



A review of the genus *Engystenopus* (Crustacea: Decapoda: Stenopodidea) *Juxtastenopus*, gen. nov. , a new combination for *E. spinulatus* Holthuis, 1946, and transfer of *E. palmipes* Alcock & Anderson, 1894 to the family Spongicolidae Schram, 1986*

JOSEPH W. GOY

Department of Biology, Harding University, 915 E. Market Avenue, Searcy, Arkansas 72149-2251 USA. E-mail: jwgoy@harding.edu

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Abstract

A review of the genus *Engystenopus* is presented. A new genus, *Juxtastenopus*, is created for the rare deepwater stenopodid shrimp, *Engystenopus spinulatus* based on a series of specimens from the Red Sea, Gulf of Aden and the Philippines. The genus *Engystenopus* is now restricted to *E. palmipes*, its range is extended to Australian, Indonesian, and Madagascan waters, a new diagnosis of the genus is presented, and the genus is transferred to the family Spongicolidae.

Key words: Red Sea, Philippine, Indonesian, Madagascan, Australian deepwater fauna, Stenopodidae, Spongicolidae, *Engystenopus*, *Juxtastenopus* gen. nov.

Introduction

The genus *Engystenopus* was described on the basis of one specimen collected off Trincomallee, Bay of Bengal, Indian Ocean in depths of 365–640 m (Alcock & Anderson 1894). The diagnosis was only two sentences stating the genus was “as *Stenopus*, but with simple claw-like dactyli to the fourth and fifth pairs of trunk legs, which also have all their joints simple and unsegmented; and with the third pair of trunk legs remarkably slender as far as the propodus. The external maxillipeds are of the ordinary pediform shape.” From this the authors derived the genus name from the Greek “engy” meaning near, combined with *Stenopus*, which they thought was closely related. At the time only 11 species of stenopodidean shrimps were known, mostly inadequately described and some even in the wrong genera. Also, at this time all stenopodideans were placed in a single family, Stenopodidae Claus, 1872. Schram (1986) split the then 25 species into two families, Stenopodidae and Spongicolidae. This was further refined by Holthuis (1993) who still placed *Engystenopus* within the Stenopodidae.

The rare stenopodid species *Engystenopus spinulatus* was described by Holthuis (1946) on the basis of the mutilated holotype taken in Lobetoli Strait, east of Flores, Lesser Sunda Islands, Indonesia. Three additional specimens of this species were recorded from the Red Sea (Bals 1914, 1915, 1929 [as *Stenopus spinosus*]; Lewinsohn & Holthuis 1978; Goy 1986). The four specimens all lacked several appendages, including the third pereopods. Holthuis (1946) questionably placed the species in the genus *Engystenopus* and the three Red Sea specimens did not provide any additional information that would place them in another genus.

The third pereopod of the type species for the genus *Engystenopus*, *E. palmipes* Alcock & Anderson, 1894, has a very distinct morphology. Through the courtesy of the late Dr. M. de Saint Laurent, a specimen of *E. spinulatus* taken from the stomach contents of a golden threadfin bream found in the Hong Kong fish market was made available for examination. Even though the specimen was severely damaged, the third

pereiopod was intact. Also, Dr. M. Türkay provided 18 specimens of *E. spinulatus* collected by the “Meteor” Expedition of 1987 in the deep Red Sea and Gulf of Aden, of which one male was complete. Another complete male was collected off the Philippines, whose morphological data and color photograph were made available by Dr. T.-Y. Chan.

This paper summarizes the morphology of 27 specimens of *E. spinulatus* and transfers the species to a new genus *Juxtastenopus* of the family Stenopodidae. With the removal of *E. spinulatus* into the new genus *Juxtastenopus*, the examination of an additional 22 specimens of *E. palmipes*, and over 60 species in 13 genera and 3 families for the infraorder Stenopodidea, the closeness of *Engystenopus* to *Stenopus* needed to be closely reexamined.

Fifteen specimens of *E. palmipes* were thoroughly described from the Philippines by de Saint Laurent and Cleva (1981), who concluded that this species was nearer to *Spongicola* than to *Stenopus*. In the present study, a reexamination of these 15 specimens of *E. palmipes* plus an additional 7 specimens from Madagascar, the Philippines, and Australia supports the closer relationship to *Spongicola*. Therefore, the now monotypic genus *Engystenopus* is rediagnosed and transferred to the family Spongicolidae.

The specimens are deposited in the collections of the Natur-Museum und Forschungsinstitut Senckenberg, Frankfurt (SMF), Zoologisch Museum Amsterdam, Amsterdam (ZMA), Rijksmuseum van Natuurlijke Historie, Leiden (RMNH), Muséum National d’Histoire Naturelle, Paris (MNHN), Museum and Art Gallery of the Northern Territory, Darwin (NTM), Queensland Museum, Brisbane (QM), Museum Victoria, Melbourne (NMV), Institute of Marine Biology, National Taiwan Ocean University, Keelung (NTOU), and National Museum of Natural History, Washington DC (USNM). Abbreviation used: cl, postorbital carapace length (in mm), tl, total length (in mm), ov, ovigerous.

Systematics

Stenopodidae Claus, 1872

Juxtastenopus gen. nov.

Diagnosis. Small stenopodidean shrimp with slender, laterally compressed body. Carapace densely covered with scattered spines arranged in longitudinal rows. Cervical groove distinct, very deep at dorsum of carapace. Rostrum long, compressed, dorsally and ventrally dentate. Antennal spine strong; hepatic spine, supraorbital spine, branchiostegal spine and pterygostomial spine present. Pleon feebly spinose; first 3 pleomeres dorsally with transverse ridges provided with small spinules, last three pleomeres with few oblique rows of small spinules. Telson narrow, lance-shaped with median groove flanked by 2 longitudinal spined carinae; lateral margin with medial spine; posterior margin ending in 2 distinct posterolateral teeth between which, margin somewhat rounded with small median denticle. Eyes well developed with globular, pigmented cornea. Dorsal surface of eyestalk with few spines near base of cornea; submarginal spines partially overlap cornea. Antennular peduncle with strong, acute stylocerite on outer margin; inner margin with broad, subrectangular process and setose scale-like projection distodorsally. Antenna with well developed, narrow scaphocerite with serrate outer margin, 2 dorsal longitudinal carinae. Mandible with fused molar and incisor processes; palp 3-segmented. Maxillule with broad proximal endite, rounded distal endite and simple setose endopod. Maxilla with slender endopod, bilobed basal and coxal endites, scaphognathite slender, well developed. First maxilliped with 3-segmented endopod; basal endite broad, coxal endite feeble, bilobed; exopod well developed; epipod well developed, bilobed; arthrobranchs absent. Second maxilliped with distal segments of endopod distinct; coxa and basis reduced to rounded lobes; propodus with prominent ventral hook proximally; exopod well developed. Third maxilliped with strongly developed, slender endopod; propodus with weak setiferous organ; carpus, merus and ischium spinulate; exopod well developed. First 3 pereopods slender, chelate. First pereopods with weakly developed carpo-propodal setiferous organ; pincers of chela long, slender, palm slightly swollen. Third pereopods larger than first and second, with slender chelae and spinulate meri, carpi, propodi and dactyli. Fourth and fifth pereopods long, slender; carpus and propodus distinctly

segmented; propodus with movable ventral spines, lacking on carpus; dactylus long, uniunguiculate. Pleopods without appendices internae, biramous except first pair; basipodites ventrally with spines. Uropods normal, exopod and endopod laterally serrated; dorsal surfaces each with 2 carinae, 0–1 spinules on exopod, row of 3–7 spinules on endopod.

Type species. *Engystenopus spinulatus* Holthuis, 1946 by present designation and monotypy.

Etymology. The genus name is derived from a combination of the Latin word “*juxta*” meaning “close to” and the genus *Stenopus* Latreille, 1819, to which the new genus is closely related. The gender is masculine.

