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An annotated checklist of the family Cymothoidae (Isopoda: Cymothooidea) infesting marine fishes from Malaysian waters, with new host and geographical records

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Abstract

A checklist of parasitic cymothoids from Malaysian waters is presented based on available literature and material collected from 2010 to 2020. Most of the collected specimens were recorded from waters of Terengganu, east coast of Peninsular Malaysia (facing South China Sea), whereas literature records were represented from Sarawak, along the Miri coast of northwest Borneo. The checklist comprises 18 species under 10 genera, seven of which are new records from Malaysia, which includes *Anilocra nemipteri* Bruce, 1987; *Ceratothoa barracuda* Martin, Bruce and Nowak, 2015; *Ceratothoa carinata* (Bianconi, 1869); *Cymothoa epimerica* Avdeev, 1979; *Elthusa sigani* Bruce, 1990; *Joryma engraulidis* (Barnard, 1936) and *Renocila richardsonae* Williams and Bunkley-Williams, 1992. Eight new host records are based on collected specimens: *Anilocra nemipteri* was dorsally attached on *Nemipterus nemurus* (Bleeker 1857), *Nemipterus nematophorus* (Bleeker 1854), *Nemipterus tambuloides* (Bleeker 1853), and *Nemipterus thosaporni* Russell 1991 (family Nemipteridae); *Ceratothoa carinata* was found in the buccal cavity of *Decapterus macrosoma* Bleeker 1851 (family Carangidae); *Cymothoa eremita* (Brunnich, 1783) was attached in the buccal cavity of *Nemipterus tambuloides* and *Nemipterus furcosus* (Valenciennes 1830); *Elthusa sigani* was found attached on *Pterois russelli* Bennett 1831 (family Scorpaenidae); and *Renocila richardsonae* was attached on the caudal fin of *Upeneus japonicus* (Houttuyn 1782) (family Mullidae). All cymothoid species listed here are known to have a Central Indo Pacific distribution, with some ranging as far as the western Indian Ocean. The cymothoid-host association is here listed from 28 fish families, with the most common reported from Carangidae (pompanos, jack mackerels, runners, scads), Engraulidae (anchovies) and Leiognathidae (ponyfishes, slipmouths). This paper is the first comprehensive treatment to update both verified literature data and deposited specimens, with a key for the family Cymothoidae in Malaysian waters.

Keywords: Cymothoida, marine fish parasite, South China Sea, east coast Malaysia, crustacean fish parasite.

Introduction

Cymothoid isopods are parasitic crustaceans that can severely affect harvested fishes in both fisheries and aquaculture and cause global economic losses (Nowak et al. 2020). Attributing to the fact that cymothoids are ubiquitous in freshwater, brackish and predominantly marine waters, these parasites can be found on commercial and non-commercial fishes. To date, 380 verified species under 46 genera (excluding nomen dubium and taxon inquirendum) have been recorded and listed on the World Register for Marine Species (Boyko et al. 2008 onwards), with increasing evidence of cymothoids displaying high host and site-specificity. Although there is no clear evidence on host morphological or behavioral influences towards cymothoid-host preferences (Smit et al. 2014), it has been postulated that some cymothoids are inclined to select hosts of similar ecological or ecosystem preferences between varying latitudes, with increased specificity within the tropics (Brusca 1981). In addition, the nature and distribution of the host may predispose cymothoid geographical occurrence. Hence, some cymothoids such as *Glossobius auritus* Bovallius, 1885 and *Glossobius impressus* (Say, 1818) may display extensive geographical occurrence (Martin et al. 2015b), while others such as *Cinusa tetradontis* Schioedte & Meinert, 1884 have only been recorded in waters from South Africa (Hadfield et al. 2010).

Though there has been significant development on cymothoid taxonomic research worldwide, regional documentation has been inconsistent and sporadic in certain areas. A map of the marine cymothoid distribution by Smit et al. (2014) showed skewed results, with the highest diversity represented within the tropical regions of the Central Indo-Pacific realm, followed by the Western Indo-Pacific and Tropical Atlantic realm. While the highest cymothoids biodiversity are centred on the tropics, the low account of recorded species from the temperate regions and other tropical realms (e.g. Eastern Indo-Pacific and Tropical Eastern Pacific) reflects a region that is poorly understudied rather than low biodiversity (Trilles 1994, Poore and Bruce 2012, Smit et al. 2014). As of the twentieth century, specialists that have contributed to the taxonomic knowledge of cymothoids on a regional basis are accredited to the works of Thatcher for freshwater cymothoids of South American (see examples in Thatcher et al. 2003 a, b, c, 2009); Brusca for cymothoids of the Eastern Pacific region (see examples in Brusca 1978a, b, 1981); Williams and Bunkley-Williams for the Eastern Atlantic and the Caribbean (e.g. Bunkley Williams and Williams 1981; Williams and Bunkley-Williams 1992; Bunkley-Williams et al. 2006); Smit and Hadfield for the southern African region (e.g.

Hadfield et al. 2010, 2013, 2014, 2015, 2016; Van der Wal et al. 2019); Bruce for Australia and neighboring islands (e.g. Bruce 1987a, b, c, 1990, 2007); and more recently the works of Aneesh, Rameshkumar and Ravichandran for cymothoids of Indian waters (Aneesh et al. 2015, 2016, 2019a–d, 2020a, b, 2021a, b; Rameshkumar et al. 2012, 2013a, b, c; Ravichandran et al. 2010a, b, 2019).

Notwithstanding the point that the Central Indo-Pacific has the highest cymothoid diversity records worldwide, Malaysia accounts for little contribution towards this data. Strategically located at the Indo-Malaysian triangle (Wallace et al. 2003), its waters are exposed to a plethora of ecosystems (rocky and sandy intertidal shores, mangroves, sea grass, coral reefs). Despite the lack of consistent and adequate sampling, the isopod fauna can be expected to increase in due course with the aid of more human resources and expertise. Minimal cymothoid records specific to the Malaysian region are attributed to records from Lanchester (1902) during his *Skeat Expedition* to Peninsular Malaysia and Anand Kumar et al. (2015, 2017) for cymothoids off the coast of Miri in Borneo. Unfortunately, the type specimen for *Cymothoa pulchrum* Lanchester, 1902 could not be located (see Martin et al. 2016) and material examined by Anand Kumar et al. (2015, 2017) were not deposited in any established museums or repository, and one could only rely on their published photographs and have been noted to have misidentification in their record.

Bruce and Wong (2015) have strongly indicated that there have been few historic accounts for isopods from South East Asia. Ergo, despite being far from comprehensive, the authors hope that this list will serve as an initial effort for verifying and locating examined material for cymothoid specimens from Malaysian waters.

Materials and methods

The cymothoid species listed in this checklist are a compilation of the three known literature records from Malaysian waters (Lanchester 1902; Anand Kumar et al. 2015, 2017); collections from sampling effort; and donated specimens to the repository. Some of these collections are opportunistic sampling from University Malaysia Terengganu's field trips using small local fish traps called *bubu ikan* around the coastal areas of Terengganu waters (facing the South China Sea), demersal resource survey expeditions by the Fisheries Research Institute research vessel in Sarawak (2010) and MV SEAFDEC 2 in the EEZ waters of the east coast of Peninsular Malaysia (2016) which used fish trawl nets. All sampled cymothoid isopods were removed by hand or forceps and fixed in 70% ethanol. Examinations of the specimens were aided with the use of a compound microscope Olympus SZX7 and photography was completed using Nikon D750 (Lense Nikon AF-S VR Mikro-NIKKOR 105mm f/2.8G). Methods for appendages dissection follow Martin et al. (2013, 2014a, b). Host nomenclature and distributions (references excluded) were verified from Fishbase (Froese and Pauly 2019 and Catalogue of Fishes (Fricke et al. 2020). Specimens were registered at the South China Sea Repository and Reference Centre, Universiti Malaysia Terengganu, Malaysia (SCS-RRC), with the reference code "UMTCrus". Taxa without examined specimens were based on the literature records

Abbreviations: **BMNH**—British Museum of Natural History, London; **EEZ**—Exclusive Economic zone; **MNHN**—Museum Nationale d'Histoire Naturelle, Paris, France; **MTQ-QM**—Museum of Tropical Queensland, Townsville, Australia; **MV SEAFDEC**—Marine Vessel Southeast Asia Fisheries Development Center; **NMV**—Museum of Victoria, Melbourne, Australia; **NZC-ZSI**—Zoological Survey of India; **RMNH**—Rijksmuseum von Natuurlijke Historie (National Museum of Natural History), Leiden, Netherlands; **SAMC**—South African Museum, Cape Town; **SCS-RRC**—South China Sea Repository and Reference Centre, Universiti Malaysia Terengganu, Malaysia; **TINRO**—Russian Pacific Federal Fisheries Research Institute, Vladivostok; **USNM**—National Museum of Natural History; Smithsonian Institution; Washington DC; **UMTCrus**—University Malaysia Terengganu_Crustacea, Universiti Malaysia Terengganu, Malaysia; **ZMUC**—Zoological Museum, University of Copenhagen, Denmark.

Results

Present annotated checklist is based on published literature (Lanchester 1902; Anand Kumar et al. 2015, 2017); expeditions along the South China Sea and off the coast of Miri, donated specimens and opportunistic field trips from 2010 to 2020. There are 10 genera and 18 species of cymothoids from this region, of which seven are new locality records: *Anilocra nemipteri* Bruce, 1987; *Ceratothoa barracuda* Martin, Bruce and Nowak, 2015; *Ceratothoa carinata* (Bianconi, 1869); *Cymothoa epimerica* Avdeev, 1979; *Elthusa sigani* Bruce, 1990; *Joryma engraulidis* (Barnard, 1936) and *Renocila richardsonae* Williams and Bunkley-Williams, 1992. The majority of species belong to the genus *Nerocila* Leach, 1818 (five); followed by *Cymothoa* Fabricius, 1793 (three); *Catoessa* Schioedte and Meinert, 1884, *Ceratothoa* Dana, 1852 (two each); and *Anilocra* Leach, 1818, *Elthusa* Schioedte and Meinert, 1884, *Joryma* (Barnard, 1936), *Lobothorax* Bleeker, 1857, *Norileca* Bruce, 1990 and *Renocila* Miers, 1880 (one each). A key for the genera *Nerocila* and *Cymothoa* of the Malaysian region are provided prior to the list of species within the genus. Eight new host records are based on collected specimens from Malaysian waters and have been listed together with other known cymothoid host–association in table 1.

Systematics

Order Isopoda

Suborder Cymothoida

Superfamily Cymothooidea

Family Cymothoidae

Key to Genera of the Family Cymothoida in Malaysian waters

1. Antennula length shorter than antenna; maxilliped palp article 3 slender, with setae; dactyli shorter than propodus. *Elthusa* Schiöedte & Meinert, 1884
- Antennula and antenna subequal length; maxilliped palp article 3 robust, without setae; dactyli longer than propodus. 2
2. Body strongly vaulted; anterolateral margins of pereonite 1 shorter or reaching anterior margin of rostrum, without prominent lobes. *Cymothoa* Fabricius, 1793
- Body weakly vaulted; anterolateral margins of pereonite 1 longer beyond rostrum, with prominent lobes. 3
3. Cephalon deeply immersed in pereonite 1; coxae shorter than respective pereonites; pereonite 7 partly overlaps pleonite 1. *Lobothorax* Bleeker, 1857
- Cephalon weakly or not immersed in pereonite 1; coxae similar or longer than respective segment; pereonite 7 overlaps pleonite 1 4
4. Uropod shorter than pleotelson; pleonite lateral and ventrolateral margins produced. *Joryma* Bowman & Tareen, 1983
- Uropod longer than pleotelson length; pleonite lateral and ventrolateral margins not produced. 5
5. Body widest at pereonite 4 or 5; pleotelson rounded. 6
- Body widest at pereonite 6; pleotelson rectangular or subtruncate. 7
6. Pereopod 5–7 basis without well-developed carina; pleon and pleotelson axially twisted against the pereon. *Catoessa* Schiöedte & Meinert, 1884
- Pereopods 5–7 basis with well-developed carina; pleon and pleotelson are not axially twisted against pereon. *Ceratothoa* Dana, 1852
7. Coxae 4–7 shorter than respective pereonite; body dorsoventrally vaulted. *Anilocra* Leach, 1818
- Coxae 4–7 similar or longer than respective pereonite; body dorsoventrally flattened. 8
8. Pleonites 1 and 2 ventrolateral margins produced. *Nerocila* Leach, 1818
- Pleonites 1 and 2 ventrolateral margins not produced. 9
9. Antennula subequal to, or shorter than antenna; coxae posteriorly rounded. *Norileca* Bruce, 1990
- Antennula as long as, or longer than antenna; coxae 5–7 posteriorly acute. *Renocila* Miers, 1880

Genus *Anilocra*, Leach, 1818

1) *Anilocra nemipteri* Bruce, 1987 (Figure 1 Ai-Aiv)

Anilocra nemipteri Bruce, 1987a: 106, figs. 15–17.—Roche, Strong, and Binning, 2013: 330–333.—Binning, Roche and Layton, 2013: 1–4.

