

***Alainopagurus crosnieri*, gen. et sp. nov.
(Decapoda, Anomura, Paguridae) from the Western Pacific**

by Rafael LEMAITRE & Patsy A. MCLAUGHLIN

Abstract. — A new genus is proposed for a distinctive new species of bivalve-inhabiting hermit crab. Its type species, *Alainopagurus crosnieri* sp. nov., is described and illustrated. *Alainopagurus* gen. nov. is compared with *Porcellanopagurus* and *Solitariopagurus*, two other pagurid genera with similar habitat adaptations.

Keywords. — Decapoda, Paguridae, *Alainopagurus crosnieri*, gen. et sp. nov., Western Pacific.

**Un nouveau genre et une nouvelle espèce de pagure
(Decapoda, Anomura, Paguridae) du Pacifique occidental**

Résumé. — Un nouveau genre de pagure est proposé pour une espèce nouvelle qui utilise pour se protéger une coquille de mollusques bivalves. L'espèce-type du genre, *Alainopagurus crosnieri* sp. nov., est décrite et figurée. *Alainopagurus* gen. nov. est comparé à *Porcellanopagurus* et *Solitariopagurus*, deux autres genres de pagures qui présentent de semblables adaptations quant à leur habitat.

Mots-clés. — Decapoda, Paguridae, *Alainopagurus crosnieri*, n. gen., n. sp., Pacifique occidental.

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INTRODUCTION

During a survey of the collections of the MUSORSTOM expeditions to New Caledonia, Indonesia, and some of the other South Pacific islands, a solitary female specimen of a singularly distinctive species was recognized. Although initially appearing to be a species of *Porcellanopagurus* Filhol, 1885, in having a well calcified shield, eleven pairs of phyllobranch gills, symmetrical uropods, and markedly reduced abdomen, this specimen had several characters that set it apart from FILHOL's taxon. Further investigations of the MUSORSTOM collections yielded two additional specimens, both males. The presence, in these males, of paired sexual tubes on the coxae of the fifth pereopods, together with the single left gonopore of the female, suggested a possible relationship with the recently described *Solitariopagurus* Türkay, 1986. But once again, several characters immediately separated this species from TÜRKAY's genus. *Alainopagurus*, while sharing characters with both *Porcellanopagurus* and *Solitariopagurus* is unquestionably a distinct taxon meriting generic rank.

The male holotype and a female paratype have been returned to the collections of the Muséum national d'Histoire naturelle, Paris (MNHN); a male paratype has been deposited in the collections of the National Museum of Natural History, Smithsonian Institution, Washington, D. C. (USNM). The length of the shield (SL), as measured from the tip of the rostrum to the midpoint of the posterior margin of the shield, is given as an indication of specimen size. Terminology for the regions of the carapace follows that proposed by PILGRIM (1973).

ALAINOPAGURUS gen. nov.

TYPE SPECIES. — *Alainopagurus crosnieri*, sp. nov. Gender masculine.

ETYMOLOGY. — This genus is named for Alain CROSNIER, directeur de recherches (ORSTOM), who has made this material available to us.

DIAGNOSIS

Anterior carapace (Fig. 1a, b) vaulted and strongly calcified, with dorsolateral and posterolateral regions of shield distinctly globular, anterolateral regions slightly depressed. Posterior carapace with *linea transversalis* calcified, and with additional calcification of posterolateral plates anteriorly; remainder of posterior carapace membranous or with slight calcification. Outer pterygostomial plate and upper portion of posterior branchiostegite well calcified. Eleven pairs of phyllobranchiae. Antennal peduncle with supernumerary segmentation. Maxillule with external endopodal lobe obsolete or absent. Third maxilliped with well developed crista dentata and one accessory tooth. Sternite of third maxillipeds incompletely fused to sternite of chelipeds (fourth thoracic somite). Sternite of chelipeds subtriangular, with three or four bluntly spinose processes. Sternite of second pereopods broad, subdivided into two lobes by shallow median groove, anterior margins rounded, weakly crenulate. Sternite of third pereopods with narrow, transverse anterior lobe, and perpendicular posterior plate (partially visible in Fig. 4a). Sternite of fourth pereopods as transverse rod positioned directly below (in ventral view) sternite of third pereopods. Sternite of fifth pereopods reduced to very narrow transverse rod widely separated from preceding sternal plates. Abdomen (Fig. 4d) with tergal plate of first somite chitinous or very faintly calcified; tergal plate of second only weakly delineated; tergal plates of somites three to five clearly defined, chitinous or very weakly calcified; tergite of sixth somite weakly calcified, subdivided into narrow anterior, transverse rod, and posterior pair of broad plates separated by distinct median groove. Uropods symmetrical. Telson with terminal margin entire.