Remarks. The family Stenopodidae is characterized by compressed body; elongate, lance-shaped telson ending in two strong spines, sometimes with a third spine in between; endopod of uropod with two longitudinal dorsal ridges; propodus of second maxilliped with cristate ventral margin; third maxilliped with distinct exopod; third pereopod longest; chela long, slender; chelate appendages with cutting edges bearing series of peg-like teeth separated by chitinous lamellae distally; branchial formula always composed of 19 branchial endites (Holthuis 1993; Alvarez et al. 2006). Based on these characters, the present new genus clearly falls into those characteristics of the family Stenopodidae.

Systematic position. The new genus is morphologically closely similar to *Stenopus*, from which it is readily distinguishable by dactyli of fourth and fifth pereopods being long, slender and uniunguiculate, and lacking ventral carpal movable spines; telson ending in two posterolateral teeth, and median denticle; pleon with transverse spined grooves and dorsal spinules on first to third pleomeres; oblique rows of spines on the last three pleomeres; and anterolateral angle of antennular peduncle lacking spiny scale. Species of *Stenopus* have biunguiculate dactyli (rarely uniunguiculate) on fourth and fifth pereopods, and ventral carpal movable spines; telson ending in two posterolateral teeth; pleon with numerous erect spines, curved forward on first three pleomeres; last three pleomeres with straight posteriorly directed spines, pressed against body; anterolateral angle of antennular peduncle with spiny scale.

***Juxtastenopus spinulatus* (Holthuis, 1946) comb. nov.**

(Figs. 1–5)

Stenopus spinosus — Balss 1914: 137 (nec *Stenopus spinosus* Risso, 1826). — Balss 1915: 33 (nec *Stenopus spinosus* Risso, 1826). — Balss 1929: 25, 26, 27 (nec *Stenopus spinosus* Risso, 1826).

? *Engystenopus spinulatus* — Holthuis 1946: 45, pl. IV figs. a, b.

Engystenopus spinulatus — Burukovsky 1974: 93. — Lewinsohn & Holthuis 1978: 229, fig. 1. — Burukovsky 1983: 132. — Goy 1986: 211–216, fig. 1. — Türkay 1996: 48, fig. 5.

Material examined. (i) 1 male holotype, cl 8.8, Siboga Expedition Station 306, Indonesia, Lobetoli Strait, East of Flores, 8°27'S, 122°54.5'E, 247 m, sandy mud, also in 29 m, *Lithothamnion*, 8.II.1900, ZMA. (ii) 1 male, cl 6.4, taken from stomach of a golden threadfin bream (*Nemipterus virgatus*) caught in the Indian Ocean at 40–100 m and found in the Hong Kong fish market, leg. A. J. Bruce, MNHM. (iii) 1 male, cl 5.2, SLR1699, Decapoda 222, Hebrew University of Jerusalem, Marsat Abu Samara, Red Sea, Israel; Gulf of Eilat, 20°16.5'N, 34°47'E, 604 m, 30. V. 1968, RMNH D41305. (iv) 1 ov. female, cl 7.3, R. V. “Valdiva I” Station VA22-111TA, ST-235, closing trawl, Central Red Sea, 21°28.97'N, 38°15.55'E, 740–785 m, 12.IV.1979, SMF 12340. (v) 1 female, cl 5.2, R. V. “Sonne” Station SoO2-27TA, ST-202, closing trawl, Red Sea, Ras Abu Shagara, 21°10.8'N 37°34'E, 733–757 m, 19.X.1977, SMF 27871. (vi) 1 ov. female, 3 females, cls 6.7, 7.1, 5.2, 5.9, R. V. “Meteor” Station Me5-96 KU, beam trawl, Red Sea, off N. Sudan, 22°04.2'N, 37°10'E to 22°05'N, 37°09.3'E, 600 m, 9. II. 1987, SMF 27872. (vii) 2 males, 4 females, cls 6.0, 7.0, 7.7, 7.0, 6.0, 6.2, R. V. “Meteor” Station Me5-148 KU, beam trawl, Red Sea, off Port Sudan, 19°43.3'N, 37°40.5'E to 19°44.5'N, 37°40.2'E, 517–583 m, 20. II. 1987, SMF 27874. (viii) 3 females, cls 6.6, 6.6, 5.7, R. V. “Meteor” Station Me5-171 KU, beam trawl, Red Sea, off S. Sudan, 18°34.5'N, 39°02.4'E to 18°35.3'N, 39°03.5E, 434–469 m, 23. II. 1987, SMF 27875. (ix) 1 female, cl 6.4, R. V. “Meteor” Station Me5-172 KU, beam trawl, Red Sea, off S. Sudan, 18°34.8'N, 39°03.2'E to 18°34.7'N, 39°01.9'E, 428–459 m, 23. II.1987, SMF 27876. (x) 1

ov. female, 2 females, cls 7.6, 7.5, 4.6, R. V. "Meteor" Station Me5-193 KU, beam trawl, Red Sea, N. of Masamirit, 19°24.3'N, 38°31.2'E to 19°25.5'N, 38°30.9'E, 696–705 m, 28. II. 1987, SMF 27877. (xi) 1 female, cl 6.6, R. V. "Meteor" Station Me5-194 KU, beam trawl, Red Sea, N. of Masamirit, 19°18.2'N, 38°15.5'E to 19°18.2'N, 38°14.8'E, 537–681 m, 28. II. 1987, SMF 27878. (xii) 1 female, cl 7.3, R. V. "Meteor" Station Me5-197 KU, beam trawl, Red Sea, off Port Sudan, 19°52.2'N, 37°35.3'E to 19°53.4'N, 37°35.1'E, 747–778 m, 1. III. 1987, SMF 27879. (xiii) 1 ov. female, 1 female, cls 6.1, 6.2, R. V. "Meteor" Station Me5-281 KU, beam trawl, Gulf of Aden, 12°38.5'N, 45°28.5'E to 12°38.7'N, 45°28.8'E, 1063–1068 m, 15. III. 1987, SMF 27880. (xiv) 1 male, cl 6.5, "PANGLAO" Station CP2377, Philippines, 8° 40.6'N 123°20.3'E, 82.4–85.3m, 28. V. 2005, NTOU M00788.

Diagnosis. As for the genus.

Redescription. A slender stenopodid shrimp with a compressed body form.

Rostrum (Fig. 1) moderately long, reaching slightly past antennular peduncle; narrow, laterally compressed, slender, usually straight, but sometimes slightly upturned at tip. Dorsal margin bearing 7–12 teeth, ventral margin with 2–7 teeth; no lateral teeth; dorsal margin continuing as postrostral ridge behind orbit up to cervical groove bearing 6–10 pairs of spines.

