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Two new species of *Erugosquilla* from the Indo-West Pacific (Crustacea: Stomatopoda: Squillidae)

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Abstract.—The fifth and sixth species of *Erugosquilla* to be recognized are *E. grahami,* new species, from Australia and Taiwan; and *E. serenei,* new species, from Vietnam. Both species resemble *E. woodmasoni* (Kemp) in lacking distinct tubercles adjacent to the median carina of the telson, and in this feature differ from *E. massavensis* (Kossmann) and *E. hesperia* (Manning), both from the western Indian Ocean. The two new species differ from *E. woodmasoni* in having the anterior margin of the ophthalmic somite trapezoidal rather than rounded in shape; and the outer inferodistal angle of the raptorial merus produced into a blunt angle rather than a spine. *Erugosquilla grahami* and *E. serenei* can be distinguished by the length of the prelateral lobe of the telson and the color in life of the antennal peduncle.

Erugosquilla Manning, 1995 was erected for species of the *Oratosquilla woodmasoni* species group. *Erugosquilla* is distinguished from other species of *Oratosquilla* and allies by the combination of the broad carapace, smooth dorsum, suppression of the anterior bifurcation of the median carina of the carapace and the apically spinulate anterior margin of the ophthalmic somite.

Manning (1995) recognized *Erugosquilla* for four species: *E. septemdentata* (Ahyong 1994), *E. woodmasoni* (Kemp 1911), *E. massavensis* (Kossman 1880), and *E. hesperia* (Manning 1968). Recent sampling from Australia as part of revisionary work on the Australian fauna and restudy of Vietnamese material collected by Raoul Serène revealed two new species of *Erugosquilla,* one from Australia and Taiwan, and one from Vietnam, described below.

The following abbreviations are used: A1, antennule; A2, antenna; AS, abdominal somite; CI, corneal index (CI), 100CL divided by cornea width; CL, carapace length, measured along the midline, excluding the rostral plate; coll., collector or collected by; F.R.V., Fisheries Research Vessel; IM, intermediate; LT, lateral; m, meter(s); MD, median; MG, marginal; mm, millimeter(s); MXP, maxilliped; n, number; NSW, New South Wales; PLP, pleopod; SM, submedian; St, stomatopod catalogue, MNHN, Paris; TL, total length, measured on the midline, from the anterior margin of the rostral plate to a line between the apices of the submedian teeth of the telson; TS, thoracic somite; WA, Western Australia. Terminology and size descriptors typically follow the conventions of Manning (1969, 1978), supplemented by some abbreviations proposed by Makarov (1979). All measurements are in millimeters.

Type material is deposited in the Australian Museum, Sydney (AM); Muséum National d'Histoire Naturelle, Paris (MNHN); National Taiwan Ocean University (NTOU), Keelung; and the National Museum of Natural History, Smithsonian Institution, Washington (USNM).

Family Squillidae Latreille, 1803
Erugosquilla Manning, 1995
Erugosquilla grahami, new species
Figs. 1, 2, 3A

Oratosquilla woodmasoni.—Graham et al., 1993:73 [list; not *Oratosquilla woodmasoni* (Kemp 1911)].

Material.—Holotype: Australia: AM P4276, 1 ♂, TL 139 mm, off Patonga, NSW, 32°34′S, 151°17′E, trawled, 7–10 m, coll. S. T. Ahyong.

Paratypes: Australia: AM P42767 (to USNM), 1 ♂, TL 133 mm, type locality, coll. S. T. Ahyong, 29 Jan 1994; AM P42762–66, 3 ♂♂, TL 92–141 mm, 2 ♀♀, TL 102–145 mm, type locality, coll. S. T. Ahyong, 12 Feb 1994; AM P42768–70, 3 ♂♂, TL 136–151 mm, type locality, coll. S. T. Ahyong, 12 Feb 1994

Other material.—AM P19332, 2 ♂♂, TL 115–134 mm, 30 miles south of Carnarvon [24°52′S, 113°38′E], WA, sandy mud with *Posidonia* and *Cymodocea* banks, 14–18 m, coll. N. Coleman, 3 Jun 1972; AM P19333, 1 ♀, TL 123 mm, off Carnarvon, WA, 23 m, coll. A. Nickol, May 1972; AM P41798, 1 ♂, TL 134 mm, east of Port Hunter, Newcastle, NSW, 32°55′S, 157°56′E, 66 m, F.R.V. *Kapala,* coll. K. Graham, Jun 1990; AM P41799, 1 ♂, TL 140 mm, southeast of Brunswick Heads, NSW, 28°35′S, 153°34′E, 12–15 m, F.R.V. *Kapala,* coll. K. Graham, 11 Aug 1991; AM P42955, 1 ♂, TL 125 mm, off Newcastle, NSW, 32°55′S, 151°56′E, 69–73 m, F.R.V. *Kapala,* coll. K. Graham, 3 Dec 1990; AM P42956–58, 1 ♂, TL 144 mm, 2 ♀♀, TL 101–141 mm, off Clarence river, NSW, 30°48′S, 153°02′E, 22–30 m, F.R.V. *Kapala,* coll. K. Graham, 5 Nov 1991; AM P42949, 1 ♀, TL 94 mm, Port Jackson, NSW, 33°55′S, 151°15′E, coll. M. Beatson, 7 Mar 1994; AM P42950, 1 ♀, TL 74 mm, Port Jackson, NSW, 33°55′S, 151°15′E, coll. M. Beatson, 7 Mar 1994; AM P42951–54, 2 ♂♂, TL 64–116 mm, 2 ♀♀, TL 122–146 mm, Port Jackson, NSW, 33°51′S, 151°15′E, coll. M. Beatson, 7 Mar 1994.

