

**New records for the axiid shrimp *Eutrichocheles modestus* (Herbst, 1796) with discussion on the genera *Eutrichocheles* Wood-Mason, 1876 and *Paraxiopsis* de Man, 1905 (Crustacea: Decapoda: Thalassinidea)**

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*Abstract.*—New material discovered for the rare species *Eutrichocheles modestus* allows a detailed study and a comparison with its closely related congener, *E. crosnieri* Ngoc-Ho, 1998. The taxonomic status of *Eutrichocheles* Wood-Mason, 1876 and *Paraxiopsis* de Man, 1905 is discussed. The separation of the two, as proposed by Kensley (1996a), is accepted.

*Eutrichocheles modestus* (Herbst) was described in 1796, and in the intervening 208 years only twelve specimens, all males, have been recorded. These records, along with the complicated synonymy (as *E. modestus*, *Astacus scaber* Fabricius, 1798, and *Axius biserratus* von Martens, 1868) were summarized by Holthuis (1986). Since then, Ngoc-Ho (1998) described *Eutrichocheles crosnieri* from Vietnam based on a single holotype female, and examined males of *E. modestus* from Penang and Singapore (Ngoc-Ho 1998:374).

New material of both male and female *Eutrichocheles modestus* from Thailand and Malaysia was examined for this study. It allows a comparison of this species with *E. crosnieri* Ngoc-Ho, 1998 and confirms the validity of the latter species. A discussion on the separation of *Eutrichocheles* Wood-Mason, 1876 and *Paraxiopsis* de Man, 1905, as proposed by Kensley (1996a), is presented. Further observations are made on the morphology and colour pattern of

what is a widely distributed, if rarely collected, species in Southeast Asia.

The measurements given in the description are the carapace length (cl.) measured from the tip of the rostrum to the posterior border of the carapace and the total length (tl.) measured from the tip of the rostrum to the posterior border of the telson. The material examined comes from the Zoological Reference Collection, Singapore (ZRC), the Rijksmuseum van Natuurlijke Historie, Leiden (RMNH), and the Muséum National d'Histoire Naturelle, Paris (MNHN).

This study was originally started in collaboration with the late Brian Kensley. His untimely demise, however, meant that he could not complete the work with us. Nevertheless, his initial role was an important one, for which we are most grateful.

Family Axiidae

Genus *Eutrichocheles* Wood-Mason, 1876

*Eutrichocheles* Wood-Mason, 1876:231.—  
de Man, 1916:96.—Bouvier, 1917:14.—  
Balss, 1933:87.—Chopra, 1933:277.—

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Holthuis, 1946:71.—Balss, 1957:1580.—de Saint Laurent, 1979:32 (footnote).—Sakai & de Saint Laurent, 1989:3, 51.—Poore, 1994:97.—Kensley, 1996a:710.

*Diagnosis.*—Rostrum triangular with pointed tip overreaching eyes; lateral rostral border continuous posteriorly with lateral carina of gastric region of carapace. Gastric region slightly convex in median part, lateral and submedian carinae with spines. Cervical groove well defined, anterolateral border of carapace with one or two spines. Telson longer than wide, dorsal surface with paired oblique carina bearing spines, posterior border often with median notch and median spine.

Eyestalk globulous, corneas pigmented. Antennal peduncle with acicle reduced to bifid or trifid scale. Maxilla bearing a long seta on scaphognathite. Pereopods 1 subequal, similar; fingers distinctly longer than propodal palm, latter with spine or spinules on upper margin; chelae with a gap and a digitiform tubercle on the cutting edge of the fixed finger, pronounced in male.

Single epipod on maxillipeds 1–3 and pereopods 1–4. Paired arthrobranch on maxilliped 3 and pereopods 1–4.

Male pleopod 1 as small stubby article without flagellum, female pleopod 1 present, uniramous, with basal article and distal flagellum. Male pleopod 2 with appendix masculina; male and female pleopod 2–5 lacking appendix interna. Uropodal exopod with suture.