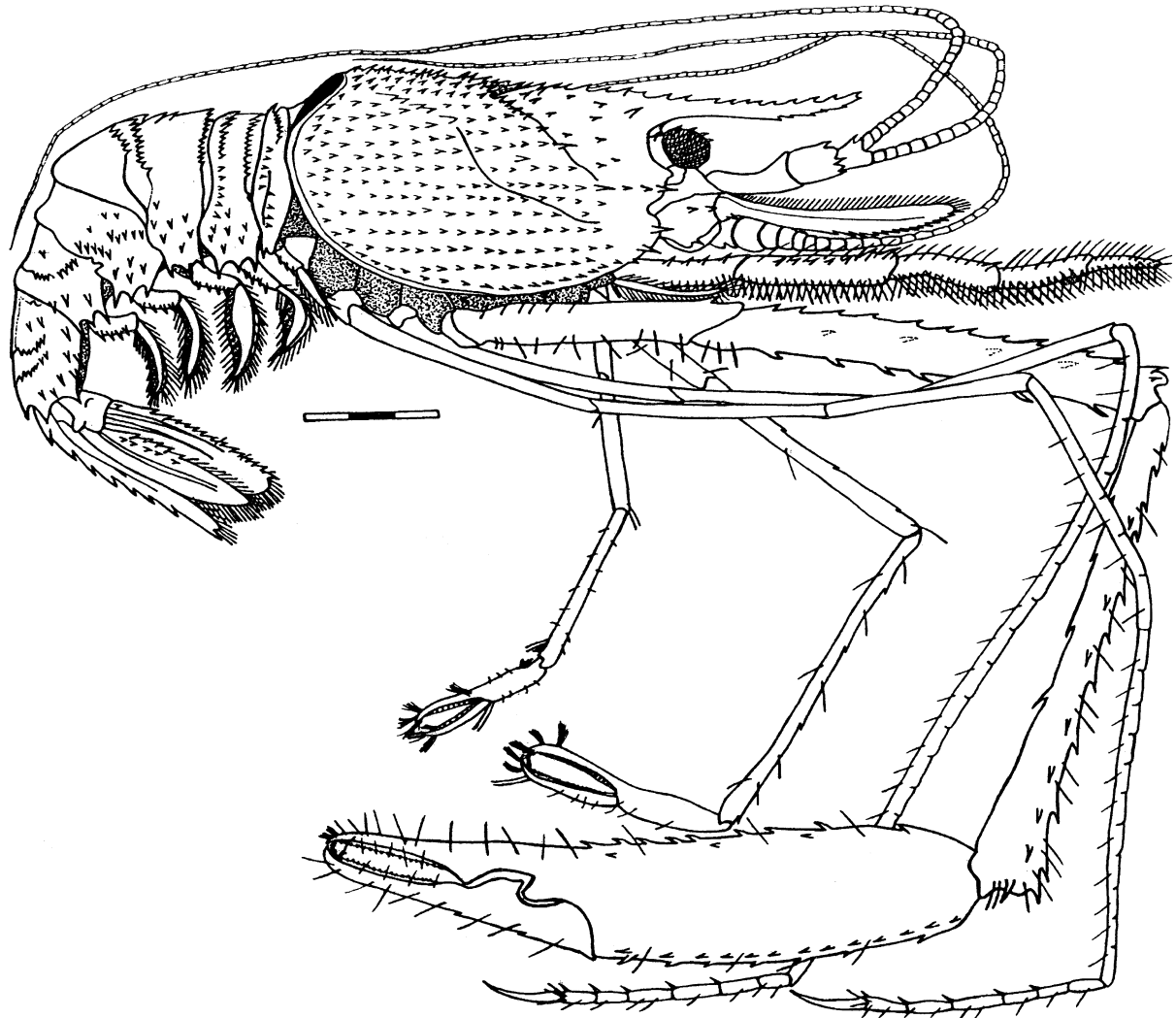


FIGURE 1. *Juxtastenopus spinulatus* **comb. nov.** female, SMF 27874. Scale bar in millimeters.

Carapace (Figs. 1, 2A) with strong antennal, branchiostegal, hepatic, and pterygostomial spines. Cervical groove very deep with 10–14 spines along posterior margin, running obliquely forward and downward, ending in spine lying directly behind antennal spine. Fairly large supraorbital spine, few spines and spinules in

triangular area between dorsal carapacial margin, orbit and cervical groove. Median dorsal margin behind cervical groove bears 3 or 4 rows of 6-12 spines just before posterior margin. Lateral surface with spines arranged in number of longitudinal rows; before posterior margin bearing in each half transverse row of 6 or 7 spines.

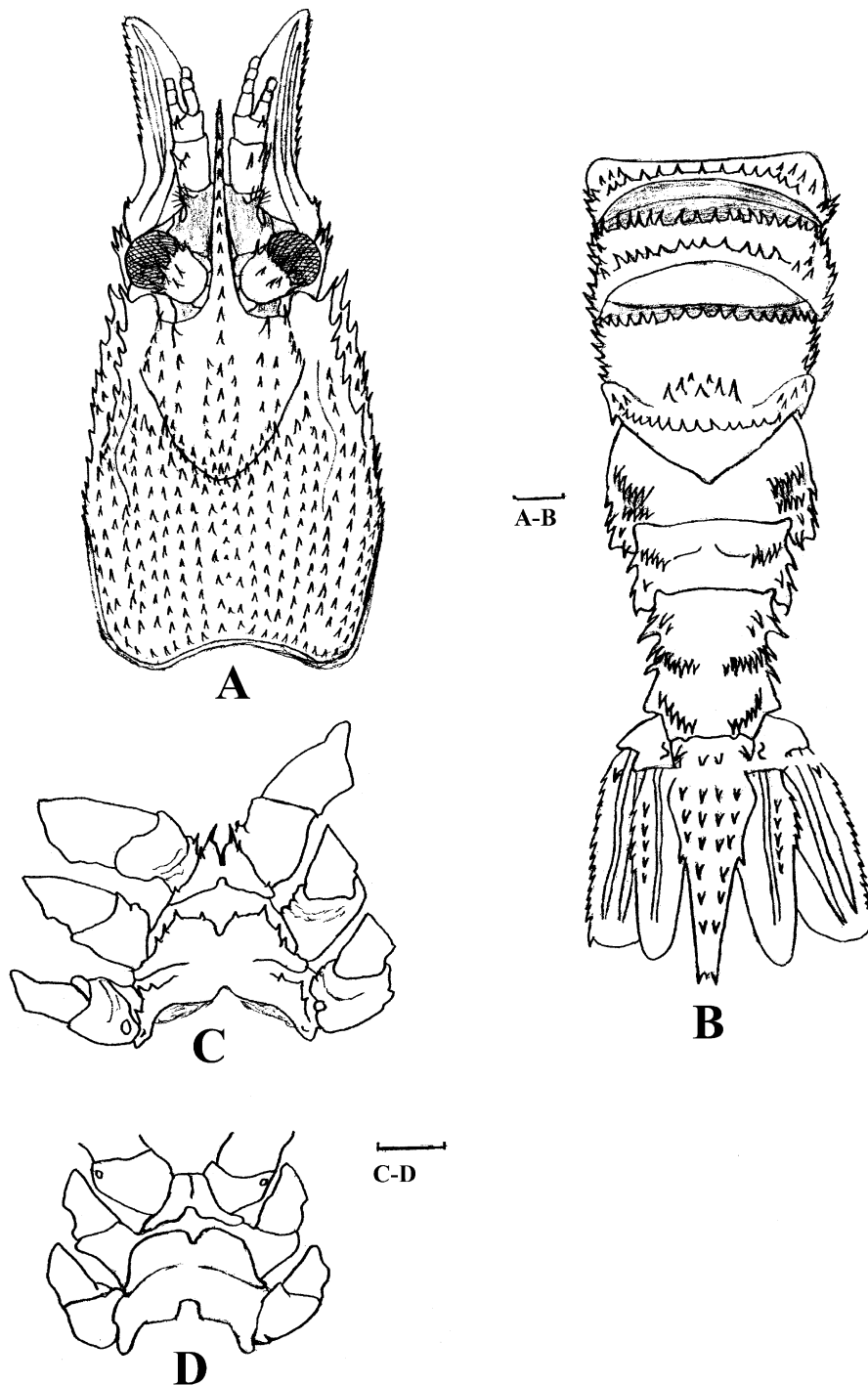


FIGURE 2. *Juxtastenopus spinulatus* **comb. nov.:** A, carapace, dorsal view; B, abdomen, dorsal view; C, 6th– 8th thoracic sternites; D, 6th– 8th thoracic sternites. A–B, D female SMF 27874; C, male SMF 27874. Scale bars = 1.0 mm.

