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**PETROLISTHES EXTREMUS, A NEW PORCELAIN CRAB
(DECAPODA: ANOMURA: PORCELLANIDAE)
FROM THE INDO-WEST PACIFIC**

Roy K. Kropp and Janet Haig

Abstract.—*Petrolisthes extremus*, new species, is described from several locations in the Indo-west Pacific. The new species is most similar to *P. coccineus* and *P. carinipes*, with which it shares a transversely rugose carapace, sinuously triangular front, and one epibranchial spine. *Petrolisthes extremus* is distinguished from the *P. coccineus* by having the lateral margins of the carapace not converging strongly between its widest point and the epibranchial spines and by having the carpus of the cheliped relatively shorter and wider. *Petrolisthes extremus* is distinguished from *P. carinipes* by having a narrower front of the carapace that has sharply oblique lateral lobes. The new species is known from Cocos Keeling, the Kermadec Islands, Lord Howe Island, Easter Island, the Mariana Islands, and Taiwan.

Among several collections of porcellanid crabs from the Indo-west Pacific were specimens belonging to an undescribed species of *Petrolisthes*. Study of the material revealed that several previous literature records also could be referred to the new species.

The material used in this study is located in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM), the Natural History Museum of Los Angeles County (the collections formerly were associated with the Allan Hancock Foundation), Los Angeles, California [LACM (AHF)], the Bernice P. Bishop Museum, Honolulu, Hawaii (BPBM), the Australian Museum, Sydney, Australia (AM), the National Museum of New Zealand, Wellington, New Zealand (NMNZ), and the Institute of Zoology, Academia Sinica, Taipei, Taiwan (IZAS).

Abbreviations used are: cl, carapace length; cw, carapace width; coll., collector; ft, feet; m, meters; mm, millimeters; and ovig., ovigerous.

Petrolisthes extremus, new species

Fig. 1

- Petrolisthes*, sp.—Whitelegge, 1889:36 [list, Lord Howe Island].
- Petrolisthes lamarcki*.—Gillett & McNeill, 1959:158, pl. 152, figure at bottom of page [Lord Howe Island]. [Not *Petrolisthes lamarckii* (Leach, 1820)].
- Petrolisthes coccineus*.—Gillett & McNeill, 1962:158, pl. 152, figure at bottom of page; Gillett and McNeill, 1967:158, pl. 152, figure at bottom of page [Lord Howe Island]. [Not *Petrolisthes coccineus* (Owen, 1839)].
- Petrolisthes* n. sp. 2 [Haig, ms].—Kropp et al., 1981:39 [Guam]; Kropp & Eldredge, 1982:125 [Cabras Island, Guam].

Type material.—Holotype: Mariana Islands: Guam; Asan Point; shore at low tide; 13 Jun 1980; coll. R. K. Kropp; 1 ♂ LACM 80-151.1 (AHF 8014). Paratypes: Cocos Keeling Island: West Island (ocean side); cove on N end (12°8'22"S, 96°49'0"E); dead coral; <1 m; 22 Feb 1974; coll. Smith-

Vaniz et al., 1 ♀ (ovig.) USNM 190765. Kermadec Islands: Sunday Island; 1909–1910; coll. R. S. Bell & W. R. B. Oliver; 9 ♂, 7 ♀ (3 ovig.) NMNZ. Taiwan: Hsan Tiao Chiao; 10 May 1969; coll. Ting; 1 ♂ IZAS. Yeh Liu Pi; poison station; 2 m; 28 Jun 1978; coll. L. G. Eldredge; 2 ♂, 1 ♀ (ovig.) LACM 78-237.1 (AHF); Kuei-An; 47 km S of Hualien; subtidal under rock; 2 Jul 1978; coll. L. G. Eldredge; 1 ♀ (ovig.) USNM 210587. Mariana Islands: Guam; Asan Point; shore at low tide; 13 Jun 1980; coll. R. K. Kropp; 1 ♀ (ovig.) LACM 80-151.2 (AHF); Piti Bay; outer reef flat W of Camel Rock; down 1–2 m in consolidated rubble; 11 Jun 1986; coll. B. D. Smith & H. Conley; 2 ♀ (ovig.) BPBM. Easter Island: from starfish stomach; Jan 1965; coll. I. Efford & J. Mathias; 1 ♂ LACM 65-325.2 (AHF 654); Anakena; 20–25 ft [7–8 m]; 15 Jan 1965; coll. I. Efford & J. Mathias; 1 ♂ (damaged) LACM 65-325.1 (AHF); Motu Iti; rock; 8 Aug 1972; coll. H. I. Moyano; 1 ♀ LACM 72-358.1 (AHF).