Males with stout, moderately long sexual tubes of approximately equal length on coxae of both fifth pereopods (Fig. 4b, c), each with long setae mesially and terminally; no paired or unpaired pleopods. Female with single gonopore opening posteriorly on coxa of left third pereopod; no paired pleopods; unpaired left uniramous pleopods on abdominal somites 2-4.

REMARKS

Clearly, *Alainopagurus* is related to *Solitariopagurus* and *Porcellanopagurus*. As previously indicated, *Alainopagurus* shares with *Solitariopagurus* such characters in males as stout, sexual

tubes, each with a terminal tuft of long setae, and no unpaired pleopods; in females, a single left gonopore, and uniramous unpaired left pleopods only on abdominal somites 2-4. In both genera the *linea transversalis* is calcified and a pair of posterolateral calcified plates are present anteriorly, while in *Porcellanopagurus*, the *linea transversalis* appears fused with the anteriorly developed posterolateral plates to form a fourth lateral lobe (*cf.* BORRADAILE, 1916). *Alainopagurus* shares with *Porcellanopagurus*, eleven pairs of phyllobranchiate gills; only ten are present in *Solitariopagurus*. All three genera have well calcified, raised anterior carapaces and strongly calcified, broad thoracic sternal plates. Additional characters that probably reflect similarities in habitat include a reduced abdomen, symmetrical uropods with broadly rounded exopodal rasps, and development of the dactyls of the fourth pereopods as distinct hooks.

There can be no doubt that the three genera are distinct. *Alainopagurus* has a globularly shaped shield surface, with nearly straight lateral margins, whereas in both *Porcellanopagurus* and *Solitariopagurus* the surfaces of the shields are flattened, the lateral margins produced into spiniform lobes, of which the first may represent a fusion of the lateral projections with the anterolateral carapace angles. In both of these latter genera the rostrum is broadly triangular; the ocular acicles are reduced or absent. In contrast, the lateral projections in *Alainopagurus* are distinct from the anterolateral angles, albeit very widely separated from the rostrum, which is slender and upturned; the ocular acicles are very well developed and provided with 2-5 terminal spines. The pterygostomial lobe and dorsal portion of the posterior branchiostegite are calcified in *Alainopagurus*, but membranous in *Solitariopagurus* and *Porcellanopagurus*.

Alainopagurus crosnieri sp. nov.

(Figs 1-4)

MATERIAL EXAMINED. — Holotype, ♂ (SL 2.0 mm), New Caledonia, VOLSMAR, st. DW5, 22°25.9'S, 171°46.5'E, 700 m, 6 January 1989, coll. B. RICHER DE FORGES, MNHN-Pg 5239. Paratypes, 1 ♂ (SL 2.0 mm), South Pacific: banc Combe, N.O. "Alis" MUSORSTOM 7, st. DW547, 12°26'S, 177°26'W, 455 m, 17 May 1992, USNM 270077; 1 ♀ (SL 2.2 mm) with bivalve shell of family Corbulidae Lamarck, New Caledonia, N.O. "Jean-Charcot", BIOCAL, st. DW83, 20°35'S, 166°54'E, 460 m, 6 September 1985, MNHN-Pg 5240.

ETYMOLOGY. — The specific name *crosnieri* is selected to recognize still further, the contributions of Alain CROSNIER to our ever expanding knowledge of the pagurid fauna of the South Pacific.

DISTRIBUTION. — Known at present only from New Caledonia and the Wallis and Futuna area.

HABITAT. — 455-700 m depth. Inhabiting bivalve shells of the family Corbulidae Lamarck.