Pleon (Figs. 1, 2B–D) with transverse groove on first pleomere, behind which, 7–10 spines, 3 or 4 spines anterior to groove; pleuron ending in tooth preceded by rectangular or rounded lobe. Transverse grooves present on second and third pleomeres bearing row of spines; another spinous row on anterior margins of these pleomeres. Tergum of third pleomere with 5 or 6 large forwardly directed spines; few spinules. Distal

pleural margins of second to fourth pleomeres ending in 3 sharp teeth, while fifth pleomere ending in 2 or 3 teeth. Fourth pleomere with smooth tergum, two oblique rows of 4–7 spines on lower pleural margin below which are additional 1 or 2 spines. Pleuron of fifth pleomere narrowing distally, bearing 1 or 2 oblique rows of 4–6 spines, posterior row merging with groove on tergum. Sixth pleomere almost twice as long as fifth, bearing medial transverse groove with row of 4–8 posteriorly directed spines; similar transverse row of 6 or 7 spines anterior to posterior margin. Strong spine located in lower anterior of sixth pleomere just behind pleuron of fifth pleomere; a few smaller spines scattered nearby. Pleuron of sixth pleomere ending in acute tooth over base of uropod, with blunt triangular tooth medially. Sixth sternite of male with pair of triangular lobes, each distal angle produced with 1 or 2 spines, each lateral margin with spine; seventh and eighth sternites with pair of broad, trapezoid lobes with 4 and 3 spines respectively on lateral and anteromesial margins. Sternites of first five pleomeres in males with median ventral spine. Sixth to eighth sternites of female unarmed, more rectangular, not much wider than those of male.

Telson (Figs. 2B, 4D) lance-shaped, slightly longer than sixth pleomere with median groove flanked by two longitudinal carinae bearing 6–8 posteriorly directed spines. Strong anterior spine present laterally at base of telson, with 2 rows of 4–6 median spines along margin of each longitudinal carina extending slightly less than half way down length of telson. Each lateral margin bearing distinct tooth at midlength, provided with numerous long plumose setae along posterior three-fifths. Posterior margin somewhat rounded ending in 2 acute posterolateral teeth, smaller acute median denticle.

Eye (Figs. 1, 3A) well developed, with peduncle slightly longer than pigmented cornea. Dorsal surface of peduncle bears 5 or 6 spines near base of cornea, anterior margin with 2–3 more spines.

Antennule peduncle (Figs. 2A, 3D) short, extending to middle of scaphocerite; proximal segment longest with broad, subrectangular process on inner proximodorsal margin, short, acute stylocerite proximally and small plumose lobe distally on outer margin; middle segment slightly shorter than proximal segment with 2–4 small spines on distodorsal margin; distal segment shortest with distodorsal spine. Upper and lower flagella well developed, extending almost to tip of telson.

Antenna (Figs. 2A, 3E) with large basicerite, with 3–5 spines; scaphocerite 4 times as long as wide, lateral margin concave proximally, armed with 1 or 2 small teeth; 0.75 of distal length with 6–14 teeth including terminal tooth. Dorsal surface of scaphocerite with 2 distinct longitudinal carinae, no spinules; ventral surface unarmed. Flagellum well developed extending beyond tip of telson.

Epistome (Fig. 3C) anteriorly triangular with 2 long submedian spines, smaller spines laterally; labrum normally developed; paragnath shaped like arrowhead, with narrow median fissure.

Mandible (Figs. 3F–G) robust, with short, fused molar and incisor processes. Molar surface nearly smooth; incisor bearing large, rounded tooth on each end, 8 smaller sharp teeth in between. Palp well-developed, 3-segmented, segments of subequal length; proximal segment glabrous, middle and distal segments setose.

Maxillule (Fig. 3H) with slender, undivided endopod bearing plumose seta laterally, 5–6 setae distally. Proximal endite moderately broad, truncate distally, with numerous distal compound spinose and plumose setae. Distal endite of subequal size, rounded distally, with numerous plumose setae.

Maxilla (Fig. 3I) with numerous plumose setae on both lobes of coxal and basal endites, proximal lobe of coxal endite broadest. Endopod long, slender, exceeding anterior margin of scaphognathite, with 10–12 lateral, 12 or 13 distal, and 6 or 7 inner marginal plumose setae. Scaphognathite long, narrow, about 4 times longer than maximal width with numerous plumose setae along margin.

First maxilliped (Figs. 3J, 4A) with 3-segmented endopod; proximal segment longer than wide, with 10–18 long plumose setae laterally along outer margin, inner margin with 3–5 short plumose setae; middle segment 0.5 length of proximal with 12–14 long plumose setae along outer margin; distal segment slender, tapering about 0.5 length of middle with short simple terminal seta. Basipodite large, acutely rounded anterior, concave middle, rounded posterior, bearing dense fringe plumose setae; coxapodite bilobed, each lobe with numerous short plumose setae. Exopod well-developed, flagellum with 6 or 7 long simple proximal setae, 20–25 long plumose distolateral setae. Large epipod with slender proximal and distal lobes of equal length.

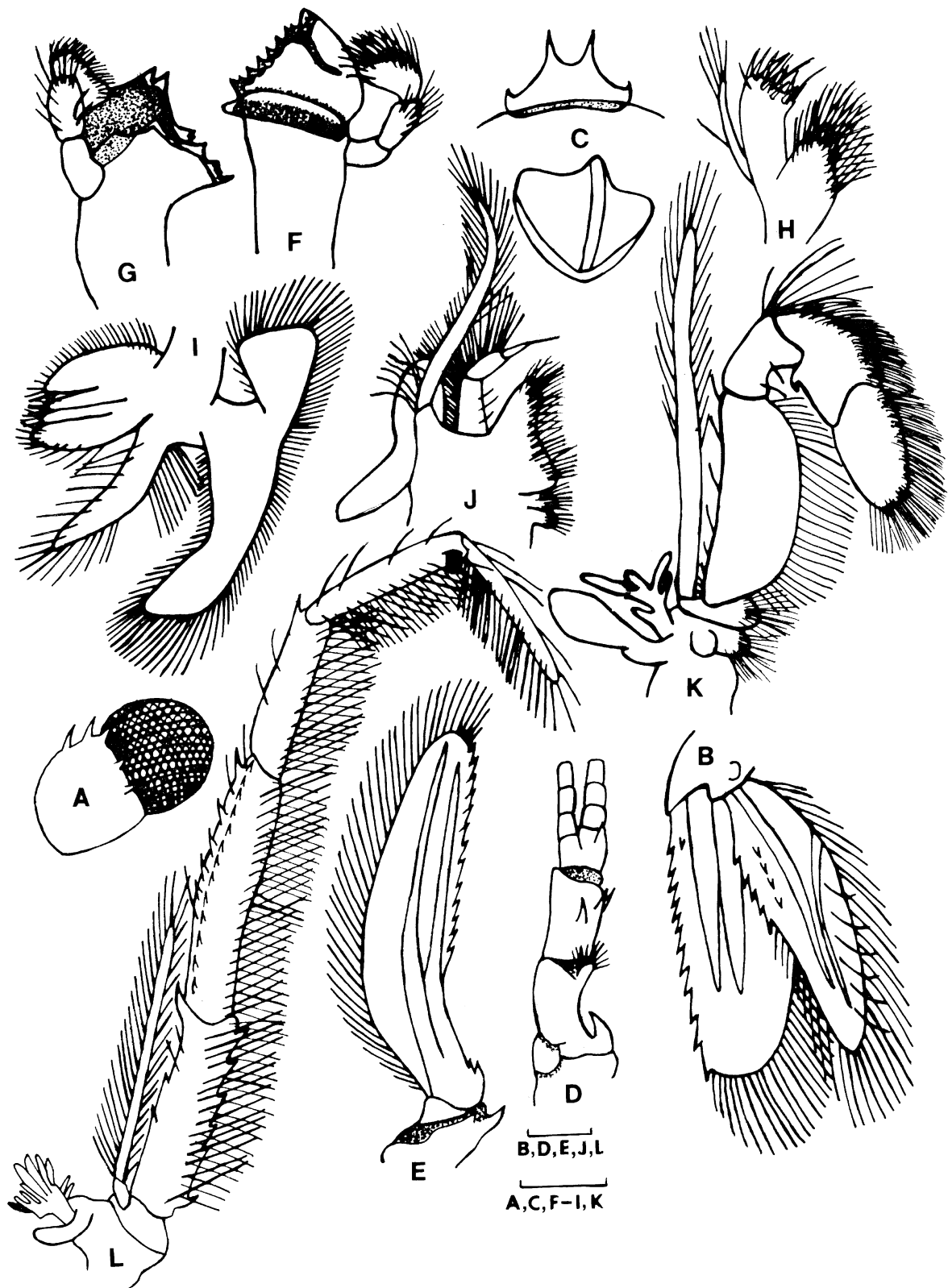


FIGURE 3. *Juxtastenopus spinulatus* **comb. nov.** holotype male. ZMA: A, eye and ocular peduncle; B, uropods; C, epistome and labrum, ventral view; D, right antennular peduncle, dorsal view; E, scaphocerite, dorsal view; F, right mandible, ventral view; G, left mandible, dorsal view; H, maxillule; I, maxilla; J, first maxilliped; K, second maxilliped; L, third maxilliped. Scale bars = 1.0 mm.