*Remarks.*—The genus *Eutrichocheles* was established by Wood-Mason in 1876 to include the species *Cancer modestus* Herbst, 1796, and was placed by its author in the Astacidea Nephropidae (see Holthuis 1986:251). Stebbing (1893), de Man (1916), and Bouvier (1917) shared this view, while Balss (1933), Chopra (1933), but more recent authors (e.g., Holthuis 1946, Sakai & de Saint Laurent 1989, Poore 1994) consider this genus as a member of the Axiidae.

*Paraxiopsis* de Man, 1905, was created

as a subgenus of *Axiopsis* for those species that are characterized by the anterior carapace sloping anteroventrally to the rostrum and that bear a small antennal stylocerite (article 2) and acicle (de Man 1925:101). *Axiopsis* (*Paraxiopsis*) *brocki* de Man, 1888, was designated as the type species. Species of *Paraxiopsis*, however, differ from those of *Axiopsis* (s.s.) by the small acicle which is also bifurcate; a further difference, as quoted by Kensley (1996:710), lies in the absence of an appendix interna on the pleopods. In *Axiopsis* (s.s.), an appendix interna is present on pleopods 2–5 and the antennal acicle is elongate.

On the basis of the small, bifurcate antennal acicle and the morphology of the telson with oblique carinae bearing spines, Sakai & de Saint Laurent (1989:51) regarded *Paraxiopsis* de Man as a junior synonym of *Eutrichocheles* Wood-Mason but Kensley (1996a) separated the two and reinstated *Paraxiopsis* as a full genus. Except for *Eutrichocheles modestus*, he assigned to *Paraxiopsis* all other Indo-Pacific species previously placed in *Eutrichocheles* by Sakai & de Saint Laurent (1989). *Eutrichocheles modestus* (Herbst) and *Paraxiopsis brocki* (de Man) were compared as the representatives of the two genera (Kensley 1996a:711) with the following differences cited: 1) a postdorsal median carina present in *Eutrichocheles*, absent in *Paraxiopsis*; 2) the chelae of P1 with a wide gape and a strong digitiform tubercle on the propodal cutting edge in *Eutrichocheles*, not in *Paraxiopsis*; 3) the telson with a distinct median notch in the posterior margin in *Eutrichocheles*, not in *Paraxiopsis*; 4) specimens of *Eutrichocheles* are much larger (cl. 20–30 mm, tl. 73–80 mm) than those of *Paraxiopsis* (cl. 5–12 mm, tl. 20–30 mm).

It can be noted that to date only males of *Eutrichocheles modestus* have been described and figured. Examination of females of *E. modestus* in this work together with the female holotype of *Eutrichocheles crosnieri* Ngoc-Ho, 1998, reveals that the first two characteristics presented by Kens-

ley for *Eutrichocheles* must be slightly altered: 1) the post cervical dorsal median carina is actually a specific character for *E. modestus*; it is nearly absent in *E. crosnieri* (at least in the female); 2) a wide gape in the chelae of pereopod 1 and a strong tubercle on the propodal cutting edge are present in males only.

The other differences mentioned by Kensley (1996a), however, are valid: the median notch on the telson is pronounced in *Eutrichocheles*, not in *Paraxiopsis* (though sometimes present) and the difference in size especially is obvious between members of the two genera. The three additional species of *Paraxiopsis* described recently from Guam (Kensley, 2003:372), also included small specimens (cl. 7.5–11.5 mm). It can be added that the fingers of the P1 chelae are longer than the palm in *Eutrichocheles*, but generally shorter than the palm (with variations) in *Paraxiopsis*.

Yet a detailed study of the new material of *Eutrichocheles modestus* reveals many similarities between the two genera, with particular emphasis on the rostrum and gastric region, the antennal acicle and mouth appendages, the morphology and spinulation of pereopod 1, and the absence of an appendix interna on the pleopods.