Other material examined.—Taiwan: Kuei-An; 47 km S of Hualien; on *Pocillopora danae* Verrill and *Stylophora pistillata* (Esper); 1–3 m; 23 Jul 1979; coll. R. K. Kropp; 3 ♀, 2 ♂ USNM 210585, 210586; San Hsien Tai; on *Pocillopora danae*; 3 m; 25 Jul 1979; coll. R. K. Kropp; specimen parasitized by rhizocephalan, USNM 210584. Mariana Islands: Anatahan; “Observation Spot”; intertidal under rocks; 19 Jul 1981; coll. L. G. Eldredge; 3 ♀ USNM 210588; subtidal under rock; 5–7 m; 19 Jul 1981; 1 ♀ USNM. Pagan; Katsu; subtidal under rock; 2 m; 7 Mar 1981; 2 ♀ USNM; “Palapala Bay”; under rock; 1 m; 15 Jul 1981; 1 ♀ USNM. Guam; Piti Bay; outer reef flat; intertidal; 13, 15 Jun 1980; 3 Jun 1981; 3 ♂, 2 ♀ (1 ovig.) USNM; outer reef flat; down 1–2 m in consolidated coral rubble; 18 May, 11 Jun 1986; coll. B. D. Smith & H. Conley; 2 ♂, 2 ♀ (ovig.) USNM; Luminao; reef front under rock; 6 m; 8 Sep 1980; coll. V. Tyndzik; 1 ♂ USNM. Pago Bay; outer reef flat; intertidal; 3 May 1980;

1 juv.; reef front under rock; 2–3 m; 24, 31 May 1986; 1 ♂, 1 ♀ (ovig.) USNM. Lord Howe Island: collected before 1900; 1 ♀ AM G.2420, 2 ♂, 2 ♀ AM G.2512; collected before 1909; coll. A. R. McCulloch; 2 ♀ AM P.1131; 1921; coll. A. R. McCulloch; 2 ♂ AM P.5248, 1 ♂, 5 ♀ AM P. 5429; collected before 1924; coll. G. P. Whitely; 4 ♂ AM P.6883; Ned’s Beach; Jul 1959; coll. E. Pope; 1 ♀ AM P.15168; Ned’s Beach; from coral; Oct 1962; coll. J. Booth; 1 ♂ AM P.15169; 6 Mar 1963; coll. J. Booth; 1 ♂, 2 ♀ AM P.15170.

Measurements.—Holotype: cl, 6.6 mm, cw, 6.5 mm. Paratypes: largest male: cl, 11.3 mm, cw, 10.5 mm; largest female: cl, 9.8 mm, cw, 9.7 mm; smallest ovigerous female: cl, 5.0 mm, cw, 4.6 mm.

Diagnosis.—Carapace with distinct transverse rugae each with anterior row of setae, 1 epibranchial spine present; front sinuously triangular, margin serrated, supraocular spine present. Chelipeds slightly unequal in size; carpus with squamate median longitudinal ridge, anterior margin with 3–4 spine-tipped teeth, posterior margin with 3 spines; dorsal surface of manus divided by longitudinal squamous ridge, outer portion with granules, outer margin serrated and with 6 or more spines on proximal half; inner edges of fingers serrated, gape with very short setae, projecting only slightly above surfaces of fingers. Merus of walking legs with transverse striations, anterior margin with 3–8 spines and fringed with plumose setae, posterodistal spines 2, 2, 0; carpus of first walking leg with or without anterodistal spine.