DESCRIPTION

Shield (Fig. 1a, b) appreciably broader than long, dorsal surface globular, with distinct bulges laterally, anterolateral region somewhat depressed (Fig. 1a); rostrum and lateral projections widely separated; anterior margin between rostrum and lateral projections very slightly concave; posterior margin truncate. Rostrum slender, acute, upturned and with minute terminal spinule; lateral projections acutely triangular, strongly produced and upturned, with very small terminal spinule.

Ocular peduncles short, approximately 4/5 shield length, bulbous basally and with constriction proximal to base of weakly dilated cornea. Ocular acicles multifid, set at angle to peduncles;

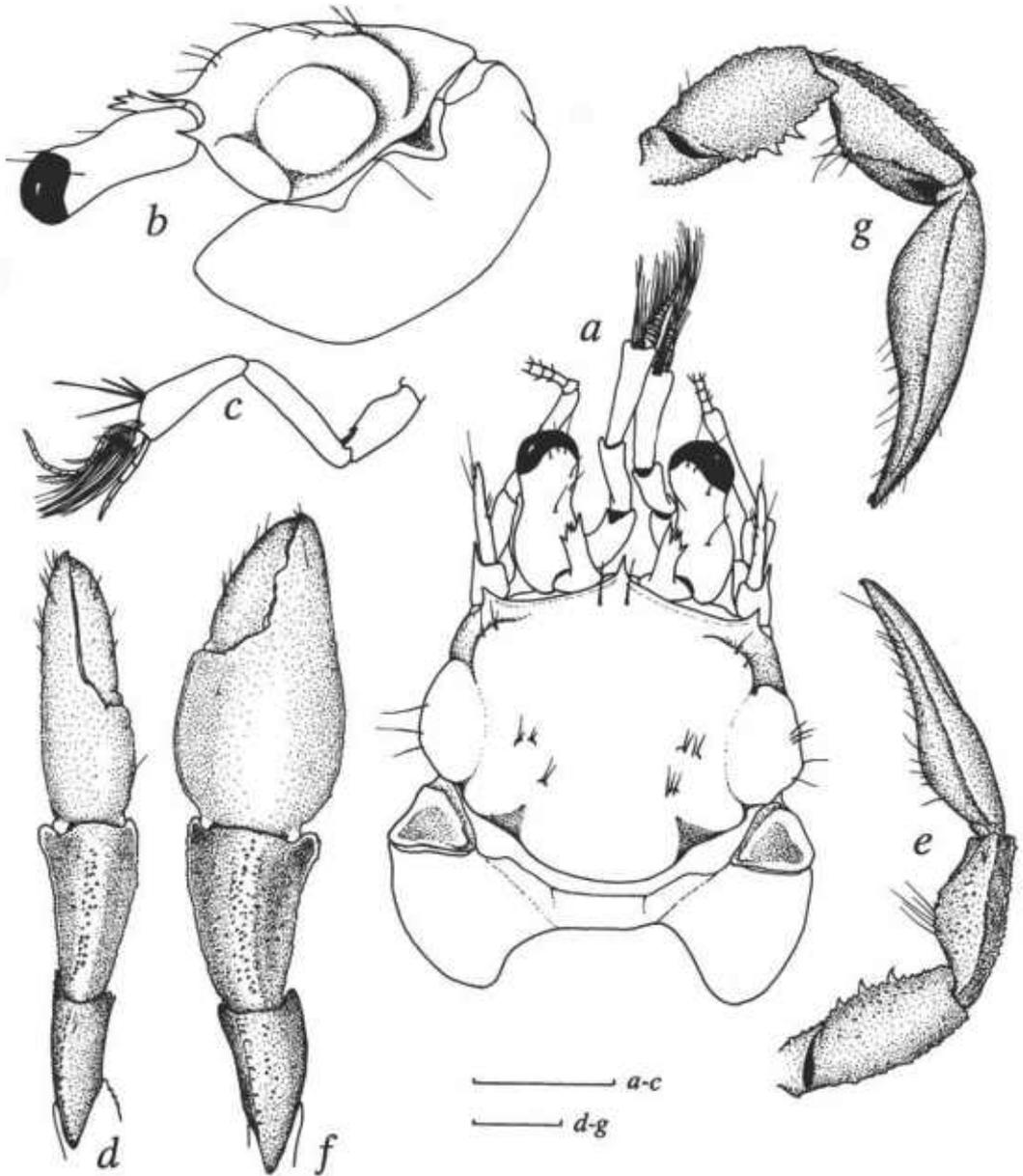


FIG. 1. — *Alainopagurus crosnieri* gen. et sp. nov.: a, cephalothorax and cephalic appendages; b, cephalothorax and left eye, lateral view; c, left antennule, lateral view; d, left cheliped; e, same, lateral view; f, right cheliped; g, same, lateral view. Scales = 1 mm. (♀ paratype, MNHN-Pg 5240).

Alainopagurus crosnieri n. g., n. sp.: a, céphalothorax et appendices céphaliques; b, céphalothorax et œil gauche, vue latérale; c, antennule gauche, vue latérale; d, chélipède gauche; e, le même, vue latérale; f, chélipède droit; g, le même, vue latérale. Echelles = 1 mm (paratype ♀, MNHN-Pg 5240).

very strong, reaching nearly to peduncular constriction, with four or five marginal spines; separated basally by more than basal width of one acicle.

Antennular peduncles (Fig. 1c) overreach ocular peduncles by more than length of ultimate peduncular segment. Ultimate segment slightly shorter than penultimate segment; dorsodistal margin with tuft of very long, stiff setae. Basal segment with statocyst enlarged but unarmed.

Antennal peduncles equaling or overreaching ocular peduncles by approximately 1/4 length of ultimate segment. Ultimate and penultimate segments with few scattered short setae. Third segment with small spinules on ventrodistal margin. Second segment with dorsolateral distal angle produced, terminating in slender spine; dorsomesial distal angle unarmed or with small spine. First segment sometimes with small tubercle on lateral surface, strongly produced ventrally, terminating subacutely or bluntly, ventrolateral margin unarmed or with row of spinules. Antennal acicle reaching beyond proximal margin of ultimate antennal segment; terminating in small spinule, mesial margin with few setae. Antennal flagellum slightly shorter than outstretched right cheliped; each article with two or three short setae.

