



## Two new species of shallow-water hermit crabs (Crustacea: Decapoda: Paguridae) from Mayotte, Comoro Islands, southwestern Indian Ocean

TOMOYUKI KOMAI<sup>1</sup> & JOSEPH POUPIN<sup>2</sup>

<sup>1</sup>Natural History Museum and Institute, Chiba, 955-2 Aoba-cho, Chuo-ku, Chiba, Japan. E-mail: komai@chiba-muse.or.jp

<sup>2</sup>Institut de Recherche de l'Ecole Navale, IRENav, BP 600, 29240 BREST, France. E-mail: joseph.poupin@ecole-navale.fr

### Abstract

Two new species of pagurid hermit crabs are described from shallow coral reefs of Mayotte, Comoro Islands, southwestern Indian Ocean. *Cestopagurus caeruleus* **sp. nov.**, representing the fourth of the genus, is morphological similar to *C. coutieri* Bouvier, 1897 and *C. timidus* (Roux, 1830), but the new species is immediately distinguished from the latter two species by the proportionally longer antennular peduncles and the different armature of the dactylus of the right cheliped. *Trichopagurus asper* **sp. nov.**, representing the third species of the genus, appears closer to *T. macrochela* Komai & Osa-wa, 2005, but the tuberculate dorsal surface of the right palm and the possession of spines on the carpus of the left cheliped readily differentiate the new species from the latter species.

**Key words:** Crustacea, Decapoda, Anomura, Paguridae, *Cestopagurus*, *Trichopagurus*, new species, Mayotte Island

### Introduction

This work constitutes part of a series of taxonomic studies that present the faunistic results obtained during the KUW 2009 Expedition carried out in Mayotte, Comoro Islands, southwestern Indian Ocean, in 1–21 November 2009. This expedition was organized by Jean-Marie Bouchard, Kraken Underwater Works Cie (KUW), Mayotte, with scientific partnership between the Institut de Recherche de l'Ecole Navale (IRENav), Brest, and the Muséum national d'Histoire naturelle (MNHN), Paris (Bouchard *et al.* 2009). The objective of the expedition was to establish the first inventory of the Crustacea Decapoda and Stomatopoda of the Mayotte region. The previous outputs of this expedition include the description of a new sentinel crab of the genus *Macrophthalmus* (Poupin & Bouchard 2010), the shallow-water squat lobsters (Macpherson & Cleve 2010), the terrestrial, mangrove and freshwater decapods (Bouchard *et al.* in press), the anomurans (Poupin *et al.* in press), and the caridean shrimps (Li *et al.* 2012). All these results are also integrated into a database (<http://crustaceamayotte.free.fr/>) used as a collaborative tool to update, share, and retrieve the data of the KUW project including, list of the species, with photographs, stations data, maps, field observations, and associated literature.

The present paper complements the checklist of the anomuran crustaceans (Poupin *et al.*, in press). Two new species of Paguridae are described and illustrated in detail, viz. *Cestopagurus caeruleus* and *Trichopagurus asper*. Affinities of these two new species are discussed.

### Material and methods

The material was collected in shallow-water of the lagoon during SCUBA dives made between 6–22 m. Specimens were mixed with coral debris and rubbles that were brought to the surface in large bins and carefully sorted after each dive. Details on the sampling techniques used during KUW fieldwork are described by Bouchard *et al.* (2009, in press) with a list of the stations. The material collected during the survey is deposited in MNHN.

General terminology follows McLaughlin *et al.* (2007), except for numbering of thoracic sternites. Shield length (sl), measured from the tip of the rostrum to the midpoint of the posterior margin of the shield, indicates specimen size. Others abbreviations are: coll., collected by; stn, station.

## Systematic account

### Family Paguridae Latreille, 1802

### Genus *Cestopagurus* Bouvier, 1897

#### *Cestopagurus caeruleus* sp. nov.

(Figs 1–4)

**Material examined.** *Holotype*: male (sl 1.9 mm), stn 12, La Prévoyante reef, Mayotte, 12°41'34.70"S, 45°9'59.99"E, 6–12 m, coll. J.-M. Bouchard, V. Dinhut & J. Dumas, SCUBA diving, suction pump on fine coral sediment, MNHN-IU-2011-5017 (Pg 8518).

*Paratypes*: 1 male (sl 1.4 mm), 3 ovigerous females (sl 1.3–1.5 mm), stn 14, La Prudente bank, Mayotte, 12°38'50.68"S, 44°58'41.93"E, 15–17 m, coll. J.-M. Bouchard, V. Dinhut & J. Dumas, SCUBA diving, suction pump on fine coral sediment, MNHN-IU-2011-5625 (Pg 8519); 1 male (sl 1.2 mm), stn 25, islet M'tzamboro, Mayotte, 12°39'30.18"S, 45°1'38.65"E, 15–20 m, *Acropora* and *Pocillopora* coral grounds, brushing on coral blocks and rubble, coll. J.-M. Bouchard, V. Dinhut & J. Dumas, SCUBA diving, MNHN-IU-2011-5035 (Pg 8520).

*Non-type*: 1 male (not measured, accidentally lost after identification), stn 17, North reef, Mayotte, 12°34'49.93"S, 45°5'52.62"E, 22 m, coll. J.-M. Bouchard, V. Dinhut & J. Dumas, SCUBA diving, suction pump on fine coral sediment, MNHN-IU-2011-5033 (Pg 8545).

