

Occurrence of cymothoid isopod from Miri, East Malaysian marine fishes

A. Anand Kumar · Ganapathy Rameshkumar ·
Samuthirapandian Ravichandran · E. Rethna Priya ·
Ramasamy Nagarajan · Alex Goh Kwang Leng

Received: 16 May 2013 / Accepted: 22 May 2013 / Published online: 9 June 2013
© Indian Society for Parasitology 2013

Abstract To identify the isopod parasite, which has been recorded from Miri, East Malaysian marine fishes. During the present study, four cymothoid isopods are reported three genera, including *Cymothoa eremita*, *Lobothorax typus*, *Nerocila longispina* and *Nerocila loveni*. *Nerocila longispina* and *N. loveni* are also previously reported from Malaysia and two additional cymothoids *C. eremita* and *L. typus* are reported for the first record of Miri coast, East Malaysia. New hosts were identified for *N. loveni* on *Chirocentrus dorab* for the first time in the world fauna. The Parasitological indexes were calculated. The site of attachment of the parasites on their hosts was also observed. These parasites can cause the damage in gill, eye and internal organ including swim bladder. Marine fish parasitology is a rapidly developing field of aquatic science.

Keywords Cymothoid · Isopod · Miri coast · Marine fishes · Occurrence

A. Anand Kumar · R. Nagarajan
Department of Applied Geology, School of Engineering and Science, Curtin University, CDT 250, 98009 Miri, Sarawak, Malaysia

G. Rameshkumar (✉) · S. Ravichandran · E. R. Priya
Centre of Advanced Study in Marine Biology, Faculty of Marine Science, Annamalai University, Parangipettai 608 502, Tamil Nadu, India
e-mail: grkumarcas@gmail.com

A. G. K. Leng
Department of Electrical and Computer Engineering, School of Engineering and Science, Curtin University, CDT 250, 98009 Miri, Sarawak, Malaysia

Introduction

Cymothoid isopods are a widespread family of blood-feeding crustaceans that parasitize both marine and fresh-water fishes in South America, Asia, Africa and Australia (Trilles et al. 2011; Rameshkumar et al. 2011, 2012, 2013). They are responsible for causing large wounds, stunted growth and sometimes death in their hosts (Bunkley-Williams and Williams 1998). The parasites also affected the stability of their host requiring them to expend more energy just to keep upright (Östlund-Nilsson et al. 2005). These isopods are potentially economically important parasites as they have been shown to cause detrimental effects on fish in captivity including growth inhibition, anaemia and death in smaller fish (Adlard and Lester 1995). Parasitism by cymothoids has also been found to decrease fecundity in adults (Fogelman et al. 2009). Other sub-lethal effects include anemia (Adlard and Lester 1995) and tissue damage (Bunkley-Williams and Williams 1998) in hosts. Still several parts of the world where cymothoid fauna is poorly known or even completely unknown. There are currently relatively few studies on parasitic cymothoids in Malaysia. Therefore, the objective of the present study was to identify the isopod parasite, which has been recorded from Miri, East Malaysian marine fishes with parasitologic indexes, host species and geographical distribution are reported for each.

Materials and methods

Fishes were collected directly from the trawlers from landed at Miri (Latitude 4°29'38.72"N and Longitude 113°59'46.19"E) which is located East Malaysia (Fig. 1). They were examined for ectoparasites during March 2013.

Standard methods were followed for collection, fixation and identification of parasites isopods were removed alive from the body surface and the buccal cavities of the fish hosts and immediately placed into 70 % ethanol. The taxonomy and fish names were updated according to Froese and Pauly (2011). The host species, the site of attachment and the geographical distribution of parasites were noted. The specimens of this cymothoid isopod is preserved in personal collection were deposited at the Curtin University, Sarawak campus, Miri. Their total length and fish length measurements are in centimetres were described in (Table 1). Fish host were not preserved.

Results and discussion

The cymothoid isopods were removed from the buccal regions and body surface of the infected fishes (Fig. 2A–E). Cymothoid isopods were identified following protocols described by (Briinnich 1783; Bleeker 1857; Miers 1880; Bovallius 1887). During the present study, four cymothoid isopods are reported three genera, including *Cymothoa eremita*, *Lobothorax typus*, *Nerocila longispina* and *Nerocila loveni*. The positions of attachment of the

parasites were also observed. Two cymothoid isopod genera, *Cymothoa* and *Lobothorax* from the buccal cavities in the fishes *Psettodes erumei* and *Trichiurus lepturus*. At the site of attachment, the cymothoid isopod *Nerocila* from the body surface of the infected fishes *Terapon puta*, *Otolithes ruber* and *Chirocentrus dorab* were identified. No tissue damage and no other effects were noticed on fish hosts. Already *N. longispina* and *N. loveni* are previously reported from Malaysia and two additional cymothoids *C. eremita* and *L. typus* are reported for the first record of Miri coast, East Malaysia. In the present study, a new host record of this cymothoid isopod *N. loveni* on the host *C. dorab* for the first time in the world fauna.