Maxillule (Fig. 2a) with one stiff seta on moderately well developed internal endopodal lobe; external lobe obsolete. Maxilla (Fig. 2b) with endopod considerably overreaching distal margin of scaphognathite. First maxilliped (Fig. 2c) with slender exopod. Second maxilliped (Fig. 2d) without distinctive characters. Third maxilliped (Fig. 2e) with strong spine on dorsodistal margin of merus. Sternite of third maxillipeds (Fig. 4a) produced anteriorly into paired or single bifid spinose process on either side of midline, separated by deep median concavity.

Right cheliped (Fig. 1f, g) much stronger but only slightly longer than left; palm, fixed finger and dactyl somewhat dorsoventrally compressed. Dactyl approximately as long as palm; cutting edge calcareous and faintly sinuous, with one or two weakly defined calcareous teeth proximally and few small calcareous teeth distally; terminating in small corneous claw; dorsomesial margin not delimited, dorsal and ventral surfaces with few tufts of setae, more numerous ventrally. Palm with slightly convex, unarmed dorsal surface, dorsomesial and dorsolateral margins very slightly elevated, each minutely serrate; fixed finger with scattered setae, cutting edge with one or two weakly defined, calcareous teeth in proximal half, short row of small calcareous teeth distally, terminating in very small corneous claw. Carpus equal to or slightly longer than palm; dorsomesial and dorsolateral distal angles flared and elevated, dorsomesial and dorsolateral margins minutely serrate, dorsal midline with serrate longitudinal crest, dorsal surface with numerous, minute spinules; lateral, mesial and ventral surfaces also minutely spinose, ventromesial and ventrolateral margins with slightly stronger serrations. Merus subtriangular; dorsal margin with very short, transverse rows of minute spinules; lateral face minutely spinulose dorsally, ventrolateral margin with irregular row of spines; mesial face unarmed, ventromesial margin faintly serrate distally and with tubercles proximally, with one stronger subacute spine at proximal angle. Ischium with row of small spinules on ventromesial margin and row of even smaller spinules on ventrolateral margin.

