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# Occurrence of ectoparasitic isopod *Norileca indica* (H. Milne Edwards, 1840) on bigeye scad *Selar crumenophthalmus* (Bloch, 1793) from Great Nicobar Island, India

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**Abstract** Present study records the occurrence and range extension of an ectoparasitic isopod, *Norileca indica* (H. Milne Edwards, 1840) from the branchial cavity of bigeye scad *Selar crumenophthalmus* (Bloch, 1793) collected from Pilobah, Great Nicobar Islands. Detailed morphological characteristic of the parasite were presented along with prevalence, mean intensity and abundance. Out of the 130 specimens of *S. crumenophthalmus* examined, 32 were found to be infested with *N. indica*. The sizes of the female specimens were in the ranges 14.0 to 20.1 mm and the male specimens were 13–14 mm.

**Keywords** Cymothoidae · Fish parasite · *Norileca* · Nicobar · Range extension

## Introduction

Cymothoid isopods are ubiquitous, obligate fish ectoparasites with extreme diversity in tropical and subtropical seas (Brusca 1981; Bakenhaster et al. 2006). They mainly infest the tropical marine fishes; few of them infest brackish and freshwater fishes (Rameshkumar et al. 2013a, b; Smit et al.

2014). The family Cymothoidae consists of 383 species within 43 genera (Smit et al. 2014); of them 49 species have recorded from Indian waters (Ravichandran et al. 2019). Cymothoids are site and host specific (Smit et al. 2014), mostly infesting hosts body parts like buccal cavity, gill chamber, body surface and fins, or sometimes they burrow inside the host body (Trilles 1969; Brusca 1981; Bunkley-Williams and Williams 1998). Their infestation can cause severe problems like necrosis and atrophy of the gill chamber, which resulted in reduced gas exchange (Rameshkumar and Ravichandran 2015; Behera et al. 2016). Parasitic isopods of Andaman and Nicobar Islands are poorly studied with only few records (Praveenraj et al. 2017, 2019; Anil et al. 2018, 2019, 2020).

The genus *Norileca* have three known species, *Norileca borealis* Javed and Yasmeeen 1999, *N. indica* (H. Milne Edwards, 1840), and *N. triangulata* (Richardson, 1910) of them two species, *N. indica* and *N. triangulata* were reported from Indian waters (Ravichandran et al. 2019). The genus *Norileca* can be distinguished from other cymothoidae genera by following combination of characters; body twisted to one side, posterior margin of cephalon weakly indented; Antennula shorter than, or subequal to antenna; narrow coxae; shorter than, or as long as respective pereonites, pereonites 3–7 shorter than respective segment; pleonite 1 widest and first two pleonites without ventrolateral processes, pleonites 2–5 becoming progressively narrower. Uropods not extending beyond posterior margin of pleotelson (Hadfield 2012; Wal et al. 2017; Ravichandran et al. 2019). The present paper reports new record of *Norileca indica* to Great Nicobar Island.