**Description.** *Males*. Eleven pairs of distally quadriserial gills.

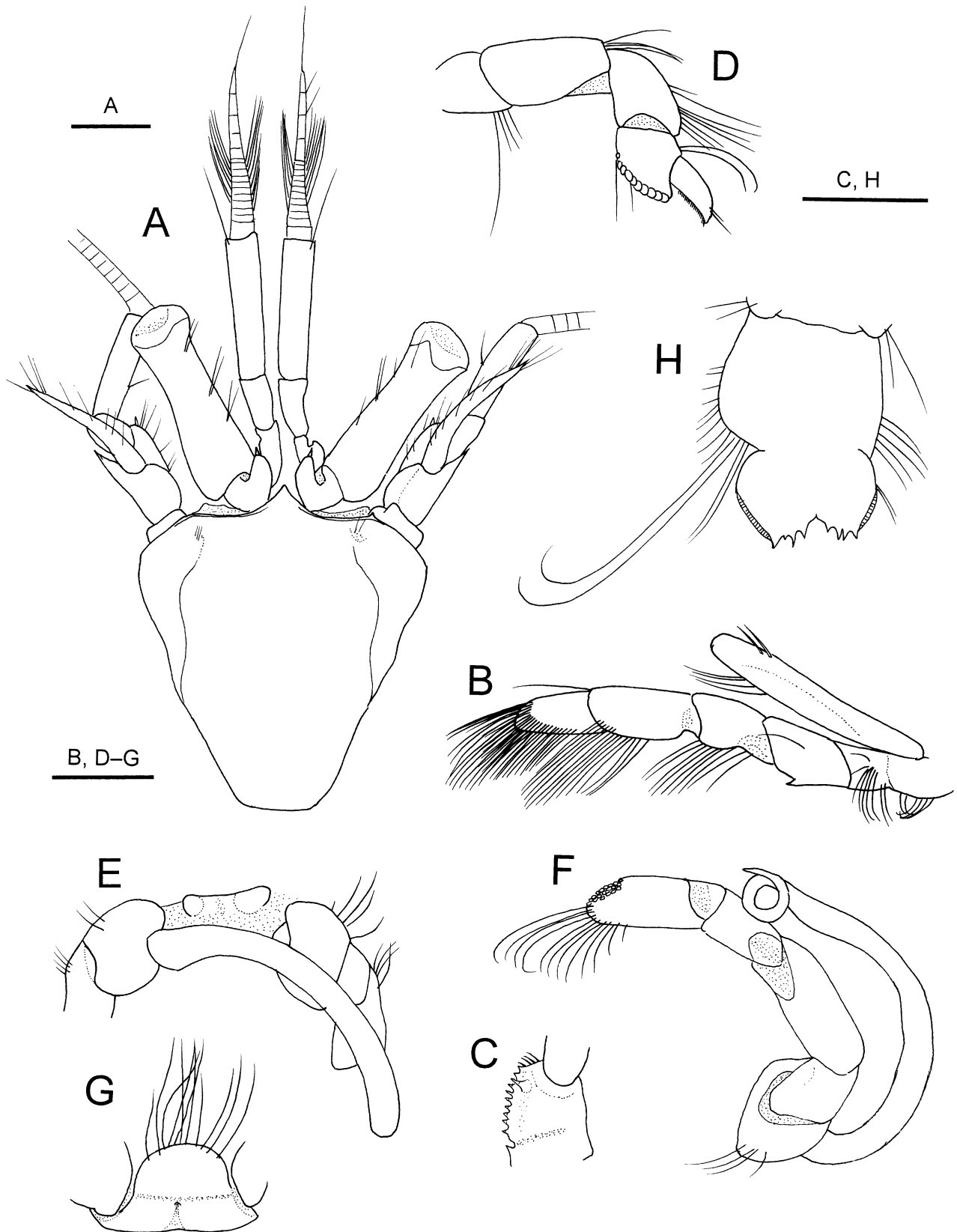
Shield (Fig. 1A) 1.1 times longer than broad; anterior margin between rostrum and lateral projections slightly concave or nearly straight; anterolateral margins sloping; posterior margin truncate; dorsal surface slightly convex, with tufts of short setae posterior to anterolateral projection, otherwise naked; paragastric grooves distinct. Rostrum triangular with acute terminal spine or broadly rounded, slightly to distinctly overreaching lateral projections. Lateral projections obsolete, with marginal or submarginal spinule.

Ocular peduncles (including cornea) (Fig. 1A) moderately slender, 0.6–0.7 times of shield length; somewhat inflated basally; cornea slightly dilated; dorsal surface with tufts of stiff setae mesially. Ocular acicles subtriangular or subovate, separated basally by width of one acicle, with small submarginal spine terminally; dorsal surface slightly concave.

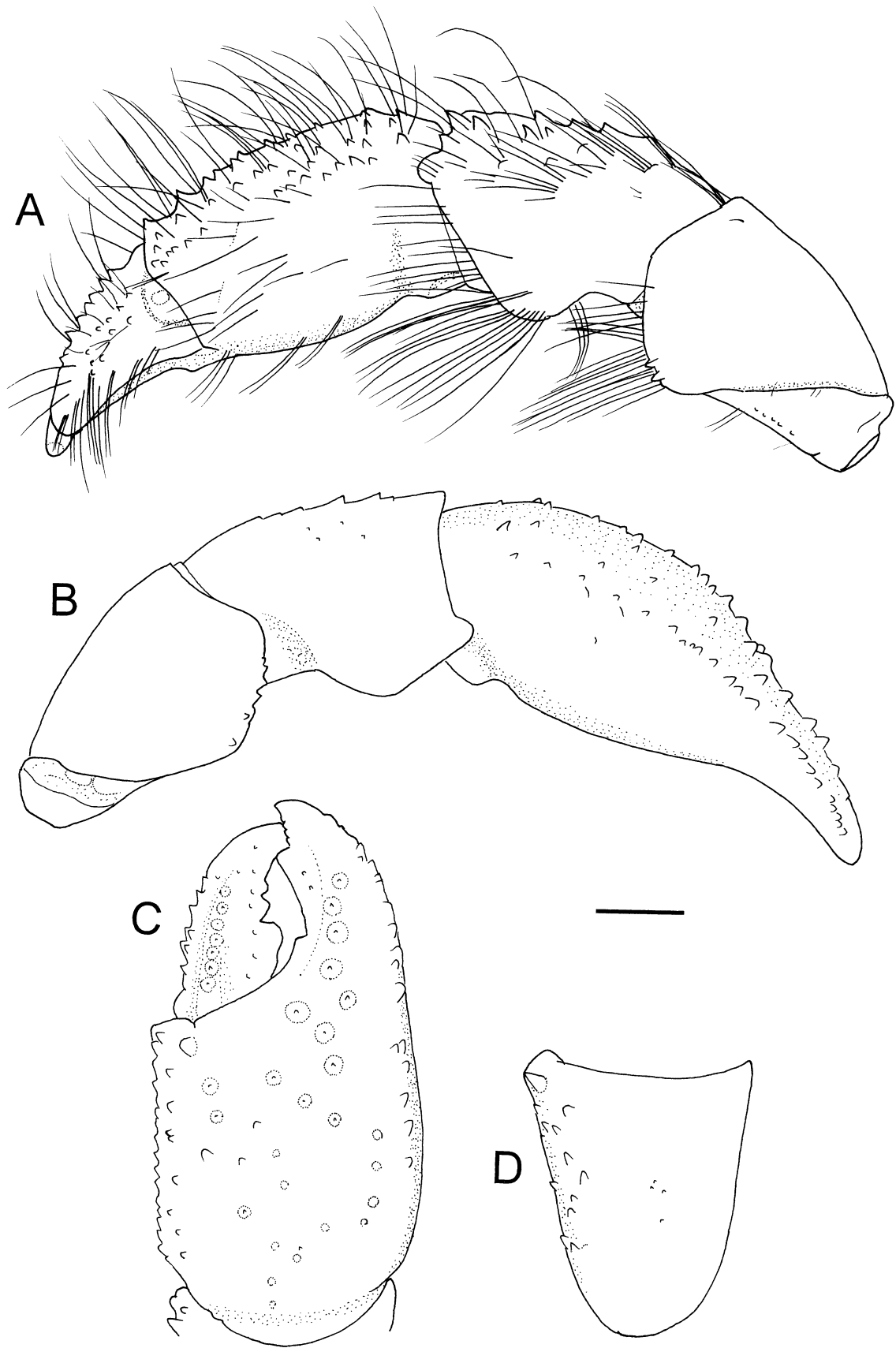
Antennular peduncles (Fig. 1A), when fully extended, overreaching distal corneal margins by half-length of ultimate segment. Ultimate segment approximately twice length of penultimate segment, somewhat widened distally in lateral view, with single seta at dorsodistal lateral angle. Penultimate segment short, without setae. Basal segment with distolateral margin distinctly produced as short process, statocyst lobe weakly inflated, with small spine distolaterally.

