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Corallana nodosa (Schioedte and Meinert, 1879) (Crustacea: Isopoda: Corallanidae), Attacking Freshwater Fish at the Durian Tunggal Dam, Melaka, Malaysia

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Abstract

In January 2005, some dying freshwater fish were reported in Durian Tunggal Dam, Melaka. An isopod was observed to cause the injuries, lesions on various parts of the fish body. The isopod attaches at the base of the fins, on the head and abdomen, under scales and in the gill cavity. In one severe case, haemorrhages were seen all over the body of the infected fish, leading to its death. This isopod is not host specific as it attaches to various species of freshwater fish such as black tilapia (*Oreochromis mossambicus*), red tilapia (*Oreochromis niloticus* hybrid), common carp (*Cyprinus carpio*) and the goldfish (*Carrasius auratus*). Light-microscopic examination identified the isopod as *Corallana nodosa* (Schioedte and Meinert, 1879). The key identification characters were based on sparse setae on the maxilliped, short and tiny maxilla and maxillules generally hooked or with one or two terminal spines. An attempt to establish the life cycle of this parasite was not successful after 28 trials in laboratory. The isopods could survive up to day five under laboratory conditions.

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Introduction

Attacks on cultured fish from parasitic isopods of the families Cymothoidae and Aegidae have been reported widely (Chinabut 2002; Koesharyani et al. 1999; Mladineo 2002, Papapanagiotou et al. 1999; Papapanagiotou and Trilles 2001; Rajkumar et al. 2005). In the wild and in aquaculture, ectoparasitic isopods can pose serious problems by infecting marine and freshwater fishes. McAndrew (2002) reported that the parasitic isopod *Alitropus typus* (Milne-Edwards, 1840) was identified as one of the pathogens that caused diseases and economic loss to small-scale freshwater cage farmers in Bangladesh. In Thailand, between 1998-2002, an estimated US$234–468 per cage was lost due to parasitic isopod *Alitropus typus* attacking cage-reared tilapia (Chinabut 2002). The same isopod was also reported to cause 40–80% mortality in cultured *tilapia* in fish cages in the Philippines (Rosario et al. 1996). Koesharyani et al. (2001) highlighted the problem caused by another isopod known as rhexanellosis in groupers where affected fish became weak due to the parasite's setae disturbing fish-eating behaviors. *Corallana nodosa* (Schioedte and Meinert, 1879), a primarily estuarine species, had not previously been reported in freshwater fish in this region. Other corallanid species, notably of the genus *Tachaea* (Schioedte and Meinert, 1879), are known from freshwater, for example Mariappan et al. 2003 reported infection of *Tachaea spongillicola* on freshwater prawns *Macrobrachium* spp. in southern India which they believed the source of this isopod came from *M. nobilii* and *M. malcolmsonii* that migrated between fresh and marine water. Thus, this study aims to describe the morphology of the isopod that caused the mortalities of freshwater fish in Durian Tunggal Dam in Melaka, Malaysia.

Materials and Methods

Case history

From January 2004 to March 2005, several cases of freshwater fish mortality in Durian Tunggal Dam, Melaka were reported in local newspapers. In March 2005, fish cage-culture operations in Durian Tunggal Dam were shut down because of high mortality due to the effects of parasitic isopod infections. Durian Tunggal Dam is a freshwater dam except for a brief introduction of sea water in 1993 when there was a shortage of water supply for domestic use. At the moment, it is a fully freshwater dam. No serious fish mortality has been reported previously.

Collection of the isopod

Live isopods were collected between 1900–2200 hrs by placing healthy fish into a small cage in the dam. After 10–15 minutes, attacking isopods were removed individually from the fish by forceps.

Morphological study under stereomicroscope

Live isopods were placed into a Petri dish containing 0.85% normal saline and examined under a dissecting microscope at 4–40x magnifications. Identification was made from the original literature (e.g. Bruce 1982; Bruce et al. 1982; Delaney 1989; Schioedte and Meinert, 1879)

Morphological study under Scanning Electron Microscope

A total of 10 isopods with various sizes were fixed in McDowell solution for 5–24 hours before washing in 0.2M sodium cacodylate buffer (3x) and post-fixed in 2% aqueous osmium tetroxide for 20 minutes (McDowell and Trump 1976). They were processed using Hexamethyldisilazane to prepare soft insect tissues for scanning electron microscopy according to Nation method (Nation 1983) before viewing under LeoSupra 50VP Field emission SEM equipped with Oxford INCA400 energy dispersive x-ray microanalysis system at magnifications of 25x–10Kx.

Experiment design for the isopod life cycle

Approximately 2000–3000 live isopods of different sizes were collected together with the infected fish from the dam. The infected fish were transported to the wet laboratory in Penang in oxygenated polythene bags filled with dam water and examined within 24 hours of collection. The sediment from the dam was also collected and placed into the 250mL, 500mL and 13L aquaria. The isopods in pairs were isolated and placed into aquaria. A total of 3 or 4 pairs were placed in each aquarium and aerated for 24 hours. The number of isopods from each aquarium were counted and examined each day under a dissecting microscope at 6x to 25x magnifications.

