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Naricolax zafirae sp. nov. (Copepoda: Bomolochidae) parasitic in the nasal cavities of *Polydactylus oligodon* (Polynemidae) from the Western Atlantic Ocean

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Abstract

The cyclopoid family Bomolochidae Claus, 1875 is one of the most common groups of parasitic copepods infesting fishes worldwide. During a survey of marine fishes from northeast Brazil, a new species of *Naricolax* Ho, Do & Kasahara, 1983 was found in the nasal cavities of the littlescale threadfin *Polydactylus oligodon* (Günther, 1860) (Polynemidae) in the Maranhão Gulf, Brazil. *Naricolax zafirae* sp. nov. can be distinguished from all congeners because it has a pair of acutely pointed tines in the rostral area and an elongated last endopodal segment of leg 4, features that have never been reported in the genus. In addition, the new species differs from the closely related congeners by having a T-shaped rostral area, an outer spine on the second endopodal segment of leg 3 shorter than the segment, and by the apical seta on the last endopodal segment of leg 4 shorter than the rami. The present study provides the first report of a bomolochid parasitizing a fish of the family Polynemidae Rafinesque, 1815 as well as the first report of the genus *Naricolax* in the Atlantic Ocean. A dichotomous key for species of *Naricolax* is provided.

Introduction

Situated at the southernmost point of the Brazilian Amazon coast (western Atlantic Ocean), the Maranhão Gulf is shaped by the São Marcos and the São José bays, which are on either side of São Luís Island (Czizeweski et al. 2020). This region constitutes an estuarine complex extending for 5,414 km^2 and is characterized by a diverse landscape that includes extensive mangroves, dunes, beaches, islands, estuaries, and one of the largest macrotidal ranges in Brazil, with an average tidal amplitude ranging from 3 to 7 m (Czizeweski et al. 2020; Lima et al. 2021). Within this ecosystem, there is a rich diversity of fishes with over 300 species recorded (Instituto Maranhense de Estudos Socioeconômicos e Cartográficos – IMESC 2021), representing a wide range of potential hosts for parasites. Despite the high fish diversity in the Maranhão Gulf, studies focused on parasitic copepods on these hosts are scarce and only three species have been recorded so far, namely: *Boylea inflata* Paschoal, Couto, Nunes & Pereira, 2024 from *Bagre bagre* (Linnaeus, 1766), *Notarius grandicassis* (Valenciennes, 1840), and *Sciades herzbergii* (Bloch, 1794), *Colobomatus conodoni* Paschoal, Dias, Nunes & Luque 2025 from *Conodon nobilis* (Linnaeus, 1758), and *Tuxophorus caligodes* Wilson, 1908 from *Echeneis naucrates* Linnaeus, 1758 (Ferreira et al. 2022; Paschoal et al. 2024, 2025).

The cyclopoid family Bomolochidae Claus, 1875 represents one of the most rich species groups of parasitic cyclopoid copepods worldwide, comprising about 167 species distributed in 25 genera (Paschoal et al. 2024). These copepods are ectoparasites on marine fishes, mainly found in the branchial cavities, but occasionally in the nostrils, nasal sinuses, or orbits of their hosts (Boxshall and Halsey 2004; Casanova et al. 2023). Along the Brazilian coast, 21 species of bomolochids have been reported parasitizing bony fish, in which seven belong to the genus *Bomolochus* von Nordmann, 1832, three to the genera *Acantholochus* Cressey, 1984 and *Ceratocolax* Vervoort, 1965, two to the genera *Hamaticolax* Ho & Lin, 2006 and *Orbitocolax* Shen, 1957, and one to the genera *Boylea* Cressey, 1977, *Neobomolochus* Cressey, 1981, *Nothobomolochus* Vervoort, 1962 and *Unicolax* Cressey & Cressey, 1980 (Luque and Tavares 2007; Luque et al. 2013; Casanova et al. 2023; Paschoal et al. 2024). However, the bomolochid fauna in Brazil remains poorly known, given the broad extent of the Brazilian coast and the high diversity of the local marine ichthyofauna, which surpasses 1,200 species (Casanova et al. 2023; Froese and Pauly 2025).

The littlescale threadfin *Polydactylus oligodon* (Günther, 1860) is a demersal polynemid fish, occurring from the Atlantic coast of USA (southern Florida) to southeastern Brazil (Coast of Santos), but not found in the Gulf of Mexico and in the western Caribbean Sea (Froese and Pauly 2025). This species commonly lives along sandy or muddy shores, feeding upon a variety of invertebrates (mainly crustaceans) and small fish (Marceniuk et al. 2021; Froese and Pauly 2025). In Brazil, *P. oligodon* has low commercial value, commonly a bycatch in pink shrimp *Farfantepenaeus brasiliensis* (Latreille, 1817) fishing (Marceniuk et al. 2021). Currently, only the nematode *Procamallanus* (*Spirocamallanus*) *papillicaudatus* (Bashirullah & Williams, 1980) is known to parasite this fish off Puerto Rico (Bashirullah and Williams 1980; Pereira and González-Solís 2022).

During parasitological studies on specimens of *P. oligodon* from the Brazilian coastal zone, some parasitic copepods were recovered from their nasal cavities. Detailed morphological study of these parasites revealed that they represented a new species of *Naricolax*, which is described herein. In addition, a dichotomous key for species of *Naricolax* is given.

