

**Nerocila** species (Crustacea, Isopoda, Cymothoidae) from Indian marine fishes

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Received: 18 September 2012 / Accepted: 17 December 2012 / Published online: 17 January 2013
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Abstract

Eleven *Nerocila* species are recorded from 22 marine fishes belonging to 15 families. Three, *Nerocila arres*, *Nerocila depressa*, and *Nerocila loveni*, are new for the Indian fauna. *N. arres* and *Nerocila sigani*, previously synonymized, are redescribed and their individuality is restored. *Nerocila exocoeti*, until now inadequately identified, is described and distinctly characterized. A neotype is designated. New hosts were identified for *N. depressa*, *N. loveni*, *Nerocila phaiopleura*, *Nerocila serra*, and *Nerocila sundaica*. Host–parasite relationships were considered. The parasitologic indexes were calculated. The site of attachment of the parasites on their hosts was also observed. A checklist of the nominal *Nerocila* species until now reported from Indian marine fishes was compiled.

Introduction

Many fish species are parasitized by Cymothoid isopods. They are found from various parts of the fish, on the skin, on the fins, in the buccal or branchial cavities, sometimes in a pouch. Some are highly host specific, even in the manca stage (Trilles 1964; Tsai et al. 1999). However, several species show a poor host specificity and the mancae may attach and feed on optional intermediate hosts belonging to different fish families (Sarusic 1999) and sometimes even on several other organisms (Trilles and Öktener 2004; Wunderlich et al. 2011).

*Nerocila* is a large genus of the family Cymothoidae including at least 65 species living attached on the skin or on the fins of fishes. As already reported by Trilles (1972, 1979), Williams and Williams (1980, 1981), and Bruce (1987a, b), several species are morphologically highly variable and their identification is often difficult. The variability was particularly studied in *Nerocila armata* and *Nerocila orbignyi* (Monod 1931), *Nerocila excisa* (Trilles 1972), *Nerocila sundaica* (Bowman 1978), *Nerocila acuminata* (Brusca 1981), *Nerocila arres*, and *Nerocila kisra* (Bowman and Tareen 1983), and *N. orbignyi, Nerocila monodi, and Nerocila phaiopleura* (Bruce 1987a).

Until now few studies were performed on parasites collected from Indian marine fishes (Pillai 1954, 1964; Ravichandran et al. 2010; Rameshkumar et al. 2011, 2012a, b; Trilles et al. 2011). Nevertheless, 17 nominal species belonging to the genus *Nerocila* were so far reported from India. However, several of these reports, often published in local journals not easily accessible, contain misidentifications and descriptions that are of doubtful validity. Thus, a more accurate study of the Indian *Nerocila* species is necessary (Trilles et al. 2011).

In the present survey, 11 species were collected. Parasitologic indexes, host species, and geographic distribution are reported for each. A taxonomic study is performed for *N. arres, Nerocila exocoeti, and Nerocila sigani*, poorly known or inadequately identified. A comprehensive summary of the nominal *Nerocila* species until now recorded from India is also provided.

Materials and methods

One thousand six hundred forty-six specimens belonging to 22 fish species were directly collected from the trawlers
landed at the Tamil Nadu coasts in South India (Fig. 1 and Table 1) from April 2009 to December 2011. Samplings were performed twice monthly. Isopods were removed alive from the host and immediately placed into 70 % ethanol. The sampling date, locality, host fish, and site of attachment on the host fish were recorded. Mouthparts and appendages were carefully dissected using dissecting needles and forceps. Drawings were made with the aid of a camera lucida. The total length of isopods was measured and recorded in millimeters. The overall prevalence (number of infested hosts/number of examined hosts×100 %) and intensity (total number of parasites/number of infested hosts) were calculated according to Margolis et al. (1982) and Bush et al. (1997) as well as the mean prevalence and intensity for each parasite–host association. The parasites were identified according to Pillai (1954), Trilles (1975; 1979), Bowman (1978), Bowman and Tareen (1983), Bruce (1987a), Bruce and Harrison-Nelson (1988), and Rameshkumar et al. (2011). Voucher specimens were deposited at the Annamalai University, India (collection Ravichandran) and at the National Museum of Natural History, Paris, France (Appendix). Host nomenclature and fish taxonomy are according to Fish Base (Froese and Pauly 2011). A checklist of the Nerocila nominal species already reported from Indian marine fishes, updated with our new reports, was compiled (Electronic supplementary material).