This situation can be interpreted, as G. Poore suggests (in a reviewer's comment), that species of *Eutrichocheles* are a more derived clade of *Paraxiopsis*, leaving the latter paraphyletic. The separation of *Eutrichocheles* from *Paraxiopsis* as proposed by Kensley (1996a) is here considered under this view.

*Type species.*—*Cancer modestus* Herbst, 1796, as designated by Wood-Mason, 1876.

*Species included.*—*E. modestus* (Herbst, 1796) (Indian Ocean and South China Sea), *E. crosnieri* Ngoc-Ho, 1998 (South Vietnam).

*Eutrichocheles modestus* (Herbst, 1796)  
(Figs. 1–3)

*Cancer modestus* Herbst, 1796:173, pl. 43, fig. 2.—Latreille, 1816:35.—Stebbing, 1893:206.—Balss, 1933:87.

*Astacus scaber* Fabricius, 1798:407.—Bosc, 1801–1802:62.—Latreille, 1803:241; 1806:52.—Desmarest, 1830:41.—H. Milne-Edwards, 1837a:335; 1837b:383.—Broderip, 1838:274.—Zimsen, 1964:652.

*Astacus Scaber.*—Lamarck, 1818:217.

*Axius biserratus* von Martens, 1868:612.—Nobili, 1903:12.—de Saint Laurent, 1979:32.

*Eutrichocheles modestus.*—Wood-Mason, 1876a:231; 1876b:264.—Miers, 1880:380.—Stebbing, 1893:206.—de Man, 1916:96.—Bouvier, 1917:14.—Balss, 1933:87.—Chopra, 1933:277, fig. 1, pl. 6.—Balasubrahmanyam & Jacob, 1961:830, fig. 1.—de Saint Laurent & Le Loeuff, 1979:32.—Holthuis, 1986:249.—Sakai & de Saint Laurent, 1989:51, 102.—Kensley, 1996a:710.—Ngoc-Ho, 1998:374, fig. 6C–F.

*Axiopsis (Paraxiopsis) biserrata.*—de Man, 1925a:138, fig. 6; 1925b:7, 71.

*Material examined.*—Andaman Sea, Thailand, Phuket fishing port, S. Chaitiamvong et al. coll., December 1998: 1 male, cl. 32 mm, tl. 82 mm, (both P1 missing, P2 present); P.K.L. Ng coll.: 1 male, cl. 33 mm, tl. 81 mm, (both chelipeds of P1 present); Pichai Fish Port, Phuket, P.K.L. Ng coll., April 1999: 1 female, cl. 33 mm, tl. 84 mm (all pereopods missing) (ZRC 1999.0088).—Gulf of Thailand, S. Chaitiamvong don., 1980: 1 female, cl. 30 mm, tl. 70.5 mm (RMNH D 38354).—Ketam Island, Salangor, Malaysia, E.R. Alfred coll., 2 July 1961: 1 male, cl. 29 mm, tl. 71 mm (RMNH D 17656).—Singapore, fish market, Dr. Falshawn coll., January 1914: 1 female, cl. 33 mm, tl. 83.5 mm (MNHN Th 1267).

*Type.*—Missing (according to Balss, 1933:87).

*Distribution.*—Tranquebar, India (Herbst's type, according to Holthuis 1986); Porto Novo, South India (Balasubrahmanyam & Jacob 1961); Malacca, Malaysia (Wood-Mason 1876); Arakan coast of Burma

(Chopra 1933); Penang, Malaysia (Ngoc-Ho 1998), Selangor, Malaysia; Andaman Sea, Thailand; Singapore.

*Color pattern.*—Body generally orange-brown, lateral surfaces of carapace yellowish-white, abdomen with three thick (1 median and 2 lateral) longitudinal white bands. Eyes dark brown. Pereopods 1 whitish and densely covered with dark brown setae, bearing a subdistal red spot on merus. Pereopods 2–5 reddish brown, with white rings at articulations (Fig. 3).