Antennal peduncles (Fig. 1A) reaching or slightly overreaching distal corneal margins, with supernumerary segmentation. Fifth and fourth segments with few setae distally. Third segment with spinule at ventromesial distal margin. Second segment with dorsolateral distal angle produced, reaching midlength of fourth segment, terminating in simple or bifid, acute spine; dorsomesial distal angle unarmed; mesial and lateral faces with few setae. First segment with spinule on lateral face; ventromesial distal margin strongly produced anteriorly, with 1 spinule laterally. Antennal acicle overreaching base of cornea, but not reaching distal corneal margin, weakly arcuate, terminating in small spine; dorsomesial margin with sparse moderately long setae. Antennal flagellum about 3.5–4.5 length of shield; each article with 1 or 2 moderately short setae and 1–3 very short setae on distal margin.

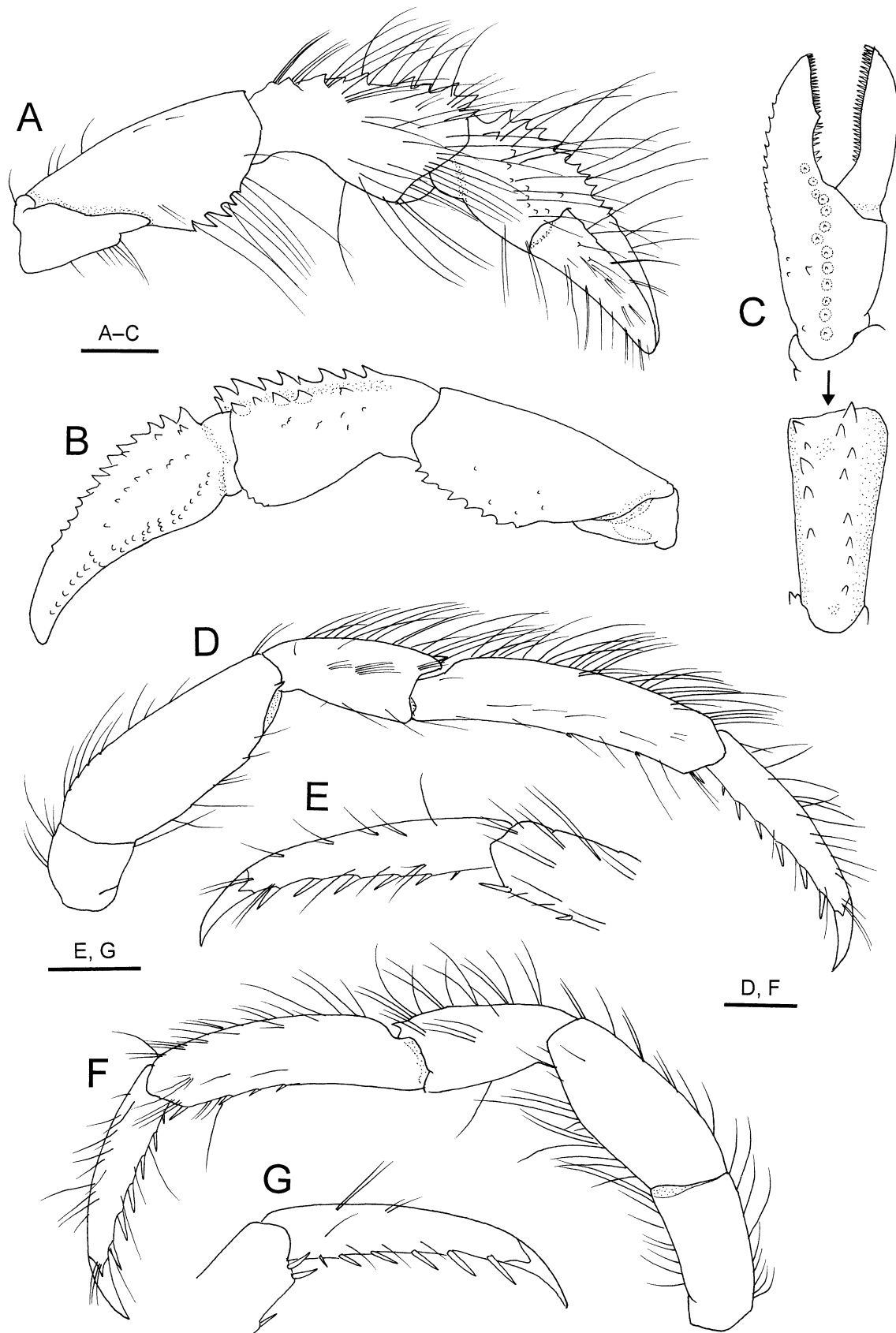
Mouthparts not dissected. Third maxilliped (Fig. 1B) moderately stout; carpus unarmed on dorsodistal margin; merus unarmed on dorsodistal margin, but armed with small ventral spine slightly distal to midlength; ischium with crista dentata consisting of moderately spaced corneous teeth and with 1 accessory tooth (Fig. 1C); basis-ischium fusion incomplete; basis with 1 spinule distally on mesial margin; exopod slightly falling short of carpus.



**FIGURE 1.** *Cestopagurus caeruleus* sp. nov., holotype, male (sl 1.9 mm), MNHN-Pg 8518. A, shield and cephalic appendages, dorsal view (corneas deformed due to dehydration); B, left third maxilliped, lateral view; C, same, ischium and distal part of basis, ventral view; D, right fourth pereopod, lateral view; E, coxae of fifth pereopods, right sexual tube, and eighth thoracic sternite, ventral view; F, left fifth pereopod and distal part of right sexual tube, lateral view; G, sixth thoracic sternite, ventral view; H, telson, dorsal view. Scale bars = 0.5 mm.



**FIGURE 2.** *Cestopagurus caeruleus* sp. nov., holotype, male (sl 1.9 mm), MNHN-Pg 8518. A, right cheliped, mesial view; B, same, lateral view (setae omitted); C, same, chela, dorsal view; D, same, carpus, dorsal view. Scale bar = 0.5 mm.



**FIGURE 3.** *Cestopagurus caeruleus* sp. nov., holotype, male (sl 1.9 mm), MNHN-Pg 8518. A, left cheliped, mesial view; B, same, lateral view (setae omitted); C, same, chela and carpus, dorsal view; D, right second pereopod, lateral view; E, same, dactylus, mesial view (only mesial setae shown); F, left third pereopod, lateral view; G, same, dactylus, mesial view (only mesial setae shown). Scale bars = 0.5 mm.



**FIGURE 4.** *Cestopagurus caeruleus* sp. nov., holotype, male (sl 1.9 mm), MNHN-Pg 8518. Entire animal, lateral view, showing coloration in life.

