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***Neoliomera moana*, a new cavernicolous species of xanthid crab from the Marquesas Islands (Crustacea: Decapoda: Brachyura)**

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Abstract

A new crab Liomerinae, *Neoliomera moana* **sp. nov.**, is described from the Marquesas Islands, based on three specimens collected by hand at the entrance of submarine caves at depths of 6–28 m. Within the genus the new species belongs to a group of six species that have the carapace cristate on the anterolateral margins. It can be recognized by the presence of a double crest on the upper margin of the palm of chela and by its colour pattern, with about twenty red spots on the dorsal surface of the carapace. This new species is considered has a potential endemic form to the Marquesas Islands.

Key words: Decapoda, Crustacea, Brachyura, Xanthidae, *Neoliomera*, new species, cavernicolous crabs, taxonomy, Marquesas Islands

Résumé

Un nouveau crabe Liomerinae, *Neoliomera moana* **sp. nov.**, est décrit des îles Marquises à partir de trois spécimens récoltés à la main à l'entrée de grottes sous-marines, à une profondeur de 6–28 m. La nouvelle espèce appartient dans le genre à un groupe de six espèces qui ont le bord antérolatéral de la carapace marginée. Elle se distingue par la présence de deux carènes sur le bord supérieur de la paume du chélicépède et par sa coloration, avec une vingtaine de points rouges sur la face dorsale de la carapace. Cette nouvelle espèce est considérée comme une forme potentiellement endémique des îles Marquises.

Introduction

A scientific expedition (“*Pakaihi i te Moana*”, or “respect of the ocean” in the Marquesan language) was carried out in 2011–2012, by the Agence des Aires Marines Protégées (AAMP, Brest, France) in collaboration with the French Polynesia government, the Marquesas Islands local authorities, and four scientific institutions, the Centre National de la Recherche Scientifique (CNRS), Institut Français pour le Développement (IRD), Institut Français de Recherche pour l'Exploitation de la Mer (IFREMER), and the Muséum national d'Histoire Naturelle, Paris (MNHN). The main goal of the expedition was to increase our knowledge of the marine life in these distant and relatively unspoiled islands, and study possibilities for its management. The expedition took place from November 2011 to February 2012, with four distinct legs. Legs 1, 2, and 4 were dedicated to study, respectively, coastal fishes, algae and invertebrates of littoral and shallow waters, and pelagic species. Leg 3 (10–30 January 2012) was dedicated to study the biodiversity in marine caves and depth waters, with scuba dives made in marine caves at depths of 10–50 m and submersible dives with a remotely operated vehicle (ROV) at depths of 50–550 m. The deep-water decapod crustaceans observed by the ROV during leg 3 were listed by Poupin *et al.* (2012). We describe herein a new species of xanthid crab collected by scuba in marine caves.

Material and methods

Three crabs were collected by hand during two scuba dives. Colour photographs were taken just after collection and before preservation in 95% alcohol. Specimens are deposited in the Muséum national d'Histoire naturelle, Paris (MNHN). Measurements in millimetres are of the carapace length and width. The abbreviations used are G1 and G2 for the first and second male pleopods respectively; P1–P5 for the first to fifth pereopods respectively, P1 being the cheliped and P2–P5 being the first to fourth ambulatory legs, respectively, and USNM for United States National Museum, Smithsonian Institution, Washington, D.C. The terminology for the carapace regions follows that of Serène (1984, figs. A–C) and Dana (1852: 74, unnumbered figure).

Taxonomy

Family Xanthidae MacLeay, 1838

Subfamily Liomerinae Sakai, 1976

Neoliomera moana sp. nov.

(Figs. 1A–D; 2A–B; 3A–B; 4A–E)

Neoliomera sp. nov.—Legall & Poupin 2012 [10 photographs].—Pérez *et al.*, 2012: 63 [lower photograph A–D].

Material examined. Holotype male (15.6 × 27.8 mm) (MNHN IU-2013-7281, accession number LC172), Marquesas Is., Fatu Hiva I., Matauta cave, *Pakaihi i te Moana* Expedition, leg 3, stn. MQ15-GR, 17–18 January 2012, 10°28.310'S, 138°40.680'W, scuba, 0–28 m, sand and coral rubble, coll. J. Starmer.

