

New occurrence of parasitic isopods from Indian fishes

Ganapathy Rameshkumar · Samuthirapandian Ravichandran ·
Kanagasabapathy Sivasubramanian ·
Jean-Paul Trilles

Received: 12 January 2012 / Accepted: 28 May 2012 / Published online: 17 June 2012
© Indian Society for Parasitology 2012

Abstract Until now, 36 species belonging to the family Cymothoidae (Crustacea, Isopoda) were recorded from Indian fishes. In this study, ten additional cymothoids are reported in India, most of them for the first time. They parasitize nine fish species, several of them being new host species.

Keywords Cymothoidae · Parasitic isopods ·
Host fishes · India

Introduction

Cymothoidae are ectoparasitic isopods infesting many tropical and temperate fishes worldwide. They are blood feeding. Several species settle in the buccal cavity of the fish host, others are attached in the gill chambers, on the surface of the body, often on the fins. Studies on cymothoids parasitizing Indian marine fishes are scanty. However,

47 nominal species corresponding to 36 valid species infesting hosts belonging to 34 fish families were until now recorded from India (Trilles et al. 2011). In this study, ten additional cymothoids are reported from nine Indian fishes.

Materials and methods

One thousand and seven hundred and twenty-eight specimens belonging to several fish families and nine species, from the Nagapattinam, Muthupettai, Agatti Island (Lakshadweep), Muttam, Mudasalodai and Parangipettai coasts of India were examined during the years 2010–2011. They were caught with nets. The cymothoid specimens were preserved in 70 % alcohol. They were identified according to Trilles (1979), Avdeev (1979), Bowman and Tareen (1983), Bruce (1986, 1990), Bruce and Harrison-Nelson (1988), Yu and Bruce (2006). The overall prevalence was calculated. The host species, the site of attachment and the geographical distribution of parasites were noted. All specimens were deposited in the collection of the Annamalai University (AUCR, Collection Ravichandran). The taxonomy and fish names were updated according to Froese and Pauly (2011).

Results

In the present study, ten species are reported (Table 1; Fig. 1A–J). Nine of them, *Cymothoa parupenei*, *C. frontalis*, *C. bychowskyi*, *Joryma sawayah*, *Lobothorax typus*, *Nerocila arres*, *N. loveni*, *Norileca indica* and *Mothocya* sp. are recorded for the first time from India. The species *Nerocila sigani* was already reported from Tamil Nadu, India by Bruce and Harrison-Nelson (1988).

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

J.-P. Trilles
Equipe Adaptation Ecophysiologique et Ontogenèse, UMR 5119
(CNRS-UM2-IRD-UM1-IFREMER), Université Montpellier 2,
CC. 092, Place E. Bataillon, 34095 Montpellier Cedex 05,
France

Table 1 Parasitological indexes of the collected Indian Cymothoidae

Parasite species	Hosts species	Number of fish examined	Number of fish infested	Prevalence	Locality
<i>Cymothoa parupenei</i> Avdeev 1979	<i>Upeneus sulphureus</i>	17	1	5.9	Nagapattinam
<i>Cymothoa frontalis</i> Milne Edwards 1840	<i>Strongylura leiura</i>	14	1	7.1	Muthupettai
<i>Cymothoa bychowskyi</i> Avdeev 1979	<i>Fistularia villosa</i>	38	3	7.9	Agatti Island, Lakshadweep
<i>Joryma sawayah</i> Bowman and Tareen 1983	<i>Ilisha melastoma</i>	496	88	17.7	Muttam
<i>Lobothorax typus</i> Bleeker 1857	<i>Trichiurus lepturus</i>	398	50	12.6	Parangipettai
<i>Mothocya</i> sp.	<i>Strongylura leiura</i>	16	1	6.3	Parangipettai
<i>Nerocila arres</i> Bowman and Tareen 1983	<i>Nemipterus japonicus</i>	201	18	9.0	Nagapattinam
<i>Nerocila loveni</i> Bovallius 1887	<i>Eubleekeria splendens</i>	347	39	11.2	Nagapattinam
<i>Nerocila sigani</i> Bowman and Tareen 1983	<i>Siganus oramin</i>	23	2	8.6	Mudasalodai
<i>Norileca indica</i> (Milne Edwards 1840)	<i>Rastrelliger kanagurta</i>	178	8	4.5	Parangipettai
Total		1728	211	12.2	

Order Isopoda

Family Cymothoidae Leach 1814

Genus *Cymothoa* Fabricius 1793

Cymothoa parupenei Avdeev 1979 Material: One female of *Cymothoa parupenei* was collected from the buccal region of 1 of 17 *Upeneus sulphureus* (Mullidae) ($P = 5.9\%$) at Nagapattinam.

