

A new genus and species of hermit crab (Crustacea: Anomura: Paguridae) from Taiwan

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Abstract

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A new monotypic hermit crab genus, *Chanopagurus* (Paguridae), is described for a new species, *C. atopos*, based on an ovigerous female specimen collected in deep water (880 m) off the coast of Taiwan. The single specimen is unique in having: 13 pairs of quadriserial gills which include two reduced but functional pleurobranches on the fifth and sixth thoracic somites; ocular peduncles concave mesially; reduced, unpigmented corneas located lateroventrally; ocular acicles each armed with very small spine; unpaired left gonopore; and paired first pleopods. The new species shares with *Propagurus* McLaughlin and de Saint Laurent, the presence of reduced pleurobranches on the fifth and sixth thoracic somites. The superficial resemblance of *C. atopos* with species of *Tomopaguropsis* Alcock, in having subequal chelipeds, and long, dense setae on the antennae, chelipeds and second and third pereopods, is considered homoplasy.

Keywords

Crustacea, Anomura, Paguridae, taxonomy, *Chanopagurus*, new genus, new species

Introduction

While studying hermit crabs obtained in deep waters off Taiwan during a joint Taiwanese-French cruise (TAIWAN 2000, July–August, 2000), a female specimen of Paguridae was encountered that could not be assigned to any known genus. The combined presence of 13 pairs of quadriserial gills, subequal chelipeds, unpaired left gonopore and paired first pleopods are distinctive among Paguridae. In addition, the concave shape of the mesial surfaces of the ocular peduncles, the lateroventral placement of the unpigmented corneas, and unusually small spines on the ocular acicles, are striking. The specimen clearly represents a separate lineage for which a new genus and species are herein described and illustrated.

Gill terminology follows McLaughlin and de Saint Laurent (1998: 161). Forest et al. (2000: 24) is followed in the interpretation of the ocular peduncle, which is provided basally with a small calcified plate referred to as the “ocular acicle”. The term “semichelate” was defined by McLaughlin (1997: 435). Shield length (SL) is measured from the tip of the rostrum to the mid-point of the posterior margin of the shield.

Chanopagurus gen. nov.

Type species. Chanopagurus atopos sp. nov.

Diagnosis. 13 pairs of quadriserial gills (Fig. 1a): 2 arthrobranches on each of third maxillipeds and first to fourth pere-

opods, 1 reduced but functional pleurobranch on fifth and sixth thoracic somites (above second and third pereopods), and 1 well-developed pleurobranch on seventh thoracic somite (above fourth pereopods). Shield well calcified. Rostral lobe unarmed, not exceeding lateral projections. Cornea lateroventral. Ocular acicle with small spine. Posterior carapace almost entirely membranous. Antennal peduncle with supernumerary segmentation. Maxillule with external endopodal lobe not recurved. Third maxillipeds widely separated basally; ischium with crista dentata well developed, and 1 accessory tooth. Chelipeds subequal in length. Second and third pereopods similar except for slightly longer meri on right pereopods. Sixth thoracic sternite (of third pereopods) divided into anterior and posterior lobes by distinct, membranous hinge. Abdomen not reduced, membranous except for moderately calcified tergite of sixth somite. Tergite of sixth somite with transverse furrow dividing tergite into anterior and posterior portions, each portion having weak, median longitudinal depression. Uropods asymmetrical, left larger than right. Telson symmetrical, with distinct lateral indentations separating anterior and posterior lobes, latter each with “half-moon” contour and blade-like lateral margin. Female with unpaired left gonopore; with paired first and biramous left second to fifth pleopods. Male unknown.

Etymology. This genus is named for Dr Tin-Yam Chan (NTOU), in recognition of his outstanding efforts to advance our knowledge of the Taiwanese crustacean fauna. The genus

name is a combination of his last name with the Greek *pagourus* meaning crab. Masculine.