*Diagnosis.*—Carapace with postcervical median carina in posterior quarter; anterolateral border of carapace usually with spinule and tubercle, or with two spinules. Rostrum with four or five spinules on lateral border; lateral carina with two large spines, submedian carina with five to seven spines, median carina unarmed except for tubercle at midlength. Telson bearing pair of oblique dorsal carinae with spines; posterior border with median notch and median spine. Antennal acicle reduced, with two teeth on mesial margin. Pereopods 1 subequal, subsimilar, propodal palm shorter than fingers with upper subdistal spine; chelae showing wide gape in male.

Male pleopod 1 small, without flagellum, female pleopod 1 uniramous with basal article and distal flagellum. Male pleopod 2 with appendix masculina; male and female pleopod 2–5 lacking appendix interna.

*Description.*—Carapace (Fig. 1B) rugose with fine granules especially in postcervical region. Rostrum with pointed tip, far overreaching eyestalks, lateral border with four or five spinules, continuous with lateral carina, latter terminating halfway to cervical groove and carrying two large spines. Median carina of gastric region with tubercle at midlength, lacking teeth; submedian ca-

rina bearing five to seven spines. Cervical groove well defined; anterolateral border of carapace (Fig. 1A) often with spinule and tubercle, rarely with two spinules; postcervical region carrying short median dorsal carina in posterior quarter. Abdominal pleura 2–6 triangular ventrally (Fig. 1A), pleura 3–5 with spinule on anterior margin, often stronger in male than in female. Telson (Fig. 1K) about 1.3 times as long as wide, bearing four spinules on lateral border, pair of oblique carinae dorsally each with four spines, longitudinal median shallow groove on posterior half; posterior border with median notch and median spine.

