

First record of a cold-seep squat lobster *Munidopsis lauensis* Baba and de Saint Laurent, 1992 (Anomura: Galatheoidea) from Indian waters

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ABSTRACT

The present study reports the first zoogeographical record of the squat lobster *Munidopsis lauensis* Baba and de Saint Laurent, 1992 from a cold-seep site in the Krishna-Godavari Basin (Bay of Bengal), Northern Indian Ocean. Molecular analysis of the partial mitochondrial gene coding for cytochrome C oxidase subunit I (COI mtDNA), and mitochondrial 16S ribosomal RNA (16S rRNA) validated its identity. The present observation extends its geographical distribution to the Northern Indian Ocean. Additionally, molecular barcodes (COI) were generated for *Munidopsis scobina* Alcock, 1894, *Munidopsis wardeni* Anderson, 1896, and *Shinkaia crosnieri* Baba and Williams, 1998 collected from the Indian Exclusive Economic Zone.

KEYWORDS

Bay of Bengal, deep-sea, morphology, Munidopsidae, new record

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INTRODUCTION

The cold-seep ecosystem, originally discovered by Paull et al. (1984) in the abyssal plains (> 3,000 m) of the Gulf of Mexico, was subsequently reported from more than 150 active cold-seep sites globally (German et al., 2011). The first-ever documentation of a cold-seep environment in the Indian waters was made in the Krishna-Godavari basin (K-G basin), western Bay of Bengal, India (Mazumdar et al., 2019), which revealed the occurrence of methane gas hydrates at 2–3 m under the sea floor with a thriving community of chemosymbiont-bearing annelids, echinoderms, crustaceans, and molluscs (Mazumdar et al., 2019; Sangodkar et al., 2022). Gonsalves et al. (2022) reported the first occurrence of the hydrothermal vent and cold-seep inhabiting monotypic squat lobster, *Shinkaia crosnieri* Baba and Williams, 1998, from this site.

The squat lobster genus *Munidopsis* Whiteaves, 1874 is represented by 32 species in Indian waters (Patel et al., 2022; Tiwari et al., 2022a; 2022b). In this study, *Munidopsis lauensis* Baba and de Saint Laurent, 1992, a hydrothermal vent and cold-seep inhabitant of the western Pacific and the Central Indian oceans (Hwang et al., 2022), is recorded for the first time from a cold-seep site in the Indian Exclusive Economic Zone (Fig. 1) based on morphological and molecular analyses.

MATERIAL AND METHODS

The squat lobster specimens examined during this study were collected during the Research Vessel Sindhu Sadhana cruise number SSD-045 (March 2018) (Fig. 1), using a box corer from 1,754.5 m depth in the K-G Basin, Bay of Bengal, India. The specimens were then cleaned of debris, photographed, and preserved in 80% ethanol. Taxonomic identification followed the identification key provided by Baba (2005). Photographic and line illustrations were prepared using Adobe® Photoshop CS5. Morphometric measurements of the carapace and pereopods were carried out using vernier callipers with an accuracy of 0.1 mm.

Morphological terminology used in this study followed Baba et al. (2009). The specimen size was defined by (i) the length of the postorbital carapace, measured along the dorsal midline from the posterior margin of the orbit to the posterior margin of the carapace, and (ii) the maximum width of the carapace. The specimens were deposited, as reference voucher samples, in the National Repository for Marine Flora and Fauna at CSIR-National Institute of Oceanography (NIO), Dona Paula, Goa, India.

The isolation of the genomic DNA from the pereopod tissue was done using the DNeasy Blood