Anilocra cavicauda —Beumer, Ashburner, Burbury, Jetté, Lahtam, 1982: 31, 58.

Not *Anilocra cavicauda* —Hale, 1926: 210, fig. 7.

Type material. Female holotype (NMV 112947). For a list of paratypes and other material examined refer to Bruce (1987a).

Type locality. Northwest Shelf, Western Australia

Type host. Recorded from *Nemipterus virgatus* (Houttuyn 1782)

Material examined. 13 ovig ♀ (30.63, 28.99, 27.29, 26.25, 25.66, 25.24, 24.71, 23.11, 23.07, 22.58, 22.01, 20.84, 18.23 mm TL; 10.66, 10.88, 8.57, 8.04, 8.43, 8.47, 8.02, 7.51, 7.66, 7.92, 7.05, 7.70, 6.37 mm W) [UMTCrus 01136, 01135, 01139, 01144, 01138, 01154, 01140, 01157, 01151, 01141, 01145, 01152, 01156], 4 mature ♂ (19.77, 18.46, 18.23, 12.96 mm TL; 5.68, 5.24, 6.37, 3.66 mm W) [UMTCrus 01142, 01143, 01159, 01137], 7 juvenile ♂ (13.09, 12.88, 12.57, 11.83, 11.63, 11.63, 11.63 mm TL; 4.25, 3.59, 3.77, 3.96, 4.78, 4.77, 4.76 mm W) [UMTCrus 01153, 01150, 01155, 01149, 01146, 01147, 01148], located at the South China Sea EEZ, leg 1, station 15 (06° 55' 85" N; 103° 34' 56" E) and station 10 (07° 04' 00" N; 103° 40' 47" E), 13 May 2016; attached to the upper dorsal skin of *Nemipterus nemurus* (Bleeker 1857), *Nemipterus nematophorus* (Bleeker 1854), *Nemipterus tambuloides* (Bleeker 1853), and *Nemipterus thosaporni* Russell 1991, coll. crew of MV SEAFDEC 2016.

Host. From families Nemipteridae and Pomacentridae in Bruce 1987a: *Nemipterus virgatus* (Houttuyn 1782), *Nemipterus tolu* [currently known as *Nemipterus peronii* (Valenciennes 1830)], *Scolopsis bilineatus* (Bloch 1793), *Scolopsis margaritifer* (Cuvier 1830), *Scolopsis monogramma* (Cuvier 1830), *Pentapodus setosus* (Valenciennes 1830), *Pomacentrus jerdoni* [= *Pristotis obtusirostris* (Günther 1862)].

Distribution. Australia: North West Shelf, Gulf of Carpentaria, Lizard Island, Great Barrier Reef Palm Group, (Bruce 1987a); Malaysia: Terengganu (current study).

Remarks. *Anilocra nemipteri* is here reported as a new locality record for Malaysian waters. It is readily recognised by the broad ovate body shape, short antennule and antenna, weakly developed pereopod nodules on the dactylus anterior margin, and pleonite 1 long with posteriorly directed posterolateral margins, and very dark brown to pale tan on both life and preserved specimens (Bruce 1987a).

It is evident that *Anilocra nemipteri* is host specific to the families Nemipteridae and Pomacentridae. Bruce (1987a) listed seven host species from the genera *Nemipterus*, *Scolopsis*, *Pentapodus* and *Pomacentrus*. During the MV SEAFDEC 2016 expedition, the crew collectively sampled these cymothoids from four new host species: *Nemipterus nemurus*, *Nemipterus nematophorus*, *Nemipterus tambuloides*, and *Nemipterus thosaporni*. Unfortunately, trawls that were hauled in from various sampling stations along South China Sea had all sorts of fishes that were later gathered in a single data by the crew. Ergo, it is impossible to keep track specifically which host specimens were found on the exact individual fish, as the nemipterids and pomacentrids are known to school together.

This species has minimal documentation on its taxonomy and biology since its description in 1987 and has only been known from Australia and now Malaysia. Roche et al. (2013) reported the prevalence (4.3%; range = 0–28%) of *Anilocra nemipteri* infecting the bridled monocle bream *Scolopsis bilineatus* on reefs surrounding Lizard Island on the northern Great Barrier Reef. Binning et al. (2013) used this species as a model parasite to exhibit that parasitised fish have higher standard metabolic rates (SMRs), poorer aerobic capacities and lower maximum swimming speeds than non-parasitised fish. Though adding a model parasite did not significantly affect SMR, it reduced swimming speed and increase oxygen consumption rates in naturally parasitised fish. This establishes that ectoparasites create drag effects that are important at high speeds.

Genus *Catoessa* Schioedte and Meinert, 1884

2) *Catoessa boscii* (Bleeker, 1857)

(Figure1 Bi-Biv)

Livoneca boscii Bleeker, 1856: 21, 29–30, pl. 1, fig. 9.—Schioedte and Meinert 1884: 365–367, pl. 15 (Cym. XXXIII), figs 7–8.—Nierstrasz 1931: 143, 145.

Lironeca boscii Miers 1880: 466–467. —Nierstrasz 1915: 100.—Trilles 1979: 265–266.—Trilles 1994: 174.

Catoessa boscii Bruce 1990: 251, 254.—Trilles, Ravichandran and Rameshkumar 2012: 181–188, figs 1–4.—Rameshkumar and Ravichandran, 2013: 119–120, figs 1, 2.—Rameshkumar, Ravichandran and Sivasubramanian, 2013b: 88–94.—Rameshkumar, Ravichandran and Ramesh, 2014c: 124–128, fig. 6.—Aneesh, Helna and Sudha, 2016: 1270–1277, fig. 1f.—Anand Kumar, Rameshkumar, Ravichandran, Nagarajan, Prabakaran and Ramesh, 2017: 3.—Ravichandran, Vigneshwaran and Rameshkumar, 2019: 14, figs 1d–f.

Joryma brachysoma. —Ravichandran, Rameshkumar and Balasubramanian, 2010a: 97–98, fig. 1.—Ravichandran, Sunitha and Rameshkumar, 2010b: 370–373, fig. 3.

Type material. Ovigerous female RMNH (No. I. 67) (see Trilles et al. 2012)

Type locality. Batavia Sea (= Java, Indonesia)

Type host. Bleeker (1857) did not specifically state the type host and site attachment except for a generic comment “Habite la peau de diverses especes depoissons” which translates to “Living on the skin of different host species”.

Material examined. 1 ovig ♀ (12.55 mm TL; 5.68 mm W) [UMTCrus01158], 1 mature ♂ (7.94 mm TL; 2.10 mm W) [UMTCrus01159], stretch of beach along the Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 05°24.927'S; 103°5.2531'E, 8 March 2020, coll. Yusri Yusuf.

Host. From families Carangidae and Engraulidae: *Stolephorus indicus* (van Hasselt 1823) (see Trilles 1979), *Carangoides malabaricus* (Bloch & Schneider 1801) (refer to Trilles et al. 2012), *Alectis indicus* (currently *Alectis indica*) *Alectis indica* (Rüppell 1830) (Anand Kumar et al. 2017), *Rastrelliger kanagurta* (Cuvier 1816) (Ravichandran et al 2019).

Distribution. Previously recorded from Indonesia (Bleeker 1857, Trilles 1979) southeast coast of India (Trilles et al. 2012; Ravichandran et al 2019), off the coast of Miri, Malaysia (Anand Kumar et al. 2017).

Remarks. The genus contains three other species known to occur from the Pacific and Indian Oceans: *Catoessa ambassae* Bruce, 1990 from Australia; *Catoessa gruneri* Bowman and Tareen, 1983 from Kuwait and India; and *Catoessa scabricauda* Schioedte and Meinert, 1884 from Indonesia. *Catoessa boscii* was only recently reported as a new record for Malaysia from Miri, Sarawak by Anand et al. (2017). The authors reported the species from Sarawak in the buccal cavity of hosts *Alectis indicus* (22% prevalence; 1.25 mean intensity).

3) *Catoessa gruneri* Bowman and Tareen, 1983

Catoessa gruneri Bowman and Tareen, 1983: 18–21, figs 14n, 15.—Bruce, 1990: 251.—Aneesh, Helna and Sudha, 2016: 1270–1277, fig. 1f.—Ravichandran, Vigneshwaran and Rameshkumar, 2019: 15, figs 1d–f.

Joryma brachysoma. —Anandkumar, Rameshkumar, Ravichandran, Nagarajan, Prabakaran and Ramesh, 2017: 55–60, fig. 2f.

Type material. Female holotype deposited at the National Museum of Natural History (USNM 191070). For other paratypes see Bowman and Tareen (1983).

Type locality. South of Faylaka, Kuwait Bay, Arabian Gulf

Type host. From the gills of *Aurigequula fasciata* (Lacepède 1803) (formerly written as *Leiognathus fasciatus*).

Host. From families Leiognathidae, Terapontidae and Pristigasteridae: *Leiognathus fasciatus* [currently *Aurigequula fasciata* (Lacepède 1803)] (see Bowman and Tareen 1983), *Ilisha melastoma* (Bloch & Schneider 1801), *Terapon puta* (Cuvier 1829), *Leiognathus daura* (currently accepted as *Karalla daura*) (Cuvier 1829) and *Eubleekeria splendens* (Cuvier 1829) (Aneesh et al. 2016; Ravichandran et al. 2019).

Distribution. Recorded from the Arabian Gulf, Kuwait (Bowman and Tareen 1983), India (Aneesh et al. 2016; Ravichandran et al. 2019); off the coast of Miri, Malaysia (Anand Kumar et al. 2017).

Remarks. *Catoessa gruneri* can be readily diagnosed by the pyriform cephalon; pereopods without carina on basis; shorter 2–6 coxae than their respective pereonites; pereonite 7 partly to nearly completely overlapping pleonite 1; narrower than rest of pleon, pleonites 2–5 as wide as pereonite 7; epimera laterally directed, rounded rostral point and posteriorly narrowed pleotelson; and uropods reaching posterior end of pleotelson (Ravichandran et al. 2019).

According to Aneesh et al. 2019b, Anandkumar et al.'s (2017) figure of *Joryma brachysoma* (Pillai, 1964) from the host *Netuma bilineata* in Sarawak, Malaysia is a misidentification and refers to *Catoessa gruneri* based on its morphological characteristics.

Genus *Ceratothoa* Dana, 1852

4) *Ceratothoa barracuda* Martin, Bruce and Nowak, 2015

(Figure 1 Ci-Civ)

Ceratothoa sp. 1.—Trilles, 1979: 269, pl. 2, fig. 13.

Ceratothoa barracuda Martin, Bruce and Nowak, 2015a: 261, figs. 5–8.

Material examined (). 1 ovig. ♀ (19 mm TL; 6 mm W) [UMTCrus 01160], 1 mature ♂ (7 mm TL; 3 mm W) [UMTCrus 01161], St 109, EEZ, 04° 44' 85" N; 104° 39' 45.18" E, 15 July 2016, from buccal-cavity of *Sphyræna fasteri*, coll. SEAFDEC.

Host. Only known from the family Sphyrænidae: bigeye barracuda *Sphyræna forsteri* (Cuvier 1829) (Martin et al. 2015a, present study).

Distribution. Present material collected from off the coast of Terengganu waters, facing the South China Sea. Previously known from northern Australia (Martin et al. 2015a), and West Papua (Trilles 1979). Based on the known host association and its distribution, *Ceratothoa barracuda* is likely to have an Indo-Pacific distribution: from East Africa and Southeast Asia to Japan and south of New Caledonia (Froese and Pauly 2019).

Remarks. *Ceratothoa barracuda* is here reported as a new locality record for Malaysian waters. The species is easily identified by the elongate body; subtriangular cephalon, subacute anterolateral projections on pereonite 1, pleotelson with a convex posterior margin, and pereopods 5–7 basis each with strong carinae and enlarged ischium (Martin et al. 2015a). *Ceratothoa barracuda* is most likened to *Ceratothoa carinata*, but *C. carinata* has a pleotelson with a strongly concave posterior margin, an enlarged ischium and basis only present on pereopod 7, and the articles distal to article 4 of the antennula are narrower than those of *C. barracuda* (Martin et al. 2015).

5) *Ceratothoa carinata* (Bianconi, 1869)

(Figure2 Di-Div)

Cymothoa carinata Bianconi, 1869: 210–211, pl. II, figs 2 (a–b). —Gerstaecker 1901: 258.