Chelipeds distinctly unequal and dissimilar. Right cheliped (Fig. 2A–D) moderately stout. Chela subovate in dorsal view, about 2.0 times as long as wide (greatest width at about midlength of palm); prominent hiatus between fingers. Dactyl about 0.9 length of palm, weakly curved ventrally, overlapped by fixed finger distally; dorsal surface with row of small spines on midline, dorsomesial margin delimited by row of spinules; all surfaces with scattered tufts of short to moderately short setae, mesial face with row of tiny spines adjacent to dorsal margin; cutting edge 3 calcareous teeth in proximal half (proximalmost tooth largest, rounded), otherwise smooth, terminating in small calcareous claw. Palm subequal in length to carpus; dorsomesial margin with row of tiny spinulose tubercles, dorsolateral margin with row of small spines or tubercles extending nearly to tip of fixed finger; dorsal surface gently convex, with irregular longitudinal rows of small spines or tubercles and with scattered tufts of long setae; lateral face with scattered setae dorsally; mesial face nearly smooth, with scattered setae; ventral surface gently convex, with few tufts of setae. Fixed finger slightly curving ventrally, with scattered tufts of moderately long setae on dorsal surface; cutting edge with 1 large tooth distal to midlength and row of minute calcareous teeth in distal one-third, terminating in small calcareous claw. Carpus widened distally, subequal in length to merus; dorsal surface with irregular longitudinal rows of small spines or tubercles mesially, otherwise with few minute tubercles, dorsodistal margin unarmed, dorsolateral margin not delimited; lateral surface with tufts of setae; mesial surface with tufts of setae dorsally and distally, nearly smooth; ventral surface convex, with numerous long setae mesially. Merus with glabrous dorsal surface, dorsodistal margin unarmed; lateral and mesial faces also glabrous, ventrolateral margin with row of spinules or minute tubercles, ventromesial margin with 2 small spines and numerous long setae; ventral surface convex. Ischium with faintly tuberculate ventromesial margin; surfaces with few short setae. Coxa unarmed.

Left cheliped (Fig. 3A–C) moderately slender. Chela about 2.7 times longer than broad (greatest breadth at base of dactylus), with numerous tufts of short to long setae; distinct proximal hiatus between fingers. Dactylus about 1.2 times longer than palm, unarmed, with tufts of short to moderately long setae; cutting edge with row of small, slender corneous teeth, terminating in small corneous claw. Palm about half length of carpus, with row of

small spines on weakly elevated midline; sloping dorsolateral face with short row of minute tubercles, dorsomesial face with few minute tubercles, sloping to mesial face; ventrolateral margin with double row of minute tubercles; mesial face with several low tubercles; ventral surface slightly convex. Cutting edge of fixed finger with small triangular calcareous tooth at midlength and row of small corneous teeth, terminating in small corneous claw. Carpus slightly shorter than merus, dorsally with numerous tufts of long setae; dorsolateral and dorsomesial margins each with row of small spines increasing in size distally; lateral face with few minute granules, mesial face nearly smooth; ventral surface slightly convex, ventrolateral distal angle with few minute tubercles. Merus with dorsal surface unarmed, with few setae proximally; lateral and mesial faces nearly smooth, ventrolateral margin with row of 8 small spines, ventromesial margin with row of 5 small spines; ventral surface without distinct spines or tubercles, but with long stiff setae. Ischium unarmed, with few setae. Coxa unarmed.

Ambulatory legs (Fig. 3D, F) moderately long and stout, right second pereopod nearly reaching tip of extended right cheliped. Dactyli about 6.0 times longer than broad, in dorsal view straight, in lateral view slightly curving ventrally, 0.9–1.0 times as long as propodi; dorsal margins with sparse stiff setae; lateral faces non-sulcate; mesial faces non-sulcate, unarmed (Fig. 3E, G); ventral margins each with 6 or 7 small to moderately strong corneous spines. Propodi distinctly longer than carpi; dorsal surfaces each with row of tufts of moderately long setae; lateral and mesial faces with some setae; ventral surface with 2 or 3 corneous spines and single or paired corneous spines on ventrodistal margin. Carpi each with small dorsodistal spine and rows of tufts of long stiff setae on dorsal surface; lateral faces with few tufts of setae. Meri each with row of sparse setae on dorsal and ventral margins; ventrolateral distal margin with 1 tiny spine (second) or unarmed (third), ventral surfaces nearly smooth, with 0–3 small spines (second) or unarmed (third). Ischia with sparse setae on dorsal and ventral margins.

Fourth pereopods (Fig. 1D) semichelate. Dactyli each with row of minute corneous teeth on ventral margin, terminating in minute corneous claw; no preungual process. Propodal rasp consisting of single row of small corneous scales.

Fifth pereopods chelate. Coxae (Fig. 1E) slightly dissimilar. Right coxa with long sexual tube oriented toward left across ventral body surface and then upward along lateral side of body, extending to distal margin of carpus of left fifth pereopod (when distal part coiled) (Fig. 1F) or passing over dorsal side of body to right. Left coxa without gonopore.

Third thoracic sternite with anterior margin slightly produced medially, unarmed. Anterior lobe of sixth thoracic sternite (Fig. 1G) subsemicircular, with long setae on anterior margin. Eighth thoracic sternite (Fig. 1E) with 2 unequal (left larger), rounded, widely separated, lobes, slightly produced laterally.

Pleon dextrally twisted. Male with 3 unpaired, very unequally biramous left pleopods (third to fifth pleopods). Uropods markedly asymmetrical; protopods unarmed.

Telson (Fig. 1H) with distinct lateral indentations; left posterolateral margin of anterior lobe with greatly elongate setae; posterior lobes rounded, terminal margins oblique, each with row of 3 or 4 small spines, lateral margins forming chitinous plate.

*Females.* Generally similar to males. Right cheliped subequal in length to left cheliped; armature on the chelae and carpi of cheliped more pronounced. Both coxae of third pereopods with gonopore. Abdomen with 4 unpaired left pleopods (second to fifth pleopods).

**Color in life.** Shield cream, with short brown longitudinal stripes anteriorly and posteriorly. Posterior carapace with large brown patch lateral to posteromedian plate, remaining having scattered brown dots. Ocular peduncles cream, with short brown longitudinal stripe proximolateral to base of cornea; cornea gray-brown. Antennular peduncles generally blue, proximal half of ultimate segment brown; flagellum translucent, base of aesthetascs yellowish. Antennal peduncle generally cream, with brown spots on second segment; flagellum alternated with transparent and brown. Chelipeds generally cream with short to moderately short brown stripes on dorsal, lateral and mesial faces of each segment. Ambulatory legs generally cream, with short brown longitudinal stripes; dactyli each with light brown ring subterminally and 2 very short stripes on lateral face proximally (area between stripes pale grayish); propodi each with 2 or 3 short stripes on lateral face slightly proximal to midlength (areas between stripes grayish); carpi each with 3 short stripes on lateral face; meri each with 2 sets of 2 or 3 short longitudinal stripes on lateral face; ischia each with 2 stripes extending over entire length on lateral face. Pleon translucent. See Fig. 4.