Abbreviations used: AUCR—Annamalai University, collection Ravichandran, MNHN—Museum National d’Histoire Naturelle, Paris.

Results

Taxonomic remarks

Eleven Nerocila species were reported in this study. Most of them, Nerocila depressa Milne Edwards 1840, Nerocila longispina Miers 1880, Nerocila loveni Bovallius 1887, N. phaiopleura Bleeker 1857, Nerocila poruvae Rameshkumar et al. 2011, Nerocila serr Schioedte and Meinert1881, N. sundaica Bleeker 1857, and Nerocila trichura (Miers 1877), are now well identified. Accurate descriptions with figures of these species have been given by Bowman (1978; Bowman and Tareen (1983), Bruce (1987a), Bruce and Harrison-Nelson (1988), and Rameshkumar et al. (2011). Thus, the necessity of redescribing these species does not arise here. Therefore, we are presenting only additional photos of these parasites to contribute to their identification by future workers. However, the validity of N. arres, N. exocoeti, and N. sigani, was still to be verified.

Nerocila arres Bowman and Tareen 1983

Synonymy: Nerocila arres Bowman and Tareen 1983: 12–17, figs 10–12. —Trilles 1994: 82. —Rameshkumar et al. 2012b: not paginated. Nerocila sigani Bowman and Tareen 1983. Bruce and Harrison-Nelson 1988: 597–598 (part).

Material examined: 17 Nerocila arres, female (14 ovigerous, size from 20 to 28 mm, No. MNHN-IU-2009-1934 and AUCR 473 to 484; 3 nonovigerous, size from 17 to 19 mm, No. AUCR 485 to 487), Nagappatinam, Southeastern coast of India, on Nemipterus japonicus, 08 January 2011 and 01 April 2011 (Fig. 2a).

Description of the ovigerous female (Figs. 3a–c, 4a–q, and 6a–e): Body about 2.0 times as long as wide, widest between pereonites 6–7. Cephalon 0.75 as long as wide, rounded anteriorly. Eyes with facets almost indistinct. Antennulae not widely separated at base. Pereonites 6–7 longest and subequal, 1 and 5 subequal in length, shorter than 6–7, 2–4 shortest and subequal. Posterolateral angles of all pereonites produced into points increasing in length from 1 to 7; pereonites 5–7 with broad posteroventral corners. Coxae 2–7 visible in dorsal view, produced into pointed and narrow (2–5) or pointed and broad (6–7) processes; 2–5 not extending beyond posterior of pereonites, 6–7 slightly longer than their respective segment or subequal. All pleonites visible, one longer than 2–5 subequal in length, ventrolateral margins of pleonites 1–2 slightly enlarged, posteriorly directed, extending distinctly beyond pleonite 5, pleonite 3–5 not produced. Pleotelson nearly as wide as long or 1/3 wider than long, lateral margins curving to medial point.