Taiwan: NTOU, 1 ♂, TL 91 mm, western Taiwan, 50 m, on sand, commercial trawler, 6 Jul 1996.

Description.—Size large, TL of adults to at least 150 mm. Dorsal surface smooth, polished.

Eye large, not extending beyond A1 peduncle segment 1; cornea strongly bilobed, set obliquely on stalk; CI 295-403 (holotype 373).

Ophthalmic somite anterior margin trapezoid, with median spinule. Ocular scales separate, subtruncate.

A1 peduncle subequal to CL. A1 somite dorsal processes trianguloid, apices acute, directed anterolaterally. A2 scale slender, length 0.5–0.7 CL.

Rostral plate broader than long, trapezoid; lateral margins upturned, convergent, straight; apex truncate; dorsal surface lacking MD carina.

Carapace anterior width 0.6 CL; anterolateral spines not extending beyond base of rostral plate; MD carina very low, indistinct; anterior bifurcation absent; with normal complement of carinae (MD, SM, LT, MG); posterior median projection very low or absent.

Raptorial claw dactylus with 6 teeth, outer margin sinuous, lacking basal notch or lobe; carpus dorsal carina irregularl tuberculate; propodus opposable margin evenly pectinate, distal margin lacking stout tooth; merus outer inferodistal angle at most a blunt angle.

Mandibular palp 3-segmented. MXP1–4 each with epipod. MXP5 basal segment with ventrally directed spine.

TS6–8 each with SM and IM carinae, former indistinct. TS5 lateral process bilobed, anterior lobe a slender spine directed anterolaterally, posterior lobe short, triangular, apex acute, directed laterally.

TS6 lateral process bilobed; anterior lobe much smaller than posterior, slender, apex blunt; posterior lobe broad, triangular, anterior margin straight, apex acute.

TS7 lateral process bilobed, anterior lobe much smaller than posterior, latter lobe