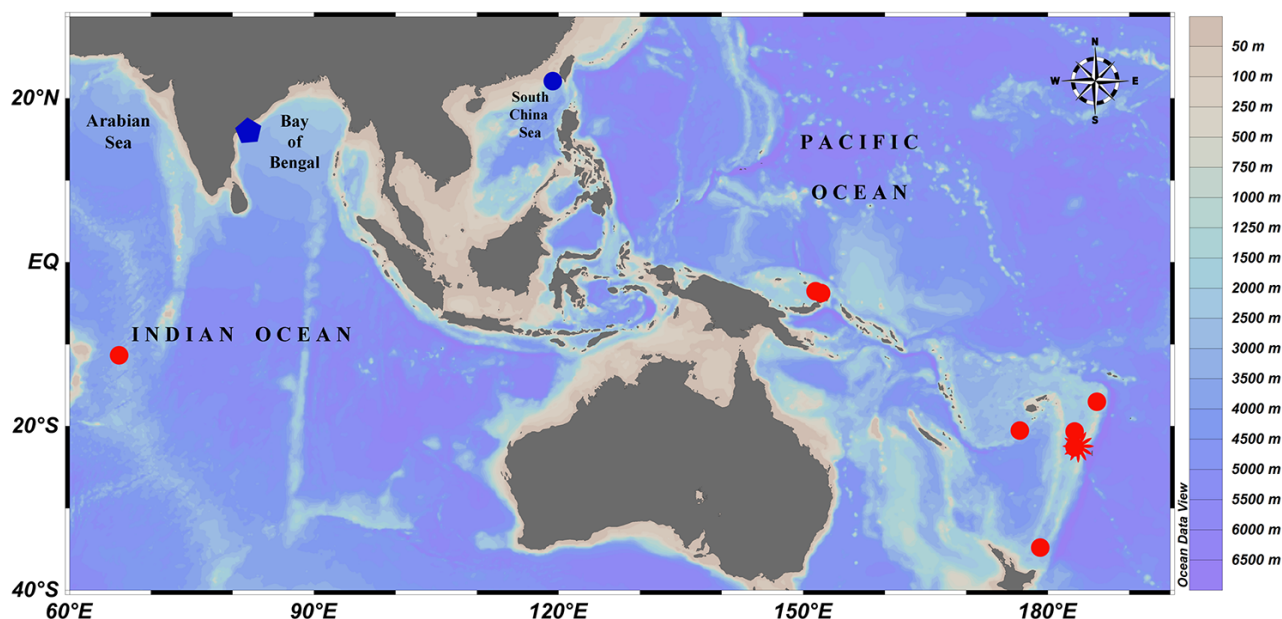


Figure 1. Map indicating the known geographical distribution of *Munidopsis lauensis* Baba and Saint Laurent, 1992. Symbols in red denote hydrothermal vent sites, those in blue denote cold-seep sites. ★ – type locality; ★ – present study area; ● – hydrothermal vent location; ● – cold-seep location.

and Tissue (Qiagen) kit following the manufacturer’s protocol. Universal primer LCO1490/HCO2198 was used to amplify the partial mitochondrial cytochrome oxidase subunit I (COI) by polymerase chain reaction (PCR) (Folmer et al., 1994). Similarly, Palumf-16s/ Palumr-16s was used to amplify the partial mitochondrial 16S rRNA (Palumbi, 1996). The editing and alignment of the obtained DNA sequences were done using the BioEdit sequence alignment editor version 5.0.9 (Hall, 1999). Except for *M. lauensis*, *Munidopsis scobina* Alcock, 1894, and *Munidopsis wardeni* Anderson, 1896 sequenced in this study, other *Munidopsis* sequences (*M. dasypus* Alcock, 1894, *M. trifida* Henderson, 1885; see Tab. 1 for GenBank accession number) obtained from the GenBank database were used for comparative and phylogenetic analyses.

The evolutionary history was inferred by using the Maximum Likelihood method and Tamura 3-parameter

model. The tree with the highest log likelihood (-2111.58) is shown. Initial tree(s) for the heuristic search were obtained automatically by applying the Maximum Parsimony method. A discrete Gamma distribution was used to model the evolutionary rate differences among sites (5 categories (+G, parameter = 0.4657)). The tree is constructed to scale, with branch lengths measured in the number of substitutions per site. This analysis involved 10 nucleotide sequences. Codon positions included were 1st+2nd+3rd+Noncoding. There was a total of 503 positions in the final dataset. All of the above-mentioned analyses were conducted in MEGA X (Kumar et al., 2018).

ODV mapping software (Schlitzer, 2023) was employed to plot the geographical distribution of *M. lauensis*. The following abbreviations were used: CW – carapace width; min – minutes; P1, P2 – first and second pereopods; PCL – postorbital carapace length; s – seconds; SP2 – spade core 2; stn – station number.

Table 1. Accession number, and reference details of the species used in phylogenetic tree for COI genes.

