



Two new host records of the cymothoid isopods from Rameswaram Island, southeast coast of India

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Abstract Cymothoid isopods are parasitic crustaceans that are considered as a potential threat to the health of different fish species, which eventually lead to economic loss to the fisherman's society. For the first time, cymothoid isopods *Nerocila sundaica* and *Nerocila poruvae* infested on the two new host fish species viz., *Eleutheronema tetradactylum* and *Setipinna taty*, which were collected from Rameswaram Island, Southeast coast of India. Being an ectoparasite, *N. sundaica* was found attached on the gill chamber of *E. tetradactylum*, while *N. poruvae* was attached on the body surface of *S. taty*. The standard length 10–250 cm body mass was established for the new host species, and the parasitologic indexes were calculated.

Keywords Cymothoid isopods · Ectoparasites · Infestation · *Nerocila* sp.

Introduction

Cymothoids (Crustacea, Isopoda) are parasitic isopods inhabiting various parts of fish on the skin, on the fins, in the buccal or branchial cavities, and sometimes in a pouch; the family of Cymothoidae is among the largest of parasitic isopod families (< 10 mm and > 50 mm in length) with 380 species been recorded (Smit et al. 2014). They are

mostly pelagic at their young stage, and the adults are parasitic in nature (Rameshkumar et al. 2015), thus causing larger wounds, stunted growth, and sometimes death to their hosts (Trilles 1964; Bunkley-Williams and Williams 1998; Tsai et al. 1999) by feeding on the host's mucus, tissues, and blood and inflict fatal injuries through secondary infection (Margolis et al. 1975; Oktener and Sezgin 2000). Mouthparts of cymothoids are highly modified and specialized for feeding the hosts' blood and are often asymmetric in nature (Brusca 1981; Thatcher 2000).

Though reports on Cymothoid isopods are scattered in the literature, many parts of the world are still incompletely known or even completely unknown (Hadfield et al. 2010). A global level catalogue on Cymothoidae was provided (Trilles 1994) and emphasized the lack of information on fish parasitic isopods specifically in Eastern Africa, Northern Africa, South Africa, South America, and Asia. Until now, few studies reported that the parasites *Nerocila* sp. were collected from Indian marine fishes (Pillai 1954, 1964; Ravichandran et al. 2010; Trilles et al. 2011, Rameshkumar et al. 2011, 2012a, b). To the best of our knowledge, this is the first report on the identification of two new host species of *Nerocila sundaica* and *Nerocila poruvae* infestation in *Eleutheronema tetradactylum* and *Setipinna taty*, which were collected from Rameswaram Island, Southeast coast of India.

Materials and methods

The infested fishes were collected from Rameswaram fish landing center during 2018 (Latitude 09°16'864" N and Longitude 079°18'908" E) and are shown in Fig. 1. Eighty individuals of *E. tetradactylum* and fifty-four individuals of *S. taty* were collected and brought to the laboratory for

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Fig. 1 Map showing the study area

