 15-18.

Lophiomus setigerus (Vahl, 1797)
det. J.H. Caruso on photo. Specimen lost (TGT1752) 08° 58'S., 116° 34'E. Conspecific specimen NTM S.10758-003 from 08° 58'S., 116° 13'E. Areas A, B, C.

ANTENNARIIDAE

Antennarius commerson (Anonymous in Lacepède (e Commerson) 1798)
det. TGT & T.W. Pietsch. LPPL JIF10 (TGT1770) 08° 56'S., 116° 33'E. Area B.

Antennarius hispidus (Bloch & Schneider, 1801)
det. PK. CSIRO CA1689 20° 03'S., 116° 10'E. Areas B, C.

Antennarius pictus (Shaw, 1794)
det. T.W. Pietsch on photo. Specimen lost (TGT980) 08° 30'S., 116° 42'E. Areas B, C.

Antennarius striatus (Shaw, 1794)
det. PK. CSIRO CA2314 20° 40'S., 116° 00'E. Area C.

Lophiocharon trisignatus (Richardson, 1844)
det. PK. CSIRO CA2313 19° 29'S., 115° 59'E. Area C.

Tathicarpus butleri Ogilby, 1907
det. CSIRO. CA 1397 10° 50'S., 131° 07'E. Area C.

TETRABRACHIIDAE

Tetrabrachium ocellatum Günther, 1880
det. PK. Specimen lost. 12° 24'S., 137° 48'E. Area C. Conspecific material from Survey area determined by T.W. Pietsch is WAM P.26130-001 from 14° 00'S., 126° 36'E.

CHAUNACIDAE

Chaunax gomoni Ho, Kawai & Satria, 2015
det. H. Ho. NTM S.10998-010 (TGT2531) 01° 25'S., 100° 19'E. Areas A, B, C.

OGCOCEPHALIDAE

A note about *Halieutaea*: Even with the assistance of experts we are unable to place the correct identities on some of the material caught in the Survey mainly because of the variety of characteristics used to define species.

Halieutaea sp. 1
det. H. Ho. CSIRO CA1394 from 10° 02'S., 130° 05'E. Area C. This species belongs in the *H. coccinea* group. (pers. comm. H. Ho September 2019).

Halieutaea coccinea Alcock, 1889
det. PK. NTM S.11117-002 (no field number) 08° 01'S., 109° 27'E. Area A. Drawing of preserved specimen.

Halieutaea fumosa Alcock, 1894
det. PK. NTM S. 10761-010 (TGT3152J 08° 27'S., 117° 47'E. Areas B, C.

Halieutaea indica Annandale & Jenkins, 1910
det. PK. NTM S. 11001-005 (TGT2556) 03° 07'S., 101° 20'E. Area A.

Halieutaea sp. 2
det. PK. NTM S.10995-005 (TGT2610) 08° 33'S., 114° 31'E. Areas A, B, C.

Halieutaea sp. 3
det. PK. NTM S.10999-002 (TGT2457) 00° 25'S., 98° 40'E. Area A.

Malthopsis kobayashii Tanaka, 1916
det. PK. NTM S.10760-013 (TGT1711) 08° 58'S., 116° 34'E. Areas B, C.

VELIFERIDAE

Velifer sp.
det. PK. WAM P.26194-010 19° 26'S., 116° 31'E. Areas B, C. In all of our material, the lateral line count (59-63) is consistently below that stated for *V. hypselopterus* Bleeker (70-72).

TRACHIPTERIDAE

Desmodema polystictum (Ogilby, 1898)
det. PK. NTM S.11036-001 (TGT1560) 08° 03'S., 108° 39'E. Area B. (photo of preserved voucher: PK 5).

***Trachipterus trachypterus** (Gmelin, 1789)
No figure voucher. Our Survey material determined by P. Whitehead (BMNH 1984.1.1.62 (TGT (PJPW) 834) from 08° 43'S., 114° 15'E.). Area A. *Diagnosis*: No scales on body; anus near middle of body. Anal fin absent; upper lobe of caudal fin well-developed and upturned, lower lobe reduced to stump in adults. Greatest body depth immediately behind head; caudal peduncle depth contained less than twice in body depth at level of 10th lateral line spine before tail tip. Body silvery fawn, with 2-5 large dark blotches along side.

ATELEOPODIDAE

Ateleopus japonicus Bleeker, 1853
det. P. Whitehead. BMNH 1984.1.1.52 (TGT (PJPW) 355) 00° 50'S., 98° 32'E. Area A. We have two other specimens (TGT1562, NTM S.11036-002 from 08° 03'S., 108° 39'E.) which may be conspecific. Area B.

*MELAMPHAIDAE

***Scopelogadus mizolepis** (Günther, 1878)
No figure voucher. Our specimen (BMNH 1984.1.1.60 (TGT (PJPW) 177) from 08° 45'S., 114° 17'E.) determined by P. Whitehead. Area A. *Diagnosis* (family): small fishes with body deep or somewhat elongate. Head large with thin bones and mucous cavities; fine jaw teeth, no palatine teeth. Short dorsal fin with few spines; ventral fin with one spine, 6 to 9 rays; caudal fin forked. Diagnosis (species): scales very large and cycloid, easily lost, 12-18 in lateral line. D II-III, 9-11. A I-II, 8. V. I, 7. Depth 3.5-3.7 in SL, head 2.5 in SL. Pectoral fin very long. Colour dark blue-grey or black.

TRACHICHTHYIDAE

Aulotrachichthys latus (Fowler, 1938)
No figure voucher. Our material determined by M.F. Gomon (e.g. NMV A3270 (TGT1884) from 08° 27'S., 117° 47'E.). Area B.

Aulotrachichthys sp.
det. M.F. Gomon. NTM S. 10752-009 (TGT3190A) 09° 01'S., 116° 18'E. Areas B, C?

***Hoplostethus ravurictus** Gomon, 2008
No figure voucher. M. Gomon determined our material (WAM P.26209-015 from 18° 18'S., 118° 08'E.). Area C. Paratype. *Diagnosis:* D VI, 13-14. A 111, 9. Total G.R. 18-20. 15 abdominal scutes between ventral fin bases and anus, which is just before anal fin origin. Vertical soft fins rounded. Eye 7.6-8.5 in SL; body depth 1.9-2 in SL.

MONOCENTRIDAE

Monocentris japonica (Houttuyn, 1782)
det. CSIRO. CSIRO CA1807 09° 40'S., 135° 00'E. Areas A, B, C.

HOLOCENTRIDAE

Myripristis berndti Jordan & Evermann, 1903
det. TGT. BPBM 29389 (TGT2190) 08° 43'S., 115° 16'E. Areas A, B.

Myripristis kuntee Cuvier, 1831
det. TGT & PK. BPBM 29388 (TGT2180). 08° 43'S., 115° 16'E. Area B.

Myripristis botche Cuvier, 1829
det. PK. CSIRO CA1545 from 20° 10'S., 115° 15'E. Areas B, C. Conspecific material at LPPL JIF12 (PAN 9) 08° 31'S., 115° 32'E.

Neoniphon opercularis (Valenciennes, 1831)
det. TGT. LPPL JIF11 (TGT1224) 08° 10'S., 114° 54'E. Area B.

Ostichthys acanthorhinus Randall, Shimizu & Yamakawa, 1982
det. J. Randall. BMNH 1982.4.6.25-26 (TGT1464) 08° 58'S., 116° 05'E. Areas A, B.

Ostichthys japonicus (Cuvier, 1829)
det. LPPL JIF13 (TGT3000) 08° 25'S., 117° 48'E. Areas B, C.

Ostichthys kaianus (Günther, 1880)
det. J. Randall. AMS I.22807-052 18° 32'S., 118° 17'E. Area C.

Sargocentron caudimaculatum (Rüppell, 1838)
Specimen lost. det. J. Randall on photo. (TGT1012) 08° 43'S., 115° 16'E. Area B.

Sargocentron diadema (Lacepède, 1802)
det. J. Randall. BMNH 1984.1.1.61. (TGT(PJPW)347) 02° 35'S., 99° 56'E. Area A.

Sargocentron punctatissimum (Cuvier, 1829)
det. TGT & PK. LPPL JIF14 (PAN2) 08° 31'S., 115° 32'E. Area B.

Sargocentron rubrum (Forsskål, 1775)
det. CSIRO. CSIRO CA1816 20° 12'S., 115° 19'E. Areas B, C.

Sargocentron spiniferum (Forsskål, 1775)
det. TGT. LPPL JIF15 (BZ01) 06° 10'S., 104° 38'E. Areas A, B.

ZEIDAE

Zenopsis conchifer (Lowe, 1852)
det. TGT. LPPL JIF16 (TGT (PJPW) 390) 01° 48'S., 99° 21'E. Area A.

Zenopsis nebulosa (Temminck & Schlegel, 1845)
det. TGT. NTM S.10752-010 (TGT3229) 09° 01' S., 116° 18'E. Areas B, C.

Zeus faber Linnaeus, 1758
det. CSIRO. Specimen lost. (Conspecific material determined by CSIRO is CA250 from 19° 58'S., 115° 12'E.). Area C.

PARAZENIDAE

Cyttopsis cypho (Fowler, 1934)
det. TGT. NTM S.10998-011 (TGT2529) 01° 25'S., 100° 19'E. Areas A, B, C.

ZENIONTIDAE

Zenion sp.
det. D. Bray. NTM S.10998-007 (TGT2522) 01 ° 25'S., 100° 19'E. Area A.

*GRAMMICOLEPIDIDAE

***Xenolepidichthys dalgleishi** Gilchrist, 1922
det. J. Paxton. AMS 1.22825-012 18° 43'S., 117° 20'E. Area C. *Diagnosis* (family): Body oval or oblong-shaped, strongly compressed. Body, cheeks and operculum covered with vertically-elongated scales. Mouth very small. A row of small spines along each side of vertical fin bases. Two dorsal fins: V-VII; 27-34. A II, 27-39. First anal spine greatly elongated in juveniles. *Diagnosis* (species): body very deep and compressed; no spiny scutes on of sides body; dorsal fin spines plus rays 32-34. Silvery body with round black spots, caudal margin black. Reference: Heemstra 1986.

ANTIGONIIDAE

Antigonia capros Lowe, 1843
det. P. Zehren. NTM S.10760-015 (TGT1742) 08° 58'S., 116° 34'E. Areas A. B.

Antigonia rubescens (Günther, 1860)
det. P. Zehren. NTM S.11034-002 (TGT2330) 02° 42'S., 99° 56'E. Areas A, B, C.

Antigonia rubicunda Ogilby, 1910
det. P. Zehren. NTM S.11116-004 (no field number). Areas A, B, C.

Antigonia malayana Weber, 1913
det. P. Zehren. NTM S.11042-001 (TGT2288) 05° 35'S., 102° 25'E. Area A.

FISTULARIIDAE

Fistularia commersonii Rüppell, 1838
No figure voucher. Our material determined by G. Leyland (e.g. CSIRO CA1547 from 19° 52'S., 115° 54'E.). Area C.

Fistularia petimba Lacepède, 1803
det. TGT. LPPL JIF17 (TGT2232) 06° 13'S., 105° 44'E. Areas A, B, C.

CENTRISCIDAE

***Centriscus cristatus** (De Vis, 1885)
No figure voucher. Our specimen determined by J.B. Hutchins (WAM P.26188-034 from 20° 21'S., 115° 53'E.). Area C. *Diagnosis*: body depth 4.6-5 in SL., interorbital convex and not grooved. D III, 12. A 13-14. P.12. First dorsal spine not jointed, fused with body armour.

Centriscus scutatus Linnaeus, 1758
det. PK. NTM S.10749-007 (TGT1812) 08° 48'S., 116° 43'E. Areas A, B, C.

SYNGNATHIDAE

Halicampus macrorhynchus Bamber, 1915
No figure voucher. Our specimen (apparently lost (TGT1883) from 08° 27'S., 117° 47'E.) determined by C.E. Dawson. Area B.

Haliichthys taeniophora Gray, 1859
No figure voucher. Our material (e.g. CSIRO CA1811 from 19° 52'S., 118° 12'E.) determined by R. Kuiter. Area C.

Hippocampus angustus Günther, 1870
No figure voucher. Our material (e.g. CSIRO CA2184 from 20° 30'S., 115° 34'E.) determined by W. White. Area C.

Hippocampus spinosissimus Weber, 1913
det. R. Kuiter. NTM S.10749-006 (TGT1813). 08° 48'S., 116° 43'E. Areas B, C.

Solegnathus lettiensis Bleeker, 1860
No figure voucher. C.E. Dawson determined our material on photo of lost CSIRO specimen from 19°54'S., 116° 02'E. Another example is WAM P.26194-001 from 19° 26'S., 116° 31'E. Area C.

Trachyrhamphus bicoarctata (Bleeker, 1857)
No figure voucher. Our material (e.g. NTM S. 11085-001 from 19° 57'S., 116° 17'E.) determined by C.E. Dawson Area C.

APISTIDAE

Apistops caloundra (de Vis, 1886)
det. PK. CSIRO CA1618 14° 08'S., 138° 34'E. Area C.

Apistus carinatus (Bloch & Schneider, 1801)
det. PK. LPPL JIF19 (TGT1198) 08° 47'S., 118° 25'E. Areas A, B, C.

NEOSEBASTIDAE

Neosebastes occidentalis Motomura, 2004
det. H. Motomura. CSIRO CA1388 21° 27'S., 114° 15'E. Area C. Paratype.

SCORPAENIDAE

Brachypterois serrulifer Fowler, 1938
det. PK. NTM S.11016-003 (TGT2465) 00° 04'S., 99° 01' E. Area C.

Dendrochirus brachypterus (Cuvier, 1829)
det. CSIRO. CSIRO CA1836. 20° 09'S., 116° 07'E. Areas B, C.

Dendrochirus zebra (Cuvier, 1829)
det. PK. CSIRO CA1303 19° 52'S., 118° 12'E. Areas B, C.

Ebosia bleekeri (Döderlein, 1884)
det. TGT. ANSP 152033 (TGT3189) 09° 01'S., 116° 18'E. Area B.

Neomerinthe amplisquamiceps (Fowler, 1938)
det. PK. AMS 1.22805-012 18° 28'S., 118° 15'E. Area C. Our material is not clearly different to *N. procurva* q.v.(the pectoral fin count is 20, for example).

Neomerinthe megalepis (Fowler, 1938)
det. L-C Chen. CAS 54544 (TGT2469) 00° 04'S., 99° 01'E. Area B.

Neomerinthe procurva Chen, 1981
det. L-C Chen. CAS 54545 (TGT3203) 09° 01'S., 116° 18'E. Area B.

Neomerinthe erostris (Alcock, 1896)
det. L-C. Chen. SDSU 83-16(TGT2317) 03° 24'S, 100° 33'E. Area A.

Parascorpaena aurita (Rüppell, 1838)
det. M. Matsunuma. NTM S. 10748-018 (TGT1016) 08° 43'S., 115° 16'E. Area B. Conspecific material is SDSU 83-13; (no field number).

Pontinus macrocephalus (Sauvage, 1882)
det. W.N. Eschmeyer. ANSP 152032 (TGT1750) 08° 58'S., 116° 34'E. Area B.

Pterois antennata (Bloch, 1787)
det. PK. LPPL JIF22 (TGT1544) 08° 22'S., 117° 15'E. Area B.

Pterois paucispinula Matsunuma & Motomura, 2014
det. M. Matsunuma. NTM S.10621-001 from 19° 57'S., 116° 17'E. Areas B, C.

Pterois radiata Cuvier, 1829
det. PK. LPPL JIF23 (PAN43) 08° 31'S., 115° 32'E. Area B.

Pterois russelii Bennett, 1831
det. PK. LPPL JIF24 (TGT2622) 08° 42'S., 115° 05'E. Areas B, C.

Pterois volitans (Linnaeus, 1758)
det. TGT. LPPL JIF25 (TGT1339I 08° 46'S., 118° 17'E. Areas B, C.

Rhinopias frondosa (Günther, 1892)
det. TGT. ANSP 152031 (TGT3277I 10° 55'S., 122° 43'E. Area B.

Scorpaena neglecta Temminck & Schlegel, 1843
det. PK. AMS 1.22821-048 18° 16'S., 118° 12'E. Area C.

Scorpaena onaria Jordan & Snyder, 1900
det. PK. AMS 1.22807-037 18° 32'S., 118° 17'E. Area C.

Scorpaenodes evides (Jordan & Thompson, 1914)
det. PK. WAM P.26191-007 20° 09'S., 116° 31'E. Area C.

Scorpaenodes smithi Eschmeyer & Rama Rao, 1972
det. PK. Specimen lost. 20° 15'S., 115° 59'E. Area C. (Conspecific Survey material at CSIRO). A catalogued example from the Survey area is BMNH 1933.8.11.4 from 11° 59'S., 126° 38'E.

Scorpaenopsis neglecta Heckel, 1837
det. PK. WAM P.26230-017 19° 01'S., 119° 25'E. Area C.

Scorpaenopsis oxycephalus (Bleeker, 1849)
det. PK. NTM S.10734-014 (TGT1227) 08° 10'S., 114° 15'E. Areas A, B, C.

Scorpaenopsis venosa (Cuvier, 1829)
det. W.N. Eschmeyer. CAS 54542 20° 15'S., 116° 02'E. Area C.

SEBASTIDAE

Sebastiscus vibrantus Morishita, Kawai & Motomura 2018.
det. H. Motomura. SDSU 83-14 (TGT1751) 08° 58'S., 116° 34'E. Area B.

SETARCHIDAE

Ectreposebastes imus Garman, 1899
det. W.N. Eschmeyer. BMNH 1984.1.1.63 (TGT (PJPW) 824) 08° 43'S., 114° 15"E. Area A.

Lythrichthys cypho (Fowler, 1938)
det. H. Wada. NTM S.10998-005 (TGT2523) 01° 25'S., 100° 19'E. Conspecific material at WAM P.26209-008. Areas A, C.

Lythrichthys dentatus Wada, Kai & Motomura, 2021
det. H. Wada. CSIRO CA1584. 10° 02'S., 130° 03'E. Areas A, C. Holotype.

Setarches guentheri Johnson, 1862
det. H. Wada. WAM P.26209-008 18° 18'S., 118° 08'E. Area C.

SYNANCEIDAE

Erosa erosa (Cuvier, 1829)
det. J.B. Hutchins. WAM P.26197-021 20° 05'S., 117° 05'E. Area C.

Inimicus cuvieri (Gray, 1835)
det. PK. LPPL JIF20 (TGT1394) 08° 46'S., 115° 02'E. Area B.

I**nimicus didactylus** (Pallas, 1769)
det. TGT. LPPL JIF21 (TGT2366) 01° 59'S., 99° 26'E. Areas A, C.

Inimicus sinensis (Valenciennes, 1833)
det. W.N. Eschmeyer. BMNH 1984.1.1.64 (TGT (PJPW) 711) 08° 25'S., 114° 25'E. Areas A, C.

Minous groeneveldi Matsumura & Motomura, 2018
det. PK. NTM S.11031-002 (TGT2621) 08° 42'S., 115° 05'E. Area B. Holotype.

Minous pictus Günther, 1880
det. M. Matsunuma. CSIRO CA1679 19° 29'S., 115° 59'E. Area C.

Minous roseus Matsunuma & Motomura, 2018
det. M. Matsunuma. CSIRO CA1844 20° 09'S., 116° 07'E. Area C. Holotype.

Minous versicolor Ogilby, 1910
det. PK. CSIRO CA1300 20° 31'S., 116° 00'E. Area C.

Synanceia verrucosa Bloch & Schneider, 1801
det. TGT. LPPL JIF18 (TGT1020) 08° 43'S., 115° 16'E. Area B.

TETRAROGIDAE

***Ablabys taenianotus** (Cuvier, 1829)
No figure voucher. Our specimen determined by PK (CSIRO uncatatalogued from 20° 50'S., 116° 27'E.). Area C.
Diagnosis: D XVII, 7-8. A III, 5. Head naked, small embedded scales on body. Dorsal fin begins above eyes, anterior spines (except first) much longer than posterior ones and not removed from rest of fin; membrane extends to spine tips; dorsal, anal and pectoral rays branched. Body tan or brown, streaked dark brown; pectoral fin barred brown.

Cottapistus cottoides (Linnaeus, 1758)
det. S.G. Poss. UMMZ 212292 (TGT3245) 08° 24'S., 116° 01'E. Areas B, C.

Liocranium pleurostigma (Weber, 1913)
det. H. Motomura. CSIRO CA1730 19° 38'S., 118° 40'E. Area C.

Neocentropogon aeglefinus (Weber, 1913)
det. PK. ANSP 152034 (TGT3144) 08° 27'S., 117° 47'E. Areas B, C.

Neocentropogon trimaculatus Chan, 1966
det. S.G. Poss. CAS 54602 (TGT3195) 09° 01'S., 116° 18'E. Areas B, C.

Paracentropogon longispinis (Cuvier, 1829)
det. S.G. Poss. ANSP 153167 (TGT2119) 08° 46'S., 115° 10'E. Areas B, C.

Snyderina yamanokami Jordan & Starks, 1901
det. S.G. Poss UMMZ 212291 (TGT3192) 09° 91'S., 116° 18'E. Area B.

Richardsonichthys leucogaster (Richardson, 1848)
det PK. CSIRO B.2984 20° 50'S., 116° 27'E. Area C.

TRIGLIDAE

Lepidotrigla sp cf japonica Bleeker, 1854
det. M. Gomon. Specimen lost. 19° 44'S., 116° 02'E. Area C. (Conspecific Survey material determined by CSIRO: CA1423 from 20° 48'S., 116° 00'E.). This species is an Australian-Indonesien endemic that will be described in a forthcoming review of Australian species (pers. comm. M. F. Gomon.) Another specimen is NTM S.11013-004 (TGT1797) 08º 40'S., 116º 37'E. Area B.

Lepidotrigla sp. 1
This specimen represents an undescribed Australian endemic species distributed off the northern Western Australia. (pers. comm M.F. Gomon) CSIRO CA1627 10° 02'S., 130° 03'E. Area C.

***Lepidotrigla sp 2**
M.F. Gomon informed us (October 2019) that this specimen represents another undescribed long-finned species in the complex endemic to Western Australia. Area C, northwest of Dampier (NMVA 1950 from 19° 60'S., 115°59'E.).
Diagnosis: D IX, 14. A 14. L. lat. 59. Pectoral fin long, to 13-14th dorsal fin ray. Prominent broad rostral spine with many small adjacent ones. Scales weakly attached; breast and anterior ⅓ of belly naked. Pectoral fin mostly black with obvious pale spots (preserved colour).

Lepidotrigla spiloptera Günther, 1880
det. M.F. Gomon. NTM S.10752-015 (TGT3198) 09° 01'S., 116° 18'E. Areas A, B, C.

Lepidotrigla maculapinna Gomon & Kawai, 2018
det. M.F. Gomon. NTM S.10999-004 (TGT2460) 00° 25'S., 98° 40'E. Areas A, B, C. Paratype.

Lepidotrigla macracaina Gomon & Kawai, 2018
det. M.F. Gomon. NTM S.10995-006 (TGT2594) 08° 33'S., 114° 31 'E. Areas A, B.

Lepidotrigla russelli del Cerro & Lloris, 1995
det. M.F. Gomon. CSIRO CA1114 14° 03'S., 124° 05'E. Area C.

Lepidotrigla tanydactyla Gomon & Kawai, 2018
det. M.F. Gomon. NTM S.10761-009 (TGT3147) 08° 27'S., 117° 47'E. Area B. Paratype.

Lepidotrigla venusta Fowler 1938
det. M. Gomon. AMS 1.22830-007 19° 19'S., 117° 13'E. Areas B, C.