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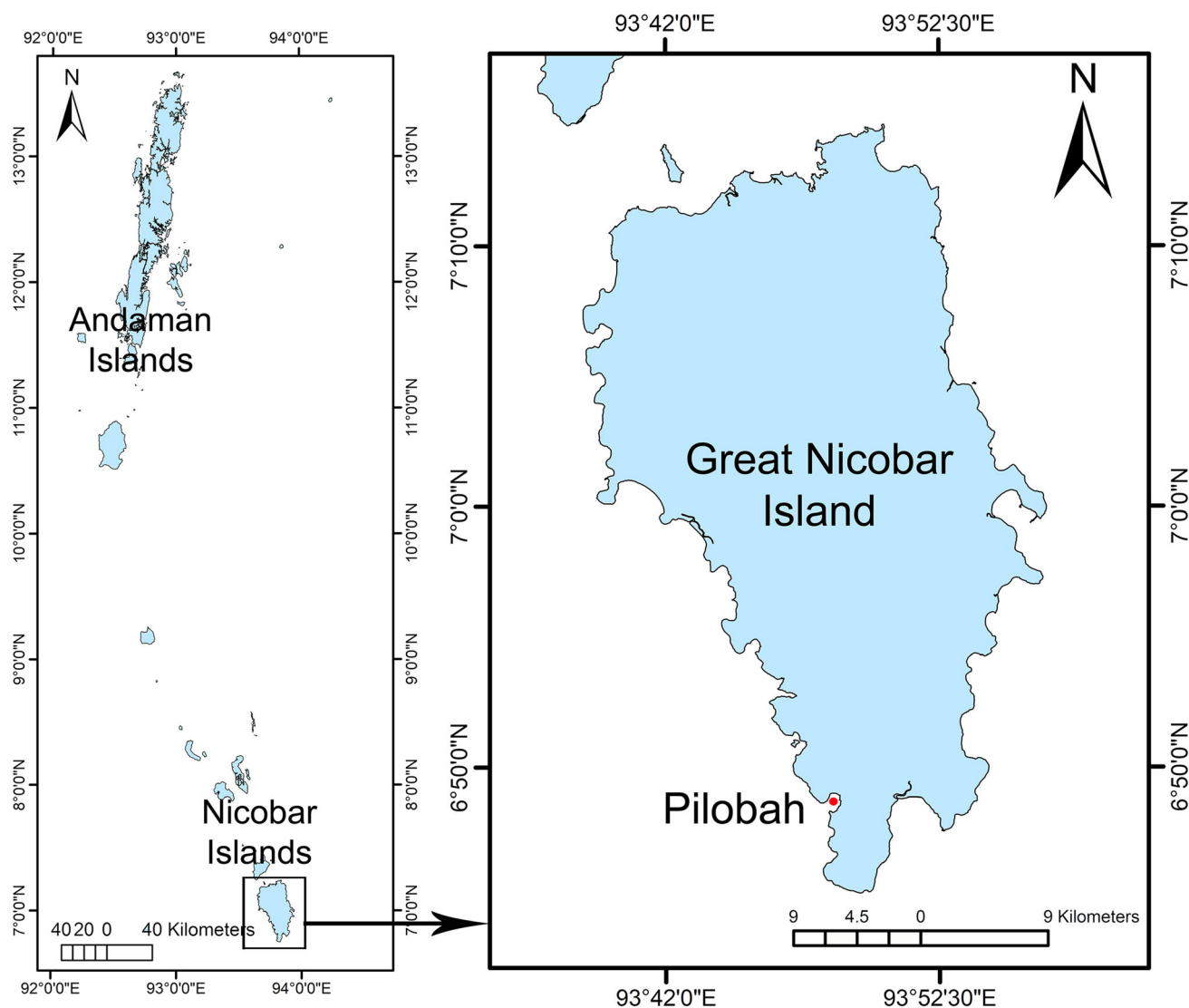
## Methodology

Parasite samples were collected opportunistically from the gill chambers of *Selar crumenophthalmus* captured in gillnet from the inshore waters of Pilobah region (Lat: 6° 48' 45.968" N; Long: 93° 48' 37.498" E) western side of Great Nicobar Island during December 2019 (Fig. 1). The catch was dominated by *S. crumenophthalmus* (60%), followed by juveniles of *Alectis indica* (Ruppell, 1830), *Gerres spp.*, *Mulloides spp.* and *Upeneus vittatus* (Forsskal, 1775). One thirty specimens of *S. crumenophthalmus* of varying sizes were randomly analysed and of them 32 fishes were found infested with parasites. Ten specimens of parasites were collected for taxonomic study. Parasitic isopods were carefully removed and preserved in 70% alcohol for further analysis. Field photographs of host fish with parasites were taken using Canon G7x digital camera. Microphotographs

