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Short communication

The Occurrence of Cestode *Ligula intestinalis* (Linnaeus) from Attentive Carplet *Amblypharyngodon melettinus* (Valenciennes) in Sri Lanka

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Abstract

The pleuroceroid stages of *Ligula intestinalis* (L.) were found in the body cavities of 333 among the 1105 *Amblypharyngodon melettinus* (Valenciennes) examined from the Victoria Reservoir, Sri Lanka from January 1999 to January 2000. Mean prevalence of this parasite was 23.38%. Mean intensity of infection of *L. intestinalis* in *A. melettinus* was 1.006. Mean body condition (CF) of infected *A. melettinus* was 0.009991 that was significantly different from that of uninfected fish (CF = 0.010445; $t = 2.03$; $p < 0.05$). The occurrence of this parasite in *A. melettinus* represents the first record of *L. intestinalis* in any freshwater fish of Sri Lanka.

Introduction

Attentive carplet *Amblypharyngodon melettinus* (Valenciennes) is one of the most abundant fish species in Sri Lankan reservoirs (De Silva and Sirisena 1987; Amarasinghe 1990; Pet et al. 1996). Although *A. melettinus* is not presently exploited by the commercial fishers, this species has a great potential to support a profitable subsidiary fishery (De Silva and Sirisena 1987). Since it could be converted to fish meal to feed livestock, this resource

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is a potential source of supplementary income for reservoir fishers in Sri Lanka (Amarasinghe 1990; Amarasinghe et al. 2001). Furthermore *A. melettinus* plays a significant role in the trophic dynamics of the reservoir ecosystems due to its high abundance and effective feeding on food resources (Pet et al. 1996). During a detailed study (January 1999 to January 2000) on the trophic evaluation of Sri Lankan reservoirs (Schiemer et al. 2000), a parasitic tapeworm was found in some specimens of *A. melettinus* examined from the Victoria Reservoir, Sri Lanka.

Materials and Methods

A. melettinus was caught from the Victoria Reservoir using gillnets of 12.5, 16 and 20 mm stretched mesh sizes. Length and depth of gillnets used were 25 and 1.5 m respectively. Gillnets were exposed for 20 to 30 min to catch *A. melettinus*. Those caught were immediately fixed in 10% neutral-buffered formalin and later transferred to 70% ethanol until examination of parasites. The size range of the 1105 specimens of fish examined were from 6.6 to 8.2 cm total length and 3.2 to 5.6 g body weight (excluding weight of the parasite). The fish were dissected and the body cavities were examined for presence of parasites. The tapeworms present in the body cavities of *A. melettinus* were removed carefully and some of them were stained in aqueous acetocarmine, dehydrated and mounted in balsam. Transverse sections of the parasites, stained with aqueous acetocarmine and prepared in the same way were also examined.

This parasite was identified as the pleurocercoïd stage of *Ligula intestinalis* (Linnaeus 1758) (Cestoda, Ligulidae, Ligulinae), according to the keys published by Bykhovskaya-Pavlovskaya et al. (1964) and Bauer (1987). In these pleurocercoïds of tapeworms, external segmentation of strobila is absent and the anterior end of the body is rounded. Genital complexes extend in one irregular longitudinal row in strobila. Testes, ovaries, vitellary follicles and genital ducts are visible in the transverse sections of the pleurocercoïds. The length of the tapeworms observed in the body cavities of *A. melettinus* in the Victoria Reservoir ranged from 59 to 161 mm (mean – 108 mm).

Table 1. Occurrence of *Ligula intestinalis* in the body cavities of *Amblypharyngodon melettinus* from the Victoria Reservoir, Sri Lanka.

Month	No. of fish		Prevalence (%)
	examined	infected	
January 1999	36	03	8.33
July 1999	22	07	31.82
August 1999	309	51	16.51
January 2000	738	272	36.86
Total	1105	333	
Mean			23.38

Results and Discussion

Pleuroceroid larval stages of *Ligula intestinalis* (L.) were found in the body cavities of 333 of the 1105 of *A. melettinus* examined from the Victoria Reservoir from January 1999 to January 2000 (Table 1). Mean prevalence (%) of *L. intestinalis*, as defined by Bush et al. (1997) is 23.38%. It should be noted however, as the host fish were sampled using gillnets of a narrow range of mesh sizes, the estimate of mean prevalence may be biased. Each fish contained a single tapeworm except in two occasions when there were two tapeworms per fish. Mean intensity of infection (Bush et al. 1987) of *L. intestinalis* in *A. melettinus* was 1.006. This parasite is known to be the causative agent of ligulosis disease in fish.