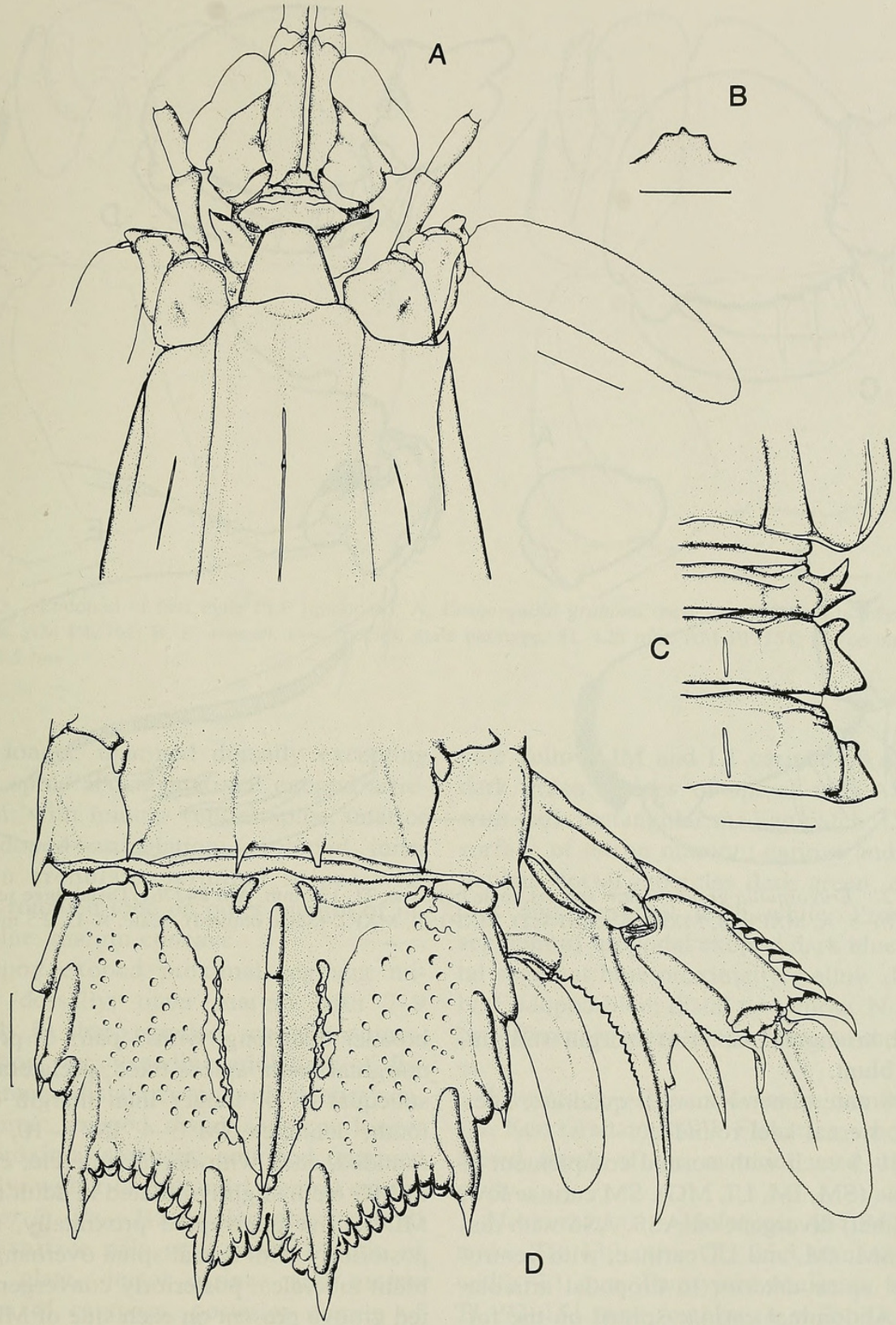

Fig. 1. *Erugosquilla grahami,* new species, male holotype, TL 139 mm, AM P42761. A, Anterior part of body; B, Anterior margin of ophthalmic somite, enlarged; C, Lateral processes of TS5–7; D, AS6, telson, and right uropod. (Setae omitted). Scale: A,C,D, 5 mm; B, 2.5 mm.