Distribution: From waters of the Indian Ocean off Australia (Avdeev 1979).

Hosts: Until now, this species was only recorded from *Parupeneus spilurus* (Avdeev 1979).

Cymothoa frontalis Milne Edwards (1840) Material: One female *Cymothoa frontalis* was collected from the branchial cavity of 1 of 14 specimens of *Strongylura leiura* (Belonidae) ($P = 7.1\%$) from the coast of Muthupettai.

Distribution: *Cymothoa frontalis* has been reported from the Indian Ocean (Milne Edwards 1840; White 1847; Trilles 1975), particularly at Singapore (Heller 1868), Bangkok (Schioedte and Meinert 1884; Trilles 1975) and from the western Australia (Avdeev 1978). This species was also doubtfully recorded from the Pacific Ocean, at Oahu (Hawaii), by Dana (1853).

Hosts: Until now, this species was only recorded “on the gills of *Cyclopterus*” (White 1847).

Cymothoa bychowskyi Avdeev 1979 Material: Three pairs of specimens (female and male) were found in the mouth of 3 of 38 *Fistularia villosa* (Fistulariidae) ($P = 7.9\%$) from the coast of Agatti island, Lakshadweep.

Distribution: *Cymothoa bychowskyi* was firstly collected in fishes from waters of the Indian Ocean off Australia (Avdeev 1979) and later from Okinawan coral reef fishes, in Japan (Williams et al. 1996).

Hosts: *Cymothoa bychowskyi* was found parasitizing particularly cornet fishes, *Fistularia villosa*, and *Fistularia petimba* (Avdeev 1979; Williams et al. 1996).

Genus *Joryma* Bowman and Tareen 1983

Joryma sawayah Bowman and Tareen 1983 Material: The species *Joryma sawayah* was collected in the branchial cavities of 88 of 496 *Ilisha melastoma* (Pristigasteridae) ($P = 17.7\%$) from the Muttam.

Distribution: Until now, this species was recorded from Kuwait, South of Faylaka, Doha and “Gord of Oha” (Bowman and Tareen 1983).

Hosts: Previously collected from the gills of *Ilisha indica* and *Therapon* (= *Terapon*) *puta* (Bowman and Tareen 1983).

Genus *Lobothorax* Bleeker 1857

Lobothorax typus Bleeker 1857 Material: *Lobothorax typus* was collected from the mouth of 50 of 398 *Trichiurus lepturus* (Trichiuridae) ($P = 12.6\%$) from the coast of Parangipettai.

Distribution: 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).

Hosts: *Lepturacanthus savala* was the only host until now recorded.

A *Cymothoa parupenei*B *Cymothoa frontalis*C *Cymothoa bychowskyi*D *Joryma sawayah*E *Lobothorax typus*F *Mothocya* sp.G *Nerocila arres*H *Nerocila loveni*I *Nerocila sigani*J *Norileca indica*

Fig. 1 (a–j): New collected Indian Cymothoidae: **a** *Cymothoa parupenei*, **b** *Cymothoa frontalis*, **c** *Cymothoa bychowskyi*, **d** *Joryma sawayah*, **e** *Lobothorax typus*, **f** *Mothocya* sp., **g** *Nerocila arres*, **h** *Nerocila loveni*, **i** *Nerocila sigani*, **j** *Norileca indica*

Genus *Nerocila* Leach 1818

Nerocila arres Bowman and Tareen 1983 Material: *Nerocila arres* was collected on the caudal peduncle of 18 of 201 *Nemipterus japonicus* (Nemip-

teridae) ($P = 9.0\%$) from the coast of Nagapattinam.

Distribution: Until now, this species was only reported from Kuwait, Seif fish market, Kuwait City and north of platform (Bowman and Tareen 1983).

Hosts: It was found on several host species, *Epinephalus* [sic] (= *Epinephelus*) *tauvina*, *Acanthopagrus latus*, *Nemipterus japonicus* and *Nemipterus tolu* (Bowman and Tareen 1983).

Nerocila loveni Bovallius 1887 Material: *Nerocila loveni* was collected from the caudal peduncle of 39 of 347 *Eubleekeria splendens* (Leiognathidae) ($P = 11.2\%$) from the coast of Nagapattinam.

Distribution: 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).

Hosts: Until now only recorded from *Leiognathus* sp. (Bruce and Harrison-Nelson 1988).

Nerocila sigani Bowman and Tareen 1983 Material: *Nerocila sigani* was collected on the caudal fin of 2 of 23 *Siganus oramin* (Siganidae) ($P = 8.6\%$) from the coast of Mudasalodai.