Cymothoa (Ceratothoa) carinata. —Hilgendorf 1879: 846.

Ceratothoa carinata. —Schioedte and Meinert 1883: 327–329, pl. XIII (Cym. XX) figs 1–2. —Trilles 1986: 623, tab. 1; 1994: 116–117; 2008: 23. —Kensley 2001: 232. —Bruce 2007: 278. —Martin, Bruce and Nowak 2013: 397–401, figs 1–3. —Nagasawa, Fukuda and Nishiyama 2014: 59–61, fig. 1. —Martin, Bruce and Nowak 2015a: 266–267. —Hadfield, Bruce and Smit 2016: 48–51, fig. 3.

Meinertia carinata. —Lanchester 1902: 378. —Stebbing 1910: 103–104. —Trilles 1972b: 1244–1245, 1256, pl. I, photos 5–7; 1972c: 3–7, photos 1–4. —Avdeev 1979b: 48, 50.

Codonophilus carinatus. —Nierstrasz 1931: 132.

Ceratothoa curvicauda Nunomura, 2006: 36–38, figs 12–13.

Ceratothoa sp. —Saito 2009: 7–9, photos 1–2.

Type material. Female neotype (SAMC-A085795); three female paratypes (SAMC-A085796) (see Hadfield et al. 2016)

Type locality. Maputo Bay, Mozambique (Hadfield et al. 2016)

Type host. From the buccal-cavity of *Selar crumenophthalmus* (Bloch 1793) (Hadfield et al. 2016)

Material examined (New record). 2 ♀ ovig. (33, 32 mm TL; 8, 8 mm W), LKIM Besut, Terengganu, 05°49.872'N; 102°33.714'E, 3 February 2020, from buccal cavity of shortfin scad (*Decapterus macrosoma*), coll. Norshida Ismail [UMTCrus01162, 01163].

Host. Predominantly from family Carangidae, and lesser known for Lutjanidae: *Lutjanus adetii* (Castelnau 1873) (previously *Lutjanus amabilis*) (Trilles 1972b, c); *Pseudocaranx dentex* (Bloch & Schneider 1801) (see Nunomura 2006); *Decapterus muroadsi* (Temminck & Schlegel 1844) (see Nunomura 2006, Saito 2009, Nagasawa et al. 2014); *Selar crumenophthalmus* (Bloch 1793) (see Martin et al. 2013) and *Decapterus macrosoma* Bleeker 1851 (present material).

Distribution. Western Indian Ocean and the southwest Pacific Ocean: Mozambique (Bianconi 1869, Hilgendorf 1879, Schioedte and Meinert 1883, Hadfield et al. 2016); Seychelles (Stebbing 1910); New Caledonia (Trilles 1972b, c, Bruce 2007); Red Sea (Trilles 2008); Japan (Nunomura 2006, Saito 2009, Nagasawa et al. 2014); Australia (Martin et al. 2013); Malaysia (present material).

Remarks. *Ceratothoa carinata* is here reported as a new locality record for Malaysian waters. Diagnostic characteristics of this species includes a medial ridge extending longitudinally along the dorsal pereon surface; laterally depressed and wider than long pleotelson; an enlarged carinate ischium and enlarged bulbous protrusion on the merus of pereonite 7; uropods reaching the distal edge of the pleotelson; and a concave pleotelson posterior margin (Martin et al. 2015a). *Ceratothoa trigonocephala* (Leach, 1818) and *Ceratothoa trillesi* (Avdeev, 1979b) are similar species to *Ceratothoa carinata*, but the former two have a narrow pleonite 1, shorter pleotelson with a generally convex posterior margin, a smooth and convex dorsum, and pereopod 7 lacks an enlarged ischium. Bianconi (1869) originally described this species as a single ovigerous female from Mozambique without the location of its deposition. Schioedte and Meinert (1883) later mentioned a specimen from the type locality deposited in the Zoologisches Museum, Museum für Naturkunde, Humboldt-Universität in Berlin, Germany. Hadfield et al. (2016) made enquiries to both the Zoologisches Museum and the Muséum National d'Histoire Naturelle, Natural History Museum in London regarding the whereabouts of the type specimen, but to no avail. In order to conform to the stability and universality of the species according to the International Code of Zoological Nomenclature, Hadfield et al. (2016) designated a new specimen from the type locality as a neotype and deposited it at the South African Museum in Cape Town.

Genus *Cymothoa* Fabricius, 1793

6) *Cymothoa epimerica* Avdeev, 1979

(Figure2 Ei-Eiv)

Cymothoa epimerica Avdeev, 1979a: 225, pl. 2–3.—Trilles, 1994: 139; 2008: 23.—Trilles & Bariche, 2006: 228.—Bruce, Lew, Ton & Poore, 2002: 175.—Hadfield, Bruce & Smit, 2013: 157.—Martin, Bruce & Nowak, 2016: 10, figs 3–8.

Cymothoa pulchra. —Yu & Li, 2003a: 228, fig. 5; 2003b: 267.

Type material. Female holotype (TINRO AGK 75023) (see Martin et al. 2016).

Type locality. Indian Ocean off Australia (Martin et al. 2016).

Type host. Malabar blood snapper *Lutjanus malabaricus* (Bloch & Schneider 1801) (Martin et al. 2016).

Material examined (New record). 2 ovig ♀ (22.23, 18.31 mm TL; 11.03, 7.33, mm W) [UMTCrus 01164, 01165], 5 mature ♂ (14.38, 13.43, 13.20, 12.90, 12.78 mm TL; 6.33, 4.83, 6.05, 5.52, 4.54 mm W) [UMTCrus 01166, 01169, 01167, 01168, 01170], 4 juvenile ♂ (9.25, 8.50, 7.18, 7.15 mm TL; 3.86, 3.08, 3.44, 2.90 mm W) [UMTCrus 01171, 01174, 01172, 01173]; leg 4, ST 121, EEZ, 04° 19' 38" N; 103° 43' 50" E, 18 June 2016 via bottom trawl.

Host. Host specimens for this study were not recorded by the SEAFDEC expedition crew, but were previously recorded from the family Serranidae: *Epinephelus coioides* (Hamilton 1822) (Martin et al. 2016) and family Lutjanidae: *Lutjanus malabaricus* (Bloch & Schneider 1801) (Avdeev 1979a).

Distribution. Northern Territory, Australia (Martin et al. 2016); South China Sea, Peninsular Malaysia (present material).

Remarks. *Cymothoa epimerica* is here reported as a new locality record for Malaysian waters. The species has an ovoid body; subtriangular cephalon deeply immersed in pereonite 1; pereonite 1 anterolateral margins deeply curved towards cephalon; pereopods 5–7 superior proximal margin with acute carinae and dorsally visible; and coxae 6 and 7 posteroventral margins acute and dorsally visible (Martin et al. 2016). Our female specimens are very much similar to the illustrations and photographs provided by Martin et al. (2016), with the distinctively visible pereonite 1 margins and acute coxae 6 and 7 posteroventral margins, which is not as prominent in *Cymothoa eremita* or *Cymothoa pulchrum*.

Cymothoa epimerica from Seychelles (SMF-76) and the Red Sea (SMF-567 and SMF-572) without host association or illustrations has been documented by Trilles (2008) and briefly mentioned the similarities of *Cymothoa epimerica* and *Cymothoa curta*. *C. epimerica* and *C. curta* have a similar ovoid body, pleotelson posterior margin rounded and cephalon immersed in pereonite 1. *C. curta* differs from *C. epimerica* in the small and acute anterolateral margins of pereonite 1; posterolateral margins of coxae rounded and not dorsally visible; pereopod 6 basis superior proximal margin rounded; pereopod 7 basis highly raised and broad; uropodal rami broader than *C. epimerica*, uropod apices rounded; and the smooth mesial and lateral margins of pleopods 1-5. (Martin et al. 2016)

7) *Cymothoa eremita* (Brunnich, 1783)

(Figure 2 Fi-Fiv)

Oniscus oestrum. — Spengler 1775: 312, pl. 7 (figs. i–k).

Oniscus eremita Brünnich, 1783: 319.

Cymothoa leschenaultii Leach, 1818: 352.—Desmarest, 1825: 309.

Cymothoa mathoei Leach, 1818: 353; Desmarest, 1825: 309.

Cymothoamathoei. — Milne Edwards, 1840: 270.—Hilgendorf, 1869: 114.—Gerstaecker, 1901: 182, 258.

Cymothoa leschenaultii. —White, 1847: 109.—Miers, 1880: 461.—Ellis, 1981: 124.

Cymothoa matthaei [sic]. —White, 1847: 110.—Bleeker, 1857: 22.

Cymothoa mathaei. —Lucas, 1850: 248.—Kossmann, 1880: 117, pl. 10 (figs. 1–3).

Cymothoa edwardsii Bleeker, 1857: 21, 33, tab. II, fig. 12.—Miers, 1880: 461.—Gerstaecker, 1901: 261.

Cymothoa stromatei Bleeker, 1857: 21, 33, 35-tab II, fig. 13.—Miers, 1880: 461.—Gerstaecker, 1901: 181.—Lanchester, 1902: 377.—Richardson, 1910: 22.—Hale, 1926: 214, fig. 9h.—Brian and Dartevelle, 1949: 184.—Sachlan, 1952: 41, 50 photo 28.—Pillai, 1954: 15.

Cymothoa eremita. —Schioedte and Meinert, 1884: 259, tab. VII (Cym. XXV), figs. 3–13.—Stebbing, 1893: 354; 1910: 102.—Gerstaecker, 1901: 182.—Thielemann, 1910: 39, figs. 37, 38, tab. 4.—Nierstrasz, 1915: 90; 1931: 135, pl. 10, fig. 9.—Monod, 1924: 100; 1933: 195; 1976: 859, figs. 23–25.—Boone, 1935: 215, pl. 63.—Shiino, 1951: 81 figs. 2 (b–c).—Avdeev, 1978a: 30; 1982b: 69.—Trilles, 1975: 987, pl. II (12–13); 1979b: 261; 1986: 627, tab. 1; 1994: 139; 2008: 23.—Bowman and Tareen, 1983: 25, fig. 20.—Radhakrishnan and Nair, 1983: 96, 105, 107.—Saito, Itani and Nunomura, 2000: 65.—Shireen, 2000: 21, figs. 1–3.—Kensley, 2001: 232.—Yu and Li, 2003a: 228, fig. 4; 2003b: 267.—Trilles and Bariche, 2006: 228.—Williams and Bunkley-Williams, 2009: 557.—Trilles, Ravichandran and Rameshkumar, 2011: 446.—Rameshkumar, Ravichandran and Trilles, 2012: 191.—Hadfield, Bruce and Smit, 2013: 158, figs. 3–5.—Anand Kumar, Rameshkumar, Ravichandran, Priya, Nagarajan and Goh, 2015: 208, 209, fig 2b.—Martin, Bruce and Nowak 2016: 6, 18–24, figs 9–13.—Anand Kumar, Rameshkumar, Ravichandran, Nagarajan, Prabakaran and Ramesh, 2017: 57, 58, fig 2g.

Cymothoa limbata Schioedte and Meinert, 1884: 248, tab. VII (Cym. XXV), figs. 1, 2.—Hale, 1926: 214.—Nierstrasz, 1931:136.—Bruce, Lew Ton and Poore, 2002: 175 [new synonymy].

Cymothoa edwardsi. —Nierstrasz, 1931: 135.

Cymothoa sp. (an. *eremita* Brünnich, 1783) [sic]. — Monod, 1934: 13, pl. 27 (a–b), pl. 30 (b).

Cymothoa erimitae (typographical error?). — Sachlan, 1955: 31.

Cymothoa cinerea Bal and Joshi, 1959: 567, pl. 2, figs. 1–5.—Kensley, 2001: 232.

Cymothoa cinerius. — Joshi and Bal, 1960: 446.

Cymothoa mathieui. — Ellis, 1981: 124.

Cymothoa leaschenaultii [sic]. — Kensley, 2001: 232.

Cymothoa epimerica. — Trilles, 2008: 23 (SMF-567).

Type material. Female holotype deposited at the Zoological Museum, University of Copenhagen, (ZMUC-CRU-10078). For further details of other types of material refer to Hadfield et al. (2013).

Type locality. Not reported. For further details of other types of localities refer to Hadfield et al. (2013).