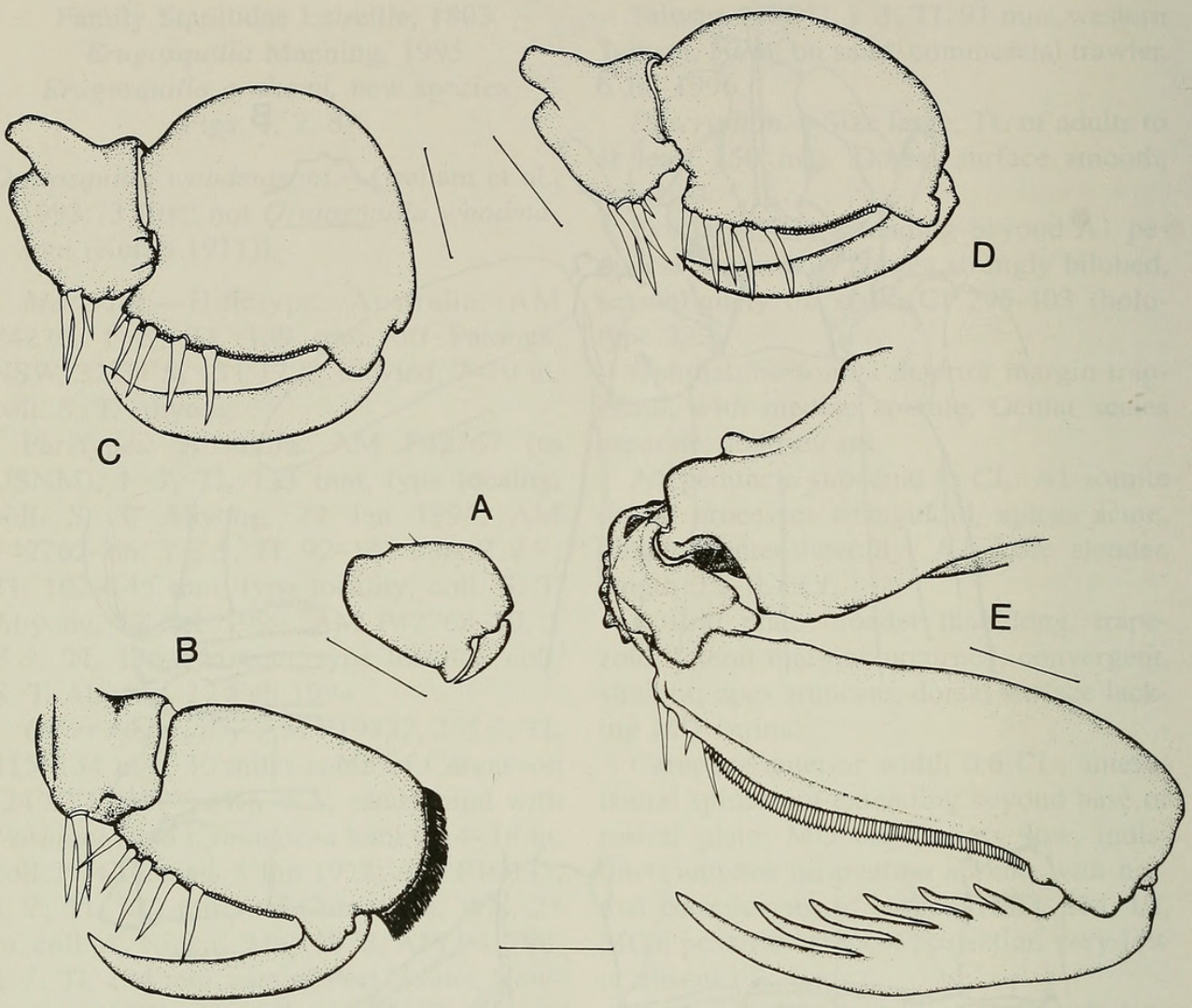

Fig. 2. *Erugosquilla grahami,* new species, male holotype, TL 139 mm, AM P42761. Distal three segments of MXP1–5. A, MXP1; B, MXP5; C, MXP4; D, MXP3; E, MXP2. (Setae omitted). Scale: A–D, 2.5 mm; E, 5 mm.

broad, triangular, anterior margin straight, apex blunt.

TS8 anterolateral margin quadrate, apex blunt; sternal keel rounded.

AS1–5 each with normal complement of carinae (SM, IM, LT, MG). SM carinae low, indistinct; divergent on AS5. AS6 with distinct SM, IM, and LT carinae; with ventrolateral spine anterior to uropodal articulation. Abdominal carinae spined on the following somites: SM 5–6; IM 3–6; LT (2)3–6; MG 1–5.

Male PLP1 endopod with hook process approximately half length of tube process; apex blunt.

Telson flattened, subquadrate, slightly broader than long; with 3 pairs of primary marginal teeth, apices fixed; prelateral lobe subequal to or longer than margin of LT tooth; denticles SM 3–4, IM 8–10, LT 1, rounded, each with dorsal tubercle; carinae of MG teeth slightly inflated in adult males; MD carina interrupted proximally, armed posteriorly with apical spine overhanging 2 blunt tubercles; posteriorly convergent, pitted groove present on each side of MD, lateral margin raised, irregular, but not formed by distinct tubercles; dorsolateral surface with curved rows of shallow pits; ventral surface with postanal carina.

Uropod protopod terminating in 2 slender spines, dorsally and ventrally carinate,

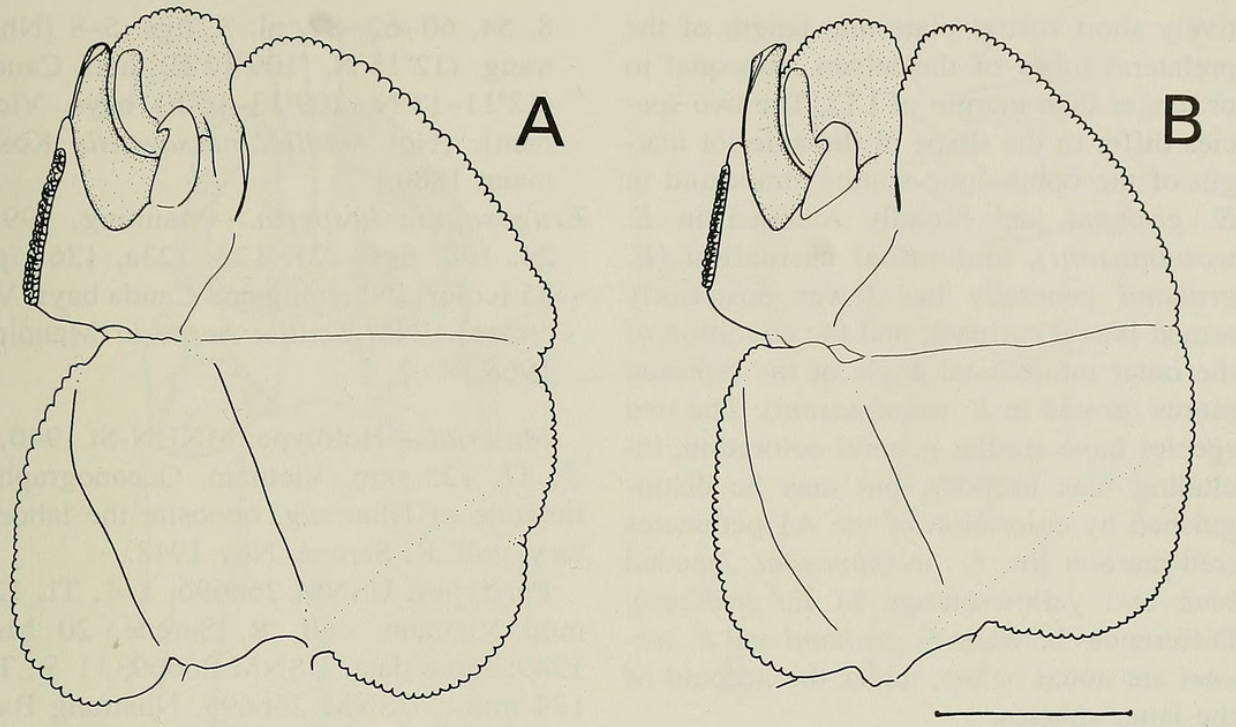

Fig. 3. Endopod of first male PLP (gonopod). A, *Erugosquilla grahami,* new species, male holotype, TL 139 mm, AM P42761; B, *E. serenei,* new species, male paratype, TL 125 mm, AM P12151. (Setae omitted.) Scale: 2.5 mm.