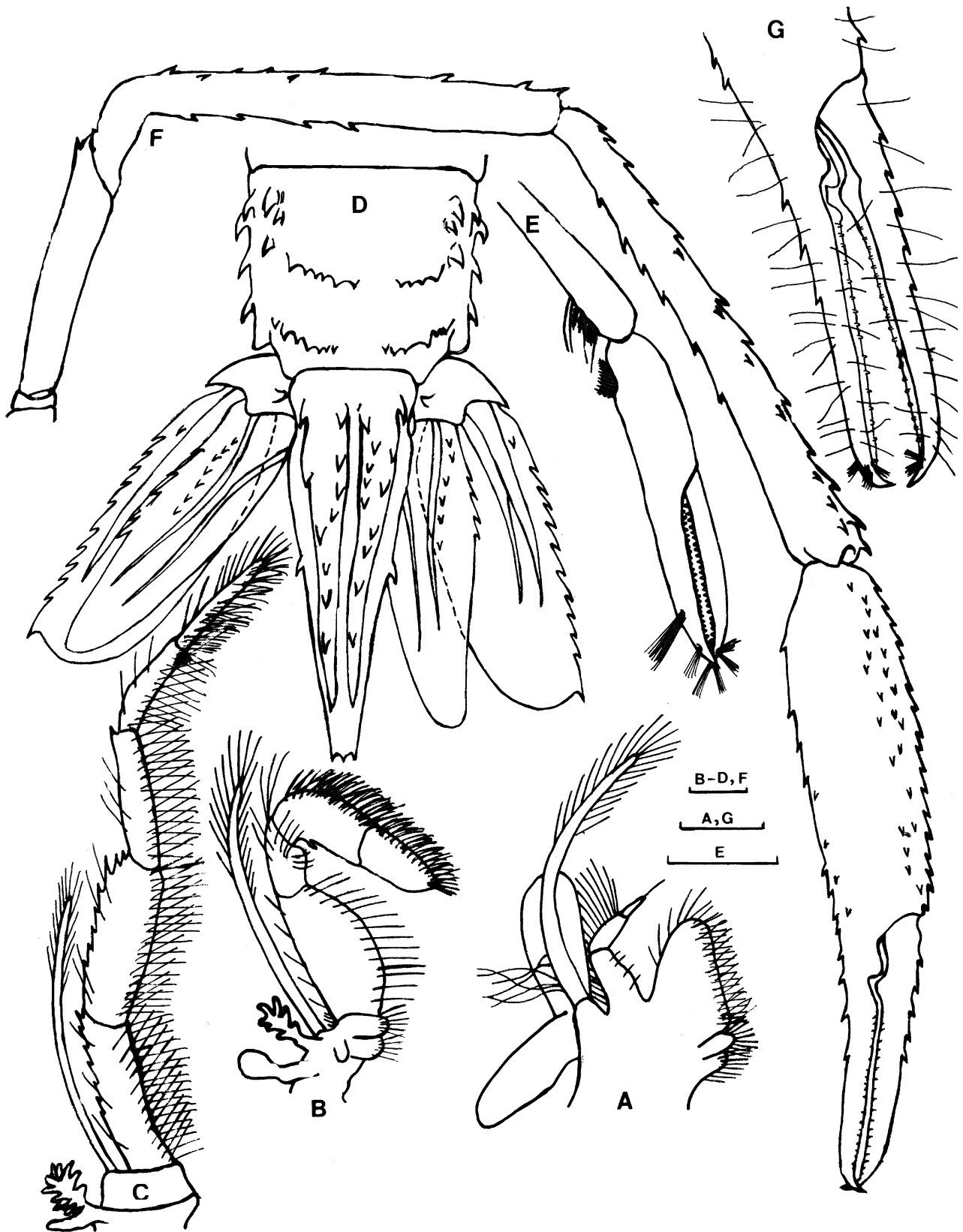


FIGURE 4. *Juxtastenopus spinulatus* **comb. nov.** male MNHM: A, first maxilliped; B, second maxilliped; C, third maxilliped; D, telson and uropods; E, first pereiopod carpus, propodus and dactylus; F, third pereiopod; G, third pereiopod chela. Scale bars = 1.0 mm.

Second maxilliped (Figs. 3K, 4B) with 4-jointed endopod; dactylus suboval, longer than broad. With dense fringe of short setae along distodorsal margin; propodus slightly longer than dactylus densely setose on dorsal margin, ventral margin bearing acute proximal tooth; carpus short, narrow, 0.5 propodal length, with 5 or 6 long simple setae at distodorsal angle, 0–4 distomesial short setae, 2 or 3 short setae on ventral margin; merus slightly more than 2 times dactylar length, 2.5 times longer than broad, dorsal margin with 9 short simple setae, ventral margin convex with fringe of numerous long simple setae; ischium fused to basis, both lobate with dense fringe of short setae; coxa unarmed. Exopod long, slender, undivided with distal 0.5 bearing 20–25 plumose setae; small elongate epipod present; arthrobranch and podobranch also present.

Third maxilliped (Figs. 3L, 4C) with 7-segmented endopod; dactylus, propodus and carpus subequal in length, with numerous long plumose setae; propodus bears weak setiferous organ at distomesial angle while distal extremity of outer margin of carpus with acute spine; merus longest, widest segment with 4–8 outer marginal spines, one specimen with 9 spines on inner margin, holotype with row of 13 small spines near outer margin; numerous long plumose setae on dorsal and ventral margins; ischium slightly shorter than merus with 2–5 outer marginal spines, holotype with 6 spines on inner margin, numerous long plumose setae on inner margin; basis and coxa short unarmed; exopod long, setose.

First pereopod (Figs. 1, 4E) smallest, shortest cheliped; chela slender, long with fingers and palm subequal in length, with palm slightly swollen, cutting edges provided with small stout peglike denticles separated by rectangular chitinous lamellae. Fingers bearing small tufts of long setae; distoventral part of carpus and distoproximal part of propodus bearing weak setiferous organ composed of stout serrate setae, few long plumose setae; rest of pereopod glabrous, unarmed. Carpus longest segment, 1.2 times meral and ischial length.

Second pereopod (Fig. 1) more robust than first pereopod, longer, tips of fingers more strongly hooked than first, with small tufts of long setae; cutting edges of chela similar to those of first. Carpus longest segment nearly twice propodal length, bearing 2–4 spinules on dorsal margin; merus same length as propodus with spinule about midway on dorsal margin; ischium unarmed, short, 0.5 times meral length.