Materials and methods

Fish sampling and processing

Fish were caught by artisanal fishermen, between March to April 2023, in the Maranhão Gulf (2°24′29′′S, 44°05′52′′W) (Figure 1), near the municipality of Raposa, State of Maranhão, Brazil. Hosts were measured and subsequently necropsied mostly fresh, but some specimens were kept frozen at −20°C, prior to parasitological examination. Their specific identification was based on Marceniuk et al. (2021), and the nomenclature and classification were updated according to Eschmeyer's Catalog of Fishes (Fricke et al. 2025). Bomolochid copepods were collected from the host nasal cavities and were preserved in 80% ethanol for morphological analysis.

Parasitological procedures

For light microscopical analysis, preserved copepod specimens were cleared in a drop of 85% lactic acid and the appendages were dissected and examined using the wooden slide technique established by Humes and Gooding (1964). Drawings were made using a drawing tube attached to an Olympus BX51 microscope (Olympus Corporation, Tokyo, Japan). Measurements were made with a NIS-Elements software (v4.00.06; Nikon), using a Nikon Eclipse 80i microscope (Nikon, Tokyo, Japan) equipped with a DS-Ri1 camera (Nikon), and are expressed in micrometres as the range followed by the mean and standard deviation in parentheses. The descriptive terminology and classification follow Huys and Boxshall (1991) and Boxshall and Halsey (2004), respectively. Prevalence and mean intensity are used according to Bush et al. (1997). Type specimens were deposited in the collection of the Museu de Zoologia da Universidade de São Paulo (acronym MZUSP), Brazil.

Results

Six specimens of *P. oligodon* (standard length 13.2–27.3 cm; mean ± standard deviation 18.7 ± 5.6 cm) were analysed, five of which were parasitized by at least one specimen of *Naricolax*. A total of eight female copepods were collected, showing prevalence of 83% and mean intensity of 1.6 copepods per infected fish (range 1–2).

Systematics

Class Copepoda Milne Edwards, 1840
Order Cyclopoida Burmeister, 1834
Family Bomolochidae Claus, 1875
Genus *Naricolax* Ho, Do & Kasahara, 1983
Type-species: *Naricolax atypicus* Ho, Do & Kasahara, 1983 by original designation
Naricolax zafirae sp. nov.
ZooBank registration: urn:lsid:zoobank.org:act:B08090CA-BC1C-4BF6-B80A-7C08ED4666D3
(Figures 2–4)

Material examined

Holotype (MZUSP-48257) and five paratype (MZUSP-48258) females collected in the nasal cavities of the littlescale threadfin *Polydactylus oligodon* (Günther, 1860) (Actinopterygii: Polynemidae) (type host) in the Maranhão Gulf, near the municipality of Raposa, State of Maranhão, Brazil (2°24′29′′S, 44°05′52′′W) (type locality). Two specimens were dissected and kept in the personal collection of the first author.

Etymology

The new species is named after Dr. Zafira da Silva de Almeida (1967–2021) from the Universidade Estadual do Maranhão, Brazil, for her contributions to the knowledge on functioning and conservation of the Amazonian fishery resources.

Description

Adult female [based on 08 specimens]. Body cyclopiform (Figure 2A) 728–844 (807 ± 40) long, measured on sagittal plane, from frontal margin of rostrum to posterior margin of caudal rami, excluding caudal setae; prosome length 404–508 (473 ± 32), maximum width 324–367 (344 ± 14) at posterior edge of dorsal cephalothoracic shield. Prosome comprising broad cephalothorax, incorporating first pedigerous somite, and free second to fourth pedigerous somites; third somite not overlapping fourth in dorsal view (Figure 2A). Urosome (Figure 2B) 270–350 (321 ± 26) long, comprising fifth pedigerous somite, genital double somite and three free abdominal somites. All urosomites wider than long (Figure 2B); genital double-somite 77–98 (88 ± 7) × 108–126 (118 ± 6), with strongly convex lateral margins; third to fifth urosomites progressively decreasing in size; anal somite weakly incised posteromedially. Surfaces of first and second urosomites smooth, lacking ornamentation; anal somite with sharp spinules on ventral surface (Figure 2C). Caudal rami (Figure 2C) about twice as long as wide, with sharp spinules on ventral surface; each ramus armed with two large medial setae plus two shorter terminal setae, one short subterminal dorsal seta, and one short lateral seta.

Rostral area (Figure 2D) with T-shaped sclerite and armed with pair of small, acutely pointed tines. Antennule (Figure 2E) six-segmented, comprising broader proximal part and slender distal part; proximal part three-segmented with third segment divided by partial suture; distal part slender, comprising three segments. First segment with frontally-directed pedestal bearing three plumose