Fig. 1 Map showing the sampling area
| Isopod species         | Host species          | Host family   | Locality         | Number of fish examined | Number of fish infested and % prevalence | Parasites collected and mean intensity | Site of attachment     |
|------------------------|-----------------------|---------------|------------------|-------------------------|------------------------------------------|---------------------------------------|------------------------|
| Nerocila arres<sup>a</sup> | Nemipterus japonicus | Nemipteridae  | Nagappatinam     | 168                     | 17 (10.11)                               | 17 (1)                                | Caudal peduncle         |
| Nerocila depress<sup>a</sup> | Sardinella gibbosa<sup>b</sup> | Clupeidae    | Pazhayar         | 56                      | 7 (12.5)                                 | 7 (1)                                 | Body surface            |
| Nerocila exocoeti      | Exocoetidae           | Exocoetidae   | Parangipettai    | 82                      | 10 (12.19)                               | 10 (1)                                | Body surface            |
| Nerocila longispina    | Otolithes ruber       | Sciaenidae    | Vedaranyam       | 27                      | 2 (7.40)                                 | 2 (1)                                 | Body surface            |
| Terapon puta          | Terapontidae          |               |                  | 19                      | 2 (10.52)                                | 2 (1)                                 | Body surface            |
| Nerocila loveni<sup>a</sup> | Eubleekeria splendens<sup>b</sup> | Leiognathidae | Nagappatinam     | 180                     | 17 (9.44)                                | 22 (1.3)                              | Caudal peduncle         |
| Nerocila phaiopkura    | Carangoides malabaricus<sup>b</sup> | Leiognathidae | Parangipettai    | 174                     | 14 (8.04)                                | 19 (1.4)                              | Body surface            |
| Carangoides sp.<sup>b</sup> | Carangidae            | Leiognathidae | Parangipettai    | 29                      | 2 (6.89)                                 | 2 (1)                                 | Pectoral fin            |
| Chirocentrus dorab     | Chirocentidae         | Carangidae    | Parangipettai    | 17                      | 1 (5.88)                                 | 1 (1)                                 | Body surface            |
| Dussumieria acuta      | Clupeidae             | Carangidae    | Parangipettai    | 21                      | 2 (9.52)                                 | 2 (1)                                 | Body surface            |
| Gazza minuta<sup>b</sup> | Leiognathidae         | Leiognathidae | Parangipettai    | 15                      | 1 (6.66)                                 | 1 (1)                                 | Body surface            |
| Leiognathus splendens<sup>a</sup> | Leiognathidae       | Leiognathidae | Parangipettai    | 32                      | 3 (9.37)                                 | 4 (1.3)                              | Body surface            |
| Rastrelliger kanagurta | Scombridae            | Carangidae    | Parangipettai    | 155                     | 13 (8.38)                                | 17 (1.3)                              | Caudal peduncle         |
| Sardinella gibbosa     | Clupeidae             | Carangidae    | Parangipettai    | 56                      | 4 (7.14)                                 | 5 (1.3)                              | Body surface            |
| Sardinella longiceps   | Clupeidae             | Carangidae    | Parangipettai    | 98                      | 12 (12.24)                               | 14 (1.2)                              | Body surface            |
| Seroaloides leptolepis<sup>a</sup> | Carangidae           | Leiognathidae | Parangipettai    | 23                      | 2 (8.69)                                 | 2 (1)                                 | Body surface            |
| Sphyraena jello<sup>b</sup> | Sphyraenidae         | Sphyraenidae  | Parangipettai    | 47                      | 3 (6.38)                                 | 4 (1.3)                              | Body surface            |
| Tenualosa ilisha<sup>b</sup> | Clupeidae             | Clupeidae     | Parangipettai    | 12                      | 1 (8.33)                                 | 1 (1)                                 | Body surface            |
| Thryssa mystax        | engraulidae           | Carangidae    | Parangipettai    | 18                      | 1 (5.55)                                 | 1 (1)                                 | Body surface            |
| Nerocila poruva        | Thryssa mystax       | engraulidae   | Vedaranyam       | 42                      | 4 (9.52)                                 | 4 (1)                                 | Body surface            |
| Trichiurus lepturnus   | Trichiuridae          | Trichiuridae  | Vedaranyam       | 24                      | 1 (4.16)                                 | 1 (1)                                 | Body surface            |
| Nerocila serr           | Arius maculatus<sup>b</sup> | Leiognathidae | Nagappatinam     | 106                     | 9 (8.49)                                 | 9 (1)                                 | Caudal peduncle         |
| Nerocila sigani        | Sigamis oramin       | Sigamidae     | Mudasalodai      | 23                      | 2 (8.69)                                 | 2 (1)                                 | Caudal fin              |
| Nerocila sundaica      | Carangoides malabaricus<sup>b</sup> | Leiognathidae | Parangipettai    | 33                      | 2 (6.06)                                 | 2 (1)                                 | Pectoral fin            |
| Ilisha melastoma       | Priugiasternidae      | Priugiasternidae | Nagappatinam     | 26                      | 1 (3.84)                                 | 1 (1)                                 | Body surface            |
| Otolithes ruber        | Sciaenidae            | Sciaenidae    | Nagappatinam     | 22                      | 1 (4.54)                                 | 1 (1)                                 | Body surface            |
| Seroaloides leptolepis<sup>b</sup> | Carangidae          | Carangidae    | Nagappatinam     | 18                      | 1 (5.55)                                 | 1 (1)                                 | Body surface            |
| Terapon puta<sup>b</sup> | Terapontidae         | Carangidae    | Nagappatinam     | 84                      | 7 (8.33)                                 | 8 (1.1)                              | Pectoral fin            |
| Opisthopterus Tardoore<sup>b</sup> | Clupeidae             | Clupeidae     | Nagappatinam     | 22                      | 1 (4.54)                                 | 1 (1)                                 | Body surface            |
| Nerocila trichiura     | Exocoetidae           | Carangidae    | Parangipettai    | 17                      | 1 (5.88)                                 | 1 (1)                                 | Pectoral fin            |