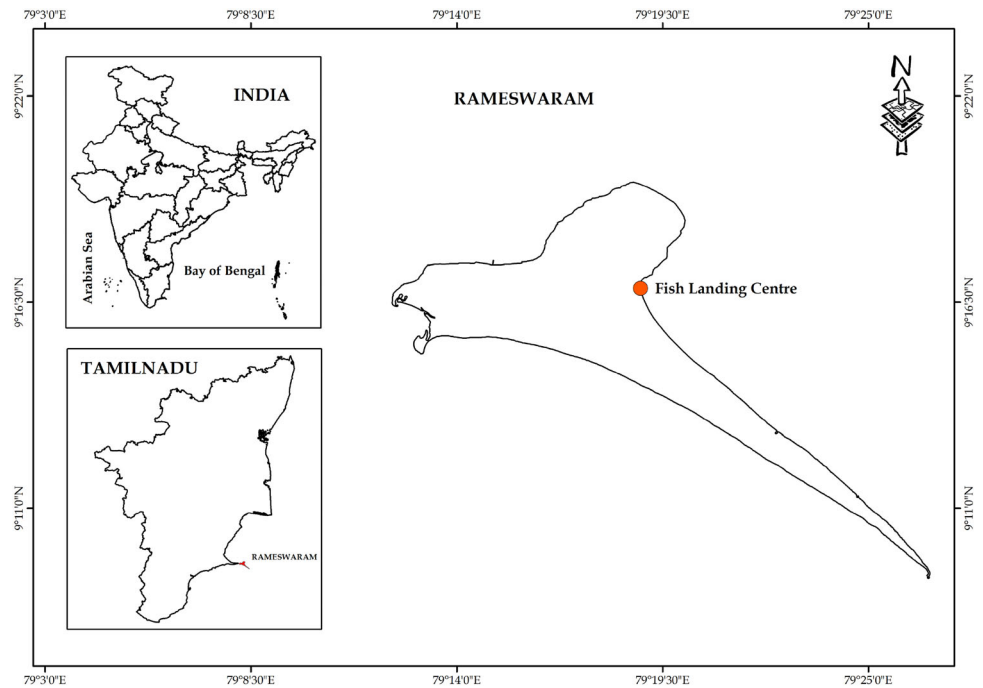


Table 1 Parasitological features of cymothoids collected from Rameswaram

Host fishes	Cymothoid isopods	Attachment site	Total length of the host fish (cm)	Total length of the Cymothoid isopod (cm)	No. of fishes examined	No. of infested fish	Prevalence (%)
<i>E. tetradactylum</i>	<i>N. sundaica</i>	Gills chamber	21–50	2.6–2.9	80	5	6.25
<i>S. taty</i>	<i>N. poruvae</i>	Body surface	10–18	2.3 – 2.5	54	3	5.55

analysis. The isopod parasites were immediately removed from the hosts and were fixed in 70% ethanol for further use. The identification was done based on the protocols given by Bowman (1978) for *N. sundaica* and Rameshkumar et al. (2011) for *N. poruvae*, respectively. The host fish were identified based on the FAO fish identification manuals and described based on Froese and Pauly (2011) and the FISHBASE database (www.fishbase.org). After completion of work, the specimen of Cymothoid isopods was stored at the Institutional museum, Centre of Advance Study in Marine biology, Annamalai University, Parangipettai.

Results

The Cymothoid isopod parasites of *N. sundaica* and *N. poruvae* were infested on *E. tetradactylum* and *S. taty*, respectively. Parasite infested host fishes length and weight was measured, such as *E. tetradactylum* was ranged from

21 to 50 cm and 70 to 1290 g and *S. taty* was ranged from 10 to 18 cm and 130 to 450 g) respectively, host fishes were identified based on phenotypic and meristematic characters. Eighty individuals of *E. tetradactylum* were examined, of which five specimens were found to be parasitized, followed by fifty-four individuals of *S. taty* that were collected, of which three fish were infested with *N. poruvae*. The prevalence of *N. sundaica* is 6.25% in *E. tetradactylum*, and 5.55% of prevalence in *N. poruvae* from the host of *S. taty* (Table 1). Whitish *N. sundaica* was found in the gill chamber of *E. tetradactylum* (Fig. 2), the parasite size was ranged from 2.6 to 2.9 cm long. *N. poruvae* was attached on the body surface of *S. taty*, the parasitic colour was varied, anterior part of dorsal region and entire ventral region shows whitish in colour, however posterior part of dorsal segments shows gray in colour, size of the parasite was ranged between 2.6 and 2.9 cm (Fig. 3). The gill filaments and the body of the infested fish showed significant damage of recent and chronic wounds, which is clearly exhibits the prolonged parasitic infestations (Fig. 2b, c).