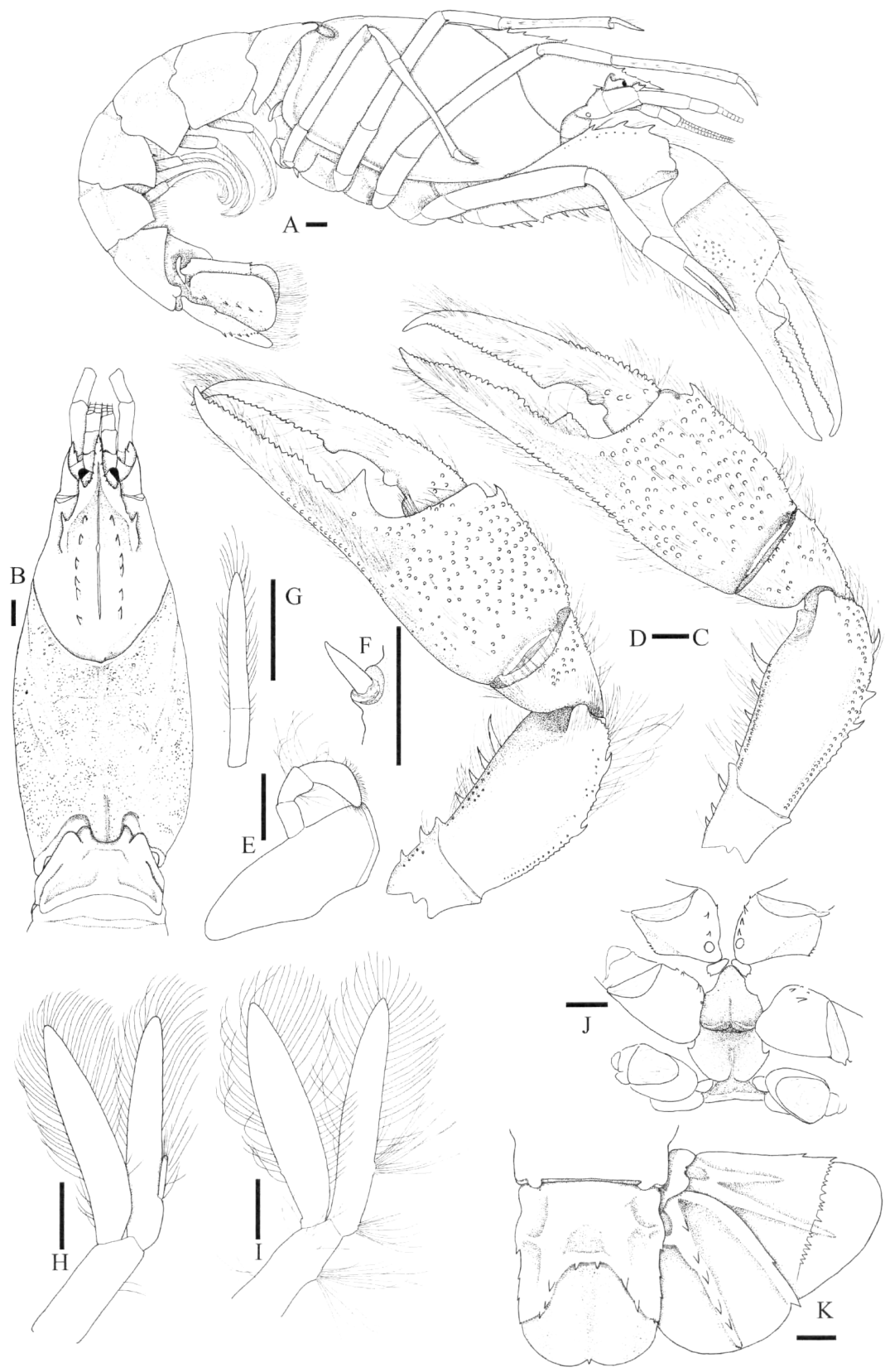
Eyestalks (Fig. 1B) cylindrical, corneas terminal. Antennular peduncle (Fig. 2A) unarmed with article 1 about as long as article 2 and 3 combined. Antennal peduncle (Fig. 2B) with small mesiodistal spinule on article 3; acicle bifid, distal tooth stronger than proximal. Mandible (Fig. 1E) and maxillule (Fig. 2G) as figured. Maxilla (Fig. 2H) endopod slender, posterior seta on scaphognathite. Maxilliped 1 (Fig. 2C) with short digitiform endopod; epipod large, bilobed, tapering distally. Maxilliped 2 (Fig. 2D) exopod overreaching distal border of merus, with terminal flagellum. Maxilliped 3 (Figs. 2E, F) pediform; coxa and basis with lower spine; ischium bearing six to seven lower spinules, strong mesial ischial crest with five spinules and ten large spines; merus with seven lower spinules proximally and two large distal spines; carpus with lower subdistal and distal spine; exopod slightly overreaching distal border of merus, with flagellum.

Pereopods 1 (Figs. 1C, D) subequal, more slender in female, ischium with lower tubercles and two or three lower spines; merus with weak longitudinal upper crest

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Fig. 1. *Eutrichocheles modestus* (Herbst). A, C, female from Thailand (RMNH D 38354); B, G, I, K, female from Phuket, Thailand (ZRC 1999.0088); D, male from Malaysia (RMNH D 17656); E, F, H, J, male from Singapore (MNHN Th 1267). A, lateral view; B, carapace in dorsal view; C, D, pereopod 1; E, mandible; F, male pleopod 1; G, female pleopod 1; H, male pleopod 2; I, female pleopod 2; J, 4th abdominal sternite in ventral view; K, telson and uropods. Scale line: 2 mm.



