



Document heading

doi:10.12980/JCLM.1.20133D154

© 2013 by the Journal of Coastal Life Medicine. All rights reserved.

Prevalence of copepod parasite (*Lernaeenicus polynemi*) infestation on *Eleutheronema tetradactylum* from Pazhayar coastal waters, southeast coast of India

Pazhanivel Bharadhirajan¹, Ayyaru Gopalakrishnan^{1*}, Kuzhanthaivel Raja¹, Sambantham Murugan¹, Ramalingam Vijayakumar¹, Mohammad M. Rahman²

¹Centre of Advanced Study in Marine Biology, Faculty of Marine Science, Annamalai University, Parangipettai – 608 502, Tamil Nadu – India

²Institute of Oceanography and Maritime Studies, International Islamic University Malaysia, Jalan Sultan Ahmed Shah, Bandar Indera Mahkota, 25200 Kuantan, Pahang, Malaysia

PEER REVIEW

Peer reviewer

Dr. M. Rajkumar, Post Doctoral Researcher, Department of Zoology, University of Madras, Maraimalai Campus, Guindy, Chennai–600 025, Tamil Nadu, India.

E-mail: arunachalashivamdr@yahoo.com

Comments

This is a good study in which the authors describe the seasonal prevalence and intensity of copepod parasite (*L. polynemi*) on Indian salmon. The study is very straight forward. The results and conclusion of the study is almost clear.

Details on Page 280

ABSTRACT

Objective: To study the prevalence and mean intensity of copepod parasite *Lernaeenicus polynemi* infestation on *Eleutheronema tetradactylum* from Pazayar, Tamil Nadu, southeast coast of India.

Methods: The fish was collected from Pazhayar landing centre from January to December 2012 and their biometric measurements were examined. Total number of infected fish and total number of parasites were recorded.

Results: Higher prevalence and mean intensity of infestation of 35.23% and 3.1 were respectively reported during monsoon season of 2012. The parasitic infestations were scattered over the entire body of the host and targeted the different internal organs such as liver and the dorsal aorta. The highest intensity was reported to be 66 parasites in a single host.

Conclusions: Due to the heavy parasitic attack the fish will suffer and its economical value or the marketability may reduce.

KEYWORDS

Lernaeenicus polynemi, Copepod, Prevalence, Intensity, Secondary infection

1. Introduction

Among the marine fish parasites, nearly 25% are crustaceans, mainly represented by copepod, brachiura and isopod[1]. Among copepods, Siphonostomatoida contains 20 genera[2], most of which are known as meso parasites. The thorax and abdomen become deeply embedded within the host's tissues, whereas the genital segment protrudes externally and bears egg sacs[3]. As several species of this family have negative impacts on commercially important fishes, and it has been well documented by researchers[4].

Parasitic copepods feed on host mucous, tissues and blood and their attachment and feeding activities are accountable for any primary diseases that develop due to parasitization.

The Lernaeid genus *Lernaeenicus* is represented in the Indian region by *Lernaeenicus hemirhamphi*[5], *Lernaeenicus seeri*[6], *Lernaeenicus ramosus*[7] and *Lernaeenicus alatus*[8]. The revision of the family Lernaeidae has recognized 12 valid species in this genus[9]. Recently the genus *Lernaeenicus* was reported by Gopalakrishnan *et al*[10]. *Lernaeenicus hemirhamphi* in *Hemiramphus far*. Vijayakumar *et al.* studied *Lernaeenicus hemirhamphi* infestation on

*Corresponding author: A Gopalakrishnan, Centre of Advanced Study in Marine Biology, Faculty of Marine Science, Annamalai University, Parangipettai, 608 502, Tamil Nadu, India.

E-mail: aquagopal@gmail.com

Foundation Project: Supported by MOES major project (Ref. No. 36/OOIS/SIBER/07) and UGC major project (F.No. 39–569/2010 (SR)).