Species	Accession Number	Reference
<i>Munidopsis lauensis</i>	OP776916	Present study
<i>Munidopsis lauensis</i>	MH717895	Sun et al., 2019
<i>Munidopsis lauensis</i>	KF774316	Lin et al., 2013
<i>Munidopsis nitida</i>	MN397923	Dong et al. 2019
<i>Munidopsis trifida</i>	ON886875	Rodríguez-Flores et al., 2023
<i>Munidopsis dasypus</i>	JN166777	Ahyong et al., 2011
<i>Munidopsis scobina</i>	OR363375	Present study
<i>Munidopsis wardeni</i>	MW292588	Present study
<i>Shinkaia crosnieri</i>	OP776917	Present study
<i>Shinkaia crosnieri</i>	OP776918	Present study

SYSTEMATICS

Family Munidopsidae Ortmann, 1898

Genus *Munidopsis* Whiteaves, 1874

Munidopsis lauensis Baba and
de Saint Laurent, 1992
(Figs. 2–3)

Munidopsis lauensis Baba and de Saint Laurent, 1992: 326, fig. 3 (type locality: Valufa Ridge, Hine Hina, Lau Basin, BIOLAU 89, *Nautila* dive BL03, 22°32’S 176°43’E, 1,750 m). — Chevaldonné and Olu, 1996: 291. — Baba, 2005: 290 (key, synonymies).

— Martin and Haney, 2005: 478, tabs 1, 2. — Macpherson and Segonzac, 2006: 443, figs. 1–3. — Cubelio et al., 2007: 516, fig. 3. — Baba et al., 2008: 147 (synonymies). — Lin et al., 2013: 93, figs. 1, 2. — Thaler et al., 2014: fig. 1 (map). — Niu et al., 2017: fig. 6.5a (photograph). — Sun et al., 2019: record. — Hwang et al., 2022: fig. 1, tab. 1.

Material examined. 1 male (12.9 × 10.9 mm) (NIO1014/23), Krishna-Godavari Basin, western Bay of Bengal, off Machilipatnam, India, ORV Sindhu Sadhana, stn. SP3, 15°42.93726’N 82°03.82330’E, 1,754.9 m depth, spade corer, 18.III.2018, coll. M.J. Gonsalves.

Description of the present material. Body smooth (Fig. 2); carapace (Figs. 2, 3A, B) with PCL $1.2 \times$ CW, dorsal surface gently convex transversely. Rostrum triangular, length 0.4 times PCL, carinate dorsally, feebly upcurved, lateral margins finely serrated along distal one-third portion. Frontal margin strongly oblique; outer orbital spine represented by angular process. Gastric region dilated, bearing 1 pair of distinct anterior transverse striae. Anterior branchial region bearing short striae, anterolateral spine distinct, followed by few minute teeth. Slightly elevated submarginal ridge followed by gently concave posterior margin.

Thoracic sternum (Fig. 3C) smooth; sternite 3 posteriorly narrowed, anterior margin bearing 2 lobes, anterolateral angle terminating in distinct blunt process on each side. Pleon (Fig. 3D) smooth; tergites 2, 3 bearing 1 medially interrupted transverse groove each, that on tergite 2 distinct. Telson (Fig. 3E) comprising 10 plates.

Ocular peduncle (Fig. 3A, B) immovable, cornea ovate. First antennular peduncle article (Fig. 3F) unarmed on ventrodistal margin with, distolateral spine distinctly larger than distomesial spine. First antennal peduncle article (Fig. 3F) with distomesial spine reaching distal end of second article, distolateral spine short, not reaching distal end of second article; second article with short distolateral spine not reaching distal end of third article. Maxilliped 3 (Fig. 3G) ischium half as long as merus, distal angles prominent, crista dentata with 27 denticles; merus flexor margin with 2 small obsolescent spines, dorsal margin with small distolateral spine.

P1 (Figs. 2, 3H–K) $1.8 \times$ PCL with long plumose setae. Ischium bearing distomesial spine. Merus with setose striae arranged longitudinally, distoventral and distomesial spines distinct, ventromesial margin bearing 3 spines. Carpus bearing mesial marginal spine at widest distal portion. Palm length 0.7 times



Figure 2. *Munidopsis lauensis* Baba and Saint Laurent, 1992. Adult male PCL 12.9 mm, CW 10.9 mm (NIO1014/23). Dorsal habitus. Scale bar: 5 mm.

