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The *Eiconaxius cristagalli* species complex (Decapoda, Axiidea, Axiidae)

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Abstract

Poore, G.C.B., and Dworschak, P.C. (2018). The *Eiconaxius cristagalli* species complex (Decapoda, Axiidea, Axiidae). *Memoirs of Museum Victoria* 77: 105–120.

Four species of *Eiconaxius* are known to possess a denticulate median rostral carina: *E. antillensis* Bouvier, 1905, *E. asper* Rathbun, 1906, *E. cristagalli* Faxon, 1893, and *E. indicus* (De Man, 1907). They are reviewed and two similar new species are described: *E. dongshaensis* sp. nov., and *E. gololobovi* sp. nov. A key to distinguish them is presented.

Keywords

Crustacea, Decapoda, Axiidae, *Eiconaxius*, new species

Introduction

The axiid genus *Eiconaxius* Bate, 1888 comprises more than 30 species confined to deep water that are, as far as is known, associates of sponges (Komai and Tsuchida, 2012). A few species differ from all others in having a prominent median denticulate crest on the rostrum reaching back to the gastric region where it bifurcates. In all other species this ridge is low and smooth, or at best only slightly serrate. Faxon (1893), who used the species epithet *cristagalli* for the first species in this group alluded to a cock's comb and described the ridge as bearing 'prominent teeth'. Three more similar species were described shortly thereafter (Bouvier, 1905; Rathbun, 1906; De Man, 1907). These four are rediagnosed and two new similar species are described from the Indo-West Pacific.

Methods

The material comes from: the Muséum nationale d'Histoire naturelle, Paris (MNHN) expeditions to Guadeloupe, (KARUBENTHOS 2016) and to the Mayotte-Glorieuses region, 2017 (BIOMAGLO); four expeditions by MNHN-ORSTOM (Office de la recherche scientifique et technique outre-mer, now IRD Institut de recherche pour le développement) (see <http://expeditions.mnhn.fr/> and Richer de Forges et al., 2013); collections made by the National Taiwan Ocean University, Keelung (NTOU) in the South China Sea; and the IUCN Seamounts expedition to the southwestern Indian Ocean, 2011 (Rogers and Taylor, 2012), material now lodged in Naturhistorisches Museum, Vienna (NHMW).

Type material consulted and types of new species are lodged in the Naturalis Biodiversity Center, Leiden (ZMA), Museums Victoria, Melbourne (NMV) and the Museum of Comparative Zoology, Harvard University, Cambridge (MCZ). Other specimens were viewed in the National Museum of Natural History, Washington (USNM).

Size is expressed as carapace length, including rostrum, in mm. Relative lengths of fixed fingers of chelipeds are expressed as $(a-b)/b$ where a is the length of the lower margin of the propodus, including the fixed finger, and b is the length of the upper margin.

As part of this study and continuing discovery of new species in the Indo-West Pacific diagnoses have been prepared for all species of *Eiconaxius* and coded into a DELTA database (Dallwitz, 2010). This database was used to generate the diagnoses presented here; character states in italics diagnose each species in at least two respects from every other species. The poorly known *Eiconaxius asper* Rathbun, 1906 is diagnosed on the basis of its description but not included in the key.

Family Axiidae Huxley, 1879

Eiconaxius Bate, 1888

Eiconaxius Bate, 1888: 40. – Poore, 2017: 365–366.

Remarks. Poore (2017) provided a new diagnosis and discussed the synonymy of the genus. The following key deals only with species having a prominent median denticulate crest on the rostrum reaching back to the gastric region.

Key to species of *Eiconaxius cristagalli* species complex

1. East Pacific or Caribbean species 2
 - Indo-West Pacific species 3
2. Rostrum triangular, tapering, median carina with 6 or 7 teeth; lateral carina without clear hiatus between posterior extension of rostral margin and posterior section; East Pacific *E. cristagalli* Faxon, 1893
 - Rostrum tapering more steeply anteriorly, median carina with >10 teeth (Figs 1b, 2b); lateral carina with a clear hiatus between posterior extension of rostral margin and posterior section (Figs 1b, 2b); Caribbean *E. antillensis* Bouvier, 1905
3. Major cheliped palms fixed finger cutting edge crenellate (Fig. 5f, g); rostrum parallel-sided basally, tapering steeply anteriorly; lateral carina continuous from lateral margins of rostrum, with short overlap posteriorly (Fig. 5c); Western Indian Ocean *E. golobovi* sp. nov.
 - Major cheliped palms fixed finger cutting edge with simple blade (Figs 3e, f, 9g, h); rostrum tapering evenly

from base to acute apex; lateral carina usually with considerable hiatus between lateral margins of rostrum and posterior section, or absent (Figs 3c, 9c) 4

4. Rostrum with ventral tooth (Fig. 3b); major cheliped, distolateral margin of propodus with 2 teeth at base of dactylus, lobe and narrow keyhole-shaped notch in gape (Fig. 3e); East China Sea *E. dongshaensis* sp. nov.
 - Rostrum without ventral tooth (Fig. 9b); major cheliped, distolateral margin of propodus straight at base of dactylus, circular notch in gape (Fig. 9g); SW Pacific *E. indicus* (De Man, 1907)

***Eiconaxius antillensis* Bouvier, 1905**

Figures 1, 2

Eiconaxius crista-galli var. *antillensis* Bouvier, 1905: 803.

Iconaxius cristagalli var. *antillensis*. – Balss, 1925: 210.

Axius (*Eiconaxius*) *crista-galli antillensis*. – Bouvier, 1925: 456–458, pl. 8 fig. 3, pl. 9 fig. 1. – De Man, 1925: 4, 33.

Eiconaxius antillensis. – Sakai and de Saint Laurent, 1989: 21. – Kensley, 1996: 475. – Sakai, 2011: 273. – Felder et al. 2009: 1063.

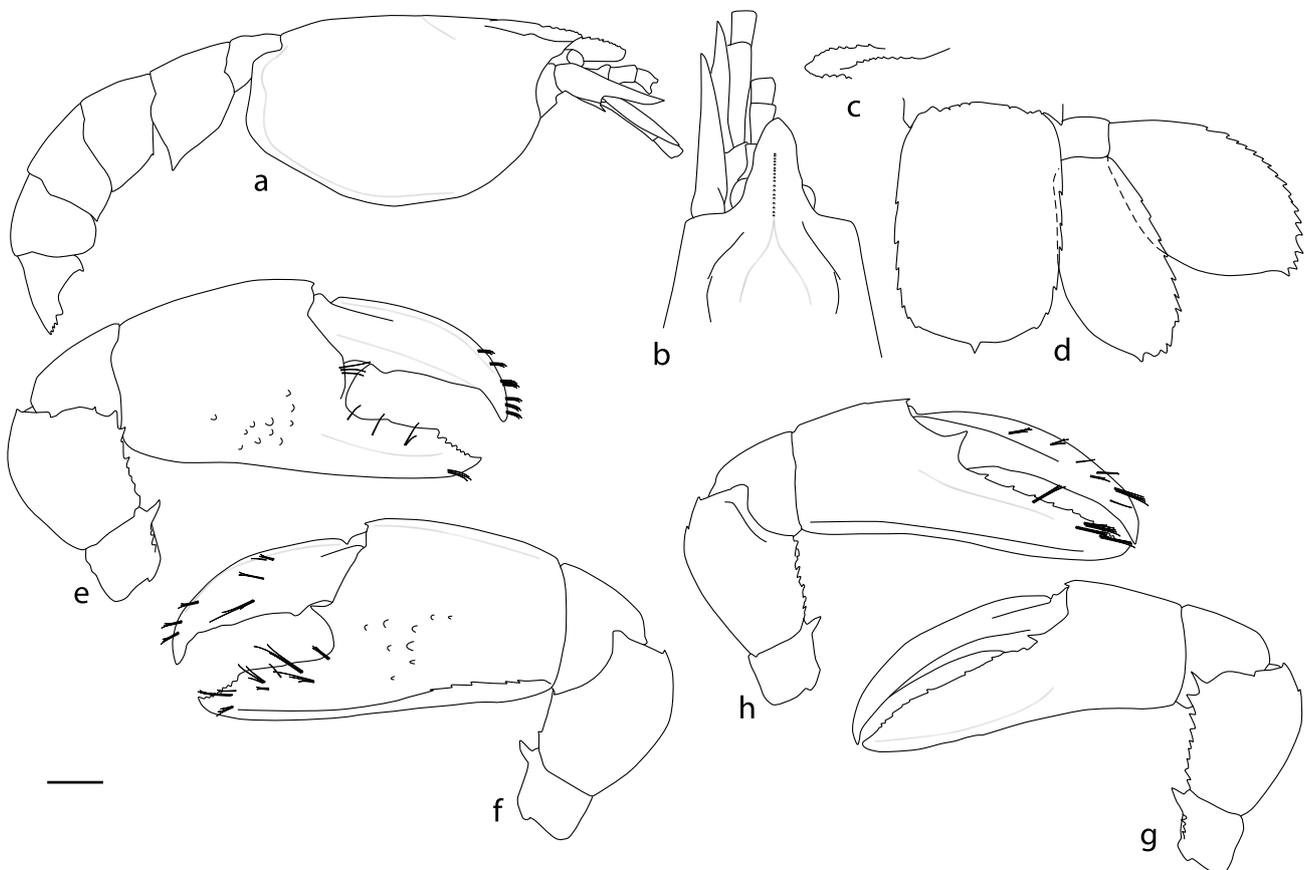


Figure 1. *Eiconaxius antillensis* Bouvier, 1905, Syntype, MCZ 11964 (male, 6.1 mm) – a, carapace, pleon, lateral. b, anterior carapace, antenna, antennule, dorsal view. c, rostrum, anterior median carina, left oblique view. d, telson, right uropod. e, f, major cheliped (left), mesial, lateral views. g, h, minor cheliped (right), mesial, lateral views. Scale bar = 1 mm.