inner longer, unarmed dorsally excepting dorsal spine above proximal exopod articulation; with minute ventral spine anterior to endopod articulation; protopod inner margin crenulate, terminal spines with small, rounded lobe on outer margin of inner spine, margin concave.

Uropod exopod proximal segment unarmed dorsally; outer margin with 7–9 (usually 8) sharp, graded, movable spines, distalmost not exceeding midlength of distal segment; distal margin with slender ventral spine; exopod distal segment longer than proximal segment; endopod unarmed dorsally, with 1 dorsal and 1 ventral carina.

Color in life.—Base color white; overall dorsal surface pale gray-green. Margin of rostral plate, dorsal carinae and gastric grooves of carapace, posterior margin of carapace and thoracic somites, SM carinae of thoracic and abdominal somites, red. A1 peduncle with alternating blue and yellow-orange banding. A2 scale blue proximally, yellow distally. Meral-carpal articulation of raptorial merus yellow. Meral depression pale yellow. IM and LT carinae of AS5–6 dark green; apices of spines red. AS2, 5 with dark rectangular median patch. Dorsal surface of telson maroon; carinae and denticulate dorsal tubercles dark green; denticles and marginal teeth white. Proximal segment of uropodal exopod dark blue; distal segment blue proximally, yellow distally. Endopod blue; distal tip yellow. No color differences were noted between the sexes.

Etymology.—This species is named for Mr. Ken Graham, NSW Fisheries, who collected much of the material used in this study.

Measurements.—Holotype: AM P42761, male, TL 139 mm, CL 26.5 mm, cornea width 7.1 mm. Paratypes: Males (n = 7), TL 92–151 mm; females (n = 2), TL 102 and 145 mm. Other material: males (n = 9) 64–151 mm; females (n = 7) TL 74–146 mm.

Remarks.—*Erugosquilla grahami,* new species, is morphologically most similar to *E. woodmasoni* (Kemp 1911) in the rela-

tively short rostral plate and length of the prelateral lobes of the telson (subequal to or longer than margin of LT). The two species differ in the shape of the anterior margin of the ophthalmic somite (trapezoid in *E. grahami* and broadly rounded in *E. woodmasoni*), abdominal carination (*E. grahami* generally has fewer posteriorly armed lateral carinae), and the condition of the outer inferodistal angle of the raptorial merus (armed in *E. woodmasoni*). The two species have similar general coloration, including blue uropods, but may be distinguished by coloration of the A1 peduncles (red-maroon in *E. woodmasoni,* banded blue and yellow-orange in *E. grahami*). Differences between *E. grahami* and *E. serenei* are noted below, under the account of the latter species.

Both *E. woodmasoni* and *E. grahami* are known from New South Wales, but the latter is more common. Like most squillids, *E. grahami* inhabits shallow coastal waters and constructs burrows in soft level substrates. The present specimens were collected in depths of 7–73 m (but usually less than 30 m), over sandy mud and vegetated sand (*Cymodocea* and *Posidonia*).

The known distribution of *E. grahami* (i.e., Taiwan and Australia) is discontinuous, but likely reflects limited sampling effort in intermediate localities. The disjunct Australian distribution of *E. grahami* suggests that it probably occurs throughout northern Australian waters. The Taiwanese specimen agrees in almost all respects, including live coloration, with Australian material, except that the TS7 lateral process anterior lobe is sharper than in most Australian specimens.

Distribution.—Taiwan and Australia, from northern New South Wales, south to Port Jackson, and Carnarvon, Western Australia.

Erugosquilla serenei, new species
Figs. 3B, 4

Squilla massavensis.—Serène, 1951:fig. 2 [Vietnam]; 1953:507 [Vietnam]; 1954:6, 8, 54, 60–62, 87, pl. 3, figs. 5–8 [Nhatrang (12°15′N, 109°12′E) and Cauda (12°11–13′N, 109°13–16′E) bays, Vietnam]. [Not *Squilla massavensis* Kossmann 1880.]

Erugosquilla hesperia.—Manning, 1995: 24, 198, figs. 121, 122, 123a, 136a, pl. 35 [color] [Nhatrang and Cauda bays, Vietnam]. [Not *Squilla hesperia* Manning 1968.]