Type host. *Parastromateus niger* (Bloch 1795) (previously *Coryphaena apus*)

Material examined (New record). 10ovig ♀ (24.59, 24.13, 20.95, 19.98, 18.86, 18.37, 17.49, 15.51, 13.22, 12.63 mm TL; 11.83, 10.12, 8.89, 9.75, 8.19, 8.11, 7.90, 7.53, 6.85, 6.47 mm W) [UMTCrus 01190, 01187, 01184, 01185, 01188, 01189, 01182, 01178, 01180, 01177], 3mature ♂ (13.37, 12.29, 10.11 mm TL; 7.19, 6.72, 4.21 mm W) [UMTCrus 01176, 01181, 01175], 3 juvenile ♂ (9.62, 8.11, 7.97 mm TL; 4.92, 4.13, 3.78 mm W) [UMTCrus 01183, 01179, 01186]; leg 4, EEZ, from 04° 39' 20" N; 104° 53' 09" E to 04° 43' 50" N; 104° 22' 09" E, 14 June 2016 from buccal-cavity of *Nemipterus tambuloides* and *Nemipterus furcosus*, coll. SEAFDEC crew via bottom trawl of 75m.

Host. Specimens in this study were collected from host species of the family Nemipteridae: *Nemipterus tambuloides* (Bleeker 1853) and *Nemipterus furcosus* (Valenciennes 1830). Known also from 11 other host families: Aulopidae, Carangidae, Haemulidae, Lutjanidae, Mugilidae, Psettodidae, Serranidae, Siganidae, Sphyraenidae, Stromateidae, Tetraodontidae (see Hadfield et al. 2013, Martin et al. 2016).

Distribution. Known from the Indian Ocean and Indo-Pacific regions. For locality details see Trilles (1994, 2008) and Hadfield et al. (2013).

Remarks. *Cymothoa eremita* is here reported as a new locality record for Malaysian waters. This species is instantly identified by the subtruncate cephalon; pereonite 1 anterolateral margins extending nearly half the length of cephalon; pleon as wide as pereon; uropods not extending to pleotelson posterior margin; bulbous protrusion on pereopod 7 ischium; and small horn-like structures on the posterolateral margins of pereonite 1. (Hadfield et al. 2013).

Cymothoa eremita is one of the most common and greatly reported species in comparison to its other cymothoid relatives, and interestingly one of the few species to display low host specificity (11 known host families) and wide geographical distribution from the western Indo-Pacific (e.g. Mozambique) to as far as the Central Indo-Pacific (e.g. Australia) (see Hadfield et al. 2013, Martin et al. 2016). The first report of this species for Malaysian waters was by Anand et al. (2015, 2017) in Sarawak, where the species was retrieved from the buccal cavity of *Psettodes erumei*. Sampling by the authors resulted in a range of low to fairly high prevalence, with the following results: 15 September 2013: 4/20 (20% prevalence) 5/20 (1.25 mean intensity); 27 October 2013: 1/2 (50% prevalence) 2/2 (1 mean intensity).;

8) *Cymothoa pulchrum* Lanchester, 1902

(Figure 3 Gi-Giv)

Cymothoa pulchrum Lanchester, 1902: 377, pl. 35, figs. 8, 8a.—Monod, 1924: 100.—Trilles, 1975: 991, pl. II (16); 1994:148.—Galzin and Trilles, 1979: 257, figs. 1–52.—Avdeev, 1982b: 69.—Williams, Bunkley-Williams and Dyer, 1996: 1, fig. 5.—Kensley, 2001: 233.—Trilles and Bariche, 2006: 228.—Martin, Bruce and Nowak 2016: 6, 37–43, figs. 22–26.

Cymothoa pulchra.—Nierstrasz, 1915: 92, pl. 3 (fig. 11), pl. 4 (figs. 12, 13); 1931: 133, pl. 10 (figs. 1–4).—Monod, 1934: 12, pl. 26 (a–b), 30 (a).—Shiino, 1951: 81, 85, figs. 4 (a–h).—Avdeev, 1978b: 281.—Saito, Itani and Nunomura, 2000: 65.—Bruce, Lew Ton and Poore, 2002: 176.—Nagasawa and Uyeno, 2012: 139, fig. 1.

Not *Cymothoa pulchra*. — Yu and Li, 2003a: 228, fig. 5; 2003b: 267 [= *Cymothoa epimerica*].

Type material. No indication for the type *Cymothoa pulchrum* from the University Museum of Zoology, Cambridge's catalogue (see Martin et al. 2016)

Type locality. Pulau Bidan, northern Straits of Malacca, Malay Peninsula (Lanchester, 1902)

Type host. Host unknown (see Martin et al. 2016)

Material examined 1 ♀ ovig. (40 mm TL, 18 mm W; UMTCrus 01104) [UMTCrus 01104], 1 ♂ mature (13 mm TL, 6 mm W) [UMTCrus 01105], UMT Beach, Terengganu, 05°24'54" S; 103°05'21" E, 25 February 2020, from buccal cavity of Stellate puffer [*Arothron stellatus* (Anonymous, 1798)], coll. Azwarina and Muhammad Fadhli.

Host. Predominantly found on Tetraodontidae and Diodontidae. Tetraodontidae: *Arothron stellatus* (Anonymous 1798) (see Monod 1934; Trilles 1975; Avdeev 1978b; Galzin and Trilles 1979; Nagasawa and Uyeno 2012; present material); *Arothron meleagris* (Anonymous 1798) (see Galzin and Trilles 1979). Diodontidae: *Diodon holocanthus* (currently accepted as *Diodon holocanthus* Linnaeus 1758, see Shiino 1951; Williams et al. 1996; Nagasawa and Uyeno 2012); *Diodon hystrix* Linnaeus 1758 (see Williams et al. 1996; Galzin and Trilles 1979); *Diodon liturosus* Shaw 1804 (see Williams et al. 1996) and *Chilomycterus reticulatus* (Linnaeus 1758) (see Nagasawa and Uyeno 2012).

The cymothoid has been reported from the family Carangidae (*Caranx* sp., see Monod 1924) but until enough evidence is available, this record is considerably uncertain.

Distribution. Known from the central and western Indo-Pacific region: Malaysia (Lanchester 1902, present material); Singapore (Martin et al 2016); Indonesia (Nierstrasz 1915, 1931); Sri

Lanka (Monod 1924); Vietnam (Monod 1934; Trilles 1975); Japan (Shiino 1951; Saito et al. 2000; Nagasawa and Uyeno 2012); Australia (Avdeev 1978b); French Polynesia and Fiji (Galzin and Trilles 1979)

Remarks. *Cymothoa pulchrum* has an anteriorly subtruncate cephalon; wide and subtruncate pereonite 1 anterolateral margins nearly reaching rostrum; pleon partially overlapped by pereonite 7; rounded pleotelson posterior margin; raised carinae on basis of pereopods 6 and 7; prominent lobe on ischium pereopod 7; coxae visible from dorsal view and uropods reaching half the pleotelson length (visible from ventral view). For further comparisons on gender and comparatively similar species, refer to Martin et al. (2016).

Lanchester (1902) reported a female specimen of the species from the northern Straits of Malacca, Malay Peninsula as part of the collection from the Skeat Expedition to the Malay Peninsula. Most of Skeat Expedition collection by Lanchester (1902) had known to be deposited at the University Museum of Zoology, Cambridge (UMZC). Martin et al. (2016) mentioned that despite locating other *Cymothoa* specimens deposited in UMZC, the type for *Cymothoa pulchrum* was not available in their catalogue. In the event the type material is not available, designation of a neotype specimen is not necessary, as the species has been thoroughly described and easily distinguishable from its other *Cymothoa* relatives. In addition, host association and geographical distribution has been well documented for the species as to not pose any threat to its nomenclatural stability and universality.

Genus *Elthusa* Schioedte and Meinert, 1884

9) *Elthusa sigani* Bruce, 1990

(Figure 3 Hi-Hii)

Elthusa sigani Bruce, 1990: 270–276, figs. 16–18.—Van der Wal, Smit and Hadfield, 2019: 1–37.

Type material. Female holotype held at the Queensland Museum (QM W13080). For paratype details see Bruce (1990).

Type locality. North Stradbroke Island, Moreton Bay, southeastern Queensland, Australia (see Bruce 1990).

Type host. From the host *Siganus spinus* (Linnaeus 1758) (see Bruce 1990).

Material examined (New record). 1 matured ♂ (8.34 mm TL, 5.16 mm W), Leg 4, ST 110, EEZ, 04°39.03'N; 104°53.43'E, 14 June 2016, from Russell's lionfish (*Pterois russelli*), coll. Muhammad 'Arif bin Samshuri, SEAFDEC crew [UMTCrus REG 01191].

Host. Reported from the families Siganidae: *Siganus spinus* (Linnaeus 1758) (Bruce 1990) and Scorpaenidae: *Pterois russelli* Bennett 1831 (present material).

Distribution. Only known from Moreton Bay, Australia (Bruce 1990), and the South China Sea, Peninsular Malaysia (present material).

Remarks. *Elthusa sigani* is here reported as a new locality record for Malaysian waters. Our specimen agrees with the illustrations by Bruce (1990), in which the species is characterised by the even body, broad rostrum, antennule and antenna subequal in length, antennules separate, dorsally visible coxae (particularly coxae 5–7), rounded uropods not exceeding pleotelson posterior margin, and wide pleon. The only variation noted in our specimen is that it is not as twisted as Bruce's (1990) female specimen. Though the specimen can be confused with *Elthusa raynaudii* (Milne-Edwards, 1840) by the similar coxal and pleon morphology (see Bruce 1990), it can be easily distinguished from *Elthusa sigani* by the difference in body size (≥ 20 mm *vs* ≤ 13 mm), pereopods 5–7 morphology (proximal carina with a boss *vs* smooth carina) and body surface (harder exterior *vs* softer exterior).

Genus *Joryma* Bowman and Tareen 1983

10) *Joryma engraulidis* (Barnard, 1936)

(Figure 3 li-lii)

Agarna engraulidis Barnard, 1936: 169–170, fig. 9a–c.

Livoneca engraulidis. — Pillai, 1964: 2018, fig. 7e.

Joryma engraulidis. — Bowman and Tareen 1983: 21.—Aneesh, Helna and Sudha, 2016: 1270–1277.—Aneesh, Helna, Trilles and Chandra, 2019a: 14–18, figs 9–12.—Ravichandran, Vigneshwaran, Rameshkumar, 2019: 29, 30.

Not *Joryma engraulidis*. — Kazmi, Schotte and Yousuf, 2002: 110, fig. 100 [= *Joryma hilsae*].

Unconfirmed reports. — Veerappan and Selvamathi, 2009: 417.

Type material. Oviparous female neotype (10.5 mm) was held at the National Zoological Collections of Zoological Survey of India (NZC-ZSI C-7136/2) (see Aneesh et al. 2019a).

Type locality. Marina Beach, Chennai Bay of Bengal, India (see Aneesh et al. 2019a).

Type host. From the host *Thyssa setirostris* (Brousseau 1782) (see Aneesh et al. 2019a).

Material examined (New record). 2 ♀ ovig. (9.30, 9.37 mm TL; 6.56, 5.71 mm W), stretch of beach along with the Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 05°24.927'S; 103°5.2531'E, 8 March 2020, from the gills of Longjaw thryssa (*Thyssa setirostris*), coll. Yusri Yusuf [UMTCrus REG 01194, 01195].

Host. Only reported from Longjaw thryssa *Thyssa setirostris* (Brousseau 1782) (Barnard 1936; Aneesh et al. 2016, 2019a; present material).

Distribution. Previous records were only known from Indian waters: Devi River, Orissa Coast, India (Barnard 1936), Malabar Coast, Arabian Sea (Aneesh et al. 2016), and Chennai, Bay of Bengal (Aneesh et al. 2019a, Ravichandran et al. 2019). Our current specimen is the first record for Malaysian waters and the greater South China Sea.

Remarks. *Joryma engraulidis* is here reported as a new locality record for Malaysian waters. This species is different from other species within the genus by the dorsally conspicuous cephalon reaching beyond pereonite 1 expansion, unilateral and non-bilobed expansion of pereonite 1, and the broadly rounded pleotelson (Aneesh et al. 2019a).

Kazmi's et al. (2002) figure of *J. engraulidis* from the host *Sardillella sp.* is confound to *J. hilsae*, but can be differentiated by the cephalon prominent dorsally and moving to the margin of pereonite 1 expansion (vs, pereonite 1 anterolateral expansion bilateral and slightly bilobed, pleonites are not overlapped, pleotelson loosely rounded, uropods rami equal mandibular palp 3-segmented (Rameshkumar et al. 2011).

The species was formerly referred to as *Agarna engraulidis* Barnard, 1936 but was later transferred to *Livoneca engraulidis* by Pillai (1964) and lastly to the genus *Joryma* by Bowman and Tareen (1983), but both the latter authors were apprehensive in addressing the species position in their generic diagnosis. Other than Barnard's (1936) minimal description and figure, the type had to be located to resolve the genus conundrum and to redescribed the specimen to modern standards. Aneesh's (2019a) attempt to locate the type specimen was futile, but was fortunate to designate a newly collected specimen as a neotype (similar to Barnard's original type locality) and provided a detailed description of the Indian specimen. The latest key to species within genus *Joryma* has been updated by both Aneesh et al. 2019a and Ravichandran et al. 2019.