In Sri Lanka, some studies on the occurrence of parasites in freshwater fish have been reported (Fernando and Furtado 1963; Fernando and Hanek 1973; Lewis and Costa 1988). However, the occurrence of this parasite in *A. melettinus* represents the first record of *L. intestinalis* in any freshwater fish of Sri Lanka.

Mean body condition [$CF = (\sum W/L^3) \div n$ where W and L are weight in g and total length in cm of individual fish respectively and n is the number of fish] of infected *A. melettinus* was 0.009991, which was significantly lower than that of uninfected fish ($CF = 0.010445$), as found by Student t-test assuming unequal variances ($t = 2.03$; $p < 0.05$). Kosheva (1956; cited by Bauer 1962) reported poor CF of bream *Abramis brama* infected by *L. intestinalis* in Kutuluk Reservoir, Russia. The parasite is known to have other effects on the host fish (Bauer 1962). Due to pressure *L. intestinalis* causes degeneration of the gonads and the subsequent partial or complete sterilization of fish. Changes in blood pressure were also noted in fish suffering from ligulosis (Bauer 1962). During this preliminary study however, we have not investigated the effect of parasite on the host fish in detail.

L. intestinalis occurs in fish in most parts of the world such as the spottail shiner *Notropis hudsonius* in Dauphin Lake in Manitoba, Canada (Szalai et al. 1989), roach *Rutilus rutilus* and gudgeon *Gobio gobio* in the United Kingdom (Taylor and Hoole 1989). First records of *L. intestinalis* in New Zealand from rainbow trout *Salmo gairdneri* and common bully *Gobiomorphus cotidianus* were presented by Weekes and Penlington (1986). Rahman (1989) reported the occurrence of *L. intestinalis* in the alimentary system of long snouted barb *Puntius dorsalis* in the Kolar district in Karnataka, India.

Sexually mature individuals of *Ligula intestinalis* live in the intestines of fish-eating birds (Bauer 1962). *L. intestinalis* was reported to occur in cormorants and darters from South Africa (Mokgalong and Saayman 1986). As the predatory pressure on fish by cormorants is extremely high in Sri Lankan reservoirs (Winkler 1983), it is likely that cormorants serve as the secondary hosts of this parasite. The first intermediate hosts of this parasite are reported to be the copepods, which come into contact with coracidia, that swim near the surface of the water body (Bauer 1962). The proceroid entering the intestine of fish with the copepods, perforates the intestinal wall and

emerges into the body cavity to pass the pleuroceroid phase, which lasts for several months (Bauer 1962).

Conclusion

In Sri Lanka, most reservoirs are inter-connected as cascade systems. Therefore there is a possibility that this parasitic infection can spread to fish communities in other reservoirs of the country when suitable conditions prevail. Due to the possible effects of parasite on the biology and physiology of the host fish, further investigations on ligulosis in *A. melettinus* are urgently needed in Sri Lanka. This is of particular importance because *A. melettinus* plays a significant role in the trophic dynamics of reservoir ecosystems (Pet et al. 1996).