Remarks. *Chanopagurus* is the sixth genus of Paguridae with 13 pairs of quadrilateral gills; the others are: *Bathypaguroopsis* McLaughlin, 1994, *Propagurus* McLaughlin and de Saint Laurent, 1998, *Tomopaguroides* Balss, 1912, *Tomopaguroopsis* Alcock, 1905, and *Xylopagurus* A. Milne Edwards, 1880. *Chanopagurus* shares with *Propagurus* the presence of reduced or moderately well developed pleurobranches on the fifth and sixth thoracic somites. As in the *Pylopaguroopsis* group of pagurid genera (cf. de Saint Laurent-Dechancé, 1966) *Chanopagurus* seems to be undergoing an evolutionary process leading to reduction or loss of pleurobranches similar to that in *Propagurus* (see McLaughlin and de Saint Laurent, 1998). *Chanopagurus* shows only homoplastic similarity to *Tomopaguroopsis*, in having species with subequal chelipeds, and numerous setae on the antennal peduncles and flagella, chelipeds and second and third pereopods. *Chanopagurus* differs from *Propagurus* and *Tomopaguroopsis* in important characters, for example, the shape and location of the corneas, ocular acicles, number of rows of scales on the propodal rasp of the fourth pereopods, number of female gonopores, number of pleopods in females, and shape of telson. Although reduction of ocular peduncles and corneas has occurred frequently in some Pylochelidae, Paguridae, Parapaguridae, it rarely is accompanied by a shift in the position of the corneas or a change in the shape of the peduncles as seen in this new species. The lateroventral position of the corneas, and concave mesial surface of the ocular peduncles (Figs 1c–e) in *C. atopus*, are unique autapomorphies among Paguridae. Although the short ocular acicles, each armed with a very small spine in *C. atopus*, are unusual among Paguridae, a similar condition does occur in *Probebebe mirabilis* Boone, 1926, a highly specialized deep-sea parapagurid (de Saint Laurent, 1972; Lemaitre, 1998).

Chanopagurus atopus sp. nov.

Figures 1–3

Material examined. Holotype: South China Sea, off Taiwan, 22°14.8'N, 120°02.8'E, 880 m, 29 Jul 2000 (TAIWAN 2000 station CP 23), National Taiwan Ocean University, Keelung, Taiwan, NTOU H-23a (ovigerous female, SL 6.0 mm).

Description of holotype. Shield (Fig. 1b) about as broad as long; anterolateral margins sloping; posterior margin truncate; accessory portions extending posteriorly slightly beyond posterior margin, delimited by deep grooves; dorsal surface with numerous tufts of short transverse or oblique rows of setae. Rostral lobe not exceeding lateral projections, broadly rounded. Lateral projections subtriangular, strongly produced and each armed with prominent terminal spine. Branchiostegites calcified dorsodistally; anterodistal margins rounded, setose. Posterior carapace with small calcareous anterolateral tubercle on each side, and small calcified portion adjacent to posterior margin of shield lateral to each cardiac sulcus.

Ocular peduncles (Fig. 1b–e) short, stout, inflated and nearly contiguous basally, tapering distally; dorsal surface with tuft of few setae medially; dorsomesial margin well defined by low,

setose lobes; mesial surface (Fig. 1d) concave medially, with small setose tubercle submedially. Cornea reduced, surface weakly convex, unpigmented. Ocular acicles (Fig. 1c) nearly contiguous basally, about 3 times as broad as long, each with very small calcareous spine pointing anteromesially.

Antennular peduncle (Fig. 1b), when fully extended, overreaching ocular peduncle by 0.5 length of penultimate segment. Ultimate segment about 2.3 times as long as penultimate segment; dorsal surface with short setae. Penultimate segment with few setae dorsally. Basal segment with acute spine on dorsolateral margin. Ventral flagellum with 6 articles. Antennal peduncle (Fig. 1b) strong and nearly as long as shield length, overreaching ocular peduncles by full length of fourth peduncular segment. Fifth segment nearly twice as long as fourth segment; with setae laterally. Fourth segment with few setae laterally. Third segment with small spine on ventrodorsal margin. Second segment with dorsolateral, distal angle produced, terminating in strong simple (left) or bifid (right) spine; dorsomesial distal angle with prominent spine. First segment with small spine at laterodorsal margin, and 2 small spines on ventrodorsal margin. Acicle long, reaching distal margin of fifth antennal segment; broadly curving laterally (dorsal view), terminating in strong spine; mesial margin with dense, long simple setae. Flagellum relatively short, not overreaching right cheliped; articles with numerous long, simple setae 1–4 times as long as each antennal article.

Mouthparts not dissected. Mandible with incisor edge nearly straight, calcified. Maxillule with external endopodal lobe short, internal endopodal lobe bearing 3 long distal setae. First maxilliped with multiarticulate flagellum. Maxilla with elongate, slender endopod reaching distal margin of adjoining endite. Second maxilliped without distinguishing characters. Third maxilliped with crista dentata (Fig. 1f) of 13 or 14 corneous-tipped teeth; accessory tooth on inner face of ischium placed submedially; basis with 3 corneous-tipped teeth on mesial margin. Third thoracic sternite (of third maxillipeds; Fig. 1f) with strong corneous-tipped spine on each side of midline.