Results and Discussion

Gross features on the infected fish showed lesions on various parts of the body. The isopod attaches at the base of the fins, on the head and abdomen, under the scale and in the gill cavity. It can be found throughout the body (epidermis layer under the scales), gills and fins. In one severe case, haemorrhages were seen all over the body of infected fish, leading to its death (Figure 1). This isopod is not host specific as it attaches to various species of freshwater fish such as black tilapia, *Oreochromis mossambicus*, red tilapia, *Oreochromis niloticus* hybrid, common carp, *Cyprinus carpio* and goldfish, *Carrasius auratus.* The isopod sucked the fish blood and detached when the stomach was full (Figure 2a and b). This feeding habit indicates that the species is a micro-predator rather than a parasite, feeding in a similar manner to many species of Aegidae (Bruce 2004). It was noted that it attaches on dead fish and to air stones (Figure 3a and b).

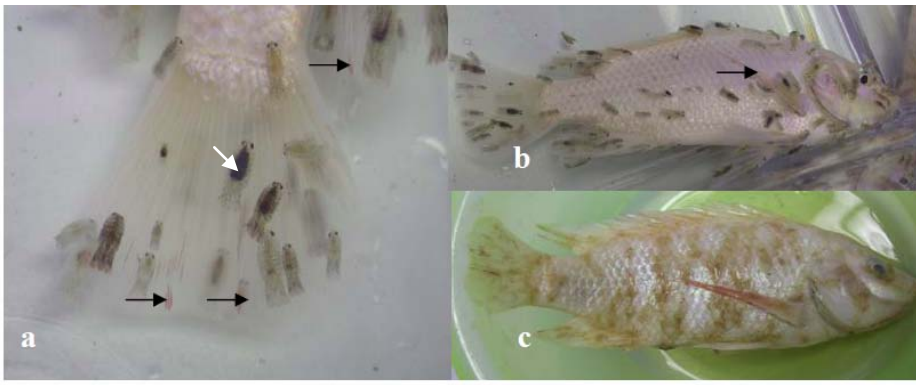

Fig. 1. Gross features of the infected fish showed hemorrhages (arrow) at caudal and anal fins after 3-hr infection with isopod (a & b) and lesion on the various parts of body after 24-hr infection (c).

Fig. 2. The isopod isolated from the infected fish: isopod without blood in the pouch **(a)** and isopod filled with fish blood in the pouch **(b)**.

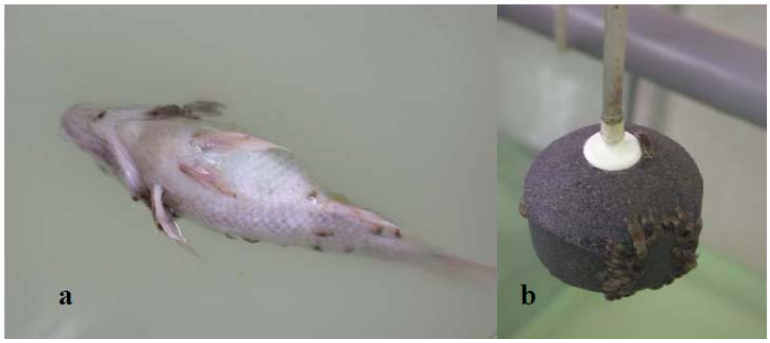

Fig. 3. The isopod with the dead fish **(a)** and attached to the air-stone **(b)**.

The species was identified as *Corallana nodosa* (Schioedte and Meinert,1879) (family Corallanidae), agreeing well with the original description. Most isopod infection of cultured freshwater fish in South-East Asia has been due to *Alitropus* sp. (family Aegidae). However the isopod isolated from freshwater dam in Durian Tunggal Melaka was different from *Alitropus* sp. which is larger than *Corallana nodosa* when fully grown with much bigger eyes and a rather flat dorsum; in addition the pleotelson is broadly rounded. The critical mouthpart characteristics for *Alitropus* sp. are hooked spines on the maxilliped, wide and large maxilla, maxillules slender with terminal hooked spines. In *Corallana nodosa* the key identification characters were based on sparse setae on the maxilliped, short and tiny maxilla and maxillules generally hooked or with one or two terminal spines. Family-level keys separate these genera.

Attempts to establish the life cycle of this isopod were not successful after 28 trials in different volumes of water at laboratory level. However, it was observed that this isopod could survive up to day 5 under laboratory conditions (Table 1).

There is little information relating fish mortality caused by this isopod as it does not appear to be a particularly significant disease in our freshwater fish in comparison to the aegid isopod, *Alitropus typus*, which is widespread in the tropical Indo-Pacific in brackish water (Bruce 1983; Chinabut 2002; Kabata 1985). In large part this is probably due to *C. nodosa* being an estuarine species, whereas *A. typu*s occurs freely in freshwater (Bruce 1983; Ho and Tonguthai 1992 and citations therein). This could be the first incidence in Malaysia and also in Southeast Asia on the infection of *Corallana nodosa* in freshwater fish causing mass mortality with consequent commercial loss.