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References

- Amarasinghe, U.S. 1990. Minor cyprinid resources in a man-made lake in Sri Lanka: a potential supplementary source of income for fishermen. *Fisheries Research* 9: 81-89.
- Amarasinghe, U.S., P.A.D. Ajith Kumara and M.H.S. Ariyaratne 2001. Role of non-exploited fishery resources in Sri Lankan reservoirs as a source of food for cage aquaculture. In: *Management and Ecology of Lake and Reservoir Fisheries* (ed. I.G. Cowx). pp. 000-000. Proceedings of an International Symposium and Workshop, 10-14 April 2000, University of Hull International Fisheries Institute. Fishing News Books, Blackwell Science Ltd., Oxford.
- Bauer, O.N. 1962. The ecology of parasites of freshwater fish (Relationship between parasites and environment). *Parasites of freshwater fish and the biological basis for their control*, Bulletin of the State Scientific Research Institute of Lake and River Fisheries 49: 3-215. (Translated from Russian by Israel Program for Scientific Translations, Jerusalem).
- Bauer, O.N. Editor 1987. *Freshwater fish parasites of the USSR*. Parasitological Monograph No. 3, Publication of the Academy of Sciences of the USSR, Nauka, Leningrad, USSR (in Russian).
- Bush, A.O., K.D. Lafferty, J.M. Lotz and A.W. Shostak 1997. Parasitology meets ecology on its own terms: Margolis et al. revisited. *Journal of Parasitology* 83: 575-583.
- Bykhovskaya-Pavlovskaya, I.E., A.V. Gusev, M.N. Dubinina, N.A. Izyumova, T.S. Smirnova, I.L. Sokolovskaya, G.A. Shtein, S.S. Shul'man and V.M. Epshtein 1964. Key to parasites of freshwater fish of the U.S.S.R. Academy of Sciences of the U.S.S.R., Zoological Institute, Key to Fauna of USSR 80. (Translated from Russian by Israel Program for Scientific Translations, Jerusalem), 919 p.

- De Silva, S.S. and H.K.G. Sirisena 1987. New fish resources in reservoirs in Sri Lanka: Feasibility of introduction of a subsidiary gillnet fishery for minor cyprinids. *Fisheries Research* 6: 17-34.
- Fernando, C.H. and J.I. Furtado 1963. A study of some helminth parasites of freshwater fishes in Ceylon. *Zoologie Parasitenkologie* 23: 141-163.
- Fernando, C.H. and G. Hanek 1973. Some parasitic copepoda from Sri Lanka (Ceylon) with a synopsis of parasitic crustacea from Ceylonese freshwater fishes. *Bulletin of the Fisheries Research Station, Sri Lanka (Ceylon)* 24: 63-67.
- Lewis, J.W. and H.H. Costa 1988. The occurrence of an eye fluke (*Digenia Diplostomatidae*) from *Oreochromis mossambicus* in Sri Lanka. *Tropical Freshwater Biology* 1: 91-93.
- Mokgalong, N.M. and J.E. Saayman 1986. Cestoda of cormorants and darters from the northern Transvaal (Summary only). *South African Journal of Sciences* 82: 648.
- Pet, J.S., G.J.M. Gevers, W.L.T. van Densen and J. Vijverberg 1996. Management options for a more complete utilization of the biological fish production in Sri Lankan reservoirs. *Ecology of Freshwater Fish* 5: 1-14.
- Rahman, M.F. 1989. An incidence of cestode *Ligula intestinalis* (Linnaeus) in *Puntius dorsalis* (Jerdon). *Journal of Inland Fisheries Society of India* 21: 62-63.
- Schiemer, F., U.S. Amarasinghe, J. Frouzova, B. Sricharoendham and E.I.L. Silva 2000. Ecosystem structure and dynamics – a management basis for Asian reservoirs and lakes. In: *Reservoir and Culture-based Fisheries Biology and Management* (ed. Sena S. De Silva). pp. 00-00. ACIAR, Canberra.
- Szalai, A.J., X. Yang and T.A. Dick 1989. Changes in numbers and growth of *Ligula intestinalis* in the spottail shiner (*Notropis hudsonius*), and their roles in transmission. *Journal of Parasitology* 75: 571-576.
- Taylor, M. and D. Hoole 1989. *Ligula intestinalis* (L.) (Cestoda: Pseudophyllidea): An ultra-structural study of the cellular response of roach fry, *Rutilus rutilus* L., to an unusual intramuscular infection. *Journal of Fish Diseases* 12: 523-528.
- Weekes, P.J. and B. Penlington 1986. First records of *Ligula intestinalis* (Cestoda) in rainbow trout, *Salmo gairdneri*, and common bully, *Gobiomorphus cotidianus*, in New Zealand. *Journal of Fish Biology* 28: 183-190.
- Winkler, H. 1983. The ecology of cormorants (genus *Phalacrocorax*). In: *Limnology of Parakrama Samudra-Sri Lanka: a case study of an ancient man-made lake in the tropics* (ed. F. Schiemer). pp. 193-199. Dr. W. Junk Publishers, The Hague.