Pterygotrigla (Parapterygotrigla) multiocellata (Matsubara, 1937)
det. PK. AMS 1.22807-029 18° 32'S., 118° 17'E. Area C.

Pterygotrigla (Parapterygotrigla) macrorhynchus Kamohara, 1936
det. T. Kawai. NTM S.10998-018 (TGT2510) 01° 25'S., 100° 19'E. Areas B, C.

Pterygotrigla (Otohime) draiggoch Richards, Yato & Last, 2003
det. PK. NTM S.10760-016 (TGT1737) 08° 58'S., 116° 34'E. Areas A, B, C.

Pterygotrigla (Bovitrigla?) leptacanthus (Günther, 1880)
det. PK. CSIRO CA1632 10° 02'S., 130° 03'E. Area C.

Pterygotrigla (Pterygotrigla) ryukyuensis Matsubara & Hiyama, 1932
det. PK & TGT. NTM S.10998-007 (TGT2525) 01° 25'S., 100° 19'E. Areas A, B.

PERISTEDIIDAE

Gargariscus prionocephalus (Dumeril, 1869)
det. PK. CSIRO CA3724 10° 02'S., 130° 03'E. Area C.

Peristedion liorhynchus Günther, 1872
det. PK. AMS 1.22807-028 18° 32'S., 118° 17'E. Areas B, C.

Satyrichthys laticeps (Schlegel, 1852)
det. PK & T. Kawai. NTM S.10760-017 (TGT1740) 08° 58'S., 116° 34'E. Areas B, C. (Conspecific material is WAM P.26209-019 from 18° 18'S., 118° 08'E.).

Satyrichthys moluccense (Bleeker, 1850)
det. T. Kawai & PK. NTM S.10999-005 (TGT2456) 00° 25'S., 98° 40'E. Areas A, C.

***Scalicus orientalis** (Fowler, 1938)
No figure voucher. PK has determined our material from northwestern Australia (e.g. WAM P.26209-009 from 18° 18'S., 118° 08'E.). Area C. *Diagnosis:* D_2 21-22. A 20-22. Lower GR 18-20. 3 or 4 simple lip barbels and 3-4 simple chin barbels on each side of lower jaw. Second row of body scutes 34-36. Probably red in life, upper body spotted, fins marbled brown.

Satyrichthys rieffeli (Kaup, 1859)
det. T. Kawai. NTM S.10751-006 (TGT1681) 08° 30'S., 117° 46'E. Areas A, B, C.

Satyrichthys welchi (Herre, 1925)
det. PK & T. Kawai. Specimen lost. 09° 52'S., 129° 12'E. Conspecific Survey material (CA353) determined by CSIRO. Area C.

APLOACTINIDAE

Erisphex aniarus (Thompson, 1967)
det. S.G. Poss. CAS 54596 10° 02'S., 120° 03'E. Areas B, C.

***Erisphex philippinus** (Fowler, 1938)
No figure voucher. Our specimen determined by S.G. Poss (CAS 54604 from 08° 36'S., 114° 41'E.). Area A. *Diagnosis* (in part by Poss): D. XI-XII, 14-16. A 1-11, 13-15. P 12-13. A single, continuous dorsal fin beginning above eye; ventral fin base just before pectoral fin base. Two sharp lachrymal spines. Body and fins tan, with scattered dark spots and markings; fin margins dark, edges white.

***Kanekonia queenslandica** Whitley, 1952
No figure voucher. Our specimen determined by S.G. Poss (CAS 54853 from 20° 58'S., 115° 55'E.). Area C. *Diagnosis* (in part by Poss): D XII-XIII, 8-10. A 1-11, 8-9. P 12-16. A single, continuous dorsal fin beginning above hind part of eye; ventral fin base under or just behind pectoral fin base; lachrymal and preoperculum spines blunt. Head large, 2.5-3.5 in SL; interorbital ridges thick, fused in middle of interorbital. Body thickset, its depth 2.5-2.7 in SL; skin prickly. Body and fins red-olive; red blotch on spinous dorsal fin extending onto back; ventral and caudal fins dark pink.

***Paraploactis pulvinus** Poss & Eschmeyer, 1978
No figure voucher. Our specimen determined by S.G. Poss (CAS 54852 from 20° 39'S., 115° 58'E.). Area C. Diagnosis: D XIII-XIV,9-10. A I, 8-9. P 14. VI, 3. A single continuous dorsal fin, first 3 spines longer than remainder; ventral fin base just behind pectoral fin base. Knobs, spines and ridges on head, interorbital ridges diverging strongly posteriorly; snout very steep with many cirri; large fleshy pad on isthmus ½-¾ as wide as long. Skin roughened and knobby. Body tan with dark banding on fins.

PLATYCEPHALIDAE

Cociella punctata (Cuvier, 1829)
(A) det. L.W. Knapp NTM S.10733-014 (TGT1288) 08° 46'S., 115° 10'E. (B). det. L.W. Knapp. BMNH 1984.1.1.65 (TGT1393) 08°46'S., 115° 02'E. This is the colour form *guttata* Cuvier, 1829. Area B.

Cymbacephalus nematophthalmus (Günther, 1860)
det. PK. CSIRO CA1160 12° 30'S., 130° 05'E. Area C.

Elates ransonnettii (Steindachner, 1876)
det. TGT. USNM 264801 (TGT2233) 06° 13'15"S., 105° 44'E. Areas A, C.

Grammoplites scaber (Linnaeus, 1758)
det. PK. NTM S.10734-016 (TGT1033) 08° 10'S., 114° 54'E. Area B.

Cymbacephalus bosschei (Bleeker, 1860)
det. PK. CSIRO CA1862 14° 32'S., 136° 06'E. Area C.

Inegocia harrisii (McCulloch, 1914)
det. CSIRO CA1215 13° 25'S., 126° 19'E. Area C.

Inegocia japonica (Cuvier, 1829)
det. PK. CSIRO CA1221 19° 38'S., 119° 31'E. Areas B, C.

Onigocia macrocephala (Weber, 1913)
det. H. Imamura. NTM S.10739-003 (TGT1781) 08° 57'S., 116° 08'E. Areas B, C.

Onigocia sp
det. H. Imamura. Specimen lost. 19° 38'S., 119° 31'E. (Conspecific Survey material determined by CSIRO is CA1867 from 20° 40'S., 116° 00'E.). Area C.

Onigocia spinosa (Temminck & Schlegel, 1843)
det. H. Imamura. Specimen lost. 11° 01 'S., 128° 37'E. (Conspecific Survey material determined by CSIRO is CA1876 from 20° 16'S., 116° 02'E.). Area C.

***Onigocia pedimacula** (Regan, 1908)
No figure voucher. Our material determined by L.W. Knapp. NTM S.11086-001 20° 15'S., 116° 02'E. Area C. *Diagnosis*: no cirrus on upper surface of eye; iris lappet scalloped; 2 pairs of nasal spines; 14-16 spines on suborbital ridge; 3 preocular spines. 30-32 scales in longitudinal series.

Platycephalus endrachtensis Quoy & Gaimard, 1825
det. H. Imamura. NTM S.10733-044 (TGT1289) 08° 46'S., 115° 10'E. Areas B, C. Conspecific Survey material (USNM 264795) determined by L.W. Knapp. Our material showed some differences in gill raker count and head proportions to eastern Australian populations.

Platycephalus westraliae (Whitley, 1938)
det. H. Imamura. CSIRO CA1162. 20° 45'S., 115° 32'E. Area C.

Ratabulus fulviguttatus Imamura & Gomon, 2010
det. M. Gomon. Specimen lost. 10° 02'S., 130° 03'E. Area C. Conspecific Survey material determined by M. Gomon (e.g. AMS 1.22805-013 from 18° 25'S., 118° 15'E.).

Rogadius pristiger (Cuvier, 1829)
det. H. Imamura. NTM S.11013-001 (TGT1798) 08° 40'S., 116° 37'E. Areas B, C.

Sorsogona tuberculata (Cuvier,1829)
det. PK. NTM S.11013-002 (TGT1799) 08° 40'S., 116° 37'E. Areas B, C.

Rogadius welanderi (Schultz, 1966)
det. L.W. Knapp. USNM 264803 (TGT3030) 08° 43'S., 115° 16'E. Area B.

Insidiator macracanthus (Bleeker, 1869)
det. L.W. Knapp. CSIRO B.2126 13° 29'S., 129° 01'E. Areas A, B, C.

Kumococius rodericensis (Cuvier, 1829)
det. AMS. 1.21842-032 10° 35'S., 133° 45'E. Other examples from Survey Area C.

Cociella hutchinsi Knapp, 1996
det. L.W. Knapp. CSIRO CA1865 09° 16'S., 135° 00'E. Area C. Holotype.

Rogadius patriciae Knapp, 1987
det. L. W. Knapp WAM P.26230-006 19° 07'S., 119° 25'E. Area C.

Sunagocia otaitensis (Cuvier, 1829)
det. L.W. Knapp. NTM S.10734-015 (TGT1221). 08° 10'S., 114° 54'E. Areas A, B.

BEMBRIDAE

Bembras megacephala Imamura & Knapp, 1998
det. PK. USNM 264796 (TGT1726) 08° 58'S., 116° 34'E. Areas B, C. Paratype.

PLECTROGENIIDAE

Bembradium sp.
det. PK. NTM S.10760-004 (TGT1710) 08° 58'S., 116° 34'E. Area B. We remain unsure whether our material truly belongs in *B. roseum* Gilbert because of certain differences (such as the lower 10 pectoral fin rays being thickened (not in *B. roseum)*, and the lower number of serrae (11-12) on the suborbital ridge (18-20 in the type of *B. roseum*; although Ms Saki Kishimoto has recorded 3-14 serrae; pers comm 2020). There are three known species of *Bembradium* Gilbert: *roseum* Gilbert (Madagascar to Japan, Indonesia, Hawaii, New Caledonia, Chile); *furici* Fourmanoir & Rivaton (south-west Pacific); and *magnoculum* Kishimoto, Kawai, Tashiro & Aungtonya, 2019 (Andaman Sea to Thailand).

HOPLICHTHYIDAE

Hoplichthys gilberti Jordan & Richardson, 1908
det. PK. No figure voucher; 160 mm SL specimen from Lombok, Lesser Sunda Islands, USNM 264804; and AMS I.34494-002 from south-east of Lombok, determined by M. McGrouther. Area B.

Hoplichthys imamurai Nagano, McGrouther & Yabe, 2013
det. Y. Nagano. AMS 1.22807-040. 18° 39'S., 117° 53'E. Areas A, B, C. Holotype.

DACTYLOPTERIDAE

Dactyloptena macracantha (Bleeker, 1855)
det. W.N. Eschmeyer. CAS 53136 (TGT2464) 00° 04'S., 99° 01E. Areas A, B, C.

Dactyloptena orientalis (Cuvier, 1829)
det. W.N. Eschmeyer. CAS 53138 (TGT2603) 08° 33'S., 114° 31'E. Areas A, B, C.

Dactyloptena papilio Ogilby, 1910
det. G. Leyland. Specimen lost. (no field number). (Conspecific Survey material determined by CSIRO is CSIRO CA1714 from 13° 06'S., 125° 03'E.). Area C.

Dactyloptena peterseni (Nyström, 1887)
No figure voucher. det. CSIRO (e.g. CSIRO CA1720 from 19° 40'S., 116° 12'E.). Areas B, C.

PEGASIDAE

Pegasus volitans Linnaeus, 1758
det. CSIRO. Specimen lost. (no field number). (Conspecific Survey material is CSIRO CA2139 from 16° 56'S., 140° 10'E.). Area C.

Eurypegasus draconis (Linnaeus, 1766)
det. PK. CSIRO CA1427 20° 39'S., 115° 58'E. Area C.

ACROPOMATIDAE

1. Recognition of this family, also SYNAGROPIDAE and MALAKICHTHYIDAE, follows Ghedotti et al., 2018. Dr Artem Prokofiev (pers comm., November 2021) has advised however, that distinction of these families and other genera variously placed within the Acropomatiformes relies largely on molecular data; and that SYNAGROPIDAE and MALAKICHTHYIDAE should be placed within the ACROPOMATIDAE sensu Johnson, 1984.
2. We recommend readers consult Ghedotti et al (2018), Schwarzhans & Prokofiev (2017), Betancur et al (2017), Yamanoue (2016) and Johnson (1984) for discussion on this matter.

Acropoma leobergi Prokofiev, 2018
det. A. Prokofiev. LPPL JIF44 (TGT3158) 08° 27'S., 117° 47'E. Areas A, B, C.

Doederleinia berycoides (Hilgendorf, 1879)
det. PK. Specimen lost. 10° 02'S., 130° 03'E. Areas A, B. C. (Conspecific Survey material is CSIRO CA346 from 18°33'S., 118° 00'E.).

SYNAGROPIDAE

Synagrops japonicus (Döderlein, 1883)
det. PK. WAM P.26209-020 18° 18'S., 118° 08'E. Areas A, B, C.

Parascombrops philippinensis (Günther, 1880)
det. PK. NTM S.10998-007 (TGT2524) 01° 25'S., 100° 19'E. Areas B, C.

MALAKICHTHYIDAE

Malakichthys elegans Matsubara & Yamaguti, 1943
det. K. Mochizuki & TGT. NTM S.10998-019 (TGT2517) 01° 25'S., 100° 19'E. Areas A, C.

Malakichthys griseus Döderlein, 1883
No figure voucher. det. Matsuura. WAM P.26208-019 18° 22'S., 118° 03'E. Area C.

***Malakichthys levis** Yamanoue & Matsuura, 2002
No figure voucher. Material determined by Y. Yamanoue. CSIRO CA1391, CA333 and CA1389, north of NW Cape, Western Australia. Area C. *Diagnosis*: No paired spines on chin near symphysis; D X, 9-10. GR on lower arm 20–23; Tr above 5-7; A III, 8; P 14; L. lat. 49-53; body depth 26-35% SL.

CENTROGENYIDAE

Centrogenys vaigiensis (Quoy & Gaimard, 1824)
det. PK. CSIRO CA1577 11° 53'S., 131° 15'E. Area C.

SERRANIDAE

Arrangement within this family follows Parenti & Randall, 2020.

Subfamily Serraninae

Chelidoperca flavolineata Matsunuma, Tan & Peristiwady, 2020
det. M. Matsunuma. NTM S. 10752-016 (TGT3217) 09° 01 'S., 116° 18'E. Areas A, B, C.

Chelidoperca stella Matsunuma & Motomura, 2016
det. M. Matsunuma. CSIRO CA887 19° 40'S., 116° 12'E. Area C.

Subfamily Epinephelinae

Aethaloperca rogaa (Fabricius, 1775)
det. J. Randall on photo. Specimen lost (no field number). Area A.

Anyperodon leucogrammicus (Valenciennes, 1828)
det. TGT. LPPL JIF26 (TGT3323) 10° 18'S., 120° 22'E. Area B.

Cephalopholis argus Schneider, 1801
det. TGT. LPPL JIF27 (TGT3316) 10° 18'S., 120° 22'E. Area B.

Cephalopholis boenak (Bloch, 1790)
det J.B. Hutchins. WAM. P.26188-012 20° 21'S., 115° 53'E. Areas A, B, C.

Cephalopholis miniata (Forsskål, 1775)
det. J. Randall. NTM S.10734-018 (TGT1264) 08° 10'S., 114° 54'E. Areas A, B.

Cephalopholis sexmaculata (Rüppell, 1830)
det. J. Randall. NTM S.10748-019 (TGT1024) 08° 43'S., 115° 16'E. Area B.

Cephalopholis sonnerati (Valenciennes, 1828)
det. J. Randall. NTM S.10734-017 (TGT1039) 08° 10'S., 114° 54'E. Area B.

Cephalopholis urodeta (Forster, 1801)
det. J. Randall. LPPL JIF28 (TGT1021) 08° 43'S., 115° 16'E. Area B.

Chromileptes altivelis (Valenciennes, 1828)
det. TGT. LPPL JIF29 (TGT921) 08° 30'S., 116° 42'E. Area B.

Epinephelus amblycephalus (Bleeker, 1857)
det. J.B. Hutchins. WAM P.26251-001 16° 03'S., 120° 58'E. Areas A, B, C.

Epinephelus areolatus (Forsskål, 1775)
det. TGT. LPPL JIF30. (TGT2593) 08° 33'S., 114° 31'E. Areas A, B, C.

Epinephelus bleekeri (Vaillant, 1878)
det. J. Randall. BPBM 29372 (TGT3256) 09° 01'S., 116° 18'E. Areas A, B.

Epinephelus coeruleopunctatus (Bloch, 1790)
det. J. Randall. LPPL JIF31 (TGT910) 08° 43'S., 115° 16'E. Area B.

Epinephelus cyanopodus (Richardson, 1846)
det. J. Randall on photo. Specimen lost. (TGT1120) 08° 28'S., 119° 08'E. Area B.

Epinephelus epistictus (Temminck & Schlegel, 1843)
det. J. Randall on photo. Specimen lost. (TGT1120) 08° 28'S., 119° 08'E. Area B.

Epinephelus fasciatus (Forsskål, 1775)
det. J. Randall. LPPL JIF33 (TGT3174) 08° 43'S., 115° 16'E. Areas A, B, C.

Epinephelus heniochus Fowler, 1904
det. PK. NTM S.10998-006 (TGT2536) 03° 45'S., 101° 54'E. Areas A, C.

Epinephelus latifasciatus (Temminck & Schlegel, 1843)
det. J. Randall. No figure voucher. AMS 1.22805-025 from 18° 28'S., 118° 15'E.). Area C.

Epinephelus longispinis (Kner, 1864)
det. J. Randall on photo. Specimen lost. (TGT997) 08° 30'S., 116° 42'E. Areas A, B.

Epinephelus maculatus (Bloch, 1790)
det. CSIRO. CSIRO CA893 11° 22'S., 125° 17'E. Areas B, C.

Epinephelus magniscuttis Postel, Fourmanoir & Guézé, 1963
det. J. Randall & PK. CSIRO CA2280 10° 19'S., 129° 57'E. Area C.

Epinephelus malabaricus (Bloch & Schneider, 1801)
det. TGT. LPPL JIF34 (TGT2392) 01° 57'S., 99° 26'E. Areas A, B, C.

Epinephelus melanostigma Schultz, 1953
det. J. Randall. BPBM 28950 (TGT1539) 08° 06'S., 115° 16'E. Area B.

Epinephelus polyphekadion (Bleeker, 1849)
det. J. Randall. LPPL JIF35 (TGT1416) 08° 03'S., 110° 05'E. Areas B, C.

Epinephelus multinotatus (Peters, 1876)
det. Randall. CSIRO CA898, 20° 08'S., 117° 03'E. Area C. *E. rankini* Whitley is a synonym (Parenti & Randall, 2020)

Epinephelus ongus (Bloch, 1790)
det. J. Randall. NTM S.11011-003 (TGT3314) 10° 18'S., 120° 22'E. Area B.

Epinephelus poecilonotus (Temminck & Schegel, 1843)
det. J. Randall on photo. Specimen lost (no field number). Area A.

Epinephelus quoyanus (Valenciennes, 1830)
det. J. Randall. BPBM 28953 (TGT1038) 08° l0'S., 114° 54'E. Areas A, B, C.

Epinephelus radiatus (Day, 1868)
det. J. Randall. AMS 1.22828-025 19° 19'S., 117° 12'E. Area C.

Epinephelus retouti Bleeker, 1868
det. J. Randall. NTM S.10734-019 (TGT1052) 08° 10'S., 115° 54'E. Area B.

Epinephelus rivulatus (Valenciennes, 1830)
det. J. Randall on photo. Specimen (A) lost. The survey caught two colour variants. (TGT995) 08° 30'S., 116° 42'E. Area B.

Epinephelus sexfasciatus (Valenciennes, 1828)
det. PK. CSIRO CA883 18° 53'S., 120° 49'E. Area C.

Epinephelus tauvina (Fabricius, 1775)
det. TGT. LPPL JIFJ6 (TGTJ142) 08° 37'S., 118° 02'E. Areas B, C.

Epinephelus undulosus (Quoy & Gaimard, 1824)
det. J. Randall. LPPL JIF37 (TGTJ257) 09° 0l'S., 116° 18'E. Areas A, B.

Epinephelus stictus Randall & Allen, 1987
det. J. Randall on photo. Specimen lost (est. at 380 mm SL). Conspecific material is WAM P.28277-001. Juveniles of this species have also been obtained (CSIRO collection, AS4/80 and AS5/80 cruises). Area C.

***Plectropomus leopardus** (Lacepède, 1802)
No figure voucher. Specimen lost. det J. Randall on photo (TGT1000) from 08° 30'S., 116° 42'E. Area B. *Diagnosis:* head and body with small blue spots; no spots on lower part of body, 2 or more on pectoral fin base; 2 or 3 spots on inner pectoral fin base. Gill rakers long; hind anal fin margin convex. 16 rays in pectoral fin.

Plectropomus maculatus (Bloch, 1790)
det. CSIRO. CSIRO CA2251 20° 15'S., 115° 56'E. Areas B, C.

Plectropomus pessuliferus (Fowler, 1904)
det. D.F. Hoese. AMS 1.24048-001 (TGT2439) 00° 20'N., 98° 33'E. Area A.

Variola albimarginata Baissac, 1953
det. J. Randall. NTM S.11038-001 (TGT300l) 08° 30'S., 117° 58'E. Areas B, C.

Variola louti (Fabricius, 1775)
det. TGT. NTM S.10771-002 (TGT2402) 00° 35'N., 97° 55'E. Areas A, B, C.

Diploprion bifasciatus Cuvier, 1828 **(Tribe Diploprionini)**
det. CSIRO. Specimen lost. 19° 59'S., 117° 24'E. Area C. No other specimens were obtained on the Survey.

Grammistes sexlineatus (Thunberg, 1792) **(Tribe Grammistini)**
det. TGT. LPPL JIF38 (TGT1048) 08° 46'S., 115° 10'E. Area B.

Subfamily Anthiadinae

Pseudanthias gibbosus (Klunzinger, 1884)
det. TGT. BPBM 29352 (TGT2597) 08° 33'S., 114º 31'E., Areas A, B. Conspecific material from the survey determined by P.C. Heemstra.

Pseudanthias rubrizonatus (Randall, 1983)
Voucher (A) det. J. Randall. RUSI 19988 (TGT1373 in part) (male) 08° 46'S., 115° 02'E. Voucher (B) det. A.C. Gill on photo. RUSI 19987 (TGT3228) (female) 09º 01'S., 116º 18'E. Area B.

Pseudanthias squamipinnis (Peters, 1855)
det. P.C. Heemstra. NTM S.11011-002 (TGT3294) 10° 55'S., 122° 43'E. Area B.

Odontanthias rhodopeplus (Günther, 1872)
det. P.C. Heemstra on photo. Specimens lost (no field number). Area A.

Plectranthias japonicus (Steindachner, 1883)
det. J. Randall. BPBM 28951 (TGT3149) 08° 27'S., 117° 47'E. P.C. Heemstra has determined duplicate material from the Survey (RUSI 20016).

Plectranthias ferrugineus Gill, Pogonoski, Moore & Johnson, 2021
No figure voucher. det. H. Wada. RUSI 19990 (TGT3126) from 08° 37'S., 118° 02'E.). Area B. Drawing of preserved specimen. 61 mm SL when caught.

Selenanthias analis Tanaka, 1918
det. PK. AMS 1.22807-039 18° 32'S., 118° 17'E. Area C.

***Pseudanthias lunulatus** (Kotthaus, 1973)
Unphotographed specimen (RUSI 20015, (PJPW33) from south Java. Area A. det. P.C. Heemstra. *Diagnosis*: First dorsal spine shorter than 2nd spine, body depth 2.6-2.9 in SL; tail lunate. Pinkish orange with a yellow, violet-edged stripe from upper lip through eye to pectoral fin base, leading edge of ventral fin white. D X, 15-16. A III, 7. P 17-18. GR: 9-10 + 22-25. L. lat. 38-43.