Paratypes: 1 female (12.9 × 23.7 mm), 1 female juvenile (7.1 × 12.5 mm) (MNHN IU-2013-4930, accession number LC172), same station than holotype; 1 female juvenile (8.9 × 16.5 mm) (MNHN IU-2013-4929, accession number LC316), Marquesas Is., Ua Pou I., Hakaheteau cave, *Pakaihi i te Moana* Expedition, leg 3, stn. MQ24-GR-R, 23 January 2012, 9°23.714'S, 140°07.759'W, scuba, 6–12 m, sand and coral rubble, coll. J. Starmer.

Description of holotype male. Carapace (Figs. 1A, D, 2A, B) transversally oval, width 1.78 times length. Front slightly produced beyond orbits, bilobed, with anterior margins almost straight, lobes separated by narrow incision. Anterolateral margins strongly convex, cristate, emphasized by furrow running parallel to margin; divided into 4 demarcated lobes, anterior lobe longest, poorly separated from second, third lobe well separated from adjacent lobes by sharp incisions, situated at widest point of carapace, fourth lobe smallest, sub-dentiform. Anterior half of dorsal surface of carapace sparsely setose, covered with numerous, evenly spaced, round granules. Regions poorly defined except for depressed epigastric areas; meso-, metagastric areas forming a distinct 3 M region; incisions between lateral lobes 2, 3 and 3, 4 continuing dorsally on one-fifth of carapace width as 2 sub-parallel grooves, with posterior one deepest. Posterolateral margins of carapace slightly convex, almost straight. Posterior dorsal half of carapace glabrous, with granules reduced; cardiac, intestinal areas appearing almost smooth to naked eye; posterior margin of carapace straight, with line of closely set granules.

Pterygostomial, suborbital, sub-branchial regions covered with granules (Figs. 1B–C, E, 3A–B). Orbits sub-circular, supra-orbital margin smooth, infra-orbital margin crested, feebly granular; cornea small, round, pigmented; ocular peduncle with granules of various sizes, largest at base of cornea. Antennules folding transversally. Basal antennal article sub-rectangular, about 1.1 times as long as wide; antennal flagellum short, slightly longer than movable articles of antennal peduncle; movable part of antenna freely accessing orbit. Epistome medially depressed; anterior margin granular, produced medially as narrow tip; posterior margin almost straight, slightly concave, smooth. Endostome smooth, regularly convex without noticeable ridges.

Third maxilliped minutely granular; ischium slightly elongated, 1.6 times longer than wide, with sub-median longitudinal sulcus; merus sub-rectangular, half as long as ischium, antero-external angle rounded, not noticeably produced, palp inserted at antero-internal angle. Exopod wider at proximal fourth portion, regularly tapering distally, reaching to antero-external angle of merus.



FIGURE 1. *Neoliomera moana* sp. nov., holotype, male 15.6 × 27.8 mm (MNHN IU-2013-7281, Marquesas Is., Fatu Hiva I. A, dorsal view; B, ventral view; C, frontal view; D, dorso-frontal view; E–F, ventro-frontal view.

Thoracic sternum sparsely granular (Figs. 1B, F, 3B, 4E); sternites 1, 2 fused, granular, separated from sternite 3 by horizontal suture bordered with granules along anterior margin of sternite 3; suture between segments 3, 4 visible laterally; sternite 3 with low granules; sternite 4 with round granules disposed around the telson; presence of supplementary slits in sterno-abdominal cavity, at level of thoracic sternite 4 (Fig. 4E: 's').

Abdomen narrow, irregularly pitted, almost smooth; somites 1, 2 trapezoidal, somites 3–5 fused with traces of sutures separating somites still discernible, somite 6 quadrate with lateral margins straight, parallel, telson triangular with tip bluntly rounded, medial length/basal width ratio, 1.1.