Left cheliped (Fig. 1d, e) with elongate, dorsoventrally compressed chela and slightly ventrally curved dactyl and fixed finger. Dactyl long, approximately one and a half times length of palm; dorsomesial margin minutely serrate; dorsal and ventral surfaces with scattered setae; cutting edge with row of tiny corneous teeth, terminating in acute corneous claw, and slightly overlapped by fixed finger. Palm with slightly convex dorsal surface, dorsomesial and dorsolateral

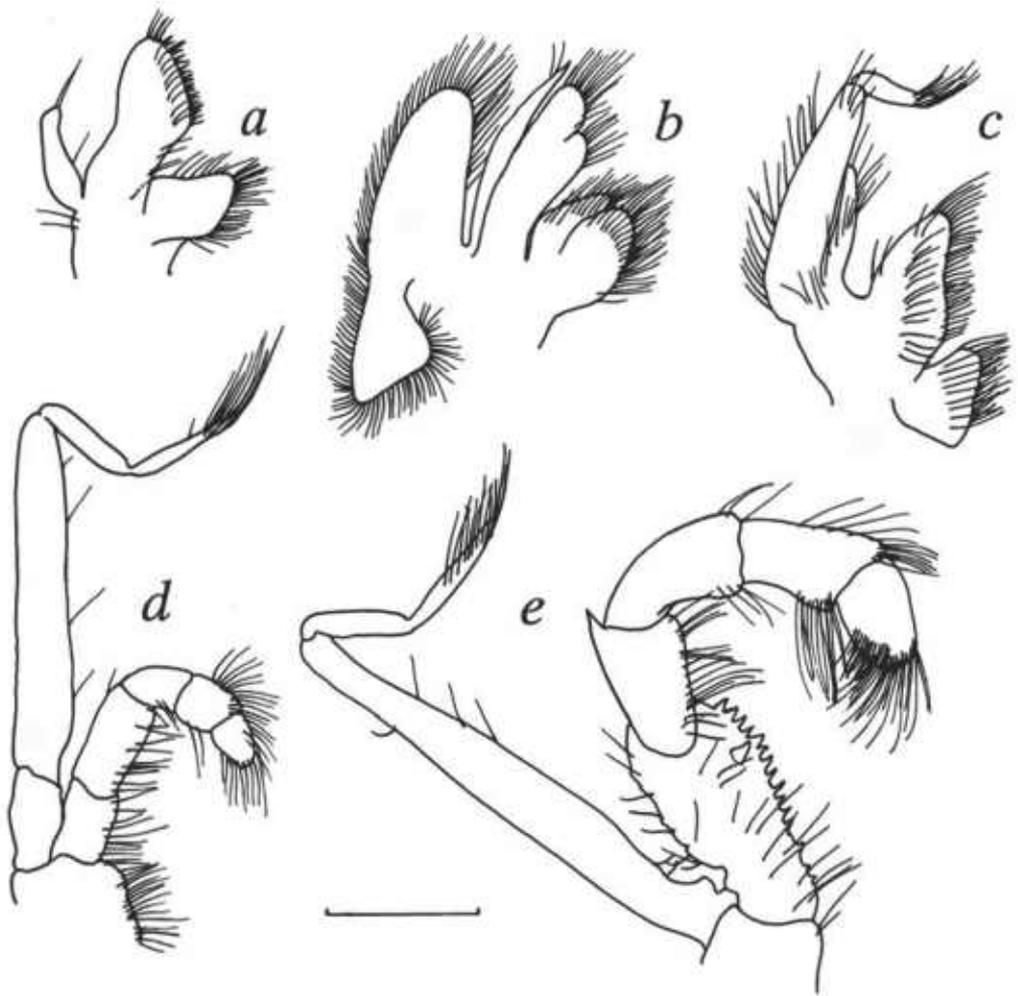


FIG. 2. — *Alainopagurus crosnieri* gen. et sp. nov., left mouthparts, internal view: a, maxillule; b, maxilla; c, first maxilliped; d, second maxilliped; e, third maxilliped. Scale = 0.5 mm. (♂ paratype, USNM 270077).