Chelipeds subequal in length; right slightly longer, stouter. Right cheliped (Fig. 1g) with dorsal surfaces of carpus and chela covered with numerous tufts or short transverse rows of long, simple, stiff setae. Dactyl and fixed finger weakly curved ventrally, lacking spines; dactyl about as long as mesial margin of palm, terminating in blunt corneous claw; cutting edges each with 2 large, rounded calcareous teeth on proximal half, and row of short, fused corneous teeth distally. Palm about as broad as long, unarmed except for small, setose tubercles on dorsal and ventral surfaces; mesial and lateral margins rounded; ventral surface smooth except for scattered tufts of setae proximally, and long setae near base of fixed finger. Carpus slightly broadened distally; unarmed except for distal dorsomesial spine and low setose tubercles on dorsal surface; ventral surface smooth except for scattered setae. Merus with short transverse rows of setae on dorsal margin; lateral, mesial, and ventral surfaces smooth except for scattered setae; ventral surface with small ventromesial and ventrolateral spines distally. Ischium with scattered setae; ventral surface with small ventromesial and ventrolateral spines distally. Left cheliped (Fig. 1h) with

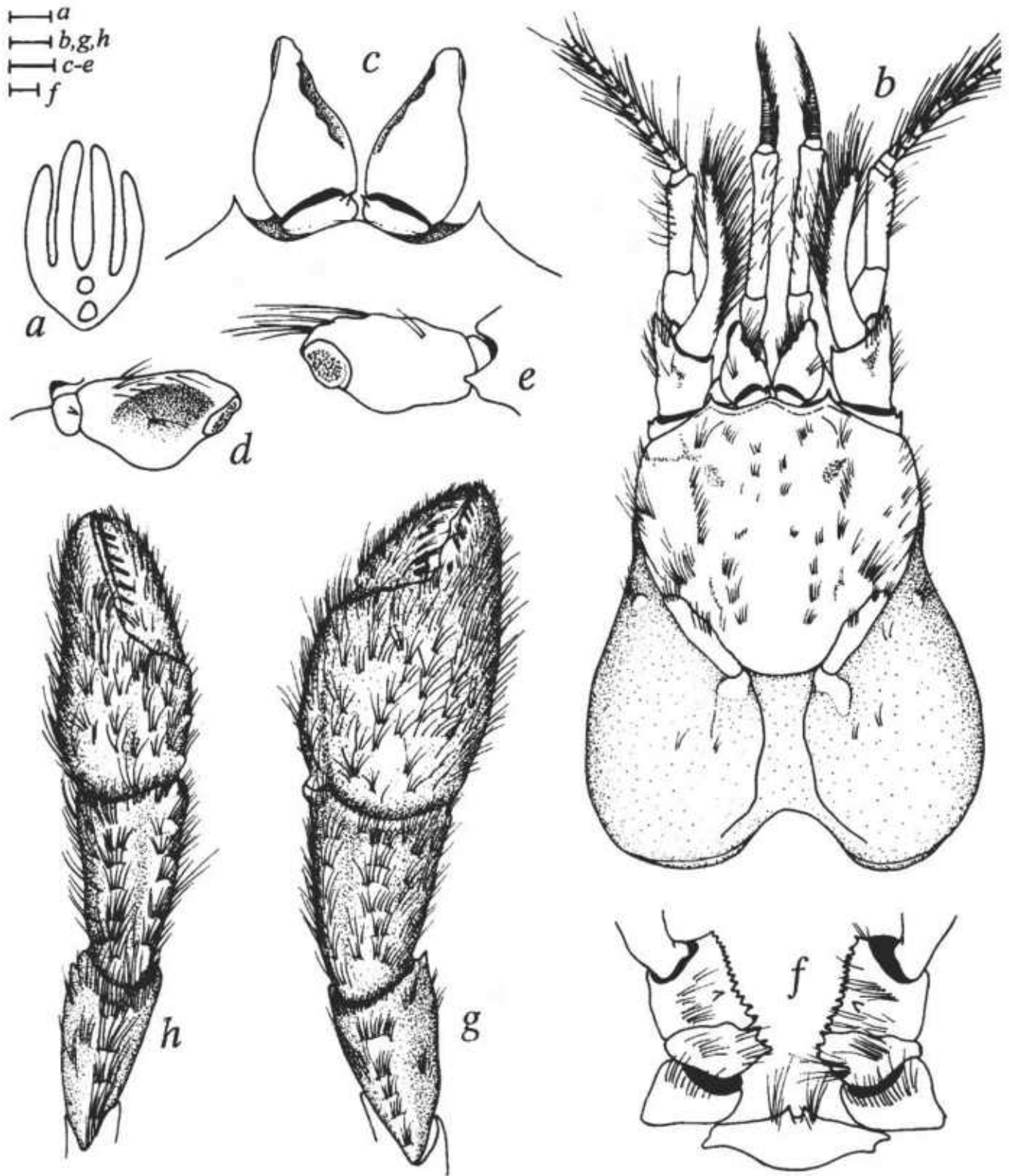


Figure 1. *Chanopagurus atopus* sp. nov., holotype female ovigrcous (NTOU H-23a): a, gill lamella; b, shield, posterior carapace, and cephalic appendages, dorsal; c, ocular peduncles and acicles, rostral lobe and lateral projections, dorsal (setae omitted); d, left ocular peduncle and cornea, mesial (stippled area indicates concave portion); e, same, lateral; f, sternite, coxae, bases, and ischia of third maxillipeds, ventral; g, right cheliped, dorsal; h, left cheliped, dorsal. Scales equal 0.25 mm (a), 1 mm (b, g, h) and 0.5 mm (c-e, f).