Genus *Lobothorax* Bleeker, 1857

11) *Lobothorax typus* Bleeker, 1857

(Figure 4 Ji-Jii)

Lobothorax typus Bleeker, 1857: 39, 40, fig. 16.—Stebbing, 1893: 353.—Nierstrasz, 1931: 130.—Yu and Bruce, 2006: 643, figs 1–3.—Trilles, 2008: 25.—Rameshkumar, Ravichandran, Sivasubramanian, and Trilles, 2013c: 43, fig 1E.—Anand Kumar, Rameshkumar, Ravichandran, Priya, Nagarajan and Goh, 2015: 208, 209, fig 2b.—Anand Kumar, Rameshkumar, Ravichandran, Nagarajan, Prabakaran and Ramesh, 2017: 57, 58, fig 2g.—Aneesh, Bruce, Kumar, Bincy, Sreenath, 2021a: 3, 4.

Saophra Typus Schioedte and Meinert, 1883: 283, pl. 11 figs. 1, 2.

Saophra typus—Nierstrasz, 1915: 87.—Trilles, 1994: 114.

Lobothorax aurita—Stebbing, 1893: 353.—Nierstrasz, 1915: 87; 1931:130.

Type material. Bleeker, 1857 by monotypy.

Type locality. Jakarta Bay, western Java Sea, Indonesia.

Type host. Unknown

Material examined. 2 ovig ♀ (33.55, 19.65 mm TL; 9.88, 7.81 mm W), Bidong Island, Terengganu, (5°36'49.9"N; 103°03'12.9"E), 5th August 2017, in the buccal cavity of *Trichiurus lepturus*, coll. Melissa B. Martin [UMTCrus REG 01196, 01197].

Host. Only known from the family Trichiuridae: large head hairtail *Trichiurus lepturus* Linnaeus 1758 (see Rameshkumar et al. 2013; Anand Kumar et al. 2015, 2017; present study) and the cutlass fish *Lepturacanthus savala* (Cuvier 1829) (see Bleeker, 1857; Yu and Bruce 2006, Rameshkumar et al. 2013).

Distribution. The current specimen was retrieved from the Bidong Archipelago in Terengganu, Peninsular Malaysia. This record is an addition to the distribution of the South China Sea, with Anand Kumar's et al. (2015, 2017) specimen recorded off the coast of Miri in Sarawak, Malaysia. Other occurrences of the Central Indo Pacific include Jakarta, Indonesia (Bleeker 1857; Schioedte and Meinert 1883), Ubay, Philippines (Schioedte and Meinert 1883; Trilles 2008), Hainan Island, China (Yu and Bruce 2006). The Eastern Indian Ocean is represented in Parangipettai, the Southeast coast of India (Rameshkumar et al. 2013c).

Remarks. *Lobothorax typus* is easily diagnosed from the anterolateral margins of pereonite 1 projecting forward beyond the anterior margin of the cephalon, a weak dorsal median ridge that runs along pereonites 1 to 7, and pereonites 5 to 7 abruptly shorter than pereonite 4 (Yu and Bruce 2006). To date, *Lobothorax* remains a lesser-known genus in comparison to other buccal-attaching cymothoids, with all the three known species recorded to have an Indo-Malaysian distribution (Yu and Bruce 2006). Past records specifically indicate that *Lobothorax typus* have low prevalence when infecting *Trichiurus lepturus*: 50 of 398 (P = 12.6 %) from the coast of Parangipettai (Rameshkumar et al. 2013), 1 of 32 (P = 3.16 %), and 4 of 10 (P = 40 %) off the Miri coast Sarawak (Anand Kumar et al. 2015, 2017).

Genus *Nerocila* Leach, 1818

12) *Nerocila arres* Bowman and Tareen, 1983

Nerocila arres Bowman and Tareen, 1983: 12–17, figs 10–12.—Trilles, 1994: 82.—Trilles, Rameshkumar and Ravichandran, 2013: 1273–1286, figs 2a, 3a–d, 4, 6a–e.—Rameshkumar, Ravichandran, Sivasubramanian and Trilles, 2013c: 42, fig. 1g.—Rameshkumar, Ramesh, Ravichandran and Trilles, 2014c: 940–944, fig. 1e.—Anand Kumar, Rameshkumar, Ravichandran, Nagarajan, Prabakaran and Ramesh, 2017: 3–5, fig 2c.—Ravichandran, Vigneshwaran, Rameshkumar, 2019: 46, 47, fig. 3m–o.

Nerocila priacanthusi Kumari, Rao and Shyamasundari, 1987: 413–417, figs 2–9. **Type material.** The holotype is deposited at National Museum of Natural History, Smithsonian Institution (USNM 189264, Bowman and Tareen 1983).

Type locality. South of Faylaka, Kuwait, off the Persian Gulf (Bowman and Tareen 1983).

Type host. Reported from *Nemipterus japonicus* (see Bowman and Tareen 1983).

Host. Known from five host families, which includes Ariidae, Nemipteridae, Priacanthidae, Serranidae, Sparidae: *Acanthopagrus latus* (Houttuyn 1782), *Nemipterus peronii* (Valenciennes 1830) (formerly written as *Nemipterus tolu*), *Nemipterus japonicus* (Bloch 1791), *Epinephelus tauvina* (Fabricius 1775) (Bowman and Tareen 1983; Trilles et al. 2013; Rameshkumar et al. 2013a); *Priacanthus hamrur* (Fabricius 1775) (Kumari et al. 1987); *Netuma bilineata* (Valenciennes 1840) (Anand Kumar et al. 2017).

Distribution. Recorded from the Indo-Pacific Region: Persian Gulf, Kuwait (Bowman and Tareen 1983); southeast coast of India (Trilles et al. 2013; Rameshkumar et al. 2013a, 2014c); Malaysia (Anand Kumar et al. 2017).

Remarks. *Nerocila arres* can be identified by the 2.0 times as long as body width; widest at pereonites 6 and 7; anteriorly rounded cephalon; pointed posteroventral corners of all pereonites; long, narrow and pointed processes of all coxae; curved medial point of pleotelson lateral margins; distinct nodules on the dactylus of pereopods 1, 2, 4 and 5; long and narrow posterior margin of pleonites 1 and 2; and the distinct uropod serrations on the endopod lateral margin, with 15–16 dissimilar teeth (Ravichandran et al. 2019).

Nerocila arres and *Nerocila sigani* were described by Bowman and Tareen (1983) and accepted as valid by Bruce (1987b) and Trilles (1994). Bruce and Harrisson-Nelson (1988) later synonymized the two species stating that the five distinguishing characteristics listed by Bowman and Tareen (1983) are highly variable or not reliable as a diagnostic characteristic. Trilles et al. (2013) later redescribed and illustrated both *Nerocila arres* and *Nerocila sigani* of which the former conforms holotype of Bowman and Tareen (1983) and is reinstated as valid. Though both *Nerocila arres* and *Nerocila serra* is similar in the shape of the pereonites, pleotelson, dactyls of pereopods 1, 2, 4, and 5; it differs from the latter in the uropodal endopod (longer and narrower) with a shallower notch on the medial margin and smaller serrations on the lateral margins (Ravichandran et al. 2019).

Ravichandran et al. (2019), recently transferred *Nerocila priacanthusi* Kumari, Rao and Shyamasundari 1987, as a junior synonym for *N. arres*. The type material of *Nerocila priacanthusi* Kumari, Rao and Shyamasundari, 1987 was unfortunately deposited at the Zoological Survey of India, Indian Museum, Calcutta without a registered number, and thus could not be located (Ravichandran et al. 2019). However, based on Bowman and Tareen's (1983) type material and Kumari's et al. (1987) illustration on their respective species, we agree with Trilles et al. (2011) and Ravichandran et al. (2019) remarks of the two being one of the same species based on the body, pereon, pleon, maxilla, maxilliped, and pereopod characteristics.

13) *Nerocila depressa* Milne Edwards, 1840

Nerocila depressa Milne Edwards, 1840: 254, pl. 31 (figs 17–21).—White, 1847: 108.—Schlöedde and Meinert, 1881: 15, pl. 1 (figs 10, 11).—Stebbing, 1893:351.—Lanchester, 1900: 265, pl. XII (fig. 5).—Thielemann, 1910:33.—Nierstrasz, 1931:124.—Trilles, 1975: 318, pl. II (fig. 13); 1979: 251.—Bruce, 1987b: 404, fig. 34e. —Bruce and Harrison-Nelson, 1988: 591, fig. 3.—Kazmi, Schotte and Yousuf, 2002: 105, fig. 91.—Trilles, Ravichandran and Rameshkumar, 2011: 451.—Printrakoon and Purivirojkul, 2011: 322–326, figs 2–4.—Trilles, Rameshkumar and Ravichandran, 2013: 1273–1286, fig. 2b.—Rameshkumar, Ravichandran and Ramesh, 2014c: 124–128, fig. 2.—Anand Kumar, Rameshkumar, Ravichandran, Nagarajan, Prabakaran and Ramesh, 2017: 3–5, fig 2d.—Ravichandran, Vigneshwaran, Rameshkumar, 2019: 47–50, figs. 3p–r, 6, 7.

Nerocila dolichostylis Koelbel, 1879:411, pl. II (fig. 3 a–b). — Bruce, 1987c: 404.

Nerocila pigmentata Bal and Joshi, 1959: 565, pl. 2 (figs 6–10). — Bruce, 1987b: 406.

Nerocila pigmenta. — Bal and Joshi, 1960: 446.

Not *Nerocila pigmentata*. — Parimala, 1984: 180–181, fig. 1 (= *Nerocila* sp.?).

Type material. The specimen at the MNHN (Is. 508) is in a sad state of affairs (Bruce 1987b).

Type locality. Not known

Type host. Not known

Host. Recorded from six families, which includes Ariidae, Carangidae, Clupeidae, Cyprinidae, Engraulidae, and Pristigasteridae: *Coilia dussumieri* Valenciennes 1848, *Engraulis* sp., *Cyclocheilichthys apogon* (Valenciennes 1842) (Bal and Joshi 1959); *Opisthopterus tardoore* (Cuvier 1829) (formerly written as *O. turtoor*), *Sardinella fimbriata* (Valenciennes 1847) (Bruce 1988); *Sardinella albella* (Valenciennes 1847) (Printrakoon and Purivirojkul 2011); *Sardinella gibbose* (Bleeker 1849) (Trilles et al. 2013); *Selaroides leptolepis* (Cuvier 1833) and *Carangoides malabaricus* (Bloch & Schneider 1801) (Rameshkumar et al. 2014); *Setipinna tenuifilis* (Valenciennes 1848), *Alectis ciliaris* (Bloch 1787), *Netuma bilineata* (Valenciennes 1840) (Anand Kumar et al. 2017).

Distribution. Recorded from the Indo-Pacific oceans, plausibly ranging from India to Hong Kong (Bal and Joshi 1959; Bruce 1988; Printrakoon and Purivirojkul 2011; Trilles et al. 2013; Rameshkumar et al. 2014c; Anand Kumar et al. 2017; Ravichandran et al. 2019).

Remarks. *Nerocila depressa* can be identified by the posteriorly directed coxae and pleonites posterolateral corners; posteriorly directed and acute pleonites 1 and 2 ventrolateral margins extending to pleonites 3–5 respectively; and lateral margins of pleotelson curving to a medial point. Both *Nerocila depressa* and *Nerocila loveni* have similar shaped pereonites, but differ by the former having the coxae and posterolateral corners of the pleonites posteriorly directed and are not bent dorsally (Ravichandran et al. 2019). The cymothoid has been reported to attach to the ventral part of the body, particularly the upper pectoral fin (Printrakoon and Purivirojkul 2011).

Like with other cymothoids, the prevalence and parasitic infestation of *Nerocila depressa* vary among different hosts and seasons. Printrakoon and Purivirojkul (2011) reported that 54% of the sampled *Sardinella albella* from an estuary in the Trat province, Thailand was infested with this species. The authors postulated that the parasites could occupy a host at an early phase based on the positive correlation of parasite length versus fish length and parasite infestation versus fish weight. In another scenario, Anand Kumar et al. (2017) reported *Nerocila depressa* attached on three various hosts from Sarawak: *Setipinnatenuifilis* (family Engraulidae), *Alectis indicus* (family Carangidae), and *Netuma bilineata* (family Ariidae). Though the sample size of the entire three hosts collected was less than 25 per species, the prevalence and mean intensity were low (<17% and 1.3 respectively).