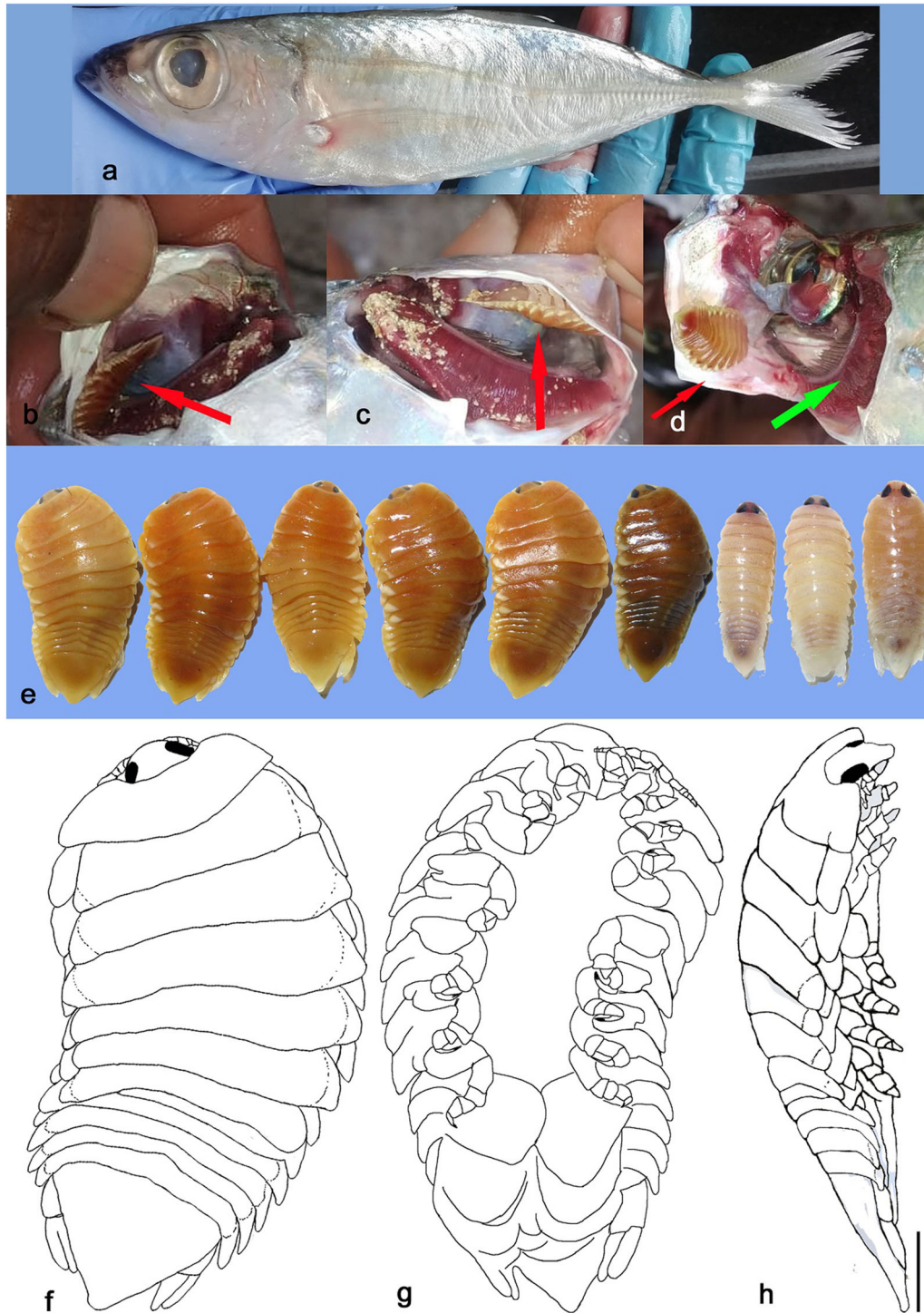
were made using a digital camera attached to the stereo microscope (LEICA M 205A). The isopod parasites were identified according to (Bruce 1990; Wal et al. 2017; Ravichandran et al. 2019). The host nomenclature and identity based on Rao et al. (2000). Voucher specimens were deposited at the Andaman Nicobar Regional Centre, Zoological Survey of India (ANRC/ZSI).