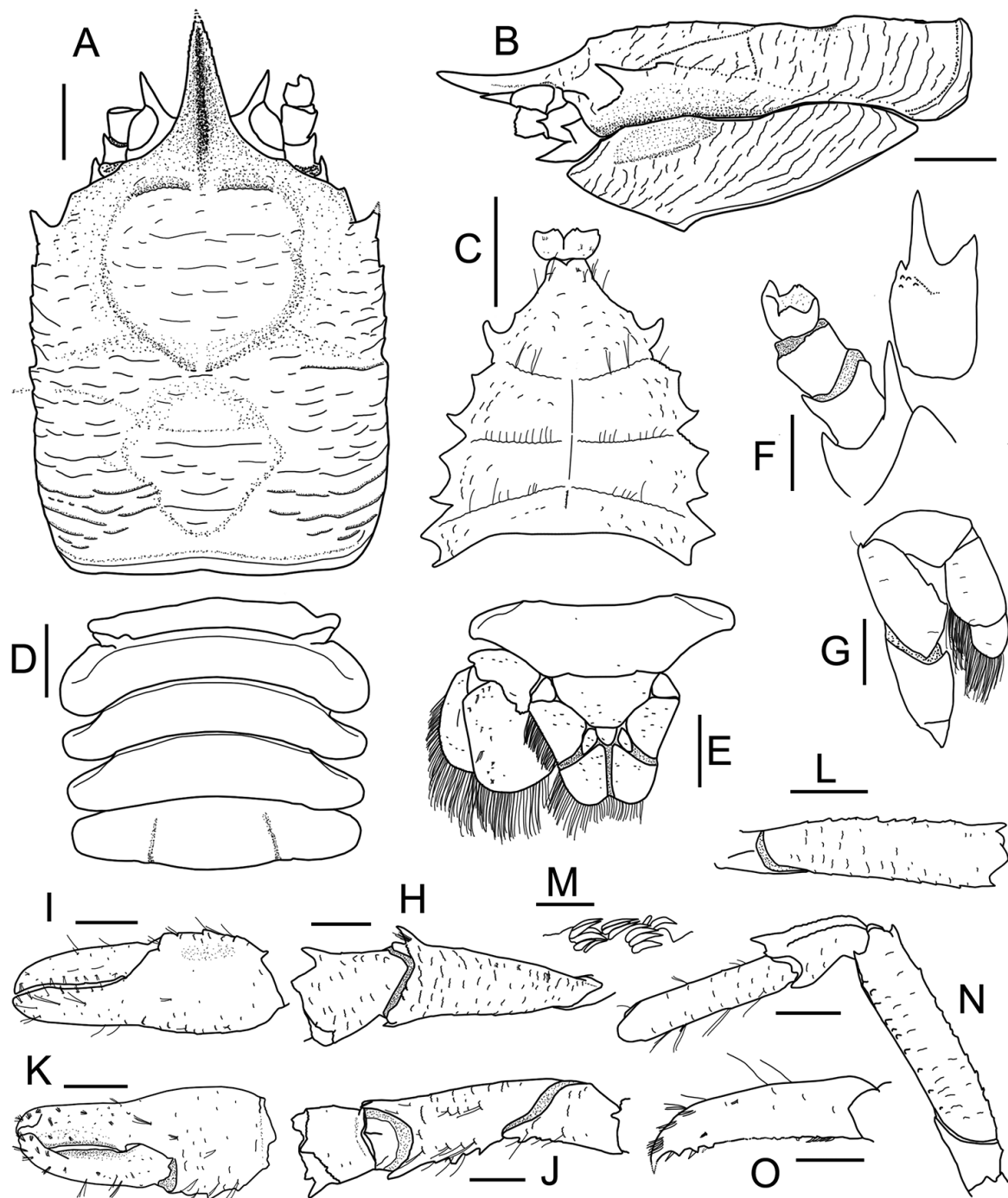


Figure 3. *Munidopsis lauensis* Baba and Saint Laurent, 1992. Adult male PCL 12.9 mm, CW 10.9 mm (NIO1014/23). **A**, Carapace dorsal view; **B**, carapace lateral view; **C**, thoracic sternum ventral view; **D**, pleonal tergites 1–5 dorsal view; **E**, pleonal tergite 6 and telson dorsal view; **F**, right antennule and antenna ventral view; **G**, third maxilliped lateral view; **H**, left P1 merus and carpus dorsal view; **I**, left P1 chela dorsal view; **J**, left P1 merus and carpus ventral view; **K**, left P1 chela ventral view; **L**, left P2 merus lateral view; **M**, Setae on extensor surface of left P2 merus; **N**, unattached pereopod ischium–propodus lateral view; **O**, unattached pereopod dactylus lateral view. Scale bars: **A–E**, **H–M** = 0.5 mm; **N–O** = 2 mm; **F** = 1 mm.

finger length, almost as long as broad, mesially with 2 spiniform processes. Fingers distally spooned, occlusal margins crenulate.