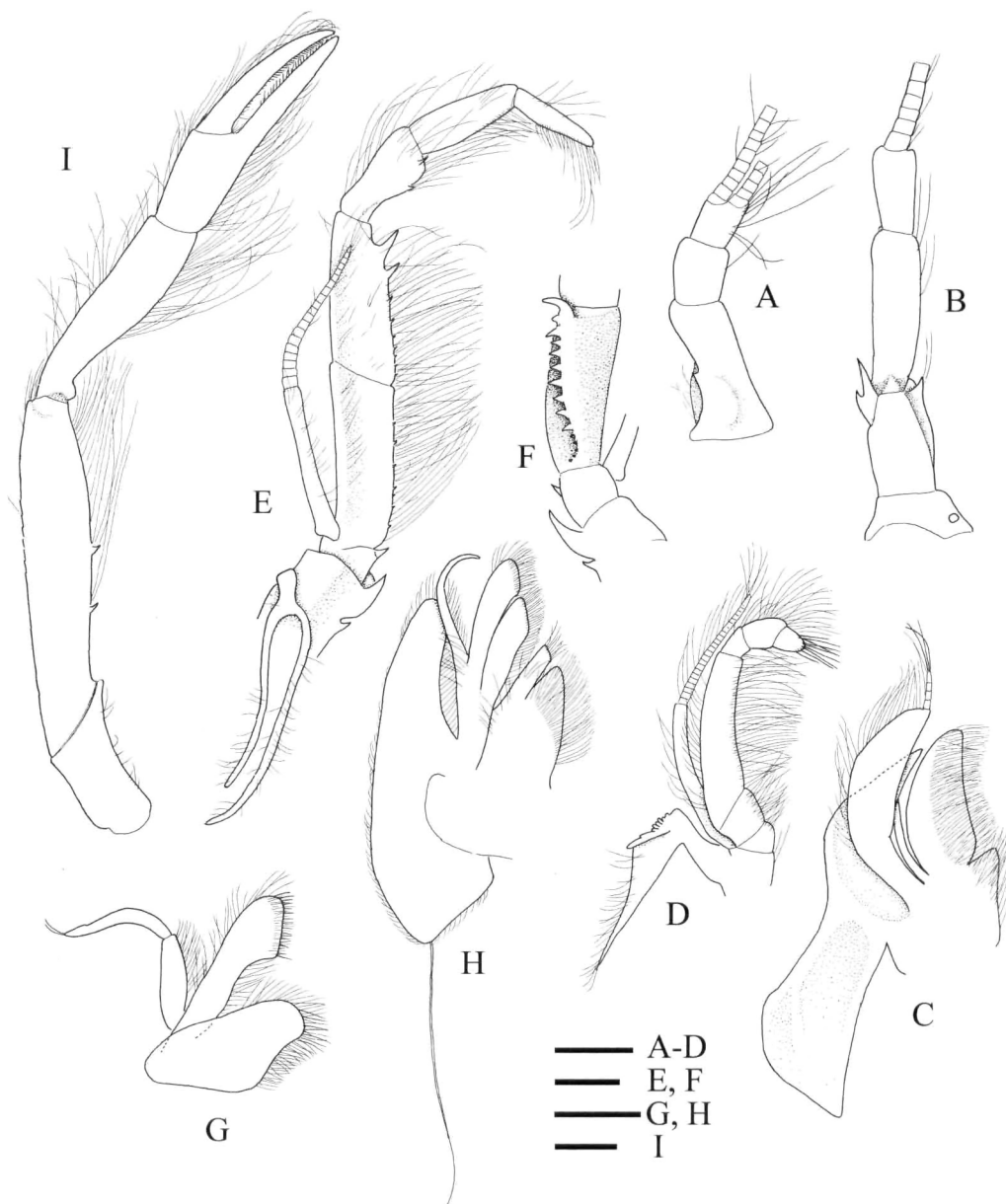


Fig. 2. *Eutrichocheles modestus* (Herbst). A-I, male from Singapore (MNHN Th 1267). A, antennule; B, antenna; C, maxilliped 1; D, maxilliped 2; E, F, maxilliped 3 and mesial crest of ischium; G, maxillule. Scale line: 1 mm.