Third pereopod (Figs. 1, 4F–G) strongest, robust, slightly longer than entire body length; propodus, carpus, merus subequal in length. Palm with dorsal row of 7–20 spinules above one or two rows of 10–13 spinules on outer side; ventral margin bearing 9–12 spinules above row of 3 or 4 spinules; few long simple setae between dorsal, ventral marginal spinules. Fingers, elongate with sharp hooked crossing tips, distally bearing short tufts of simple setae. Dactylus with 2–5 spinules on dorsal margin; cutting edge with proximal chitinous ridge, large rounded or subrectangular tooth merging row 18–20 small, stout, peg-like teeth separated by rectangular lamellae. Cutting edge of fixed finger with proximal chitinous ridge bearing large blunt tooth, sharp triangular tooth opposing dactylar tooth, merging into 16 peg-like teeth separated by chitinous lamellae. Carpus slightly widened distally, dorsal margin with 12–15 strong spines above row of 6 or 7 smaller spines, ventral margin with 7–9 spines; merus with 6–12 spines on dorsal margin above row of 4–7 smaller spines, ventral margin with 6–9 spines; ischium shortest segment with 1–7 spines on dorsal margin. Fourth and fifth pereopods (Fig. 1) long, slender, very similar; fourth slightly longer than fifth. Dactylus uniunguiculate, slender, sharply pointed, about 0.25 propodal length. Propodus subdivided into 6–8 distinct segments bearing 5–7 ventral movable spines; carpus 3 times longer than propodus indistinctly subdivided into 14–18 segments, lacking ventral movable spines; merus about 0.6 length of carpus, wider, subdivided into 2 or 3 indistinct segments; ischium subequal to length of propodus.

Pleopods without appendices internae; first shortest, uniramous; second to fifth biramous; ventral margin of basipodites armed with 0–3, 3–4, 4, 4–5, and 2–4 spinules, respectively.

Uropod (Figs. 3B, 4D) slightly shorter than telson; protopodite stout, with short rounded tubercle located proximomesial. Exopod wider than endopod with 9–15 acute teeth on outer margin; dorsal surface with 2 longitudinal carinae and small proximal spine near outer margin. Endopod with 2–8 teeth on outer margin, 2 longitudinal carinae, 1 sometimes indistinct, row of 3–7 small spines adjacent to lateral margin.

Measurements. (mm) Postorbital carapace length: females 4.6–7.7, males 5.2–8.8; carapace and rostrum length: females 7.4–12.7, males 7.5–10.2; total body length: females 17.4–28.0, males 19.8–24.6.

Colour pattern. (Fig. 5) Color notes of Dr. Türkay on board R.V. *Meteor* for an ovigerous female from Station 96 and a male from Station 148: carapace, abdomen, uropods, meri of second to fifth pereopods, basal segments of antennae and antennulae densely covered with light red pigment spots, which gives the whole animal a pink appearance. Carpi, propodi and dactyli of second to fifth pereopods transparent. Telson, scaphocerite and all segment of third maxillipeds with pink lines along their outer borders, otherwise scarcely pigmented. Sternum with few light red pigment blotches, eggs blue-green. Male similar in coloration to female, but third pereopods were pink accept the tips of the chela fingers were white. Color notes of the Philippine male specimen is through the courtesy of Dr. Chan: In life, body generally red. Rostrum, carapace and pleon red. Telson and uropods red; eye stalk transparent, but spines red; antennal scale transparent, except red dorsal carinae, red lateral and mesial margins; third maxilliped red, first pereopod transparent; second pereopod red, but chela and distal part of carpus transparent; third pereopod red but finger tips of chela white; fourth and fifth pereopods red, but carpal-meral joint and distal 0.75 of dactyli transparent.

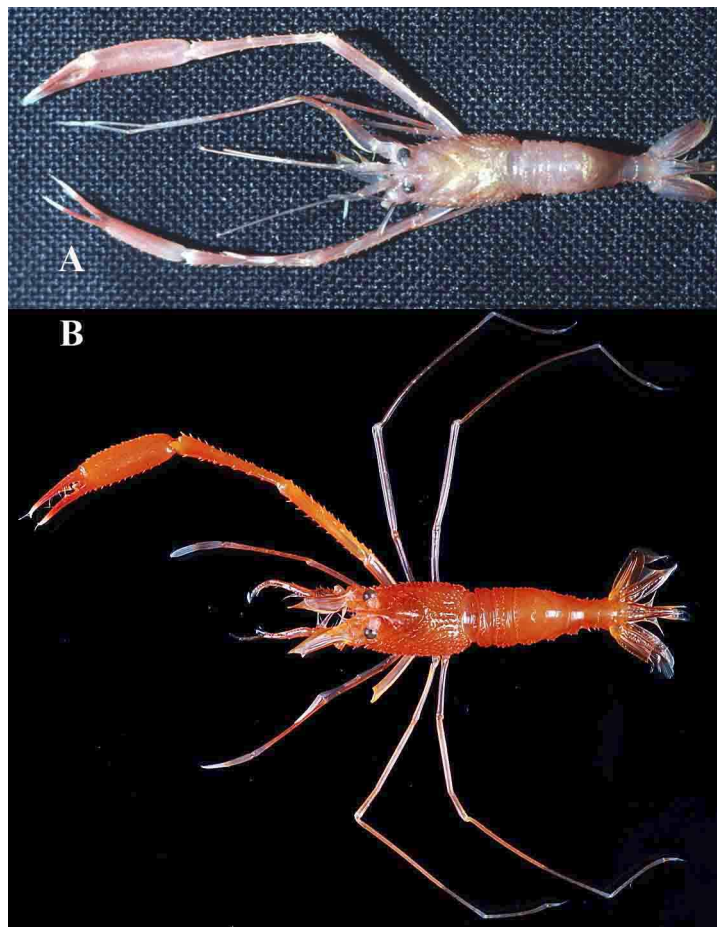


FIGURE 5. *Juxtastenopus spinulatus* comb. nov.: A, male. SMF 27874, Red Sea, photo by Michael Türkay; B, male. NTOU M00788, Philippines, photo by T.-Y. Chan.

Development. Ovigerous females ranged in size from 6.1–7.6 mm postorbital carapace length, 22.1–26.5 mm tl, and carried 27–132 eggs. Eggs at blastula stage with undifferentiated yolk cells were 0.30×0.49 mm in size, while eggs with embryos having pigmented eyes and well developed appendages were 0.60×0.80 mm in size.

Distribution. Indonesia, Red Sea, Gulf of Aden, Philippines; 82–1068 m. Most specimens have been collected throughout the Red Sea at depths of 434 to 778 m, which corresponds to the warm deep Red Sea water mass. The outflow of this deep warm water of the Red Sea sinks to around 1000m south of the Straits of Bab el Mandeb into the Gulf of Aden where one specimen of *J. spinulatus* was collected at a depth of 1068 m. Outside the Red Sea basin, this species has been collected in the Indian Ocean, Indonesia and the Philippines

at much shallower depths. The Indonesian holotype was collected at a depth of 247 m, but the label states also in 29 m, *Lithothamnion*. The Hong Kong specimen was taken from the stomach of *Nemipterus virgatus*, a demersal fish commonly caught at depths of 18–33 m (Russell, 1990), while the specimen from the Philippines was found at 82.4–83.5 m.

Remarks. *Juxtastenopus spinulatus* comb. nov. was originally described based only on one mutilated male specimen from Indonesia (Holthuis, 1946). Later, Lewinsohn & Holthuis (1978) added detailed descriptions of a male and an ovigerous female from the Red Sea originally thought to be *Stenopus spinosus* (Balss 1914, 1915, 1929). The fourth known representative of this species, an ovigerous female, was described by Goy (1986). All of these specimens were lacking the third pereopods, so they were tentatively placed in the genus *Engystenopus*. The genus *Engystenopus* was established by Alcock & Anderson (1894) for a unique specimen of *E. palmipes* collected in the Bay of Bengal, off Trincomallee with a more thorough description of the species given later by Alcock (1901). Fifteen additional specimens were collected from the Philippines and a more thorough description as well as morphological variation was provided by de Saint-Laurent & Cleva (1981), who felt that *E. spinulatus* belonged to a different, new genus. In the present paper, an additional 7 specimens of *E. palmipes* were examined, as well as three specimens of *E. spinulatus* with intact third pereopods, leading to the designation of the new genus *Juxtastenopus*.

Spongicolidae Schram, 1986

Engystenopus Alcock & Anderson, 1894

Engystenopus Alcock & Anderson, 1894: 141, 149. — Alcock 1901: 143. — A. Milne-Edwards & Bouvier 1909: 264. — Holthuis 1946: 5, 43; 1955: 143, 144. — Burukovsky 1974: 91. — de Saint Laurent & Cleva 1981: 161. — Burukovsky 1983: 128, 131. — Holthuis 1993: 313. — Poore *et al.* 2008: 12.