Distribution: This species was firstly reported from Kuwait (Bowman and Tareen 1983). After, it was doubtfully synonymized with *Nerocila arres* by Bruce and Harrison-Nelson (1988) and so, also recorded from the western Indian Ocean (Arabian Gulf, Red Sea, Madagascar and South Africa) and from the northern Indo-Pacific (Sri Lanka, Tamil Nadu, Bay of Bengal, Penang and Taiwan).

Hosts: Originally, previously only collected from *Siganus oramin* (Bowman and Tareen 1983). Later this species, was also recorded from *Argyrosoma* (*Argyrosomus*) *hololepidotus*, *Argyrosoma* (= *Pennahia*) *macrocephalus*, *Argyrosoma* (= *Atrubucca*) *nibe*, *Sciaenia* (= *Sciaena*) *dussumieri*, *Pomadasys* sp. and *Formio* (= *Parastromateus*) *niger* by Bruce and Harrison-Nelson (1988) according to the synonymy *Nerocila sigani*/*Nerocila arres* suggested by them.

Genus *Norileca* Bruce 1990

Norileca indica (Milne Edwards 1840) Material: *Norileca indica* was collected in the gill chamber of 8 of 178 *Rastrelliger kanagurta* (Scombridae) ($P = 4.5\%$) from the coast of Parangipettai.

Distribution: This species is widely distributed in Sumatra (Milne Edwards 1840), Sambelong (Heller 1868; Schioedte and Meinert 1884), Kohkram, Sumatra and Mariveles, Luzon Islands (Schioedte and Meinert 1884), Sekroë, New Guinea (Nierstrasz 1915), Sumatra, Batavia, Mayotte (Trilles 1976), north-western Australia (Avdeev 1978), “Sissie near Misool Stand” (Trilles 1979), off Mozambique and northwestern coasts of Madagascar (Rokicki 1982), in the Arafura Sea, off the Northern

Territory coast (Bruce 1990), in China (Yu and Li 2003), Philippines (Yamauchi et al. 2005) and Thailand (Nagasawa and Petchsupa 2009).

Hosts: *Norileca indica* was reported from several host species, *Atule malam* and *Rastrelliger kanagurta* (Avdeev 1978), *Selar crumenophthalmus* (Rokicki 1982), *Selar crumenophthalmus* and *Herklotichthyes* sp. (Bruce 1990), *Herklotichthyes* sp. (Yu and Li 2003), *Coryphaena hippurus* (Yamauchi et al. 2005), *Selar crumenophthalmus* (Nagasawa and Petchsupa 2009).

Genus *Mothocya* Costa in Hope (1851)

Mothocya sp. Material: A female was collected from the branchial cavity of 1 of 16 *Strongylura leiura* (Belonidae) ($P = 6.3\%$) from the coast of Parangipettai.

Acknowledgments 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, Annamalai University, Parangipettai for providing facilities and encouragement.

References

- Avdeev VV (1978) Notes on the distribution of the marine Cymothoidae (Isopoda, Crustacea) in the Australian–New Zealand region. *Folia Parasitol* 25:281–283
- Avdeev VV (1979) New species of the genus *Cymothoa* (Isopoda, Cymothoidae) from the coastal regions of Northern and North-Western Australia. *Parazitologiya* (In Russian) 13:50–55
- Bleeker P (1857) Recherches sur les Crustacés de l’Inde Archipelagique. II. Sur les Isopodes Cymothoadiens 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 Zoo* 382: 1–30
- Bruce NL (1986) Revision of the isopod crustacean genus *Mothocya* Costa, in Hope, 1851 (Cymothoidae: Flabellifera), parasitic on marine fishes. *J Nat Hist* 20:1089–1192
- Bruce NL (1990) The genera *Catoessa*, *Elthusa*, *Enispa*, *Ichthyoxenus*, *Idusa*, *Livoneca* and *Norileca* n.gen. (Isopoda, Cymothoidae), crustacean parasites of marine fishes, with descriptions of eastern Australian species. *Rec Aust Mus* 42(3):247–300
- 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 Wash* 101: 585–602
- Costa A (1851) Caratteri di alcuni de’generi e specie nuove segnete nel presente catalogo. In: Hope F W (ed) *Catalogo dei crostacei Italiani e di molti altri de Mediterraneo, Napoli Stabilemento Tipografico di Fr. Azzilono, Napoli*, pp 1–48, pl. 1
- Dana J D (1853) Crustacea. Part II. Fam. I Cymothoidae. In: *United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842, under the command of Charles Wilkes, U.S.N., XIV:746–765, pls 49–50*