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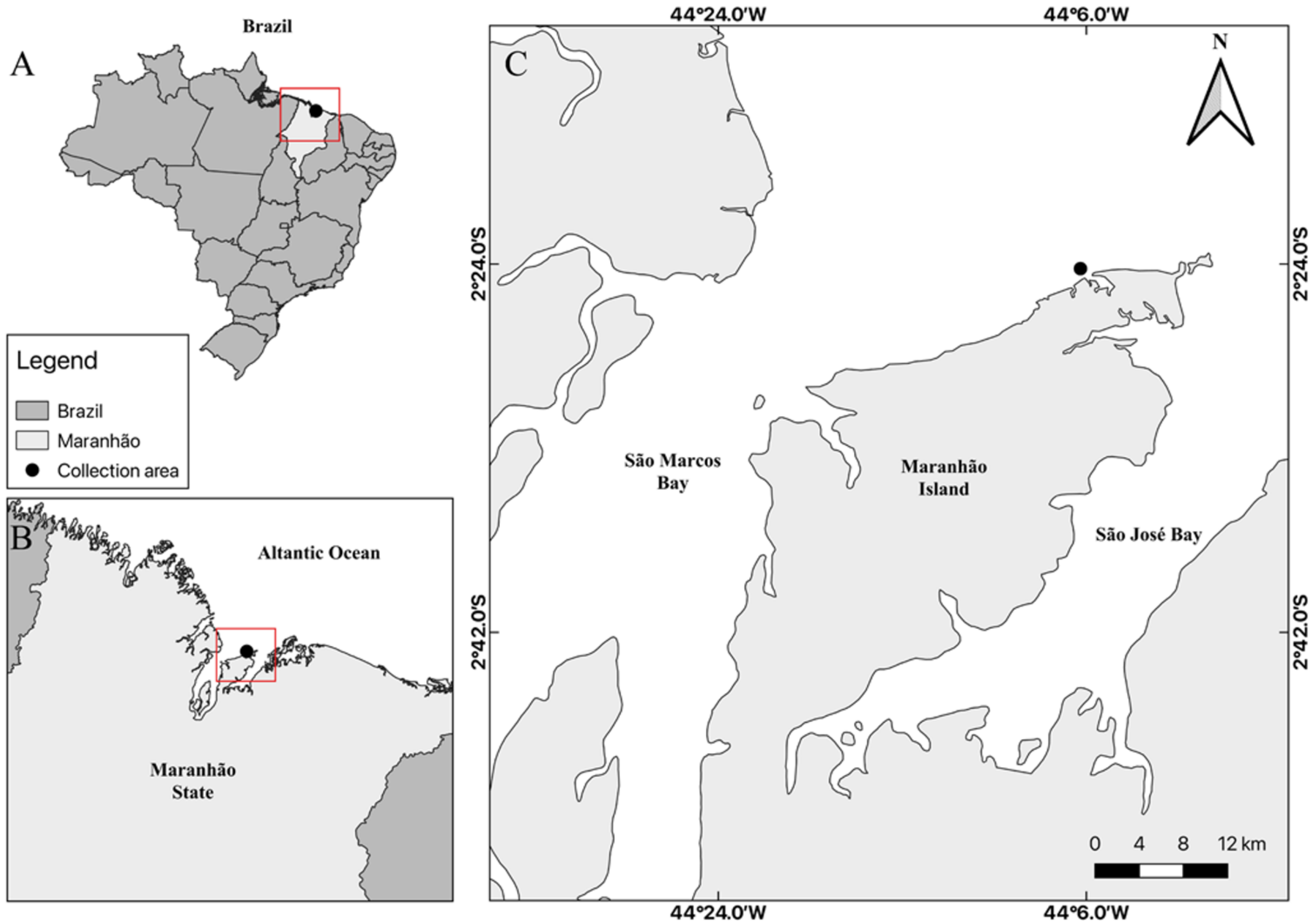

Figure 1. Sampling site of the present study: (A) Brazil, showing position of the state of Maranhão; (B) State of Maranhão, showing the Maranhão Gulf; (C) littoral of the municipality of Raposa, black circle showing sampling site.

setae proximally, modified 4th seta plus plumose 5th seta; modified 4th seta forming recurved spine-like element, with thickened basal part and three sensilla at tip. Second segment bearing five plumose setae, plus three naked setae dorsally, and three plumose setae plus four naked setae on ventral surface. Third segment bearing five plumose setae, distalmost long, extending beyond apex of antennule, two naked setae on dorsal surface plus one naked seta on ventral surface. segments four to six with setal formula: 3, 2 + 1ae, 7 + 2ae; fourth segment bearing one long plumose seta on ventral surface, extending beyond tip of antennule.

Antenna (Figure 2F) uniramous, three-segmented; comprising long proximal segment (coxobasis) bearing one naked seta, short middle segment (first endopodal) with one short naked seta and highly ornamented apical segment. Apical segment comprising partly fused second and third endopodal segments: proximal part (representing second endopodal segment) transformed into blunt distal process ornamented with ventral rows of spinules, continuous with multiple rows over ventral surface of segment, and armed with stout curved claw and distal pectinate process; distal part (third endopodal segment) bearing four curved claws and three unequal naked setae.

Labrum (Figure 3A) wider than long, ornamented with long, spiniform elements on ventral surface, and longitudinal depression medially. Mandible (Figure 3B) tipped with two unequal blades, each with single spinulate inner margin. Paragnath (Figure 3C) bipartite; basal part broad, distal process blunt, ornamented with shorter spines. Maxillule (Figure 3D) lobate, armed with one small, naked seta and three large, pilose setae. Maxilla (Figure 3E) two-segmented; proximal segment (syncoxa) larger, bearing 1 naked seta; second segment (basis) narrowing distally, bearing two spinulate apical elements plus one small naked seta. Maxilliped (Figure 3F) three-segmented; comprising syncoxa, armed with one seta in proximal half; basis armed with two unequal pilose setae; terminal (endopodal) segment forming sigmoid claw, and armed with one pilose proximal seta; claw simple, lacking accessory process.