Description.—Carapace slightly longer than broad, broadest at posterior branchial region, lateral margins strongly converging anteriorly, cristate. Front sinuously triangular, lateral lobe oblique, less produced than median lobe; margin crenulate; protogastric lobes fringed anteriorly with plumose setae, divided by median groove. Supraocular lobe well-developed, spine usually present, occasionally obsolescent. Orbits shallow, very

oblique; outer orbital angle not produced, or produced into very small tooth. Epi-branchial spine well-developed. Gastric region with strong transverse striae, sometimes interrupted at midline; hepatic, anterior branchial, outer margin of posterior branchial with shorter striae; frontal region crossed with fine transverse lines; cardiac, posterior branchials except near margins finely punctate, appearing smooth. Striae of carapace lined anteriorly with very fine, short setae, extending less than half way between crests of adjacent striae.

Basal segments of antennules with several irregularly-spaced denticles of varying size on anterior margin. First movable segment of antennae with strong, spinnule-tipped lobe on anterior margin; second rugose or strongly granulate along anterior margin, tubercle sometimes developed anteroproximally; third smooth.

Dorsal extension of ocular peduncle onto cornea triangular, lined with simple setae, single larger seta distally (often missing in preserved specimens); cornea round in lateral view.

Merus of chelipeds transversely rugose on dorsal and ventral surfaces; inner margin with strong rugose tooth or lobe, its edges crenulate; distal margin with one or two spines, lined distally with plumose setae; median or subproximal spine usually present on outer portion of dorsal surface. Carpus (excluding inner marginal teeth) about twice as long as wide; inner margin with 3–4 strong teeth, these serrate or crenulate along edges, often with smaller denticles between them; series of 5–6 spines along distal half of outer margin, including 1 at outer distal angle; dorsal surface with median longitudinal row of broad, flat squamae, inner portion (including marginal teeth) covered with smaller flattened granules; ventral surface with transverse rugae. Palm with outer margin thin, strongly curved, serrated and proximally spinulate in smaller specimens, crenulate or with blunt teeth in larger ones; dorsal surface with strong longitudinal crest

extending from base of dactyl nearly to articulation with carpus; surface inside this crest with oblique rugae or flattened squamae; surface to outside covered with flattened or somewhat upstanding granules; ventral surface obliquely rugose. Dactyl with longitudinal row of prominent, flattened squamae; surface of fixed finger slightly concave, usually granulate; cutting edges meeting for entire length; in some individuals of both sexes, fingers of 1 cheliped gaping and cutting edge of dactyl with strong conical tooth proximally; ventral surfaces of fingers with flattened granules, inner side with short, sparse pubescence or none. All segments of cheliped with very short, fine setae arising from distal side of granules and rugae, but these scarcely visible except at margins; in smaller specimens a fringe along outer margin of chela; in larger adults this fringe absent or confined to proximal portion of margin; usually fringe of plumose setae along distal side of each inner carpal tooth.

Walking legs rugose dorsally; dorsal surface of all segments with simple setae of varying length; merus with thick fringe of plumose setae along anterior margin. Leg 1: merus with 6–9 spines on anterior margin, 2 well-developed posterodistal spines (the smaller, more anterior spine occasionally obsolescent); carpus with anterodistal spine; propodus with 2–3 movable spinules along midline of posterior margin. Leg 2: merus with 4–8 spines on anterior margin, 2 well-developed posterodistal spines (the smaller, more anterior spine occasionally obsolescent); carpus without anterodistal spine; propodus with 2–3 movable spinules along midline of posterior margin. Leg 3: merus with 3–5 spines on anterior margin, posterodistal margin unarmed; carpus without anterodistal spine; propodus with 2 movable spinules along midline of posterior margin. Dactyls of all legs with 3 movable spinules on posterior margin.