P2 (Fig. 3L) merus with row of 9 small tuberculate spines (distalmost largest) on extensor surface, covered

with rows of thick setae (Fig. 3M); lateral surface and ventral margin each with rows of obsolescent tubercular processes, flexor margin with distinct distal spine.

Pereopod (not attached to specimen) (Fig. 3N) merus $4.7 \times$ as long as wide, bearing dorsal row of

10 small spines, distalmost largest, lateral surface and ventral margin each bearing rows of obsolescent tubercular processes, ventral margin with distinct distal spine. Carpus with dorsal ridge terminating in distodorsal spine, feebly tuberculate low ridge dorsolaterally parallel to dorsal margin. Propodus obliquely flattish, dorsal margin bearing obsolescent tubercular processes. Dactylus (Fig. 3O) length 0.7 times propodus length, flexor margin bearing 17 teeth, each accompanied by movable corneous spine; distalmost tooth close to corneous unguis.

Epipods absent.

Distribution. Hydrothermal vents in the South-West Pacific at 1,750 m depth at Lau Basin near Fiji, 2,000 m in the North Fiji Basin (Baba and Saint Laurent, 1992; Thaler et al., 2014), 1,649 m at Brothers Seamount in the Kermadec Arc off New Zealand (Cubelio et al., 2007), 1,300–1,900 m at Manus Basin off Papua New Guinea (Thaler et al., 2014), and 2,023 m at Onnuri Vent Field in the Central Indian Ocean (Hwang et al., 2022).

Previous reports of *M. lauensis* from a cold-seep environment were from 1,119–1,199 m and 1,750–2,000 m at Formosa Ridge off Taiwan (Lin et al., 2013; Dong and Li, 2015; Shen et al., 2016; Yang et al., 2016; Sun et al., 2019).

Remarks. The morphology of the single Indian specimen of *M. lauensis* largely resembled the type specimens, with the exception of the higher number of teeth (27) on the crista dentata of the third maxilliped ischium (vs. 23–24 in the type series). Three males reported from the Formosa Ridge (Lin et al., 2013) reportedly possessed a relatively longer P1 palm (as long as finger), along with distinct spines on the mesial

margin of P1 merus, which are less prominent in the Indian specimen, and absent in the type series.

The partial mtDNA COI sequence of the Indian specimen is identical (p-distance, 0.0%) (Tab. 2) to the previously published sequences originating from the Northwestern Pacific Ocean (KF774316 (Lin et al., 2013), and MH717895 (Sun et al., 2019)) (Fig. 4). The partial 16S rRNA sequence is nearly identical (p-distance, 1.25%) to the previously published sequence (MH717895) from the Formosa Ridge, Taiwan (Sun et al., 2019).

Munidopsis lauensis belongs to the “*orophorhynchus*” species group of the genus *Munidopsis*, characterized by a mesially placed distal eye-spine, and chelipeds shorter in length than the second pereopods. This group also includes 18 other congeneric species reported from the Atlantic, Indo-Pacific and Southern Oceans (Tab. 3). Within the “*orophorhynchus*” species group, *M. lauensis* shares the absence of epipods from all the pereopods with *Munidopsis albatrossae* Pequegnat and Pequegnat, 1973, *Munidopsis aries* (A. Milne-Edwards, 1880), *Munidopsis arietina* Alcock and Anderson, 1894, *Munidopsis centrina* Alcock and Anderson, 1894, *Munidopsis ceratophthalma* Alcock, 1901, *Munidopsis granosa* Alcock, 1901, *Munidopsis platirostris* (A. Milne-Edwards and Bouvier, 1894), *Munidopsis sharreri* (A. Milne-Edwards, 1880), and *Munidopsis spinoculata* (A. Milne-Edwards, 1880). It differs from *M. arietina*, *M. granosa*, and *M. platirostris* in having a narrow triangular rostrum; from *M. sharreri* in the smooth posterior margin of the carapace; from *M. albatrossae* in possessing moderately arched lateral carapace margins; from *M. aries* and *M. centrina* in the absence of gastric spines on the carapace; and from *M. spinoculata* in the presence of spines on the

Table 2. Kimura 2 parameter (K2P) pair-wise analysis based estimated genetic variation among COI sequences of species of *Munidopsis*.