P1 of similar size, robust, granular on outer faces (Figs 1E–F, 2A, 3A); P1 merus, carpus, palm covered with round granules, reduced on inner surfaces; merus without distinct spines or teeth, upper margin setose, serrated with denticular granules; carpus with 2 broad teeth at inner distal angle, outer surface with prominent granules arranged in nearly longitudinal rows. Palm of chela with 2 sub-parallel granular carinae on outer surface, lower carina continuing as upper groove on fixed finger; inner surface feebly granular (right inner palm encrusted with a circular colony of bryozoans *Disporella* sp. [Bryozoa, Lichenoporidae]); upper margin of palm with 2 parallel, feebly granular crests, separated by smooth furrow; fingers with 3 or 4 obtuse proximal teeth on cutting edges, outer surfaces with 2 longitudinal grooves, dorsal margin of movable finger with median carina on proximal two-thirds, tip of fingers glabrous, moderately spoon-shaped.

P2–5 stout to moderately elongated, P2–4 of similar size, P5 shortest (Figs 1A, 2B–C, 4D). Upper margins of all articles with row of dense, long setae (limited to distal half on P5 merus). P2–P4 meri without spines or teeth,

upper margin angular, serrated with denticular granules, outer surface slightly granular, inner surface smooth. P5 merus broad, 1.5 times longer than wide, upper margin cristate on proximal half (Fig. 4D: 'cm'), with scattered dentiform granules on distal half; outer surface flattened, feebly convex, smooth except for few granules on distal upper half; inner surface flat, smooth. P2–5 carpi without spines or teeth, upper margin granular, outer surface with median ridge of granules. P2–5 dactyli longer than propodus, styliform, with double row of 8–14 mobile spines on ventral margin, terminating in corneous claw; dactylo-propodal articulation with "lock" of rounded prolongation on propodal lateral margin sliding against button on proximal lateral margin of dactylus (Fig. 4D: 'dpl').

G1 long, straight, gently curving outwards distally; distal part with 8–10 mobile spines, 5–7 long setae, a leaf-like terminal lobe bearing few short, mobile spines, setae ventrally (Fig. 4A–B). G2 short, glabrous, almost straight distal four-fifths, finger-like tip (Fig. 4C).

Female morphology. Besides the sexual characters (abdomen, vulvae), the two females examined differ from the male holotype by having the P1 that are less robust and the pigment on the fixed finger not extending on the outer surface of the palm; the upper margin of the palm having the same two parallel crests of the male. The vulvae are sub-oval, with a vulvar cover, and located disto-mesially on sternites 6.