***Anthias sp.** Unphotographed specimen (RUSI 19989, TGT1373 in part, from 08° 46'S., 115° 02'E.) Area B. det. P.C. Heemstra.

CALLANTHIIDAE

Callanthias sp cf australis Ogilby, 1899
det. W.D. Anderson to genus on photo. Specimen lost. Area A.

Callanthias sp cf japonicus Franz, 1910
det. W.D. Anderson to genus on photo; PK on photo. Specimen lost. Area A. Anderson et al (2015) cited Kuiter's (2004:10) remark that a population of *Callanthias* off northwestern Australia appeared to be *C. japonicus*.

PSEUDOCHROMIDAE

Pseudochromis steenei Gill & Randall, 1992
det. J. Randall. NTM S.11035-001 (TGT3246) 08° 24'S., 116° 01 'E. Areas B, C. Paratype.

Congrogadus spinifer (Borodin, 1933)
det. R. Winterbottom on photo. CSIRO CA1542 12° 37'S., 129° 48'E. Area C.

Congrogadus subducens (Richardson, 1843)
det. R. Winterbottom on photos and notes. Specimen lost. 20° 28'S., 115° 32'E. Area C.

GLAUCOSOMATIDAE

Glaucosoma buergeri Richardson, 1845
det. CSIRO. CSIRO CA959 19° 40'S., 116° 12'E. Area C.

Glaucosoma magnificum (Ogilby, 1915)
det. CSIRO. Specimen lost. 13° 30'S., 125° 41'E. (Conspecific survey material determined by CSIRO is CA1098 from 13° 38'S., 124° 30'E). Area C.

TERAPONTIDAE

Pelates quadrilineatus (Bloch, 1790)
det. TGT & PK. NTM S.10733-003 (TGT1282) 08° 46'S. 115° 10'E. Areas B, C.

Terapon jarbua (Fabricius, 1775)
det. TGT. LPPL JIF40 (TGT2614) 08° 42'S., 115° 05'E. Areas A, B, C.

Terapon puta Cuvier, 1829
det. TGT. NTM S.10744-006 (TGT926) 08° 30'S., 116° 42'E. Area B.

Terapon theraps Cuvier, 1829
det. TGT. LPPL JIF39 (TGT2213) 06° 20'30"S., 109° 10'E. Areas A, B, C.

BANJOSIDAE

Banjos banjos brevispinis Matsunuma & Motomura, 2017
det. G. Hardy. NMNZ P.015089 (TGT3199) 09° 01 'S., 116° 18'E. Areas B, C. Paratype.

PRIACANTHIDAE

Cookeolus japonicus (Cuvier, 1829)
det. W. Starnes. USNM 263762 (TGT1414) 08º 01'S, 116º 18'E. Areas A, B, C

Priacanthus blochii Bleeker, 1853
det. W. Starnes. USNM 263758 (TGT2531) 01° 25'S., 100° 19'E.

Heteropriacanthus carolinus (Cuvier, 1829)
det W. Starnes on photo. NTM S.10732-007 (PAN20) 08° 31'S., 115° 32'E. Areas A, B, C.

Priacanthus hamrur (Fabricius, 1775)
det. W. Starnes. USNM 263761 (TGT2414) 00° 35'N., 97° 55'E. Areas A, B, C.

Priacanthus macracanthus Cuvier, 1929
det. W. Starnes. USNM 263759 (TGT2557) 03° 07"S., 101° 20'E. Areas A, B, C.

Priacanthus tayenus Richardson, 1846
det. TGT. LPPL JIF207 (TGT2587) 07° 58'S., 109° 20'E. Areas A, B, C.

Priacanthus sagittarius Starnes, 1988
det. W. Starnes. USNM 263757 (TGT2291) 04° 07'S., 101° 04'E. Areas A, B, C. Paratype.

Priacanthus fitchi Starnes, 1988
det. W. Starnes. USNM 263760 (TGT2454). 00° 25'ES, 98° 40'E. Areas A, B, C. This species has only been caught below 170 m. Paratype.

Pristigenys niphonia (Cuvier, 1829)
det. CSIRO. CSIRO B.2174. 09° 57'S., 129° 25'E. Areas A, C.

APOGONIDAE

Ozichthys albimaculosus (Kailola, 1976)
det. PK. WAM P.26567-001 13° 14'S., 127° 53'E. Area C.

Ostorhinchus apogonoides (Bleeker, 1856)
det. PK. WAM P.28134-002 (TGT2309) 03° 24'S., 100° 33'E. Area A.

***Ostorhinchus atrogaster** (Smith & Radcliffe, 1912)
No figure voucher. G.R. Allen determined our specimens from 19° 57'S., 116° 17"E. WAM P.28306-001. *Diagnosis*: Seven dorsal fin spines; caudal fin forked. Preoperculum margin serrate, ridge and suborbital smooth. Total GR 20-24, rakers slender; palatine teeth present. Body cream with silvery band from head to tail base; brown band from snout to eye, mouth cavity dark grey or black. Area C.

Ostorhinchus aureus (Lacepède, 1802)
det. G.R. Allen. WAM P.28045-002 (TGT1590) 08° 06'S., 115° 16'E. Areas B, C.

Apogonichthyoides brevicaudatus (Weber, 1909)
det. PK. WAM P.26252-001 19° 03'S., 120° 23'E. Areas B, C.

Jaydia carinata (Cuvier, 1828)
det. PK. CSIRO CA1599 19° 14'S., 116° 10'E. Area C.

Fibramia lateralis (Valenciennes, 1832)
det. T. Fraser. WAM P.28044-002 (TGT1028) 08° 46'S., 115° 10'E. Area B.

Apogonichthyoides timorensis (Bleeker, 1854)
det. PK. WAM P.28090-001 (TGT2311) 03° 24'S., 100° 33'E. Area B.

Jaydia smithi Kotthaus, 1970
det. O. Gon. NTM S.10996-003 (TGT2308) 03° 24'S., 100° 33'E. Areas A, B, C.

Ostorhinchus hartzfeldii (Bleeker, 1852)
det. G.R. Allen. Specimen lost. 12° 37'S., 129° 48'E. (Conspecific Survey material determined by G.R. Allen is WAM P.26197-015 from 20° 05'S., 117° 05'E.). Area C.

Ostorhinchus hoevenii (Bleeker, 1854)
det. G.R. Allen. WAM P.28046-001 (TGT1051) 08° 10'S., 114° 54'E. Area B.

Ostorhinchus sp. 1
det. T. Fraser. CSIRO CA 1572 15° 32'S., 124° 02'E. Area C.

Ostorhinchus moluccensis (Valenciennes, 1832)
det. G.R. Allen. WAM P.28044-004 (TGT1049) 08° 46'S., 115° 10 E. Area B.

Apogonichthyoides atripes (Ogilby, 1916)
det. PK. CSIRO CA 1617 12° 18'S., 129° 18'E. Areas B, C.

Ostorhinchus nigrocincta (Smith & Radcliffe, 1912)
det. PK. WAM P.28134-003 (TGT2310) 03° 24'S., 100° 33'E. Areas A, B.

Ostorhinchus novemfasciatus (Cuvier, 1828)
det. G.R. Allen. WAM P.28047-001 (TGT3017) 08° 43'S., 115° 16'E. Areas B, C.

Jaydia poeciloptera (Cuvier, 1828)
det. PK. Specimen lost. 10° 41'S., 127° 42'E. Areas A, B, C.

Ostorhinchus fasciatus (Shaw, 1790)
det. TGT. LPPL JIF41 (TGT2160) 08° 46'S., 115° 13'E. Areas A, B, C.

Ostorhinchus taeniophorus (Regan, 1908)
det. O. Gon. WAM P.28044-005 (TGT1044) 08° 46'S., 115° 10'E. Area B.

Ostorhinchus semilineatus (Temminck & Schlegel, 1843)
det. PK. NTM S.10824-006 (TGT2365) 01° 59'S., 99° 26'E. Areas A, B, C.

Ostorhinchus septemstriatus (Günther, 1880)
det. PK. WAM P.26188-013 20° 21'S., 115° 53'E. Areas B, C.

Ostorhinchus sp. 2
det. O. Gon. Specimen lost (no field number). (Conspecific Survey material is CSIRO CA2895 from 19° 37'S., 117° 33'E.). Area C.

Ostorhinchus chrysopomus (Bleeker, 1854)
det. PK. WAM P.28044-001 (TGT1065) 08° 46'S., 115° 10'E. Area B.

***Apogon sp.**
No figure voucher. G.R. Allen determined our material (e.g. WAM P.26197-013 from 22° 55'S., 117° 05'E.). *Diagnosis*: seven dorsal spines; serrated preopercular margin, ridge and suborbital; total GR 17-18; buccal cavity charcoal, 2 dark lines on head, dark spot at caudal fin base. Areas B, C.

***Paxton concilians** Baldwin & Johnson, 1999
No figure voucher. det. C. Baldwin & G.D. Johnson (WAM P.26197-019 from 20° 05'S., 117° 05'E.). *Diagnosis*: Bright yellow head, body and fins, outer ⅓ of dorsal fin black. Body naked. Mouth very large, teeth on jaws and vomer caninoid. Dorsal fin with 3 spines, anal with 18-19 rays. 11 formed gill rakers. 20 pectoral rays. Gill opening wide; caudal fin truncat**e.** Area C.

Taeniamia fucata (Cantor, 1849)
det. G.R. Allen on photo. BMNH 1984.1.1.66 (TGT 1403) 08° 46'S., 115° 02'E. Areas A, B.

Cheilodipterus isostigma (Schultz, 1940)
det. G.R. Allen. NTM S.10733-019 (TGT1064) 08° 46'S., 115° 10'E. Area B.

Cheilodipterus macrodon (Lacepède, 1802)
det. PK. LPPL JIF42 (TGT1589) 08° 06'S., 115° 16'E. Area B.

***Foa fo** Jordan & Seale, 1905
det. PK. WAM P.28043-003 (TGT1621) 07° 16'S., 118° 12'E. Area B. *Diagnosis:* Lateral line not complete, ending before soft dorsal fin, with 8-12 pored scales. Seven dorsal fin spines; caudal fin rounded. Palatine teeth present; preopercular ridge and margin entire. Body mottled brownish with five darker bars: first before dorsal fin, second from middle of spinous dorsal, third from middle of soft dorsal fin, fourth behind soft dorsal fin, last across peduncle; gill rakers and rudiments usually 13–15; body scales margins uniform to pale edging; whitish spot in axil of pectoral fin, another behind soft dorsal fin; spinous dorsal fin mostly dark brown. Total GR 13-15.

Gymnapogon sagittarius Yoshida, Kawai & Motomura, 2019
det. H. Motomura. WAM P.28134-001 (TGT2313) 03° 24'S., 100° 33'E. Area B.

Pseudamia gelatinosa Smith, 1956
det. H.K. Larson. NTM S.10824-001 (TGT2370) 01° 59'S., 99° 26"E. Area B.

Rhabdamia gracilis (Bleeker, 1856)
det. PK. WAM P.28137-001 (TGT2283) 06° 07'S., 102° 25'E. Areas A, B, C.

Siphamia fuscolineata Lachner, 1953
det. PK. WAM P.28136-001 (TGT2374) 01° 59'S., 99° 26'E. Area B.

Siphamia roseigaster (Ramsay & Ogilby, 1887)
det. PK. Specimen lost (was 50 mm SL). 15° 30'S., 124° 01'E. (Conspecific Survey material determined by CSIRO is CSIRO B.2052 from 13° 25'S., 126° 19'E.). Area C.

Siphamia tubifer Weber, 1909
det. G.R. Allen. WAM P.28050-001 (TGT1647) 08° 57'S., 116° 17'E. Areas B, C.

***Jaydia argyrogaster** (Weber, 1909)
No figure voucher. Our material determined by O. Gon. (e.g. WAM P.26212-007 19° 14'S., 118° 22'E.). Area C. *Diagnosis*: D VII; I, 9. A ii, 8. P. 15-16. Caudal fin truncate. Three or 4 rows of dusky golden or bronze blotches on sides; all expect pectoral fins dark.

Sphaeramia orbicularis (Cuvier, 1828)
det. TGT. LPPL JIF43 (TGT2154) 08° 46'S., 115° 13'E. Area B.

SILLAGINIDAE

Sillago burrus Richardson, 1842
det. TGT & R.J. McKay. NTM S.10754-002 (TGT1179) 08° 48'S., 118° 57'E. Areas A, B.

Sillago robusta Stead, 1908
det. R.J. McKay. CSIRO CA1312 17° ·25'S., 121° 50'E. Area C.

Sillago sihama (Fabricius, 1775)
det. R.J. McKay QM I. 20280 (TGT1084) 08° 46'S., 115° 10'E. Areas B, C.

Sillago vittata McKay, 1985
det. R.K. McKay. CSIRO CA1342 17° 25'S., 121° 50'E. Area C.

***Sillago asiatica** McKay 1982
No figure voucher. Our specimen determined by R.J. McKay (BMNH 1980.10.27:1-2 (PJPW2008) from 08°32'S., 116° 52'E.). *Diagnosis*: Swim bladder with anterolateral extensions recurved posteriorly; no dark mark on pectoral fin base. Head and body pale yellowish brown; fins hyaline, margins of unpaired fins finely spotted brown; upper and lower margins of caudal fin dark brown. D2 20-21. As 21-23. L. lat. 67-70. Area B.

Sillago ingenuua McKay, 1985
det. R.J. McKay. CSIRO CA1940 13° 29'S., 129° 01'E. Area C.

***Sillago lutea** McKay, 1985
No figure voucher. R.J. McKay has determined this species among Survey material (e.g. QM 1.20305 from 11° 47'S., 136°16'E.; WAM P.14261-001). *Diagnosis:* Swim bladder without posteriorly recurved anterolateral extensions; no dark mark on pectoral fin base. First dorsal fin membrane tipped black. D2 20-22. A2 21-24. L. lat. 67-72. Area C. Paratype.

LOBOTIDAE

Hapalogenys dampieriensis Iwatsuki & Russell 2006
det. Y. Iwatsuki. CSIRO CA1552. 19° 34'S., 116° 09'E. Area C. Paratype.

LATILIDAE (=Branchiostegidae)

Branchiostegus sawakinensis Amirthalingam, 1969
det. PK. WAM P.26201-001 19° 05'S., 117° 37'E. Area C. Paratype.

Branchiostegus australiensis Dooley & Kailola, 1988
det. J.K. Dooley on photo. Specimen lost, which was 240 mm SL when caught. Area A.

Branchiostegus gloerfelti Dooley & Kailola, 1988
det. J.K. Dooley on photo. Specimen lost. Area A.

Branchiostegus australiensis Dooley & Kailola, 1988
det. J.K. Dooley. WAM P.27217-004 26° 21'S., 112° 35'E. Area C. Drawing made from a colour transparency of the specimen, which was 265 mm SL when caught. Holotype.

***Branchiostegus gloerfelti** Dooley & Kailola, 1988
No figure voucher. det J.K. Dooley. (WAM P.28304-001 (PJPW2071) from 00° 22'S., 98° 44'E.). Area A. Holotype.

MALACANTHIDAE

Malacanthus brevirostris Guichenot, 1848
No figure voucher. Our 2 juvenile specimens (BMNH 1984.4.11.7-8; (PJPW2043)) from 08° 32'S., 114° 27'E. determined by J.K. Dooley. Area A. (Photo supplied by N. Rau of a Philippines specimen).

Malacanthus latovittatus (Lacepède, 1801)
det. TGT. LPPL JIF45 (TGT3033) 08° 43'S., 115° 16'E. Area B.

LACTARIIDAE

Lactarius lactarius (Bloch & Schneider, 1801)
det. TGT. LPPL JIF46 (TGT2503) 00° 19'S., 99° 38'E. Areas A, B, C.

RACHYCENTRIDAE

Rachycentron canadum (Linnaeus, 1766)
det. CSIRO. CSIRO CA1054 13° 18'S., 128° 21'E. Areas B, C.

ECHENEIDAE

Echeneis naucrates Linnaeus, 1758
det. J.B. Hutchins. WAM P.26220-006 16° 30'S., 122° 09'E. Areas A, B, C.

Remora remora (Linnaeus, 1758)
det. TGT. NTM S.10730-003 (TGT1501) 08° 57'S., 116° 26'E. Area B. Drawing of preserved specimen.

CARANGIDAE

Alectis ciliaris (Bloch, 1787)
det. TGT. LPPL JIF192 (TGT2360) 01° 59'S., 99° 26'E. Areas A, B, C.

Scyris indica Rüppell, 1830
det. TGT. Specimen lost (no field number) (TGT1191) 08° 47'S., 118° 48'E. Areas A, B, C.

Alepes djedaba (Fabricius, 1775)
det. W. Smith-Vaniz. LPPL JIF193 (TGT1764) 08° 34'S., 116° 47'E. Areas A, B.

Alepes melanoptera (Swainson, 1839)
det. W. Smith-Vaniz. ANSP 152028 (TGT2496) 00° 19'S., 99° 38'E. Area A.

Alepes apercna Grant, 1987
det. S. Kimura on photo. LPPL JIF217 (TGT1167) 08° 28'S., 119° 08'E. Area B.

Atule mate (Cuvier, 1833)
det. W. Smith-Vaniz. ANSP 152029 (TGT2433) 00° 51'N., 97° 58'E. Areas A, B, C.

Flavocaranx bajad (Fabricius, 1775)
det. W. Smith-Vaniz. ANSP 152114 (TGT3002) 08° 43'S., 115° 16'E. Area B.

Turrum coeruleopinnatum (Rüppell, 1830)
det. W. Smith-Vaniz. LPPL JIF173 (TGT2396) 00° 35'N., 97° 55'E. Area A.

Platycaranx chrysophrys (Cuvier, 1833)
det. TGT. LPPL JIF174 (TGT2245) 06° 25'S., 105° 34'E. Areas A, B, C.

Carangichthys dinema (Bleeker, 1851)
det. TGT. Specimen lost (no field number) 00° 14'S., 99° 34'E. Areas A, B.

Kaiwarinus equula (Temminck & Schlegel, 1844)
det. J.B. Hutchins. WAM P.26182-010 21° 25'S., 114° 18'E. Area C.

Ferdauia ferdau (Fabricius, 1775)
det. W. Smith-Vaniz. LPPL JIF175 (TGT3041) 08° 35'S., 117° 59'E. Area B.

Turrum fulvoguttatum (Forsskål, 1775)
det. TGT. Specimen lost (TGT1158) 08° 28'S., 119° 08'E. Areas A, B, C.

Turrum gymnostethus (Cuvier, 1833)
det. J. Gunn. Specimen lost (no field number). Area C.

Atropus hedlandensis (Whitley, 1934)
det. W. Smith-Vaniz. LPPL JIF176 (TGT2243) 06° 25'S., 105° 34'E. Areas A, B, C.

Carangichthys humerosus (McCulloch, 1915)
det. J. Gunn. CSIRO CA1058 15° 31'S., 124° 02'E. Area C.

Platycaranx malabaricus (Bloch & Schneider, 1801)
det. W. Smith-Vaniz. LPPL JIF177 (TGT2236) 06° 25'S., 105° 34'E. Areas A, B.

Ferdauia orthogrammus (Jordan & Gilbert, 1882)
det. W. Smith-Vaniz. LPPL JIF204 (TGT3301) 10° 55'S., 133° 43'E. Areas B, C.

Craterognathus plagiotaenia (Bleeker, 1857)
det. TGT. LPPL JIF178 (TGT2397) 00° 35'N., 97° 58'E. Area A.

Platycaranx talamparoides (Bleeker, 1852)
det. TGT. LPPL JIF179 (TGT2237) 06° 25'S., 105° 34'E. Areas A, B, C.

Alepes kleinii (Bloch, 1793)
det. TGT. LPPL JIF216 (TGT2120) 08° 46'S., 115° 10'E. Areas A, B, C.

Caranx bucculentus Alleyne & Macleay, 1877
det. J. Gunn. CSIRO CA1061 13° 18'S., 128° 21 'E. Area C.

Caranx ignobilis (Forsskål, 1775)
det. TGT. LPPL JIF180 (TGT3136) 08° 37'S., 118° 02'E. Areas A, B, C.

Caranx lugubris (Poey, 1860)
det. J. Gunn. Specimen lost (no field number). Area C. Est. 400 mm SL when caught.

Caranx melampygus Cuvier, 1833
det. W. Smith-Vaniz. LPPL JIF181 (TGT2395) 00° 35'N., 97° 55'E. Areas A, B, C.

Pantolabus radiatus (Macleay, 1881)
det. J. Gunn. Specimen lost (no field number) Conspecific Survey material determined by J. Gunn: CSIRO CA1062 from 11° 04'S., 130° 37'E. Area C.

Caranx heberi (Bennett, 1830)
det. W. Smith-Vaniz. LPPL JIF182 (TGT1040) 08° 46'S., 115° 10'E. Areas A, B.

Caranx sexfasciatus Ouoy & Gaimard, 1825
det. J. Gunn. Specimen lost (no field number). Areas A, B, C.

Caranx tille Cuvier, 1833
det. TGT. LPPL JIF183 (TGT2244) 01° 59'S., 99° 26'E. Areas A, B, C.

Decapterus kurroides Bleeker, 1855
det. W. Smith-Vaniz. ANSP 152025 (TGT2589) 08° 33'S., 114° 31'E. Areas A, C.

Decapterus macarellus Cuvier, 1833
det. W. Smith-Vaniz. ANSP 152023 (TGT2270) 06° 07'S., 104° 39'E. Areas A, B, C.

Decapterus macrosoma Bleeker, 1851
det. W. Smith-Vaniz. ANSP 152027 (TGT2272) 06° 07'S., 104° 39'E. Areas A, C.

Decapterus russelli (Rüppell, 1830)
det. W. Smith-Vaniz. ANSP 152030 (TGT2271) 06° 07'S., 104° 39'E. Areas A, C.

Elagatis bipinnulata (Ouoy & Gaimard, 1825)
det. J. Gunn. CSIRO CA2472 11° 01'S., 141° 36'E. Areas A, B, C.

Gnathanodon speciosus (Forsskål, 1775)
det. TGT. LPPL JIF184 (TGT3109) 08° 57'S., 116° 28'E. Areas A, B, C.

Megalaspis cordyla (Linnaeus, 1758)
det. TGT. LPPL JIF185 (TGT2246) 06° 25'S., 105° 34'E. Areas A, B, C.

Parastromateus niger (Bloch, 1795)
det. TGT. LPPL JIF48 (TGT2221) 06° 13'S., 105° 44'E. Areas A, C.

Scomberoides commersonnianus Lacepède, 1801
det. TGT. Specimen lost (no field number) 03° 14'S., 101° 25'E. Areas A, C.

Scomberoides tala (Cuvier, 1832)
det. TGT. LPPL JIF186 (TGT1181) 08° 47'S., 118° 48'E. Areas A, B, C.

Scomberoides tol (Cuvier, 1832)
det. TGT & PK. LPPL JIF218 (TGT1260) 08° 46'S., 115° 10'E. Areas A, B, C.

Selar boops (Cuvier, 1933)
No figure voucher (was 180 mm SL when caught). Photo supplied by John Marek. Conspecific material from Survey determined by PK & TGT (e.g. LPPL JIF219 (TGT1831) from 08° 58'S., 116° 13'E). Areas A, B, C.

Selar crumenophthalmus (Bloch, 1793)
det. TGT. LPPL JIF187 (TGT2612) 08° 42'S., 115° 05'E. Areas A, B, C.

Selaroides leptolepis (Cuvier, 1833)
det. W. Smith-Vaniz. ANSP 152026 (TGT2426) 00° 51'N., 97° 58'E. Areas A, B, C.