**Distribution.** Known only from Mayotte, at depths of 6–22 m.

**Remarks.** The present new species agrees well with the generic diagnosis of *Cestopagurus* (de Saint Laurent 1968; McLaughlin 2003). *Cestopagurus* contains three previously described species, *C. coutieri* Bouvier, 1897

from the Red Sea and Madagascar, *C. puniceus* Komai & Takeda, 2005 from Japan, and *C. timidus* (Roux, 1830) from the eastern Atlantic and the Mediterranean (de Saint Laurent 1968; Komai and Takeda 2005; McLaughlin *et al.* 2010). The present new species is morphologically similar to *C. coutieri* and *C. timidus*. Shared characters include: dactylus of right chela armed at least with median row of small spines; and right palm bearing irregular rows of small spines or tubercles on dorsal surface. *Cestopagurus caeruleus* is readily distinguished from the latter two species by the antennular peduncle clearly overreaching the distal corneal margins by the one-third to half length of the ultimate segment. In *C. coutieri* and *C. timidus*, the antennular peduncle reaches to the distal corneal margins (de Saint Laurent 1968; Komai & Takeda 2005). The dactylus of the right cheliped is armed only with a median row of small spines on the dorsal surface in *C. caeruleus*, whereas there are additional rows of small spines mesial to the median row in *C. coutieri* and *C. timidus*. Furthermore, the new species differs from *C. coutieri* in the oblique, rather than horizontal, terminal margins of the telson.

**Etymology.** Named *caeruleus*, Latin for blue, after the color of antennular peduncle in this new species.

## Genus *Trichopagurus* de Saint Laurent, 1968

### *Trichopagurus asper* sp. nov.

(Figs 5–7)

**Material examined.** *Holotype*: male (sl 1.4 mm), stn 8, Lagoon close to Great north-eastern reef, Mayotte, 12°41'58.41"S, 45°13'11.47"E, coll. J.-M. Bouchard, V. Dinhut & J. Dumas, SCUBA diving, 6–8 m, sandy bottom, coral boulders, MNHN-IU-2011-5025 (Pg-8521).

**Description.** Eleven pairs of biserial gills.

Shield (Fig. 5A) 1.1 times longer than wide; anterior margin between rostrum and lateral projections slightly concave; anterolateral margins sloping; posterior margin roundly truncate; dorsal surface weakly convex, with some tufts of short setae; no paragastric groove delineated. Rostrum triangular, reaching midlength of ocular acicles, terminating in spinule. Lateral projections obsolete, with small marginal spine.

Ocular peduncles (including cornea) (Fig. 5A) stout, about 0.7 times of shield length; not inflated basally; cornea not dilated, corneal width about half of peduncular length; dorsal surface with tufts of stiff setae near base of cornea. Ocular acicles subtriangular, widely separated basally, with small submarginal spine terminally; dorsal surface flat.

Antennular peduncles (Fig. 5A) stout, when fully extended, overreaching distal corneal margins by half length. Ultimate segment approximately twice length of penultimate segment, somewhat widened distally in lateral view, with tuft of long setae at dorsodistal lateral angle. Penultimate segment short, without setae. Basal segment with distolateral margin distinctly produced as short process, statocyst lobe weakly inflated, unarmed laterally.

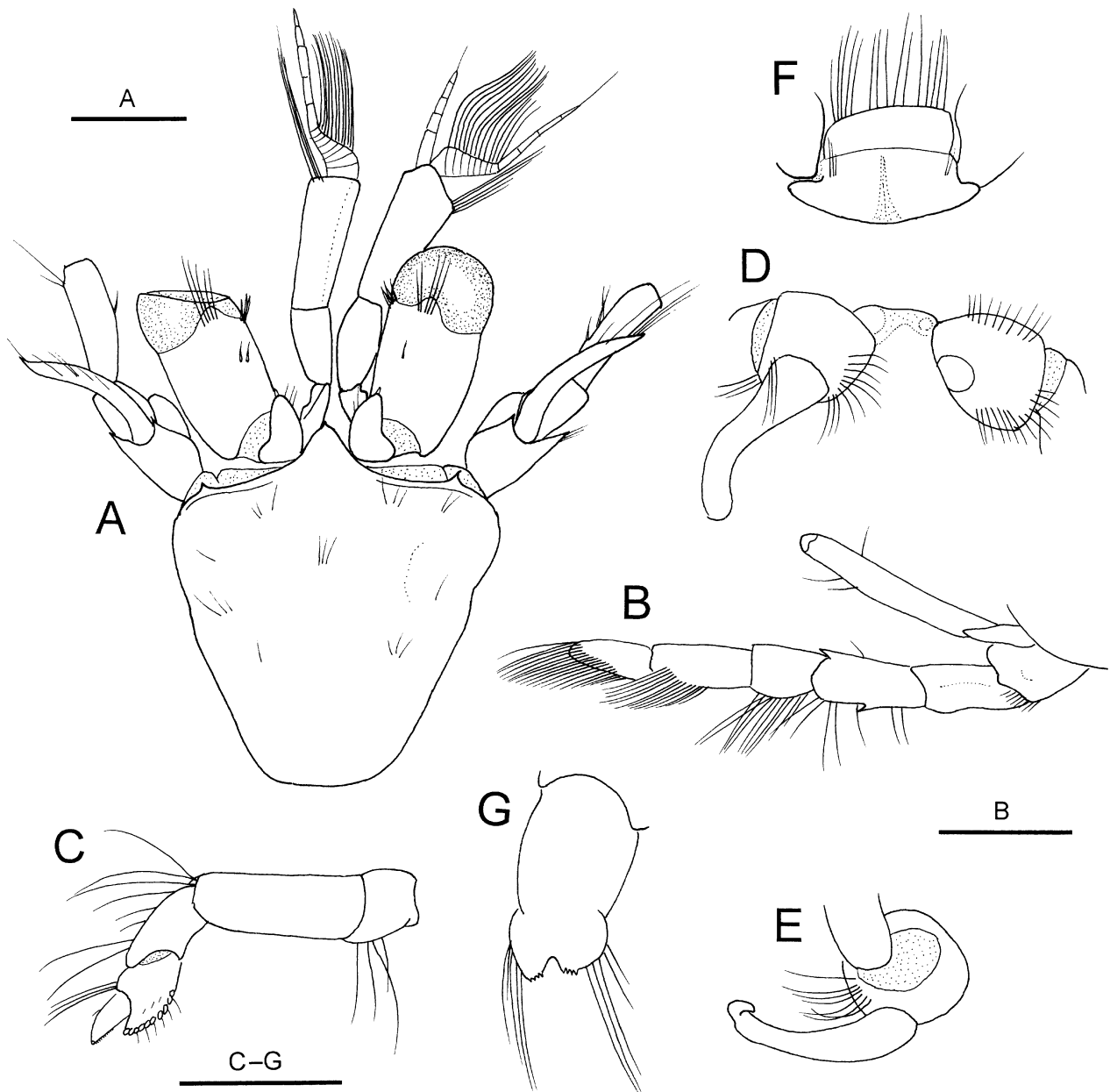
Antennal peduncles (Fig. 5A) reaching distal corneal margins, with supernumerary segmentation. Fifth and fourth segments with few setae. Third segment with spinule at ventromesial distal margin. Second segment with dorsolateral distal angle produced, not reaching midlength of fourth segment, terminating in simple, acute spine; dorsomesial distal angle with small spine; mesial and lateral faces naked. First segment with small spine at dorsolateral distal angle; ventromesial distal margin strongly produced anteriorly, with 1 minute spinule laterally. Antennal acicle overreaching base of cornea but not reaching distal corneal margin, terminating in small spine; dorsomesial margin with sparse setae. Antennal flagellum 4.0–5.0 length of shield; each article with 3–5 very short to moderately long setae on distal margin.