14) *Nerocila longispina* Miers, 1880

Nerocila longispina Miers, 1880: 468.—Nierstrasz, 1915: 78.—Nierstrasz, 1931: 125. Ellis, 1981: 124.—Bruce, 1987b: 355, 412, fig. 35a–d.—Trilles, 1994: 92.—Rameshkumar, Trilles and Ravichandran 2011: 82–84, figs 3, 4.—Trilles, Ravichandran and Rameshkumar, 2011: 452.—Trilles, Rameshkumar and Ravichandran, 2013: 1273–1286, fig. 2d.—Anand Kumar, Rameshkumar, Ravichandran, Rethna Priya, Nagarajan and Kwang Leng, 2015: 206–210, fig. 2c.—Anand Kumar, Rameshkumar, Ravichandran, Nagarajan, Prabakaran and Ramesh, 2017: 3–5, fig 2h.—Ravichandran, Vigneshwaran, Rameshkumar, 2019: 52, 53.

Type material. Holotype was held at the British Museum of Natural History (BMNH 1849: 86). Presented by I. Ward, according to Ellis (1981) and figured by Bruce (1987b).

Type locality. Malabar coast, India.

Type host. Unknown

Host. Known from families Terapontidae and Sciaenidae: *Therapon puta* Cuvier 1829, *Otolithes ruber* (Bloch & Schneider 1801) (Rameshkumar et al. 2011, Anand Kumar et al. 2015, 2017, Ravichandran et al. 2019).

Distribution. Recorded from the Central Indo Pacific region and the Indian Ocean (Miers 1880; Ellis 1981; Bruce 1987b; Rameshkumar et al. 2011; Anand Kumar et al. 2015, 2017).

Remarks. *Nerocila longispina* has a body twice as long as wide, widest at pereonites 6 and 7; narrowly rounded or slender medial point cephalon anterior margin; longer pointed processes on coxae 2–7; wider than long and smoothly rounded pleotelson; uropod rami extending beyond posterior margin of pleotelson; exopod slightly longer than endopod; a notch on medial margin and very coarsely serrated lateral margin of the uropod endopod (Ravichandran et al. 2019).

Miers (1880) established the species with only an illustrated lateral view of the sixth coxae and an unknown host. Bruce (1987) later provided detailed figures (dorsal view, ventral view, cephalon, pereopod 7, and uropods) of the holotype with minimal description. Subsequently, Rameshkumar et al. (2011) diagnosed and redescribed the species from a different examined specimen collected from the host *Therapon puta* and *Otholites ruber* from Vedaranyam, Southeastern coasts of India.

15) *Nerocila loveni* Bovallius, 1887

Nerocila loveni Bovallius, 1887: 6, pl. 1 (figs 13–17), 2 (figs 18–21).—Stebbing, 1893: 352, pl. 15.—Nierstrasz, 1915:73; 1931:124.—Trilles, 1979:251, pl. 7 (fig. 2).—Bruce, 1987b: 405. —Bruce and Harrison-Nelson, 1988: 594, fig. 5.—Trilles, Rameshkumar and Ravichandran, 2013: 1273–1286, fig. 2e. Anand Kumar, Rameshkumar, Ravichandran, Rethna Priya, Nagarajan and Kwang Leng, 2015: 206–210, fig. 2e.—Rameshkumar, Ramesh, Ravichandran and Trilles, 2014a: 940–944, fig. 1f.—Rameshkumar, Ravichandran and Ramesh, 2014c: 124–128, fig. 3.—Rameshkumar, Ramesh, Ravichandran and Trilles, 2016: 968–970, figs 1, 2.—Ravichandran, Vigneshwaran, Rameshkumar, 2019: 53–57, figs 8g–i, 9–12.

Type material. Not known

Type locality. Indonesia (see Trilles, 1979)

Type host. No type of host recorded

Host. The species has been collected from the families Carangidae, Chirocentridae, Leiognathidae and Haemulidae: *Leiognathus* sp. (Bruce and Harrison-Nelson 1988); *Eubleekeria splendens* (Cuvier 1829) (Trilles et al. 2013; Rameshkumar et al. 2014a); *Chirocentrus dorab* (Fabricius 1775) (Anand Kumar et al. 2015); *Carangoides malabaricus* (Bloch & Schneider 1801) (Rameshkumar et al. 2014b) and *Pomadasys maculatus* (Bloch 1793) (Rameshkumar et al. 2016).

Distribution. Distributed in the eastern Indian Ocean and northern central Indo-Pacific region: Singapore, Thailand, Borneo and Sarawak (Bruce and Harrison-Nelson 1988; Anand Kumar et al. 2015), India (Trilles et al. 2013; Rameshkumar et al. 2014a, 2014b).

Remarks. The diagnostic characteristics of *Nerocila loveni* include the successively produced and pointed processes of its coxae; smoothly rounded or slender medial point of the cephalon anterior margin; pleonites 1 and 2 ventrolateral margins projecting as far as pleonite 5 and curving posteriorly obliquely to the longitudinal body axis (Ravichandran et al. 2019).

This species was compared to *Nerocila depressa* by Bruce and Harrison-Nelson, (1988) using examined specimens from Singapore, Thailand, and Sarawak and differed from the posterolateral extensions bent dorsally for the coxae and pereonite, and expressed laterally rather than posteriorly.

16) *Nerocila sigani* Bowman and Tareen, 1983

Nerocila sigani Bowman and Tareen, 1983: 12, fig. 9.—Bruce, 1987b: 406—Bruce and Harrison-Nelson 1988: 597–598.—Trilles, 1994: 100.—Kensley 2001: 234.—Kazmi, Schotte and Yousuf, 2002: 104, fig. 89.—Trilles, Ravichandran and Rameshkumar, 2011: 453.—Trilles, Rameshkumar and Ravichandran, 2013: 1273–1286, figs 2i, 3e–h, 4, 5f–j.—Rameshkumar, Ravichandran, Sivasubramanian and Trilles, 2013c: 42, fig. 1i.— Roy and Mitra, 2013: 1134–1135, fig. 1.—Anand Kumar, Rameshkumar, Ravichandran, Nagarajan, Prabakaran and Ramesh, 2017: 3–5, fig 2e.—Ravichandran, Vigneshwaran, Rameshkumar, 2019: 60, 61.

Type material. Female holotype (USNM 190714; see Bowman and Tareen 1983).

Type locality. South of Faylaka, Kuwait (Arabian Gulf, see Bowman and Tareen 1983)

Type host. From caudal fin of rabbit fish *Siganus canaliculatus* (Park 1797) (formerly *Siganus oramin*)

Host. Collected from the families Carangidae, Sciaenidae and Siganidae: *Siganus canaliculatus* (Park 1797) (formerly *Siganus oramin*, see Bowman and Tareen 1983; Kazmi et al. 2002; Trilles et al. 2013; Rameshkumar et al. 2013a); *Parastromateus niger* (Bloch 1795)(Bruce and Harrison-Nelson 1988); *Johnius dussumieri* (Cuvier 1830) (Anand Kumar et al. 2017).

Distribution. Recorded from the Arabian Sea (Bowman and Tareen 1983; Kazmi et al. 2002); southeast coast of India (Bruce and Harrison-Nelson, 1988; Trilles et al. 2013; Rameshkumar et al. 2013a); Sarawak, Malaysia (Anand Kumar et al. 2017).

Remarks. *Nerocila sigani* is identified the body widest at pereonites 5 and 6; anteriorly broad and rounded cephalon; absence of swelling in pereopod dactyls; pointed posteroventral corners of all pereonites; long and pointed coxae processes; coxae 6 and 7 distinctly longer than posteroventral processes of respective pereonites; smoothly rounded pleotelson and absent of medial lobe; subequal dactyl spines on pereopods 1–5; exopod slightly longer than endopod; endopod with a deep notch on medial margin and serrate lateral margin (Bowman and Tareen 1983, Trilles et al. 2013).

Genus *Norileca* Bruce, 1990**17) *Norileca indica* Milne Edwards, 1840**

(Figure 4 Ki-Kiv)

Livoneca indica Milne Edwards, 1840: 262.—Bleeker, 1857: 21, 28.—Gerstaecker, 1882: 261.—Schioedte and Meinert, 1884: 362–365, pl. 5, figs. 3–6; Richardson, 1910: 24.—Nierstrasz, 1915: 99–100.—Nierstrasz, 1931: 142–143, 145.—Borcea, 1933: 482.—Beumer, Ashburner, Burbury, Jette and Latham, 1982: 33.

Livoneca ornata Heller, 1868: 145–146, pl. 12, fig. 15.—Gerstaecker, 1882: 261.

Lironeca indica. —Trilles, 1976: 777–778, pl. 2, fig. 3.—Avdeev, 1978b: 281–282.—Trilles, 1979: 266.—Rokicki, 1982: 205–208, figs. 1–2.—Trilles, 1994: 178–179.

Norileca indica.—Bruce, 1990: 291–293.—Bruce, Lew Ton and Poore, 2002: 181.—Ghani, 2003: 219.—Yu and Li, 2003b: 235–237, fig. 10.—Yamauchi, Ohtsuka and Nagasawa, 2005: 25–27.—Nagasawa and Petchsupa, 2009: 131–133.—Rameshkumar, Ravichandran and Sivasubramanian, 2013a: 99–105.—Rameshkumar, Ravichandran, Sivasubramanian and Trilles, 2013c: 42–46.—Argente, Narido, Palla and Celedonio, 2014: 3–8.—Neeraja, Tripathi and Shameem, 2014: 49–56.—Rameshkumar and Ravichandran, 2015: 33–36.—Rameshkumar, Ramesh, Ravichandran, Trilles and Subbiah, 2015: 712–715.—Aneesh, Kappalli, Kottarathil, Gopinathan and Trilles, 2015: 42.—Behera, Ghosh and Pattnaik, 2016: 856–862.—Jithin, Swapna, Kumar, Venu, Helna and Sudha, 2016: 47–53.—Cruz-Lacierda and Nagasawa, 2017: 60–63.—Anand Kumar, Rameshkumar, Ravichandran, Nagarajan, Prabakaran and Ramesh, 2017: 3–5, fig 2a.—Van der Wal, Smit and Hadfield, 2017: 164–173, figs. 1–7.

Joryma brachysoma. —Ravichandran, Rameshkumar, Mahesh Babu and Kumaravel, 2009: 80–84, fig. 1 **Type material**. Holotype held at the Museum Nationale d’Histoire Naturelle, Paris (MNHN-IU-2007-4159; see Van der Wal et al. 2017).

Type locality. Sumatra Island, Indonesia (Milne Edwards, 1840).

Type host. Host type unavailable (see Van der Wal et al. 2017).

Material examined. 4 ovig. ♀ (35.44, 34.59, 31.70, 18.43 mm TL; 16.39, 15.53, 14.53, 7.87 mm W) [UMTCrus REG 01200, 01201, 01198, 01202], 2 mature ♂ (13.55, 12.20 mm TL; 5.61, 6.13 mm W) [UMTCrus REG 01199, 01204], 1 juvenile ♂ (12.05 mm TL; 5.10 mm W) [UMTCrus REG 01203], Station 55, EEZ, 06° 38’ 09” N; 102° 21’ 95” E, 04 June 2016, attached to the gills of *Selar crumenophthalmus*, coll. SEAFDEC crew via bottom trawl.

Host. Notably from the family Carangidae, and lesser-known from Clupeidae and Leiognathidae: *Alepes apercna* Grant 1987 ; *Rastrelliger kanagurta* (Cuvier 1816) see Avdeev 1978b; Rokicki 1982; Ghani 2003; Rameshkumar et al. 2015; Kottarathil et al. 2019); *Alepes melanoptera* (Swainson 1839) (previously known as *Atule malam*; see Avdeev 1978b); *Selar crumenophthalmus* (Bloch 1793) see Rokicki 1982; Bruce 1990; Nagasawa and Petchsupa 2009; Neeraja et al. 2014; Cruz-Lacierda and Nagasawa 2017; present study); *Decapterus russelli* (Rüppell 1830) (Ghani 2003); *Decapterus kurroides* Bleeker 1855 (Cruz-Lacierda and Nagasawa 2017); *Herklotsichthys* sp. (Bruce 1990; Ghani 2003; Yu and Li 2003b); *Deveximentum insidiator* (Bloch 1787) (previously known as *Secutor insidiator*; see Behera et al. 2016).

Distribution. Range from the Western Indo-Pacific to the Central Indo Pacific regions. The Western, Indo-Pacific records include Zambezi estuary, Mozambique, Tanjona Vilanandro, Madagascar (previously Cape Saint André) (see Rokicki 1982; Van der Wal et al. 2017); Mayotte Island (Trilles 1976); Pakistan (Behera et al. 2016); India (Rameshkumar et al. 2013b, 2015; Behera et al. 2016). Central Indo Pacific records include Thailand (Nagasawa and Petchsupa 2009; Schioedte and Meinert 1884); Indonesia (Milne Edwards 1840; Trilles 1979); China (Yu and Li 2003b); Philippines (Schioedte and Meinert 1884; Trilles 1976; Yamauchi et al. 2005; Cruz-Lacierda and Nagasawa 2017); Australia (Avdeev 1978b; Bruce 1990).