GenBank Accession no.	Species	Values							
OP776916	<i>M. lauensis</i>								
KF774316	<i>M. lauensis</i>	0.00							
MH717895	<i>M. lauensis</i>	0.00	0.00						
OR363375	<i>M. scobina</i>	0.26	0.26	0.26					
W292588	<i>MM. wardeni</i>	0.28	0.28	0.28	0.07				
JN166777	<i>M. dasypus</i>	0.27	0.27	0.27	0.20	0.21			
MN397923	<i>M. nitida</i>	0.14	0.14	0.14	0.27	0.28	0.28		
ON886875	<i>M. trifida</i>	0.24	0.24	0.24	0.23	0.23	0.21	0.27	

Table 3. Geographical and bathymetric distribution of species belonging to the “*orophorhynchus*” species group of the genus *Munidopsis* Whiteaves, 1874.

Species	Bathymetric range in meters	Distribution
<i>Munidopsis albatrossae</i> Pequegnat and Pequegnat, 1973	1920–3680	Eastern Pacific (Alaska Bay, off Oregon, Monterey Bay, Baja California, East Pacific Rise and west of Costa Rica, Galapagos Islands), Western Pacific (Weijia Guyot and Hawaii) and Bellingshausen Sea (Antarctic waters) (Osawa et al., 2023)
<i>Munidopsis aries</i> (A. Milne-Edwards, 1880)	2615–5320	New England, Middle Atlantic Bight, Bequia, Colombian Basin, Venezuelan Basin, south of Azores, Iberia abyssal plain, Off Mauritania, Angola, South Africa, Réunion Island (Baba et al., 2008); Central Indian Ridge, South East Indian Ridge, Rodriguez Triple Junction (Gerdes et al., 2021).
<i>Munidopsis arietina</i> Alcock and Anderson, 1894	1836–3852	Bay of Bengal, Taiwan (Baba et al., 2008); Great Australian Bight, off the eastern coast of Australia (Farrelly and Ah Yong, 2019)
<i>Munidopsis centrina</i> Alcock and Anderson, 1894	2300–3485	Indian Ocean (Mozambique Channel, Southwest Indian Ocean, Bay of Bengal), Western Pacific Ocean (south of Tosa Bay, Taiwan, New Caledonia; off the eastern coast of Australia (Baba et al., 2008; Farrelly and Ah Yong, 2019)
<i>Munidopsis ceratophthalma</i> Alcock, 1901	677–878	Andaman Sea, West of Sumatra (Baba et al., 2008)
<i>Munidopsis edwardsii</i> (Wood-Mason, 1891 in Wood-Mason and Alcock, 1891)	1379–3065	SW of Sri Lanka, Bay of Bengal, Taiwan, New South Wales (Baba et al., 2008)
<i>Munidopsis granosa</i> Alcock, 1901	2610–3485	Mozambique Channel, Bay of Bengal, Taiwan (Baba et al., 2008)
<i>Munidopsis lauensis</i> Baba and de Saint Laurent, 1992	1119–2023	Formosa Ridge off Taiwan, South-West Pacific (Lau Basin, North Fiji Basin, Brothers Seamount, Kermadec Arc off New Zealand, Manus Basin off Papua New Guinea), Central Indian Ocean (Onnuri Vent Field) (Baba et al., 2008) (Hwang et al., 2022)
<i>Munidopsis livida</i> (Perrier, 1886)	2070–3113	Gulf of Mexico, off Jamaica off Canary Islands, Cape Ghir, off Congo, off Angola (Baba et al., 2008)
<i>Munidopsis marionis</i> (A. Milne-Edwards, 1882)	374–1700	Planier Island, Western Tyrrhenian Sea, Levant Basin (Baba et al., 2008)
<i>Munidopsis nitida</i> (A. Milne Edwards, 1880)	592–3680	Atlantic Ocean (South West Gulf of Mexico, Guadeloupe, Dominica, Bahamas, Brazil, Gulf of Guinea), Indian Ocean (off Madagascar, Mozambique Channel, Gulf of Aden, Bay of Bengal), Western Pacific Ocean (Makassar Strait, off Sulawesi, Moluccas, Philippines, off eastern coast of Australia, off Admiralty Islands, off Arou Islands, between Papua and Admiralty Islands, Solomon Islands, New Caledonia, Vanuatu, Taiwan, Izu Shoto (Japan); Eastern Pacific (off Oregon, South Eastern Gulf of California, off Mariato Point, Cocos Island, and Gulf of Panama) (Baba et al., 2008; Farrelly and Ah Yong, 2019)
<i>Munidopsis pallida</i> Alcock, 1894	2233–3299	Off Zanzibar, Bay of Bengal, Andaman Sea, Taiwan (Baba et al., 2008)
<i>Munidopsis parfaiiti</i> (Filhol, 1885)	2895–5330	Atlantic Ocean (West European Basin, from off Ireland to off South Africa) and Indian Ocean (Madagascar) (Baba et al., 2008)
<i>Munidopsis platirostris</i> (A. Milne-Edwards and Bouvier, 1894)	101–860	Florida Strait, Yucatan Strait, northwest Caribbean Sea, Bahamas, Lesser Antilles, Puerto Rico, Colombia, Venezuela (Baba et al., 2008; Poupin and Corbari, 2016; Williams et al., 2019)
<i>Munidopsis recta</i> Baba, 2005	2216–3190	Gulf of Panama and East Pacific Rise (Baba et al., 2008)
<i>Munidopsis sharreri</i> (A. Milne-Edwards, 1880)	298–454	Santa Cruz (Virgin Islands) and Carriacou Island (Grenada) (Baba et al., 2008)
<i>Munidopsis spiniculata</i> (A. Milne-Edwards, 1880)	597–1738	Florida Strait, Gulf of Mexico, Caribbean Sea, Lesser Antilles Dominica, north coast of Cuba, southwest off British Honduras, near Jamaica (Baba et al., 2008; Poupin and Corbari, 2016)
<i>Munidopsis squamosa</i> (A. Milne-Edwards, 1880)	212–500	Dominican Republic, Yucatan Channel, Lesser Antilles, Islands of the Caribbean (Baba et al., 2008; Poupin and Corbari 2016)
<i>Munidopsis subsquamosa</i> Henderson, 1885	1789–4800	Atlantic Ocean (off Namibia, West of Cape Point), Indian Ocean (Marion Island, Crozets), Western Pacific (off Japan, Queensland and New South Wales,) Eastern Pacific (off Oregon, Panama, Chile) (Baba et al., 2008; Farrelly and Ah Yong, 2019)