Cymothoa eremita is comparatively a large species. The parasite was attached in such a way that its broader posterior part was lodged in the wider portion of the floor of the buccal cavity and its narrow anterior part either located towards the mouth or protruding from the mouth (Rameshkumar et al. 2012). Moreover, with the exception of *C. eremita*, the validity of some of these species must be considered questionable, details of their morphology being until now poorly known or unknown (Bowman and Tareen 1983; Trilles 1994). Trilles (1994) suggested synonymising *C. limbata* with *C. eremita* and after reviewing the type of drawings of *C. limbata*, this synonymisation seems viable but a personal observation of the holotype would be necessary for absolute confidence in this regard. *Cymothoa eremita* is very widely distributed in the Indo-Pacific. Accepting Trilles (1994) synonymy, the distribution of this species ranged from Japan through the Pescadores, the Philippines and Indonesia to the Cape York Peninsula, Australia and East to the Society Islands. It has been also reported from Singapore, Malaysia and Bangkok, Ceylon, Indian Peninsula from Madras to Bombay, Mauritius, Seychelles and Red sea. Its range is extended to Miri coast. It has been recorded on several fish previously, *Arothron leopardus*, *Hime japonica*, *Pampus argenteus*, *Pampus cinereus*, *Parastromateus niger*, *Peprilus paru*, *Psettodes erumei*, *Siganus canaliculatus* and *Sphyræna obtusata*, were recorded by several authors as compiled by Trilles (1994).

Lobothorax typus remains one of the more poorly known genera of the Cymothoidae. These specimens agree well with the description provided by Bleeker (1857) from Batavia (Jakarta). *Lobothorax typus* is widely distributed Jakarta, Java, Indonesia (as Batavia, Bleeker 1857; Schioedte and Meinert 1883), Ubay, Philippines (Schioedte and Meinert 1883; Trilles 2008), South China Sea (Yu and Bruce 2006), Parangipettai, Southeast coast of India (Rameshkumar et al. 2013). Now here is extended to the coast of Miri from the previous record, the hosts were *Lepturacanthus savala* (Bleeker, 1857) and *Trichiurus lepturus* (Rameshkumar et al. 2013). In the present study,

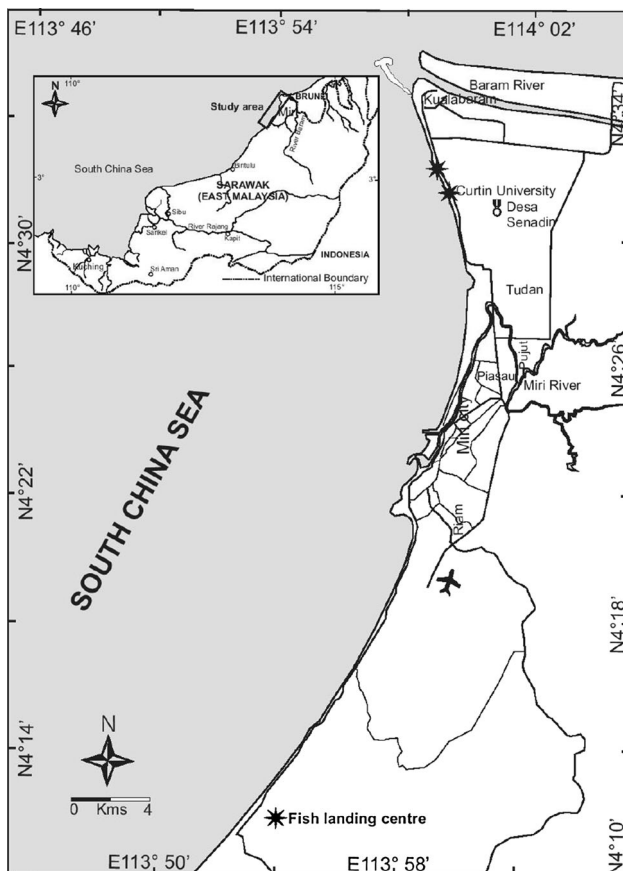


Fig. 1 Study area

Fig. 2 **A** *Cymothoa eremita* in *Psettodes erumei*. **B** *Lobothorax typus* in *Trichiurus lepturus*. **C** *Nerocila longispina* on *Terapon puta*. **D** *Nerocila longispina* on *Otolithes ruber*. **E** *Nerocila loveni* on *Chirocentrus dorab*