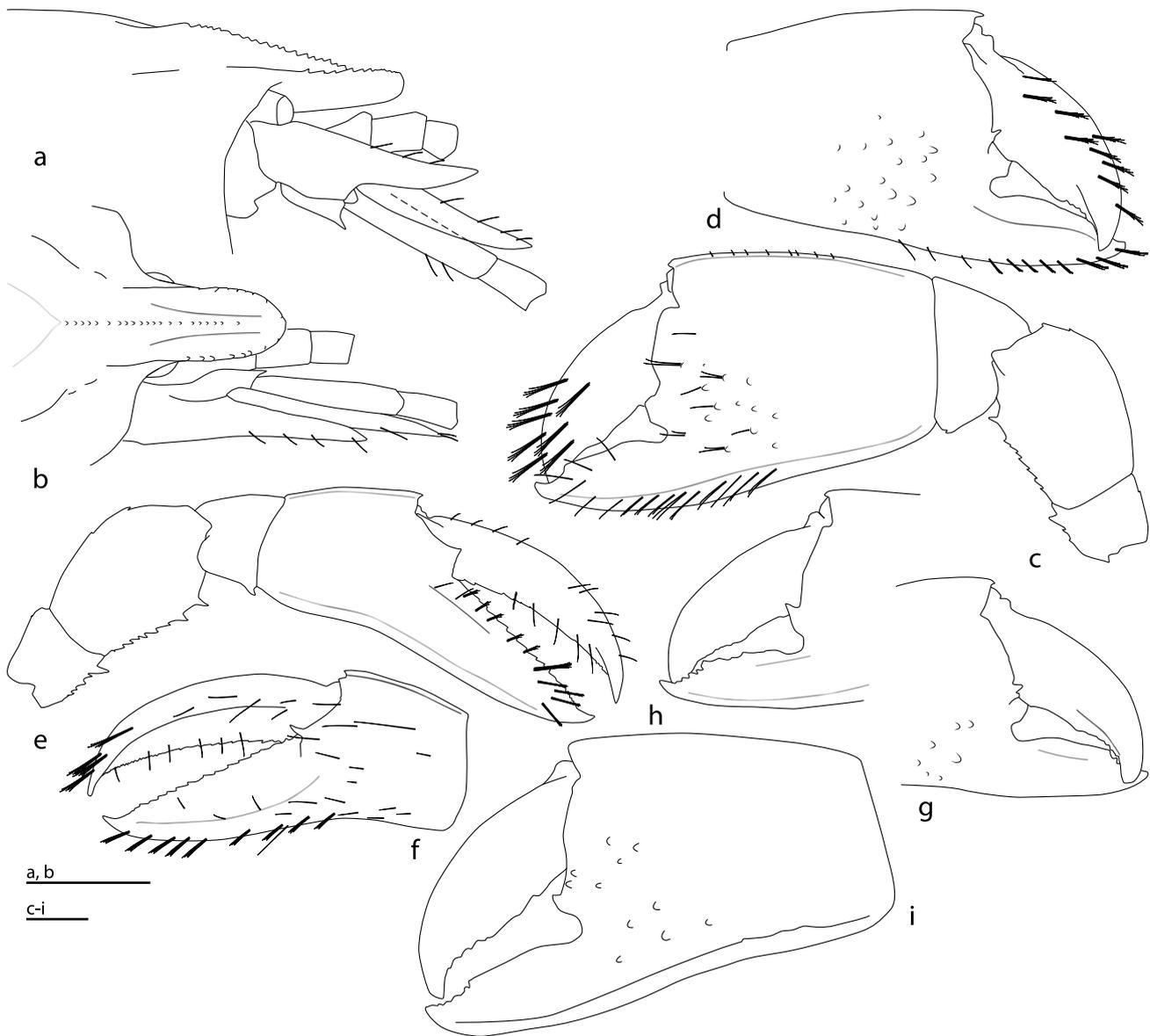


Figure 2. *Eiconaxius antillensis* Bouvier, 1905, IU-2016-8456 (ovigerous female, 6.3 mm) – a, b, anterior carapace, antenna, antennules, lateral, dorsal views. c, d, major cheliped (left), lateral, mesial views. e, f, minor cheliped (right), lateral, mesial views. g, h, major cheliped (left), distal propodus, dactylus, lateral, mesial views. NMV J71649 (ovigerous female, 7.6 mm) – i, major cheliped (left), lateral view. Scale bars = 1 mm.

Eiconaxius ?antillensis. – Poupin and Corbari, 2016: 32, fig. 8a (photograph).

Material examined. Syntypes. Off Montana, Monserrat, 16.7°N, 62.2°W, 545 m, *Blake* stn 154, MCZ CRU-11946 (male, 6.1 mm). Barbados, 12.9°N, 59.6°W, 527 m, *Blake* stn 281, MCZ CRU-11947 (ovigerous female, 6.7 mm).

Guadeloupe, N of Grande Terre, 16°37'N, 61°31'W, 432–482 m (KARUBENTHOS stn DW4550), MNHN IU-2016-8456 (ovigerous female, 6.3 mm), MNHN IU-2018-106 (3 females, 5.8–7.1 mm), MNHN IU-2013-18924 (2 males, 4.3, 6.7 mm), NMV J71649 (ovigerous female, 7.6 mm). NMV J71655 (4 females, 5.3–7.3 mm).

Caribbean Sea, Mexico, NE of Yucatan, 22.72°N, 86.22°W, 1030 m, (Cruise: 65A9-21) USNM 1014172 (1 specimen, det. B. Kensley, examined by C.C. Tudge). E of Guadeloupe, 16.55°N, 61.62°W, 466–585 m (*Pillsbury* stn P994), USNM 1081088 (3 specimens, examined by C.C. Tudge).

Diagnosis. Rostrum tapering more over distal third than proximal, with rounded apex in adult (acute in juvenile), 1.2–1.3 times as long as wide. Median carina erect, with clear dentition (10–20 teeth); lateral gastric carina with hiatus between lateral rostral margin and short gastric section, visible only posterior to confluence of submedian carinae. Major

cheliped, palm wider distally than at midpoint, distolateral margin with sharp tooth at base of finger; fixed finger about 3/4 length of upper margin of palm, cutting edge with *basal notch, blade-like proximal half, and distal concavity*; dactylus cutting edge with *blunt tooth at midpoint, denticulate beyond*. Minor cheliped, palm upper margin as long as greatest width; distolateral margin with prominent triangular toothed lobe at base of dactylus; fixed finger cutting edge weakly crenellate, with excavated distal quarter.

Distribution. Monserrat, Barbados, Guadeloupe, Caribbean Sea, W Atlantic, S. of Jamaica; 432–1030 m.

Remarks. Bouvier (1905) listed no specimens when he erected his new variety but mentioned a male and a female from two stations later (Bouvier, 1925). We treat them as syntypes. The male syntype differs significantly from all other specimens identified by us and by others in the past, including the second specimen identified by Bouvier (1925). Notably the distolateral margin of the palm of the major cheliped bears a high and sharp tooth (Fig. 1f) whereas in all other material there is a blunt asymmetrical tooth (Figs 2h, i are typical; broken in Fig. 2c). The notch below this tooth is less pronounced in the male syntype than in other specimens. These differences appear not size-related – this specimen is within the size range of the other material.

Eiconaxius antillensis is the only species of this group in the Atlantic but is confined to the Caribbean or nearby, an area with biogeographic affinities to the Indo-West Pacific where the remainder live. The species is similar to *E. cristagalli*, the Eastern Pacific species, in the dentition of the propodus and fixed finger of the major cheliped, both with a deep notch in the gape and a distal concavity on the finger. It differs in having a narrow, parallel-sided rostrum with numerous teeth on the median carina (cf. rostrum triangular, tapering, median carina with six or seven teeth in Faxon's and Kensley's accounts of *E. cristagalli*). Kensley (1996: fig. 7F) showed the distolateral margin of the minor cheliped of *E. cristagalli* with two teeth; only one is present on these specimens of *E. antillensis*. The lateral carina has a clear hiatus between the posterior extension of the rostral margin and the ridge level with the submedian carina, as in *E. gololobovi* sp. nov.; Kensley (1996) noted no such hiatus in *E. cristagalli*.

***Eiconaxius asper* Rathbun, 1906**

Eiconaxius asper Rathbun, 1906: 895, fig. 52. – Sakai and de Saint Laurent, 1989: 22. – Kensley, 1996: 475. – Sakai, 2011: 273.

Iconaxius asper. – Balss, 1925: 209.

Axius (Eiconaxius) asper. – De Man, 1925: 4, 14, 34.

Diagnosis. Median carina erect, with clear dentition. *Major cheliped, palm wider distally than at midpoint. Major cheliped, palm lateral and mesial faces tuberculate near base of fingers; distolateral margin with 1 or 2 teeth in gape but without a deep notch; fixed finger about half as long as upper margin of palm, cutting with basal notch, blade-like proximal half, and distal concavity; dactylus cutting edge with basal molar-like tooth, notch and straight beyond. Minor cheliped, palm lateral and mesial faces tuberculate near base of fingers.*

Distribution. Hawaii, Kauai I., 418–628 fm (765–1149 m) (known only from type locality).

Remarks. Rathbun (1906) remarked that the species resembled *E. cristagalli* in having the median carina denticulate but differed in the 'presence of a larger basal tooth on dactylus of larger hand and a more prominent tooth not far from middle of the pollex [fixed finger]'. She illustrated only the larger cheliped where these differences are unconvincing compared to Faxon's (1895) figures of a type or Kensley's (1996) figure of *E. cristagalli* from the Galapagos. Without examining the types we are unsure of the status of this species. It is omitted from the key.

***Eiconaxius cristagalli* (Faxon, 1893)**

Axius crista-galli Faxon, 1893: 193. – Faxon, 1895: 104, pl. 28 fig. 1–1h.

Axius (Eiconaxius) crista-galli. – Borradaile, 1903: 538. – De Man, 1925: 4, 14.

Eiconaxius crista-galli. – Rathbun, 1906: 895.

Iconaxius cristagalli. – Balss, 1925: 210.