Seriola dumerili (Risso, 1810)
det. W. Smith-Vaniz & TGT. LPPL JIF188 (TGT3139) 08° 37'S., 118° 02'E. Areas A, C.

Seriola rivoliana Valenciennes, 1833
det. J. Gunn. CSIRO CA2467 19° 01'S., 117° 58'E. Areas B, C.

Seriolina nigrofasciata (Rüppell, 1829)
det. TGT. LPPL JIF189 (TGT2443) 00° 20'N., 98° 33'E. Areas A, B, C.

Atropus aurochs (Ogilby, 1915)
det. J. Gunn. Specimen lost. 13°18'S., 128° 21'E. Conspecific Survey material determined by J. Gunn: CSIRO CA2497 from 11° 01'S., 132° 01'E. Area C.

Atropus mentalis (Cuvier, 1833)
det. TGT. LPPL JIF190 (TGT1372) 08° 46'S., 115° 02'E. Areas A, B, C.

Uraspis uraspis (Günther, 1860)
det. TGT. LPPL JIF191 (TGT2436) 00° 20'N., 98° 33'E. Areas A, C.

MENIDAE

Mene maculata (Bloch & Schneider, 1801)
det. TGT. LPPL JIF49 (TGT2223) 06° 13'S., 105° 44'E. Areas A, B, C.

LEIOGNATHIDAE

Gazza rhombea Kimura, Yamashita & Iwatsuki, 2000
det. S. Kimura. NTM S.11040-001 (TGT2504) 00° 19'S., 99° 38'E. Areas A, B.

Gazza minuta (Bloch, 1795)
det. J. Seigel. NTM S.11031-003 (TGT2615) 08° 42'S., 115° 05'E. Areas A, B, C.

Photopectoralis aureus (Abe & Haneda, 1972)
det. S. Kimura. NTM S.11000-004 (TGT2381) 01° 20'S., 98° 35'E. Area A.

Equulites klunzingeri (Steindachner, 1898)
det. S. Kimura. NTM S.10750-003 (TGT1443) 08° 56'S., 116° 24'E. Area B.

Photopectoralis bindus (Valenciennes, 1835)
det. J. Seigel. NTM S.10733-042 (TGT2108) 08° 46'S., 115° 10'E. Areas A, B, C.

Nuchequula glenysae Kimura, Kimura & Ikejima, 2008
det. S. Kimura. Specimen lost. Other material determined by CSIRO, e.g. CSIRO B.2179 (Paratype) from 14° 20'S., 136° 10'E. Area C.

Nuchequula gerreoides (Bleeker, 1851)
det. G. Jones. BMNH 1984.1.1.67 (TGT (PJPW) 735) 08° 38'S., 114° 18'E. Areas A, B, C. We found that in Australian waters *N. gerreoides* lacks the typical golden-yellow blotch on the breast which is so characteristic of the material obtained in Indonesia.

Equulites elongatus (Günther, 1874)
det. J. Seigel. NTM S. 10824-007 (TGT2378) 01° 59'S., 99° 26'E. Areas A, C.

Leiognathus equula (Forsskål, 1775)
det. TGT. NTM S.11003-003 (TGT2238) 06° 25'S., 105° 34'E. Areas A, B, C. *L. equula* is the largest of the leiognathids and is often caught at sizes 15-20 cm.

Aurigequula fasciata (Lacepède, 1803)
det. J. Seigel. NTM S.11003-002 (TGT2234) 06° 25'S., 105° 34'E. Areas A, B, C.

Equulites sp. cf leuciscus Günther, 1860
det. S. Kimura. NTM S.11041-001 (TGT2350) 01° 34'S., 98° 44'E. Areas A, B, C. This is an adult, in which the second dorsal fin spine is more elongate.

Photolateralis moretoniensis (Ogilby, 1912)
No figure voucher. Our Survey material determined by G. Jones (e.g. CSIRO CA440 from 16° 09'S., 122° 33'E.). Area C.

Eubleekeria rapsoni (Munro, 1964)
det. J. Seigel. NTM S.10733-043 (TGT2107 08° 46'S., 115° 10'E. Areas A, B.

Aurigequula longispinis (Valenciennes, 1835)
det. TGT. NTM S.11007-004 (TGT2437) 00° 20'N., 98° 33'E. Areas A, B, C.

Eubleekeria jonesi (James, 1971)
det. S. Kimura. NTM S.11007-003 (TGT2418) 00° 51 'N., 97° 58'E. Areas A, B, C.

Photolateralis stercorarius (Evermann & Seale, 1907)
det. J. Seigel. NTM S.10735-007 (TGT1402) 08° 46'S., 115° 02'E. Area A.

Deveximentum indicium (Monkolprasit, 1973)
det. J. Seigel. LPPL JIF215 (TGT3306) 10° 55'S., 122° 43'E. Conspecific material TGT3306A, same data, LACM 43591-1. Area B.

Deveximentum insidiator (Bloch, 1787)
det. J. Seigel. NTM S.11005-004 (TGT2208) 05° 20'S., 109° 10'E. Areas A, B, C.

Deveximentum megalolepis (Mochizuki & Hayashi, 1989)
det. S. Kimura. NTM S.11005-003 (TGT2209) 05° 20'S., 109° 10'E. Areas A, B, C.

BRAMIDAE

Brama dussumieri Cuvier, 1831
det. PK. NTM S.11119-001 (no field number) 08° 36'S., 113° 53'E. Area A. Drawing of preserved specimen.

Taractes rubescens (Jordan & Evermann, 1887)
det. PK & TGT. LPPL JIF50 (TGT2125) 10° 30'S., 117° 45'E. Area B.

SYMPHYSANODONTIDAE

Symphysanodon maunaloae Anderson, 1970
det. W.D. Anderson. GMBL 81-158 (TGT1721) (A. Female) 08° 58'S., 116° 34'E. (B. Male) RUSI 20017 (TGT1713A) 08° 58'S., 116° 34'E. Area B.

Symphysanodon typus Bleeker, 1877
No figure voucher. Photo supplied by W.D. Anderson who also determined our specimen (GMBL 81-162 (TGT1461)) from 08° 58'S., 116° 05'E.). Area B.

EMMELICHTHYIDAE

Erythrocles schlegelii (Richardson, 1846)
det. PK. BMNH 1984.1.1.68 (TGT (PJPW) 846) 08° 33'S., 114° 31'E. Area A. Drawing of preserved specimen.

LUTJANIDAE

Aphareus rutilans Cuvier, 1830
det. W.D. Anderson. GMBL 81-163 (TGT3259) 09° 01'S., 116° 18'E. Area B.

Aprion virescens Valenciennes, 1830
det. TGT. LPPL JIF51 (TGT2257) 05° 13'S., 104° 38'45"E. Areas A, B.

Etelis carbunculus Cuvier, 1828
det. J.B. Hutchins. WAM P.26288-004 16° 21'S., 120° 51'E. Areas B, C.

Etelis radiosus Anderson, 1981
No figure voucher. Photo supplied by W.D. Anderson who determined our specimen (BMNH 1981.10.30.1 (TGT (PJPW) 827) from 08° 43'S., 114° 15'E. Area A.

Lipocheilus carnolabrum (Chan, 1970)
No figure voucher. Our material determined by J.B. Hutchins (WAM P.26288-002 from 16° 21'S., 120° 51'E.) and PK (CSIRO CA3546 from 18° 41'S., 117° 54'E.). Area C.

Lutjanus argentimaculatus (Forsskål, 1775)
det. TGT. LPPL JIF52 (TGT2299) 03° 24'S., 100° 33'E. Areas A, B, C.

Lutjanus bengalensis (Bloch, 1790)
det. G.R. Allen on photo. BMNH 1984.1.1.71 (TGT (PJPW) 311) 00° 50'S., 98° 32'E. Areas A, B.

Lutjanus bitaeniatus (Valenciennes, 1830)
det. G.R. Allen on photo. BMNH 1984.1.1.72 (TGT (PJPW) 398) 05° 34'S., 102° 19'E. Areas A, B, C.

Lutjanus bohar (Fabricius, 1775)
det. TGT. LPPL JIF53 (TGT2298) 03° 24'S., 100° 33'E. Areas A, B, C.

Lutjanus boutton (Lacepède, 1802)
det. J. Marek on photo. Specimen lost. Catch coordinates lost. Area A.

Lutjanus carponotatus (Richardson, 1842)
det. J.B. Hutchins. WAM P.26252-003 19° 03'S., 120° 23'E. Area C.

Lutjanus decussatus (Cuvier, 1828)
det. TGT. NTM S.11017-001 (TGT3024) 08° 46'S., 115° 10'E. Areas A, B.

Lutjanus erythropterus Bloch, 1790
det. TGT. LPPL JIF68 (TGT2258) 06° 13'S., 104° 38'45"E. Areas A, B, C.

Lutjanus fulviflamma (Forsskål 1775)
det. TGT. LPPL JIF69 (TGT1060) 08° 46'S., 115° 10'E. Area B.

Lutjanus fulvus (Forster, 1801)
det. G.R. Allen on photo. LPPL JIF214 (TGT1015) 08° 43'S., 115° 16'E. Area B. Our specimen has a poorly-developed preopercular notch and the suborbital is rather narrow.

Lutjanus gibbus (Forsskål, 1775)
det. CSIRO. Specimen lost (no field number). Areas B, C.

Lutjanus johnii (Bloch, 1792)
det. TGT. Specimen lost (no field number). Areas A, B, C.

Lutjanus lemniscatus (Valenciennes, 1828)
det. TGT. LPPL JIF54 (TGT3186) 08° 58'S., 116° 31'E. Areas A, B, C.

Lutjanus lunulatus (Park, 1797)
det. TGT. BPBM 29338 (TGT2398) 00° 35'N., 97° 55'E. Area A.

Lutjanus lutjanus Bloch, 1790
det. TGT. LPPL JIF55 (TGT2359) 01° 59'S., 99° 26'E. Areas A, B, C.

Lutjanus xanthopinnis Iwatsuki, Tanaka & Allen, 2015
det. TGT based on authors. LPPL JIF56 (TGT915) 08° 30'S., 116° 42'E. Areas A, B.

Lutjanus malabaricus (Bloch & Schneider, 1801)
det. TGT. LPPL JIF57 (TGT2385) 01° 20'S., 98° 35'E. Areas A, B, C. This species is sometimes called *L. sanguineus* (Cuvier) but that species is confined to the Red Sea and western Indian Ocean (Allen & Talbot, 1985).

Lutjanus monostigma (Cuvier, 1828)
det. TGT. LPPL JIF58 (TGT2405) 00° 35'N., 97° 55'E. Areas A, B.

Lutjanus quinquelineatus (Bloch, 1790)
det. TGT. BPBM 29339 (TGT2404) 00° 35'N., 97° 55'E. Areas A, B, C.

Lutjanus rivulatus (Cuvier, 1828)
det. TGT. LPPL JIF60 (TGT2344) 01° 59'S., 99° 26'E. Areas A, C.

Lutjanus russellii (Bleeker, 1849)
det. G.R. Allen on photo. LPPL JIF61 (TGT2400) 00° 35'N., 97° 55'E. Areas B, C.

Lutjanus sebae (Cuvier, 1816)
det. TGT. LPPL JIF62 (TGT2297) 03° 24'S., 100° 33'E. Areas A, B, C.

Lutjanus timoriensis (Ouoy & Gaimard, 1824)
det. TGT. LPPL JIF63 (TGT2368) 01° 59'S., 99° 26'E. Areas A, B.

Lutjnus vitta (Ouoy & Gaimard, 1824)
det. TGT. LPPL JIF64 (TGT2446) 00° 21'N., 98° 38'E. Areas A, B, C.

Macolor niger (Forsskål, 1775)
No figure voucher. Photo of a New Guinea specimen supplied by PK (photo 3). TGT determined our material (LPPL JIF59 (TGT1354) from 08° 31'S., 115° 32'E.). Area B.

Paracaesio kusakarii Abe, 1960
det. W. D. Anderson. GMBL 81-163 (TGT3258) 09° 01 'S., 116° 18'E. Area B.

Paracaesio xanthurus (Bleeker, 1869)
det. W.D. Anderson, GMBL 83-33 (TGT2377) 01° 59'S., 99° 26'E. Areas A, B.

Pinjalo pinjalo (Bleeker, 1850)
det. PK. LPPL JIF65 (TGT1127) 08° 28'S., 119° 08'E. Areas A, B.

Pinjalo lewisi Randall, Allen & Anderson, 1987
det. PK. NTM S.11116-002 (TGT1922) 08° 46'S., 115° 02'E. Area B. Drawing of the preserved specimen. Paratype.

Pristipomoides filamentosus (Valenciennes, 1830)
det. W.D. Anderson. GMBL 81-167 (TGT3264) 09° 01'S., 116° 18'E. Area B.

Pristipomoides multidens (Day, 1871)
det. TGT. LPPL JIF66 (TGT2600) 08° 42'S., 115° 05'E. Areas A, B, C.

***Pristipomoides sieboldii** (Bleeker, 1855)
No figure voucher. Our juvenile material determined by W.D. Anderson (GMBL 81-171). Area B. *Diagnosis*: DX, 11; A III, 8. L. lat. 71-74; total GR 28-32; diamond shaped patch of teeth on vomer. Violet body and fins, rows of blue spots on back and orange margin to dorsal and caudal fins.

Pristipomoides typus Bleeker, 1852
det. TGT. LPPL JIF205 (TGT2333) 02° 42'S., 99° 56'E. Areas A, B, C.

Symphorichthys spilurus (Günther, 1874)
det. TGT. LPPL JIF70 (TGT3255) 09° 01'S., 116° 18'E. Area B.

Symphorus nematophorus (Bleeker, 1860)
det. TGT. LPPL JIF71 (TGT1484) 08° 57'S., 116° 26'E. Areas B, C.

CAESIONIDAE

Caesio caerulaurea Lacepède, 1801
det. K. Carpenter. BPBM 29366 (TGT1573) 08° 06'S., 115° 16'E. Area A.

Caesio cuning (Bloch, 1791)
det. K. Carpenter. BPBM 29378 (TGT2172) 08° 46'S., 115° 10'E. Areas A, B.

Caesio lunaris Cuvier, 1830
det. K. Carpenter. BPBM 29334 (PAN 22) 08° 31'S., 115° 32'E. Area B.

Caesio teres Seale, 1906
det. K. Carpenter. BPBM 29367 (TGT1581) 08° 06'S., 115° 16'E. Area B.

Caesio xanthonota Bleeker, 1853
det. K. Carpenter. BPBM 29375 (TGT2401) 00° 35'N., 97° 55'E. Areas A, B.

Dipterygonotus balteatus (Valenciennes,, 1830)
det. K. Carpenter. BPBM 29376 (TGT2283) 06° 07'S., 104° 39'E. Areas A, B, C.

Gymnocaesio gymnoptera (Bleeker, 1856)
det. K. Carpenter. BPBM 293n (TGT2293) 03° 34'S., 100° 41'E. Areas A, B.

Pterocaesio chrysozona (Cuvier, 1830)
det. J.B. Hutchins. WAM P.26191-003. 20° 09'S., 116° 31'E. Areas A, C.

Pterocaesio digramma (Bleeker, 1864)
det. K. Carpenter. BPBM 29341 (TGT962) 08° 30'S., 116° 42'E. Areas B, C.

Pterocaesio pisang (Bleeker, 1853)
det. G.R. Allen. BPBM 29342 (TGT939) 08° 30'S., 116° 42'E. Areas A, B.

Pterocaesio tessellata Carpenter, 1987
det. K. Carpenter. BPBM 29368 (TGT1582) 08° 06'S., 115° 16'E. Areas A, B.

NEMIPTERIDAE

Nemipterus balinensis (Bleeker, 1858)
det. B.C. Russell. NTM S.10824-002 (TGT2362) 01° 59'S., 99° 26'E. Areas A, B, C.

Nemipterus bathybius Snyder, 1911
det. B.C. Russell. NTM S.10999-001 (TGT2459) 00° 25'S., 98° 40'E. Areas A, B, C.

Nemipterus furcosus (Valenciennes, 1830)
det. B.C. Russell. NTM S.11018-001 (TGT2276) 05° 07'S., 104° 39'E. Areas A, B, C.

Nemipterus hexodon (Quoy & Gaimard, 1824)
det. B.C. Russell. NTM S.10754-001 (TGT1188) 08° 47'S., 118° 48'E. Areas B, C.

Nemipterus isacanthus (Bleeker, 1873)
det. B.C. Russell on photo. Specimen lost. 13° 22'S., 124° 48'E. (Conspecific material from near Survey area determined by CSIRO: CSIRO CA3736 from 10° 19'S., 133° 05'E.) Area C.

Nemipterus japonicus (Bloch, 1791)
det. B.C. Russell. NTM S.11003-001 (TGT2240) 06° 25'S., 105° 34'E. Areas B, C.

Nemipterus marginatus (Valenciennes, 1830)
det. B.C. Russell. NTM S.11005-001 (TGT2205) 05° 20'S., 109° 10'E. Areas A, B, C.

Nemipterus zysron (Bleeker, 1856)
det. B.C. Russell. NTM S.11001-001 (TGT2551) 03° 07'S., 101° 20'E. Areas B, C.

Nemipterus mesoprion (Bleeker, 1853)
det. B.C. Russell. NTM S.11007-001 (TGT2435) 00° 51 'N., 97° 58'E. Areas A, B.

Nemipterus nematophorus (Bleeker, 1854)
No figure voucher. Photo of New Guinea specimen supplied by PK. Specimens from Area A determined by TGT & PK (e.g. NTM S.11016-002 (TGT2486) from 00° 04'S., 99° 01'E.) (photo: PK 6).

Nemipterus nematopus (Bleeker, 1851)
det. B.C. Russell. NTM S.10731-005 (TGT1129) 08° 28'S., 119° 08'E. Areas B, C.

Nemipterus peronii (Valenciennes, 1830)
det. B.C. Russell. NTM S.10731-003 (TGT1131) 08° 28'S., 119° 08'E. Areas A, B, C.

Nemipterus tambuloides (Bleeker, 1853)
det. B.C. Russell. NTM S.11000-001 (TGT2379) 01° 20'S., 98° 35'E. Areas A, B, C.

Nemipterus sugillatus Russell & Ho, 2017
det. B.C. Russell. NTM S.11004-001 (TGT2573) 07° 59'S., 108° 58'E. Areas A, C. Paratype.

Nemipterus gracilis (Bleeker, 1873)
det. B.C. Russell. NTM S.11000-002 (TGT2380) 01° 20'S., 98° 35'E. Conspecific material determined by B. Russell at NTM as S.11006-001 (TGT1841) 08° 56'S., 116° 24'E. Areas A, B, C.

Nemipterus balinensoides (Popta, 1918)
det. B.C. Russell. NTM S.11001-002 (TGT2560) 03° 07'S., 101 ° 20'E. Conspecific material at NTM S.10733-006 (TGT1013) 08° 43'S., 115° 16'E. Areas A, B.

Nemipterus thosaporni Russell 1991
No figure voucher. Photo supplied by B.C. Russell who identified our specimen (NTM S.10744-005 (TGT928) from 08° 30'S., 116° 42'E.). Area B. Paratype.

Parascolopsis eriomma (Jordan & Richardson, 1909)
det. B.C. Russell. NTM S.10995-001 (TGT2592) 08° 33'S., 114° 31'E. Areas A, C.

Parascolopsis inermis (Temminck & Schlegel, 1843)
det. B.C. Russell. NTM S.10752-005 (TGT3197) 09° 01'S., 116° 18'E. Area B.

Parascolopsis tosensis (Kamohara, 1938)
det. B.C. Russell. NTM S.10760-003 (TGT1732) 08° 58'S., 116° 34'E. Areas A, B.

Parascolopsis tanyactis Russell, 1986
det. B.C. Russell. NTM S.10739-002 (TGT1782) 08° 57'S., 116° 08'E. Areas A, B, C. Paratype.

Parascolopsis qantasi Russell & Gloerfelt-Tarp, 1984
det. B.C. Russell. NTM S.10997-001 (TGT2323) 03° 24'S., 100° 33'E. Areas A, C. Holotype.

Pentapodus caninus (Cuvier, 1830)
det. B.C. Russell. NTM S.10660-001 (no field number) 08° 08'S., 114° 32'E. Area B.

Pentapodus emeryii (Richardson, 1843)
det. TGT & PK. NTM S.10731-004 (TGT1136) 08° 28'S., 119° 08'E. Area B. Juveniles lack the filamentous extensions to the upper and lower caudal lobes typical of adults (e.g. NTM S.10744-006 (TGT977)).

Pentapodus nagasakiensis (Tanaka, 1915)
det. CSIRO. AMS 1.22831-033 20° 00'S., 117° 16'E. Areas B, C.

Pentapodus porosus (Valenciennes, 1830)
det. CSIRO. Specimen lost (no field number) (Conspecific material from Survey determined by B.C. Russell: CSIRO CA2523 from 20° 14'S., 115° 52'E.). Area C.

Pentapodus setosus (Valenciennes, 1830)
det. B.C. Russell. NTM S.10749-004 (TGT1808) 08° 48'S., 116° 43'E. Areas A, B.

Pentapodus trivittatus (Bloch, 1791)
det. B.C. Russell. NTM S.10733-020 (TGT1275) 08° 46'S., 115° 10'E. Area B.

Pentapodus vitta Ouoy & Gaimard, 1824
det PK. CSIRO CA2515 20° 39'S., 116° 45'E. Area C.

Scolopsis affinis Peters, 1877
det. B.C. Russell. NTM S.10763-002 (TGT1693) 08° 32'S., 115° 55'E. Area B.

Scolopsis aurata (Park, 1797)
det. B.C. Russell. NTM S.10771-001 (TGT2408) 00° 35'N., 97° 55'E. Area A.

Scolopsis bilineata (Bloch, 1793)
No figure voucher. B.C. Russell supplied the photo and identified our material (e.g. NTM S.10732-001 (PANG) 08° 31'S., 115° 32'E.). Area B.

Scolopsis ciliata (Lacepède, 1802)
det. B.C. Russell. NTM S.10733-005 (TGT1042) 08° 46'S., 115° 10'E. Area B.

Scolopsis lineata Ouoy & Gaimard, 1824
det. B.C. Russell. NTM S.11002-001 (TGT1541) 08° 22'S., 117° 15'E. Area B.

Scolopsis margaritifera (Cuvier, 1830)
det. B.C. Russell. NTM S.10747-006 (TGT3327) 10° 18'S., 120° 22'E. Area B.

Scolopsis monogramma (Cuvier, 1830)
No figure voucher. Photo of New Guinea specimen supplied by PK (photo 7). Russell determined our material. Areas A, B, C. This species has been called *S. regina* Whitley in Australian waters.

Scolopsis taenioptera (Cuvier, 1830)
det. B.C. Russell. NTM S.11014-001 (TGT2219) 06° 13'S., 105° 44'E. Areas A, B, C.

Scolopsis trilineata Kner, 1868
det. B.C. Russell. NTM S.10733-007 (TGT1069) 08° 46'S., 115° 10'E. Area B.

Scolopsis vosmeri (Bloch, 1792)
det. B.C. Russell. NTM S.10733-011 (TGT1011) 08° 43'S., 115° 16'E. Areas A, B, C.

GERREIDAE

Gerres erythrourus (Bloch, 1791)
det. D.J. Woodland. NTM S.10733-016 (TGT1068) 08° 46'S., 115° 10'E. Area B. (Note: Chakraborty et al (2006) suggest that two species are included under this name.)

Gerres longirostris (Lacepède, 1801)
det. D.J. Woodland on photo. Specimen lost (no field number). Area A.

Gerres filamentosus Cuvier, 1829
det. D.J. Woodland. NTM S.10733-017 (TGT1072) 08° 46'S., 115° 10'E. Areas A, B, C.