Alainopagurus crosnieri, n. g., n. sp., appendices buccaux gauches, vue interne : a, maxillule ; b, maxille ; c, premier maxillipède ; d, second maxillipède ; e, troisième maxillipède. Échelle = 0,5 mm (paratype ♂, USNM 27077).

margins minutely serrate and extending approximately 2/3 length of fixed finger; mesial face with scattered minute spinules, ventral surface with scattered setae; cutting edge of fixed finger with row of very small calcareous teeth, dorsal and ventral surfaces with scattered setae. Carpus slightly longer than palm, subtriangular, with dorsomesial and dorsolateral (particularly) distal angles produced and armed with minute spinules, dorsomesial and dorsolateral margins spinulose and weakly elevated, dorsal surface with slightly elevated, rounded, spinulose or tuberculate

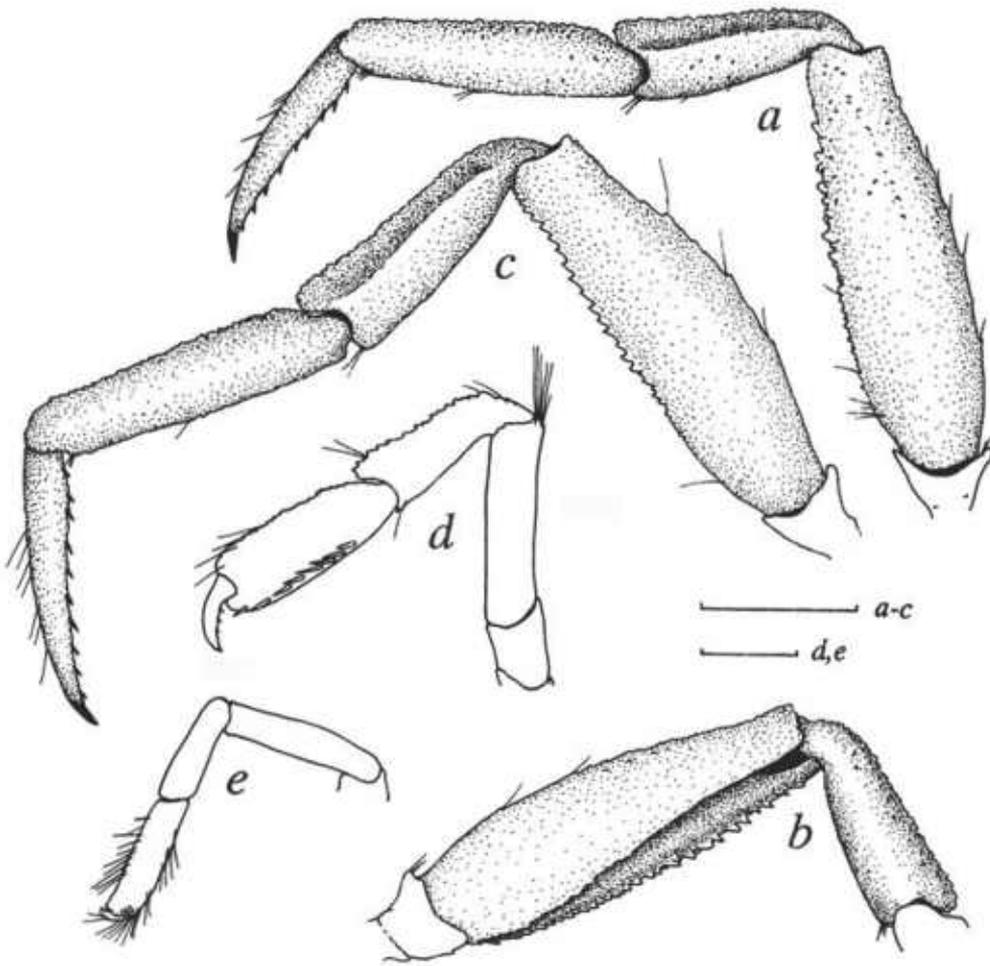


FIG. 3. — *Alainopagurus crosnieri* gen. et sp. nov., left second to fifth pereopods, lateral view (except b): a, second; b, merus and carpus of same, mesial view; c, third; d, fourth; e, fifth. Scales = 1 mm (a-e), and 0.5 mm (d, e). (♀ paratype, MNHN-Pg 5240).