Material.—Holotype: MNHN-St 1940, 1 ♂, TL 125 mm, Vietnam, Oceanographic Institute of Nhatrang, opposite the laboratory, coll. R. Serène, Nov 1948.

Paratypes: USNM 266696, 1 ♂, TL 126 mm, Vietnam, coll. R. Serène, 20 May 1949; same data, USNM 266693, 1 ♀, TL 124 mm.—USNM 266695, Nhatrang Bay, 1 ♀, TL 103 mm, coll. R. Serène, 21 May 1949.—USNM 277646, 1 ♀, TL 142 mm, Oceanographic Institute of Nhatrang; AM P12151, 1 ♂, 126 mm, same locality, depth 25 m, coll. R. Serène, 23 Nov 1949; AM P51049, 1 ♀, 116 mm, same locality, coll. R. Serène, 23 Nov 1949.

Description.—Size large, TL of adults to at least 140 mm. Dorsal surface smooth, polished.

Eye large, extending to or slightly overreaching A1 peduncle segment 1; cornea strongly bilobed, set obliquely on stalk; CI 325–380 (holotype 349).

Ophthalmic somite anterior margin trapezoidal, with small median spinule (broken in Fig. 4A). Ocular scales separate, subtruncate.

A1 peduncle slightly shorter than CL. A1 somite dorsal processes triangular, apices acute, directed anterolaterally. A2 scale slender, length 0.7 CL.

Rostral plate appearing elongate, length and width at base subequal; lateral margins upturned, convergent anteriorly, straight; apex truncate; dorsal surface lacking MD carina.

Carapace anterior width 0.6 CL; anterolateral spines not extending beyond base of rostral plate; MD carina distinct posterior to