## Results

The present study reports the occurrence of *Norileca indica* (H. Milne Edwards, 1840) from the bigeye scad, *Selar crumenophthalmus* (Bloch, 1793) collected from the Great Nicobar Islands for the first time. Out of the 130 specimens of *S. crumenophthalmus* examined, 32 were found to be infested with *N. indica* with a prevalence of 24.61%.



**Fig. 1** Map showing the study area Pilobah, Great Nicobar Island



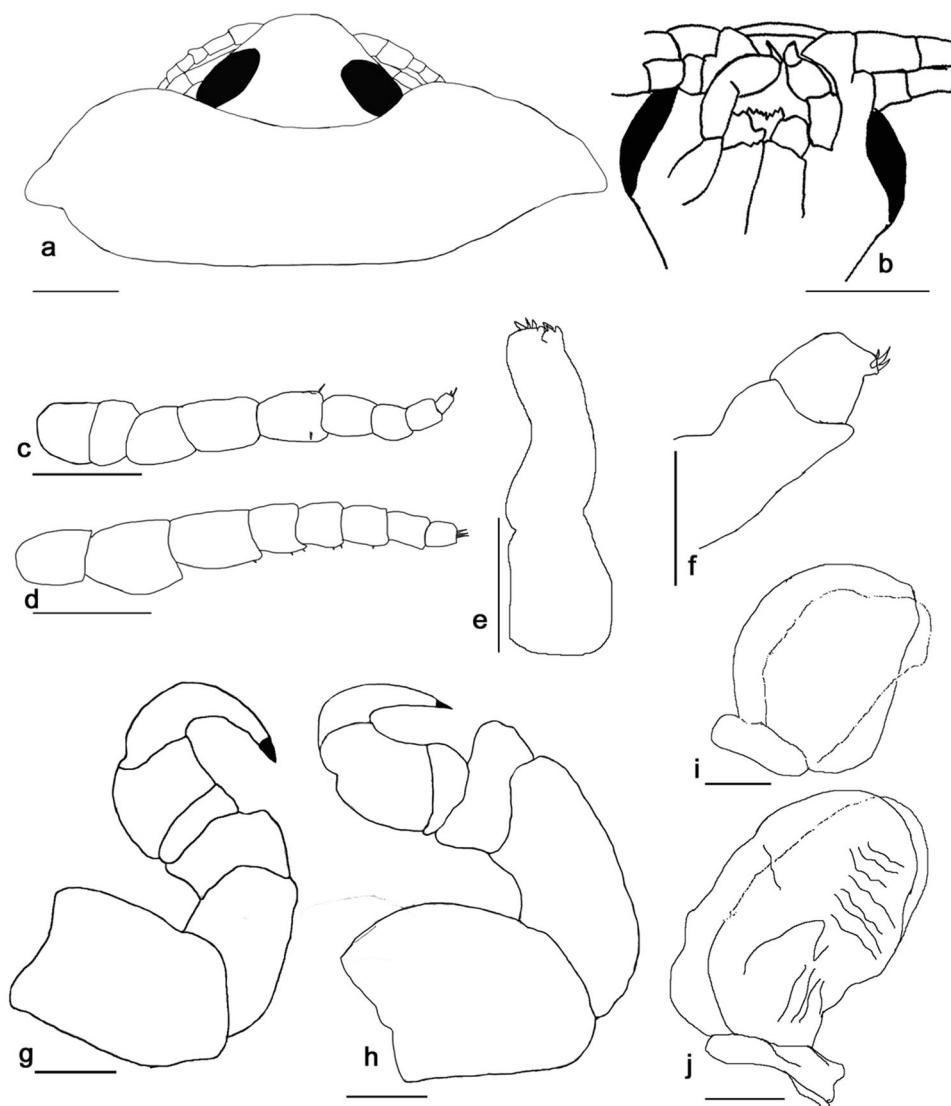
**Fig. 2** **a** Host fish *Selar crumenophthalmus* (Bloch, 1793), **b–d** infested parasite at branchial cavities *Selar crumenophthalmus* (Bloch, 1793), **e** lab photograph of *Norileca indica* (H. Milne Edwards, 1840) females (15.6 mm TL; 7.1 mm W), **f** male specimen,