Alainopagurus crosnieri, n. g., n. sp., second à cinquième péréiopodes gauches, vue latérale (sauf b) : a, second ; b, merus et carpus du même, vue mésiale ; c, troisième ; d, quatrième ; e, cinquième. Échelles = 1 mm (a-c) et 0,5 mm (d, e) (paratype ♀, MNHN-Pg 5240).

median crest and scattered small spinules or tubercles mesially and laterally; mesial and lateral faces nearly perpendicular, armed with numerous small spinules or spinulose tubercles; ventral surface with scattered spinules, ventromesial and ventrolateral margins spinulose, strongest laterally. Merus slightly longer than carpus; subtriangular; dorsal margin with irregular row of small spinules; lateral face with numerous minute spinules, ventrolateral margin with row of predominately

small spines, but with two appreciably stronger; ventromesial margin with irregular row of spinules and one larger spine at proximal angle, ventral surface with few spinules. Ischium with row of small spines on ventrolateral margin and row of much smaller spinules on ventromesial margin, one stronger spine at ventromesial proximal angle.

Ambulatory legs (Fig. 3a-c) slightly shorter than outstretched right cheliped; generally similar. Dactyls slightly shorter than propodi; straight in both dorsal and lateral views; terminating in moderately strong corneous claws; dorsal surfaces with scattered long setae; ventral margins each with nine (second) or ten to twelve (third) corneous spines. Propodi slightly longer than carpi, somewhat laterally compressed; dorsal and ventral surfaces each with irregular rows of tiny spinules, providing serrate appearance; mesial and lateral faces minutely spinulose, partic-