Eiconaxius cristagalli. – Sakai and de Saint Laurent, 1989: 18. – Hendrickx, 1995: 390. – Hendrickx, 2008: 1002, fig. 2. – Kensley, 1996: 475, 480–481, fig. 7. – Sakai, 2011: 276–278.

Diagnosis. Rostrum 1.5–2.0 times as long as wide. Median carina erect, with clear dentition. Major cheliped, palm lateral and mesial faces tuberculate near base of fingers; distolateral margin with *single blunt tooth in gape*; fixed finger 0.6 length of upper margin of palm, cutting edge with *broad blade over proximal half, irregular beyond*; dactylus cutting edge with basal molar-like tooth, notch and straight beyond. Minor cheliped, palm upper margin as long as greatest width; distolateral margin with prominent bifid triangular tooth at base of dactylus. Uropod endopod anterolateral apex acute, with 1 or few small teeth.

Distribution. Pacific coast, Panama (*Albatross* stn 3358), 465 fm (851 m) (type locality); Ecuador, Galapagos Is, 717 m (Kensley, 1996), 1123–1378 m (Hendrickx, 2008).

Remarks. The species was redescribed by Kensley (1996) and compared by us with *E. antillensis* above. Hendrickx (2008) illustrated variation in the dentition of the rostrum of five syntypes and recorded the species from much greater depths than previously.

***Eiconaxius dongshaensis* sp. nov.**

(<http://zoobank.org/urn:lsid:zoobank.org:act:7A965426-D789-4C02-8B8C-4A3A84C17E3B>)

Figures 3, 4a, b

Eiconaxius indicus. – Sakai and Ohta, 2005: 73–77, figs 3–5. – Tsang et al., 2008: 363, fig. 2.

Material examined. Holotype. South China Sea, off Pratas Islands, S of Hong Kong, 20°50.9'N, 117°27.17'E, 730–720 m (stn CD320), NTOU A01439 (female, 10.0 mm).

Paratype. Collected with holotype, NTOU A01440 (female, 9.4 mm).

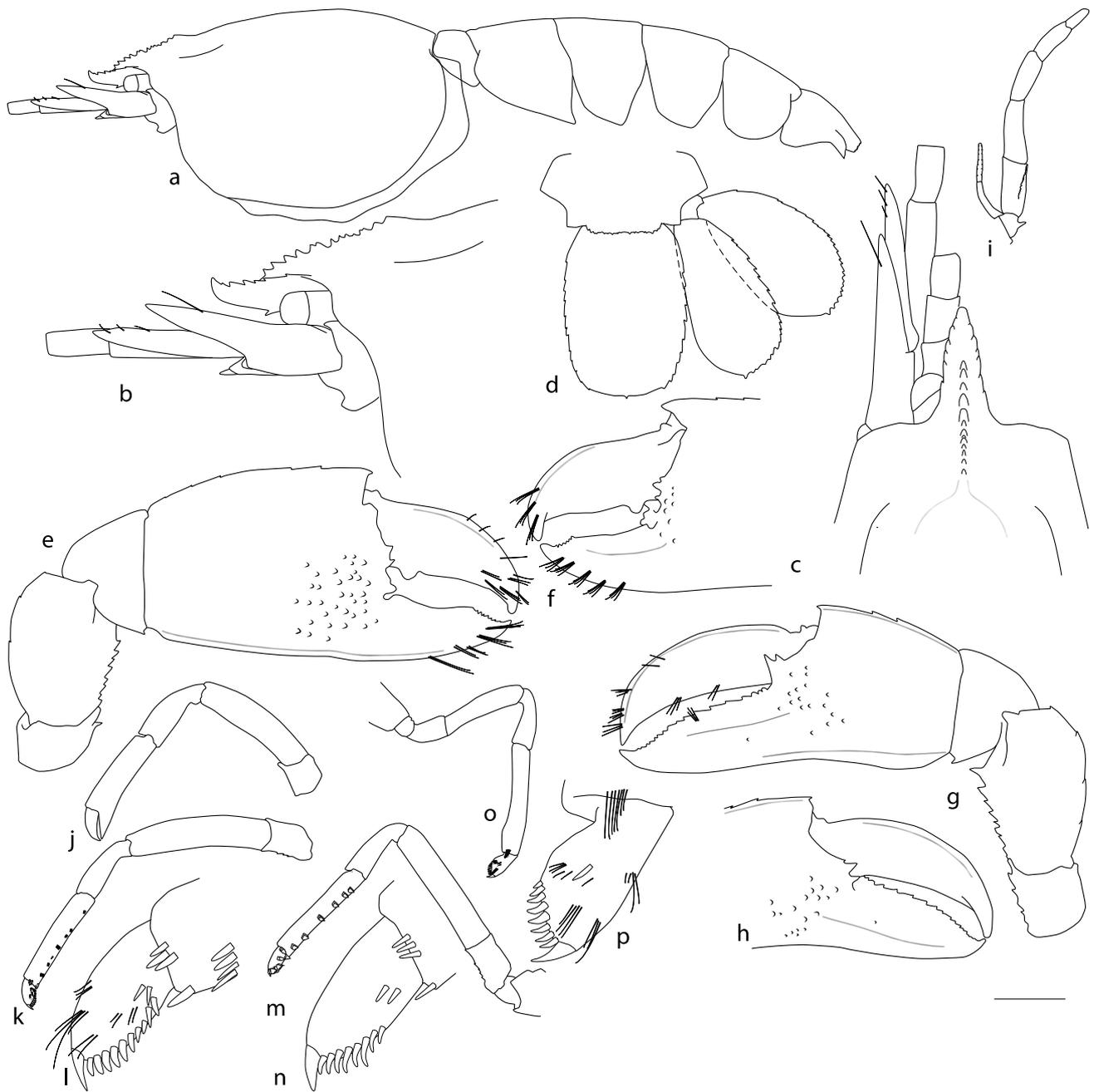


Figure 3. *Eiconaxius dongshaensis* sp. nov. Holotype, NTOU A01439 (female, 10.0 mm) – a, carapace, pleon, lateral. b, anterior carapace, antenna, lateral. c, anterior carapace, antenna, dorsal. d, pleomere 6, telson, right uropod. e, f, right major cheliped, lateral and mesial. g, h, left minor cheliped, lateral and mesial. i, maxilliped 3. j, pereopod 2. k, l, left pereopod 3, detail of dactylus. m, n, left pereopod 4, detail of dactylus. o, p, left pereopod 5, detail of dactylus. Scale = 2 mm (except b, c, l, n, p).

Diagnosis. Rostrum 1.5–2.0 times as long as wide; with ventral tooth. Median carina erect, with clear dentition; sublateral gastric carinae present, diverging widely from base of median carina; lateral gastric carina not running from rostrum, commencing level with confluence of submedian carinae. Major cheliped, palm wider distally than at midpoint, upper

margin denticulate; lateral and mesial faces of palm tuberculate near base of fingers; distolateral margin with 2 teeth at base of dactylus, lobe and keyhole-shaped notch in gape; fixed finger about half as long as upper margin of palm, cutting edge with basal notch, blade-like proximal half, and distal concavity; dactylus cutting edge with basal molar-like tooth, notch and

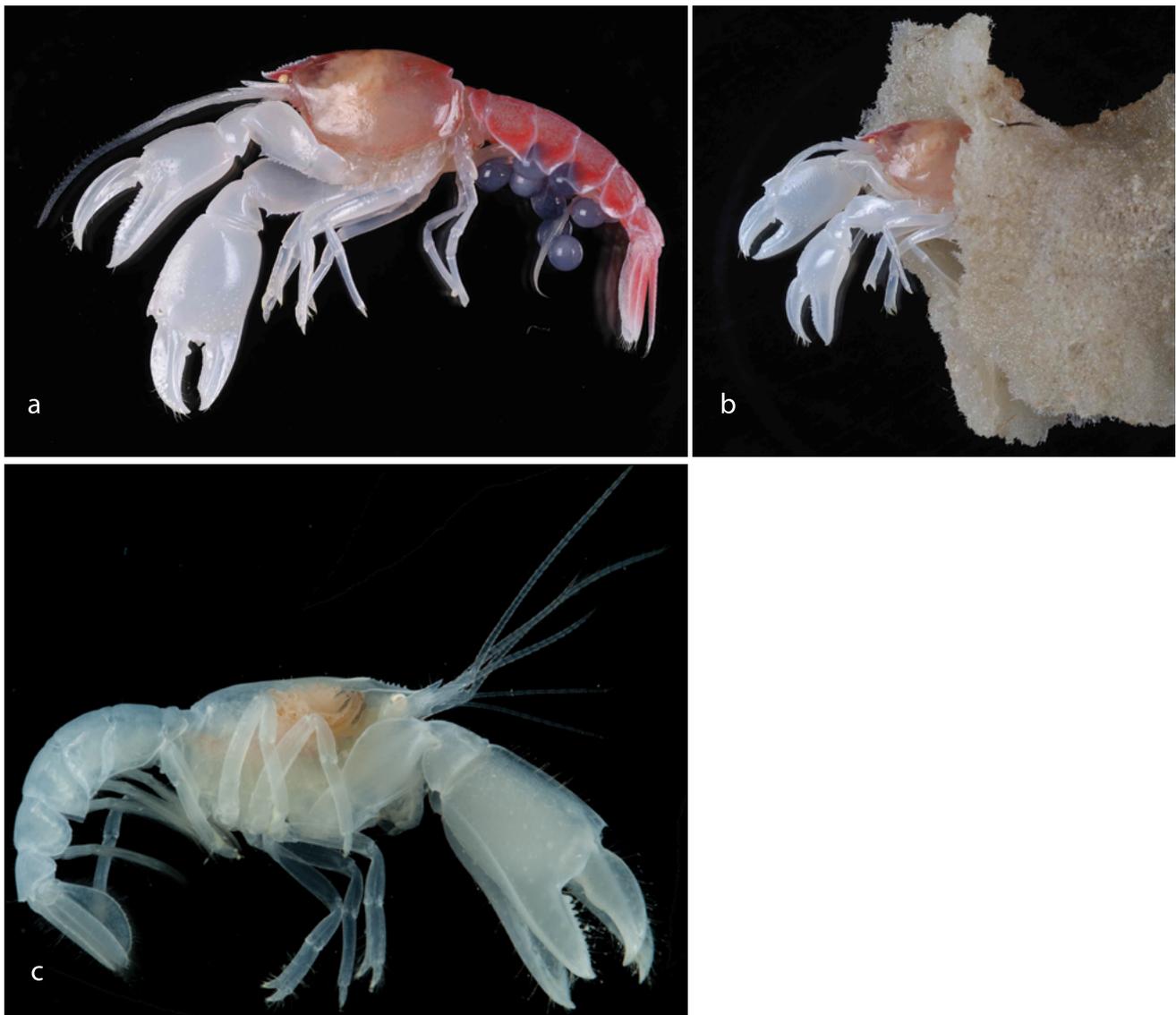


Figure 4. *Eiconaxius dongshaensis* sp. nov., holotype, NTOU A01439 (female, 10.0 mm) – a, habitus, in vivo. b, habitus in host sponge (photos, Tin-Yam Chan). *Eiconaxius gololobovi* sp. nov., unspecified specimen – c, habitus, in vivo (photo, David Shale).

straight beyond. Minor cheliped, palm upper margin as long as greatest width; distolateral margin with prominent triangular tooth at base of dactylus (bifid); lateral and mesial faces tuberculate near base of fingers.