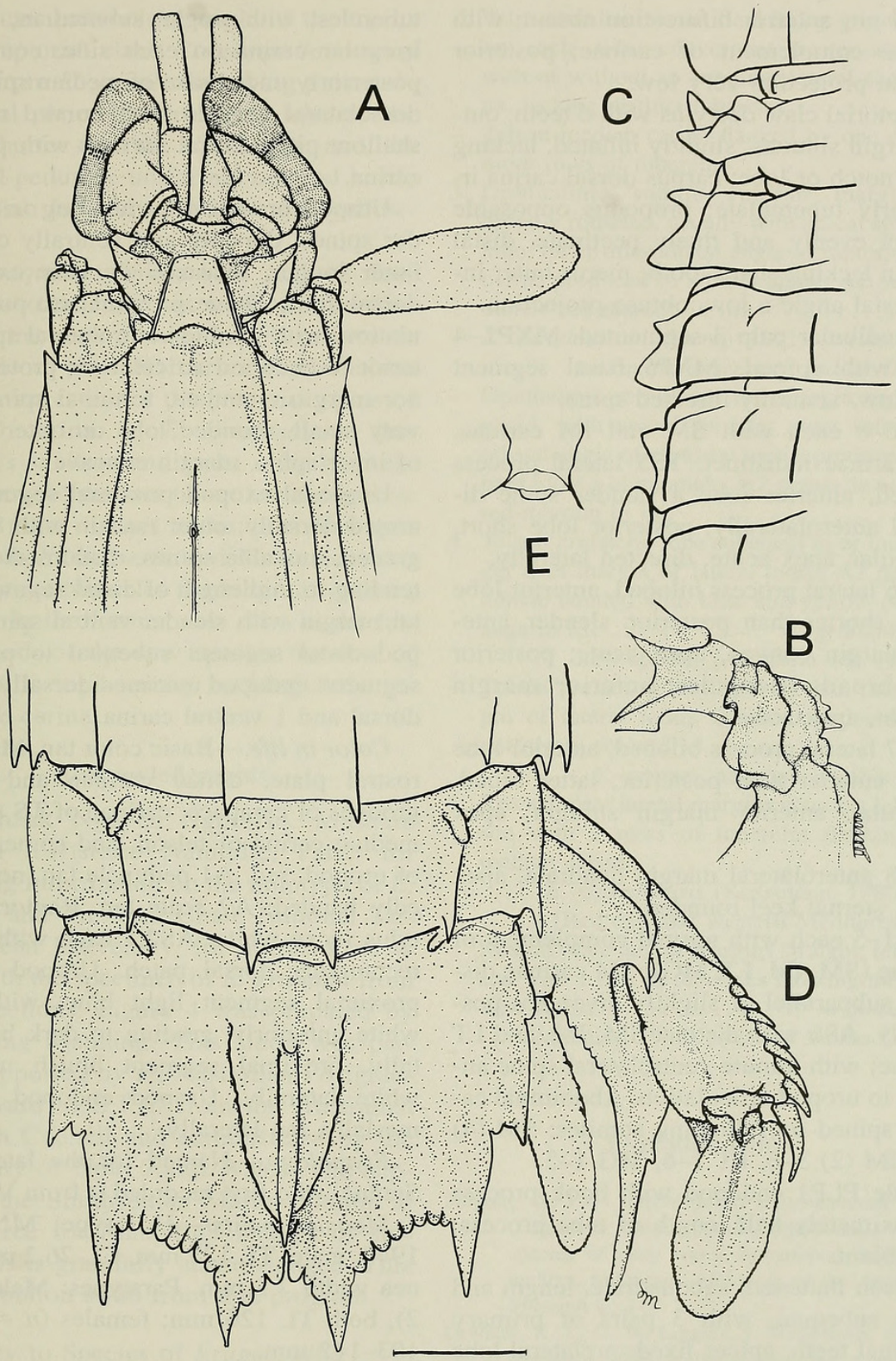

Fig. 4. *Erugosquilla serenei,* new species. A–D, female paratype, TL 103 mm, USNM 266695; E, female paratype, TL 124 mm, USNM 266693. A, Anterior part of body; B, Carpus of raptorial claw; C, Lateral processes of TS5–8; D, AS5–6, telson, and right uropod; E, anterior margin of ophthalmic somite. (Setae omitted). Scale: A–D, 5 mm; E, 2.5 mm.

dorsal pit, anterior bifurcation absent; with normal complement of carinae; posterior median projection very low.

Raptorial claw dactylus with 6 teeth, outer margin sinuous, slightly inflated, lacking basal notch or lobe; carpus dorsal carina irregularly tuberculate; propodus opposable margin evenly and finely pectinate, distal margin lacking sharp tooth; merus outer inferodistal angle a low, obtuse projection.

Mandibular palp 3-segmented. MXP1–4 each with epipod. MXP5 basal segment with low, ventrally directed spine.

TS6–8 each with SM and IM carinae, SM carinae indistinct. TS5 lateral process bilobed, anterior lobe a slender spine directed anterolaterally, posterior lobe short, triangular, apex acute, directed laterally.

TS6 lateral process bilobed, anterior lobe much shorter than posterior, slender, anterior margin convex, apex acute; posterior lobe broad, triangular, anterior margin straight, apex acute.

TS7 lateral process bilobed, anterior lobe much smaller than posterior; latter broad, triangular, anterior margin straight, apex blunt.

TS8 anterolateral margin quadrate, apex blunt; sternal keel rounded.

AS1–5 each with normal complement of carinae (SM, IM, LT, MG); SM carinae distinct, subparallel or slightly divergent posteriorly. AS6 with distinct SM, IM, and LT carinae; with minute ventrolateral spine anterior to uropod articulation. Abdominal carinae spined on following somites: SM (4) 5–6, IM (2) 3–6, LT 1–6, MG 1–5.

Male PLP1 endopod with hook process approximately half length of tube process; apex blunt.

Telson flattened, subquadrate, length and width subequal, with 3 pairs of primary marginal teeth, apices fixed; prelateral lobe shorter than margin of LT tooth; denticles SM2–3, IM7–9, LT1, rounded, each with dorsal tubercle; carinae of MG teeth at most slightly inflated in adult males; median carina interrupted proximally, armed posteriorly with apical spine overhanging 2 blunt tubercles; with single, submedian, curved, irregular carina on each side, converging posteriorly under base of median spine, and dorsolateral surface with curved rows of shallow pits; ventral surface with postanal carina.

Uropod protopod terminating in 2 slender spines, dorsally and ventrally carinate, inner longer; unarmed dorsally excepting dorsal spine above proximal exopod articulation; with minute ventrolateral spine anterior to endopod articulation; protopod inner margin crenulate, terminal spines with very small, rounded lobe on outer margin of inner spine, margin concave.

Uropodal exopod proximal segment unarmed dorsally; outer margin with 8 sharp, graded, movable spines, distalmost not extending to midlength of distal segment; distal margin with slender ventral spine; exopod distal segment subequal to proximal segment; endopod unarmed dorsally, with 1 dorsal and 1 ventral carina.

Color in life.—Basic color tan. Margin of rostral plate, dorsal carinae and gastric grooves of carapace, carinae of TS and AS, median carina of telson, and some carinae of uropod, red. A1 peduncle tan, not markedly banded; A2 scale tan. Raptorial dactylus ivory white. AS2,5 each with dusky, rectangular dorsal patch. Uropod exopod proximal segment light blue, with some white anteriorly, grading to dark blue distally, proximal segment bluish mesially, white laterally. Uropod endopod reddish mesially, tan laterally.

Etymology.—Named for the late Raoul Serène, who first recorded it from Vietnam.

Measurements.—Holotype: MNHN-St 1940, male, TL 125 mm, CL 26.2 mm, cornea width 7.5 mm. Paratypes: Males (n = 2), both TL 126 mm; females (n = 4) TL 103–142 mm.