Table 1 Parasitological index of the cymothoids collected from Miri coast

Name of the parasites	Host	Location in the host	Date of collection	Size of the host (cm)	Size of the parasite (cm)	No of fishes examined	No of parasites collected
<i>Cymothoa eremita</i>	<i>Psettodes erumei</i>	Buccal cavity	09.03.13	23.4	2.8	25	1
<i>Lobothorax typus</i>	<i>Trichiurus lepturus</i>	Buccal cavity	09.03.13	60.2	3.1	32	1
<i>Nerocila longispina</i>	<i>Terapon puta</i>	Body surface	09.03.13	8.2	2.3	68	2
<i>Nerocila loveni</i>	<i>Chirocentrus dorab</i>	Body surface	09.03.13	30.5	2.1	29	1
<i>Nerocila loveni</i>	<i>Otolithes ruber</i>	Body surface	09.03.13	13	2.4	43	2

this species was reported from the same fish in the south-east coast.

Nerocila is a large genus of the family Cymothoidae including at least 65 species living attached on the skin or on the fins of fishes. Until now few studies were performed on *Nerocila* genus collected from marine fishes (Rameshkumar et al. 2011, 2013; Trilles et al. 2013). *Nerocila longispina* belongs to the Emphyllia group of species (Bowman and Tareen 1983; Bruce and Harrison-Nelson 1988). *Nerocila longispina* differs from *Nerocila sundaica* in having the lateral margin of uropod endopod finely serrate, the coxae 5–7 more strongly angled away from the lateral margin of the body, the posterolateral angles of pereonite 7 weakly produced instead backward into a pointed process as in *Nerocila sundaica* (Rameshkumar et al. 2011). Previously recorded from the two hosts are identified: *Terapon puta* and *Otolithes ruber* (Rameshkumar et al. 2011). In the present study, *N. longispina* isopods parasites are reported in a same host species of are *Terapon puta* and *Otolithes ruber* along Miri coast. *Nerocila longispina*, were collected from the body surface, on the head, on the pectoral fin or from the caudal peduncle of hosts (Trilles et al. 2013). However, in the present investigation *N. longispina* was attached on the opercular region of *Terapon puta* and *Otolithes ruber*, distributed to Malaysian region (Miers 1880; Bruce and Harrison-Nelson 1988; Malabar, Java (Ellis 1981), Vedaranyam coast, Southeastern India (Rameshkumar et al. 2011; Trilles et al. 2013).

Nerocila loveni (Bovallius 1887) can be distinguished from *N. depressa* by having the coxae and pereonite posterolateral extensions bent dorsally and expressed laterally rather than posteriorly (Bruce and Harrison-Nelson 1988), distributed in the northern central Indo-Pacific region: Java coasts (Bovallius 1887), Batavia and Siam gulf (Nierstrasz 1915, 1931; Trilles 1979, 1994), Singapore, Thailand, Borneo and Sarawak (Bruce and Harrison-Nelson 1988), Nagapattinam, Southeast coast of India (Rameshkumar et al. 2013). *Nerocila loveni*, were attached on the caudal peduncle or on the caudal fin of the fishes (Rameshkumar et al. 2013; Trilles et al. 2013). But in the present study the site of attachment, the *N. loveni* from the

body surface of the infected fish *C. dorab* were identified. Until now only recorded from *Leiognathus* sp. (Bruce and Harrison-Nelson 1988). In the present study collected from the body surface of *C. dorab* are new host for the world fauna.

Cymothoid isopods have been studied for many years. They are found in various parts of the buccal region and fish body, including internal organs, gills even in fins. These parasites can cause the damage in gill, eye and internal organ including swim bladder. Marine fish parasitology is a rapidly developing field of aquatic science. Parasitic isopods are fairly common Crustacean infestations of wild marine fish species of Malaysia (Bruce and Harrison-Nelson 1988). In this study, four Cymothoid species were observed in Malaysian marine fishes. This study revealed for the first time the presence of two *C. eremita* and *L. typus* species from Miri Coast of Malaysia. The distribution of parasitic isopods is closely related to the occurrence and ecology of their hosts.

Acknowledgments The first author wishes to express his gratefulness to Curtin Sarawak Research Institute Academic Grant (CSRI 1011: Ramasamy Nagarajan).