Legs 1 to 4 biramous, armature of legs (spines, Roman numerals; setae, Arabic numerals) as follows:

	Coxa	Basis	Exopod	Endopod
Leg 1	0–1	1–1	I–0; I–1; III, 5	0–1; 0–1; 5
Leg 2	0–1	1–0	I–0; I–1; III, I, 5	0–1; 0–2; II, 3
Leg 3	0–1	1–0	I–0; I–1; II, I, 5	0–1; 0–2; II, 2
Leg 4	0–0	1–0	I–0; I–1; II, I, 5	0–1; 0–1; I, 1, I

Leg 1 (Figure 4A) modified with flattened rami typical of bomolochids; members of leg pair joined by robust interpodal plate wider than long, with terminal row of spinules. Coxa with hirsute

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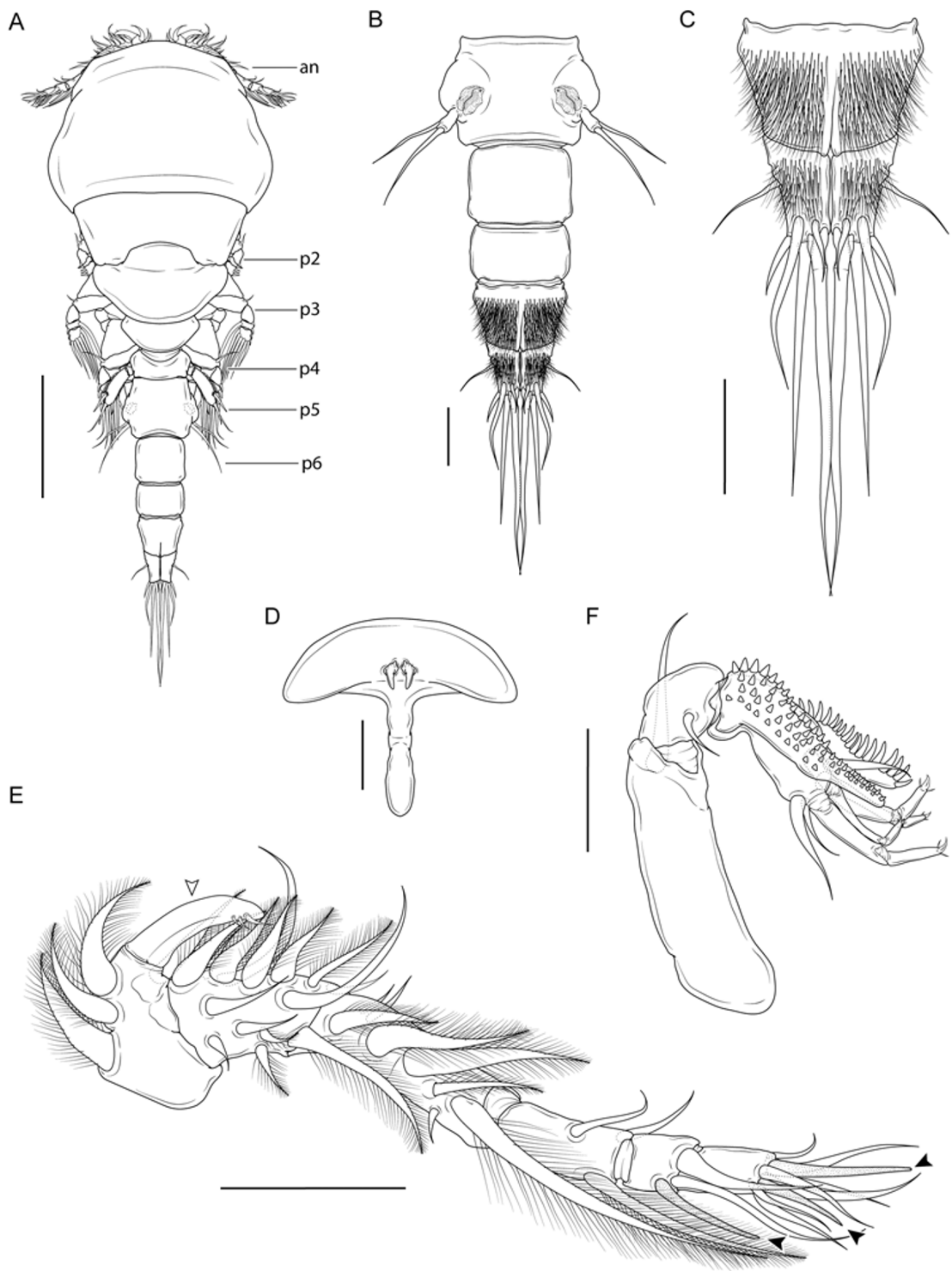

Figure 2. *Naricolax zafirae* sp. nov. adult female: (A) habitus, an = antennule, p2 = leg 2, p3 = leg 3, p4 = leg 4, p5 = leg 5, p6 = leg 6; (B) urosome, ventral; (C) anal somite and caudal rami, ventral; (D) rostral area, ventral; (E) antennule, ventral, white arrow showing modified seta, black arrowheads showing aesthetascs; (F) antenna, ventral. Scale bars: A, 200 μm; B–C, 40 μm; D, 20 μm; E–F, 30 μm.

plumose seta, with blunt-apex drawn out into elongate tip; ventral surface with patch of setules and hair-like setules at outer margin. Basis with outer pilose seta; ventral surface with thumb-shaped seta and two rows of hair-like setules. Exopod three-segmented; outer spines on exopodal segments bear flagelliform tip and scale-like denticles on surface; last outer spine shortest, discernible in posterior aspect only; second and third segments with one and five plumose setae, respectively. Endopod three-segmented; all segments flattened and expanded transversely; first and second segments with inner plumose seta and ornamented with hair-like setules on outer margin; third segment armed with five plumose setae plus one reduced spine at outer margin.