carrying tubercles and two or three spines, four lower spines; carpus and propodus bearing abundant tubercles, propodus with upper subdistal spine, sometimes followed by another behind; fixed finger with large triangular proximal tooth, more prominent

in male than in female, and small round teeth on the rest of cutting edge. Dactylus cutting edge with quadrate proximal tooth preceded by two teeth sitting side by side or separated by short unarmed space; rest of cutting edge with small round teeth. Dac-

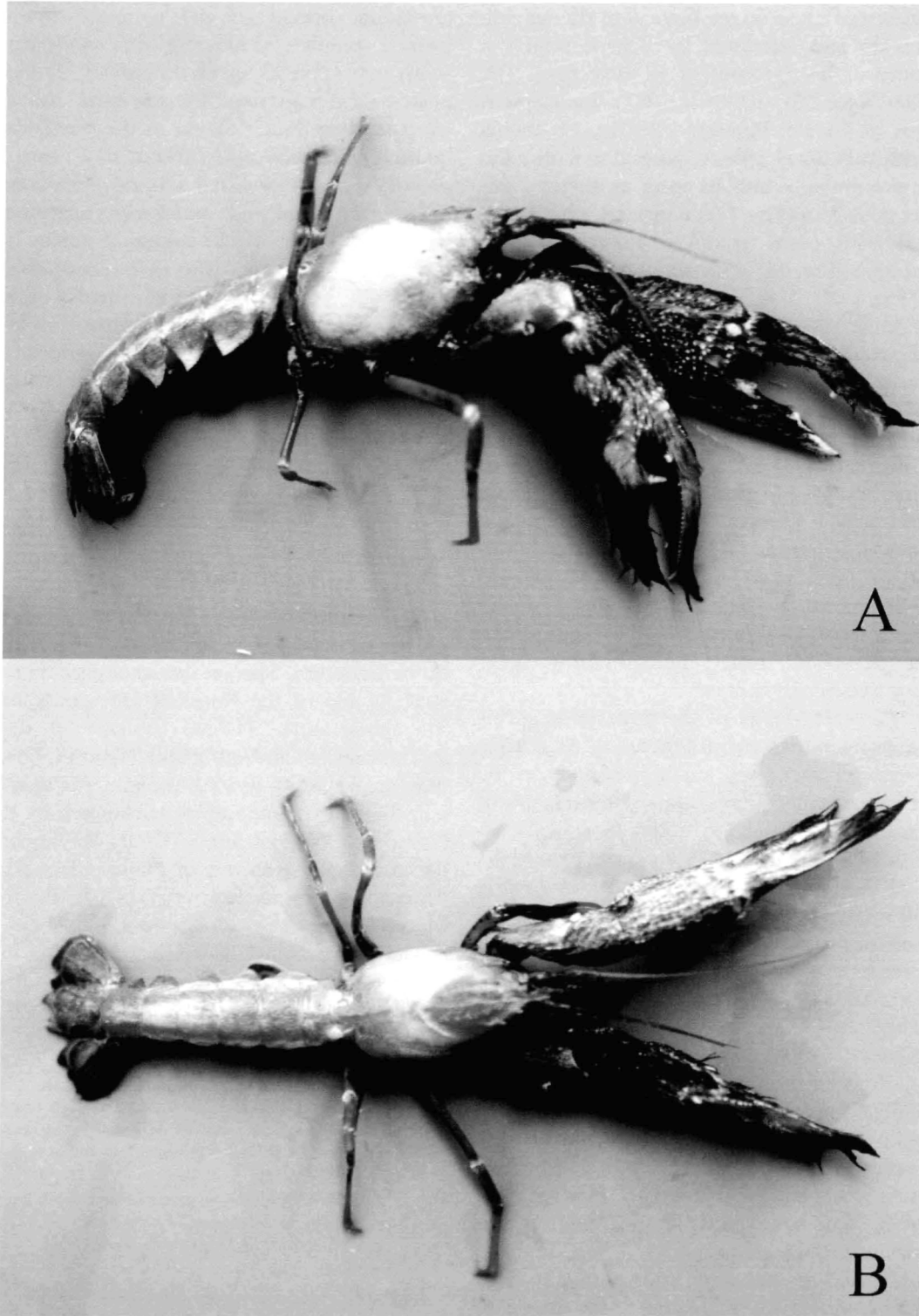


Fig. 3. *Eutrichocheles modestus* (Herbst), male cl. 33 mm, tl. 81 mm, Andaman Sea, Thailand. A, lateral view; B, dorsal view.



