Middle-East Journal of Scientific Research 11 (9): 1212-1215, 2012
ISSN 1990-9233

DOI: 10.5829/idosi.mejsr.2012.11.09.64157

# *Lernaeenicus sprattae* (Crustacea: Copepoda) on *Hemiramphus far*

*Ganapathy Rameshkumar and Samuthirapandian Ravichandran*

Centre of Advanced Study in Marine Biology, Faculty of Marine Science,
Annamalai University, Parangipettai-608 502, Tamil Nadu, India

**Abstract:** Copepod parasite *Lernaeenicus sprattae* were collected from the body surface regions and there root was found from the kidney of the host fish *Hemiramphus far*. *Lernaeenicus sprattae* is a blood-feeding copepod parasite and has a particularly serious effect at the site of infection: its feeding has a severe effect on the fish. *L. sprattae* damages their hosts directly by their attachment mechanism and by their feeding activities. The observed length of *L. sprattae* was ranged from 48mm to 52mm. The prevalence of *L. sprattae* infection was 12.3% and intensity of infection was 3. Attachment on the skin of fishes can cause pressure necrosis and the host tissue responses can include swelling, hyperplasia and proliferation of fibro blasts. Four infested parasites was recorded as a maximum number of parasites on a single host. An interesting case of parasitism (copepod *L. sprattae*) is reported on the black-barred halfbeak fish *Hemiramphus far*. These dynamic interactions between parasites and fish hosts were probably the main determinant of host specificity.

**Key words:** Blood-Feeding % Copepod Parasite % *Hemiramphus far* % *Lernaeenicus sprattae*

## INTRODUCTION

Parasitic copepod are common in wild and cultured finfish and there vast literatures available for host ranges and taxonomy. The Lernaeopodidae are a highly specialized group of parasitic copepod presumably derived from a Caligoid stem and some clue to their systematic position should be found in their development. Lernaeosis is caused by parasitic copepods (*Lernaea* spp.) that infect many fishes important to aquaculture and recreation. Fish less than 20 mm tong may be killed by the parasites if vital organs are penetrated by the anchors [1]. Heavy infections of *Lernaea cyprinacea* caused death of yearling rainbow trout *Oncorhynchus mykiss* [2]. Copepods may open routes for secondary infection; however, quantitative data on these secondary effects are scant [3, 4]. Another interesting parasitic copepod is *L. sprattae* which occurs embedded in the eye or occasionally in the dorsal body muscles of sprat and sardines in Europe [5].

The lernaeid genus *Lernaeenicus* is represented in the Indian region by *L. polynemi* [6], *L. hemirhamphi* [7], *L. seeri* [8], *L. ramosus* [9], *L. nemipteri* [10], *L. stromatei* [10], *L. sayori* [11] and *L. alatus* [12]. A recorded a species of *Lernaeenicus* without assigning a specific name [13]. The revision of the family Lernaeidae has recognised 12 valid species in this genus [5].

Generally, parasitic infections show an increase in infection intensity with an increase in host size, due to the larger surface area available for attachment [14], e.g. [15] clearly demonstrated an increased intensity of infection with Monogenea and Copepoda with increasing age and size of *Lepomis gibbosus*. On the other hand, the parasitic copepod *Lernaeenicus sprattae* did not demonstrate a host-size preference [16].

Copepods have been reported parasitizing several fishes of Kerala coastal waters [17]. An interesting case of parasitism (copepod *L. sprattae*) is reported on the black-barred halfbeak fish *Hemiramphus far*.

## MATERIALS AND METHODS

In this study, only fish infected with *L. sprattae* were examined. Specimens of black-barred halfbeak fish, *Hemiramphus far* (Hemiramphidae), were collected with a fish net from the inshore waters of the Parangipettai coast (Southeast coast of India) during March 2012. These fish were brought to the laboratory, where copepods were

**Corresponding Author:** Ganapathy Rameshkumar, Centre of Advanced Study in Marine Biology,
Faculty of Marine Science, Annamalai University, Parangipettai-608 502, Tamil Nadu, India.
Tel: +91-4144-243223, 243533.

removed from the fish, fixed in 10% formalin or 70% ethanol and then preserved in 70% ethanol. Copepod identification was based on morphological features according to (Sowerby, 1806). The parasites of each fish were counted and the total length of the fish hosts and isopods was measured and all measurements are in millimetres. The prevalence (number of infested hosts / number of examined hosts x 100%) and the mean intensity \(total number of parasites / number of infested hosts) were calculated according to [18]. Host nomenclature and fish taxonomy are according to Fish Base [19].