*N. indica* Non-ovigerous **g** dorsal view, **h** ventral view, **i** lateral view. (Scale bar = 2 mm) (Red arrow indicating parasites at ventral part of host branchial cavity and blue arrow indicating necrosis at gill filaments and margins) (color figure online)

Whereas the range of parasite load per infested fish was 1 to 2, in most cases one female and male. Ten specimens (2

ovigerous, 5 non ovigerous females and 3 males) were recovered for detailed analysis.

**Fig. 3** *Norileca indica* (H. Milne Edwards, 1840) Non-ovigerous female (15.6 mm TL; 7.1 mm W). **a** dorsal view of head and pereonite 1, **b** ventral head, **c** antenna, **d** antennule, **e** maxilleped, **f** maxilla, **g** pereopod 1, **h** pereopod 7, **i** pleopod 1, **j** pleopod 7 (Scale bar = **a**, **b** 1 mm; **c**–**f** 0.5 mm; **g**–**j** 1 mm)



## Systematics

Order Isopoda Latreille, 1817.

Family Cymothoidae Leach, 1818.

Genus *Norileca* Bruce, 1990.

*Norileca indica* (H. Milne Edwards, 1840).

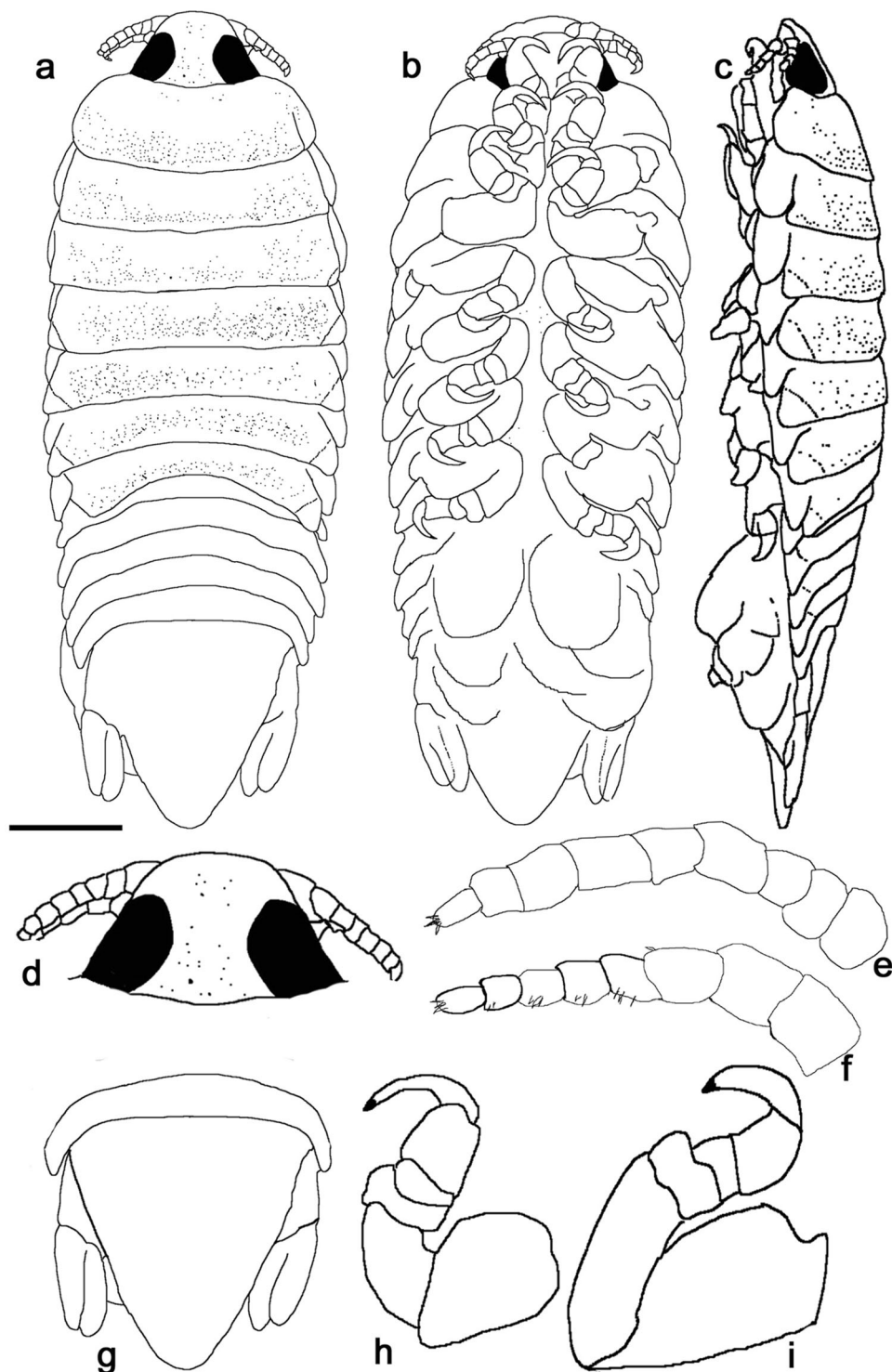
Material examined: Two ovigerous females (Total Length (TL) 15.7–20.1 mm; 7.1–9.2 mm width, 5 non-ovigerous females (TL 14.0–15.6 mm; 6.9–7.1 mm W) (Reg. No. ZSI/ANRC/M/25055), 3 males (TL 12–14 mm; width 5.1–5.3 mm) (Reg. No. ZSI/ANRC/M/25064), Pilobah, Great Nicobar Island, A & N Islands on 21st December 2019.