Gerres oyena (Fabricius, 1775)
det. PK. NTM S.11007-002 (TGT2429) 00° 51'N., 97° 58'E. (TGT1067) 08° 46'S., 115° 10'E. Conspecific material at NTM S.10733-015. Areas B, C.

Pentaprion longimanus (Cantor, 1849)
det. D.J. Woodland on photo. BMNH 1984.1.1.73 (TGT (PJPW) 783) 08° 37'S., 115° 59'E. Areas A, B, C.

HAEMULIDAE

Diagramma pictum (Thunberg, 1792)
det. R.J. McKay. Specimen lost. 13° 55'S., 124° 33'E. (Conspecific material determined by CSIRO is CSIRO CA1649 from 19° 34'S., 120° 03'E.). Areas A?, B?, C.

Diagramma punctatum Cuvier, 1830
det. TGT. NTM S. 11037-001 (TGT2444) 00° 20'N., 98° 33'E. Conspecific material from the Survey determined by R.J. McKay. Area A. (Note: lower caudal lobe damaged on voucher).

Plectorhinchus chrysotaenia (Bleeker, 1855)
det. TGT. BPBM 29335 (TGT1351) 08°31'S., 115° 32'E. Area B.

Plectorhinchus chaetodonoides Lacepède, 1801
det. R.J. McKay on photo. Specimen lost (no field number). Area A.

Plectorhinchus chubbi (Regan, 1919)
det. R.J. McKay. LPPL JIF74 (TGT900) 08° 43'S., 115° 16'E. Area B.

Plectorhinchus flavomaculatus (Cuvier, 1830)
det. R.J. McKay. Specimen lost (TGT1368) 08° 46'S., 115° 02'E. Areas A, B, C.

Plectorhinchus gibbosus (Lacepède, 1802)
det. J.B. Hutchins. WAM P.26218-004 18° 10'S., 121° 17'E. Areas A, B, C.

Plectorhinchus lineatus (Linnaeus, 1758)
det. TGT. LPPL JIF75 (TGT922) 08° 30'S., 116° 42'E. Area B.

Plectorhinchus lessonii (Cuvier, 1830)
det. TGT. BPBM 29350 (TGT2123) 08° 46'S., 115° 10'E. Area B.

Plectorhinchus albovittatus (Rüppell, 1838)
det. R.J. McKay. BPBM 29349 (TGT1239) 08° 49'S., 115° 15'E. Area B. (Note: voucher is a juvenile specimen)

Plectorhinchus vittatus (Linnaeus, 1758)
det. TGT. BPBM 29336 (TGT1357) 08° 31'S., 115° 32'E. Area B.

Diagramma melanacrum Johnson & Randall, 2001
det. R.J. McKay. QM I. 20291 (TGT3251) 08° 24'S., 116° 01'E. Area B. Holotype.

Plectorhinchus polytaenia (Bleeker, 1853)
det. TGT. LPPL JIF72 (TGT3239) 09° 01'S., 116° 18'E. Area B.

Pomadasys argenteus (Forsskål, 1775)
det. TGT. BPBM 29343 (TGT929) 08° 30'S., 116° 42'E. Areas A, B, C. The lower GR count distinguishes this species from the similarly-coloured Western Indian Ocean species *P. multimaculatus* (Playfair) and *P. commersonnii* (Lacepède).

Pomadasys argyreus (Valenciennes, 1833)
det. PK. LPPL JIF73 (TGT2226) 06° 13'15"S., 105° 44'E. Areas A, B, C.

Pomadasys furcatus (Bloch & Schneider, 1801)
det. PK. BPBM 29348 (TGT3028) 08° 43'S., 115° 16'E. Area B.

Pomadasys kaakan (Cuvier, 1830)
det. TGT. NTM S.11014-002 (TGT2225) 06° 13'15"S., 105° 44'E. Areas A, B, C. Conspecific material determined by R.J. McKay.

Pomadasys maculatus (Bloch, 1793)
det. TGT. BPBM 29351 (TGT2239) 06° 25'S., 105° 34'E. Areas A, B, C.

Pomadasys sp.
det. R.J. McKay. BMNH 1984.1.1.78 (TGT (PJPW) 606) 08° 37'S., 115° 59'E. Area A. This is the '*P. fisheri*' of McKay.

LETHRINIDAE

Gnathodentex aureolineatus (Lacepède, 1802)
det. PK. NTM S.10771-003 (TGT2413) 00° 35'S., 97° 55'E. Area A.

Gymnocranius elongatus Senta, 1973
det. TGT. NTM S.11018-004 (TGT2285) 06° 07'S., 104° 39'E. Areas A, B, C.

Gymnocranius griseus (Temminck & Schlegel, 1843)
det. TGT. LPPL JIF195 (TGT2369) 01° 59'S., 99° 26'E. Areas A, B, C.

Gymnocranius grandoculis (Valenciennes, 1830)
det. TGT. LPPL JIF196 ITGT2332) 02° 42'S., 99° 56'E. Areas A, B, C.

Gymnocranius sp.
det. TGT. NTM S.10771-004 (TGT2403) 00° 35'S., 97° 55'E. Area A.

Lethrinus nebulosus (Forsskål, 1775)
det. CSIRO. Specimen lost. 19° 59'S., 117° 24'E. (Conspecific Survey material determined by CSIRO is CSIRO CA935 from 12° 37'S., 129° 48'E.). Area C.

Lethrinus conchyliatus (Smith, 1959)
det. M. Walker on photo. LPPL JIF197 (TGT1054) 08° 10'S., 114° 54'E. Areas A, B.

Lethrinus microdon Valenciennes, 1830
det. TGT. LPPL JIF198 (TGT2410) 00° 35'S., 97° 55'E. Conspecific material determined by M. Walker at WAMRL Leth Bali 6/83 (TGT2443) 00° 20'S., 98° 33'E. Areas A, B, C.

Lethrinus laticaudis Alleyne & Macleay, 1877
det. CSIRO. Specimen lost. 19° 59'S., 117° 24'E. Areas B, C.

Lethrinus harak (Fabricius, 1775)
det. M. Walker on photo. BMNH 1984.1.1.113 (no field number) 03° 35'S., 100° 38'E. Area A.

Lethrinus erythropterus Valenciennes, 1830
det. M. Walker on photo. Specimen lost (TGT930) 08° 30'S., 116° 42'E. Areas A, B.

Lethrinus lentjan (Lacepède, 1802)
det. M. Walker. WAMRL Leth Bali 6/83 (TGT2406) 00° 35'S., 97° 55'E. Areas A, C.

Lethrinus atkinsoni Seale, 1910
det. CSIRO. Specimen lost (no field number) Conspecific Survey material determined by M. Walker (e.g. TGT (PJPW) 386), BMNH uncat., from 01° 48'S., 99° 21'E.). Areas A, C.

Lethrinus miniatus (Forster, 1801)
det. CSIRO. CSIRO CA980. 20° 10'S., 115° 15'E. Area C.

Lethrinus genivittatus Valenciennes, 1830
det. CSIRO. Specimen lost. 19° 59'S., 117° 24'E. Areas A, B, C.

Lethrinus ornatus Valenciennes, 1830
det. TGT. LPPL JIF199 (TGT2399) 06° 25'S., 105° 34'E. Areas A, B.

Lethrinus rubrioperculatus Sato, 1978
det. M. Walker. WAMRL Leth Bali 10/83 (TGT2320) 03° 24'S., 100° 33'E. Areas A, B, C.

Lethrinus semicinctus Valenciennes, 1830
det. CSIRO. CSIRO CA948. 09° 52'S., 129° 12'E. Areas B, C.

Lethrinus variegatus Valenciennes, 1830
det. CSIRO. CSIRO CA968 20° 10'S., 115° 15'E. Areas B, C.

Lethrinus sp.
det. TGT. WAMRL Leth Bali 7/83 (TGT2411) 00° 35'S., 97° 55'. Areas A, B. This is the '*Maldive Emperor*' (refer Carpenter, 2001:3046). There is additional material (TGT2411 and TGT1053) at the NTM as S.10734-021.

Monotaxis grandoculis (Forsskål, 1775)
det. TGT. LPPL JIF200 (PAN 40) 08° 31'S., 115° 32'E. Areas A, B.

Wattsia mossambica (Smith, 1957)
det. PK on photo. Specimen lost (no field number). Area A.

SPARIDAE

Argyrops bleekeri Oshima, 1927
det. Y. Iwatsuki. LPPL JIF76 (TGT2572) 07° 59'S., 108° 58'E. Areas A, B, C.

***Argyrops notialis** Iwatsuki & Heemstra, 2018
No figure voucher. Our material from Western Australia (e.g. CSIRO CA1375) re-determined based on Iwatsuki & Heemstra, 2018. Additional material is AMS I.22830-014, from 175 km NW of Port Hedland. *Diagnosis*: D XI, 10; A III, 8; P 16; L. lat. 50-51; lower GR 15-17. First dorsal fin spine very small, 2nd-5th spines very elongate and flattened (juveniles), becoming shorter and reaching to 1st dorsal fin ray in adults, 2nd spine reaching further. Eye diameter less than suborbital depth; pupil diameter subequal to or less than preorbital length; rear margin of upper jaw reaches a vertical beyond anterior rim of pupil. Body pinkish red with faint reddish bars across back; fins reddish hyaline. Area C.

Dentex spariformis Ogilby, 1910
det. Y. Iwatsuki. NTM S.10752-008 (TGT3196) 09° 01'S., 116° 18'E. Areas A, B, C. Additional material is AMS I.22807-036, in part, 210 mm SL from 18° 32' S, 118° 17' E, determined by A. Hay & K. Graham.

Evynnis tumifrons (Temminck & Schlegel, 1843)
No figure voucher. Our material (e.g. BMNH 1984.1.1.74 (PJPW 170) from 08° 32'S., 114° 30'E.) determined based on Iwatsuki et al., 2007. Area A. *E. japonica* Tanaka is a synonym (Iwatsuki et al., 2007).

Pagrus auratus (Forster, in Bloch & Schneider, 1801)
det. TGT & PK. Specimen lost (no field number). Based on Taniguchi et al. (1986) and earlier deliberations, Paulin (1990) confirmed that *auratus* Forster is a senior synonym of *Pagrus major* (Temminck & Schlegel, 1843). This species has been recorded (as *P. auratus*) from Bali (Carpenter, 2001) and Dr Y. Iwatsuki has identified material collected north of Darwin (pers. comm., 2019). It is regrettable that this single specimen trawled off south Sumatra, was lost. Area A.

SCIAENIDAE

Argyrosomus amoyensis (Bleeker, 1863)
No figure voucher. Our material determined by E. Trewavas (BMNH 1984.1.1.75 (TGT (PJPW) 747) from 08° 45'S., 115° 05'E.). Area A.

Atrobucca brevis Sasaki & Kailola, 1988.
det. PK. CSIRO CA1422 15° 53'S., 124° 02'E. Area C.

Atrobucca nibe (Jordan & Thompson, 1911)
det. E. Trewavas. BMNH 1984.1.1.76 (TGT1440) 08° 56'S., 116° 24'E. Area B.

Johnius (Johnieops) borneensis (Bleeker, 1851)
det. PK. CSIRO CA2010 15° 32'S., 124° 02'E. Areas A, B, C.

Johnius (Johnius) amblycephalus (Bleeker, 1855)
det. PK. LPPL JIF77 (TGT (PJPW) 720) 08° 43'S., 115° 00'E. Areas A, B, C.

***Johnius (Johnius) belangerii** (Cuvier, 1830)
No figure voucher. E. Trewavas tentatively identified our 126 mm SL specimen as this species (BMNH 1984.1.1.77 (TGT (PJPW) 479) from 07° 49'S., 108° 54'E.). Area A. *Diagnosis*: D VIII-X, I, 26-30; GR. 2-5 + 5-10. Tr above 6-11. Swim bladder hammer-shaped with11 to 13 pairs of swim bladder appendages; pores of snout 5 + 5. Snout abrupt and steeply curved, slightly projecting in front of upper jaw. Ctenoid scales on head and upper part of body Head 3-3.8 in SL; second anal spine 7.1-12.5 in HL; eye 3.7-4.8 in HL. Body dark grey-bronze over head and back, fins dark brown or black; young specimens with dark vertical bars on back.

Johnius (Johnius) laevis Sasaki & Kailola, 1991
det. PK. CSIRO B.1972 13° 25'S., 126° 19'E. Areas A, C.

Johnius (Johnius) macropterus (Bleeker, 1853)
det. PK. NTM S.10992-011 (TGT3081) 08° 57'S., 116° 28'E. Area B.

Otolithes ruber (Bloch & Schneider, 1801)
det. P. Whitehead. Specimen lost (no field number). Areas A, B.

Nibea soldado (Lacepède, 1802)
det. PK. NTM S.11030-001 (TGT2201) 06° 42'S., 109° 05'E. Area A.

Pennahia macrocephalus (Tang, 1937)
det. PK. NTM S.10992-008 (TGT3072) 08° 57'S., 116° 28'E. Areas A, B.

Pennahia anea (Bloch, 1793)
det. PK. NTM S.10733-012 (TGT2170) 08° 46'S., 115° 10'E. Areas A, B.

Pennahia pawak (Lin, 1940)
det. PK. NTM S.11029-001 (TGT2252) 06° 13'S., 105° 44'E. Area A.

Protonibea diacanthus (Lacepède, 1802)
det. J.B. Hutchins. WAM P.26484-001 20° 47'S., 116° 46'E. Areas B, C.

MULLIDAE

Mulloidichthys flavolineatus (Lacepède, 1801)
det. TGT & PK. LPPL JIF78 (TGT1580) 08° 06'S., 115° 16'E. Area B.

Parupeneus barberinoides (Bleeker, 1852)
det. TGT. Specimen lost. (TGT974) 08° 30'S., 116° 42'E. Area B.

Parupeneus barberinus (Lacepède, 1801)
det. TGT. LPPL JIF79 (TGT1097) 08° 46'S., 115° 10'E. Areas A, B.

Parupeneus crassilabris (Valenciennes, 1831)
det. F. Uiblein. LPPL JIF80 (PAN34) 08° 31'S., 115° 32'E. Area B.

Parupeneus chrysopleuron (Temminck & Schlegel, 1843)
det. CSIRO. AMS 1.21949-002 08° 53'S., 135° 15'E. Areas B, C.

Parupeneus cyclostomus (Lacepède, 1801)
det. J. Randall. LPPL JIF81 (TGT3013) 08° 48'S., 116° 43'E. Areas A, B. This species is often misidentified because its colour changes with growth.

Parupeneus indicus (Shaw, 1803)
det. TGT. LPPL JIF82 (TGT3272) 08° 46'S., 115° 10'E. Areas A, B, C.

Parupeneus macronemus (Lacepède, 1801)
det. TGT. LPPL JIF83 (TGT2307) 03° 24'S., 100° 33'E. Areas A, B.

Parupeneus heptacantha (Lacepède, 1802)
det. TGT & PK. LPPL JIF84 (TGT (PJPW) 610) 08° 25'S., 114° 25'E. Areas A, C.

Parupeneus pleurostigma (Bennett, 1831)
det. F. Uiblein. LPPL JIF85 (TGT963) 08° 30'S., 116° 42'E. Area B.

Parupeneus rubescens (Lacepède, 1801)
det. TGT & PK. LPPL JIF86 (TGT3320) 10° 18'S., 120° 22'E. Areas B, C.

Parupeneus jansenii (Bleeker, 1856)
det. PK. NTM S.11018-002 (TGT2277) 06° 07'S., 104° 39'E. Area A.

Parupeneus multifasciatus (Quoy & Gaimard, 1825)
det. F. Uiblein on photo. Specimen lost. (TGT960) 08° 30'S., 116° 42'E. Area B. This species is very similar to *P. trifasciatus* (Lacepède) which ranges from southern Japan to western Indonesia, Seychelles to South Africa.

Upeneus australiae Kim & Nakaya, 2002
det. PK based on Kim & Nakaya 2002. Specimen lost (no field number). (Conspecific material determined by CSIRO is CA3042 from 20° 07'S., 118° 02'E.). Area C.

Upeneus torres Uiblein & Gledhill, 2014
det. F. Uiblein. NTM S.10995-003 (TGT2591) 08° 33'S., 114° 31 'S. Areas A, B, C.

Upeneus moluccensis (Bleeker, 1855)
det. TGT. LPPL JIF87 (TGT2432) 00° 51'N., 97° 58'E. Areas A, B, C.

Upeneus quadrilineatus Cheng & Wang, 1963
det. TGT & PK. NTM S.10748-012 (TGT1017) 08° 43'S., 115° 16'E. Areas A, B.

Upeneus sulphureus Cuvier, 1829
det. TGT. LPPL JIF88 (TGT2224) 06° 13'15"S., 105° 44'E. Areas A, B, C.

Upeneus sundaicus Bleeker, 1855
det. CSIRO. CSIRO CA2036 12° 30'S., 130° 05'E. Area C.

Upeneus tragula Richardson, 1846
det. F. Uiblein. LPPL JIF89 (TGT1061) 08° 46'S., 115° 10'E. Conspecific Survey material determined by PK. and CSIRO (e.g. CA2057 from 21° 00'S., 115° 40'E.). Areas A, B.

Upeneus vittatus (Forsskål, 1775)
det. TGT. LPPL JIF90 (TGT2545) 03° 07'S., 101° 20'E. Areas A, B.

Upeneus guttatus (Day, 1868)
det. F. Uiblein. NTM S.11033-001 (TGT2389) 01° 57'S., 99° 26'E. Areas A, C. Conspecific material is NTM S.11018-002. This species is often mistaken for *U. japonicus* (Houttuyn) which is distributed from east Malaysia to Philippines, South Korea, Peter the Great Bay and Japan.

Upeneus subvittatus (Temminck & Schlegel 1843)
det. F. Uiblein. NTM S.11001-003 (TGT2546) 03° 07'S., 101° 20'E. Area A.

PEMPHERIDAE

Parapriacanthus ransonneti Steindachner, 1870
det. PK. NTM S.10996-002 (TGT2312) 03° 24'S., 100° 33'E. Areas A, B, C.

Pempheris molucca Cuvier, 1829
det. R. Jubb. NTM S.11089-001 (TGT (PJPW) 653) 08° 41'S., 114° 34'E. Area A.

Pempheris vanicolensis Cuvier, 1831
det. R. Jubb. NTM S.10732-005 (PAN5) 08° 31'S., 115° 32'E. Areas A, B.

KYPHOSIDAE

Kyphosus cinerascens (Forsskål, 1775)
det. TGT. LPPL JIF91 (PAN24) 08° 31'S., 115° 32'E. Area B.

Kyphosus vaigiensis (Quoy & Gaimard, 1825)
No figure voucher. Photo of a New Guinea specimen supplied by PK (PK1). TGT & PK determined our Survey material (e.g. PAN25 (LPPL JIF92) from 08° 31'S., 115° 32'E.). Areas A, B.

DREPANEIDAE

Drepane longimana (Bloch & Schneider, 1801)
det. TGT. NTM S. 11016-005 (TGT2461) 00° 04'S., 99° 01 'E. Areas A, B.

Drepane punctata (Linnaeus, 1758)
det. TGT. LPPL JIF93 (TGT2247) 06° 25'S., 105° 34'E. Areas A, B, C.

EPHIPPIDAE

Ephippus orbis (Bloch, 1787)
det. TGT. NTM S. 11001-004 (TGT2552) 03° 07'S., 101° 20'E. Areas A, B.

Platax batavianus Cuvier, 1831
det. TGT. LPPL JIF94 (TGT2450) 00° 21'N., 98° 38'E. Areas A, B.

***Platax orbicularis** (Forsskål, 1775)
No figure voucher. Specimen lost. TGT determined our material from 08° 46'S., 115° 02'E. Area A. *Diagnosis*: D. V, 35-39. A III 25-29, P 17-19. L. lat. 44-53. Snout convex before eye. Ventral fins black.

Platax teira (Fabricius 1775)
det. TGT. LPPL JIF95 (TGT2440) 00° 20'S., 98° 33'E. Areas A, C.

Zabidius novemaculeatus (McCulloch, 1916)
det. CSIRO. CSIRO CA1501. 17° 47'S., 121° 46'E. Area C.

CHAETODONTIDAE

Chaetodon assarius Waite, 1905
det. PK. CSIRO CA1677 19° 55'S., 116° 17'E. Area C.

Chaetodon aureofasciatus Macleay, 1878
det. PK. CSIRO CA2189 20° 39'S., 115° 58'E. Area C.

***Chaetodon auriga** Forsskål, 1775
No figure voucher. Material at CSIRO from northwestern Australia (e.g. CA3031 from 19° 45'S., 117° 58'E.). Area C. *Diagnosis*: Broad vertical white-edged band through eye; anteriorly descending oblique dark lines on back, last intersected by posteriorly-descending lines over sides and tail. Caudal fin yellow; large round black spot on soft dorsal fin.

Chaetodon baronessa Cuvier, 1829
det. TGT. NTM S.10732-006 (PAN33) 08° 31'S., 115° 32'E. Area B.

Chaetodon citrinellus Cuvier, 1831
det. TGT. LPPL JIF100 (TGT2102) 08° 43'S., 115° 16'E. Area B.

Chaetodon decussatus Cuvier, 1829
det. TGT. LPPL JIF101 (TGT1210) 08° 43'S., 115° 16'E. Area B.

Chaetodon ephippium Cuvier, 1831
det. TGT. LPPL JIF102 (TGT1099) 08° 46'S., 115° 10'E. Area B.

Chaetodon guentheri Ahl, 1923
det. P. Whitehead. NTM S.10747-007 (TGT3338) 10° 18'S., 120° 22'E. Areas A, B.

Chaetodon kleinii Bloch, 1790
det. TGT. LPPL JIF103 (TGT2105) 08° 43'S., 115° 16'E. Areas A, B.

Chaetodon melannotus Bloch & Schneider, 1801
det. TGT. LPPL JIF104 (TGT1545) 08° 22'S., 117° 15'E. Area B.

Roa australis Kuiter, 2004
det. TGT. CSIRO CA2188 13° 43'S., 124° 11 'E. Area C. Paratype.

Chaetodon selene Bleeker, 1853
det. TGT. LPPL JIF105 (TGT3227) 09° 01'S., 116° 18'E. Area B.

Chaetodon trifascialis Ouoy & Gaimard, 1825
det. TGT. LPPL JIF107 (TGT1096) 08° 46'S., 115° 10'E. Area B.

Chelmon marginalis Richardson, 1842
det. R. Steene. CSIRO CA994 20° 15'S., 115° 56'E. Area C.

Chelmon muelleri Klunzinger, 1879
det. R. Steene. CSIRO CA995 13° 42'S., 125° 45'E. Area C.

Coradion altivelis McCulloch, 1916
No figure voucher. Our material determined by R. Steene (e.g. CSIRO CA2955 from 19° 02'S., 118° 36'E). Area C.

Coradion chrysozonus (Cuvier, 1831)
det. PK. CSIRO CA998 20° 21'S., 116° 22'E. Areas A, B, C.

Heniochus acuminatus (Linnaeus, 1758)
No figure voucher. R. Kuiter supplied the photograph of a specimen from eastern Australia. G.R. Allen determined our Survey material (e.g. LPPL JIF108 (TGT3121) from 08° 57'S., 116° 28'E.). Areas A, B.

Heniochus chrysostomus Cuvier, 1831
det. TGT. LPPL JIF109 (TGT1547) 08° 22'S., 117° 15'E. Area B.

Heniochus diphreutes Jordan, 1903
det. CSIRO. CSIRO CA1504 19° 05'S., 118° 46'E. Areas A, B, C.

Heniochus singularius Smith & Radcliffe, 1911
det. TGT. LPPL JIF96 (TGT1025) 08° 51'S., 115° 14'E. Area B.