Remarks.—*Erugosquilla serenei* resembles *E. grahami* and differs from *E. woodmasoni* (Kemp) in having the anterior margin of the ophthalmic somite trapezoidal in shape rather than evenly rounded and a blunt angle or lobe rather than a sharp spine

at the outer inferodistal angle of the merus of the raptorial claw. *Erugosquilla serenei* differs from *E. gracilis* in having a narrower rostral plate; the prelateral lobe of the telson shorter than the LT margin; and, the antennal peduncle uniformly colored in life rather than banded with blue and yellow-orange.

Erugosquilla woodmasoni and its four congeners that have six teeth on the dactylus of the claw all also have a groove on each side of the MD carina of the telson that converges under the posterior spine of the MD carina. In *E. woodmasoni,* this groove is shallow and lacks a flanking carina or row of distinct tubercles; the groove is much more distinct in the other four species. Both *E. hesperia* and *E. massavensis* have distinct tubercles flanking this groove, one row in the former, two rows in the latter. In both of the new species the row of tubercles is replaced by an irregularly tuberculate carina.

Acknowledgments

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Key to Species of *Erugosquilla*

1. Dactylus of claw with 7 teeth; rostral plate as long as broad, apex evenly rounded ..... *E. septemdentata* (Ahyong 1994) [Indonesia]
– Dactylus of claw with 6 teeth; rostral plate usually apically flattened 2
2. Telson median carina flanked by groove on each side, convergent posteriorly, with or without an irregular lateral carina, lacking distinct tubercles 3
– Telson median carina flanked by one or more rows of tubercles 5
3. Ophthalmic somite anterior margin broadly rounded, usually with apical spinule; outer inferodistal angle of raptorial merus produced to a blunt spine; A2 peduncle red-maroon in life ..... *E. woodmasoni* (Kemp 1911) [western Pacific to western Indian Ocean]
– Ophthalmic somite anterior margin trapezoid, with apical spinule; outer inferodistal angle of raptorial merus produced to at most a blunt angle; A2 peduncle not red-maroon in life 4
4. Telson prelateral lobe subequal to or longer than margin of lateral tooth; A2 peduncle banded with blue and yellow-orange in life ..... *E. grahami,* new species [Australia and Taiwan]
– Telson prelateral lobe shorter than margin of lateral tooth; antennal peduncle uniformly colored ..... *E. serenei,* new species [Vietnam]
5. Rostral plate lateral margins sinuous; telson with 2 rows of tubercles flanking median carina ..... *E. massavensis* (Kossmann, 1880) [Red Sea and western Mediterranean]
– Rostral plate lateral margins straight; telson with 1 row of tubercles flanking median carina ..... *E. hesperia* (Manning 1968) [western Indian Ocean]

Literature Cited

Ahyong, S. 1994. *Oratosquilla septemdentata* n. sp. (Crustacea: Stomatopoda: Squillidae), a new species of deep water stomatopod from Halmahera, Indonesia.—Records of the Australian Museum 46:1–4.

Graham, K. J., G. W. Liggins, J. Wildforster, & S. J. Kennelly. 1993. Relative abundances and size compositions of prawns and by-catch species on New South Wales prawn grounds during surveys V–VIII (May 1991–May 1992).—Kapala cruise report 112:1–73. Fisheries Research Institute, NSW.

Kemp, S. 1911. Preliminary descriptions of new species and varieties of Crustacea Stomatopoda in

the Indian Museum.—Records of the Indian Museum 6(2):93–100.

Kossmann, R. 1880. Malacostraca.—Zoologische Ergebnisse einer im Auftrage der königlichen Akademie der Wisssenschaften zu Berlin ausgefürten Reise in die Küstengebiete des Rothen Meeres 2(1):1–140, pls. 1–15.

Makarov, R. R. 1979. A collection of stomatopod crustaceans of the genus *Clorida* Eydoux & Souleyet, 1842, from Tonkin Bay, Vietnam.—Crustaceana 37(1):39–56.

Manning, R. B. 1968. Stomatopod Crustacea from Madagascar.—Proceedings of the United States National Museum 124:1–61.

———. 1969. Stomatopod Crustacea of the western Atlantic.—Studies in Tropical Oceanography, Miami 8:1–380.

———. 1978. Further observations on *Oratosquilla*, with accounts of two new genera and nine new species (Crustacea: Stomatopoda: Squillidae).—Smithsonian Contributions to Zoology 272:1–44.

———. 1995. Stomatopod Crustacea of Vietnam: The legacy of Raoul Serène.—Crustacean Research, Special Number 4:1–339. The Carcinological Society of Japan, Tokyo.

Serène, R. 1951. Sur la circulation d'eau à la surface du corps des Stomatopodes.—Bulletin de la Société zoologique de France 76(3):137–143, pl. 1.

———. 1953. Sur la collection des Stomatopodes de l'Institut Océanographique de l'Indochine.—Proceedings of the Seventh Pacific Science Congress, 1949 4(Zoology):506–508.

———. 1954. Observations biologiques sur les Stomatopodes.—Mémoires de l'Institut Océanographique de Nhatrang 8:1–93, pls. 1–10.