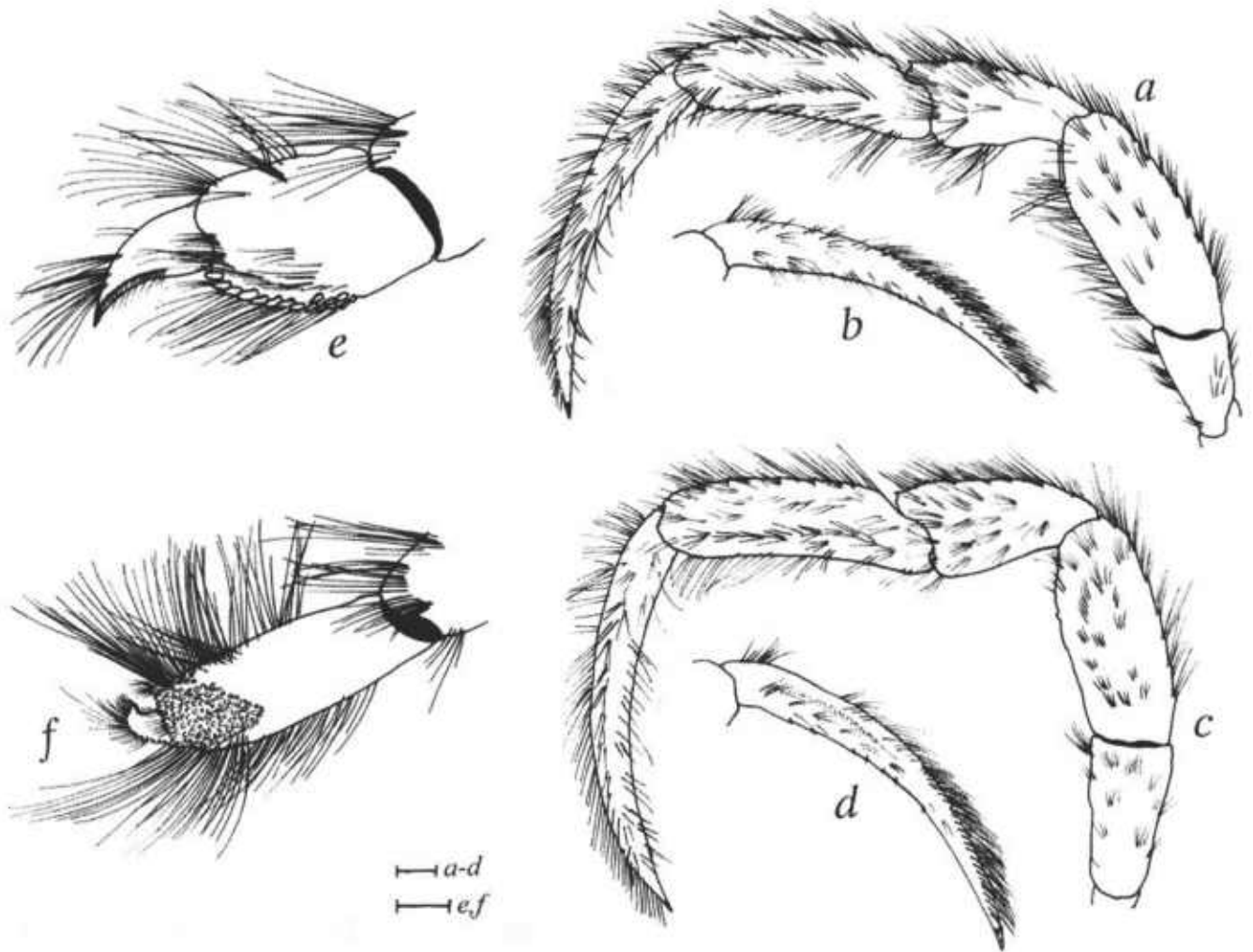


Figure 2. *Chanopagurus atopus* sp. nov., holotype female ovigerous (NTOU H-23a): a, left second pereopod, lateral; b, dactyl of same, mesial; c, left third pereopod, lateral; d, dactyl of same, mesial; e, propodus and dactyl of left fourth pereopod, lateral; f, propodus and dactyl of left fifth pereopod, lateral. Scales equal 1 mm (a–d), and 0.5 mm (e, f).

dorsal surfaces of carpus and chela covered with numerous tufts or short transverse rows of long, simple, stiff setae. Dactyl and fixed finger weakly curved ventrally, each terminating in blunt corneous claw; dactyl about 1.5 times as long as mesial margin of palm; cutting edges each with row of short, fused corneous teeth distally, on fixed finger corneous teeth interspersed with short calcareous teeth. Palm lacking spines; dorsal surface with very small setose tubercles; ventral surface smooth except for long setae near base of fixed finger. Carpus with dorsodistal spine; dorsal surface with weak longitudinal depression; mesial margin strongly sloping; ventral surface smooth except for scattered setae. Merus with short, transverse rows of long setae on dorsal margin; lateral, mesial, and ventral surfaces smooth except for scattered setae; ventral surface with small ventromesial and ventrolateral spines distally. Ischium with scattered setae; ventral surface with small ventromesial and ventrolateral spines distally.

Second and third pereopods (Figs 2a–d) with meri, carpi, propodi and dactyls having numerous, long stiff setae on lateral and mesial surfaces; meri, carpi and propodi with low tubercles transverse rows of long stiff setae. Dactyls (Figs 2b, d) broadly curved, each terminating in sharp, corneous claw, about 1.7 (second pereopod) to 1.9 (third pereopod) as long as propodus; with dorsal and dorsomesial distal rows of long setae; with ventromesial row of 3–8 spinules. Propodi lacking spines. Carpi each with dorsodistal spine. Meri lacking spines. Ischia with scattered tufts of setae on lateral face and dorsal margin. Sixth thoracic sternite (of third pereopods; Fig. 3a) with anterior lobe subrectangular, setose, with 6 small subdistal spines. Fourth pereopod (Fig. 2e) semichelate, with long setae dorsally on merus, carpus, propodus and dactyl. Dactyl subtriangular, terminating in sharp, corneous claw; with ventrolateral row of closely-set corneous spines; no preungual process. Propodus with rasp consisting of single row of ovate