Parachaetodon ocellatus (Cuvier, 1831)
det. CSIRO. Specimen lost. 14° 10'S., 124° 27'E. (Conspecific Survey material determined by CSIRO is CA997 from 20° 21 'S., 116° 22'E.). Areas B, C.

POMACANTHIDAE

Apolemichthys trimaculatus (Curvier, 1831)
det. TGT. NTM S.10752-002 (TGT3231) 09° 01'S., 116° 18'E. Areas A, B, C.

Chaetodontoplus duboulayi (Günther, 1867)
det. CSIRO. Specimen lost (no field number). (Conspecific Survey material determined by CSIRO is CA2261 from 20° 10'S., 115° 15'E.). Area C.

Chaetodontoplus melanosoma (Bleeker, 1853)
det. TGT. NTM S.10744-002 (TGT951) 08° 30'S., 116° 42'E. Area B. Juvenile colouration.

Chaetodontoplus personifer (McCulloch, 1914)
det. CSIRO. CSIRO CA983 20° 12'S., 115° 19'E. Area C.

Pomacanthus annularis (Bloch, 1787)
det. TGT. Specimen lost. (TGT1365) 08° 46'S., 115° 02'E. Areas A, B.

Pomacanthus imperator (Bloch, 1787)
det. TGT. LPPL JIF97 (TGT3275) 10° 46'S., 122° 43'E. Areas B, C.

Pomacanthus semicirculatus (Cuvier, 1831)
det. TGT. LPPL JIF98 (TGT3237) 09° 01'S., 116° 18'E. Areas A, B.

Pomacanthus sexstriatus (Cuvier, 1831)
det. TGT. LPPL JIF99 (TGT3242) 09° 01 'S., 116° 18'E. Areas B, C.

PENTACEROTIDAE

Histiopterus typus Temminck & Schlegel, 1844
det. CSIRO. CSIRO CA2257 09° 52'S., 129° 12'E. Areas A, C.

POMACENTRIDAE

Abudefduf bengalensis (Bloch, 1787)
det. CSIRO. CSIRO CA2897 20° 11 'S., 117° 13'E. Areas B, C.

Abudefduf vaigiensis (Quoy & Gaimard, 1825)
det. TGT. LPPL JIF 10 (TGT1576) 08° 06'S., 115° 16'E. Area B. Sometimes erroneously called *Abudefduf saxatilis* (Linnaeus), a species inhabiting Western Australian waters.

Chromis sahulensis Allen & Allen, 2021
det. TGT. AMS 1.22801-019 19° 32'S., 118° 10'E. Area C.

Pristotis obtusirostris (Günther, 1862)
det. TGT. LPPL JIF111 (TGT2337) 03° 24'S., 100° 33'E. Areas B, C.

CIRRHITIDAE

Cirrhitichthys aprinus (Cuvier, 1829)
det. TGT & PK. LPPL JIF113 (TGT3248) 08° 24'S., 116° 01'E. Areas B, C.

Cirrhitichthys aureus (Temminck & Schlegel, 1843)
det. PK. NTM S.10736-005 (TGT1755) 08° 34'S., 116° 47'E. Area B.

Cyprinocirrhites polyactis (Bleeker, 1874)
det. PK. NTM S.11015-001 (TGT1912), 07° 16'S., 118° 12'E. Area B. Drawing of preserved specimen.

Paracirrhites forsteri (Schneider, 1801)
det. TGT. LPPL JIF112 (TGT1575) 08° 06'S., 115° 16'E. Area B.

CEPOLIDAE

Acanthocepola abbreviata (Valenciennes, 1835)
det. PK. ANSP 152037 (TGT917) 08° 30'S., 116° 42'E. Area B.

Acanthocepola krusensternii (Temminck & Schlegel, 1845)
det. PK. ANSP 152036 (TGT2462) 00° 04'S., 99° 01'E. Areas A, C.

Cepola schlegelii Bleeker, 1854
det. PK. NTM S.10999-003 (TGT2453) 00° 25'S., 98° 40'E. Area A.

Owstonia sibogae (Weber, 1913)
det. W. Smith-Vaniz. ANSP 152642 (TGT1673) 08° 30'S., 117° 46'E. Area B.

Owstonia nudibucca Smith-Vaniz & Johnson, 2016
det. W. Smith-Vaniz. ANSP 151993. No field number. 01° 22'S., 98° 37'E. Area A. Holotype.

SPHYRAENIDAE

Sphyraena barracuda (Edwards, 1771)
det. TGT. LPPL JIF209 (TGT2182) 08° 46'S., 115° 10'E. Area B.

Sphyraena flavicauda Rüppell, 1838
det. PK. CSIRO CA1342 17° 25'S., 121° 50'E. Area C.

Sphyraena forsteri Cuvier, 1829
det. TGT. LPPL JIF114 (TGT2412) 00° 35'N., 97° 55'E. Conspecific material determined by J.M. Rose. Areas A, B, C.

Sphyraena pinguis Günther, 1874
det. TGT. LPPL JIF115 (TGT2484) 00° 04'S., 99° 01'E. Areas A, B, C.

Sphyraena putnamae Jordan & Seale, 1905
det. TGT. LPPL JIF116 (TGT2228) 06° 13'S., 105° 44'E. Areas A, B, C.

***Sphyraena stellata** Morishita & Motomura, 2020
No figure voucher. Material from north-western Australia (e.g. CSIRO 50108-37382003) refers.) Area C. *Diagnosis*: body brown above, silvery below. One gill raker at angle of first gill arch; ventral fin inserted slightly before vertical through first dorsal fin origin; eye 4.9-6 in HL; HL 3-3.1 in SL; body depth less than 8 in SL. L. lat. 134-141. Two yellow stripes along sides; caudal fin grey. Clearly the naming of this species has removed confusion over the appropriate identity of the common, one-gilled, many-lateral line-scaled sphyraenid inhabiting Indonesian and northern Australian waters (and further afield). Previously it has been misidentified as either *S. acutipinnis* Day (endemic to the Arabian Sea), *S. africana* Gilchrist & Thomson (only in SW Indian Ocean) or *S. waitii* (eastern Australia and northern New Zealand) (H. Motomura, pers. comm. 2021).

POLYNEMIDAE

Filimanus perplexa Feltes, 1991
det. TGT. LPPL JIF117 (TGT1387) 08° 46'S., 115° 02'E. Area A.

Polydactylus microstomus (Bleeker, 1851)
det. TGT. LPPL JIF118 (TGT2472) 00° 04'S., 99° 01'E. Areas A, B.

Polydactylus multiradiatus (Günther, 1860)
det. PK. CSIRO CA1544 13° 02'S., 125° 07'E. Area C.

Polydactylus nigripinnis Munro, 1964
No figure voucher. Photo of New Guinea specimen supplied by PK (PK4). Conspecific Survey material (e.g. CSIRO CA1806 from 13° 25'S., 126° 19'E.) determined by CSIRO. Area C.

Polydactylus plebeius (Broussonet, 1782)
det. R. Feltes. BMNH 1984.1.1.79 (TGT (PJPW) 764) 08° 36'S., 115° 00'E. Area A.

Polydactylus sextarius (Bloch & Schneider, 1801)
det. R. Feltes on photo. Specimen lost. Area A.

Filimanus xanthonema (Valenciennes, 1831)
det. R. Feltes. BMNH 1984.1.1.80 (TGT (PJPW) 475) 08° 02'S., 109° 03'E. Area A.

LABRIDAE

Anampses lennardi Scott, 1959
det. PK. AMS 1.22806-026 19° 29'S., 118° 22'E. Area C.

Bodianus bilunulatus (Lacepède, 1801)
det. M. Gomon. NTM S.10735-003 (TGT1363) 08° 46'S., 115° 02'E. Area B.

Bodianus solatus Gomon, 2006
det. M. Gomon. CSIRO C2172 from 20° 07'S., 115° 59'E. Area C. Paratype.

Oxycheilinus bimaculatus (Valenciennes, 1840)
No figure voucher. R. Kuiter lent a photo of this species and M. Gomon determined our material (e.g. BMNH 1984.1.1.81 (TGT969) from 08° 30'S., 116° 42'E.). Area B.

Oxycheilinus orientalis (Günther, 1862)
det. M. Gomon. BMNH 1984.1.1.82 (TGT1319) 08° 46'S., 118° 17'E. Area B.

Cheilinus trilobatus Lacepède, 1801
det. TGT. LPPL JIF119 (TGT909) 08° 10'S., 114° 54'E. Area B.

Cheilio inermis (Forsskål, 1775)
det. TGT. NTM S.10748-015 (TGT1004) 08° 43'S., 115° 16'E. Area B.

Choerodon anchorago (Bloch, 1791)
det. M. Gomon on photo. NTM S.10741-001 (TGT3011) 08° 43'S., 115° 16'E. Area B.

Choerodon cephalotes (Castelnau, 1875)
det. PK. CSIRO CA2144 19° 52'S., 118° 12'E. Area C.

Choerodon monostigma Ogilby, 1910
det. CSIRO. AMS 1.21842-029 10° 35'S., 133° 45'E. Area C.

Choerodon robustus (Günther, 1862)
det. M. Gomon on photo. Specimen lost (no field number). Area A.

Choerodon schoenleinii (Valenciennes, 1839)
det. CSIRO. Specimen lost (no field number). Areas A, B, C.

Choerodon vitta Ogilby, 1910
det. CSIRO. AMS 1.22831-028 20° 00'S., 117° 16'E. Area C.

Choerodon zamboangae (Seale & Bean, 1907)
det. PK & TGT. NTM S.10752-014 (TGT3238) 09° 0l'S., 116° 18'E. Areas B, C.

Choerodon cauteroma Gordon & Allen, 1987
det. M. Gomon. CSIRO CA2155 20° 17'S., 116° 04'E. Area C.

Choerodon sugillatum Gomon, 1987
det. M. Gomon. CSIRO CA2168 12° 27'S., 124° 27'E. Area C.

Cirrhilabrus filamentosus (Klausewitz, 1976)
det. J. Randall. NTM S.10744-001 (TGT955) 08°. 30'S., 116° 42'E. Area B.

Epibulus insidiator (Pallas, 1770)
det. TGT. NTM S.10757-001 (TGT1708) 08° 43'S., 115° 16'E. Area B.

Halichoeres hartzfeldii (Bleeker, 1852)
det. M. Gomon. BMNH 1984.1.1.84 (TGT935) 08° 30'S., 116° 42'E. Area B.

Halichoeres margaritaceus (Valenciennes, 1839)
det. J. Randall. LPPL JIF120 (TGT3063) 08° 43'S., 115° 16'E. Area B.

Halichoeres nebulosus (Valenciennes, 1839)
det. J. Randall. NTM S.10734-010 (TGT1219) 08° 10'S., 114° 54'E. Area B.

Hemigymnus melapterus (Bloch, 1791)
det. M. Gomon on photo. LPPL JIF121 (TGT1551) 08° 22'S., 117° 15'E. Area B.

Hologymnotus rhodonotus Randall & Yamakawa, 1988
det. J. Randall on photo. Specimen lost (TGT979) 08° 30'S., 116° 42'E. Area B.

Labroides dimidiatus (Valenciennes, 1839)
det. B.C. Russell. NTM S.10736-001 (TGT1757) 08° 34'S., 116° 47'E. Areas A, B.

Leptojulis cyanopleura (Bleeker, 1851)
det. J. Randall. AMS 1.22806-019 19° 29'S., 118° 22'E. Areas B, C.

Novaculichthys taeniourus (Lacepède, 1801)
det. J. Randall on photo. NTM S.10748-017 (TGT1003) 08° 43'S., 115° 16'E. Area B. This specimen is a juvenile.

***Paracheilinus carpenteri** Randall & Lubbock, 1981
No figure voucher. J. Randall determined our specimen (BMNH 1984.1.1.85 (TGT968) from 08° 30'S., 116° 42'E.). Area B. *Diagnosis*: D IX, 11. A III, 9. P 13-14. L. lat. 14-17 + 4-6. GR. 14-17. Mouth small, 3 pair of canine teeth anteriorly in upper jaw, one pair anteriorly in lower jaw. 2 to 4 rays of dorsal fin produced (in adults); caudal fin rounded. Lateral line interrupted. Body orange-pink, white below; 4 or 5 violet broken longitudinal stripes over head and body, 2 stripes under pectoral fin; fins orange and pink with blue bands.

Pseudodax moluccanus (Valenciennes, 1840)
det. G.R. Allen. BMNH 1984.1.1.86 (TGT (PJPW) 341) 01° 47'S, 98° 51'E. Area A.

Pteragogus flagellifer (Valenciennes, 1839)
det. J. Randall. BMNH 1984.1.1.87 (TGT975) 08° 30'S., 116° 42'E. Area B. (Fins damaged in our specimen).

Stethojulis interrupta (Bleeker, 1851)
det. J. Randall. LPPL JIF122 (TGT3061) 08° 43'S., 115° 16'E. Area B.

***Suezichthys soelae** Russell, 1985
No figure voucher. Our specimen determined by B.C. Russell (e.g. CSIRO CA2920 from 19° 55'S., 116° 28'E.). Area C. *Diagnosis*: D IX, 11. A III, 10. Tr. above 1½. Lateral line continuous and with less than 30 large scales. Head scaly except for snout, chin and preopercular flange. Two to three rows of cheek scales behind eye and 3 rows below eye. Preoperculum edge smooth; gill membranes free from isthmus. Lips moderately fleshy; teeth conical, 2 pair of large canines at front of upper jaw, a strong canine at angle of mouth. Body depth 4.3-5.1 in SL. A distinct brown band from middle of upper lip to front margin of eye; 7 pale bars across back; black spot on membrane between first 2 dorsal spines and 4-6 black spots on upper part of caudal fin.

Choerodon typus (Bleeker, 1856)
det. PK. NTM S.11016-004 (TGT2473) 00° 04'S., 99° 01'E. Areas A, C.

Iniistius dea (Temminck & Schlegel, 1845)
det. PK. CSIRO CA2145 19° 14'S., 118° 48'E. Areas B, C.

Iniistius opalus Fukui, 2018
det. Y. Fukui & PK. Specimen lost. 19° 47'S., 116° 33'E. (Conspecific material determined by CSIRO is CSIRO CA2974 from 19° 31'S., 118° 34'E.). Area C. Holotype.

Iniistius pavo (Valenciennes, 1840)
det. B.C. Russell. NTM S.10745-002 (TGT1888) 08° 24'S., 117° 52'E. Areas A, B.

Iniistius pentadactylus (Linnaeus, 1758)
det. J. Randall on photo. LPPL JIF123 (TGT1592) 08° 06'S., 115° 16'E. Area B.

SCARIDAE

Calotomus spinidens (Quoy & Gaimard, 1824)
det. J. Randall. NTM S.10734-007 (TGT1217) 08° 10'S., 114° 54'E. Area B. J. Randall (pers comm.) observed that our specimens differ from the recognised form of *C. spinidens* at least in having black spots in the region of the pectoral fin.

Leptoscarus vaigiensis (Quoy & Gaimard, 1824)
det. J. Randall. LPPL JIF124 (TGT3008) 08° 43'S., 115° 16'E. Area B.

Scarus rivulatus Valenciennes, 1840
det. TGT. LPPL JIF125 (TGT923) 08° 30'S., 116° 42'E. Area B.

Scarus ghobban Fabricius, 1775
det. CSIRO. Specimen lost. 12° 52'S., 125° 39'E. Areas A, B, C.

OPISTOGNATHIDAE

Opistognathus castelnaui Bleeker, 1859
det. W. Smith-Vaniz. NTM S.10762-001 (TGT1022) 08° 49'S., 115° 15'E. Area B.

Opistognathus latitabundus (Whitley, 1937)
det. W. Smith-Vaniz. AMS I. 21842-005. 10° 35'5., 133° 45'E. Area C.

CHAMPSODONTIDAE

Champsodon nudivittis (Ogilby,1895)
det. PK, based on Nemeth, 1994. NTM S.10824-004 (TGT2376) 01° 59'5., 99° 26'E. Areas A, B.

Champsodon atridorsalis Ochiai & Nakamura, 1964
det. PK, based on Nemeth, 1994. BMNH 1984.1.1.90 (TGT (PJPW) 781 in part) 09° 32'5., 114° 30'E. Areas A, B.

Champsodon vorax Günther, 1867
det. PK, based on Nemeth, 1994. BMNH 1984.4.11.10 (TGT (PJPW) 363) 03° 51'S., 101° 55'E. Area A.

Champsodon longipinnis Matsubara & Amaoka, 1964
det. PK. NTM S.11032-001 (TGT2577) 09° 01'S., 109° 11'E. Areas A, B, C.

*CHIASMODONTIDAE

Moderate-sized, elongate fishes. Premaxilla and maxilla elongate and slender, firmly fused distally, extending well past posterior eye margin; head rough and pitted by sensory pores. Teeth long, on jaws and palatines; mouth and stomach very distensible. Two separate dorsal fins, first short with VII-XIII flexible spines, second long with 18-29 segmented rays; anal fin long with I spine and 17-29 segmented rays. Body in adults naked or covered with prickles, covered with spinoid scales in juveniles. Some genera have photophores; caudal fin forked.

Four genera in the family; two species of one genus were obtained on the Survey.

*** Pseudoscopelus sagamianus** Tanaka, 1908
No figure voucher. det. PK based on Melo, 2010. BMNH 1984.1.1.93 (TGT (PJPW) 809) from 09° 43'5., 114° 15'E. and BMNH 1984.1.1.94 (PJPW 177) from 09° 33'S., 114° 37'E. Area A. *Diagnosis*: palatine teeth arranged in 2 or 3 series, rows of small mucous pores on head and belly appearing as dark streaks, snout short and rounded, and mouth cavity and gill arches entirely dark. D. VIII, 22-25. A. 20-25.

***Pseudoscopelus sp.**
No figure voucher. Our material determined by T. Uyeno. (BMNH 1984.1.1.92 (PWPW2033) from 09° 43'S., 114° 15'E.). Area B. These are juvenile specimens.

BEMBROPIDAE

Bembrops platyrhynchus (Alcock, 1894)
det. PK. AMS 1.22808-051 17° 59'S., 118° 17'E. Area C.

Bembrops curvatura Okada & Suzuki, 1952
det. PK & J.S. Nelson. NTM S.10740-004 (TGT1630) 09° 57'S., 116° 34'E. Area B.

Bembrops filiferus Gilbert, 1905
det. PK & J.S. Nelson. AMS 1.22808-001 17° 59'S., 118° 17'E. Areas B, C.

Bembrops philippinus Fowler, 1939
det. PK. NTM S.10998-002 (TGT2512) 01° 25'S., 100° 19'E. Area B.

Chrionema chlorotaenia McKay, 1971
det. PK & J.S. Nelson. NTM S.10760-009 (TGT1727) 09° 58'5., 116° 34'E. Areas B, C. Our material shows quite some overlap with *C. chryseres* Gilbert.

*HEMEROCOETIDAE

This family is split off from the BEMBROPIDAE, and contains eight genera including *Acanthaphritis*, *Spinapsaron* and *Squamicreedia* (see e.g., Nelson, 1982; www.fishbase.se). It is characterised by having a single spine on the operculum (2 in BEMBROPIDAE), upper and lower jaws equal in length (lower jaw longer in BEMBROPIDAE) and having 2 forward-directed spines on tip of snout. There are no keels on lateral line scales (scales keeled in BEMBROPIDAE).

***Acanthaphritis barbata** (Okamura & Kishida, 1963)
No figure voucher. Our material determined by PK & J.S. Nelson (e.g. NTM S.11070-001 from 19° 29'S., 115° 59'E.). Area C. *Diagnosis:* Posterior dorsal rays elongate; barbel at tip of upper jaw. Bright yellow band from operculum to upper tail base; branchiostegals bright yellow; spinous dorsal fin black, and yellow streak on caudal fin. D V, 20-21. A 24-26.

PINGUIPEDIDAE

Parapercis alboguttata (Günther, 1872)
det. PK. CSIRO CA1801 19° 54'S., 116° 02'E. Area C.

Ryukyupercis gushikeni (Yoshino, 1975)
det. PK & G. Stroud. AMS 1.22804-012 18° 57'S., 118° 12'E. Area C.

Parapercis muronis (Tanaka, 1918)
det. J. Johnson. AMS 1.22807-038 18° 32'S., 118° 17'E. Area C.

Parapercis striolata (Weber, 1913)
det. J. Johnson. CSIRO CA1441 10° 02'S., 130° 03'E. Areas A, C.

Parapercis nebulosa (Ouoy & Gaimard, 1825)
det. PK. Specimen lost. 19° 53'S., 118° 13'E. Area C.

Parapercis sexfasciata (Temminck & Schlegel, 1843)
No figure voucher. Our specimen determined by J. Gomon (BMNH 1984.1.1.88 (TGT (PJPW) 560) from 08° 03'S., 110° 05'E.). Area A. *P. lutevittata* Liao, Cheng & Shao ,2022, known from Japan, Taiwan and Indonesia, is very similar to this species.

Parapercis compressa Randall, 2008
det. J. Johnson. NTM S.10746-004 Holotype. (TGT1342) 08° 46'S., 118° 17'E. Area B.

***Parapercis rubricaudalis** Johnson & Motomura, 2017
No figure voucher. Our material determined by J. Johnson (e.g. CSIRO CA1772 from 19° 50'S., 116° 28'E. and CSIRO CA1791 from 20° 03'S., 115° 57'E.). Area C. *Diagnosis*: Posterior end of opercular ridge with two or three strong spines, margins of preopercle, subopercle and interopercle strongly serrated. Colouration of six broad irregular orange to reddish bands across body, and ventral fin and lower third of caudal fin crimson-red. D V; 21. A. I, 17. P 15-17. L. lat. 56-58.

URANOSCOPIDAE

A note about *Uranoscopus*: With support of experts we have tried to no avail to place the correct identities on the material caught in the Survey. Even recent literature on this family is conflicting with respect to characters used to define species, and maybe also growth-induced morphological changes.

Xenocephalus australiensis (Kishimoto, 1989)
det. PK. NTM S.10750-002 (TGT1450) 08° 56'S., 116° 24'E. Areas A, B.

Ichthyscopus fasciatus Haysom, 1957
det. PK. CSIRO CA1437 11° 04'S., 130° 36'E. Area C.

Ichthyscopus insperatus Mees, 1960
det. CSIRO. CSIRO CA1785 12° 17'S., 124° 04'E. Area C.

Uranoscopus bicinctus Temminck & Schlegel, 1843
det. H. Kishimoto on photo. CSIRO CA 1780 19° 37'S., 117° 49'E. Area C.

Uranoscopus cognatus Cantor, 1849
det. PK. CSIRO CA1567 13° 48'S., 124° 19'E. Areas A, B, C.

Uranoscopus kaianus Günther, 1880
det. H. Kishimoto on photo and notes. BMNH 1984.1.1.89 (TGT (PJPW) 324) 08° 02'S., 109° 03'E. Areas A, B, C. This is not the same species as Weber's (1913) and de Beaufort & Chapman's (1951) *U. kaianus.*

Uranoscopus sp. cf oligolepis Bleeker, 1878
No figure voucher. Our specimen (NTM S.11013-003 (TGT1788) from 08° 40'S., 116° 37'E.) determined by PK & TGT. Area B.

Uranoscopus sp. cf brunneus Fricke, 2018
det. PK & TGT. IORD 83-408 (TGT2583) 07° 58'S., 109° 20'E. Conspecific Survey material is IORD 83-56. Areas A, B.

Uranoscopus sp. cf japonicus Houttuyn , 1782
det. PK. CSIRO CA1779 12° 52'S., 125° 38'E. Area C. This species is characterised by the white spots over upper head and nape.

Uranoscopus sp. cf affinis Cuvier, 1829
det. PK. CSIRO CA2710 10° 50'S., 131° 07'E. Area C.