Coloration.—Overall color of carapace, chelipeds, and walking legs mottled light green, blue, and bright white with scattered

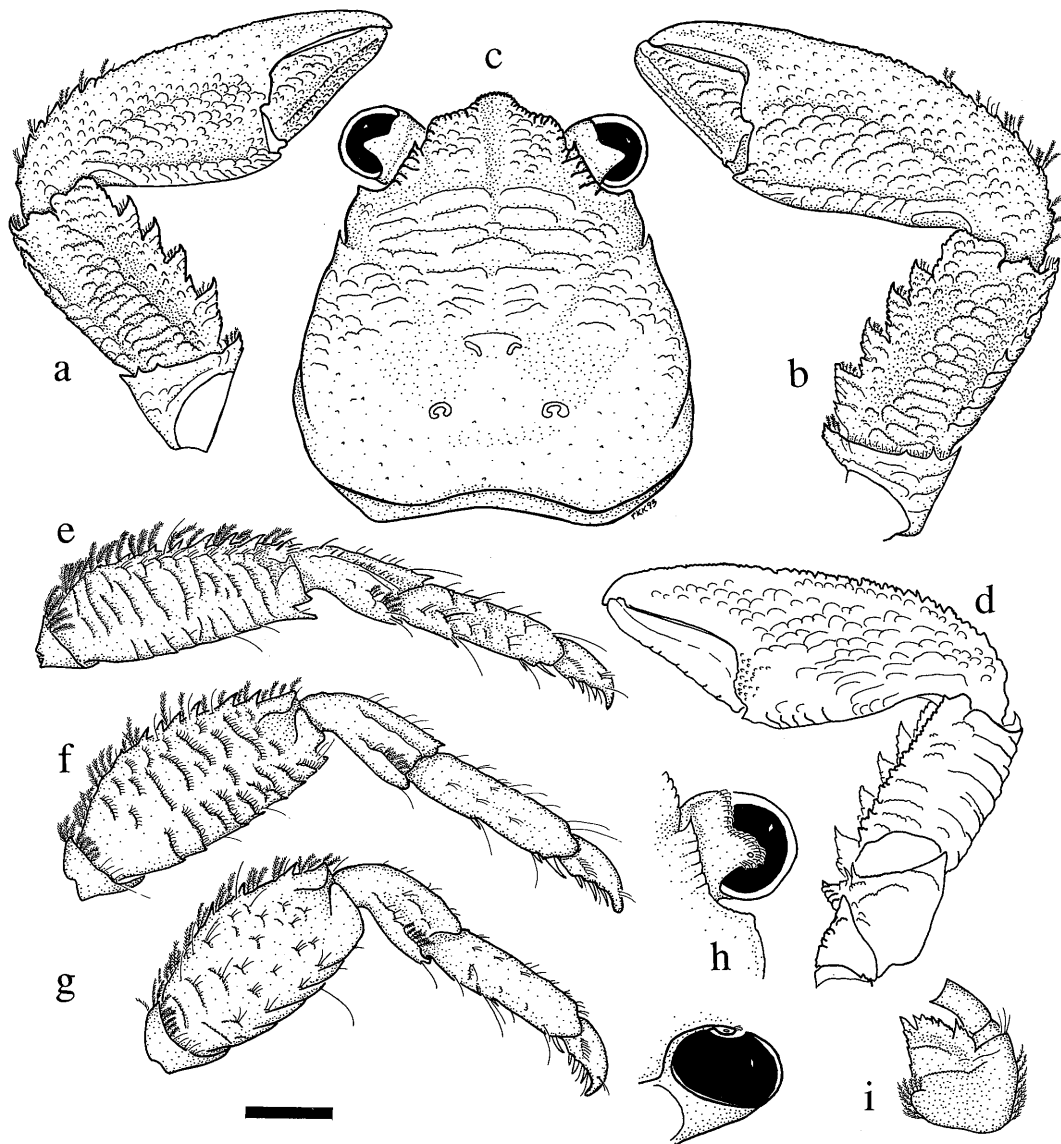


Fig. 1. *Petrolisthes extremus*, new species, paratype ♂ (Kermadec, NMNZ): a, b, chelipeds (dorsal view); c, carapace; d, left cheliped (ventral view); e-g, right walking legs 1, 2, 3; h, right eye (dorsal, lateral views); i, basal segment of right antennule. Scale: 2.2 mm (a, b, d); 1.5 mm (c, e-g); 1 mm (h-i).

burgundy spots; red setae line rugae of carapace. Propodus and dactylus of walking legs with transverse burgundy and white bands.