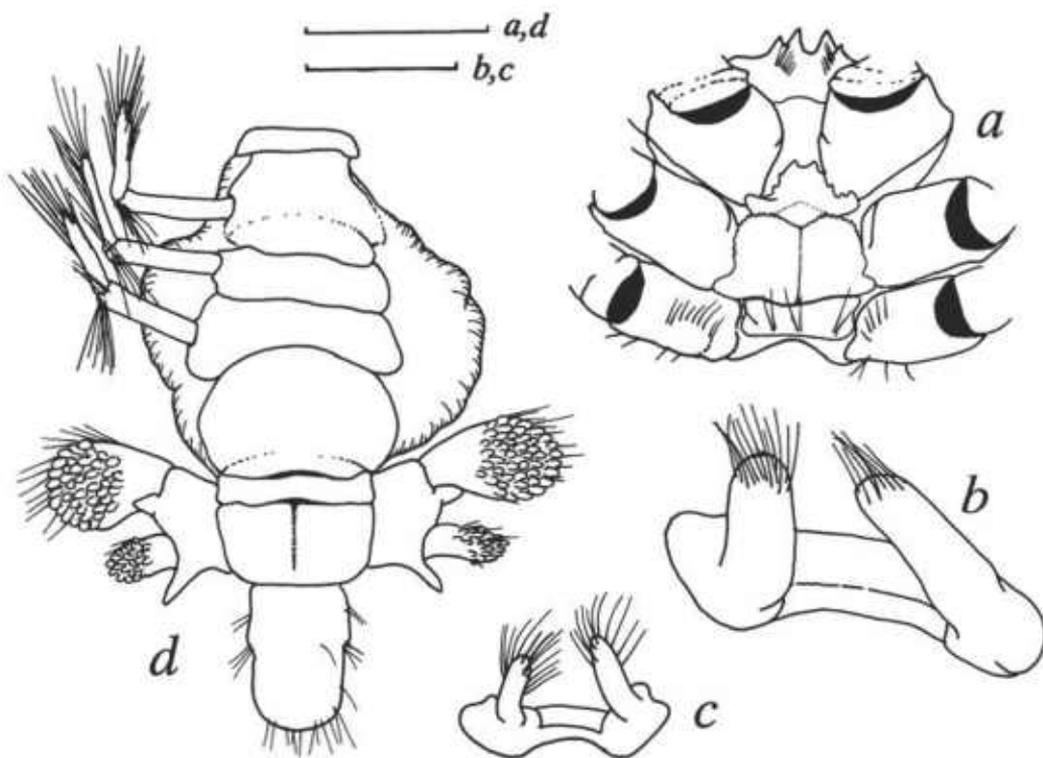


FIG. 4. — *Alainopagurus crosnieri* gen. et sp. nov.: a, sternite of third maxillipeds, and coxae and sternite of first to third pereopods, ventral view; b, c, coxae and sternites of fifth pereopods of male showing sexual tubes; d, abdomen, uropods and telson of female, dorsal view. Scales = 1 mm (a, d, c) and 0.5 mm (b). (a, d, ♀ paratype, MNHN-Pg 5240; b, holotype, MNHN-Pg 5239; c, paratype, USNM 270077).

Alainopagurus crosnieri n. g., n. sp.: a, sternite des troisièmes maxillipèdes et coxae et sternites des premiers aux troisièmes péréiopodes, vue ventrale; b, c, coxae et sternites des cinquièmes péréiopodes du mâle montrant les tubes sexuels; d, abdomen, uropodes et telson de la femelle, vue dorsale. Échelles = 1 mm (a, c, d) et 0.5 mm (b) (a, d, paratype ♀, MNHN-Pg 5240; b, holotype, MNHN-Pg 5239; c, paratype, USNM 270077).

ularly dorsally. Carpi 1/2-2/3 length of meri; dorsal surfaces each with irregular row of tiny spinules or spinulose tubercles; lateral faces spinulose or tuberculate, each with median longitudinal sulcus; mesial faces each with scattered minute spinules or spinulose tubercles; ventral surfaces with 3 or 4 widely-spaced minute spinules and short setae. Meri each with irregular rows of spinules and small spines on dorsal surfaces; mesial and lateral faces unequal in breadth, each with scattered spinules, particularly in distal halves; ventral surfaces broadened distally, each with distinct (in mesial view), shallow, longitudinal furrow (Fig. 3b); ventromesial margins each with row of minute spinules or tubercles, ventrolateral margins each with double or triple row of tuberculate spines. Ischia unarmed or with few spinulose tubercles on ventral margins. Fourth pereopods each with row of seven or eight corneous spines (transparent in single left pereopod of holotype) on ventrolateral surface of propodus; dorsal surface of propodus and carpus serrate or spinulose. Fifth pereopods (Fig. 3e) subchelate, with small propodal rasp ventrally.

Uropods (Fig. 4d) with protopods each with very prominent, posteriorly directed spine approximately half length of endopod; exopods subcircular; endopods ovate; exopods and endopods each with large, circular rasp of corneous scales covering nearly entire dorsal surfaces. Telson (Fig. 4d) with transverse suture weakly indicated, and few short marginal setae; terminal margin rounded.

Coloration (in preservative): chelipeds with chelae yellowish white, lighter on dactyls and fixed fingers, dorsomesial and dorsolateral margins faintly reddish-orange; carpi and meri light reddish-orange, darker on margins. Ambulatory legs light reddish-orange, lighter on dactyls and meri; distal margins of propodi and carpi circumscribed with whitish band.

DISCUSSION

The distinctly grooved meri of the ambulatory legs of *A. crosnieri* are similar to the structure of species of *Solitariopagurus* and *Porcellanopagurus* (personal observations). This similarity is most probably another convergent adaptation of species of these genera to their specialized bivalve habitat, and consequently may not be indicative of a phylogenetic relationship. TÜRKAY (1986) described a subchelate fifth pereopod, the claw being covered by fine setae, but made no mention of a rasp. Similarly, his illustration gives no indication of a rasp. However, in a second, recently discovered species of *Solitariopagurus* (POUPIN & MCLAUGHLIN, in prep.), a small series of scales, similar to those forming the propodal rasp of *A. crosnieri* has been observed. Both of the latter taxa are known to utilize bivalve shells, whereas this habitat has only been hypothesized for *S. profundus* Türkay, 1986.

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