Leg 2 (Figure 4B) with three-segmented rami; interpodal plate flattened and unornamented. Coxa with inner plumose seta and tiny spinules at outer margin. Basis with outer plumose seta. Exopodal spines bearing subterminal flagellum and bilateral denticulation, except for terminal spine of third segment with denticulation on outer margin only; second and third segments with one and five plumose setae, respectively. Endopodal segments broad and flattened, with hair-like setules on outer margin; first segment with one plumose inner seta; second segment with two plumose inner setae; third segment with two short spines and three plumose setae.

Leg 3 (Figure 4C) with three-segmented rami; interpodal plate flattened and ornamented with terminal row of spinules. Coxa with inner plumose seta and spine at outer margin. Basis with outer plumose seta. Exopodal spines bearing subterminal flagellum and bilateral denticulation, except for terminal spine of third segment

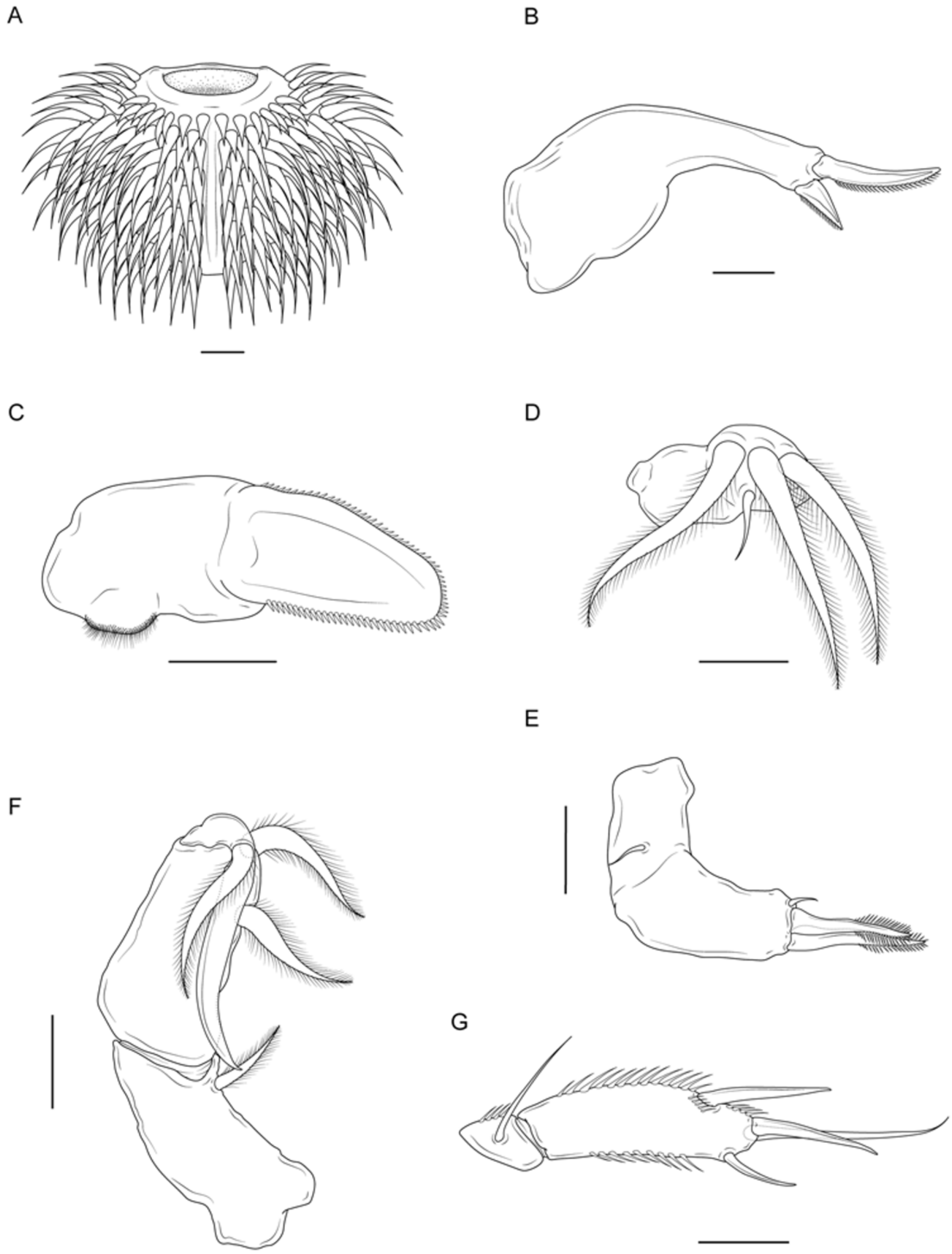

Figure 3. *Naricolax zafirae* sp. nov. adult female: (A) labrum, ventral; (B) mandible, ventral; (C) paragnath, ventral; (D) maxillule, ventral; (E) maxilla, ventral; (F) maxilliped; (G) leg 5, ventral. Scale bars: A–C, 10 μm; D–E, 20 μm; F–G, 30 μm.

with denticulation on outer margin only; inner margin of the first exopodal segment ornamented with row of hair-like setules, outer margin covered by tiny spines; second and third segments with one and five plumose setae, respectively. Endopodal segments elliptical and with hair-like setules on outer margin; first segment with one plumose inner seta; second segment with two plumose inner setae; third segment with two spines and two plumose setae.