Total 1646 144 (8.74) 162 (1.1)

<sup>a</sup> New parasitic species for the Indian fauna
<sup>b</sup> New hosts
Antennula 8 articulated, 1–2 larger than 3–8; article 4–7 with esthetes, article 8 with esthetes and spiny setae.

Antenna with nine articles, 1–2 larger than 3–9, article 4 with two plumose setae, 8–9 with four spiny setae.
Mandibular palp article 1 largest, with seven irregular smoothly rounded setae at apex of third article. Maxillula with three terminal spines. Maxilla with two spines on medial lobe and one spine on lateral lobe. Maxilliped with oostegial lobe, distal palp segment with five spines. Pereopods 1–5 without marginal hooked spines, pereopod 6 with one spine on merus, four spines on carpus, and five spines on propodus, pereopod 7 with two rows of three and 5 spines respectively on merus, two rows of three and four spines on carpus and a row of seven spines on propodus. Dactyls of pereopods 1, 2, 4, and 5 with distinct swellings. Pleopods 1–2 with five coupling hooks on protopod medial margin; pleopod 2 with appendix masculina about 0.5 length of endopod; endopod 1–5 with proximomedial lobe well developed, 1–2 not folded, 3–5 folded; endopod 3–4 with few folds, pleopod 5 endopod with several large folds. Exopod of uropod longer than endopod; endopod not extending, or slightly, beyond posterior margin of pleotelson, with very deep notch on medial margin and serrate lateral margin with a row of 15–16 dissimilar teeth.

**Nerocila sigani** Bowman and Tareen 1983

Synonymy: *Nerocila sigani* Bowman and Tareen 1983: 12, Fig. 9.—Bruce 1987: 406—Bruce and Harrison-Nelson 1988: 597–598 (part).—Trilles 1994: 100 (part).—Kensley 2001: 234.—Rameshkumar et al. 2012b: not paginated.

Material examined: two *N. sigani*, female (ovigerous, size 25 mm, No. MNHN-IU-2009-1935 and AUCR 655), Mudasalodai, Southeastern coast of India, on *Siganus oramin*, 09 December 2011.