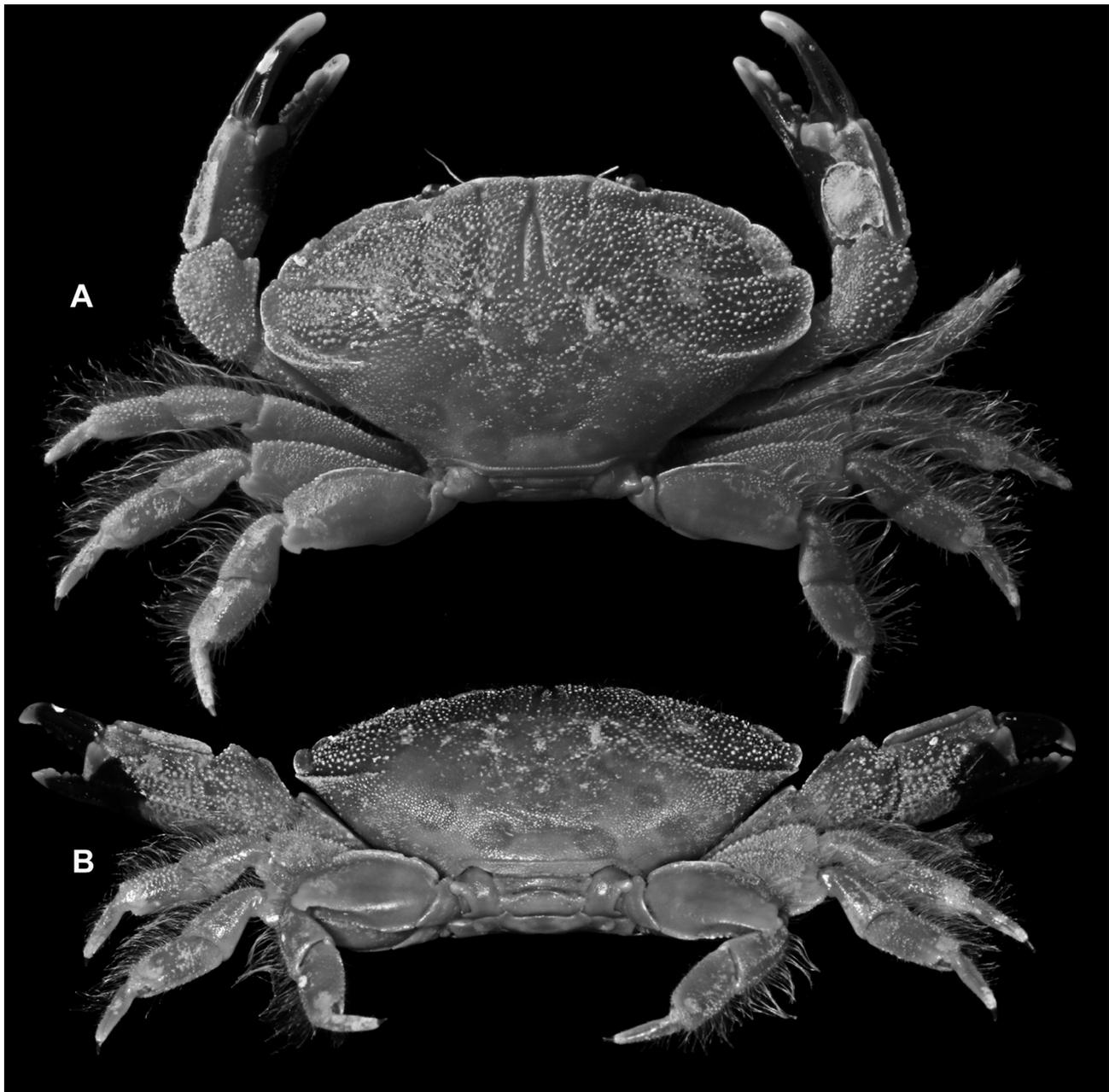


FIGURE 2. *Neoliomera moana* sp. nov., holotype, male 15.6 × 27.8 mm (MNHN IU-2013-7281, Marquesas Is., Fatu Hiva I. A, dorsal view; B, posterior view.