## Diagnosis

Non-ovigerous female (15.6 mm TL; 7.1 mm W) (Figs. 2, 3).

Body twisted to the left side, dorsal surface smooth and body is 2.2 times as long as the width, pereonite lateral margins posteriorly protruding, narrow width at pereonite 1 and pereonite 4 is widest. Head is triangular, 1.1 times longer than wide, visible from dorsal view. Eyes oval shaped with distinct margins, each eye 0.3 times the width of the head, 0.3 times the length of the head. Pereonite 1 anterior border depressed and anterolateral angle weakly produced, extending to middle of head, coxae 2 and 3 wide with postero-ventral angle rounded; coxae 4–7 acute, posteriorly pointed. Pereonites 6 and 7 narrower than pereonites 1–5. Pleonite 2 partially overlapped by pereonite 7 postero-lateral margin, pleonite 5 free not overlapped by lateral margin of pleonite 4. Antennule consist of 8 articles, contains simple setae on 3–6 and 8 articles. Antenna consist of 9 articles contains 5 and 9 articles with simple setae. Pleopods without setae, exopod larger than endopod. Peduncles lobes prestnet, pleopods 2–5 similar to pleopod

**Fig. 4** *Norileca indica* (H. Milne Edwards, 1840) Male (14 mm TL; 5.3 mm W). **a** Dorsal view, **b** ventral view, **c** lateral view (Scale bar = 2 mm), **d** dorsal view of head, **e** antenna, **f** antennule, **g** dorsal view of pleotelson with uropods, **h** pereopod 1, **i** pereopod 7



1 and gradually increasing in their size. Uropod more than half of pleotelson length; lateral margin without setae; Exopods and endopods are without setae.

Male (14 mm TL; 5.3 mm W) (Fig. 4).

Body is straight, not twisted like female. 2.64 times longer than its width. Pereonite 1 is narrow and pereonite 5

is wider. Posterior pereonite lateral margins are ovate. Head is triangular, 0.6 times longer than wide, visible from dorsal view. Pereonite 7 overlapped on Pleonite 2. Pleonites posterior margin smooth, mostly concave. Pleonite 5 free, not overlapped by lateral margins of pleonite 4. Antennula longer than antenna; consists of 8 articles. Antenna consists



of 9 articles. Mandibular molar process present; Maxillule simple with 4 terminal robust setae. Maxilla medial lobe not fused to lateral lobe. Maxilliped consists of 3 articles; article 3 with 4 setae. Pereopod 1 basis 1.7 times as long as greatest width. Pereopod 7 basis 1.6 times as long as greatest width; Uropod same length as pleotelson.