Mouthparts not dissected. Third maxilliped (Fig. 5B) moderately slender; carpus unarmed on dorsodistal margin; merus with strong dorsodistal spine and small ventromesial spine; ischium with well-developed crista dentata composed of very small corneous teeth and 1 accessory tooth; basis-ischium fusion incomplete; basis apparently unarmed on ventromesial margin; exopod reaching midlength of carpus.

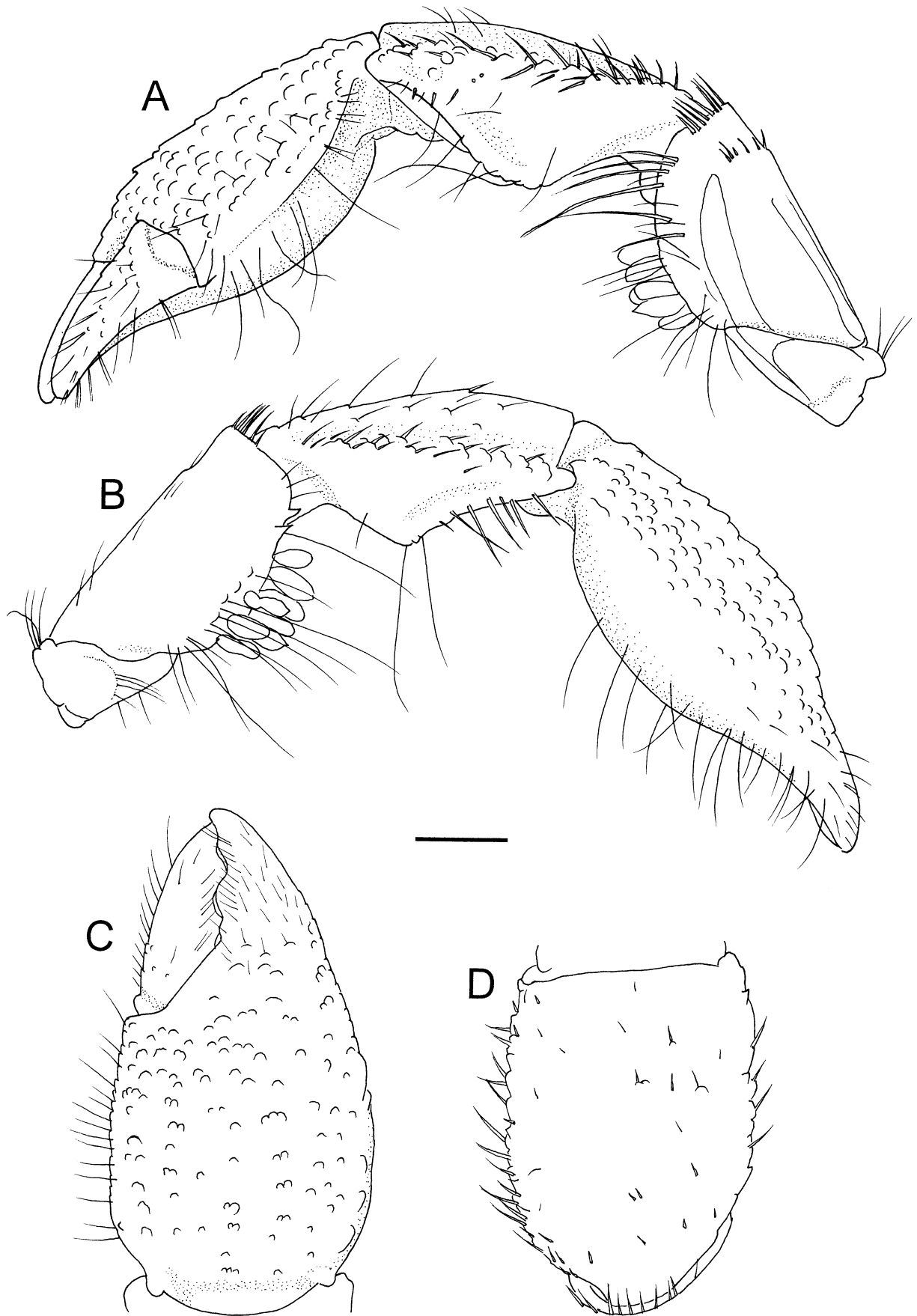
Chelipeds strongly unequal and dissimilar. Right cheliped (Fig. 6A–D) large, stout. Chela subtriangular in dorsal view, 1.8 times as long as wide (greatest width proximal to midlength of palm). Dactyl about 0.8 length of palm, slightly curved ventrally; dorsal surface with sparse microscopic granules, dorsomesial margin not delimited, all surfaces with scattered short setae; cutting edge with 2 large, triangular calcareous teeth, terminating in small calcareous claw. Palm slightly shorter than carpus, with sparse setae on surfaces; dorsomesial margin distinctly carinate in proximal half, dorsolateral margin slightly delimited by irregular row of small, low tubercles; dorsal surface