Remarks. *Norileca indica* has a distinctive asymmetrically twisted body, pleonite 5 about as wide as pleonite 1, similar length to width ratio of pleotelson and the uropods are two-thirds the length of the pleotelson length (Van der Wal et al. 2017).

Norileca indica resides at the gills of its host, attaching to the ventral part of the host's branchial cavity. The cephalon faces the anterior end of the host, and its ventral side is directed outwards, opposite the branchial operculum (Bruce 1990; Neeraja et al. 2014; Rameshkumar et al. 2015; Behera et al. 2016). Generally, the mancae, and immature males do not exhibit the strong body twist until its adult phase, and the position of the body asymmetry depends on the settlement of the cymothoid within the body cavity. The adult will be twisted to the right when it occupies the left branchial cavity and vice versa (Nagasawa and Petchsupa 2009; Neeraja et al. 2014). Kottarathil et al., (2019) observed that the instances of male-female combination can be as common as 89.17%, similar to the current observation despite the minimal material examined.

Adult *Norileca indica* has been reported to cause noticeable physical damage to the mucosal membrane of the branchial operculum, which includes atrophy of the gill filaments, an overall loss of gill normalcy, and formation of a deep pit in the gill chamber floor affected by the permanent occupancy of the ovigerous female (Helna et al. 2019).

Kottarathil et al. (2019) reported on the seasonal variations in the prevalence of host-parasite associations between *Norileca indica* and the Indian mackerel *Rastrelliger kanagurta* along the Malabar Coast of India. The monthly occurrence of the cymothoid that was monitored for a period of 38 months (July 2012 to July 2014; March 2017 to March 2018) resulted in a significant difference ($p < 0.001$) among seasons. In addition, a positive correlation was also observed for 1. between the size of female parasites and their respective host fish ($r = 0.40$); and 2. between the size of female parasites and their fecundity ($r = 0.78$). The prevalence, mean intensity, and abundance were 30.70, 1.71, and 0.52%, respectively. In Sarawak *Norileca indica* was found on the branchial cavity of *Carangid malabaricus* and *Rastrelliger kanagurta* with their respective prevalence and mean intensity: *Carangid malabaricus* 4/24 (16.6% prevalence) and 5/24 (1.25 mean intensity); and *Rastrelliger kanagurta* 6/45 (13.3% prevalence) and 7/45 (1.16 mean intensity) (refer to Anand et al. 2017).

We agree with Van der Wal et al. (2017) that both Yamauchi's et al. (2005) and Behera's et al. (2016) host association record is considered false, since *Norileca indica* is a gill-attaching and does not reside in the stomach of dolphinfish, and to date, the species has not been recorded on *Nemipterus randalli* and could refer to another species.

Genus *Renocila* Miers, 1880

18) *Renocila richardsonae* Williams and Bunkley-Williams, 1992

(Figure 4 Li-Liv)

Renocila ovata Richardson, 1910: 22.

Renocila sp. Bruce, 1987c: 169.

Renocila richardsonae Williams and Bunkley-Williams, 1992: 301, figs 2–4.—Arthur and Lumanlan-Mayo, 1997: 96.

Type material. The female holotype is deposited in the National Museum of Natural History (USNM 231173). For details of paratypes refer to Williams and Bunkley-Williams (1992)

Type locality. Sulada Island, Philippines (see Williams and Bunkley-Williams, 1992).

Type host. Williams and Bunkley-Williams (1992) mentioned “*Pseudupeneus macronema*” (now accepted as *Parupeneus macronemus*) (Lacepède 1801)

Material examined (New record). 1 ♀ ovig. (16.42 mm TL, 7.48 mm W), 1 ♂ mature (12.04 mm TL, 5.16 mm W), 200-meter depth off the coast of Sarawak, Malaysia; 02°02.474' until 03°45.153'; 110°35.599' until 110°50.351', 27th April until 10th May 2010, from *Upeneus japonicus* (Mullidae), coll. the crew of KK Manchung and Kua Beng Chu with a beam-trawl (MTQ WW34362).

Host. Since the species is rarely reported, the two consistent accounts of host preference are from the family Mullidae. The current specimen was retrieved from the Japanese goatfish *Upeneus japonicus* (Houttuyn 1782) (here reported as a new host record) and the long-barbed goatfish *Parupeneus macronemus* (Lacepède 1801) (Williams and Bunkley-Williams 1992).

Williams and Bunkley-Williams (1992) noted Fowler's host record for the USNM 40949 paratype was retrieved from that tail of a snapper, which could either be from the family Lutjanidae or Nemipteridae, thus this record is deemed doubtful.

Distribution. Central Indo-Pacific distribution: collected off the coast of Sarawak, Malaysia (present study); Philippines (Williams and Bunkley-Williams, 1992).

Remarks. *Renocila richardsonae* is here reported as a new locality record for Malaysian waters. This species differs from other members of the genus by the distinct protrusion of pereopods 1 and 2 basis and 1 to 6 ischium. For a detailed key to the species of *Renocila* refer to Williams and Bunkley-Williams (1992).

The specimens collected from Sarawak had a prevalence of 6% and a mean intensity of one isopod per fish. The species was observed attached towards the caudal peduncle of its host (similar to that reported in Williams and Bunkley-Williams, 1992), with slightly severe musculature lesion due to the strong holdfast of the cymothoid's pereopods.

Discussion

Eighteen species of cymothoids were found in Malaysian waters with a total of 76 cymothoid-host species correlations from 29 families identified in the greater Indo-Pacific region (refer to Table 1) under both literary and current records. The highest number of cymothoid species belonged to the families Carangidae (with seven cymothoids from 14 host species), followed by Engraulidae (three cymothoids from five host species), Leiognathidae (three cymothoids from four host species) whereas the remaining families either have a single or two reported isopod species. These cymothoids occur within the Indo-Pacific Regions, whereas some have a greater geographical distribution that extends towards the Western Indo-Pacific and to some degree bordering temperate Australasia, owing to their host's biology and ecology. It has been a challenge acquiring ample documents for cymothoid prevalence and mean intensity on a seasonal basis since most sampling or literary records are done opportunistically. Nevertheless, with the minimal evidence available, the species listed here are not likely to cause high mortality rates among fishes (see list of examples in Nowak et al. 2020).

Cymothoid association with commercially important fish species

The marine capture fisheries production in 2014 was reported to be 82.7 million metric tons, accounting for 42.25% of the total fisheries production global (195.7 million metric tons) with Asia and America as the main contributors (SEAFDEC 2017). Within the Southeast Asian (SEA) region in 2014, its marine captures fisheries production of 16.6 million metric tons, owing approximately 20.1% to the global marine capture fisheries production. The commercially important marine fish species that contributed significantly towards Southeast Asia's total fisheries production in 2014 include tunas (family Scombridae), small pelagic fishes (e.g. scads [family Carangidae], mackerels [family Scombridae], anchovies [family Engraulidae], sardines [family Clupeidae]), and demersal fishes [e.g. families Mullidae, Serranidae, Lutjanidae, Nemipteridae]. These fishes are high in demand not only within Malaysia and the Southeast Asian region but also in other regions of the world, and thus dominate the fishery exports of the Southeast Asian countries (LKIM 2017, SEAFDEC 2017). Ironically, 24 out of the 68 of our listed cymothoid-host associations are also reported from these highly commercial species, with the top three attributed to families Carangidae, Engraulidae, and Clupeidae (Table 1).

Our compiled evidence is still in agreement that cymothoids generally show high degrees of host specificity, either by species (e.g., *Ceratothoa barracuda*, *Joryma engraulidis*) or predominantly by genus or family (e.g., *Catoessa boscai*, *Ceratothoa carinata*, *Lobothorax typus*, *Cymothoa pulchrum*, *Norileca indica*). Though further studies are needed to understand the complexities of cymothoids with low host-specificity (such as *Cymothoa eremita*, *Nerocila arres*, *Nerocila depressa*), Brusca (1978, 1981) suggested that host with ecological similarities (e.g. demersal, schooling, etc.) may influence cymothoid preference. If this statement holds true, then it well applies to cymothoids like *Cymothoa eremita*, which are commonly found on demersal fishes. Demersal fishes are generally bottom feeders that live on or near the ocean floor. The main Southeast Asian representatives include flounders, halibuts, soles, lizardfish, sea catfishes, threadfin breams (*Nemipterus* spp.), snappers (*Lutjanus* spp.), groupers *nei* (*Epinephelus* spp.), pony fish (*Leiognathus* spp.), goatfishes, sweetlips, emperors, most of which are found in Table 1. Demersal fishes are usually caught by trawl nets, bottom gillnets, longlines, and handlines (SEAFDEC 2017).

Cymothoid implication towards aquaculture

Cymothoids are economically significant parasites as they are known to infect a wide range of fishes (be it wild or commercially important species) with a range of health implications (Nowak et al. 2020). Farmed fishes are likely to be infested with cymothoids from having to be in close contact with wild fishes or other infested cage/pens that have not been properly disinfected or if fishes are not quarantined. Although no host family is exempted from being parasitised by cymothoids, the parasite displays strong host specificity by family, genus or species. Horton et al. (2001) reported an ectoparasite *Nerocila orbignyi* infecting and killing cultured sea bass *Dicentrarchus labrax* in aquaculture systems from Diana Pond in Corsica. *Nerocila orbignyi* (Guérin-Méneville, 1832) was found attached to the skin and fins of fish and commonly infects the family Mugilidae. Another case study on the impacts of *Ceratothoa gaudichaudii* (H. Milne Edwards, 1840) on Chilean salmon found that the host had significantly reduced weight, harbouring three to eight parasites per host (Sievers et al. 1996). In India, *Cymothoa indica* Schiodte and Meinert, 1884 infection on the cultured catfish *Mystus gulio* (Hamilton 1822) had caused serious bruising and malnutrition, and 100% mortality within 10 days (Rajkumar et al. 2005). The stock fish died 100% in 10 days. Notwithstanding, the infections are not harsh and not cause fish to die but a certain negative result occur like lower weights, lesions and the damage product to customer.

Misrepresented accounts of cymothoids in Malaysia

Bokyo et al. (2008 onwards) stated that the type locality for *Renocila ovata* is Malaysia. In reference to Miers (1880), while examining Bleeker's (1857) collection, it was recorded as "Batavia", currently known as Jakarta, Indonesia. Though it is likely that *Renocila ovata* can occur in Malaysia based on (1) the relatively close geographical range of Jakarta to Malaysia and (2) the host *Stegastes fasciolatus* (previously *Eupomacentrus fasciolatus* in Bruce, 1987) are known from Malaysian waters, there has been no reports or collections to date.

Bokyo et al. (2008) also indicated that the type locality for *Catoessa scabricauda* Schioedte and Meinert, 1884 in Malaysia. This is also incorrect, as the Danish authors first described this species from Adonara Island, one of the Lesser Sunda Islands towards the east of Flores Island (Bowman and Tareen 1983; Trilles et al. 2012). The species was described as a single female without its known host and is presently in its fragile state at the Humbolt University of Berlin, Germany (ZMHU no. 3642; see Trilles et al. 2012). Inclusive of recent sampling collections, we have no records of this species in Malaysian waters other than *Catoessa boscii*, which can be easily distinguished from *Catoessa scabricauda* by the truncate rostrum (*vs* pointed anteriorly), antennae 1 and 2 subequal (*vs* 2 longer than 1), pereopods 6 and 7 with carina on basis (*vs* pereopods without carina on basis), pleonites 2-5 subequal in width (*vs* 5 narrower than 2-4), and uropods extending beyond pleotelson (*vs* reaching mid-length of pleotelson) (see Trilles et al. 2012).

Conclusion

The availability of collected samples from various field trips and expeditions, as well as donations from researchers of different organisations (see 'acknowledgment') allowed for a better understanding of cymothoids in Malaysian waters. Though far from having a comprehensive list based on the minimal specimens obtainable and literary records, it was crucial because comparison of ample specimens from different locations and host associations enabled a better understanding of commonly occurring cymothoids and cymothoid host-association, geographical distribution. Prevalence and mean intensity of cymothoids on both wild or aquaculture fish populations can pose a challenge for sampling since it is not consistently recorded seasonally for all species, and therefore unpredictable to target which host species has a higher tendency of being parasitised often. These are areas worthy of future investigation (particular cymothoids of low host specificity), particularly for stakeholders investing in the fisheries, aquaculture, and food safety industry.