References

- Adlard RD, Lester RJG (1995) The life-cycle and biology of *Anilocra pomacentri* (Isopoda, Cymothoidae), an ectoparasitic isopod of the coral-reef fish, *Chromis nitida* (Perciformes, Pomacentridae). *Aus J Zoo* 43:271–281
- Bleeker P (1857) Recherches sur les Crustacés de l'Inde Archipelagique. II. Sur les Isopodes Cymothoïdiens de l'Archipel Indien. *Natuurkundige vereeniging in Nederlandsche-Indie. Verhandelingen, Batavia* 2:20–40, pls 1–2
- Bovallius C (1887) New or imperfectly known Isopoda. Part III—Bihang till Kongelige svenska Vetenskapsakademiens. *Handlingar* 18(4):1–21 pi. 1–4
- Bowman TE, Tareen IU (1983) Cymothoidae from fishes of Kuwait (Arabian Gulf) (Crustacea: Isopoda). *Smith Contrib to Zoo* 382:1–30
- Briinnich Th (1783) Den barbugede Pampelfish (*Coryphaena apus*) en nye Art, og dens Giaest, Strukketolden (*Oniscus eremitd*) en Opdagelse af Dr. Konig paa Madrass. *Nye Samling af del Kongelige Danske Videnskabsnes Selskabs Skrifter* 2:319–325
- Bruce NL, Harrison-Nelson EB (1988) New records of fish parasitic marine isopod Crustaceans (Cymothoidae, subfamily Anilocrinae)

- from the Indo-West Pacific. Proc Biol Soc Washington 101:585–602
- Bunkley-Williams L, Williams EH Jr (1998) Isopods associated with fishes: a synopsis and corrections. J Parasitol 84:893–896
- Fogelman RM, Kuris AM, Grutter AS (2009) Parasitic castration of a vertebrate: effect of the cymothoid isopod, *Anilocra apogonae*, on the five-lined cardinalfish, *Cheilodipterus quinquelineatus*. Int J Parasitol 39:577–583
- Froese R, Pauly D (2011) FishBase: World Wide Web electronic publication. <http://Fishbase.Org>, version (3/2011). Accessed 20 March 2011
- Miers EJ (1880) On a collection of Crustacea from the Malaysian Region. Part IV. Penaeidea, Stomatopoda, Isopoda, Suctoria and Xiphosura. Ann and Magaz Nat Hist 5, Ser. 5, no. XXX, note XLI, 457–472, pls XV
- Nierstrasz HF (1915) Die Isopoden-Sammlung im Naturhistorischen Reichsmuseum zu Leiden, 1. Zoologische Mededeelingen, Rijks van Nat Hist Leiden, pp 71–108, pls 3–4
- Nierstrasz HF (1931) Die Isopoden der Siboga-Expedition. 3. Isopoda Genuina. 2. Flabellifera. Siboga-Expeditie, Monograph XXXIIc:123–233
- Östlund-Nilsson S, Curtis L, Nilsson GE, Grutter AS (2005) Parasitic isopod *Anilocra apogonae*, a drag for the cardinal fish *Cheilodipterus quinquelineatus*. Mar Ecol Prog Ser 287:209–216
- Rameshkumar G, Ravichandran S, Trilles JP (2011) Cymothoidae (Crustacea, Isopoda) from Indian fishes. Acta Parasitol 56(1):78–91
- Rameshkumar G, Ravichandran S, Trilles JP (2012) Observation on an isopod parasitizing the edible fish *Parastromateus niger* in the Parangipettai coast of India. J Environ Biol 33(2):191–193
- Rameshkumar G, Ravichandran S, Sivasubramanian K, Trilles JP (2013) New occurrence of parasitic isopods from Indian fishes. J Parasit Dis 37(1):42–46
- Schioedte JC, Meinert F (1883) Symbolae ad Monographiam Cymothoarum Crustaceorum Isopodum Familiae III. Saophridae IV. Ceratothoinae. Naturhistorisk Tidsskrift, Ser. III 13:281–378 pls 11–16
- Trilles JP (1979) Les Cymothoidae (Isopoda, Flabellifera; parasites des poissons) du Rijksmuseum van Natuurlijke Histoire te Leiden. II. Afrique, Amerique et regions Indo-Ouest-Pacifique-Zoologische Mededeelingen, Rijks van Nat Hist Leiden 54: 245–275
- Trilles JP (1994) Les Cymothoidae (Crustacea, Isopoda) du Monde (Prodrome pour une Faune). Studia Mar 21/22:5–288
- Trilles JP (2008) Some marine isopods from the Senckenberg Research Institute (Frankfurt am Main, Germany) (Crustacea, Isopoda: Cymothoidae, Aegidae, Corallanidae, Cirolanidae). Senckenberg Biol 88:21–28 pl. 1
- Trilles J, Ravichandran S, Rameshkumar G (2011) A checklist of the Cymothoidae (Crustacea, Isopoda) recorded from Indian fishes. Acta Parasitol 56(4):446–459
- Trilles JP, Rameshkumar G, Ravichandran S (2013) *Nerocila* species (Crustacea, Isopoda, Cymothoidae) from Indian marine fishes. Parasitol Res 112(3):1273–1286
- Yu HY, Bruce NL (2006) Redescription of *Lobothorax typus*, bleeker, 1857 (Isopoda, cymothoidae): the first record of the species and genus from Chinese waters. Crustaceana 79(6):641–648