Uranoscopus sp. cf arafurensis Prokofiev, 2020
det. R. Fricke. AMS 1.22821-03418° 10'S., 118° 18'E. Area C.

Uranoscopus sp. cf kishimotoi Fricke, 2018
det. R. Fricke. IORD 83-54 (TGT3219) 09° 01'$., 116° 18'E. Area B.

***Uranoscopus sp.**
No figure voucher. Our specimen near Lombok Island. (IORD 83-55 (no field number) 08° 56'S.,116°24'E.) Area B. This species is very similar to *U. japonicus* Houttuyn but differs from it in having a larger tube on posterior nostril, embedded scales on nape and fewer vertebrae. *Diagnosis*: Upper head, back and upper sides variegated with dark brown lines, pale and dark blotches. First dorsal fin base white, rest of fin black. Humeral spine strong, exposed. Flap of tissue along inside of lower jaw broad and slightly rounded (with a large broad irregular filament in juveniles). Nape naked; spines on lower border of preoperculum; 8-10th pectoral fin rays longest, hind fin border emarginate above them. One pair of prepelvic spines plus anterior buckler. D IV; 13-14. A 14. P 18. Scale rows about 55 between head and tail base.

BLENNIIDAE

Xiphasia setifer Swainson, 1839
det. PK on photo. CSIRO CA2282 15° 16'S., 139° 00'E. Areas A, C. (Note: A second species *X. matsubarai* Okada & Suzuki, may occur in the area).

AMMODYTIDAE

Bleekeria viridianguilla (Fowler, 1931)
det. PK. CSIRO B. 3861 19° 05'S., 120° 31'E. (Conspecific material determined by PK: NTM S.10744-009 (TGT950) from 08° 30'S., 116° 42'E.) Areas B, C.

Bleekeria mitsukurii (Jordan & Evermann, 1902)
det. PK. NTM S. 10744-007 (TGT949) 08° 30'S:, 116° 42'E. Areas B, C.

GOBIIDAE

Oxyurichthys ophthalmonema (Bleeker, 1856)
det. H. Larson. NTM S.10733-002 (TGT1076) 08° 46'S., 115° 10'E. Area B.

Obliquogobius yamadai Shibukawa & Aonuma, 2007
det. H. Larson. NTM S.10998-001 (TGT2528) 01° 25'S., 100° 19'E. Area A. Paratype?

ACANTHURIDAE

Acanthurus bariene Lesson, 1831
det. J. Randall on photo. Specimen lost (no field number). Area A. Est. 300 mm SL when caught.

Acanthurus mata (Cuvier, 1829)
det. TGT. LPPL JIF126 (TGT2371) 01° 59'S., 99° 26'E. Areas A, B.

Acanthurus dussumieri Valenciennes, 1835
det. PK on photo. Specimen lost. (TGT1161) 08° 28'S., 119° 08'E. Areas A, B.

Acanthurus grammoptilus Richardson, 1843
det. J. Randall. CSIRO CA1410 20° 12'S., 115° 19'E. Area C.

Acanthurus lineatus (Linnaeus, 1758)
det. TGT. LPPL JIF127 (PAN39) 08° 31'S., 115° 32'E. Area B.

Acanthurus blochii Valenciennes, 1835
det. J. Randall. LPPL JIF128 (TGT907) 08° 43'S., 115° 16'E. Area B.

Acanthurus olivaceus Bloch & Schneider, 1801
det. TGT. LPPL JIF129 (TGT1361) 08° 46'S., 115° 02'E. Area B.

Acanthurus tennentii Günther, 1861
det. J. Randall on photo. Specimen lost (no field number). Area A.

Acanthurus xanthopterus Valenciennes, 1835
det. J. Randall on photo. LPPL JIF210 (TGT1034) 08° 10'S., 114° 54'E. Areas A, B.

Naso thynnoides (Cuvier, 1829)
det. TGT. Specimen lost (no field number). Areas A, B.

Naso brachycentron (Valenciennes, 1835)
det. TGT. LPPL JIF130 (TGT3175) 08° 58'S., 116° 31'E. Areas A, B.

Naso lituratus (Forster, 1801)
det. TGT. Specimen lost (no field number). Area A.

Naso lopezi Herre, 1927
det. PK on photo. Specimen lost. (TGT1406) 07° 55'S., 109° 42'E. Area A.

Naso mcdadei Johnson, 2002
det. TGT. LPPL JIF133 (TGT2343) 01° 59'S., 99° 26'E. Areas A, B, C.

Naso unicornis (Forsskål, 1775)
det. TGT. Specimen lost. (TGT3302) 10° 55'S., 122° 43'E. Areas A, B.

Naso reticulatus Randall, 2001
det. J. Randall. LPPL JIF132 (TGT2265) 06° 13'S., 104° 38'E. Areas A, B.

ZANCLIDAE

Zanclus cornutus (Linnaeus, 1758)
det. PK. LPPL JIF134 (TGT1098) 08° 46'S., 115° 10'E. Areas B, C.

SIGANIDAE

Siganus argenteus (Quoy & Gaimard, 1825)
No figure voucher. Photo of 140 mm SL specimen from Mauritius (AMS 1.22388) supplied by D.J. Woodland who determined our specimen (BMNH 1984.1.1.95 (TGT(PJPW)333) from 03 °47'S., 101 °54'E.). Area A.

Siganus canaliculatus (Park, 1797)
det. TGT. LPPL JIF135 (TGT2501) 00° 19'S., 99° 38'E. Areas A, B.

Siganus corallinus (Valenciennes, 1835)
det. D.J. Woodland. LPPL JIF136 (TGT1438) 08° 56'S., 116° 24'E. Areas A, B.

Siganus fuscescens (Houttuyn, 1782)
det. D.J. Woodland. Specimen lost (no field number). (Conspecific Survey material determined by CSIRO is CSIRO CA1406 from 20° 03'S., 116° 21'E.). Area C.

Siganus guttatus (Bloch, 1787)
det. D.J. Woodland. LPPL JIF137 (TGT1018) 08° 45'S., 115° 17'E. Area B.

Siganus punctatus (Schneider & Forster, 1801)
det. TGT & D.J. Woodland. LPPL JIF138 (TGT1430) 08° 56'S., 116° 24'E. Areas B, C.

Siganus spinus (Linnaeus, 1758)
det. D.J. Woodland. NTM S.11044-001 (TGT1201) 08° 45'S., 115° 17'E. Area B.

Siganus virgatus (Valenciennes, 1835)
det. D.J. Woodland. NTM S.10750-004 (TGT 1431) 08° 56'S., 116° 24'E. Area A.

GEMPYLIDAE

Gempylus serpens Cuvier, 1829
det. TGT & PK. NTM S.11118-001 (no field number) 08° 23'S., 109° 19'E. Area B. Drawing of preserved specimen.

Lepidocybium flavobrunneum (Smith, 1843)
det. TGT. LPPL JIF171 (BZ12) 06° 10'S., 104° 38'E. Area A.

Neoepinnula orientalis (Gilchrist & von Bonde, 1924)
det. J.B. Hutchins. WAM P.26261-001 15° 15'S., 121° 29'E. Areas A, B, C.

Promethichthys prometheus (Cuvier, 1832)
det. PK. LPPL JIF206 (TGT1784) 08° 57'S., 116° 08'E. Area B.

Rexea prometheoides (Bleeker, 1856)
No figure voucher. Photo supplied by I. Nakamura, who identified our material (e.g. BMNH 1984.1.1.96 (TGT PJPW) 776) from 03° 88'S., 101° 95'E.). (Conspecific material NTM S.10752-013 (TGT3211A). Areas A, B, C.

*** Rexea nakamurai** Parin, 1989
No figure voucher. det. N. Parin. NTM S.11039-002 (TGT1456) from 03º 88'S., 101º 95' E. Area A. *Diagnosis*: Body iridescent greyish brown, silvery grey below. Black patch over membrane between first 2 dorsal spines, fin margin black. Body moderately long, its depth about 6 in SL; naked except for rectangular patch of scales from below middle of soft dorsal fin to caudal peduncle. Two distinct lateral lines, upper from operculum along dorsal profile ending below posterior ⅓ of soft dorsal fin, lower line branching off upper line below 5th to 6th dorsal spine, running along lower sides. Base of first dorsal fin 2.2-2.6 longer than base of second dorsal fin+finlets. Ventral fin present as short spine (no rays) in young, absent in adults; 2 small finlets present behind each unpaired fin.
D XVIII; I, 15-18 + 2. A I, 12-13 + 2. (voucher: 120 mm SL)

Thyrsitoides marleyi Fowler, 1929
det. PK & TGT. LPPL JIF172 (no field number). Areas A, B.

TRICHIURIDAE

Benthodesmus vityazi Parin & Becker, 1970
det. PK. AMS 1.22810-027 18° 40'S., 116° 30'E. Area C.

Tentoriceps cristatus (Klunzinger, 1884)
det. PK. NTM S.11034-001 (TGT2334) 02° 42'S., 99° 56'E. Areas A, B, C.

Trichiurus lepturus Linnaeus, 1758
det. PK. NTM S.11005-005 (TGT2214) 06° 20'S., 109° 10'E. Areas A, B, C.

SCOMBRIDAE

Gymnosarda unicolor (Rüppell, 1836)
det. B.B. Collette on photo. Specimen lost (no field number). Area A.

Rastrelliger brachysoma (Bleeker, 1851)
det. TGT. LPPL JIF141 (TGT2497) 00° 19'S., 99° 38'E. Areas A, B.

Rastrelliger kanagurta (Cuvier, 1816)
det. TGT. LPPL JIF142 (TGT2116) 08° 46'S., 115° 10'E. Areas A, B, C.

Sarda orientalis (Temminck & Schlegel, 1844)
det. B.B. Collette on photo. Specimen lost (no field number). Area A. 288 mm SL when caught.

Scomber australasicus Cuvier, 1832
det. B.B. Collette. LPPL JIF143 (TGT3322) 10° 05'S., 119° 50'E. Areas A, B.

Scomberomorus commerson (Lacepède, 1800)
det. PK. Specimen lost. 03° 45'S., 101° 55'E. Areas A, B, C.

Scomberomorus guttatus (Bloch & Schneider, 1801)
det. B.B. Collette on photo. Specimen lost (no field number). Area A.

Scomberomorus munroi Collette & Russo, 1980
det. PK. CSIRO CA1251 13° 16'S., 128° 21'E. Area C.

Scomberomorus queenslandicus Munro, 1943
det. PK. CSIRO CA2196 13° 42'S., 125° 45'E. Area C.

CENTROLOPHIDAE

Psenopsis humerosus Munro, 1958
det. C. Karrer on photo, specimen lost 10° 02'S., 130° 03'E. Area C.

Psenopsis obscura Haedrich, 1967
No figure voucher. C. Karrer has determined our material (BMNH 1984.1.1.98 and 1984.1.1.97 (PJPW21 and 124) from 08° 40'S., 115° 08'E.). Area A.

Psenopsis sp.
Specimen lost (TGT1686) 08° 32'S., 115° 53'E. Areas A, B. Although this was the most common *Psenopsis* obtained during the Survey we were unable to determine its full identity. Parin & Piotrovsky (2004: 41) wondered if it could be *P. shojimai* Ochiai & Mori, 1965, which is known from Malaysia, Vietnam and Japan.

NOMEIDAE

*** Cubiceps baxteri** McCulloch, 1923
No figure voucher. Our specimen determined tentatively by PK (CSIRO CA1982 from 19° 44'S., 117° 16'E.). Area C. *Diagnosis*: Predorsal scales extending onto snout, all of same size. Single rows of teeth on tongue, palate and vomer. Snout rounded, jaws terminal, predorsal profile gently convex. Body depth 25% SL. D X, I, 21-22. A III, 19-22. P 21.

Cubiceps pauciradiatus Günther, 1872
det PK. NTM S.11117-001 (no field number) Area A. Drawing of preserved specimen. Conspecific material from Saleh Bay (08° 22'S., 117° 41'E., CSIRO H.5972-34, Area B) determined by C. Karrer. Drawing of preserved specimen.

Cubiceps whiteleggii (Waite, 1894)
det. PK. NTM S.10998-013 (TGT2515) 01° 25'S., 100° 19'E. Areas A, B. Conspecific material determined by C. Karrer (e.g. NTM S.10769-001, Bali Strait, 08° 37'S., 114° 38'E. Area A).

Psenes arafurensis Günther, 1889
No figure voucher. Our material determined by C. Karrer (e.g. BMNH 1984.1.1.99 (PJPW 199A) from 08° 49'S., 114° 17'E.). Areas A, B, C.

Psenes pellucidus Lutken, 1880
No figure voucher. Our specimen (BMNH 1984.1.1.100 (PJPW2030) from 08° 49'S., 114° 17'E.) determined by C. Karrer. Area A.

Psenes sp. cf cyanophrys Valenciennes, 1833
det. C. Karrer. BMNH 1984.1.1.101 (PJPW13) 08° 40'S., 115° 08'E. Area A. *Psenes cyanophrys* Cuvier is a deep-bodied species found extensively in the northern Indian Ocean, and extending into northern Australia (Parin & Piotrovsky, 2004).

ARIOMMATIDAE

Ariomma brevimanus Klunzinger, 1884
det. TGT & PK. NTM S.10761-004 (TGT3156) 08° 27'S., 117° 47'E. Areas A, B. Conspecific material in the BMNH from our Survey have been determined by C. Karrer (e.g. BMNH 1984.1.1.116 (TGT (PJPW) 302)).

Ariomma indica (Day, 1871)
det. TGT. NTM S.10733-018 (TGT2115) 08° 46'S., 115° 10'E. Areas A, B, C.

Ariomma parini Piotrovsky, 1987
det. PK. ZMH 4/84 10° 02'S., 130° 03'E. Area C.

STROMATEIDAE

Pampus argenteus (Euphrasen, 1788)
det. R.L. Haedrich. BMNH 1984.1.2.5 (TGT (PJPW) 754) 07° 55'S., 109° 42'E. Area A.

Pampus sp cf candidus Cuvier, 1833
det. TGT. LPPL JIF144 (TGT2220) 06° 13'15"S., 105° 44'E. Area A. This is the usual '*Pampus*' obtained in the Survey area.

CALLIONYMIDAE

Callionymus meridionalis Suwardji, 1965
det. R. Fricke. BMNH 1982.8.11 :1-2 (TGT1800) 08° 40'S., 116° 37'E. Area B.

Callionymus moretonensis Johnson, 1971
det. R. Fricke. CSIRO CA3532 13° 18'S., 128° 21'E. Area C.

Callionymus semeiophor Fricke, 1983
det. R. Fricke. NTM S.10764-001 (TGT3044) 08° 30'S., 117° 58'E. Area B. Paratype.

*** Callionymus sublaevis** McCulloch, 1926
No figure voucher. Survey material determined by CSIRO, (e.g. CSIRO CA3070 from 18° 48'S., 118° 16'E.) Area C. *Diagnosis*: D IV; 9½. A 9½. P (total) 19-20. Preopercular spine with tip bent inwards, one or 2 strong curved serrae on inner margin and an antrorse spine near base on outer margin. Only first upper pectoral ray undivided; first dorsal begins well behind gill opening; upper surface of head entirely smooth and covered by skin.

Callionymus superbus Fricke, 1983
det. R. Fricke. SMNS 8561 (TGT1220) 08° 10'S., 114° 54'E. Area B.

Callionymus whiteheadi Fricke, 1981
No figure voucher. Our material determined by R. Fricke (e.g. BMNH1980.11.25:2 (TGT (PJPW) 460) from 08° 43'S., 115° 07'E.). Area A.

*** Callionymus belcheri belcheri** Richardson, 1844
No figure voucher. Our material determined by PK. e.g. CSIRO CA2141 from 19° 44'S., 116° 02'E. Area C. *Diagnosis*: D IV; 9 ½. A 9 ½. P (total) 18-20. Large preopercular spine with nearly straight tip turned slightly outwards and 7 to 11 strong serrae along inner margin which increase in size proximally and a basal antrose spine on outer margin. Only first upper pectoral ray undivided; first dorsal fin origin well behind gill opening; no membrane behind 4th spine in first dorsal fin; caudal fin much shorter than body length. Two to 5 characteristic brown spots on sides immediately below lateral line from pectoral fin tip to tail base.

Callionymus filamentosus Valenciennes, 1837
det. R. Fricke. SMNS 8501 (TGT1578) 08° 06'S., 115° 16'E. Areas A, B.

Callionymus goodladi (Whitley, 1944)
det. T. Nakabo on photo. Specimen lost. 20° 30'S., 115° 36'E. (Conspecific Survey material determined by CSIRO, e.g. CSIRO CA1477 from 21° 00'S., 115° 40'E.). Area C.

Callionymus grossi Ogilby, 1910
det. T. Nakabo on photo. Specimen lost. 20° 58'S., 115° 55'E. (Conspecific Survey material determined by CSIRO, e.g. CSIRO CA2132 from 21° 00'S., 115° 46'E.). Area C.

Callionymus japonicus Houttuyn, 1782
det. R. Fricke. SMNS 8538 (TGT2607) 08° 33'S., 114° 31'E. Area A.

*** Callionymus limiceps** Ogilby, 1908
No figure voucher. Survey material determined by PK from 11° 55'S., 131° 36'E. (Conspecific Survey material, CSIRO CA1364 from 17° 25'S., 121° 50'E., determined by CSIRO). Area C. *Diagnosis.* D IV; 9½. A 9½. P (total) 18-20. Preopercular spine with tip bent inwards, one to 2 strong curved serrae on inner margin and an antrorse spine near base on outer margin. Only first upper pectoral ray undivided, first dorsal fin origin well behind gill opening; all rays of first dorsal fin elongate in males, short in females; upper surface of head rugose.

Callionymus australis Fricke, 1983
det. R. Fricke. Specimen lost. 19° 55'S., 116° 00'E. (Conspecific Survey material is CSIRO CA2142 from 20° 03'S., 115° 57'E.). Area C.

Dactylopus dactylopus (Valenciennes, 1837)
det. PK. CSIRO CA2129 19° 37'S., 117° 49'E. Area C.

Synchiropus altivelis (Temminck & Schlegel, 1845)
det. R. Fricke. AMS I. 22828-011 19° 01'S., 117° 12'E. Areas A, C.

Synchiropus rameus (McCulloch, 1926)
det. R. Fricke. CSIRO CA2788 13° 02'S., 125° 07'E. Area C.

DRACONETTIDAE

Centrodraco rubellus Fricke, Chave & Suzumoto 1992
det. R. Fricke. SMNS 8525 (TGT1709) 08° 58'S., 116° 34'E. Area B. Paratype.

***Centrodraco insolitus** (McKay, 1971)
No figure voucher; material det. by R. Fricke. e.g. WAM P.25394-011, Rowley Shoals. Diagnosis: D spines stout, first spine longer than 2nd spine; dorsal rays filamentous in males; first dorsal pale and body plain; vertical dark lines on 2nd dorsal fin membrane; no dark streaks on upper caudal fin. D III, 13-14. A 13-14. P 20. Area C.

PSETTODIDAE

Psettodes erumei (Bloch & Schneider, 1801)
det. TGT. LPPL JIF145 (TGT2417) 00° 51'N., 97° 58'E. Areas A, B, C.

CITHARIDAE

Brachypleura novaezeelandiae Günther, 1862
det. PK. CSIRO CA1575 12° 34'S., 128° 27'E. Area C.

PARALICHTHYIDAE

Pseudorhombus argus Weber, 1913
det. G. Leyland. CSIRO CA2907 20° 29'S., 116° 10'E. Area C.

Pseudorhombus arsius (Hamilton, 1822)
det. CSIRO. CSIRO CA2898 14° 08'S., 128° 34'E. Areas B, C.

Pseudorhombus diplospilus Norman, 1926
det. CSIRO. CSIRO CA3074 20° 05'S., 118° 02'E. Area C.

Pseudorhombus dupliciocellatus Regan, 1905
det. PK. LPPL JIF146 (TGT3222) 09° 01'S., 116° 18'E. Areas A, B, C.

Pseudorhombus elevatus Ogilby, 1912
det. PK. CSIRO CA2103 13° 38'S., 124° 30'E. Areas B, C.

Pseudorhombus javanicus (Bleeker, 1853)
det. D.A. Hensley. NTM S.11043-001 (TGT2152) 08° 46'S., 115° 10'E. Areas A, B.

Pseudorhombus jenynsii (Bleeker, 1855)
det. G. Leyland. CSIRO CA3008 20° 11'S., 117° 23'E. Area C.

Pseudorhombus malayanus Bleeker, 1865
det. D.A. Hensley. NTM S.11028-001 (TGT2586) 07° 58'S., 109° 20'E. Area A.

Pseudorhombus neglectus Bleeker, 1865
No figure voucher. Our specimen determined by K. Amaoka on photo (BMNH 1984.1.1.105, no field number). Area A.

Pseudorhombus quinquocellatus Weber & de Beaufort, 1929
det. I.S.R. Munro. CSIRO CA2075 19° 44'S., 116° 28'E. Area C.

Pseudorhombus spinosus McCulloch, 1914
det. PK. CSIRO CA2098 13° 29'S., 129° 01'E. Area C.

Pseudorhombus triocellatus (Bloch & Schneider, 1801)
det. K. Amaoka. BMNH 1984.1.1.107 (TGT (PJPW) 750) 08° 36'S., 115° 00'E. Area A.

Pseudorhombus megalops Fowler, 1934
det. K. Amaoka & D.A. Hensley. CSIRO CA2526 09° 29'S., 132° 00'E. Areas A, B, C.

BOTHIDAE

Arnoglossus dalgleishi (von Bonde, 1922)
det. K. Amaoka. BMNH 1984.1.1.103 (PJPW 28) 08° 48'S., 114° 29'E. Area A.

Arnoglossus debilis (Gilbert, 1905)
det. D.A. Hensley. NTM S.10760-007 (TGT1745) 08° 58'S., 116° 34'E. Area B.

Arnoglossus elongatus Weber, 1913
No figure voucher. Our material determined by K. Amaoka & D.A. Hensley (e.g. CSIRO CA2529 from 17° 49'S., 120° 18'E.). Area C.

Arnoglossus japonicus Hubbs, 1915
No figure voucher. Our material determined by K. Amaoka (e.g. CSIRO CA2532 from 19° 29'S., 115° 59'E.). Area C.

Arnoglossus polyspilus (Günther, 1880)
No figure voucher. Our material determined by D.A. Hensley (e.g. AMS 1.22807-026 (in part) from 18° 32'S., 118° 17'E.). Area C.

Arnoglossus waitei Norman, 1926
det. D.A. Hensley. CSIRO CA2531 13° 18'S., 128° 21'E. Area C.

Asterorhombus intermedius (Bleeker, 1865)
det. PK. CSIRO CA1484 20° 56'S., 115° 40'E. Area C.

Bothus myriaster (Temminck & Schlegel, 1846)
det. K. Amaoka. BMNH 1984.1.1.104 (TGT (PJPW) 694) 08° 26'S., 114° 29'E. Area A.

Bothus pantherinus (Rüppell, 1830)
det. PK. NTM S.10733-013 (TGT1100) 08° 46'S., 115° 10'E. Area B.

Chascanopsetta lugubris Alcock, 1894
det. K. Amaoka. BMNH 1984.1.1.106 (no field number). Area A.

Crossorhombus azureus (Alcock, 1889)
det. D.A. Hensley. AMS 1.22806-020 19° 30'S., 118° 18'E. Area C.

Engyprosopon grandisquama (Temminck & Schlegel, 1846)
det. PK. CSIRO CA3066 20° 39'S., 115° 58'E. Areas A, C.

Engyprosopon maldivense (Regan, 1908)
No figure voucher. Our material determined by D.A. Hensley (e.g. CSIRO CA2527 from 13° 06'S., 125° 03'E.).