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Figure 1

Figure 2

Figure 3

Figure 4

Future legends

Figure 1: A. *Anilocra nemipteri* Bruce, 1987 ovigerous female (28.99 mm) (UMTCrus 01135): (i) dorsal view, (ii) ventral view.

Figure 1: A. *Anilocra nemipteri* Bruce, 1987 male (12.96 mm) (UMTCrus01137): (iii) dorsal view, (iv) ventral view.

Figure 1: B. *Catoessa bosicii* (Bleeker, 1857) ovigerous female (12.55 mm) (UMTCrus01158): (i) dorsal view, (ii) ventral view.

Figure 1: B. *Catoessa bosicii* (Bleeker, 1857) male (7.94 mm) (UMTCrus01159): (iii) dorsal view, (iv) ventral view.

Figure 1: C. *Ceratothoa barracuda* Martin, Bruce and Nowak, 2015 female (19.44 mm) (UMTCrus 01160): (i) dorsal view, (ii) ventral view.

Figure 1: C. *Ceratothoa barracuda* Martin, Bruce and Nowak, 2015 male (6.71 mm) (UMTCrus 01161): (iii) dorsal view, (iv) ventral view.

Figure 2: D. *Ceratothoa carinata* (Bianconi, 1869) ovigerous female (33 mm) (UMTCrus 01162): (i) dorsal view, (ii) ventral view.

Figure 2: D. *Ceratothoa carinata* (Bianconi, 1869) non -ovigerous female (32 mm) (UMTCrus 01163): (iii) dorsal view, (iv) ventral view.

Figure 2: E. *Cymothoa epimerica* Avdeev, 1979 ovigerous female (22.3 mm) (UMTCrus 01164): (i) dorsal view, (ii) ventral view.

Figure 2: E. *Cymothoa epimerica* Avdeev, 1979 male (9.25 mm) (UMTCrus 01171): (iii) dorsal view, (iv) ventral view.

Figure 2: F. *Cymothoa eremita* (Brunnich, 1783) non-ovigerous female (15.51 mm) (UMTCrus 01178): (i) dorsal view, (ii) ventral view.

Figure 2: F. *Cymothoa eremita* (Brunnich, 1783) male (8.11 mm) (UMTCrus 01179): (iii) dorsal view, (iv) ventral view.

Figure 3: G. *Cymothoa pulchrum* Lanchester, 1902 ovigerous female (40 mm) (UMTCrus 01104): (i) dorsal view, (ii) ventral view.

Figure 3: G. *Cymothoa pulchrum* Lanchester, 1902 male (13 mm) (UMTCrus 01105): (iii) dorsal view, (iv) ventral view.

Figure 3: H. *Elthusa sigani* Bruce, 1990 non-ovigerous female (8.34 mm) (UMTCrus 01191): (i) dorsal view, (ii) ventral view.

Figure 3: I. *Joryma engraulidis* (Barnard, 1936) ovigerous female (9.3 mm) (UMTCrus 01194): (i) dorsal view, (ii) ventral view.

Figure 4: J. *Lobothorax typus* Bleeker, 1857 ovigerous female (33.55 mm) (UMTCrus 01196): (i) dorsal view, (ii) ventral view.

Figure 4: K. *Norileca indica* Milne Edwards, 1840 female (31.7mm) (UMTCrus 01198): (i) dorsal view, (ii) ventral view.

Figure 4: K. *Norileca indica* Milne Edwards, 1840 male (13.55 mm) (UMTCrus 01199): (iii) dorsal view, (iv) ventral view.

Figure 4: L. *Renocila richardsonae* Williams and Bunkley-Williams, 1992 ovigerous female (16.42 mm) (MTQ W34362): (i) dorsal view, (ii) ventral view.

Figure 4: L. *Renocila richardsonae* Williams and Bunkley-Williams, 1992 male (12.04 mm) (MTQ W34362): (iii) dorsal view, (iv) ventral view.

TABLE 1: Cymothoids-host association on known marine fish species in Malaysia and the Indo-Pacific region, inclusive of commercially important fish species according to reports from Southeast Asian Fisheries Development Center (SEAFDEC 2017) and the Fisheries Development Authority Malaysia (LKIM 2017).

	Host family	Host species within the family	Economically important marine species	Cymothoid-host association
1	Aulopidae	<i>Himeformosana</i>		<i>Cymothoa eremita</i>
2	Chirocentridae	<i>Chirocentrus dorab</i>		<i>Nerocila loveni</i>
3	Cyprinidae	<i>Cyclocheilichthys apogon</i>		<i>Nerocila depressa</i>
4	Diodontidae	<i>Diodon holocanthus</i>		<i>Cymothoa pulchrum</i>
5		<i>Diodon hystrix</i>		<i>Cymothoa pulchrum</i>
6		<i>Diodon liturosus</i>		<i>Cymothoa pulchrum</i>
7		<i>Chilomycterus reticulatus</i>		<i>Cymothoa pulchrum</i>
8	Mugilidae	<i>Liza vaigiensis</i>		<i>Cymothoa eremita</i>
9	Mullidae	<i>Parupeneus macronemus</i>	SEAFDEC (2016, 2017)	<i>Renocila richardsonae</i>
10		<i>Upeneus japonicas</i>	SEAFDEC (2016, 2017)	<i>Renocila richardsonae</i>
11	Pomacentridae	<i>Pomacentrus jerdoni</i>		<i>Anilocra nemipteri</i>
12	Priacanthidae	<i>Priacanthus hamrur</i>		<i>Nerocila arres</i>
13	Psettodidae	<i>Psettodes erumei</i>		<i>Cymothoa eremita</i>
14	Sciaenidae	<i>Otolithes ruber</i>		<i>Nerocila longispina</i>
15	Scorpaenidae	<i>Pterois russelli</i>		<i>Elthusa sigani</i>

16	Serranidae	<i>Epinephelus tauvina</i>	SEAFDEC (2016, 2017)	<i>Nerocila arres</i>
17	Sparidae	<i>Acanthopagrus latus</i>		<i>Nerocila arres</i>
18	Stromateidae	<i>Peprilus paru</i>		<i>Cymothoa eremita</i>
19		<i>Pampusargenteus</i>		<i>Cymothoa eremita</i>
20	Trichiuridae	<i>Lepturacanthus savala</i>		<i>Lobothorax typus</i>
21		<i>Trichiurus lepturus</i>		<i>Lobothorax typus</i>
22	Ariidae	<i>Netuma bilineata</i>		<i>Nerocila arres</i>
				<i>Nerocila depressa</i>
23	Clupeidae	<i>Sardinella fimbriata</i>	SEAFDEC (2016, 2017)	<i>Nerocila depressa</i>
24		<i>Sardinella albella</i>	SEAFDEC (2016, 2017)	<i>Nerocila depressa</i>
25		<i>Sardinella gibbosa</i>	SEAFDEC (2016, 2017)	<i>Nerocila depressa</i>
26		<i>Herklotsichthys sp.</i>		<i>Norileca indica</i>
27	Haemulidae	<i>Plectorhinchus nigrus</i>		<i>Cymothoa eremita</i>
28		<i>Pomadasys maculatus</i>		<i>Nerocila loveni</i>
29	Lutjanidae	<i>Lutjanus adetii</i>	SEAFDEC (2016, 2017)	<i>Ceratothoa carinata</i>
30		<i>Pristipomoides multidens</i>		<i>Cymothoa eremita</i>
31	Nemipteridae	<i>Nemipterus peronii</i>	SEAFDEC (2016, 2017); LKIM (2017)	<i>Nerocila arres</i>
				<i>Anilocra nemipteri</i>
32		<i>Nemipterus japonicus</i>	SEAFDEC (2016, 2017); LKIM (2017)	<i>Nerocila arres</i>

33		<i>Nemipterusvirgatus</i>	SEAFDEC (2016, 2017); LKIM (2017)	<i>Anilocra nemipteri</i>
34		<i>Nemipterusnemurus</i>	SEAFDEC (2016, 2017); LKIM (2017)	<i>Anilocra nemipteri</i>
35		<i>Nemipterusnematophorus</i>	SEAFDEC (2016, 2017); LKIM (2017)	<i>Anilocra nemipteri</i>
36		<i>Nemipterusthosaporni</i>	SEAFDEC (2016, 2017); LKIM (2017)	<i>Anilocra nemipteri</i>
37		<i>Nemipterustambuloides</i>	SEAFDEC (2016, 2017); LKIM (2017)	<i>Anilocra nemipteri</i>
				<i>Cymothoa eremita</i>
38		<i>Nemipterus furcosus</i>	SEAFDEC (2016, 2017); LKIM (2017)	<i>Cymothoa eremita</i>
39		<i>Scolopsis bilineatus</i>		<i>Anilocra nemipteri</i>
40		<i>Scolopsis monogramma</i>		<i>Anilocra nemipteri</i>
41		<i>Scolopsis margaritifer</i>		<i>Anilocra nemipteri</i>
42		<i>Pentapodus setosus</i>		<i>Anilocra nemipteri</i>
43	Pristigasteridae	<i>Ilisha melastoma</i>		<i>Catoessa gruneri</i>
44		<i>Opisthopterus tardoore</i>		<i>Nerocila depressa</i>
45	Siganidae	<i>Siganus canaliculatus</i>		<i>Cymothoa eremita</i>
				<i>Nerocila sigani</i>
46		<i>Siganus spinus</i>		<i>Elthusa sigani</i>
47	Sphyraenidae	<i>Sphyraena forsteri</i>		<i>Ceratothoa barracuda</i>
48		<i>Sphyraena obtusata</i>		<i>Cymothoa eremita</i>
49	Tetraodontidae	<i>Arothron leopardus</i>		<i>Cymothoa eremita</i>

50		<i>Arothron stellatus</i>		<i>Cymothoa pulchrum</i>
51		<i>Arothron meleagris</i>		<i>Cymothoa pulchrum</i>
52	Terapontidae	<i>Terapon puta</i>		<i>Nerocila longispina</i>
				<i>Catoessa gruneri</i>
53	Engraulidae	<i>Stolephorus indicus</i>	SEAFDEC (2016, 2017)	<i>Catoessa boscii</i>
54		<i>Thryssa setirostris</i>	SEAFDEC (2016, 2017)	<i>Joryma engraulidis</i>
55		<i>Coilia dussumieri</i>	SEAFDEC (2016, 2017)	<i>Nerocila depressa</i>
56		<i>Engraulis sp.</i>	SEAFDEC (2016, 2017)	
57		<i>Setipinnatenuifilis</i>		
58	Leiognathidae	<i>Eubleekeria splendens</i>		<i>Catoessa gruneri</i>
				<i>Nerocila loveni</i>
59		<i>Leiognathus fasciatus</i>	SEAFDEC (2016, 2017)	<i>Catoessa gruneri</i>
60		<i>Leiognathus daura</i>	SEAFDEC (2016, 2017)	<i>Catoessa gruneri</i>
61		<i>Deveximentum insidiator</i>		<i>Norileca indica</i>
62	Scombridae	<i>Rastrelliger kanagurta</i>	SEAFDEC (2016, 2017); LKIM (2017)	<i>Catoessa boscii</i>
				<i>Norileca indica</i>
63	Carangidae	<i>Alectis indicus</i>		<i>Catoessa boscii</i>
64		<i>Carangoides malabaricus</i>		<i>Catoessa boscii</i>
				<i>Nerocila loveni</i>

				<i>Nerocila depressa</i>
65		<i>Decapterus macrosoma</i>	SEAFDEC (2016, 2017); LKIM (2017)	<i>Ceratothoa carinata</i>
66		<i>Decapterus muroadsi</i>	SEAFDEC (2016, 2017); LKIM (2017)	<i>Ceratothoa carinata</i>
67		<i>Pseudocaranx dentex</i>		<i>Ceratothoa carinata</i>
68		<i>Selar crumenophthalmus</i>	SEAFDEC (2016, 2017); LKIM (2017)	<i>Ceratothoa carinata</i>
				<i>Norileca indica</i>
69		<i>Parastromateus niger</i>	LKIM (2017)	<i>Cymothoa eremita</i>
				<i>Nerocila sigani</i>
70		<i>Alectis ciliaris</i>		<i>Nerocila depressa</i>
71		<i>Selaroides leptolepis</i>	SEAFDEC (2016, 2017); LKIM (2017)	<i>Nerocila depressa</i>
72		<i>Johnius dussumieri</i>		<i>Nerocila sigani</i>
73		<i>Alepes apercna</i>		<i>Norileca indica</i>
74		<i>Alepes melanoptera</i>		<i>Norileca indica</i>
75		<i>Decapterus kurroides</i>	SEAFDEC (2016, 2017); LKIM (2017)	<i>Norileca indica</i>
76		<i>Decapterus russelli</i>	SEAFDEC (2016, 2017); LKIM (2017)	<i>Norileca indica</i>