Leg 4 (Figure 4D) with three-segmented rami; interpodal plate slender and ornamented posteriorly with row of thick spinules. Coxa lacking inner plumose seta. Basis with outer plumose seta. All exopodal spines bearing denticulation only on outer margin and subterminal flagellum; inner margin of first exopodal segment ornamented with row of hair-like setules; second and third segments with one and five plumose setae, respectively. Endopodal segments elongate and covered by tiny spines at distal margin; first and second segments with hair-like setules on outer margin; first segment bearing one plumose inner seta extending nearly to distal part of last segment; second segment with one inner plumose seta extending beyond tip of last segment; distal segment about 2.1 times as long as second segment, and bearing three elements distally; inner and outer distal spines with bilateral denticulation each, and with similar size. Apical seta plumo-spinulate, about 2.2 times as long as spines; shorter than last endopodal segment.

Leg 5 (Figure 3G) two-segmented; protopodal segment small, ornamented with marginal row of spinules and armed with one outer naked seta; free exopodal segment armed with subterminal naked spine plus three terminal elements, middle terminal seta naked, outer, and inner spines naked. Exopodal segment

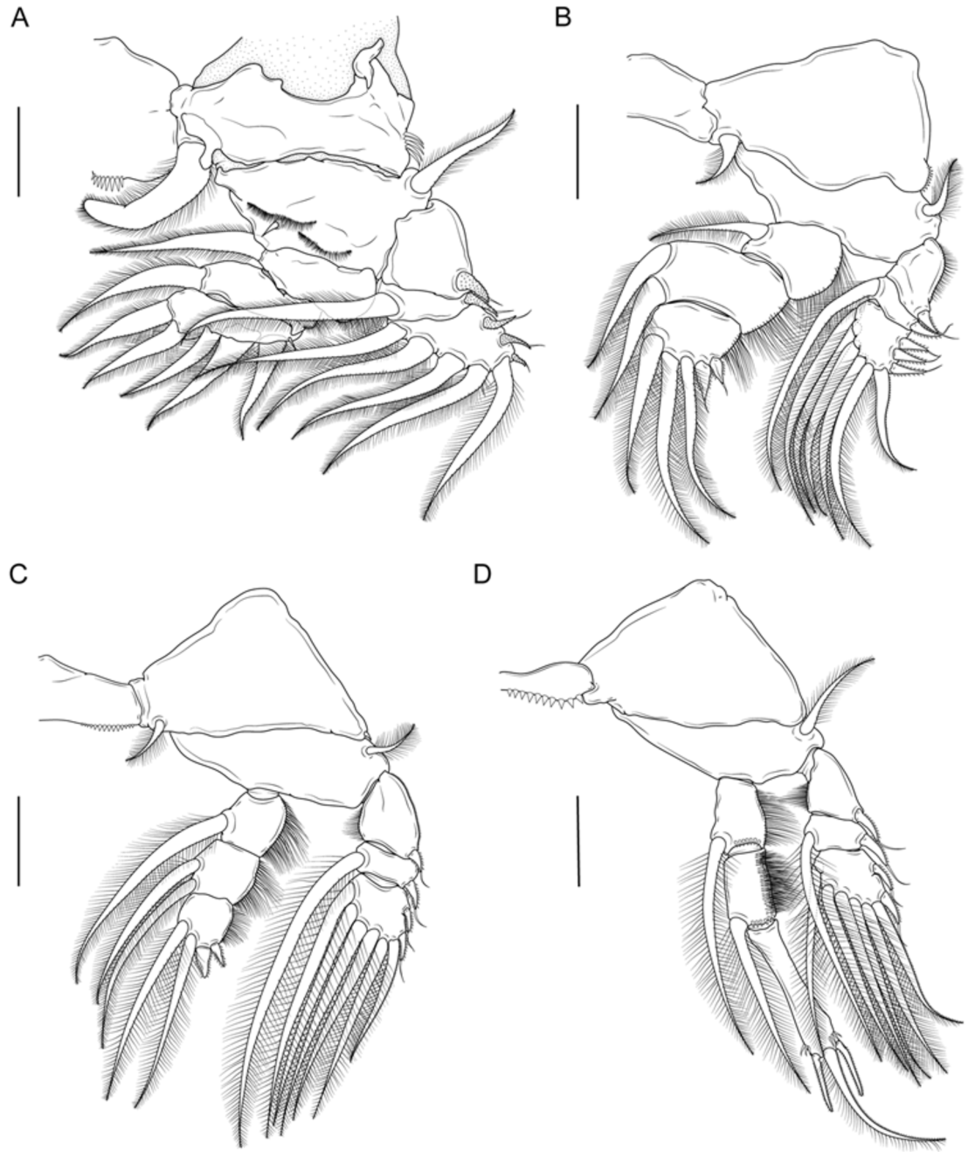

Figure 4. *Naricolax zafirae* sp. nov. adult female: (A) leg 1, ventral; (B) leg 2, ventral; (C) leg 3, ventral; (D) leg 4, ventral. Scale bars: A–D, 40 μm.

ornamented with spinules extending along outer and inner margins, plus distal rows.