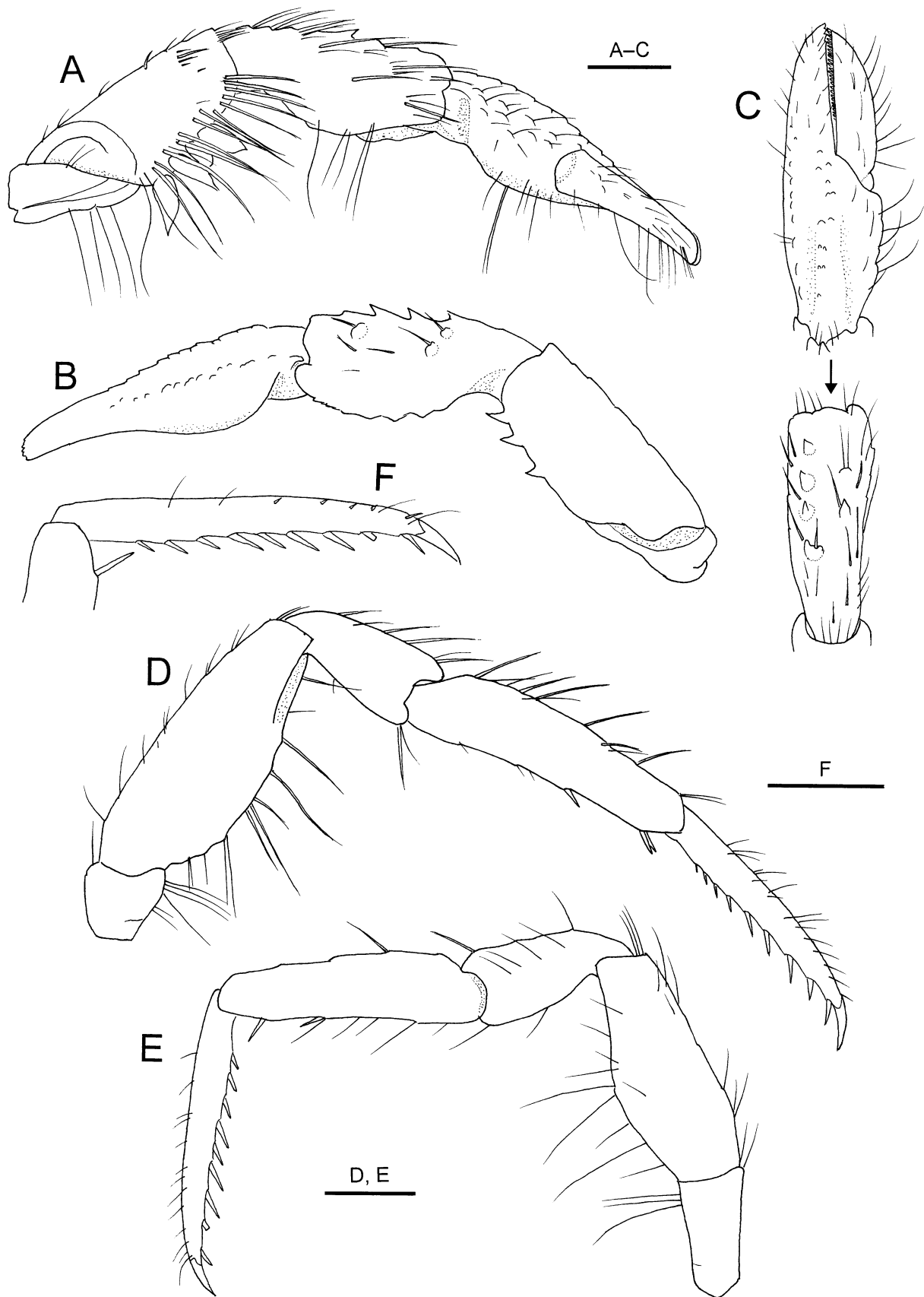
gently convex, with scattered, small, low tubercles; lateral and ventromesial faces almost smooth; ventral surface convex, smooth. Fixed finger with scattered short setae on dorsal surface; cutting edge with 2 obtuse teeth, terminating in small calcareous claw. Carpus strongly flattened dorsoventrally, not widened distally, subequal in length to merus; dorsomesial margin distinctly delimited by double row of small tubercles or low protuberances, and these tubercles and protuberances bearing 1 or more spiniform setae; dorsolateral margin also delimited by row of low protuberances and spiniform setae; dorsal surface slightly convex, with several short spiniform setae; lateral and mesial faces slightly concave; ventral surface convex in lateral and ventral views, anterior half forming shallow concavity. Merus with subdistal transverse ridge extending onto mesial face and few tufts of setae on dorsal surface, dorsodistal margin unarmed but with row of stiff setae; lateral and mesial faces almost smooth, ventrolateral margin with 2 small spines subdistally, ventromesial margin unarmed; ventral surface gently convex, with long setae. Ischium unarmed, with short stiff setae on surfaces. Coxa unarmed.



**FIGURE 5.** *Trichopagurus asper* sp. nov., holotype, male (sl 1.4 mm), MNHN-Pg 8521. A, shield and cephalic appendages, dorsal view (left cornea deformed due to dehydration); B, left third maxilliped, lateral view; C, left fourth pereopod, lateral view; D, coxae of fifth pereopods, right sexual tube and eighth thoracic sternite, ventral view; E, coxa of right fifth pereopod and right sexual tube, lateral view; F, sixth thoracic sternite, ventral view; G, telson, dorsal view. Scale bars = 0.5 mm.



**FIGURE 6.** *Trichopagurus asper* sp. nov., holotype, male (sl 1.4 mm), MNHN-Pg 8521. A, right cheliped, mesial view; B, same, lateral view; C, same, chela, dorsal view; D, same, carpus, dorsal view. Scale bar = 0.5 mm.



**FIGURE 7.** *Trichopagurus asper* sp. nov., holotype, male (sl 1.4 mm), MNHN-Pg 8521. A, left cheliped, mesial view; B, same, lateral view (setae omitted); C, same, chela and carpus, dorsal view; D, right second pereopod, lateral view; E, left third pereopod, lateral view; F, same, dactylus, mesial view. Scale bars = 0.5 mm.

Left cheliped (Fig. 7A–C) moderately slender. Chela about 3.1 times longer than wide (greatest width at base of fingers). Dactylus slightly longer than palm; dorsomesial margin not delimited, surfaces nearly smooth, with tufts of short to moderately short setae; cutting edge with row of small, slender corneous teeth, terminating in small corneous claw. Palm about 0.6 times as long as carpus; dorsal surface weakly elevated in midline, bearing some small, low tubercles and sparse short setae; dorsolateral margin (including fixed finger) delimited by row of small, low tubercles, dorsomesial margin not delimited; lateral face almost smooth; mesial face with very low protuberances and sparse setae; ventral surface convex, almost smooth, with tufts of short to long setae. Cutting edge of fixed finger with minute, sharp calcareous teeth in distal 0.2, remaining part thinly edged, microscopically crenulate. Carpus slightly shorter than merus; dorsolateral margin with 4 small spines and stiff setae, dorsomesial margin with very low protuberances, 1 small spine located at midlength and stiff setae; lateral and mesial faces with few stiff setae; ventral surface with some low protuberances laterally and long setae. Merus with row of low transverse ridges and few tufts of short setae on dorsal surface, dorsodistal margin unarmed; lateral face smooth, ventrolateral margin with 3 moderately small spines in distal half and with tufts of long setae; mesial face with numerous long stiff setae ventrally, ventromesial margin without spines; ventral surface without distinct spines or tubercles. Ischium with sparse setae. Coxa unarmed.

Ambulatory legs (Fig. 7D, E) moderately long and slender, sparsely setose, right second reaching tip of extended right cheliped. Dactyli 8.5–9.0 times longer than wide, about 1.2 times longer than propodus (second) or as long as propodus (third), in dorsal view straight, in lateral view nearly straight with slightly curved claw; dorsal margins each with row of single or tufts of short to moderately short setae; lateral and mesial faces non-sulcate; mesial faces unarmed (second), armed with corneous spinules dorsally (third) (Fig. 7F); ventral margins each with 9 long, slender corneous spines. Propodi distinctly longer than carpi; dorsal surfaces each with moderately long stiff setae; lateral and mesial faces glabrous; ventral surface with 1 slender corneous spine distal to midlength, distal margin with pair of slender corneous spines. Carpi without dorsal spines. Meri somewhat widened, unarmed on dorsal and ventral margins. Ischia unarmed.