## RESULTS AND DISCUSSION

Copepod specimens were collected from the body surface regions. Based on our morphological observations, the lernaeid parasitic copepod was identified as *Lernaeenicus sprattae* (Fig.1). The species was originally described by Sowerby, (1806). Later this species has been described [20] in northern European waters and pilchard (*Sardina pilchardus*), is an additional host farther south. During the sampling period, 65 *Hemiramphus far* were examined. Among them 8 specimens of the *Hemiramphus far* infected with a total of 24 parasites were obtained on 7$^{th}$ March 2012 collected at Parangipettai South-east coast of India. Thus, our finding of *L. sprattae* in this study is the documented of Lernaeopodidae copepods in Indian waters. It was reported from European Atlantic seaboard, the Belt Sea and western Mediterranean.

Infested fishes of females (TL = 180-270mm) and males (TL = 110-140 mm) to the parasitic copepods, *L. sprattae* length ranged from 48mm to 52mm. The prevalence of *L. sprattae* infection found here is 12.3% and intensity of infection was 3. The prevalence of *L. sprattae* infection is usually reported as between 0.4% and 7% that of *L. encrasicoli* is usually below 1% [20]. 26% mean infection by *L. encrasicoli* in the Weser estuary, which is quite unusual [21]. In other studies the percentage infected by *L. encrasicoli* is always reported to be lower than that infected by *L. sfirattae*. [21] found mean intensity of *L. sprattae* 0.4% and of *L. encrasicoli* 0.2% in the North Sea).

On a single host a maximum number of 4 parasites were infested. Generally the parasites were found attached to the head (near the eyes, on the operculum, maxilla and mandible) and also on the caudal peduncle. Most of the parasites examined were living though the host fishes were dead when brought to the laboratory. Most fish

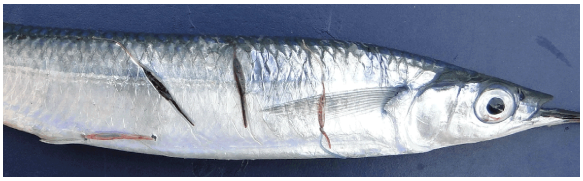

Fig. 1: Four specimens of *Lernaeenicus sprattae* with a single body host of *Hemiramphus far*

Fig. 2: *L. sprattae* parasite penetrated the body surface to kidney of the host fish *H. far*

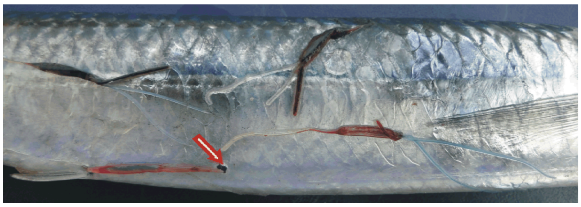

Fig. 3: Arrows indicate typical lesions caused by the parasitic copepod *Lernaeenicus sprattae*

(89%, n = 389) carried one *L. sprattae*, but double infection of one eye (n = 37), both eyes (n = 8) and triple infection of same eye (n = 2) or both eyes (n = 2) were recorded [16]. Multiple infections suggest that the host does not become immune and also that bilateral infection does not always cause total blindness.

*Lernaeenicus sprattae* is a blood-feeding copepod parasite and has a particularly serious effect at the site of infection: its feeding has a severe effect on the fish. *L. sprattae* damages their hosts directly by their attachment mechanism and by their feeding activities. Attachment by means of clawed limbs is typical for ectoparasites and penetration of the skin by claws cause local lesions, the pathology of which varies according to site and other factors. Attachment on the skin of fishes can cause pressure necrosis and the host tissue responses can include swelling, hyperplasia and proliferation of fibro blasts.