Diagnosis. Small stenopodidean shrimp with cephalothorax slightly depressed dorsoventrally. Rostrum laterally compressed with dorsal and ventral teeth, laterally with few spinules. Carapace and dorsal pleon smooth, polished; only large supraorbital spines, few small pterygostomial spines on carapace. Cervical groove distinct, unarmed. Pleon smooth, somewhat depressed dorsoventrally, rounded dorsally; posterior border of fourth and fifth pleura of female with denticles, narrower, all finely denticulate in males; sternites smooth in female, armed with median spine in male. Telson subtriangular to lance-shaped, strong spine near middle of lateral border, posterior margin with 3 teeth; two dorsal longitudinal carinae with 4 or 5 spines. Eye well developed, with small cornea, reduced pigmentation; ophthalmic peduncle smooth. Antennular peduncle with 3 short segments, strong stylocerite and anterodorsal lamellar projection on first, few spinules on second. Antennal basiscerite with strong ventromesial spine, second segment with ventral oblique spinulose crest, few spinules at outer external angle; scaphocerite subsemicircular, lateral margin slightly concave, serrate; dorsal surface with 2 longitudinal carinae. Mandible with fused molar and incisor processes; palp 3-segmented. Maxillule with broad coxal endite, rounded basal endite, simple endopod. Maxilla with slender endopod, bilobed basal and coxal endites, scaphognathite narrow, well developed. First maxilliped with 3-segmented endopod, distal segment short, less than one third as wide as second segment; basal endite broad, coxal endite bilobed; exopod well developed; epipod large, bilobed. Second maxilliped endopod with 5 segments; coxa and basis with small rounded tubercle laterally; ischium distinctly separated from basis; exopod well developed; one arthrobranch, podobranch, and epipod present. Third maxilliped strongly developed, with slender endopod; propodus with rudimentary setiferous organ; ischium with row of fine spinules on mesial border; merus with row of spinules ventrally; strong, anteromesial projection on carpus; exopod well developed; pleurobranch, 2 arthrobranches, small epipod present. First 3 pereopods chelate; first 2 very slender, all segments glabrous, cutting edges of chelae lacking teeth. First pereopods with weak carpo-propodal setiferous organ. Third pereopod largest thoracic appendage; outer distal edge of ischium with spine; outer and inner edges of merus and carpus strongly spinate, carpus distally inflated; palm very large, broad, compressed, distally spinulate; dactylus thin, compressed, proximally serrate; cutting edges of chelae

consisting of scalloped chitinous ridge. Fourth and fifth pereopods long, slender; carpus and propodus indistinctly segmented; propodus with movable ventral spines; dactylus long, uniunguiculate. Pleopods without appendices internae, biramous except first uniramous pair; basipodites glabrous. Uropods as long as telson; exopod quadrangular, outer margin serrate, dorsal surface with 2 longitudinal carinae; endopod elongate triangular, outer margin smooth; dorsal surface with 2 carinae, median one strong, other at inner half starting from basal part of inner margin curving to median one and distally runs parallel with it.

Type species *Engystenopus palmipes* Alcock & Anderson, 1894 by monotypy.

Remarks. The family Spongicolidae is characterized by depressed body; long or short telson, but broad, triangular, subtriangular, or subquadrangular, and ending in three to five subequal spines. Uropodal endopod usually with single longitudinal dorsal ridge. Propodus of second maxilliped with rounded, unarmed ventral margin. Third maxilliped with exopod well developed, rudimentary or absent. Second or third pereopod longest; propodus of third pereopod broad, if long, robust not slender. Chelate appendages with chitinous ridges distally on cutting edges, rarely with few small sharp teeth. Branchial formula always composed of 12–19 branchial endites (Holthuis 1993; Alvarez et al. 2006). The genus *Engystenopus* shares these characteristics and is transferred from the family Stenopodidae to the Spongicolidae.

Systematic position. *Engystenopus* is morphologically closely similar to *Spongicola* with respect to spination on the carapace, smooth pleomeres, spination of thoracic sternites, and overall shape and spination of the fingers of the 3rd pereopod. *Engystenopus* is readily distinguishable from *Spongicola* by the well-developed exopod of the third maxilliped; dactyli of the fourth and fifth pereopods being long, slender and uniunguiculate; uropodal endopod dorsal surface bearing 2 carinae, and the elongate merus and carpus of the third pereopod.

Engystenopus palmipes Alcock & Anderson, 1894

(Fig.6)

Engystenopus palmipes Alcock & Anderson, 1894: 149, pl.9 fig. 1. — Alcock & Anderson 1896: pl.26 fig.3. — Alcock 1899: 33. — Alcock & McArdle 1901: pl.50, fig.5. — Alcock 1901: 144, pl. 2. — A. Milne-Edwards & Bouvier 1909: 264. — Holthuis 1946: 45; 1955: 144, fig. 103. — Burukovsky 1974: 92, fig.91. — de Saint-Laurent & Cleve 1981: 161, figs. 4, 5, 6. — Burukovsky 1983: 131, fig.17; 1991: 41. — Holthuis 1993: 313, fig.308.

Engystenopus cf. *palmipes* Poore, et al. 2008: 92.

Material examined. (i) 1 male, 1 female, cls 7.2, 7.4, MUSORSTOM I, Sta. 3, Philippines, 14°01.7' N 120°16.0'E, 194–180 m, “Vauban”, 19. III.1976, beam trawl, MNHN Na 2908. (ii) 1male, cl 9.2, MUSORSTOM I, Sta. 25, Philippines, 14°02.7'N, 120°20.3'E, 200–191 m, “Vauban”, 22.III.1976, beam trawl, MNHN Na 2910. (iii) 2 males, 1 female, cls 8.6, 8.7, 9.0, MUSORSTOM I, Sta. 30, Philippines, 14°01.3'N, 120°18.7'E, 186–177 m, “Vauban”, 22.III.1976, beam trawl, MNHN Na 2911. (iv) 1 male, 1 ov. female, cls 10.2, 9.1, MUSORSTOM I, Sta. 31, Philippines, 14°00.0'N, 120°16.0'E, 187–175 m, “Vauban”, 22.III.1976, beam trawl, MNHN Na 2912. (v) 1 female, cl 8.0, MUSORSTOM I, Sta. 32, Philippines, 14°02.2'N. 120°17.7'E, 193–183 m, “Vauban”, 23. III. 1976, beam trawl, MNHN Na 2913. (vi) 1 male, cl 9.5, MUSORSTOM I, Sta. 50, Philippines, 13°49.2'N 120°01.8'E, 415–560 m, “Vauban”, 25. III. 1976, beam trawl, MNHN Na 2914. (vii) 1 ov. female, cl 10.0, MUSORSTOM I, Sta. 64, Philippines, 14°00.5'N, 120°16.3'E, 195–194 m, “Vauban”, 27.III.1976, beam trawl, MNHN Na 2915. (viii) 1 male, 1 ov. female, cls 9.2, 6.6, MUSORSTOM I, Sta. 71, Philippines, 14°09.3'N 120°26.2'E, 174–204m, “Vauban”, 28. III. 1976, beam trawl, MNHN Na 2916. (ix) 1male, cl 9.2, MUSORSTOM II, Sta. 13, Philippines, 14°00.5'N 120°20.7'E, 200–193m, “Coriolis”, 21. XI. 1980, beam trawl, MNHN Na 3896. (x) 1male, cl 9.2, MUSORSTOM II, Sta. 75, Philippines, 13°50.5'N 120°30.3'E, 300–330m, “Coriolis”, 1. XII. 1980, beam trawl, MNHN Na 3897. (xi) 1male, cl 9.0, MUSORSTOM III, Sta. CP103, Philippines, 14°00'N 120°18'E, 193–200m, “Coriolis”, 1.VI. 1985, beam trawl, MNHN. (xii) 1female, cl 8.7, KARUBAR, Sta. CP59, Indonesia, Ile Tanimbar, 08°20'S, 132°11'E, 405–399 m, “Baruna Jaya 1”, 31.X.1991, beam trawl, MNHN.