Description. Carapace smooth. Rostrum 0.18 carapace length, concave dorsally, tapering evenly to acute tip, twice as long as wide at base, with 6 teeth on lateral margins, depressed below level of median carina, not continuous with lateral carinae, with ventral tooth. Lateral gastric carina unarmed, reaching anteriorly to base of median carina. Submedian gastric carina smooth, together curved and converging on median carina. Median gastric carina prominent, erect, reaching two-thirds along rostrum, with c. 13 uneven sharp teeth.

Pleuron 1 posteroventrally rounded; pleuron 2 truncate, posteroventrally acute; pleura 3 and 4 truncate, posteroventrally subacute; pleuron 5 rounded, all 5 pleura without anteroventral tooth; pleuron 6 with acute posteroventral angle; pleonite 6 dorsal posterior margin denticulate.

Eyestalk, 0.4 length of rostrum; cornea white. Antennular peduncle reaching to midpoint of antennal article 4; article 1 unarmed. Antennal peduncle article 1 unarmed; article 2 with upper-distal elongate triangular blade, reaching two-thirds along article 4; scaphocerite a vertical blade, reaching just beyond end of article 4; article 3 lower margin with distomesial tooth; article 5 about half length of article 4.

Maxilliped 3 basis with mesial spine; ischium unarmed; crista dentata of about 16 small similar teeth; merus and carpus unarmed; exopod with flagellum reaching to base of merus.

Major cheliped merus lower margin with c. 8 irregular teeth, upper margin with 2 minute blunt teeth; carpus lower margin with 1 distal tooth; propodus upper margin carinate, obscurely dentate, angled distally, length 0.9 greatest height, lower margin smooth, lateral face tuberculate near base of fixed finger, mesial face with few tubercles near base of fixed finger; fixed finger 0.6 times as long as upper palm, cutting edge shallowly concave over proximal two-thirds, denticulate beyond, with longitudinal mesial ridge; distolateral margin of palm with 2 teeth at base of dactylus, lobe and keyhole-shaped notch in gape; distomesial margin of palm with 2 teeth at base of dactylus; dactylus distally curved, upper margin carinate, cutting edge with basal tooth, straight beyond.

Minor cheliped shorter and more slender than major, palm 0.8 times height of major palm; merus lower margin with 8 sharp teeth, increasing in size distally; carpus lower margin with 1 distal tooth; propodus dilating, upper margin carinate, weakly denticulate, as long as greatest height, lower margin smooth, lateral and mesial faces tuberculate near base of fixed finger; fixed finger 1.25 times as long as upper palm, cutting edge dentate, with longitudinal mesial and lateral ridges; distolateral margin of palm oblique, with prominent bifid triangular tooth in gape; distomesial margin of palm oblique, with 2 triangular teeth in gape; dactylus distally curved, upper margin carinate, cutting edge smooth.

Pereopod 2 ischium lower margin unarmed; merus lower margin unarmed; carpus 0.8 length of propodus upper margin; propodus upper margin 2.5 times as long as dactylus. Pereopod 3 merus unarmed; propodus 3.3 times as long as dactylus, with 7 rows of spiniform setae, of 2–4 setae; dactylus spatulate, with 10 spiniform setae along oblique margin, plus unguis, 4 facial spiniform setae. Pereopod 4 similar to pereopod 3; propodus 3.5 times as long as dactylus, with 7 rows of spiniform setae, of 1–3 setae; dactylus spatulate, with 8 spiniform setae along oblique margin, plus unguis, and 2 facial spiniform setae. Pereopod 5 dactylus spatulate, with 8 spiniform setae along oblique margin, plus unguis, with 1 facial spiniform seta.

Uropodal endopod 1.9 times as long as wide, oval, anterior-distal margin with c. 20 evenly-spaced teeth, without longitudinal ridge. Uropodal exopod 1.7 times as long as wide, oval, anterior margin with many small irregular teeth over most of length, without longitudinal rib.

Telson 1.35 times as long as wide, widest at midlength, then tapering to rounded posterolateral angles, lateral margin upturned, denticulate, distal margin evenly curved, with posteromedian spine; dorsal face smooth, concave.

Etymology. *dongshaensis*, from Dongsha, the Chinese name of the Pratas Islands near the type locality.

Distribution. Sulu Sea, Philippines, 688–2019 m (Sakai and Ohta, 2005); Pratas Is., South China Sea, 720–730 m (Tsang et al., 2008).

Remarks. Sakai and Ohta (2005) illustrated the habitus, tailfan and chelipeds of this species as *Eiconaxius indicus* based on

nine specimens of both sexes from the Sulu Sea. Their figures can by-and-large be reconciled with those published here. The chelipeds are similar but the palmar distolateral and mesiolateral armature is simpler in their figures than in the types. Sakai and Ohta (2005) showed tubercles on the lateral face of the palm of the major cheliped in fig. 3 but not in fig. 5, and did not note the easily overlooked subrostral tooth.

Eiconaxius dongshaensis is the only species in this group with a rostral ventral tooth. This tooth and the small keyhole-shaped notch in the gape of the cheliped are like no other species.

Eiconaxius gololobovi sp. nov.

(<http://zoobank.org/urn:lsid:zoobank.org:act:6BA2620A-9AF9-4536-AD2F-4C0E980F65D8>)

Figures 4c, 5–8

Material examined. Holotype. SW Indian Ocean, Gololobov Bank, ‘Coral’ seamount, 41°21.0283’S, 42°55.145’E, 1117 m (RV *James Cook* cruise JC606, code 996) NHMW 25659 (male, 7.8 mm).

Paratypes. SW Indian Ocean, Gololobov Bank, ‘Coral’ seamount, 41°21.767’S, 42°54.907’E, 686.5 m, NHMW 25658 (male, 6.8 mm), NHMW 25660 (female, 6.1 mm), NHMW 25661 (male, 7.7 mm), NHMW 25662 (male, 5.1 mm), NHMW 25663 (female, 5.4 mm), NHMW 25664 (female, 6.8 mm), NHMW 25665 (male, 4.8 mm), NHMW 25666 (male, 8.3 mm), NHMW 25667 (ovigerous female, 9.1 mm), NHMW 25668 (ovigerous female, 8.1 mm), NHMW 25669 (male, 7.0 mm), NHMW 25670 (ovigerous female, 8.0 mm), NHMW 25671 (male, 6.2 mm), NHMW 25672 (male, 5.6 mm), NHMW 25673 (female, 5.6 mm), NHMW 25674 (ovigerous female, 8.8 mm), MNHN IU-2016-8156 (male, 7.4 mm), NMV J71648 (male, 7.8 mm), NHMW 26058 (male, 6.1 mm), NHMW 26059 (female, 6.8 mm).

Other material. Madagascar. S of Pt Barrow, 25°39’S, 44°16’E, 986–991 m (ATIMO VATAE stn CP3596), MNHN IU-2014-12083 (ovigerous female, 7.4 mm).

Mozambique Channel, Geyser Bank, between Malekula and Ambrym islands, 12°18’S, 46°27’E, 920–935 m (BIOMAGLO stn DW4791), MNHN IU-2017-530 (male, 6.4 mm).

Diagnosis. Rostrum parallel-sided proximally, with acute apex, 1.2–1.3 times as long as wide. Median carina erect, with clear dentition; sublateral gastric carinae present, diverging widely from base of median carina; lateral gastric carina continuous with short overlap of ridges posterior to confluence of submedian carinae. Major cheliped, merus lower margin with 2 spines near midpoint, or with single denticle; palm wider distally than at midpoint, upper margin smooth, carinate, or denticulate (juveniles); fixed finger about half as long as upper margin of palm, cutting edge crenellate, with row of diminishing rounded teeth; dactylus cutting edge smooth. Minor cheliped, palm upper margin significantly less than greatest width; distolateral margin with prominent triangular tooth at base of dactylus; fixed finger cutting edge smooth, straight.