Article history:

Received 10 Aug 2013

Received in revised form 18 Sep, 2nd revised form 23 Sep, 3rd revised form 29 Sep 2013

Accepted 20 Oct 2013

Available online 28 Nov 2013

Hemiramphus far and *Hemiramphus lutkei*^[11]. *Lernaeenicus polynemi* (*L. polynemi*) was first described by Bassett–Smith but there is no much details of the parasite^[12]; prevalence and intensity. Hence, the objective of the present study is to investigate the seasonal prevalence and intensity of copepod parasite *L. polynemi* on *Eleutheronema tetradactylum* (*E. tetradactylum*) and understand whether the *L. polynemi* infestation on *E. tetradactylum* is related to season.

2. Materials and methods

The freshly landed Polynemidae fish *E. tetradactylum* were collected from commercial fish landing center Pazhayar (Latitude 11°21' N Longitude 79°49' E). To investigate the copepod parasite, prevalence and mean intensity of infestation had been studied for one year from January to December 2012. The fishes caught by gill net and hook and line was examined both in landing and market for their biometric measurements. The length and weight of the fishes were measured. After that the fishes were dissected and examined for parasites in targeted organs. The parasite were removed carefully using fine forceps and preserved in 70% ethanol for further study. The copepod identification was done based on morphological description given by Bassett–Smith^[12]. Prevalence and mean intensity were calculated by the method of Margolis *et al*^[13]. Pictures were taken by using a digital camera, Nikon–D–40.

3. Result

The Indian salmon, *E. tetradactylum* (Polynemidae) was investigated for parasitic infestation. Their length and weight ranged from 20 to 45 cm and 250 to 800 g respectively. Totally 3335 individuals were examined. Among them 465 were infested with *L. polynemi*. Totally 1085 parasites were collected from infested fishes. The overall percentage of infestation was 13.94% and mean intensity was 2.33. Season wise higher infestation (35.23%) was recorded during monsoon season followed by post–monsoon, pre–monsoon and summer (Table 1).

In the present study, the parasitic infestation occurred in the entire host body such as dorsal fin, pelvic fin, pectoral fin, caudal fin, operculum, anal fin, dorsal and ventral side of the fish. The fish body became reddish in colour at the site of infestation, finally the parasite attachment induced

wound and offered secondary infection by microbes. The highest infestation of parasite in single host was 66 in the entire body; most of infestations were in the pelvic region (Figures 1 and 2).

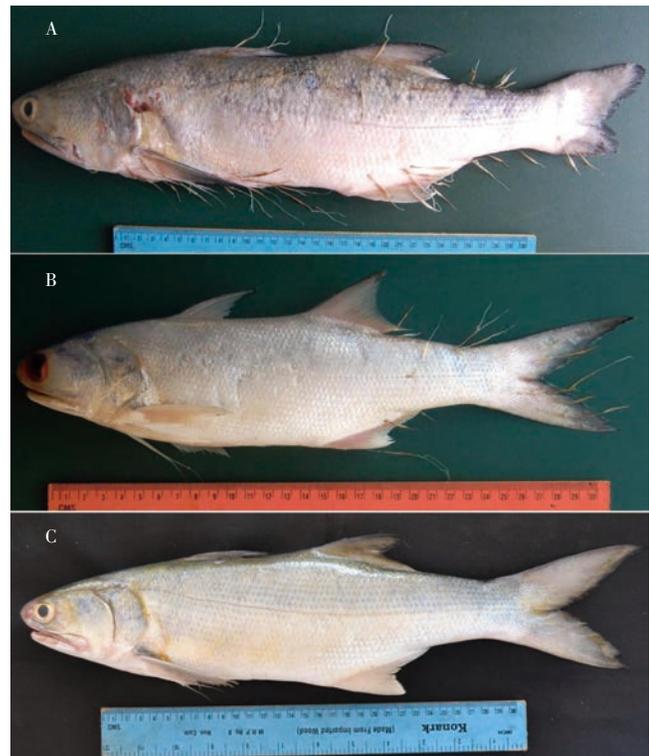


Figure 1. Copepod parasite *L. polynemi* infestation on *E. tetradactylum*.

A: Heavy infestation of *L. polynemi* (66 parasites), B: Moderate infestation (15 parasites), C: Normal fish.