Description of the ovigerous female (Figs. 3e–h, 5a–n, and 6f–j): body about 2.0 times as long as wide, widest between pereonites 5–6. Cephalon as wide as long, anterior margin rounded. Eyes with facets almost indistinct. Antennulae widely
separated at base. Pereonites 1, 5, 6, and 7 subequal in length, longest; 2–4 shortest and subequal. Posterolateral angles of all pereonites produced into points narrow and acute, increasing in length progressively from pereonite 1 to pereonite 7. Coxae 2–7 visible in dorsal view, produced into pointed and narrow processes; 2–5 not extending beyond posterior of pereonites or shortest; 6–7 distinctly longer than their respective segment and much more longer than the anterior. All pleonites visible; ventrolateral margins of pleonites 1–2 narrow and acute, posteriorly directed, extending to pleonite 5 or slightly beyond pleonite 5 respectively; pleonites 3–5 slightly produced. Pleotelson about 1/3 wider than long or as wide as long, smoothly rounded, without caudomedial lobe.

Antennula 8 articulated, 1–2 larger than 3–8; articles 4–7 each with dense posterodistal cluster of esthetes. Antenna with 10 articles, 1–2 larger than the others, 5–10 with esthetes or spiny setae. Mandibular palp article 1 largest, article 2 with one spiny seta and three unequal spiny setae at apex of third article. Maxillula with three terminal spines. Maxilla with five spines on medial lobe and one spine on lateral lobe. Maxilliped with oostegial lobe, distal palp segment with one medial and five terminal spines. Pereopods 1, 2, 4, and 5 without marginal hooked spines, pereopod 3 with two spines on propodus, pereopod 6 with two spines on merus, three on carpus, and five on propodus, pereopod 7 with one spine on ischium, merus with two rows of five spines, carpus with two rows of three and five spines respectively, propodus with a row of 7 spines. Dactylus of pereopods without distinct swellings or only very weak swellings on dactyls 4–5. Pleopods 1–2 with five coupling hooks on protopod medial margin; pleopod 2 with appendix masculina about 0.6/0.7 length of endopod and proximomedial lobe not folded;
endopod 3–5 with proximomedial lobe well developed, folded; pleopod 3–4 endopod with a single fold or twofold, pleopod 5 endopod with several large folds. Uropod rami extending beyond posterior margin of pleotelson; exopod slightly longer than endopod; endopod with deep notch on medial margin and serrate lateral margin with a row of 10 regular teeth.

*Nerocila exocoeti* Pillai 1954.

Synonymy: *Nerocila exocoeti* Pillai 1954: 12–13.—Kurochkin 1980: 289.—Bruce, 1987: 404.—Bruce and Harrison-Nelson 1988: 592–593.—Bruce and Bowman 1989: 1.—Trilles 1994: 89.—Kensley 2001: 233.—Sivasubramanian et al. 2011: 99–101.

Material examined: 10 female specimens [eight ovigerous, size from 25 to 28 mm, No. MNHN-IU-2009-1936, MNHN-IU-2009-1937 (Neotype) and AUCR 500 to 505; two non-ovigerous, size from 22 to 23 mm, No. AUCR 506 and 507], Parangipettai, Southeastern coast of India, on *Exocoetus volitans*, 12 April 2011.

Description of the ovigerous female (Figs. 7a–i, 8a–m, and 9a–e): Body about 2.5–2.8 as long as wide, widest between pereonite 5–6; cephalon anterior margin rounded; eyes with facets almost indistinct; Pereonites 1 and 5–7 longest, 2–4 subequal; pereonite 7 sometimes slightly shortest; posterior angles of pereonites 1–6 not produced; posterolateral angles of pereonite 7 produced backward into a pointed process; Coxae 2–4, often visible in dorsal view, produced into rounded processes, not exceeding beyond posterior of pereonites; Coxa 5–7, much more long than the anterior, posterior margin acute, reaching or extending slightly or distinctly beyond posterior of pereonites; All pleonites visibles, pleonite 1 shortest, pleonite 5 longest and widest, pleonies 2–4 subequal; Ventrolateral margins of pleonites 1–2
posteriorly directed and acute, extending to pleonites 3–4 or beyond pleonite 5, respectively; pleonites 3–5 lateral margins weakly acute; pleotelson 0.75–0.9 as long as wide, lateral margins convex, converging to indistinct apical point.