### Geographical distribution

Recorded from Sumatra, Philippines, Indonesia, New Guinea, North Western Australia, and eastern Australia, off Mozambique, Pakistan, China and Thailand (Trilles 1976a, b; Avdeev 1978; Rockicki 1982; Bruce 1990; Ghani 2003; Yu and Li 2003; Nagasawa and Petchsupa 2009). Also from both the Southern coasts of India (Rameshkumar et al. 2013a, b; Neeraja et al. 2014; Behera et al. 2016; Ravichandran et al. 2019), and Andaman Islands (Praveenraj et al. 2019).

### Discussion

The studies on the parasitic infestation of fishes in Andaman and Nicobar Islands are scanty, especially in Nicobar group of Islands. Praveenraj et al. (2019) reported *N. indica* infestation from Andaman Islands and the present study records the range extension of the parasite to Great Nicobar Islands. The *Norileca indica* is widely distributed in Indo-Pacific region and infest several carangids, the most preferred hosts are *Selar crumenophthalmus* and *Rastrelliger kanagurta* (Cuvier, 1816) (Rameshkumar et al. 2015; Behera et al. 2016; Aneesh et al. 2016; Wal et al. 2017). It also infests fishes like *Herklotichthyes* sp., *Alepes apercna* Grant, 1987, *Alepes melanoptera* Swainson, 1839; *Atule mate* (Cuvier, 1833); *Decapterus russelli* (Ruppell, 1830) (Neeraja et al. 2014; Behera et al. 2016; Wal et al. 2017; Ravichandran et al. 2019). As in agreement with earlier records (Bruce 1990; Neeraja et al. 2014; Rameshkumar et al. 2015; Behera et al. 2016; Praveenraj 2019), the parasitic isopods attached to the ventral part of host branchial cavity facing the branchial operculum causing slight swelling and damage to the tissues of gills. Parasitic isopod occupies more space in gill chamber as they grow and presses against the gill arch which results in stunted growth of gill filaments (Neeraja et al. 2014; Praveenraj et al. 2019), no much difference in growth was noticed in the present study.

*Norileca indica* can be distinguished from its congeners by the following combination of characters: elongate body twisted to one side, cephalon as long as wide, pleonites as wide as pereon, pleonite 5 and 1 sub equal, length of pleotelson two-thirds the uropods, triangular pleotelson approximately 1.0–1.2 times as long as wide with

anteromedial surface vaulted. Whereas the *N. borealis* described from the northern Arabian Sea (Javed and Yasmeen 1999) and *N. triaingulata* have pleonite 5 narrower than pleonite 1 and uropods almost reaching posterior margin of pleotelson. Further, *N. borealis* have shorter coxae on pereonite 2, nearly straight pleon, maxilla medial lobe with 1 robust seta and lateral lobe with 4 robust setae (Javed and Yasmeen 1999; Wal et al. 2017; Ravichandran et al. 2019). *N. triaingulata* differs from *N. indica* by its larger size, body and pleon nearly straight, maxilla medial lobe with 2 robust setae and shorter uropods (Wal et al. 2017; Ravichandran et al. 2019). The studies on prevalence and occurrence of isopod fish parasites were limited to Andaman Islands; this is the first report from Nicobar group of Islands. So, further more studies and status extension on fish parasites necessary in Andaman and Nicobar Islands.

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**Author contributions** SR, NKN collected, identified and written manuscript, MN confirmed the species and assisted in drawings; CS, supervision, support and corrected the manuscript.

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### Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest (financial, academic, commercial, political or personnel).

**Ethics approval** The specimen not under the listed category of experimental animal, which need ethics approval.

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