In the present study small pinholes and lesions were observed in the infested fish's skin and kidney regions (Fig. 2). *L. anchoviellae* preferred site of infection is the pre-anal region behind the operculum. The parasite generally pierces the lateral body wall of this region and buries its head in one of the accessible organs of the visceral cavity such as the gonads, hepatic caecae or the kidneys [22]. But in the present study *L. sprattae* was attached body surface regions and there root was find it was from the kidney of the host fish *Hemiramphus far*. 155 fish parasitized by *L. hemirhamphi* almost 44% of the parasites were inserted into the kidney [23]. Parasitic copepods other than the tissue-invading forms may occasionally damage marine fish (Fig. 3). *Lernaeenicus* sp. from the body surface of a specimen *Epinepheles malabaricus* [17]. The head of the parasite, provide with branched horns, is embedded in the trunk muscle of the fish. The parasite thus attached to the host, like a plant rooted in soil, establishes such a firm foot-hold that even when carefully pulled out of the host tissue it carries the surrounding muscle tissue also of the host.

*L. hemirhamphi* infests the body of *Hemirhamphus xanthopterus* and *H. far*, preference for the lateral and ventral (especially the base of the pelvic fins) sides of the body [17]. A fibrous connective tissue cyst formed around the cephalothorax, as a defense mechanism of the host, adds to the firm anchorage of the parasite to the host tissue, while assessing the role of crustacean as enemies of fishes, totally ignored the family Lernaeoceridae which form potent parasites of marine fishes [24]. Lernaeoceridae are also well adapted for a parasitic mode of life though they have not reached the status of the family Leernaeopodidae in this respect [24]. In the present study are in conformity with those of Kabata study [24].

*L. sprattae*: opaque lens, folding and distortion of retina, haemorrhages [25]. *L. encrasicoli*: deep burrowing in the musculature of its host, causing extensive lesions and sometimes penetration of the visceral cavity [26], reduced sensitivity of hosts of *L. sprattae* to light, poor and distorted vision and occasionally blindness [25]. Despite its common effect of the parasitic fauna on Indian fishes as already recorded by [27-32]. Surface abrasions and lesions caused by the parasites can be of serious consequence to the fish host directly, an ectoparasite which causes severe skin erosion and may even kill the fish host in heavy infestation.

**ACKNOWLEDGEMENTS**

Authors are thankful to the Department of Science and Technology and the Ministry of Environment & Forest, Government of India for providing financial support and to the Dean, Faculty of Marine Sciences for providing facilities and encouragement.

**REFERENCES**

1. Khatifa A.K. and C. Post, 1976. Histopathological effect of *Lernaea cyprinacea* (a copepod parasite) on fish. Progressive Fish-Culturist, 38: 110-113.
2. Uzmann, J.R. and H.J. Rayner, 1958. Record of the parasitic copepod *Lernaea cyprinacea* L. in Oregon and Washington fishes. The Journal of Parasitology, 44: 452-453.
3. Hoffman, C.L., 1976. Parasites of freshwater fishes. IV. Miscellaneous. The anchor parasite (*Lernaea elegans*) and related species. Fish Disease Leaflet 46, U.S. Fish and Wildlife Service, Washington, D.C., pp: 8.
4. Dempster, R.P., P. Morales and F.X. Glennon, 1988. Use of sodium chlorite to combat anchor worm infestations of fish. Progressive Fish-Culturist, 50: 51-55.
5. Wilson, C.B., 1917. North American Parasitic Copepods belonging to the Lernaeidae with a revision of the entire family. Proceedings of the United States National Museum, 53: 56-59.
6. Bassett-Smtth, P.W., 1898. Some new parasitic copepods found on fish at Bombay. Ann. Mag. Nat. Hist., 1(7): 1-17.
7. Kirtisinghe, P., 1932. Two new parasitic copepods from Ceylon. Parasitology, 24: 548-51.
8. Kirtisinghe, P., 1934. *Gloiopotes watsoni* n.sp. and *Lemaeenicus seeri* n.sp., parasitic copepods of fish from Ceylon. Ibid, 26: 173-175.
9. Kirtisinghe, P., 1956. Parasitic copepods from fishes of Ceylon. Ibid, 46: 19-20.
10. Gnanamuthu, C.P., 1953. Three lernaeid copepods parasitic on South Indian fishes. Journal of Parasitology, 39: 1-8.
11. Yamaguti, S., 1939. Parasitic copepods from fishes of Japan. Part 5. Caligoida. JH. Volumen Jubilare Prof. Sadao Yoshida, 2: 479-80.