Leg 6 (Figure 2A, 2B) represented by two setae on protuberance located at egg sac attachment area on genital double-somite.

Adult male. unknown.

Remarks

The instability of the genera within Bomolochidae has been a problem over decades of study, especially regarding their limits for differentiation (Vervoort 1962, 1969; Pérez-i-Garcia et al. 2017; Casanova et al. 2023; Paschoal et al. 2024). Aiming at the best identification of the specimens collected from *P. oligodon*, the taxonomic analysis was performed considering the diagnoses of all genera of Bomolochidae. From the 25 genera currently assigned to this family, the new species clearly not belong to 21, since only the fourth seta on the antennule is modified into a curved spine-like element (Boxshall and Halsey 2004; Izawa 2021, 2023). In relation to the remaining four genera, *i.e., Bomolochus, Megacolax* Izawa, 2021, *Naricolax* and *Unicolax*, the present bomolochid cannot be placed in *Bomolochus* and *Megacolax* because it has the maxilliped claw lacking an accessory process (vs. accessory process present in these genera) (Boxshall and Halsey 2004; Ho and Lin 2009; Izawa 2021). Furthermore, the new species was not allocated in *Unicolax*, based on its second endopodal segment of leg 3 that bears two setae (vs. one seta in the latter genus) (Boxshall and Halsey 2004). Therefore, the present bomolochid copepods from *P. oligodon* were assigned to *Naricolax*.

According to Walter and Boxshall (2025), the genus *Naricolax* currently comprises six valid species, namely, *Naricolax atypicus* Ho, Do & Kasahara, 1983, *Naricolax hoi* Hutson & Tang, 2007, *Naricolax holinorum* Izawa, 2021, *Naricolax longispina* Ho & Lin, 2005, *Naricolax sphyraenae* Izawa, 2020 and *Naricolax stocki* (Roubal, 1981). The new species differs from all the congeners by its pair of acutely pointed tines on the rostral area (vs. rostral area unarmed) (Ho et al. 1983; Ho and Lin 2005; Hutson and Tang

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Table 1. Species of *Naricolax* associated with their hosts, localities, and references

Copepod species	Host (Family)	Locality	Source
Naricolax atypicus	*Hexagrammos otakii* Jordan & Starks, 1895 (Hexagrammidae)	Japan	Ho et al. (1983); Ho and Lin (2005); Hutson and Tang (2007)
	Hexagrammos agrammus (Temminck & Schlegel, 1843) (Hexagrammidae)	Korea	Ho and Lin (2005); Hutson and Tang (2007); Kim (2014)
	Lateolabrax japonicus (Cuvier, 1828) (Lateolabracidae)	Korea	Ho and Lin (2005); Hutson and Tang (2007); Kim (2014)
Naricolax hoi	*Arius maculatus* (Thunberg, 1792) (Ariidae)	Taiwan	Hutson and Tang (2007)
Naricolax holinorum	*Acanthopagrus schlegelii* (Bleeker, 1854) (Sparidae)	Japan, Taiwan	Ho and Lin (2005); Hutson and Tang (2007); Izawa (2021)
Naricolax longispina	*Leiognathus equula* (Forsskål, 1775) (Leiognathidae)	Taiwan	Ho and Lin (2005); Hutson and Tang (2007)
Naricolax sphyraenae	*Sphyraena pinguis* Günther, 1874 (Sphyraenidae)	Japan	Izawa (2020)
Naricolax stocki	*Acanthopagrus australis* (Günther, 1859) (Sparidae)	Australia	Roubal (1981); Byrnes (1986); Hutson and Tang (2007)
	Acanthopagrus berda (Fabricius, 1775) (Sparidae)	Australia, Japan	Byrnes (1986); Hutson and Tang (2007); Izawa (2023)
	Acanthopagrus butcheri (Munro, 1949) (Sparidae)	Australia	Byrnes (1986); Hutson and Tang (2007)
	Acanthopagrus latus (Houttuyn, 1782) (Sparidae)	Australia	Byrnes (1986); Hutson and Tang (2007)
	A. schlegelii (Sparidae)	Japan	Izawa (2023)
Naricolax zafirae sp. nov.	*P. oligodon* (Polynemidae)	Brazil	Present study

2007; Izawa 2020, 2021, 2023). Moreover, *N. zafirae* sp. nov. has the last endopodal segment of leg 4 twice as long as the second segment of this ramus (vs. segments with equal length in the other congeners) (Ho et al. 1983; Ho and Lin 2005; Hutson and Tang 2007; Izawa 2020, 2021, 2023). In conclusion, these features represent clear autapomorphies of the new species within *Naricolax*, consequently supporting its establishment. Details on host and geographic occurrence of *Naricolax* spp. can be found in Table 1.