meri and carpi of pereopods. It closely resembles *M. ceratophthalma* in possessing a narrow triangular rostrum, absence of gastric spines, moderately arched lateral carapace margins, smooth posterior margin of carapace, the presence of spines on the meri and carpi of pereopods, and absence of epipods on all pereopods.

However, *M. lauensis* differs from *M. ceratophthalma* in having a relatively shorter mesial eye-spine, which is less than half of the rostral length (vs. relatively longer eye-spine, greater than half of the rostral length in *M. ceratophthalma*). An identification key to the species of the “*orophorhynchus*” group is provided below.

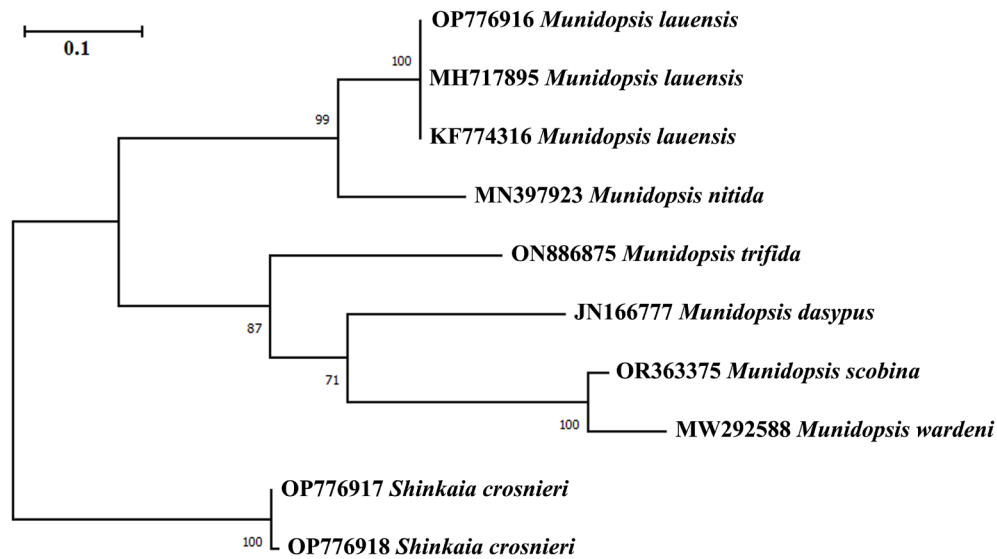


Figure 4. Maximum Likelihood (ML) tree showing relationships among *Munidopsis* Whiteaves, 1874 species based on COI gene sequence data. Numbers on branches represent bootstrap values expressed in percentages.