Description of holotype. Carapace smooth, few obsolete tubercles on gastric region between carinae. Rostrum 0.18 carapace length, concave dorsally, tapering distally to acute tip, 1.35 times as long as wide at base, with c. 8 obscure teeth on lateral margins, depressed below level of median carina, continuous with lateral carinae, without ventral tooth. Lateral gastric carina unarmed, with posterior section weakly separated

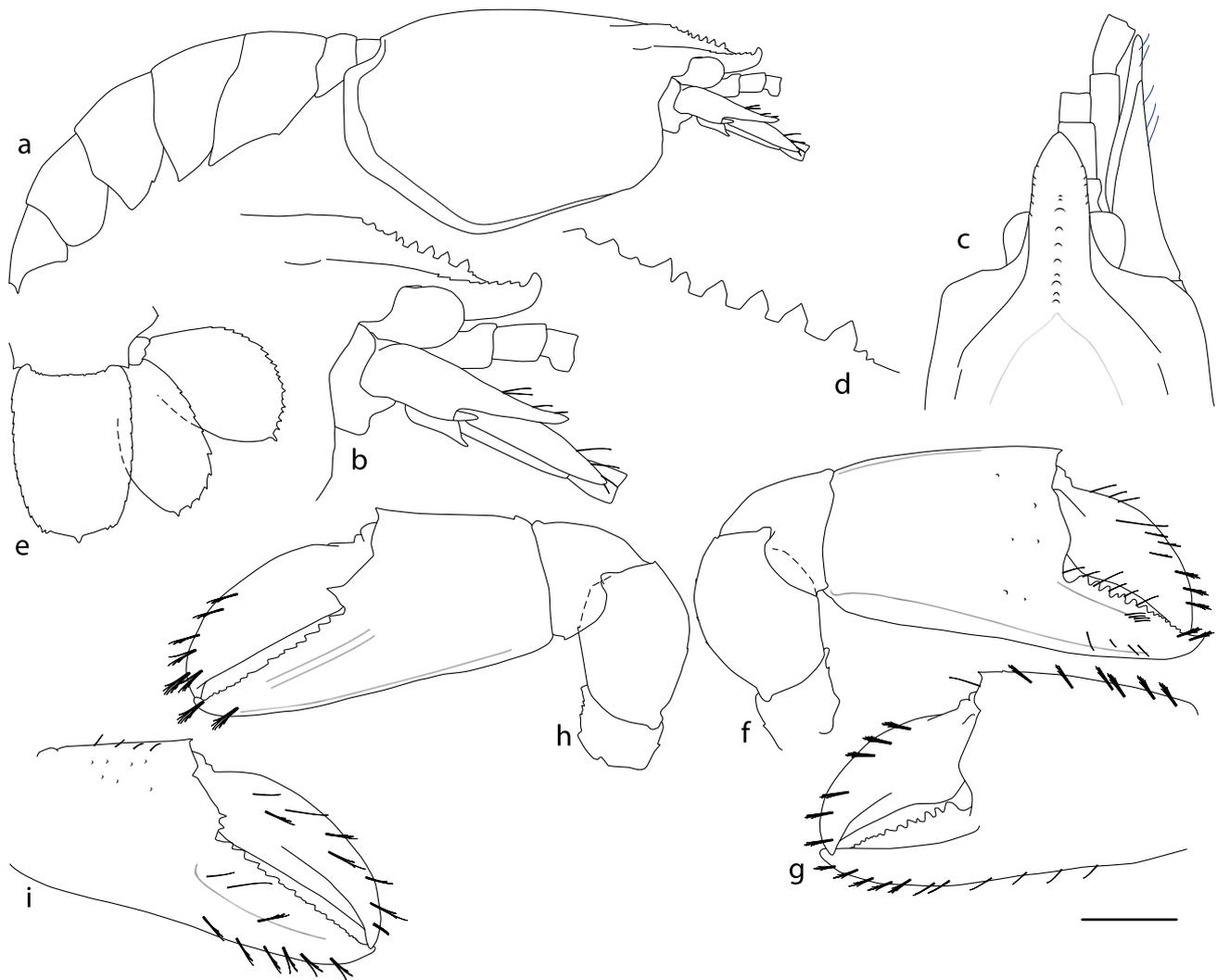


Figure 5. *Eiconaxius golobovi* sp. nov., holotype, NHMW 25659 (male, 7.8 mm) – a, carapace, pleon, lateral. b, c, anterior carapace, antennule, antenna, lateral and dorsal. d, median carina. e, pleomere 6, telson, right uropod. f, g, right major cheliped, lateral and mesial. h, i, left minor cheliped, lateral and mesial. Scale bar = 1 mm (except b–d).

from, but almost overlapping anterior section. Submedian gastric carina smooth, together curved and converging on median carina, slightly longer than lateral gastric carina. Median gastric carina prominent, erect, reaching midpoint of rostrum, with 9 erect teeth becoming pentagonal anteriorly.

Pleuron 1 posteroventrally acute; pleura 2, 3 truncate, posteroventrally acute; pleuron 4 truncate, posteroventrally subacute, with anteroventral tooth; pleuron 5 rounded; pleuron 6 with acute posteroventral angle; pleonite 6 dorsal posterior margin denticulate.

Eyestalk, reaching half length of rostrum; cornea white. Antennular peduncle reaching two-thirds length of antennal article 4; article 1 unarmed. Antennal article 1 unarmed; article 2 with distal spine an elongate triangular blade, reaching two-thirds length of article 4; scaphocerite a

vertical blade, reaching to end of article 5; article 3 lower margin with distomesial tooth; article 5 about half length of article 4.

Maxilliped 3 coxa unarmed; ischium with tubercle; crista dentata of c. 15 similar obsolete teeth; merus and carpus unarmed; exopod reaching beyond midpoint of merus.

Major cheliped merus lower margin convex, with 3 minute teeth, upper margin with minute blunt tooth; carpus lower margin with 1 distal tooth; propodus upper margin carinate, angled distally, length 1.15 greatest height, lower margin smooth, lateral face with few minute tubercles; mesial face smooth; fixed finger 0.7 times as long as upper palm, cutting edge with proximal U-shaped notch, 10 diminishing triangular teeth, with longitudinal lateral ridge; distolateral margin of palm weakly evenly convex;

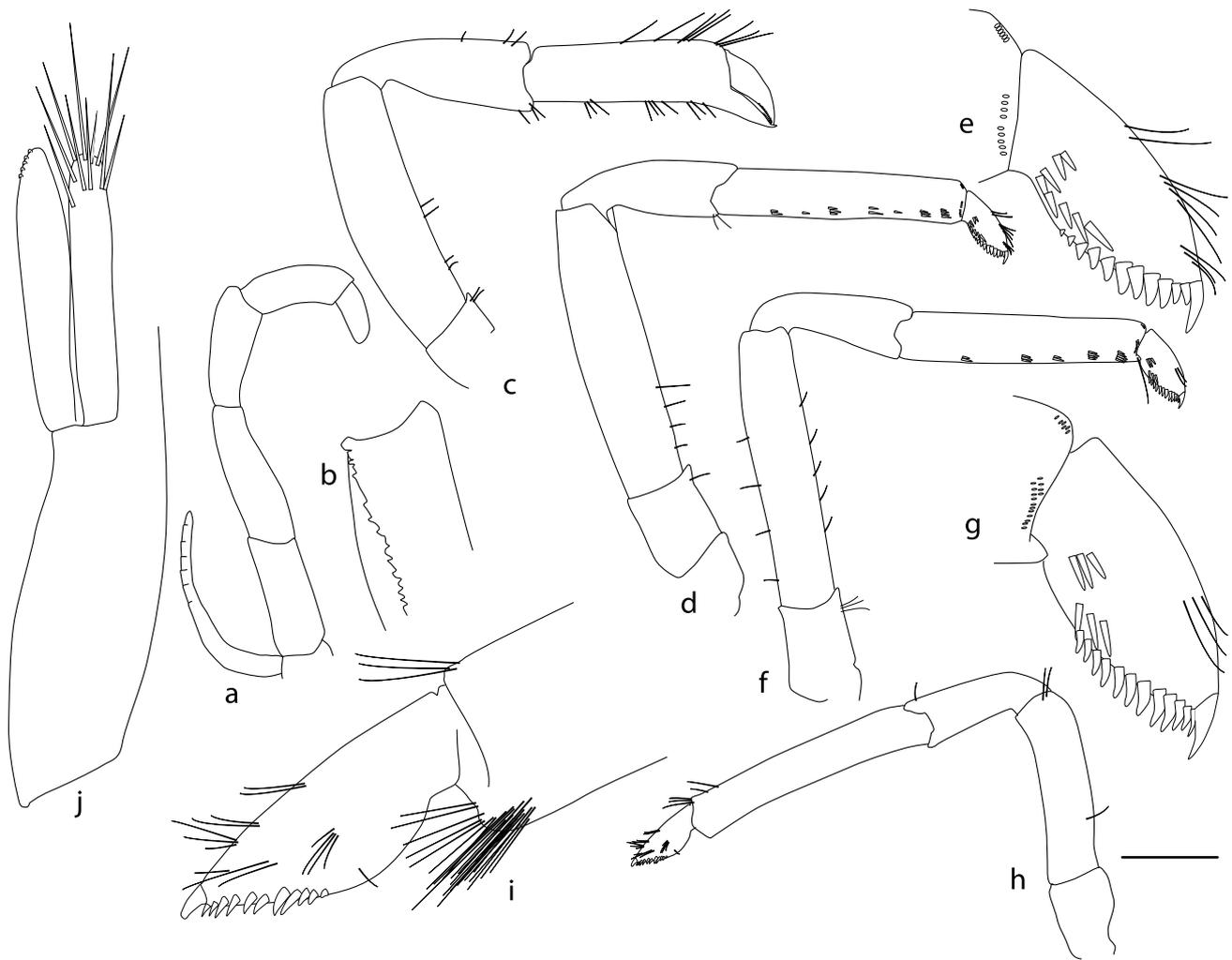


Figure 6. *Eiconaxius gololobovi* sp. nov., holotype, NHMW 25659 (male, 7.8 mm) – a, b, maxilliped 3, anterior detail of merus. c, pereopod 2. d, e, right pereopod 3, detail of dactylus. f, g, right pereopod 4, detail of dactylus. h, i, right pereopod 5, detail of dactylus. j, pleopod 2, proximal endopod, appendices interna and masculina. Scale = 1 mm (except b, e, g, i)..

distomesial margin of palm convex; dactylus distally curved, upper margin carinate, cutting edge smooth, weakly convex proximally.