Remarks.—In the Indo-west Pacific, *P. extremus* is most similar to *P. coccineus* (Owen) and *P. carinipes* (Heller), with which it shares a transversely rugose carapace, sin-

uously triangular frontal region, a supra-ocular spine, and a single epibranchial spine. The ranges of the three species overlap in the western Pacific. *Petrolisthes extremus* ranges from Taiwan and the Mariana Islands south to Lord Howe Island and east to Easter Island. *Petrolisthes carinipes* occurs from the Red Sea and western Indian

Ocean to the Ryukyu, Ogasawara, Mariana, and Chesterfield Islands in the western Pacific (Haig 1983, 1987). *Petrolisthes cocchineus* ranges throughout the Indian Ocean, the western Pacific from Indonesia to Japan, and extends eastward from the Ogasawara and Mariana Islands to the Hawaiian Islands and the Tuamotu Archipelago (Haig 1983).

The coloration of the three species differs sharply. In contrast to the mottled light green, blue, and bright white with scattered burgundy spots marking the carapace and chelipeds of *P. extremus*, those of *P. carinipes* are dark red-brown, appearing black to the unaided eye (RKK, personal observation of material from Guam). The carapace of *P. carinipes* also is marked with white spots at the tip of the rostrum, at the supraocular spines, and along the lateral and medial regions. White spots also occur on the chelipeds of *P. carinipes*. In *P. coccineus*, the carapace is pale blue-green with the gastric region marked with pale yellow-orange and a dark yellow-orange gastric ridge (RKK, personal observation of material from Guam). The manus of *P. coccineus* is blue-green and marked with a distinctive orange longitudinal crest and yellow-orange along the outer margin.

Petrolisthes carinipes and *P. extremus* are very similar in the striation pattern of the carapace and in the form and armature of the chelipeds and walking legs. However, in *P. carinipes* the lateral carapace margins are evenly convex between the epibranchial and posterolateral angles, the lateral lobes of the front are nearly transverse, and the orbits are regularly concave between the supraocular spine and the outer orbital angle. In *P. extremus* the carapace is strongly divergent posteriorly, the lateral lobes of the front are sharply oblique, and the orbits oblique between the supraocular spine and the outer orbital angle.

Petrolisthes extremus may be most easily distinguished from *P. coccineus* by the relative proportions of the carpus of the che-

liped and the spination on the posterior margin of the merus of the third walking leg. The carpus of the cheliped is about twice as long as wide in *P. extremus*, but much more than twice as long as wide in *P. coccineus*. The posterodistal margin of the third walking leg is unarmed in *P. extremus*, but armed with one or two spines in *P. coccineus*. Also, in *P. coccineus* the front is narrowly triangular with the lateral lobes even more oblique and obscure than in *P. extremus*; the strong transverse striae on the gastric region are interrupted in the midline by a short but distinct interspace; and the number of spines on the anterior margin of the merus of the walking legs averages a little higher (5 to 9, 7 to 9, and 5 to 8 on legs 1, 2, and 3, respectively).

Etymology.—From the Latin, *extremus*, meaning outermost or farthest away. When study of this taxon began by one of us (JH), the only material available had been collected from Lord Howe, Kermadec, and Easter Islands, the “outposts” of the tropical or subtropical Indo-west Pacific. Although later collections from Taiwan and the Marianas counter the idea that the species is an “outpost taxon,” the initial name was retained, at least in part, to refer to the interesting distribution of the taxon in the southern hemisphere portion of its range.

Habitat.—In the Mariana Islands, found under rocks, generally subtidal to a depth of 7 m; occasionally in the intertidal zone. In Taiwan, also on base of pocilloporid corals.

Distribution.—*Petrolisthes extremus* ranges from Taiwan and the Mariana Islands in the western Pacific south to Lord Howe Island and eastward to the Kermadec Islands and Easter Island.

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Addresses: (RKK) Battelle Ocean Sciences, 397 Washington Street, Duxbury, Massachusetts 02332, U.S.A.; (JH) Allan Hancock Foundation, University of Southern California, University Park, Los Angeles, California 90089-0371, U.S.A.