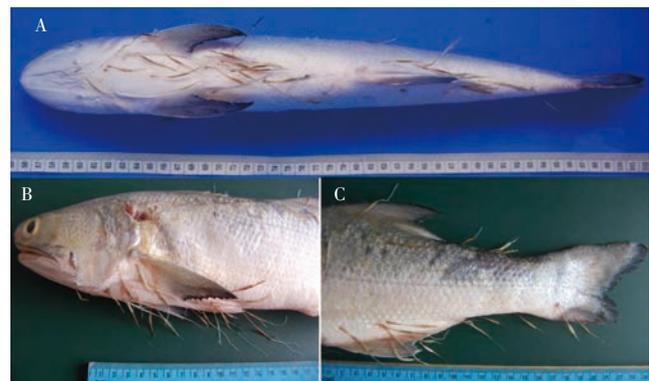


Figure 2. Copepod parasite *L. polynemi* infestation on *E. tetradactylum*.

A: Ventral side with heavy copepod infection, B: Heavy infestation in the anterior part, C: Posterior region with deformed caudal fin due to parasitic secondary infection.

The total length of the parasite varied from 4.2 to 6.1 cm with head 2 to 3 mm with three dorsal horn. Its neck was narrow, long and expandable in nature and nearly 2.4 to 3.7

Table 1

Seasonal prevalence and mean intensity of *Lernaeenicus polynemi* infestation on host fish *E. tetradactylum*.

Season	Total number of fish examined	Total number of infected host	Total number of parasites	Prevalence (%)	Mean intensity
Post monsoon	133	26	47	19.54	1.80
Summer	253	13	31	5.13	2.38
Pre monsoon	176	17	24	9.65	1.41
Monsoon	105	37	115	35.23	3.10
Total	667	93	217	13.94	2.33

cm long and could expand 9.3 to 14.7 cm. Its hind end was 0.5 to 1.3 cm, egg string narrow long 2.6 to 3.9 cm and two to three times longer than the hind end (Figures 3). After entering into the host body, the parasite targets the internal organs, where the blood circulation is more frequent such as kidney and dorsal aorta.

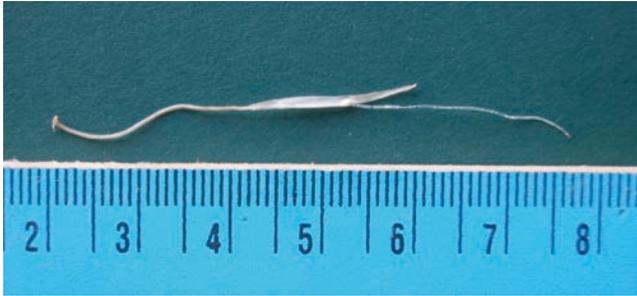


Figure 3. *L. polynemi* isolated from host, *E. tetradactylum*.

4. Discussion

The parasites have been recognized as an important component of global biodiversity and researches on the parasitic species diversity has increased[14]. The copepods are a common component of the ectoparasite assemblages of all kinds of fishes[2]. The neotropical copepods are the second largest parasitic group in marine fishes and third largest group in the freshwater hosts[15].

The family Pennellidae includes parasitic copepods. Their adult females are more or less deeply inserted into the body of host[16]. They need two hosts to complete their life cycle, which comprises two free swimming nauplius stages and an infective copepodid stage, four chalimus, and an adult stages[17]. The parasite *L. polynemi* was first described by Bassett-Smith and this parasite infested in the host *E. tetradactylum* from Mumbai, who find 12 parasites in single host[12]. Its head and neck deeply buried into the flesh and the body is full of blood. The host is always well nourished but in case of heavy infection (66) the host was smashed. The site of the infestation is higher at the base of the caudal, behind the dorsal fin and just behind and above the pectoral fin[12]. However, in the present study the parasite infested in the entire body of the host. The elastic nature of this parasite was for the first time reported in the present study.

The organisms will become infected with a certain parasite only when they enter the endemic area of that parasite[18]. As fish moves into a parasite's endemic zone, they become infected when they move out[19]. The parasite *L. polynemi* was reported only from Indian water, which shows that this parasite may endemic to the Indian waters and the present study is the first report of parasite from east coast of India.