Minor cheliped shorter and more slender than major, palm 0.9 times height of major palm; merus lower margin with minute tooth at midpoint; carpus lower margin with 1 distal tooth; propodus dilating, upper margin carinate, with obscure proximal notch, 0.85 times greatest height, lower margin smooth, lateral and mesial faces smooth; fixed finger 1.4 times as long as upper palm, cutting edge weakly serrate, with longitudinal lateral ridge; distolateral margin of palm oblique, with prominent triangular tooth in gape; distomesial margin of palm oblique-convex, with 2 tubercles in gape; dactylus distally curved, upper margin carinate, cutting edge smooth.

Pereopod 2 ischium lower margin unarmed; merus lower margin unarmed; carpus as long as propodus upper margin; propodus upper margin 2.2 times as long as dactylus. Pereopod 3 merus unarmed; propodus 2.8 times as long as dactylus, with 5 rows of 1–4 spiniform setae; dactylus spatulate, with 11 spiniform setae along oblique margin, plus unguis, and 2 rows of 3 facial spiniform setae. Pereopod 4 merus more slender than that of pereopod 3; propodus 2.8 times as long as dactylus, with 6 rows of 2–5 spiniform setae; dactylus spatulate, with 12 spiniform setae along oblique margin, plus unguis, and 2 oblique rows of 3 facial spiniform setae. Pereopod 5 dactylus spatulate, with 11 spiniform setae along oblique margin, plus unguis, without facial spiniform seta.

Pleopod 2 with appendices interna and masculina of similar lengths, 0.8 length of proximal endopod. Uropodal endopod 1.9

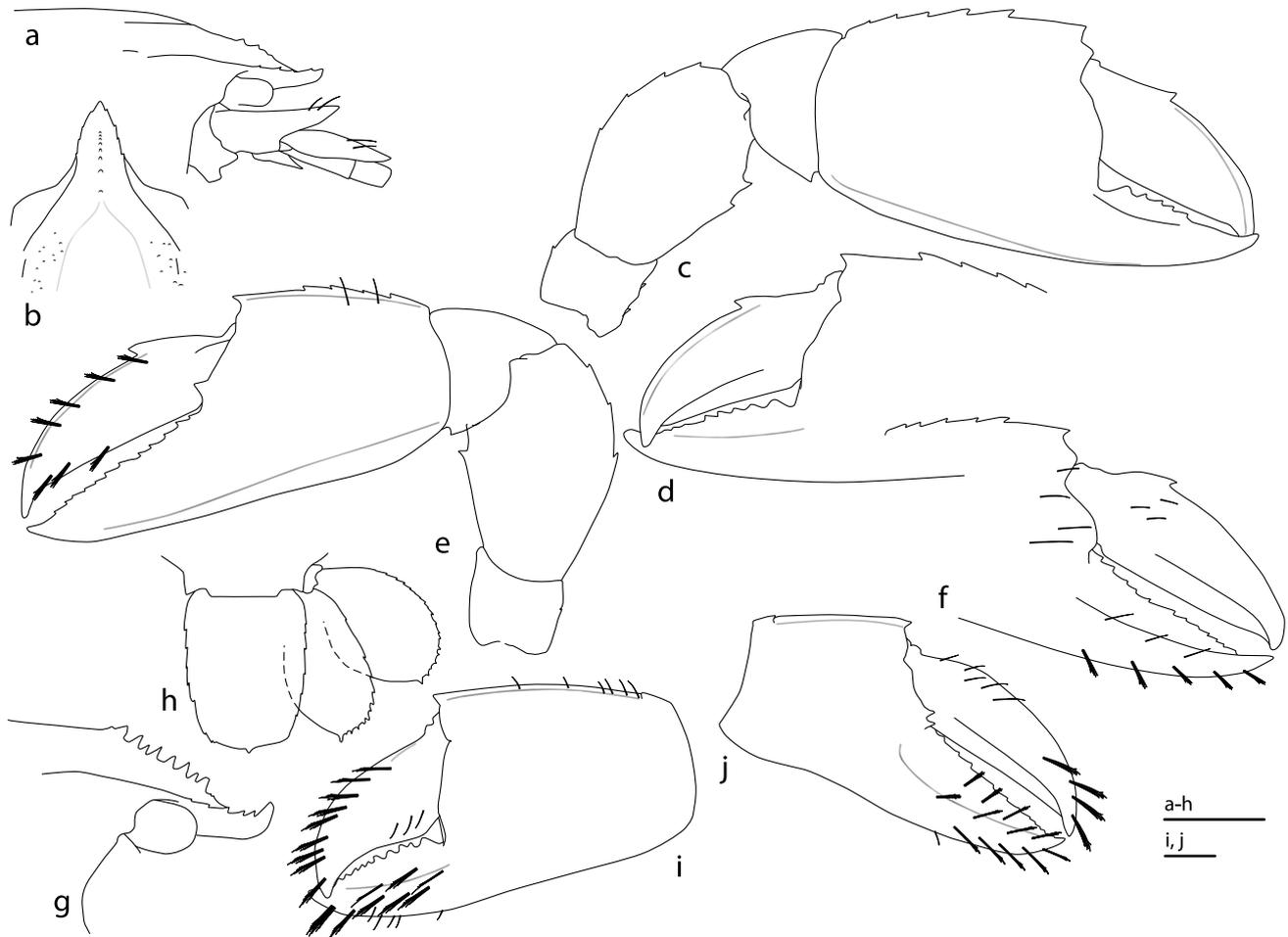


Figure 7. *Eiconaxius golobovi* sp. nov., NHMW 25662 (male, 5.1 mm) – a, anterior carapace, antenna, lateral. b, anterior carapace, dorsal. c, d, right major cheliped, lateral and mesial. e, f, left minor cheliped, lateral and mesial. NHMW 25658 (male, 6.8 mm) – g, anterior carapace. h, pleomere 6, telson, right uropod. i, left major cheliped, j, right minor cheliped. Scales = 1 mm.

times as long as wide, oval, anterior-distal margin with 10 evenly-spaced teeth, last distal, without longitudinal ridge.

Uropodal exopod 1.4 times as long as wide, oval, anterior margin with small irregular teeth over distal two-thirds, without longitudinal rib.

Telson 1.5 times as long as wide, widest at third length, then tapering to posterolateral angles, lateral margin upturned, obscurely denticulate, distal margin obtusely angled, with posteromedian spine; dorsal face smooth.

Etymology. For Ya. K. Golobov (1909–1980), Russian oceanographer, for whom the Golobov Bank on the South-west Indian Ocean Ridge is named, of which the type locality, ‘Coral’ seamount, is part.

Distribution. Golobov Bank, Mozambique Channel, south-west Indian Ocean; 686–1117 m depth.

Remarks. *Eiconaxius golobovi* sp. nov. is known from 21 specimens ranging 4.8–9.1 mm in carapace length collected from

sponges by ROV on the Golobov Bank, plus two from nearby localities in the Mozambique Channel. The species is distinguished from others in this group by the regularly dentate cutting edge of the fixed finger of the major cheliped (simple in other species) and from most species by the hiatus in the lateral carina. The dentition of cheliped fingers is obsolete in the ovigerous female from Madagascar (Fig. 8l, m). This individual has a more acute rostrum than others (Fig. 8i) but in this is similar to at least one smaller male (Fig. 8b) from Mozambique Channel. While several individuals display the distinctive pentagonal teeth on the median carina (Fig. 5d) (like children’s drawings of little houses), others have a similar number of more irregular teeth (Figs 7g, 8a, h) but in the smallest specimen dentition is obsolete (Fig. 7a). The upper margin of the propodus of the chelipeds often has a clear proximal notch (Figs 5h, i, 7i, j) but it is not obvious on the major cheliped of larger individuals (Figs 5f, g, 8d, e, l). The smallest individuals differ in having this margin serrate and a prominent tooth on the upper margin of the dactylus (Figs 7c–f).