Identification key to the species of the “orophorhynchus” group of the genus Munidopsis:

1. Epipods absent on chelipeds and pereopods 2
 - Epipods present on chelipeds, may be absent on pereopods 11
2. Rostrum styliform, bearing lateral spines *M. arietina*
 - Rostrum narrowly to broadly triangular, unarmed laterally 3
3. Rostrum broadly triangular 4
 - Rostrum narrowly triangular 5
4. Carapace uniformly tuberculate. Abdominal somites 2–4 each with sharp median tooth
 - *M. granosa*
 - Carapace sparsely tuberculate. Abdominal somites 2–4 unarmed *M. platirostris*
5. Posterior margin of carapace spinose *M. sharreri*
 - Posterior margin of carapace smooth 6
6. Carapace broadest anteriorly, lateral margins converging posteriorly *M. albatrossae*
 - Carapace broadest at midlength, lateral margins moderately arched 7
7. Carapace with gastric spines 8
 - Carapace without spines on the gastric region 9
8. Carapace with 1 pair of gastric spines *M. aries*
 - Carapace with 2 transverse rows of gastric spines *M. centrina*
9. Surfaces of meri and carpi of chelipeds and pereopods armed with spines or tubercles 10
 - Surfaces of meri and carpi of chelipeds and pereopods unarmed *M. spinoculata*
10. Eye-spine longer than half of rostral length *M. ceratophthalma*
 - Eye-spine shorter than half of rostral length *M. lauensis*

11. Epipods present on chelipeds and first two ambulatory pereopods *M. marionis* (A. Milne-Edwards, 1882)
 - Epipods present on chelipeds only 12
12. Rostrum broadly triangular 13
 - Rostrum moderately triangular 16
13. Carapace with 1 pair of gastric spines *M. pallida* Alcock, 1894
 - Carapace without gastric spines 14
14. Abdominal somites 2-4 each with blunt, low median process *M. parfaiti* (Filhol, 1885)
 - Abdominal somites 2-4 unarmed 15
15. Dorsal surface of carapace nearly smooth. Rostrum constricted between eyes *M. livida* (Perrier, 1886)
 - Dorsal surface of carapace sharply granulated. Rostrum not constricted between eyes *M. squamosa* (A. Milne-Edwards, 1880)
16. Carapace with spines on gastric region 17
 - Carapace without spines on gastric region *M. edwardsi* (Wood-Mason in Wood-Mason & Alcock, 1891)
17. Carapace with 1 pair of spines only on gastric region *M. nitida* (A. Milne-Edwards, 1880)
 - Carapace with spines in addition to 1 pair of spines on gastric region 18
18. P2–4 dactyli nearly straight on flexor margin *M. recta* Baba, 2005
 - P2–4 dactyli considerably curving *M. subsquamosa* Henderson, 1885

DISCUSSION

Morphological and molecular (partial mitochondrial cytochrome oxidase subunit 1 and 16S rRNA genes) analyses of deep-water squat lobsters collected from a cold-seep site in the western Bay of Bengal confirmed the first geographical record of *Munidopsis lauensis* from Indian waters. The present study was a preliminary attempt to shed light on the squat lobster fauna of the cold seep environment in the Northern Indian Ocean. Additional sampling surveys are required to fully understand the species composition of this little-studied region.

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**ADDITIONAL INFORMATION
AND DECLARATIONS**

Author Contributions

Conceptualization and design: MJG, ST, VPP. Performed Research: MJG, ST, VPP, JT. Acquisition of data: MJG, ST, VDS. Analysis and interpretation of data: MJG, ST, VPP, JT. Preparation of figure/tables/maps: ST. Writing – original draft: MJG, ST, VPP. Writing – critical review and editing: MJG, VDS, JT.

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