Antennula distinctly thicker than antenna, 8 articulated, articles 5–8 each with posterodistal cluster of esthetes; antenna, 10 articulated, 7–10 with setae. Mandible palp article 1 largest and article 3 without setae on distolateral margin; maxillula with three terminal spines; maxilla with two spines on medial lobe and one spine on lateral lobe; maxilliped with oostegial lobe, distal palp segment with three terminal spines. All pereopods without marginal spines, dactylus longer than propodus; pleopods 1–2 with all rami lamellar, three or four couplings hooks on protopod medial margin of pleopod 1 only, endopod proximomedial lobe well-developed but not folded; pleopod 2 with appendix masculina about 0.5 length of endopod; pleopods 3–4 endopod with a single or double lobe, proximomedial lobe well-developed and folded; pleopod 5 endopod with several large folds and proximomedial lobe well-developed and folded.

Uropod slender, tapering and sublinear exopod and endopod, exopod about two times longer than endopod; endopod reaching or extending scarcely beyond the posterior margin of pleotelson; exopod extending by far beyond it.

As already reported by Pillai (1954), the entire body of the specimens was steel blue in color, with many chromatophores.

Host–parasite relationships

One hundred and sixty-four parasitic isopods belonging to 11 cymothoid species (Table 1, Figs. 2a–k) were collected.
Among them, *N. arres*, *N. depressa*, and *N. loveni* are recorded for the first time from India. These 11 species were collected from 144 fish hosts belonging to 22 species and 15 families: Carangidae, Leiongnathidae, Nemipteridae, Sciaenidae, Scombridae, Siganidae, Sphyraenidae, Terapontidae and Trichiuridae (Perciformes), Chirocentridae, Engraulidae, Pristigasteridae and Clupeidae (Clupeiformes), Ariidae (Siluriformes), and Exocoetidae (Beloniformes) (Table 1). Carangidae and Clupeidae are the most parasitized with three and five species, respectively.

*N. arres*, *N. loveni*, and *N. serra* showed an extensive Vedaranyam distribution. *N. poruvae* and *N. longispina* showed an extensive Vedaranam distribution. *N. loveni* and *N. depressa* occurred only in Pazhaiyar region and *N. sigani* along the Mudasalodai coast. *N. exocoeti*, *N. phaiopleura*, and *N. trichiura* showed limited to the Parangipetttai coast (Table 1).

From April 2009 to December 2011, the overall prevalence reached 8.74%. A maximum prevalence was observed in *N. depressa* parasitizing *Sardinella gibbosa* (*P* = 12.5%) and a minimum prevalence in *N. sundaica* parasitizing *Ilisha melastoma* (*P* = 3.84%). The mean intensity ranged from 1 to 1.4 (Table 1).

For some species, the host-isopod association was not very specific. *N. phaiopleura* was collected from 13 host species belonging to seven families and 11 genera and *N. sundaica* from six host species belonging to five families and six genera. These two species show a euryxenic parasitic specificity. While *N. exocoeti* and *N. trichiura*, only collected from the flying fish *E. volitans*, and *N. sigani*, only
collected on the rabbit fish *Siganus oramin*, show an oïoxenic parasitic specificity. *Carangoides malabaricus*, *E. volitans*, *Leiognathus splendens*, *Otolithes ruber*, *Sardinella gibbosa*, *Selaroides leptolepis*, *Terapon puta*, and *Thryssa mystax* were parasitized by at least two species of *Nerocila*. Fifteen new hosts were identified, seven for *N. phaiopleura*, four for *N. sundaica*, and one for *N. depressa*, *N. exocoeti*, *N. loveni*, and *N. serra* (Table 1).