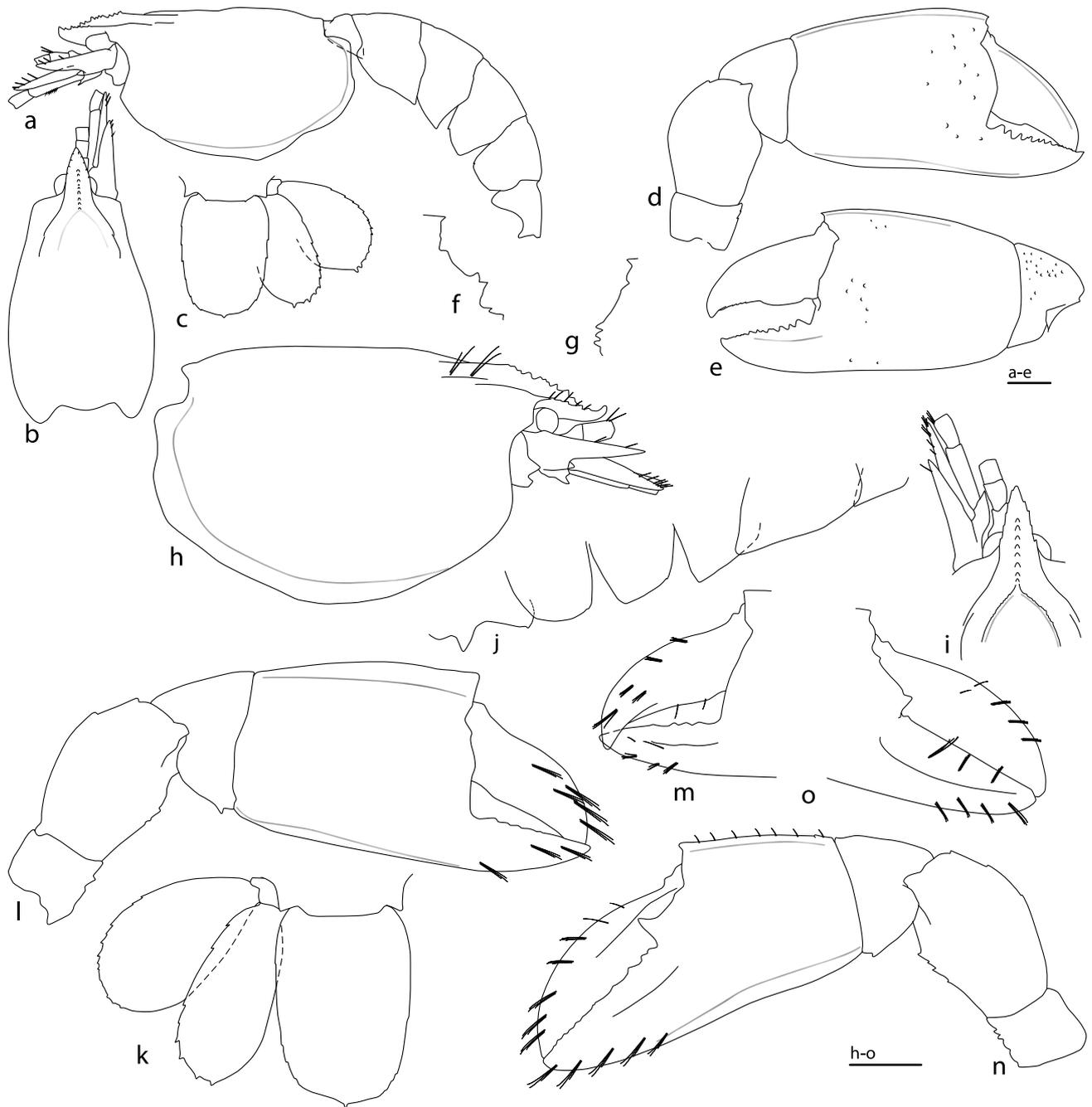


Figure 8. *Eiconaxius gololobovi* sp. nov., MNHN IU-2013-7046 (male, 6.4 mm) – a, carapace, pleon, lateral. b, carapace, dorsal. c, pleomere 6, telson, right uropod. d, e, right major cheliped, lateral and mesial. NMV J71648 (male, 7.8 mm) – f, right minor cheliped, propodus distolateral margin. MNHN IU-2016-8156 (male, 7.4 mm) – g, right minor cheliped, propodus distomesial margin. MNHN IU-2014-12083 (ovigerous female, 7.4 mm) – h, carapace, antennule, antenna, lateral. i, carapace, antennule, antenna, dorsal. j, right epimera of pleomeres 1–6. k, pleomere 6, telson, left uropod. l, m right major cheliped, lateral and mesial. n, o, left minor cheliped, lateral and mesial. Scale bars = 1 mm.

Eiconaxius indicus (De Man, 1907)

Figures 9, 10

Iconaxius crista-galli var. *indica* De Man, 1907: 128–129.*Iconaxius cristagalli* var. *indica*. – Balss, 1925: 210.*Axius* (*Eiconaxius*) *crista-galli* var. *indica*. – De Man, 1925: 4, 15, 31, pl. 2 fig 3.*Eiconaxius indica*. – Sakai and de Saint Laurent, 1989: 22.*Eiconaxius indicus*. – Kensley, 1996: 475. – Sakai, 2011: 279

(partim), fig. 52.

Not *Eiconaxius indicus*. – Sakai and Ohta, 2005: 73–77, figs 3–5.
– Tsang et al., 2008: 363, fig. 2 (= *Eiconaxius dongshaensis* sp. nov.)*Material examined*. Holotype. Indonesia, E of Palau Kei Besar (Great Kei I), 5°54'S, 132°56'7"E, 984 m (*Siboga* stn 267), ZMA102465 (ovigerous female, 10.6 mm) – photographed by C.H.J.M. Fransen, figured by Sakai (2011: fig. 52).

Vanuatu. Between Malekula and Ambrym islands, 16°30.7'S, 167°55.5'E, 550–565 m (BOA1 stn CP2468), MNHN IU-2014-10474

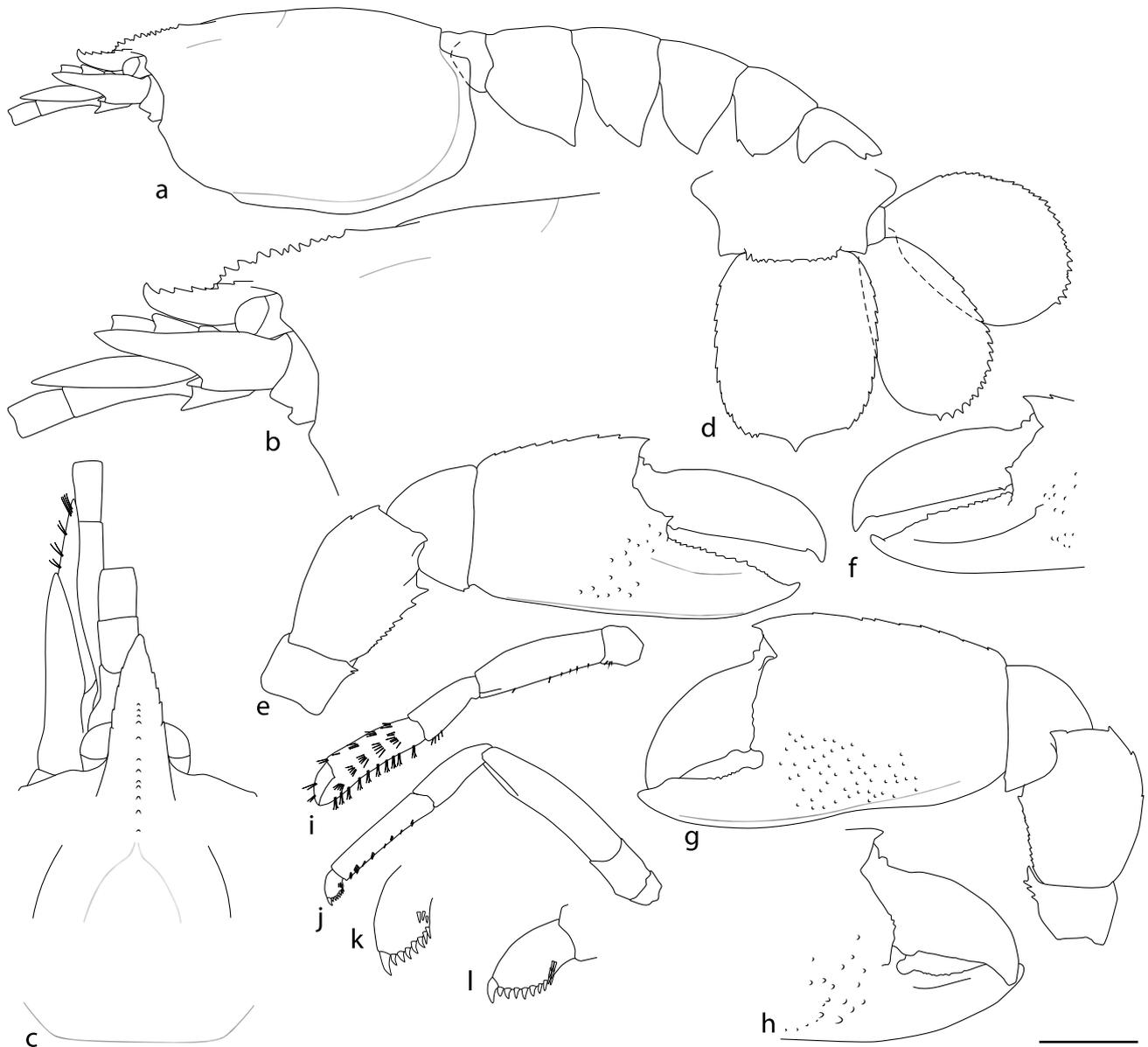


Figure 9. *Eiconaxius indicus* (De Man, 1907). MNHN IU-2014-10474 (male, 9.1 mm) – a, carapace, pleon, lateral. b, anterior carapace, antenna, lateral. c, anterior carapace, antennule, antenna, dorsal. d, pleomere 6, telson, right uropod. e, f, right minor cheliped, lateral and mesial. g, h, left major cheliped, lateral and mesial. i, pereopod 2. j, k, left pereopod 3, detail of dactylus. l, left pereopod 5, detail of dactylus. Scale = 2 mm (except b, c, k, l).