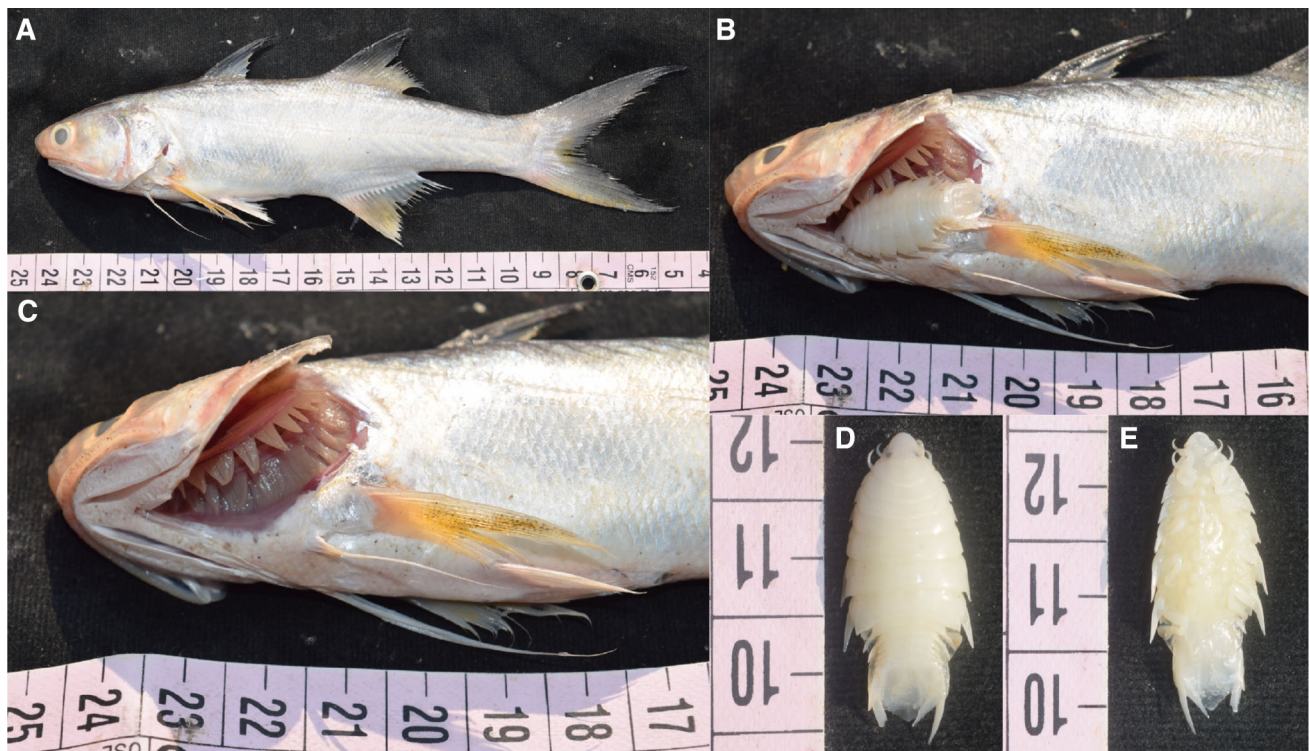


Fig. 2 *N. sundaica* attached with *E. tetradactylum* (a), *N. sundaica* infested in gill chamber (b), gill chamber of host infested (c), dorsal and ventral views of cymothoid isopod (d, e).

The highest infestation of two numbers of isopodes (both species) were collected from both species of single host, but maximum wound patches were observed on *S. taty*, than *E. tetradactylum*. *N. sundaica* was made dark reddish deep wounds by ingesting the host gill filaments, *N. poruvae* also made deep wound by eating the host trunk muscle around the attachment, wound size was ranged from 0.7 to 1.4 cm in diameter.

Nerocila poruvae

Seven posterolateral pereonite extended backward with pointed process, and reaching the anterior margin of fifth pleonite. the processus of the pleonite extended towards posteriorly and almost parallel to the body. Exopod of the uropod twisted and inwarded. Hence, the exopod tip did not visible on the dorsal view.

Nerocila sundaica

Body about 2.5 times longer than comprehensive. Anterior region of the cephalon rounded with indistinct median point. Pereonites 1 and 5–7 lengthier where as 2–4 the shorter and subequal. Pereonites long posteriorly and visible on dorsal view. Coxae 5–7 longer and broader than the 1–4 with sharp posterior margin. Pleonites visible; 1 and 5

wider and 5 also longer. Antennula posteriorly extended to pleonites. Antenna with 11 segments and ciliated. Pereopods 1–5 without spines but pereopods 6 with 2 spines on posterior margin of carpus and 1 spine on propodus and also pereopod 7 with 1 spine on posterior and 1 spine on anterior margin of merus, 2 spines on posterior margin. based on the key characteristics the present study confirm that *N. poruvae*.

Discussion

Cymothoid isopods are the leading group of the fish crustacean parasites and recently documented as an important constituent of worldwide biodiversity. Though the parasites are economically significant and reported to cause deleterious effects on the fish such as stunted growth, anemia, and mortality of fries and fingerlings, researchers paid much attention on the identification of new species and their parasitological index, host-parasite relationship, their specific characteristics, and so on. In the present study, we recorded the two Cymothoid isopods infested on the two new host species i.e. *N. sundaica* infested on *E. tetradactylum*, while *N. poruvae* infested on *S. taty*. Trilles et al. (2011) reported that *N. sudaica* was found attached on the body surface, gill chamber, and the buccal cavity of