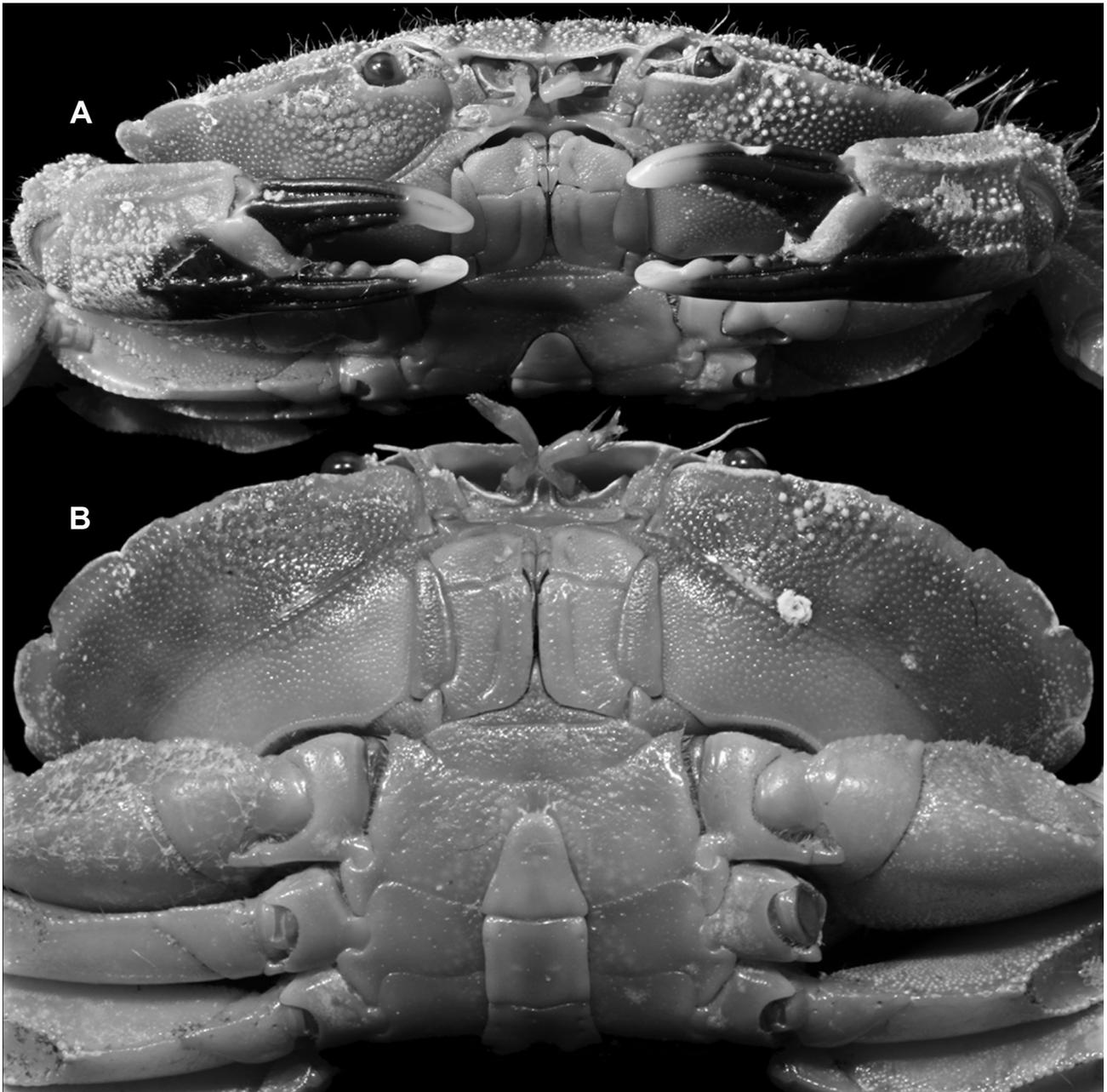


FIGURE 3. *Neoliomera moana* sp. nov., holotype, male 15.6 × 27.8 mm (MNHN IU-2013-7281, Marquesas Is., Fatu Hiva I. A, frontal view; B, ventral view.

Live coloration. Yellow-orange background on carapace and P1–5 (Fig. 1A–F). Dorsal surface of carapace with 13 medium to large red spots on anterior half and 4–7 medium to small red spots on posterior half, with 1 sub-central spot surrounded by 3–6 smaller spots; the larger spots are ringed with pale yellow. P1 with a median red band on outer and inner face of the palm, limited to upper half; fingers of chela black on proximal two thirds with tip grey to white; the black colour of the fixed finger extends to the distal lower half on the palm in the male holotype (Figs. 1E–F, 3A). The P2–5 have sub-median red bands on the merus (P5 only), carpus, propodus, and dactylus.

Etymology. The new species is given the epithet “*moana*”, “ocean” in the Marquesan language. This name was selected from “*Pakaihi i te Moana*” (“Respect of the Ocean”), the Marquesan name for the expedition through which this new species was discovered. The name is used as a noun in apposition.

Remarks. The genus *Neoliomera* Odhner, 1925 currently includes 16 species (see Ng *et al.*, 2008). *Neoliomera moana* sp. nov. belongs to a “Cristate-group” of six species that have a carapace with cristate

anterolateral margins: *N. insularis* (Adams & White, 1849), *N. moana* **sp. nov.**, *N. praetexta* (Rathbun, 1906), *N. richteroides* Sakai, 1969, *N. richtersi* (De Man, 1889), and *N. striata* Buitendijk, 1941.