Engyprosopon latifrons (Regan, 1908)
det. PK. CSIRO B.2178 20° 03'S., 115° 57'E. Area C.

Engyprosopon osculus (Amaoka & Arai, 1998)
det. D.A. Hensley. CSIRO CA2530 20° 39'S., 116° 45'E. Area C.

Grammatobothus pennatus (Ogilby, 1913)
No figure voucher. Specimens determined by PK (e.g. CSIRO B.2988 from 20° 03'S., 115° 57'E.). Area C.

Grammatobothus polyophthalmus (Bleeker, 1865)
det. PK. CSIRO CA1519 14° 01'S., 125° 34'E. Area C.

Kamoharaia megastoma (Kamohara, 1936)
det. CSIRO. Specimen lost (no field number) (Conspecific material AMS 1.22828-005 from 19° 04'S., 117° 05'E.). Area C.

Laeops guentheri Alcock, 1890
No figure voucher. Our material determined by D.A. Hensley (e.g. NTM S.10751-003 (TGT1674) from 08° 30'S., 117° 46'E.). Area B.

Laeops parviceps Günther, 1880
det. K. Amaoka. CSIRO CA2528 13° 16'S., 128° 21'E. Area C.

Neolaeops microphthalmus (von Bonde, 1922)
det. D.A. Hensley. NTM S.10998-004 (TGT2526) 01° 25'S., 100° 19'E. Area A. Our specimen came from a depth of 225-236m.

Parabothus kiensis (Tanaka, 1918)
det. D.A. Hensley. AMS 1.22807-026 (in part) 18° 32'S., 118° 17'E. Area C. Several specimens, others determined by K. Amaoka).

Psettina gigantea Amaoka, 1963
No figure voucher. Our specimens, determined by K. Amaoka & D.A. Hensley (e.g. CSIRO CA2533 19° 29'S., 115° 59'E.). Area C.

Psettina iijimae (Jordan & Starks, 1904)
No figure voucher. Our material determined by PK (e.g. CSIRO B.2989 from 20° 03'S., 115° 57'E.). Area C.

POECILOPSETTIDAE

Poecilopsetta colorata Günther, 1880
det. PK. NTM S.10760-008 (TGT1746) 08° 58'S., 116° 34'E. Area B.

Poecilopsetta praelonga Alcock, 1894
No figure voucher. Our material determined by K. Sakamoto (e.g. NTM S.10742-001 (no field number); also WAM P.26208-021 from 18° 22'S., 118° 03'E.). Areas A, B, C.

RHOMBOSOLEIDAE

Psammodiscus ocellata (Günther, 1880)
det. M. Arai. CSIRO CA1581 20° 53'S., 115° 48'E. Area C.

SAMARIDAE

Samaris cristatus Gray, 1831
det. K. Sakamoto. Specimen lost (no field number) (Conspecific Survey material determined by PK is WAM P.26200-007 from 19° 50'S., 117° 15'E.). Areas B, C.

Samariscus huysmani Weber, 1913
det. S. C. Shen. BMNH 1984.1.1.108 (PJPW27) 08° 50'S., 114° 14'E. Area A.

SOLEIDAE

Aesopia cornuta Kaup, 1858
(A) det. PK. CSIRO CA2097 13° 16'S., 128° 21'E. (B) det. G. Leyland CSIRO CA1494 from 18° 34'S., 119° 53'E. Areas A, C. Note: Our single specimen (B) was paler in colour, had fewer body bars (11-12) and fewer fin rays D I + 65. A 51.

Aseraggodes cyaneus (Alcock, 1890)
det. PK & L.-C. Shen. NTM S.10745-005 (TGT1889) 08° 30'S., 117° 46'E. Area B.

Dexillus muelleri (Steindachner, 1879)
det. CSIRO. CSIRO CA2102 11° 52'S., 136° 10'E. Area C.

Pardachirus pavoninus (Lacepede, 1802)
det. PK. LPPL JIF147 (TGT1030) 08° 43'S., 115° 16'E. Areas A, B, C.

*** Phyllichthys punctatus** McCulloch, 1916
This temperate water species, was occasionally obtained in the southern area of the Survey region (e.g. CSIRO CA1515). Area C. *Diagnosis:* Mouth slightly contorted; caudal fin joined to anal and dorsal fins; ventral fin on eyed side joined broadly to anal fin. Body and head on eyed side brown, densely marbled and spotted white or grey, fins brown.

Zebrias cancellatus (McCulloch, 1916)
det. PK. CSIRO CA1517 19° 38'S., 119° 31'E. Area C.

Brachirus annularis Fowler, 1934
det. AMS. AMS 1.22828-015 19° 01'S., 117° 12'E. Area C.

Zebrias craticulus (McCulloch, 1916)
det. PK. CSIRO CA1533 19° 14'S., 118° 48'E. Area C.

Zebrias quagga (Kaup, 1858)
det. PK. CSIRO CA1345 17° 25'S., 121° 50'E. Area C. This species was rarely obtained.

CYNOGLOSSIDAE

Cynoglossus abbreviatus (Gray, 1834)
No figure voucher. Our material (e.g. NTM S.11116-003 (TGT1927) from 01° 24'S., 100° 20'E.) determined by PK. Area A.

Cynoglossus arel (Bloch & Schneider, 1801)
det. PK. NTM S.11028-002 (TGT2585) 07° 58'S., 109° 20'E. Areas A, B.

Cynoglossus kopsii (Bleeker, 1851)
No figure voucher. Our material (CSIRO B.2987 from 20° 03'5., 115° 57'E.) determined by PK. Area C.

*** Cynoglossus macrophthalmus** Norman, 1926
No figure voucher. Our material (e.g. CSIRO CA2074 from 10° 50'S., 131° 07'E.) determined by PK. Area C. *Diagnosis*: Three lateral lines on eyed side; caudal with 10 rays; lateral line with 100 or more tubed scales; only one nostril on eyed side.

Paraplagusia longirostris Chapleau, Renaud & Kailola, 1991
det. PK. CSIRO CA2094 13° 18'S., 128° 21'E. Area C. Paratype.

*** Cynoglossus sp. cf ogilbyi** Norman, 1926
No figure voucher. CSIRO specimens CA2109 from 11 ° 53'5., 131 ° 15'E., determined by PK. Area C. *Diagnosis*: 8-9 caudal fin rays. No lateral line on blind side, 2 on eyed side. Scales ctenoid on eyed side, cycloid on blind side. Two nostrils on eyed side; corner of mouth nearer to snout tip than to gill opening. D 117-122. A 92-96. Tr. 9-10. L. lat. 76-78. Eye 7-8.3 in HL; snout 3-3.3 in HL.

*** Cynoglossus sp. cf heterolepis** Weber, 1910
No figure voucher. Our material (e.g. CSIRO CA2718 from 09° 16'5., 135° 00'E.) determined by PK. Area C. *Diagnosis*: 10 caudal fin rays. No lateral line on blind side, 3 lateral lines on eyed side. Scales ctenoid on both sides of body. Second nostril on eyed side between eyes; corner of mouth much nearer to snout tip than to gill opening. D 112. A 88. Tr. above 12. L. lat. 72. Head and body dark brown or charcoal(eyed side), front of head and anterior dorsal fin rays white; fins black, edges white; gill cavity black.

Paraplagusia bilineata (Bloch, 1787)
det. PK. AMS 1.21943-019 11° 24'5., 134° 54'E. Area C.

TRIACANTHODIDAE

Atrophacanthus japonicus (Kamohara, 1941)
det. TGT. USNM 265190 (TGT2289) 05° 35'S., 102° 25'E. Area A.

Halimochirurgus centriscoides Alcock, 1899
det. J.C. Tyler. BMNH 1984.1.1.109 (TGT (PJPW) 470) 07° 55'5., 109° 42'E. Area A.

Macrorhamphosodes platycheilus Fowler, 1934
det. TGT. NTM S.10998-009 (TGT2516) 01° 25'S., 100° 19'E. Area A.

Triacanthodes ethiops Alcock, 1894
det. TGT. NTM S.10761-003 (TGT3143) 08° 27'S., 117° 47'E. Areas B, C.

Tydemania navigatoris Weber, 1913
det. J.C. Tyler. BMNH 1984.1.1.110 (TGT (PJPW) 515) 08° 02'5., 109° 03'E. Areas A, B.

TRIACANTHIDAE

Pseudotriacanthus strigilifer (Cantor, 1849)
det. TGT. LPPL JIF148 (TGT3334) 10° 18'5., 120° 22'1:. Areas A, B, C.

Triacanthus biaculeatus (Bloch, 1786)
det. CSIRO. CSIRO CA1267 12° 43'5., 130° 00'E. Areas B, C.

Triacanthus nieuhofii Bleeker, 1851
det. TGT. LPPL JIF149 (TGT2500) 00° 19'S., 99° 38'E. Areas A, B, C.

Trixiphichthys weberi (Chaudhuri, 1910)
det. TGT. LPPL JIF150 (TGT2547) 03° 07'S., 101° 20'E. Areas A, B, C.

BALISTIDAE

Abalistes stellatus (Anonymous, 1798)
det. TGT. LPPL JIF153 (TGT2286) 05° 07'S., 104° 39'E. Areas A, B, C. This species is sometimes called *A. stellaris* (Bloch & Schneider, 1801) (Parenti, 2021).

Balistapus undulatus (Park, 1797)
det. J.B. Hutchins on photo. LPPL JIF154 (TGT1036) 08° 10'S., 114° 54'E. Areas A, B.

Balistoides conspicillum (Bloch & Schneider, 1801)
det. TGT. Specimen lost. (TGT1349) 08° 31'S., 115° 32'E. Areas A, B, C.

Balistoides viridescens (Bloch & Schneider, 1801)
det. TGT. LPPL JIF157 (TGT2262) 05° 13'S., 104° 38'E. Areas A, B.

Canthidermis maculata (Bloch, 1786)
det. TGT. BPBM 29346 (TGT1489) 08° 57'S., 116° 26'E. Area B. This is a juvenile specimen.

Melichthys indicus Randall & Klausewitz, 1973
det. TGT. BPBM 29337 (TGT2407) 00° 35'N., 97° 55'E. Area A.

Odonus niger (Rüppell, 1836)
det. TGT. LPPL JIF155 (TGT2266) 06° 13'S., 104° 38'E. Areas A, B.

Pseudobalistes flavimarginatus (Rüppell, 1829)
det. TGT. Specimen lost. (TGT3290) 10° 55'S., 122° 43'E. Areas A, B.

Pseudobalistes fuscus (Bloch & Schneider, 1801)
det. TGT. LPPL JIF156 (TGT3240) 09° 01'S., 116° 18'E. Areas A, B, C.

Rhinecanthus aculeatus (Linnaeus., 1758)
det. TGT. LPPL JIF158 (TGT1014) 08° 43'S., 115° 16'E. Area B.

Sufflamen fraenatum (Latreille, 1804)
det. TGT. LPPL JIF159 (TGT2415) 00° 35'N., 97° 55'E. Areas A, B, C.

Xanthichthys caeruleolineatus Randall, Matsuura & Zama, 1978
det. TGT. BPBM 29340 (TGT (PJPW) 406) 06° 12'S., 104° 41'E. Area A.

Xanthichthys lineopunctatus (Hollard, 1854)
det. J.B. Hutchins. WAM P.26292-001 17° 20'S., 121° 04'E. Area C.

MONACANTHIDAE

Acreichthys tomentosus (Linnaeus, 1758)
det. J.B. Hutchins. WAM P.28199-001 (TGT1281) 08° 46'S., 115° 10'E. Area B.

Aluterus monoceros (Linnaeus, 1758)
det. TGT. LPPL JIF151 (TGT2261) 06° 13'S., 104° 38'45"E. Areas A, B, C.

Aluterus scriptus (Osbeck, 1765)
det. TGT. LPPL JIF152 (TGT3252) 09° 0l'S., 116° 18'E. Areas A, B.

Anacanthus barbatus Gray, 1830
det. PK. Specimen lost (no field number) (Conspecific material CSIRO CA1418, from 20° 16'S., 116° 02'E.). Areas A, C.

Cantherhines fronticinctus (Günther, 1867)
det. J.B. Hutchins. WAM P.28198-001 (TGT2336) 03° 24'S., 100° 33'E. Area A.

Cantherhines pardalis (Rüppell, 1837)
det. J.B. Hutchins. WAM P.25826-008 21° 42'S., 114° 17'E. Areas B, C.

Chaetodermis penicilligerus (Cuvier, 1816)
det. CSIRO. Specimen lost (no field number). Area C.

Eubalichthys caeruleoguttatus Hutchins, 1977
det. CSIRO. CSIRO CA1272 19° 16'S., 118° 02'E. Area C.

Monacanthus chinensis (Osbeck, 1765)
det. CSIRO. WAM P. 2700-001 19° 38'S., 119° 31'E. Area C.

***Paramonacanthus pusillus** (Rüppell, 1829)
No figure voucher. A single specimen from 20° 03'S., 115° 57'E. (WAM P.26565-001) determined by J.B. Hutchins. Area C. *Diagnosis:* D. I; 29. A. 28. Eye 3 in HL. Two rows of downwardly-directed spines on anterior face of dorsal spine; body scales with 4 or 5 spinules arising directly from basal plate; pelvic spine movable. Four dusky bands along body, dark checks below bases of dorsal and anal fins; 2 faint bands across caudal fin which sometimes upper lobe produced into a short filament; pelvic fin rudiment moveable.

Arotrolepis filicauda (Günther, 1880)
det. J.B. Hutchins. WAM P.26185-001 20° 52'S., 115° 10'E. Area C.

Paramonacanthus oblongus (Temminck & Schlegel 1850)
det. J.B. Hutchins. WAM P.26273-007 17° 15'S., 121° 38'E. Areas A, C. Body depth and colour pattern variable with size and sex.

Pseudalutarius nasicornis (Temminck & Schlegel, 1850)
det. TGT. BPBM 29345 (TGT1807) 08° 48'S., 116° 43'E. Areas A, B.

Pseudomonacanthus elongatus Fraser-Brunner, 1940
det. J.B. Hutchins. WAM P.26190-004 20° 35'S., 116° 15'E. Area C.

Pseudomonacanthus macrurus (Bleeker, 1856)
det. J.B. Hutchins on photo. BPBM 29344 (TGT961) 08° 30'S., 116° 42'E. Areas A, B.

Pseudomonacanthus peroni (Hollard, 1854)
det. CSIRO. CSIRO CA2203 20° 15'S., 115° 56'E. Areas B, C.

Thamnaconus hypargyreus (Cope, 1871)
det. J.B. Hutchins. WAM P. 26998-001 (no field number). (Conspecific Survey material determined by CSIRO: CSIRO CA3623 from 19° 52'S., 116° 39'E.). Area C.

Thamnaconus modestoides (Barnard, 1927)
det. J.B. Hutchins. WAM P.26265-002 17° 08'S., 121° 00'E. A rare species in Area C.

Thamnaconus striatus (Kotthaus, 1979)
det. J.B. Hutchins. WAM P.27001-001. 09° 52'S., 129° 12'E. (Conspecific Survey material determined by J.B. Hutchins: WAM P.26222-002 from 16° 50'S., 121° 01'E.). Areas B, C.

Thamnaconus tessellatus (Günther, 1880)
det. J.B. Hutchins. CSIRO CA2205 09° 52'S., 129° 12'E. Areas B, C.

OSTRACIIDAE

Lactoria cornuta (Linnaeus, 1758)
det. CSIRO. CSIRO CA2221 20° 08'S., 117° 03'E. Areas A, B, C.

Lactoria diaphana (Bloch & Schneider, 1801)
det. D. Clarke on photo. CSIRO CA2220 20° 10'S., 115° 15'E. Area C.

Lactoria fornasini (Bianconi, 1846)
det. PK and D. Clarke. NTM S.10744-008 (TGT981) 08° 30'S., 116° 42'E. Areas B, C.

Ostracion cubicum Linnaeus, 1758
det. K. Matsuura. LPPL JIF160 (TGT1002) 08° 43'S., 115° 16'E. Areas B, C.

Ostracion nasus Bloch, 1785
det. K. Matsuura on photo. Specimen lost (no field number). Areas A, C.

Ostracion rhinorhynchos Bleeker, 1851
det. K. Matsuura on photo. Specimen lost (no field number). Areas A, B, C.

Tetrosomus gibbosus (Linnaeus, 1758)
det. TGT. LPPL JIF161 (TGT2448) 00° 21'N., 98° 38'E. Areas A, B, C.

Tetrosomus reipublicae (Whitley, 1930)
det. TGT. NTM S.10995-004 (TGT2611) 08° 33'S., 114° 31 'E. Areas A, B, C.

TRIODONTIDAE

Triodon macropterus Lesson, 1829
det. CSIRO. CSIRO CA801 09° 52'S., 129° 12'E. Areas B, C.

TETRAODONTIDAE

Tylerius spinosissimus (Regan, 1908)
det. G. Hardy. CSIRO CA1152 09° 52'S., 129° 12'E. Area C.

Feroxodon multistriatus (Richardson, 1854)
det. CSIRO. CSIRO CA1506 17° 50'S., 121° 41'E. Area C.

Arothron hispidus (Linnaeus, 1758)
det. K. Matsuura on photo. Specimen lost. Areas A, B.

Arothron immaculatus (Bloch & Schneider, 1801)
det. TGT. LPPL JIF166 (TGT2227) 06° 13'15"S., 105° 44'E. Areas B, C.

Arothron manilensis (Marion de Procé, 1822)
det. J. Randall. CSIRO CA2234 20° 28'S., 115° 32' E. Area C.

Arothron stellatus (Anonymous, 1798)
Two specimens selected to record variations: (A) det. TGT. LPPL JIF167 (TGT2268) 06° 07'S., 104° 39'E. (B) det. TGT. LPPL JIF165 (TGT1045) 08° 43'S., 115° 16'E. Areas A, B, C.

Arothron caeruleopunctatus Matsuura, 1994
det. K. Matsuura on photo. Specimen lost. Area B.

Canthigaster compressa (Marion de Procé, 1822)
det. PK. NTM S.10749-005 (TGT1816) 08° 48'S., 116° 43'E. Area B.

Canthigaster axiologus Whitler, 1931
det. PK. NTM S.10747-001 (TGT3312) 10° 18'S., 120° 22'E. Areas B, C.

Canthigaster investigatoris (Annandale & Jenkins, 1910)
No figure voucher. Gerry Allen tentatively determined our specimens PJPW141A and PJPW184A (BMNH 1984.1.1.111 and 1984.1.1.112) from 08° 49'S., 114° 30'E. Area A.

Canthigaster rivulata (Temminck & Schlegel, 1850)
det. PK. CSIRO CA2769 20° 24'S., 115° 44'E. Area C. All of our material displayed the barred caudal fin pattern.

Chelonodontops patoca (Hamilton, 1822)
det. CSIRO. CSIRO CA2768 11° 14'S., 130° 37'E. Area C.

Lagocephalus cheesemanii (Clarke, 1897)
det. PK. NMNZ P.015095 (TGT2117) 08° 46'S., 115° 10'E. Areas A, B.

Lagocephalus inermis (Temminck & Schlegel, 1850)
det. TGT. LPPL JIF162 (TGT2502) 00° 19'S., 99° 38'E. Areas A, B, C.

Lagocephalus lagocephalus (Linnaeus, 1758)
det. PK. NTM S.10740-001 (TGT1651) 08° 57'S., 116° 17'E. Areas A, B.

Lagocephalus lunaris (Bloch & Scheider, 1801)
det. TGT. LPPL JIF163 (TGT1027) 08° 43'S., 115° 16'E. Areas A, B, C.

Lagocephalus sceleratus (Gmelin, 1789)
det. G. Hardy. NMNZ P.015091 (TGT2559) 03° 07'S., 101° 20'E. Areas A, B, C.

Lagocephalus spadiceus (Richardson, 1845)
det. TGT. LPPL JIF164 (TGT2490) 00° 04'S., 99° 01'E. Areas B, C.

Sphoeroides pachygaster (Müller & Troschel, 1848)
det. G. Hardy. AMS 1.22807-017 18° 32'S., 118° 17'E. Areas A, B. C.

Torquigener brevipinnis (Regan, 1903)
det. G. Hardy. NMNZ P.014787 (TGT2267) 06° 07'S., 104° 39'E. Areas A, B.

***Torquigener hicksi** Hardy, 1983
No figure voucher. Graham Hardy determined our material (e.g. NMNZ P.015094 (TGT1870) from 08° 58'S., 116° 13'E.). Area B, C. *Diagnosis*: spines on dorsal surface of body moderately sparse; few short spines but no papillae on front margin of and overlapping gill opening. Pale spots and dots on back, dark spots and brownish grey markings on cheeks and sides. Caudal peduncle length 3.8-4.3 in SL; interorbital 12.8 in SL.

Torquigener pallimaculatus Hardy, 1983
det. G. Hardy. CSIRO CA2214 20° 15'S., 115° 59'E. Area C.

Torquigener parcuspinus Hardy, 1983
det. G. Hardy. NMNZ P.015092 (TGT2226) 06° 13'15"S., 105° 44'E. Areas A, B, C.

Torquigener tuberculiferus (Ogilby, 1912)
det. G. Hardy. NMNZ P.015093 (TGT1335) 08° 46'S., 118° 17'E. Area B.

***Torquigener whitleyi** (Paradice, 1927)
No figure voucher. PK determined other material from Area C (e.g. NTM S.11084-001 from 11° 40'S., 141° 48'E). Area C. *Diagnosis*: body before dorsal fin base densely spined; no papillae or spines overlapping gill opening edge. Back spotted dark brown with few thin oblique pale lines extending from midline of back down and forward. Caudal peduncle length 3.4-4.2 in SL.

Torquigener gloerfelti Hardy, 1984
det. G. Hardy. NMNZ P.014790 (TGT1392) 08° 46'S., 115° 02'E. Areas A, B. Holotype.

Javichthys kailolae Hardy, 1984
det. G. Hardy. NTM S.11004-002. (TGT2574) 07° 59'S., 108° 58'E. Area A. Paratype.

DIODONTIDAE

Chilomycterus reticulatus (Linnaeus, 1758)
Our material (e.g. AMS I. 22555-001 (TGT1370) from 08° 46'S., 115° 02'E.) determined by Jeff Leis who also determined our photographed specimen (B) TGT1657 (AMS I. 23671-001) from 08° 57'S., 116° 17'E. The young of *C. reticulatus* (our specimen TGT1370) are spotted over head, back and fins, these spots disappearing with age or grouping into vertical body bars (J. Leis, pers, comm., 1984). (A) Areas A, B.

Cyclichthys hardenbergi (de Beaufort, 1939)
det. J. Leis. AMS I. 23707-001. 11° 04'S., 130° 37'E. Area C.

Cyclichthys orbicularis (Bloch, 1785)
No figure voucher. Our specimen determined by J. Leis (e.g. AMS I. 23670-001 (TGT1509) 08° 57'S., 116° 26'E.). Areas B, C.

Cyclichthys spilostylus (Leis & Randall, 1982)
det. J. Leis on photo. LPPL JIF208 (TGT1656) 08° 57'S., 116° 17'E. Areas A, B, C.

Diodon holocanthus Linnaeus, 1758
det. TGT. LPPL JIF168 (TGT2301) 03° 24'S., 100° 33'E. Areas A, B, C.

Diodon hystrix Linnaeus, 1758
det. TGT. LPPL JIF169 (TGT2290) 04° 07'S., 101° 04'E. Areas A, B.

Lophodiodon calori (Bianconi, 1854)
det. PK. LPPL JIF170 (TGT3328) 10° 18'S., 120° 22'E. Areas B, C.

Tragulichthys jaculiferus (Cuvier, 1818)
det. J. Leis on photo. CSIRO CA2243. 11° 53'5., 131° 15'E. Area C.

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