Fourth pereopods (Fig. 5C) semichelate. Dactyli nearly straight, each with row of minute corneous teeth on ventral margin, terminating in tiny corneous claw; no preungual process. Propodal rasp consisting of single row of small corneous scales.

Fifth pereopods chelate. Male coxae (Fig. 5D) slightly asymmetrical; right coxa with short sexual tube directed posterolaterally and curved upward, distal part strongly flexed (Fig. 5E); left coxa with small gonopore, but without sexual tube or protrusion of vas deferens.

Third thoracic sternite with anterior margin slightly produced medially, unarmed. Anterior lobe of sixth thoracic sternite (Fig. 5F) transversely oblong, with row of moderately short setae on anterior margin. Eighth thoracic sternite (Fig. 5D) composed of 2 rounded, widely separated lobes.

Pleon dextrally twisted. Male with 3 unpaired, very unequally biramous left pleopods (third to fifth pleopods). Uropods markedly asymmetrical; protopods unarmed.

Telson (Fig. 5G) with distinct lateral indentations at posterior one-third; posterior lobes rounded, terminal margins slightly oblique, each with row of 4 minute spinules, posterolateral margins each with fringe of long setae.

**Distribution.** Known only from the type locality, Mayotte Island, 6–8 m.

**Remarks.** This new species fits closely the generic diagnosis of *Trichopagurus* revised by Komai & Osawa (2005). *Trichopagurus* contains two previously described species, *T. macrochela* Komai & Osawa, 2005 and *T. trichophthalmus* (Forest, 1954), known from the tropical Indo-West Pacific. This new species more closely resembles *T. macrochela*, particularly in the flattened carpus of the right cheliped and the less setose ocular peduncles, chelipeds and ambulatory legs (Komai & Osawa 2005). Nevertheless, it is immediately distinguished from the latter in the ornamentation and armature of the chelipeds. The palm of the right cheliped has scattered small, low tubercles on the dorsal surface in *T. asper*, whereas it is smooth medially and minutely granular laterally and mesially in *T. macrochela*. The carpus of the right cheliped is armed with double row of small tubercles and short spiniform setae in *T. asper*, rather than a row of small spines and long setae in *T. macrochela*. The carpus of the left cheliped is armed with four small spines on the dorsolateral margin and one middle spine on the dorsomesial margin in *T. asper*, while unarmed in *T. macrochela*. Furthermore, in *T. asper*, the telson has distinct lateral indentations, but these indentations are hardly delimited in *T. macrochela*.

The meri of the chelipeds of the holotype bear several capsule-like structures on the ventral face, which possibly represent egg sacs of other invertebrates or parasites (Fig. 6A, B for the right cheliped; Fig. 7A for the left cheliped).

**Etymology.** The Latin word *asper* (= rough) was selected as descriptive of the roughly tuberculated dorsal surface of the right palm of this new species, in comparison with the other two congeneric species.

## Acknowledgments

Financial support for collecting specimens studied herein has been obtained from the Direction de l'Agriculture et de la Forêt of Mayotte (DAF) and Total Foundation. Jean-Marie Bouchard, Jacques Dumas and Vincent Dinhut have collected the specimens during scuba dives in Mayotte lagoon. Régis Cleva helped to sort the specimens and to integrate them in MNHN collections. Supplementary assistance for this research has been also given by the Institut de Recherche de l'Ecole Navale, Brest (IRENav) and the Muséum national d'Histoire naturelle, Paris (MNHN).

## Literature cited

- Bouvier, E.L. (1897) Sur deux paguriens nouveaux trouvés par M. Coutière dans le récif madréporique, Djibouti. *Bulletin du Muséum national d'Histoire naturelle, Paris*, 6, 229–233.
- Bouchard, J.-M., Poupin, J., Cleva, R., Dumas, J. & Dinhut, V. (2009) Rapport de mission du 2 au 22 novembre. Mission Crustacés Mayotte 2009. *Rapport Kraken Underwater Works, KUW, Mamoudzou, Mayotte*, 151 pp (<http://crustaceamayotte.free.fr>).
- Bouchard, J.-M., Poupin, J., Cleva, R., Dumas, J. & Dinhut, V. (in press) Land, mangrove and freshwater decapod crustaceans of Mayotte region (Crustacea, Decapoda). *Atoll Research Bulletin*.
- Komai, T. & Osawa, M. (2005) A new species of *Trichopagurus* de Saint Laurent (Crustacea: Decapoda: Anomura: Paguridae) from the Ryukyu Islands, and redescription of *T. trichophthalmus* (Forest). *Zootaxa*, 801, 1–20.
- Komai, T. & Takeda, M. (2005) First report of *Cestopagurus* Bouvier (Crustacea: Decapoda: Anomura: Paguridae) from the Pacific Ocean, and the description of a new species. *Bulletin of the National Science Museum, Series A (Zoology)*, 31, 93–104.
- Li, X., Cleva, R. & Poupin, J. (2012) Report on some caridean shrimps from Mayotte (Crustacea: Decapoda). *Zootaxa*, 3162, 1–30.
- Macpherson, E. & Cleva, R. (2010) Shallow-water squat lobsters (Crustacea, Decapoda, Galatheidae) from Mayotte (Comoros Island), La Réunion and Madagascar, with the description of a new genus and two new species. *Zootaxa*, 2612, 57–68.
- McLaughlin, P.A. (2003) Illustrated keys to families and genera of the superfamily Paguroidea (Crustacea: Decapoda: Anomura), with diagnoses of genera of Paguridae. *Memoirs of the Museum Victoria*, 60, 111–144.
- McLaughlin, P.A., Komai, T., Lemaitre, R. & Rahayu, D. L. (2010) Annotated checklist of anomuran decapod crustaceans of the world (exclusive of the Kiwaoidea and families Chirostylidae and Galatheidae of the Galattheoidea) Part I. Lithodoidea, Lomisoidea and Paguroidea. *Raffles Bulletin of Zoology, Supplement*, 23, 5–107.
- Poupin, J. & Bouchard, J.-M. (2010) A new dwarf sentinel crab from Mayotte Island (Decapoda: Brachyura: Macrophthalmidae). *Zootaxa*, 2501, 61–67.
- Poupin, J., Bouchard, J.-M., Dinhut, V., Cleva, R. & Dumas, J. (in press) Anomura of Mayotte region (Crustacea, Decapoda). *Atoll Research Bulletin*.
- Saint Laurent, M. de. (1968) Révision des genres *Catapaguroides* et *Cestopagurus* et description de quatre genres nouveaux. II. *Cestopagurus* Bouvier (Crustacés Décapodes Paguridae). *Bulletin du Muséum national d'Histoire naturelle, Paris*, 2<sup>e</sup> série, 42, 210–222.
- Saint Laurent, M. de. (1970) Révision des genres *Catapaguroides* et *Cestopagurus* et description de quatre genres nouveaux. V. *Trichopagurus* de Saint Laurent (Crustacés Décapodes Paguridae). *Bulletin du Muséum national d'Histoire naturelle, Paris*, 2<sup>e</sup> série, 40, 539–552.