In addition, the new species can be also differentiated from *N. atypicus, N. holinorum, N. sphyraenae* and *N. stocki* by having a T-shaped rostral area (vs. protruded in *N. atypicus* and concave in *N. holinorum, N. sphyraenae,* and *N. stocki*) (Ho et al. 1983; Izawa 2020, 2021, 2023), as well as from *N. hoi* by the apical seta on the last endopodal segment of leg 4 shorter than ramus (vs. longer than ramus in the latter species) (Hutson and Tang 2007). Finally, *N. zafirae* sp. nov. differs from *N. longispina* by the outer spine on the second endopodal segment of leg 3 shorter than this segment (vs. longer than the segment in the latter species) (Ho and Lin 2005).

Discussion

In the present study, the affinities of the new species with *Naricolax* were confirmed based on the modified fourth seta of antennule, the morphology of the maxilliped claw, the number of setae on the second endopodal segment of leg 3, and the caudal rami with two major setae (Ho et al. 1983; Boxshall and Halsey 2004). Moreover, the presence of tines on the rostral area was used to differentiate the new species from the congeners, for the first time. An analogous situation can be observed for *Bomolochus multiceros* Pillai & Natarajan, 1977, a parasite of *Ariomma indica* (Day, 1871) from India, which is the unique member of *Bomolochus* lacking rostral tines (see Ho and Lin 2009). In a similar sense, the shape of the rostral area was also used by Hutson and Tang (2007) to differentiate *N. hoi* from the remaining congeners. Therefore, the evaluation of the shape of the rostral area and the presence of tines on it, would be useful for identifying species of *Naricolax* in further taxonomic studies.

The genus *Naricolax* was established by Ho et al. (1983), to accommodate *N. atypicus* from the hexagrammid fish *Hexagrammos otakii* Jordan & Starks, 1895 off Kojima Bay, Japan. After the erection of this genus, five other species have been described infesting fishes from six actinopterygian families (Ariidae Bleeker, 1858, Hexagrammidae Jordan, 1888, Lateolabracidae Ghedotti, Davis & Smith, 2018, Leiognathidae Gill, 1893, Sparidae Rafinesque, 1818 and Sphyraenidae Rafinesque, 1815), of six orders (Acanthuriformes, Acropomatiformes, Carangaria, Eupercaria, Perciformes, and Siluriformes) off Australia, Japan, Korea, and Taiwan (see Table 1). Thus, the new species represents the first *Naricolax* described in Atlantic waters, and the seventh valid species in the genus.

The family Polynemidae Rafinesque, 1815 includes marine and brackish (sometimes riverine) fish, with global distribution along tropical and subtropical seas, and is represented by 42 species from eight genera (Froese and Pauly 2025). This family has great economic importance for artisanal fishermen, in which more than 100,000 t was harvested in the recent years (Girard et al. 2022). However, only a few species of polynemid fishes have been targeted for parasitological studies, such as *Eleutheronema tetradactylum* (Shaw, 1804) (Zischke et al. 2009; Moore et al. 2011; Bharadhirajan et al., 2013), *Filimanus heptadactyla* (Cuvier, 1829) (West 1992), *Galeoides decadactylus* (Bloch, 1795) (Diebakate and Raibaut 1996), *Polydactylus sextarius* (Bloch & Schneider, 1801) (Gudivada et al. 2014), and *Polydactylus quadrifilis* (Cuvier, 1829) (Capart 1959). Regarding parasitic copepods, polynemid fishes have been

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parasitized by members of the families Caligidae Burmeister, 1835, Lernanthropidae Kabata, 1979, Lernaeopodidae Milne Edwards, 1840, Pennellidae Burmeister, 1835, and Philichthyidae Vogt, 1877 (Boxshall and Halsey 2004; Moore et al. 2011; Bharadhirajan *et al.*, 2013). Therefore, the present study provides the first data on parasitic copepods from *P. oligodon*, as well as indicates that members of the Bomolochidae can be parasites of Polynemidae. These findings also suggest a higher biodiversity of parasites from polynemid fish, than that is currently known.

With the new species described here, a dichotomous key for species of *Naricolax* (based on adult females) is presented as follows:

1. Rostral area with one pair of acutely pointed tines; last endopodal segment of leg 4 twice as long as previous segment.. *N. zafirae* sp. nov.
– Rostral area without such ornamentation; endopodal segments of leg 4 with similar length.. 2
2. Outer spine on second exopodal segment of leg 3 longer than two distal exopodal segments combined.. *N. longispina*
– Outer spine on second exopodal segment of leg 3 shorter than two distal exopodal segments combined.. 3
3. Rostrum T-shaped; last endopodal segment of leg 4 with outermost element longer than innermost element.. *N. hoi*
– Rostrum not as above; last endopodal segment of leg 4 with outermost element shorter than innermost element.. 4
4. Modified 4th seta on first antennulary segment expressed as one stout process.. *N. sphyraenae*
– Modified 4th seta on first antennulary segment forming recurved spine-like element.. 5
5. Middle seta within the 3 distal elements on the free exopodal segment of leg 5 slightly longer than the others... *N. holinorum*
– Middle seta within the three distal elements on the free exopodal segment of leg 5 twice as long as the others.. 6
6. Spines on last endopodal segment of legs 3 and 4 coarsely serrate.. *N. atypicus*
– Spines on last endopodal segment of legs 3 and 4 finely spinulate.. *N. stocki*

Data availability. The authors confirm that the data supporting the findings of this study are available within the article.

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