tylus and fixed finger both with tip curving inward and separated by a gape which is more or less prominent in male (Fig. 1D, also Ngoc-Ho, 1998: fig. 6C), inconspicuous in female. Pereopod 2 (Fig. 2I) merus with two lower spines; propodus with palm approximately half as long as fingers. Pereopods 3–5 (Fig. 1A) unarmed, P3–5 (Fig. 1J) with coxal spinules. Fourth thoracic sternite (Fig. 1J) with small or large lateral spine.

Male pleopod 1 (Fig. 1F) short, uniramous with slightly pointed tip. Female pleopod 1 (Fig. 1G) uniramous, biarticulated with basal article and indistinctly articulated flagellum bearing setae. Male pleopod 2 (Fig. 1H) biramous, with appendix masculina; female pleopod 2 (Fig. 1I), also male and female pleopod 3–5 without appendix interna. Uropods (Fig. 1K) about as long as telson, posterior border rounded; exopod with suture, two lateral spinules at distal half; endopod with two lateral spinules, one at laterodistal corner; median carina carrying five or six spines.

*Remarks.*—One of the three male specimens examined (from Phuket, tl. 81 mm) is provided with very small gonopore on the third pereopod. This apparent hermaphroditism has also been noted in species assigned by Kensley (1996a) to *Paraxiopsis* and in *Marianaxius* (Kensley 1996b), while all members of the family Calocarididae are hermaphroditic. The most closely related species to *E. modestus* is *E. crosnieri* Ngoc-Ho, 1998, due firstly to their large size. They also share many other features (see Ngoc-Ho 1998:363, figs. 1–3): the morphology of the rostrum and anterior part of the carapace, the pereopods, the telson and uropods, and the abdominal pleura that are more or less triangular ventrally. The two were compared in Ngoc-Ho 1998 (p. 378) with some uncertainty as no female of *E. modestus* had been reported at that time and the holotype and only known specimen of *E. crosnieri* was a female. Comparison of the latter with females of *E. modestus* now reveals the following differences: 1) the an-

terolateral border of the carapace often bears a spinule and tubercle in *E. modestus* (with two spinules in *E. crosnieri*); 2) the postcervical region of the carapace has a short median dorsal carina in the posterior quarter in *E. modestus* (absent in *E. crosnieri*); 3) the abdominal pleura 3–5 carry an anterior spine in *E. modestus* (unarmed in *E. crosnieri*); 4) the antennal acicle is bifid in *E. modestus* (trifid in *E. crosnieri*); 5) the 4th thoracic sternite is armed with a lateral spine in *E. modestus* (unarmed in *E. crosnieri*). As no male of *E. crosnieri* is available for study, nothing is known of the gape on the chelae of its pereopod 1.

The above distinguishing characters permit an unambiguous separation of females of *E. modestus* from *E. crosnieri* and confirm the validity of the latter species.

#### Acknowledgments

We are grateful to the late Brian Kensley for his contribution to this work, especially in the literature. Special thanks are given to P. K. L. Ng of the National University of Singapore and C.H.J.M. Fransen of the Rijksmuseum van Natuurlijke Historie, Leiden for providing us with the material studied; the color photographs were taken by P. K. L. Ng. We also thank C. B. Boyko of the American Museum of Natural History for reading the manuscript; G. C. B. Poore of the Museum Victoria and P. C. Dworschak of the Naturhistorisches Museum in Wien for their useful comments and suggestions.

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Associate Editor: Christopher B. Boyko