The isopods may have come into the dam as dispersing juveniles, following the intake of sea water in 1993 during a shortage of water supply for domestic use. There are few data on salinity tolerances of marine and estuarine isopods, and there is no such information specifically related to corallanid isopods. Equally the biology and ecology of these isopods remain effectively unstudied. Species of *Corallana* are well known from estuarine habitats and low-salinity habitats (e.g. Bruce 1982; Jones et al. 1983) these isopods at times being immersed in pure freshwater. The closely related genus *Tachaea* is widely known to occur in freshwater habitats (see Delaney 1989 and references therein). It would seem a reasonable assumption therefore that at least some species estuarine *Corallana* are able to adapt to and survive in freshwater.

The isopod infection of *Tachaea spongillicola* on freshwater prawns *Macrobrachium* spp. in southern India was believed to originate from *M. nobilii* and *M. malcolmsonii* that had migrated between fresh and marine water (Mariappan et al. 2003). The pathogenicity trial of this isopod infection could not be performed as we failed to establish its life cycle. However, movement of live fish was banned at that time to prevent the spread of this isopod to other freshwater ponds or dams. This study aims to identify its etiology on Macrobrachium spp for prevention measures.

Table 1. Experiments to establish the life cycle of isopod in different water volume at Laboratory

Trial nu.	Nu. of isopod	Isopod condition	Water volume	Nu. of isopod survived (hour)														Observation of larva hatch
				0	12	24	48	72	96	120	144	168	192	216	240	264	288	
1	9	6-7mm	100ml(beaker)	9	9	0	0	-	-	-	-	-	-	-	-	-	-	0
2	14	6-7mm	100ml(beaker)	14	14	0	0	-	-	-	-	-	-	-	-	-	-	0
3	12	6-7mm	100ml(beaker)	12	12	9	0	-	-	-	-	-	-	-	-	-	-	0
4	20	6-7mm	16L(aquaria)	20	20	0	-	-	-	-	-	-	-	-	-	-	-	0
5	10	6-7mm	12L(aquaria)	20	10	0	-	-	-	-	-	-	-	-	-	-	-	0
6	10	6-7mm	12L(aquaria)	10	10	0	-	-	-	-	-	-	-	-	-	-	-	0
7	4	6-7mm	Individual/2ml(24 well-plate)	4	4	4	4	3	2	0	-	-	-	-	-	-	-	0
8	4	6-7mm	Individual/2ml(24 well-plate)	4	4	4	1	1	1	0	-	-	-	-	-	-	-	0
9	4	6-7mm	Individual/2ml(24 well-plate)	4	4	4	4	1	1	0	-	-	-	-	-	-	-	0
10	10	6-7mm	12L(aquaria)	10	10	1	0	-	-	-	-	-	-	-	-	-	-	0
11	10	6-7mm	12L(aquaria)	10	10	2	0	-	-	-	-	-	-	-	-	-	-	0
12	5	6-7mm	12L(aquaria)	5	5	0	0	-	-	-	-	-	-	-	-	-	-	0
13	10	6-7mm	12L(aquaria)	10	10	3	0	-	-	-	-	-	-	-	-	-	-	0
14	5	6-7mm	12L(aquaria)	5	5	3	0	-	-	-	-	-	-	-	-	-	-	0
15	4	6-7mm[a]	12L(aquaria)	4	4	2	2	2	2	0	-	-	-	-	-	-	-	0
16	10	6-7mm[b]	12L(aquaria)	10	10	10	2	2	2	0	-	-	-	-	-	-	-	0
17	10	6-7mm[c]	12L(aquaria)	10	10	0	0	0	0	0	-	-	-	-	-	-	-	0
18	10	3-4mm[b]	12L(aquaria)	10	10	10	3	3	3	0	-	-	-	-	-	-	-	0
19	10	1-2mm[b]	12L(aquaria)	10	10	10	10	10	10	0	-	-	-	-	-	-	-	0
20	10	6-7mm[a]	500ml/beaker	10	10	6	3	3	3	0	-	-	-	-	-	-	-	0
21	6	6-7mm[b]	500ml/beaker	6	6	1	1	1	1	0	-	-	-	-	-	-	-	0
22	10	6-7mm[c]	500ml/beaker	10	10	9	1	1	1	0	-	-	-	-	-	-	-	0
23	10	3-4mm[b]	500ml/beaker	10	10	3	1	1	1	0	-	-	-	-	-	-	-	0
24	10	1-2mm[b]	500ml/beaker	10	10	6	5	5	5	0	-	-	-	-	-	-	-	0
25	5	6-7mm[b]	250ml/beaker	5	5	3	3	3	3	0	-	-	-	-	-	-	-	0
26	5	6-7mm[c]	250ml/beaker	5	5	4	3	3	3	0	-	-	-	-	-	-	-	0
27	5	3-4mm[b]	250ml/beaker	5	5	4	4	4	4	0	-	-	-	-	-	-	-	0
28	5	1-2mm[b]	250ml/beaker	5	5	4	1	1	1	0	-	-	-	-	-	-	-	0

[a](isopod in pairs); [b](isopod in pairs and full with black color blood); [c](isopod in pairs and full with yellow color blood)

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