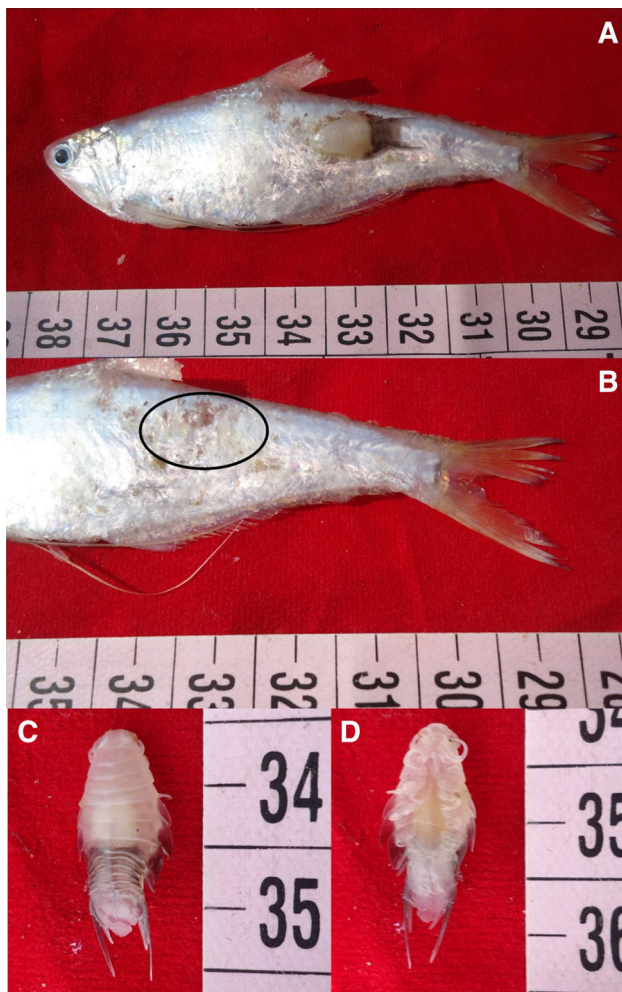


Fig. 3 *N. poruvae* attached on *S. taty* (a), circle showing the wounds on the skin (b), dorsal and ventral views of Cymothoid isopod (c, d)

marine fishes. The earlier report showed that *N. sundaica* was found on the body surface of *Carangoides malabaricus*, *Ilisha melastoma*, *Otolithes ruber*, *Selaroides leptolepis*, *Terapon puta*, *Opisthopterus tardoore*, *Siaena* sp., *Eleutheronema* sp., and *Mugil* sp. (Bruce and Harrison-Nelson 1988; Trilles et al. 2013). The present study first time reported that the parasitic isopod *N. sundaica* was attached on the gill chamber of *E. tetradactylum*, and this study coincides with the report of Parimala (1984), which showed that *Nerocila phaiopleura* (as *Nerocila pigmentata*) was found attached inside the opercular chamber of *Nematalosa nasus*. Moreover, *Caligus hirsutus* and *Lernaenicus polynemi* was reported to be the common copepods that often infest *E. tetradactylum* species in Indian coastal waters (Bassett-Smith 1898; Bharadhirajan et al. 2013). The infestation of *N. sundaica* on the gill chamber of *E. tetradactylum* may cause respiratory problems, and the color of the gill chamber was found pale due the heavy loss of blood, which may lead to anemia. The

present investigation coincided with that of Romestand et al. (1977) and Romestand (1979) who found the erosion of gill lamellae, damage of gill rakers, and pale gills that were the severe gross lesions observed as a consequence of isopod infestation.

Though limited reports were available on *N. poruvae* infestation, Rameshkumar et al. (2011) reported that *N. poruvae* were parasitized in *Trichirus lepturus* and *Thryssa mystax*. Hence, by considering the earlier reports with the present study, it was first reported that *N. sundaica* parasitized in the gill of *E. tetradactylum* and *N. poruvae* in the body surface of *S. taty*. Infestation of *N. poruvae* on *S. taty* resulted in skin and tissue damage. Ravichandran et al. (2001) and Ravichandran and Ajith Kumar (2007) reported that the damage of organ and tissue may cause osmoregulatory problems and act as a vector for pathogens such as viruses, bacteria, blood-borne protozoa, and nematodes.

Conclusion

The present study was first reported that *N. sundaica* parasitized in the gill of *E. tetradactylum* and *N. poruvae* in the body surface of *S. taty* and the parasitic crustaceans that are considered as a potential threat to the health of different fish species, which eventually lead to economic loss to the fisherman's society.

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Conflict of interest All authors declare no conflicts of interest

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