- Fabricius JC (1793) *Entomologica systemica emendata et acuta, Secundum classes, ordines, genera, species, adjectis synonymis, locis, observationibus, descriptionibus*, vol 2. C.G. Proft, Hafniae, pp viii 519
- Froese R, Pauly D (2011) FishBase: World Wide Web electronic publication. Available from: <http://Fishbase.Org>, version (3/2011) Accessed 20 March 2011
- Heller C (1868) Crustaceen, Ordo Isopoda. In: Reise der Österreichischen Fregatte Novara um die Erde in den Jahren 1857, 1858, 1859 unter den Befehlen des Commodore B. von Wüllerstorff-Urbair. Zoologischer Theil, Zweiter Band, III Abtheilung. Aus der Kaiserlich-Königlichen Hof- und Staatsdruckerei, Wien, pp 130–147
- Leach WE (1814) Crustaceology. In: D.Brewster (ed) *The Encyclopaedia*, Edinburgh, vol.VII, Blackwood, Edinburgh, pp 385–437, Pt. II
- Leach WE (1818) Cymothoidae. In: F. Cuvier (ed) *Dictionnaire des Sciences Naturelles*, vol 12. Strasbourg, Paris, pp 338–354
- Milne Edwards HM (1840) *Histoire Naturelle des Crustacés comprenant l' anatomie, laphysiologie et la classification de ces animaux* III. Librairie Encyclopédique de Roret, Paris, pp 1–605
- Nagasawa K, Petchsupa N (2009) *Norileca indica* (Isopoda, Cymothoidae) Parasitic on Bigeye Scad *Selar crumenophthalmus* in Thailand. *Biogeography* 11:131–133
- Nierstrasz HF (1915) Die Isopoden-Sammlung im Naturhistorischen Reichsmuseum zu Leiden, 1. Zoo.Med. Rijks 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
- Rokicki J (1982) *Lironeca indica* Edwards, 1840 (Crustacea, Isopoda) from *Selar crumenophthalmus* (Bloch). *Wiad Parazytol* 38: 205–206 2 pis
- 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
- Schioedte JC, Meinert F (1884) *Symbolae ad Monographiam Cymothoarum Crustaceorum* Isopodum Familiae IV. Cymothoidae, Trib. II. Cymothoinae. Trib III Livonecinae. *Naturhistorisk Tidsskrift, Ser. III* 14:221–454 pls 6–18
- Trilles JP (1975) Les Cymothoidae (Isopoda, Flabellifera) des collections du Muséum National d'Histoire Naturelle de Paris. II. Les Anilocridae Schioedte et Meinert, 1881. Genre *Anilocra* Leach, 1818 et *Nerocila* Leach, 1818. *Bulletin du Museum National d'histoire Naturelle Paris* (3) 290 (Zool. 200):303–346, pls I–III
- Trilles JP (1976) Les Cymothoidae (Isopoda, Flabellifera) des cotes Francaises. III. Les Lironecinae Schiodte et Meinert, 1884. *Bull du Mus Nat d'hist Nat Paris* 3-serie, no. 392. *Zoologie* 272: 801–820
- 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, Rijk van Nat Hist Leiden 54: 245–275
- Trilles JP (1994) Les Cymothoidae (Crustacea, Isopoda) du Monde/Prodrôme pour une Faune. *Studia Marina* 21/22 (1/2):1–288 (for 1991)
- Trilles JP (2008) Some marine isopods from the Senckenberg Research Institute (Frankfurt am Main, Germany) (Crustacea, Isopoda: Cymothoidae, Aegidae, Corallanidae, Cirolanidae). *Senck Biol* 88:21–28 pl. 1
- Trilles JP, Ravichandran S, Rameshkumar G (2011) A checklist of the Cymothoidae (Crustacea, Isopoda) recorded from Indian fishes. *Acta Parasitol* 56(4):446–459
- White A (1847) List of the specimens of Crustacea in the collection of the British Museum, London. Printed by order of the Trustees, London
- Williams EH Jr, Bunkley-Williams L, Dyer WG (1996) Metazoan parasites of some Okinawan coral reef fishes with general comparison to the parasites of Caribbean coral reef fishes. *Galaxea* 13:1–13
- Yamauchi T, Ohtsuka S, Nagasawa K (2005) Ectoparasitic Isopod, *Norileca indica* (Crustacea, Isopoda, Cymothoidae), obtained from the Stomach of *Coryphaena hippurus* (Perciformes, Coryphaeniidae) in the Philippines. *Biogeography* 7:25–27
- 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
- Yu HY, Li XZ (2003) Study on the Cymothoidae from Chinese waters. *Stud Mar Sin* 45:223–238