Four species, *N. arres*, *N. loveni*, *N. serra*, and *N. sigani*, were attached on the caudal peduncle or on the caudal fin of the fishes. *N. depressa*, *N. exocoeti*, *N. longispina*, *N. phaeopleura*, *N. poruvae*, *N. sundaica*, and *N. trichiura*, were collected from the body surface, on the head, on the pectoral fin or from the caudal peduncle of hosts.

**Discussion**

In the present study, 11 *Nerocila* species were collected and *N. arres*, *N. exocoeti*, and *N. sigani* were redescribed.

*N. arres* and *N. sigani* were described by Bowman and Tareen (1983). They were collected on *Nemipterus japonicus*, *Nemipterus tolu*, *Epinephelus tauvina*, *Acanthopagrus latus* (*N. arres*; Holotype from *N. japonicus*), and *Siganus oramin* (*N. sigani*; Holotype from *S. oramin*) from Kuwait (Arabian Gulf). These two species were accepted as valid by Bruce (1987a) and Trilles (1994). However, they were synonymized by Bruce and Harrison-Nelson (1988). These authors stated that *N. sigani* is the senior synonym to *N. arres*, but without an examination of specimens from the host fishes recorded by Bowman and Tareen (1983). Indeed, the material examined...
by Bruce and Harrisson-Nelson was collected on *Sciaenida dussumieri*, *Argyrosoma hololepidotus*, *Argyrosoma macrocephalus*, *Argyrosoma nibe*, *Parastromateus niger*, and *Pomadasys* sp. Thus, it was interesting to benefit from our material to verify the validity of the species *N. arres* and *N. sigani*. We redescribed here in detail the specimens that we collected respectively from the type hosts *N. japonicus* and *S. oramin*, including the mouthparts not examined by Bowman and Tareen (1983) and Bruce and Harrisson-Nelson (1988). Our results reveal that the synonymy of these two species cannot be maintained. Indeed, *N. sigani* and *N. arres* can be distinguished mainly by: cephalon as wide as long (*N. sigani*) or 0.75 as long as wide (*N. arres*); antennulae more separated at base in *N. sigani*; posteroventral corners of all pereonites shaped into points and coxae with pointed processes longer, narrower, and more acute in *N. sigani* than in *N. arres*; pleotelson smoothly rounded (*N. sigani*) or with lateral margins curving to medial point (*N. arres*); pereopods without distinct swellings in dactyls (*N. sigani*) or with distinct dactylus nodules in P1, P2, P4, and P5 (*N. arres*); posterior margin of pleonites 1 and 2 longer, narrower, and more acute in *N. sigani* than in *N. arres*; uropod serrations on the lateral margin of endopod distinct, with 10 regular teeth in *N. sigani* and 15–16 dissimilar teeth in *N. arres*; maxilla with five spines on medial lobe and one spine on lateral lobe (*N. sigani*) or two spines on median lobe and one spine on lateral lobe (*N. arres*); mandible palp article 3 with three setae on the distolateral margin (*N. sigani*) or seven setae (*N. arres*). Our drawings does not match the illustrations produced by Bruce and Harrisson-Nelson (1988) for two specimens, one collected from an unknown Malaysian host (USNM 232015) and another found on *Argyrosoma nibe* from Taiwan (USNM 232017), certainly not belonging to *N. arres* and *N. sigani*. Some drawings from Bowman and Tareen (1983) for two specimens collected respectively from *A. latus* and *E. tauvina* does not correspond to *N. arres*.