Indian salmon is an economically valuable fish in India. In the marine environment, it has been demonstrated that

individual fish may suffer from parasitic attacks[20]. As a result of interaction, parasites may have a wide range of detrimental effects on exploitable fish stocks, reducing the number of host due to mortality, fecundity, condition or market value. Parasites were mainly concerned with growth and host reproduction[21]. Their effects on kidney tissue were studied by Monterosso[22], who made detailed observations. The head penetrates through muscle to the dorsal aorta or brachial arteries, causing connective tissue hypertrophy and the formation of blood-filled lacunae. Parasitization often leads to loss of blood and affected fish are almost below average weight[23].

E. tetradactylum investigated in the present study for the copepod parasitic infection is a highly valuable fish. The prevalence and mean intensity range is differ from season to season and higher parasitic intensity has been noticed in monsoon season. Due to the heavy parasitic attack the fish will suffer and its economical value or the marketability may reduce.

Conflict of interest statement

We declare that we have no conflict of interest.

Acknowledgements

This work was supported by MOES major project (Ref. No. 36/OOIS/SIBER/07) and UGC major project (F.No. 39-569/2010 (SR)). We also thank the fisherman of Pazhayar for the specimen supply. We are grateful to the Director of the CAS in Marine Biology, Annamalai University for the constant encouragement and the facilities provided.

Comments

Back ground

Among the marine fish parasites, nearly 25% are crustaceans which are mainly represented by copepod, brachiura and isopod. Among Copepods, Siphonostomatoida contains 20 genera, most of which are known as mesoparasites. Several species of this family have negative impacts on commercially important fishes and it has been well documented by researchers. However, information about the seasonal prevalence and intensity of *L. polynemi* infestation on *E. tetradactylum* is lacking.

Research frontier

The manuscript deals with some important aspects: investigation of the seasonal prevalence and intensity of copepod parasite *L. polynemi* on *E. tetradactylum* and the relationship between *L. polynemi* infestation on *E.*

tetradactylum and season. The authors investigated huge number of Indian salmon (3335) in four different seasons.

Related reports

Recently the genus *Lernaeenics* (parasite) was reported by Gopalakrishnan *et al.* (2010). Vijayakumar *et al.* (2013) studied *L. hemiramphi* infestation on *Hemiramphus far* and *Hemiramphus lutkei*.

Innovations

Published information regarding the seasonal prevalence and intensity of copepod parasite *L. polynemi* on Indian salmon *E. tetradactylum* is lacking. This study has showed that the parasitic prevalence and intensity is related to season and higher parasitic intensity has been noticed in the monsoon season.

Applications

It is important to know that the *L. polynemi* has a significant parasitic effect on *E. tetradactylum*. A *L. polynemi* parasitic effect is related to season. *E. tetradactylum* is highly affected by *L. polynemi* in the monsoon time. This result can be used for the management of *E. tetradactylum*. This research also gives direction of future research on *L. polynemi* parasite especially what are the most important factors that affect the seasonal variation of *L. polynemi* infection on *E. tetradactylum*.

Comments

This is a good study in which the authors describe the seasonal prevalence and intensity of copepod parasite (*L. polynemi*) on Indian salmon. The study is very straight forward. The results and conclusion of the study is almost clear.