12. Rangnekar, M.P., 1960. Copepods parasitic on fishes of Bombay. 1. Lernaeopodoida, Journal of University of Bombay, 29: 198-200.
13. Rao, T.S.S., 1951. Occurrence of *Laernaenicus* sp. on *Scomber scomber*, Lawson's Bay, Wallair. Current Science, 21(4): 103-104.
14. Dogiel, V.A., G.K. Petrushevski and I. Yu, 1958. Parasitology of fishes. Leningrad University Press, Leningrad (translated by Kabata, Z. Oliver & Boyd, London).
15. Hanek G. and C.H. Fernando, 1978. The role of season, habitat, host age and sex on gill parasites of *Lepomis gibbosus* (L). Canadian Journal of Zoology, 56: 1247-1250.
16. Anstensud, M. and T.A. Schram, 1988. Host and site selection by larval stages and adults of the parasitic copepod *Lernaeenicus sprattae* (Sowerby) (Copepoda: Pennellidae) in the Oslofjord. Hydrobiologia, 167/168: 587-595.
17. Radhakrishnan, N. and N.B. Nair, 1983. Nature of crustacean infestation of fishes along the South West coast of India. Aeta. Incti. Et-pise, 13 (2): 93-115.
18. 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.
19. Froese, R. and D. Pauly, 2011. Fish Base: World Wide Web electronic publication. Available from: http://. Fishbase. Org., version (3/2011) (Accessed March 2011).
20. Schram, T.A., 1987. Prevalence of *Lernaeenicus sprattae* (Sowerby) and *L. encrasicoli* (Turton) (Copepoda, Pennellidae) infection of sprat from Oslofjorden. Sarsia, 72: 279-289.
21. Moller, H., 1981. Untersuchungen iiber den Gesundheitzustand der Unterweser-Fische. GKSS Forschungszentrum Geestacht GMBH. pp: 56.
22. Sebastian, M.J. and K.C. George, 1964. *Lernaeenicus anchoviellae* n. sp. (Copepoda-Lernaeidae) parasitic on *Anchoviella bataviensis* (Hardenberg) with descriptions of its three post-larval stages. Marine Biological Association of India, 6(2): 235-240.
23. Natarajan, P. and N.B. Nair, 1973. Observations on the nature of attack of *Lernaeenicus hemirahmphi* Kirtisinqhe on *Hemirhamphus xanthopterus* (Val.). Journal of Animal Morphology Physiology, 20(1): 56-63.
24. Kabata, Z., 1970. Diseases of fishes. Book. I. Crustacea as enemies of fishes. T.F.H. Publ., New York.
25. Gharbi, E.L., S. Rousset and V. Raibauta, 1985. Biologie de coptpode *Lernaeenicus sprattae* (Sowerby, 1806) et ses actions pathogtnes sur les populations de sardines des cbtes du Languedoc-Roussillon. Rev. Trav. Inst. Pcches Marit., 47: 191-201.
26. Kabata, Z., 1979. Parasitic Copepoda of British fishes. Rayal Society of London. 468 : 2031 Figs.
27. Rameshkumar, G. and S. Ravichandran, 2010. New Host record, *Rastrellger kanagurta*, for *Nerocila phaeopleura* parasites (Crustacea, isopoda, Cymothoidae).Middle-East Journal of Scientifc Research, 5(1): 54-56.
28. Ravichandran, S., G. Rameshkumar, B. Mahesh Babu and K. Kumaravel, 2009a. Infestation of *Rastrelliger kanagurta*, with cymothoid isopod, *Joryma brachysoma* in the Colachel environment of Southwest coast of India. World Journal of Fish and Marine Sciences. 1(2): 80-84.
29. Ravichandran, S., G. Rameshkumar and K. Kumaravel, 2009b. Variation in the Morphological Features of Isopod Fish Parasites. World Journal of Fish and Marine Sciences. 1(2): 137-140.
30. Kumaravel, K., S. Ravichandran and G. Rameshkumar, 2009. Distribution of Barnacle *Octolasmis* on the Gill Region of Some Edible Crabs. Academic Journal of Entomology. 2(1): 36-39.
31. Vinoth, R., T.T. Ajith Kumar, S. Ravichandran, M. Gopi and G. Rameshkumar, 2010. Infestation of copepod parasites in the food fishes of Vellar estuary, Southeast coast of India. Acta Parasitologica Globalis. 1(1): 01-05.
32. Ravichandran, S. and G. Rameshkumar, 2012. Host-parasite interaction of a gill-infecting Didymozoid in the Pazhayar, Southeast coast of India. World Journal of Fish and Marine Sciences, 4(1): 60-64.