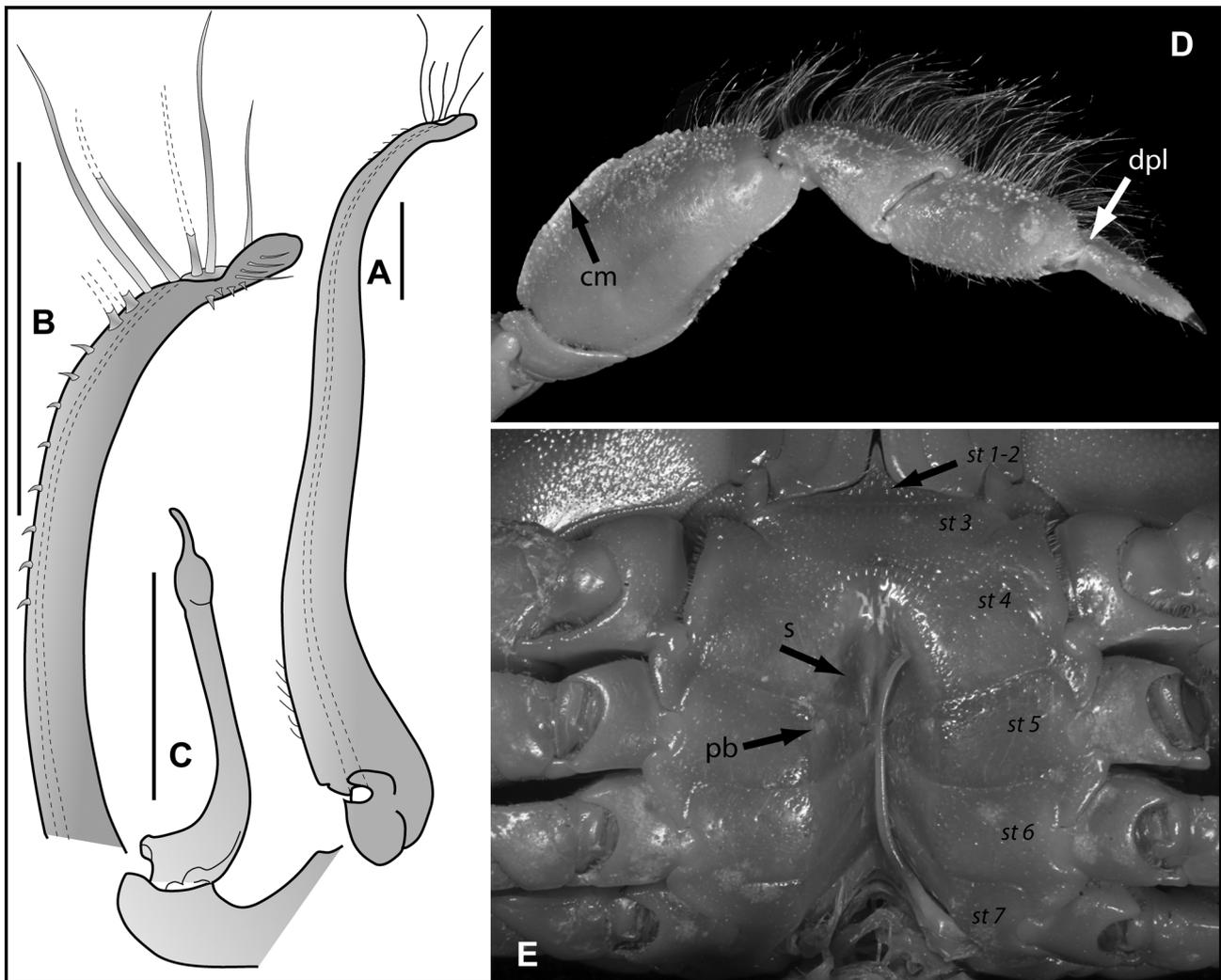


FIGURE 4. *Neoliomera moana* **sp. nov.**, holotype, male 15.6 × 27.8 mm (MNHN IU-2013-7281, Marquesas Is., Fatu Hiva I. A–B, right G1, thoracic side; C, left G2, abdominal side; D, close-up view of P5 showing cristate upper margin of merus and dactylo-propodal lock; E, close-up view of thoracic sternite, showing slits/grooves in the male sterno-abdominal cavity. Abbreviations: cm = cristate margin; dpl = dactylo-propodal lock; pb = sternal press-button; s = slit/groove; st 1–7 = thoracic sternites 1–7. Scale bars, 1mm.