References

- [1] Pavanelli GC, Eiras JC, Takemoto RM. *Fish diseases: prevention, diagnosis and treatment*. Parana: Editorada State University of Maringa; 1998, p. 264.
- [2] Boxshall GA, Halsey SH. *An introduction to copepod diversity*. London: The Ray Society; 2004, p. 966.
- [3] Kabata Z, Bullock GL, Conroy DA, Sang S, Anderson DP, Wedemeyer GA, et al. *Diseases of fishes: crustacea as enemies of fishes*. New York: Tropical Fish Hobbyist Publications; 1970.
- [4] Kabata Z. Copepoda (Crustacea) parasitic on fishes: problems and perspectives. *Adv Parasit* 1981; **19**: 1–71.
- [5] Kirtisinghe P. Two new parasitic copepods from Ceylon. *Parasitol* 1932; **24**: 548–551.
- [6] Kirtisinghe P. *Gloiopotes watsoni* n.sp. and *Lernaeenicus seeri* n.sp., parasitic copepods of fish from Ceylon. *Prasitol* 1934; **26**: 173–175.
- [7] Kirtisinghe P. Parasitic copepods of fish from Ceylon. II. *Prasitol* 1937; **29**: 435–452.
- [8] Rangnekar MP. Copepods parasitic on fishes of Bombay. 1. *Lernaeopodoida*. *J Univ Bombay* 1960; **29**: 198–200.
- [9] Wilson CB. *North American parasitic copepods belonging to the Lernaeidae with a revision of the entire family*. New York: Government Printing Office; 1917.
- [10] Gopalakrishnan A, Rajkumar M, Sun J, Trilles JP. Occurrence of double parasitism on black-barred halfbeak fish from the southeast coast of India. *Chin J Oceanol Limnol* 2010; **28**: 832–835.
- [11] Vijayakumar R, Raja K, Velvizhi S, Sinduja K, Gopalakrishnan A. Occurrence of heavy copepod infestation on *Hemiramphus lutkei* and double parasitisms on *Hemiramphus far* with copepod (*Lernaeenicus hemiramphi*) and isopod (*Mothocya plagulophora*). *J Parasit Dis* 2013; doi: 10.1007/s12639-012-0222-0.
- [12] Bassett-Smith. Some new parasitic copepod found on fish at Bombay. *Ann Mag Nat Hist* 1898; **1**: 1–17.
- [13] Margolis L, Esch GW, Holmes JC, Kuris AM, Schad GA. The use of ecological terms in parasitology (report of an ad hoc Committee of the American Society of Parasitologists). *J Parasitol* 1982; **68**: 131–133.
- [14] Poulin R, Morand S. *Parasite biodiversity*. Washington DC: Smithsonian Institution Press; 2004.
- [15] Luque JL, Poulin R. Metazoan parasite species richness in neotropical fishes: hotspots and the geography of biodiversity. *Parasitol* 2007; **134**: 865–878.
- [16] Becheikh S, Rousset V, Maamouri F, B Hassine OK, Raibaut A. Pathological effects of *Peroderma cylindricum* (Copepoda: Pennellidae) on the kidneys of its pilchard host, *Sardina pilchardus* (Osteichthyes: Clupeidae), from Tunisian coasts. *Dis Aquat Organ* 1997; **28**: 51–59.
- [17] Brooker AJ, Shinn AP, Bron JE. A review of the biology of the parasitic copepod *Lernaeocera branchialis* (L., 1767) (Copepoda: Pennellidae). *Adv Parasitol* 2007; **65**: 297–341.
- [18] MacKenzie K, Abaunza P. Parasites as biological tags for stocks discrimination of marine fish: a guide to procedures and methods. *Fish Res* 1998; **38**: 45–56.
- [19] Lester RJ, Sewell KB, Barnes A, Evans K. Stock discrimination of orange roughy, *Hoplostethus atlanticus*, by parasite analysis. *Mar Biol* 1988; **99**: 137–143.
- [20] Faliex E, Morand S. Population dynamics of the metacercarial stage of the bucephalid trematode, *Labatrema minimus* (Stossich, 1887) from Salses–Leucate lagoon (France) during the cercarial shedding period. *J Helminthol* 1994; **168**: 35–40.
- [21] Ben SJ, Ben HO. [Ecological aspects of the copepodoses of the sardine, *Sardina pilchardus* (Walbaum, 1792) of the Tunisian coasts]. *Journal of the Faculty of Sciences of Tunis (Ser D)* 1992; 1–2. French.
- [22] Motomura H, Iwatsuki Y, Kimura S, Yoshino T. Revision of the Indo–West Pacific polynemid fish genus *Eleutheronema* (Teleostei: Perciformes). *Ichthyol Res* 2002; **49**: 47–61.
- [23] Kabata Z. *Lernaeocera obtusa* n. sp. its biology and its effects on the haddock. *Mar Res* 1958; **3**: 1–26.