*N. exocoeti* was identified by Pillai (1954) from a large number of specimens in all stages of development collected on *Parexocoetus brachypterus* from Travancore, India. However, no figures have been published. The author specified only that the main distinguishing character of this species is the comparative size of the coxal plates, the second being small, not extending beyond the posterior border of the segment and the seventh reaching the tip of the first pleon segment, and that the entire body is steel blue in color. Males were collected but not described by Pillai (1954). *N. exocoeti* was later collected on *P. brachypterus* and *Scomberomorus multiradiatus* (gut contents?) from Papua New Guinea, Indonesia, and Taiwan by Bruce and Harrisson-Nelson (1988). Figures of one specimen (photos of the dorsal and ventral view) collected on the flying fish *E. volitans* from the Parangipettai Coast, South-East coast of India, were recently published (Sivasubramanian et al. 2011). *N. exocoeti* remained a poorly known species. A detailed redescription of this species was necessary.

Until now, two *Nerocila* species, *N. exocoeti* and *N. trichiura* (Miers 1877) were collected from fishes belonging to
the family Exocoetidae. Due to some marked differences, these two species are readily distinguishable. Indeed, in *N. trichiura* (Fig. 7)), the anterior margin of the cephalon is subtruncate, the posterior angle of pereonite 7 does not extend posteriorly in an acute process, the coxae 2–7 are produced into a rounded process, the ventrolateral margins of pleonites 1–2 are distinctly shorter than in *N. exocoeti*; the uropods are much longer, exopod and endopod extending far beyond the distal margin of pleotelson; the live specimens are whitish (Fig. 2k).

While the holotype of *N. trichiura* is held at the British Museum (Natural History) (Holotype: 1846: 104. Mauritius. Presented by Robert Templeton), the Pillai’s Indian specimens of *N. exocoeti* are not extant. Thus, the specimen MNHN-IU-2009-1937 is designate here as neotype of *N. exocoeti*.

Until now, 17 *Nerocila* nominal species and four parasites not yet identified to the species level were recorded from India (Electronic supplementary material). The validity of several of them is still to be verified. *Nerocila madrasensis* was poorly described by Ramakrishna and Venkata Ramaniah (1978) who suggested that this species resembles to *N. serra* and *N. trichiura*. Possibly related to *N. trichiura* according to Bruce (1987a), *N. madrasensis* and *N. trichiura* were provisionally synonymized by Trilles (1994) and Trilles et al. (2011). *Nerocila pigmentata* was synonymized with *N. depressa* by Trilles (1975), 1994), Bruce and Harrison-Nelson (1988) and Trilles et al. (2011) but it will be useful to verify once more this synonymy. Besides that, the species identified by Parimala (1984) as *N. pigmentata* is of uncertain identity and clearly not *N. depressa* (Bruce and Harrison-Nelson 1988). *Nerocila priacanthusi*, resembles to *N. serra* according to Kumari et al. (1987). However, since the endopod of uropod of this species is with deep notches on lateral margin as figured by the authors, this species is really similar to *N. arres*. This species is maybe a junior synonym of *N. arres* (Trilles et al. 2011). *Nerocila pulcatensia* was not reported since its original description by Jayadev Babu and Sanjeeva Raj (1984). Possibly related to *Nerocila latiuscula*, the description provided by the authors precludes for the moment assessment of the status of this species. *Nerocila recurvispina* was also not reported since its original description by Schioedte and Meinert (1881) from a single specimen collected at Calcutta on an unknown fish host. Additional specimens are required to describe this species according to modern standards or to verify if it remains a valid species. *Nerocila trivittata* is maybe the senior synonym of *N. serra* (Trilles 1979). However, Bowman and Tareen (1983) suggested that the question of the identity of *N. trivittata* and *N. serra* cannot be resolved now because the type of *N. trivittata* is not extant.

Acknowledgments Authors are thankful to the Department of Science and Technology and to the Ministry of environment and Forest, Government of India for providing financial support and to the Dean, Faculty of Marine Sciences, Annamalai University, Parangipettai for providing facilities and encouragement.
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