In this group only *N. moana* **sp. nov.** and *N. striata* have a double crest on the upper margin of the palm of chela. The latter species is readily separated from *N. moana* **sp. nov.** by the presence of transverse rows of granules on the dorsal surface of the carapace, giving it a diagnostic striated pattern (see Buitendijk, 1941, pl. IV, fig. 1), unique to the genus, and the origin of its specific name. *Neoliomera moana* **sp. nov.** is also related to *N. praetexta*, described from Hawaii by Rathbun (1906: 844, fig. 7). In addition to Rathbun’s description and drawings, photographs of the type specimen of *N. praetexta* in the United State National Museum, Washington, D.C. (USNM 29507) were examined (courtesy of R. Lemaitre, USNM). *Neoliomera praetexta* is distinguished from *N. moana* **sp. nov.** by: a) much denser setation on the carapace “nearly obscuring the carapace”, as indicated by Rathbun (1906: 844); b) upper margin of palm of chela rounded, granular, without a double crest; c) P5 merus not cristate on proximal half of upper margin. Because of the dorsal aspect of its carapace and shape of G1, *N. moana* **sp. nov.** is also similar to *N. richtersi* described by De Man (1899) from Tahiti (see Serène, 1984: 67, fig. 28, pl. 7, fig. E). *Neoliomera richtersi* is distinguished by having the upper margin of palm of the chela rounded, granular, without a double crest, and by the P5 merus not being crested on the proximal half of the upper margin.

Neoliomera moana **sp. nov.** superficially resembles *N. richteroides*, the only other species of the cristate-group

with a pattern of spots on the dorsal surface of the carapace (see Sakai, 1976: pl. 142, fig. 2). In *N. richteroides*, however, the spots are white, smaller, and much more numerous (about 50).

Lai *et al.* (2001) have indicated that a new subfamily may have to be established to accommodate *Neoliomera*. The new species shows morphological characters of the *Neoliomera* clade as defined by these authors (Lio 2): presence of supplementary slits/grooves in the male sterno-abdominal cavity (at level of thoracic sternite 4) (Fig. 4E: ‘s’) to accommodate the distal end of G1; fused male thoracic sternites 1 and 2 widely triangular and prominent (Fig. 4E: ‘st 1-2’); presence of a dactylo-propodal lock on the ambulatory legs (Fig. 4D: ‘dpl’); and male thoracic sternite 1 ridge not bifurcated.

Ecology and geographical distribution. All specimens of *Neoliomera moana* **sp. nov.** were collected by hand at the entrance of submarine caves at depths of 6–28 m. The crabs were found while digging through piles of coarse, unconsolidated rubble and searching under loose rocks, with the substrate consisting mostly of coral rubble, sand and gravel. Additional specimens of this distinctively coloured species were observed on Fatu Hiva I., suggesting the species was at least locally common. The new species is probably not intimately associated with life in caves as it does not have any special adaptation (*e.g.* very small size of cornea) and was not located deep inside the caves. In that aspect it resembles to *Neoliomera cerasimus* (Ng, 2002), another non obligate cave-dwelling species with similar size of cornea (see Ng, 2002: 97, fig. 2b). *Neoliomera moana* **sp. nov.** is presently known from the Marquesas Islands only (Fatu Hiva and Ua Pou islands) and is potentially endemic to the archipelago.

Key to *Neoliomera* species of the ‘cristate-group’.

The key to the genus in Serène (1984: 68) includes all species of the genus with the carapace cristate on anterolateral margin (entries 6–9), except for *Neoliomera moana* **sp. nov.** At entry 9 it is updated, as presented below, to include the new species.

- 9. Upper border of palm crested with two parallel crests separated by a furrow; P5 merus is cristate on proximal half of upper margin *N. moana* **sp. nov.**
- Upper border of palm rounded or angular, covered with granules; P5 merus not cristate on upper margin 9a
- 9a. Dorsal surface of carapace entirely setose and covered with small granules *N. praetexta*
- Dorsal surface of carapace is glabrous, covered with granules that are obliterated on the central and posterior parts *N. richteroides*

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