(xiii) 1 male, cl 12.2, Madagascar, 22°18'S, 43°04.7'E, 400 m, Chalutage 94, 27.XI.1973, leg. A. Crosnier, MNHN Na 3516, (xiv) 1 ov. female, cl 12.4, EAMBRO, St. Cr 330, Indian Ocean, 7°15'S, 39°44'E to 7°12'S 39°43.3'E, 274 m, FRV "Manihine", 15.IX.1971, leg. P. Sandhu, NTM-CR00330. (xv) 2 males, cls 7.5, 9.6, Australia, off Cairns, N. E. Queensland, 17°06'S, 150°52'E, 606–610 m, R/V "Soela" Cruise 6, Station 81, 12.VI.1985 leg. P. Davie, QM-W16088. (xvi) 1 male, cl 9.8, MUSORSTOM I, Sta. 10, Philippines, 13°59'48"N, 120°18'12"E, 187–205 m, "Vauban", 19.III.1976, beam trawl, USNM 181655. (xvii) third pereiopod only, Western Australia, off Ningaloo South, 22°04'S, 400 m, leg. G. Poore, NMV 5545.

Diagnosis. As for the genus.

Supplemental Description. The species was adequately described and illustrated by de Saint-Laurent & Cleva (1981), so only some comments on variation within the species is provided here. The entire body (Fig. 6A) is somewhat depressed, very smooth and polished with only large supraorbital spines and a few pterygostomial spinules on the carapace. The rostrum is laterally compressed with 7–12 dorsal, 1 or 2 ventral, and 1–3 lateral teeth. Pleon smooth, rounded with posterior borders of pleura finely toothed in males, but only on the fourth and fifth pleura of females. Antennal scale a little more than two times as long as wide, armed with 3–6 teeth distally on outer margin. Third pereiopod (Fig. 6B) very distinctive with merus and carpus long, slender bearing numerous teeth on outer margins, and carpus inflated distally. Dactylus serrated on dorsal margin with scattered spinules on face; palm compressed, dorsal margin serrated, ventral margin with serration extending onto fixed finger, few spinules on dorsal face, distinct row of spinules below cutting edge of fixed finger. Dactylar cutting edge with large triangular proximal tooth merging into chitinous ridge; propodal cutting edge with two proximal opposing subrectangular teeth merging distally into scalloped chitinous ridge. Fourth and fifth pereiopods with 6 carpal and 5 propodal subsegments, sometimes indistinct, propodi with 0–6 ventral movable spines. Outer margin of uropodal exopodite with 4–8 teeth, endopodite margin smooth.

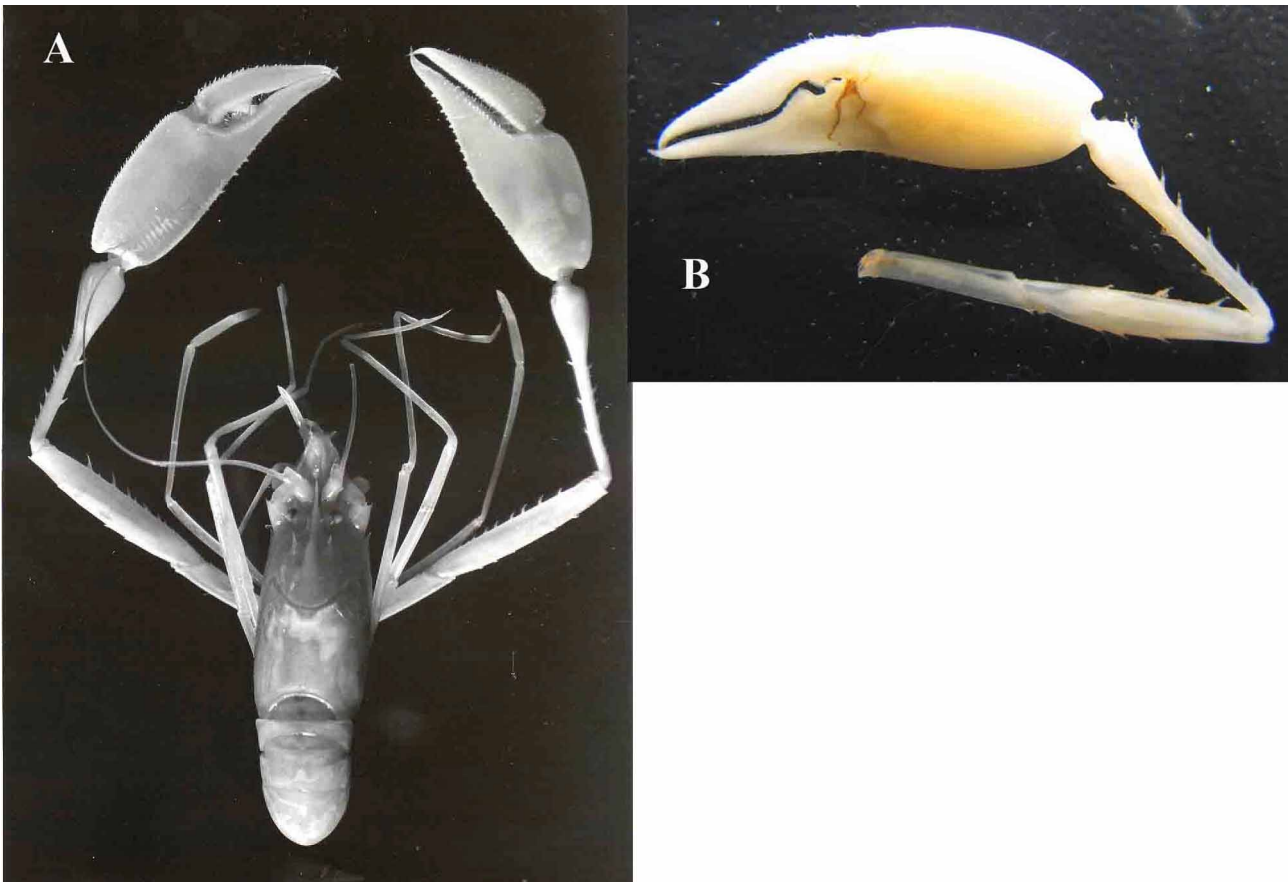


FIGURE 6. *Engystenopus palmipes*. A, male. MNHN Na 2912, Philippines; B, third pereiopod. NMV 5545, Western Australia, off Ningaloo South, photo by Gary Poore.

Measurements. (mm) Postorbital carapace length: females 6.6–12.4, males 7.0–12.2; carapace and rostrum length: females 7.8–15.3, males 9.2–15.8; tl: females 21.2–38.4, males 21.0–37.5; length of third pereopod, 32.7–58.0. Oviparous females range in size from 6.6–12.4 postorbital carapace length, 21.2–38.4 total length, and carried 34–156 eggs. Eggs at blastula stage with undifferentiated yolk cells measured 0.42×0.45 mm in size.

Colour pattern. Body salmon-red, flecked slightly with white; third pereopods with white nodes and salmon-pink internodes (Alcock & Anderson 1894).

Distribution. Indian Ocean, Philippines, Madagascar, Indonesia, and NW and NE Australia; 174–640 m. The holotype was collected in the Bay of Bengal but the species was not found again until 1976 with the addition of 15 specimens from the Philippines (de Saint Laurent & Cleve 1981). The present study adds another 3 specimens from the Philippines, 1 from Madagascar, 1 from Tanimbar Island, Indonesia, and 2 from off Queensland, Australia. The distinctive third cheliped was recorded off Western Australia (Poore et al. 2008) and Burukovsky (1991) reported a female specimen from the southwest Indian Ocean, near Madagascar.

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