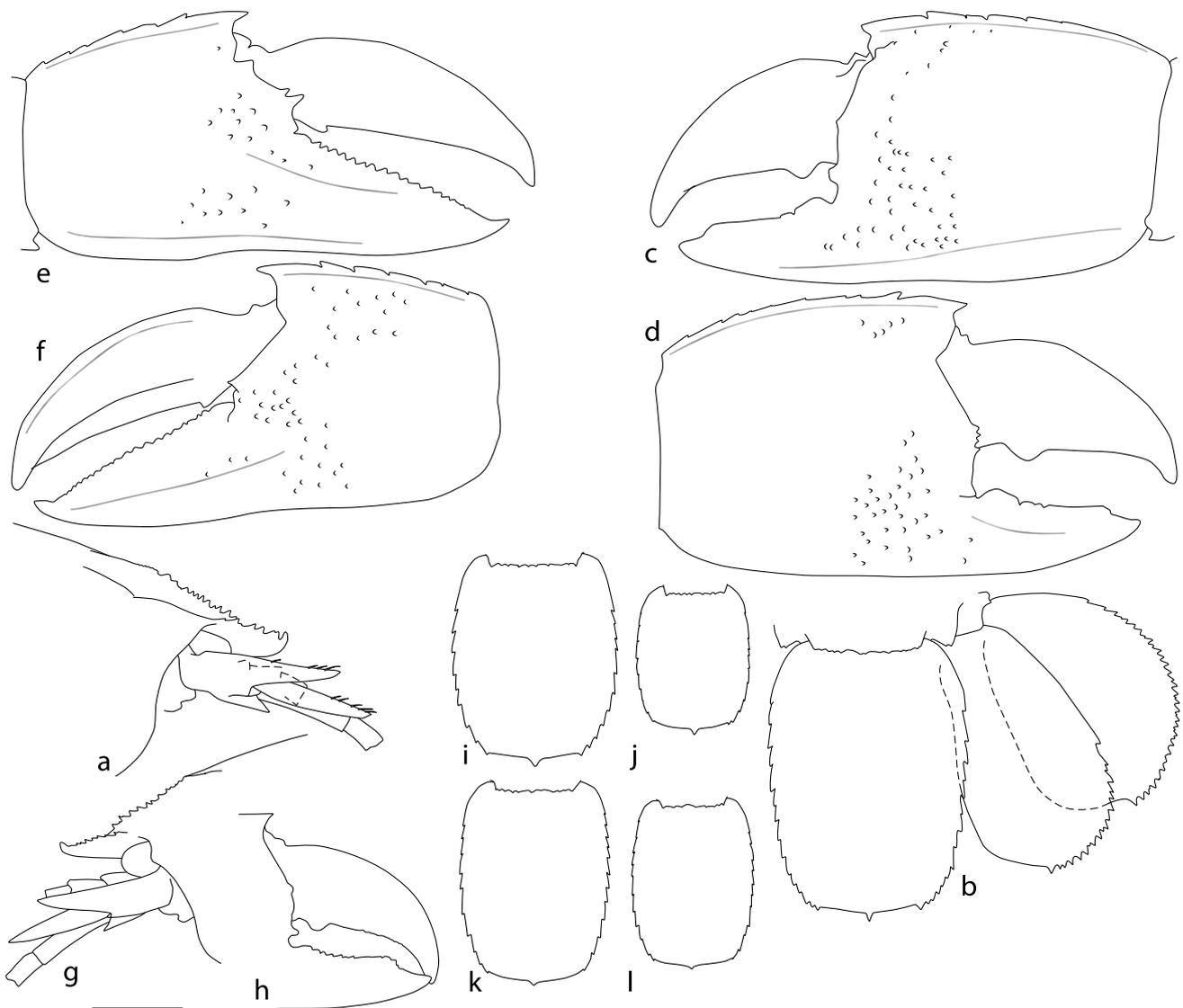


Figure 10. *Eiconaxius indicus* (De Man, 1907). MNHN IU-2016-8020 (ovigerous female, 12.1 mm) – a, anterior carapace, antenna. b, telson, right uropod. c, d, left major cheliped, lateral and mesial views. e, f, left minor cheliped, lateral and mesial views. MNHN IU-2014-7149 (ovigerous female, 11.0 mm) – g, anterior carapace, antenna. MNHN IU-2014-7151 (male, 9.0 mm) – h, right major cheliped fingers, lateral view. NMV J71631 – telsons of 4 individuals: i, male, 9.8 mm; j, male, 7.3 mm; k, ovigerous female, 9.0 mm; l, female, 7.6 mm. Scale = 2 mm

(male, 9.1 mm). Between Malekula and Epi islands, 16°38.28'S, 167°58.38'E, 586–646 m (BOA0 stn CP2307), MNHN IU-2014-7149–7152 (2 ovigerous females, 10.8, 11.0 mm; 2 males, 9.0, 10.8 mm)

Solomon Islands, NW of San Cristobal, 09°56'S, 161°04'E, 418–432 m (SALOMON 1 stn DW1826), MNHN IU-2016-8020 (ovigerous female, 12.1 mm).

New Caledonia, BATHUS 3 stations. Loyalty Ridge, seamount K, 24°43'S, 170°07'E, 750–760 m (stn DW778), NMV J71631 (4 males, 6.1–9.8 mm; 3 females, 7.6–9.0 mm); seamount K, 24°44'S, 170°08'E, 770–830 m (stn DW776), MNHN IU-2016-8022 (2 females, 6.1, 9.3 mm); seamount D, 23°35'S, 169°37'E, 655 m (stn DW800), MNHN IU-2016-8023 (female, 10.0 mm). S of Ile des Pins, 23°09'S, 167°11'E, 650–680 m (BIOCAL stn DW36), MNHN IU-2016-8021 (female, 7.8 mm).

Diagnosis. Rostrum tapering more over distal third than proximal, with rounded apex in adult (acute in juvenile), 1.5–2.0 times as long as wide. Median carina erect, with clear dentition; sublateral gastric carinae present, diverging widely from base of median carina; lateral gastric carina with hiatus between lateral rostral margin and short gastric section, visible only posterior to confluence of submedian carinae. Major cheliped, palm upper margin smooth, carinate, or denticulate; lateral and mesial faces tuberculate near base of fingers; distolateral margin with 1 or 2 teeth in gape but without a deep notch; fixed finger about half as long as upper margin of palm, cutting edge

blade-like, with proximal notch and distal concavity; dactylus cutting edge with basal molar, notch and straight beyond. Minor cheliped, palm upper margin as long as greatest width; distolateral margin with sharp spine at base of dactylus; lateral and mesial faces tuberculate near base of fingers; fingers almost as long to longer than upper margin of palm.

Description. (based on MNHN IU-2014-10474, male, 9.1 mm). Carapace smooth. Rostrum 0.2 carapace length, concave dorsally, tapering evenly to acute tip, twice as long as wide at base, with c. 7 teeth on lateral margins, depressed below level of median carina, separated from lateral carinae by long hiatus, without ventral tooth. Lateral gastric carina visible only posterior to confluence of submedian carinae, short, unarmed. Submedian gastric carina smooth, together curved and converging on median carina. Median carina prominent, erect, reaching two-thirds along rostrum, with c. 12 uneven teeth. Pleuron 1 posteroventrally rounded; pleura 2, 3 posteroventrally produced, acute; pleura 4, 5 less produced, posteroventrally acute; pleura 3, 5 with anteroventral tooth; pleuron 6 with rounded posteroventral angle; pleonite 6 dorsal posterior margin denticulate.

Eyestalk third length of rostrum; cornea unpigmented. Antennular peduncle reaching to midpoint of antennal article 4; article 1 unarmed. Antennal article 1 unarmed; article 2 without distomesial spine, stylocerite an elongate triangular blade, reaching just beyond midpoint of article 4; scaphocerite a vertical blade, reaching midpoint of article 5; article 3 lower margin with mesial tooth; article 5 about half length of article 4.

Major cheliped ischium lower margin produced as spinose ridge; merus lower margin finely denticulate, upper margin with minute tooth; carpus lower margin with 1 distal tooth; propodus upper margin carinate, denticulate, toothed distally, length 1.25 greatest height, lower margin smooth, lateral face tuberculate on lower palm, mesial face tuberculate at base of fixed finger; fixed finger half as long as upper palm, cutting edge concave with proximal and subdistal obtuse teeth, with longitudinal mesial ridge; distolateral margin of palm denticulate, with blunt tooth above circular gape; distomesial margin of palm denticulate, angled tooth near gape; dactylus distally curved, cutting edge with blunt proximal tooth, otherwise straight, smooth.

Minor cheliped shorter and more slender than major, palm 0.9 times height of major palm; ischium lower margin with 2 subdistal spines; merus lower margin denticulate, most distal spine-like; carpus lower margin with 1 distal tooth; propodus dilating, upper margin carinate, denticulate, 0.95 times greatest height, lower margin smooth, lateral and mesial faces tuberculate at base of fixed finger; fixed finger as long as upper palm, cutting edge denticulate, with longitudinal mesial and lateral ridges; distolateral margin of palm oblique, with sharp spine in gape; distomesial margin of palm oblique, with spine in gape; dactylus almost straight, upper margin carinate, cutting edge smooth, with subdistal notch.

Pereopod 2 ischium lower margin unarmed; merus lower margin unarmed; carpus 0.85 length of propodus upper margin; propodus upper margin twice as long as dactylus. Pereopod 3 merus unarmed; propodus 3.0 times as long as

dactylus, with 9 rows of spiniform setae, of 2–4 setae; dactylus spatulate, with 7 spiniform setae along oblique margin, plus unguis, 3 facial spiniform setae. Pereopod 4 virtually identical to pereopod 3. Pereopod 5 propodus with 8 rows of spiniform setae; dactylus spatulate, with 6 spiniform setae along oblique margin, plus unguis, 6 facial spiniform setae.

Uropodal endopod 1.6 times as long as wide, elongate-oval, anterior-distal margin with 19 evenly-spaced teeth, last 3 teeth distal, without longitudinal ridge. Uropodal exopod 1.4 times as long as wide, oval, anterior margin with c. 30 small teeth over most of length, without longitudinal rib.

Telson 1.1 times as long as wide, widest at mid-length, tapering to square posterolateral angles, lateral margin upturned, denticulate, distal margin concave each side of posteromedian spine; dorsal face smooth.

Distribution. Indonesia, Solomon Is, New Caledonia, Vanuatu; 418–984 m.

Remarks. The holotype, photographed for us by Charles Fransen, clearly shows the uneven row of c. 15 teeth on the median carina, the short separate lateral carina on the right side, two prominent teeth on the distomesial margin of the propodus of the minor cheliped, the semi-enclosed notch at the base of the fixed finger with two irregular teeth above, and the obscurely denticulate blade on the distomesial margin of the propodus of the major cheliped. The marginal denticulation of the fingers and the tuberculation of the propodus are consistent with the present material. Sakai's (2011) figure 52 is consistent with this except for the absence of the lateral carina.

The circular notch in the gape of the propodus of the major cheliped is similar to that in *E. dongshaensis* sp. nov. but not as enclosing; *E. indicus* lacks the ventral rostral tooth seen in the new species.

The lateral gastric carina may be obvious (Fig. 10a) but typically displays a strong hiatus between the lateral rostral ridge (Fig. 9a–c) and is sometimes absent, especially in larger specimens (Fig. 10g). In males, the circular notch in the gape of the major cheliped sometimes appears almost keyhole-shaped. The specimens from New Caledonia exhibit some variability that includes that of the Vanuatu material. The telson has the same general appearance but ranges from 1.1 to 1.3 times as long as wide, males being broader than females (cf. Figs 9d, 10i, j with 10b, k, l). The armature of the distolateral margins of the chelipeds also varies, some more spinose than others.

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