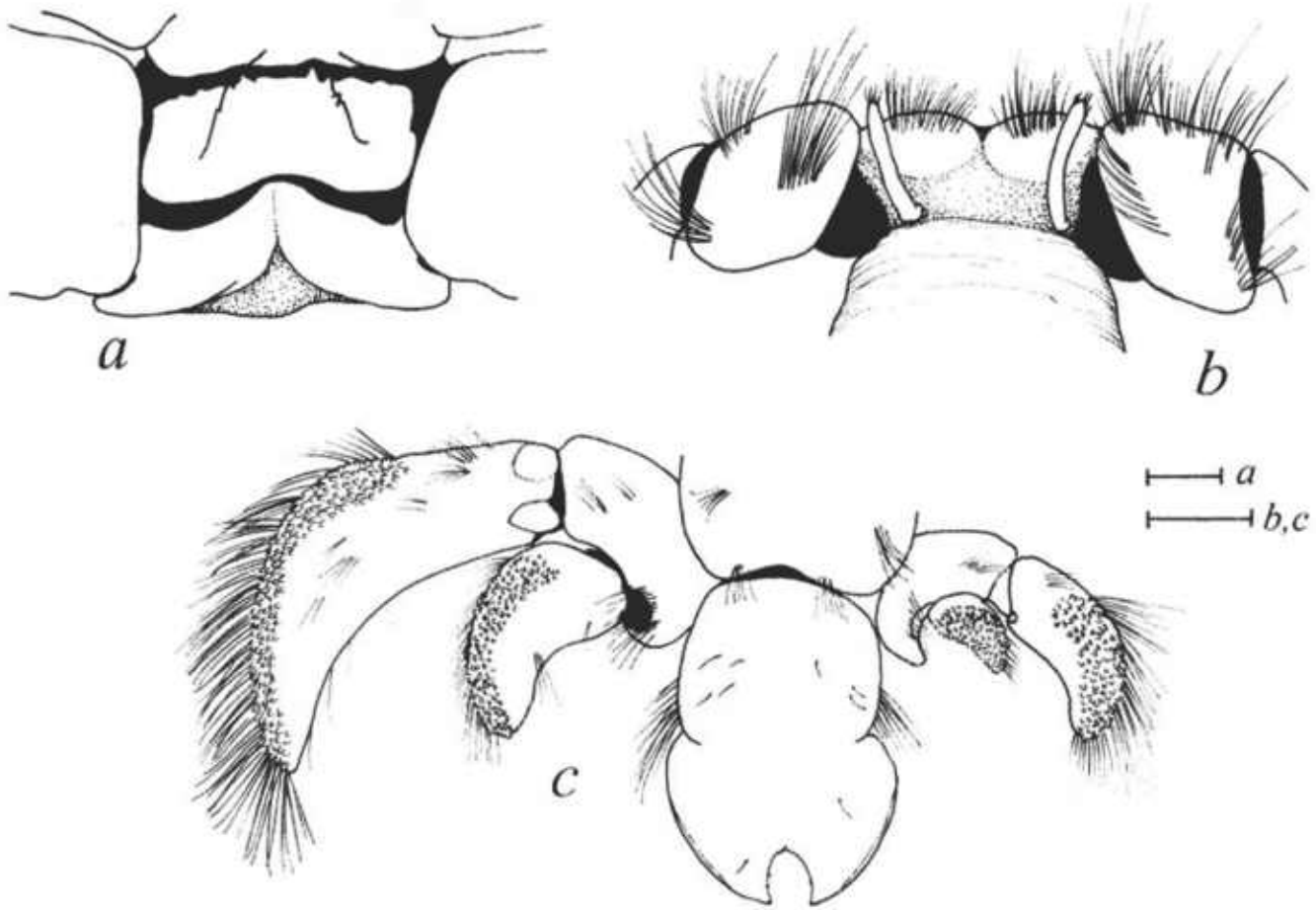


Figure 3. *Chanopagurus atopus* sp. nov., holotype female ovigerous (NTOU H-23a): a, anterior and posterior lobes of sixth thoracic sternite, ventral (setae omitted); b, female coxae and eighth thoracic sternite, and part of abdomen (lower) showing first pleopods, ventral; c, uropods and telson, dorsal. Scales equal 0.5 mm (a), and 1 mm (b, c).

scales distally, and 2 rows proximally; lateroventral surface and ventral margin setose. Fifth pereopod (Fig. 2f) chelate; chela with dense, long setae on dorsal and ventral margins distally. Propodal rasp occupying subtriangular area not reaching midpoint of segment, consisting of small, closely-set rounded scales. Merus and carpus with long setae on dorsal and ventral margins.

Uropods (Fig. 3c) with left exopod about 3 times as long as broad, somewhat sickle-shaped, and about twice as long as right exopod; rasps of exopod and endopod consisting of small, closely-set rounded scales. Telson (Fig. 3c) longer than broad, with scattered short setae dorsally; anterior lobes setose distolaterally; with lateral angles of posterior lobes each produced as prominent spine with minute corneous tip; posterior lobes separated by U-shaped median cleft, concave inner margins with 1 (right) or 2 (left) minute, blunt spines.

Female first pleopods (Fig. 3b) slender, overreaching ventral margin of eighth thoracic sternite (sternite of fifth pereopods); with few short setae distally; segmentation not apparent. Eggs large, diameter about 1.8 mm.

Male. Unknown.

Colour. In preservative, uniformly orangish, with yellowish setae.

Distribution and habitat. Off Taiwan, South China Sea; 880 m; inhabiting a gastropod shell.

Etymology. *Atopus*, Greek, meaning out of place, odd, or strange, referring to the unusual characteristics of the ocular peduncles, corneas and ocular aeiels.

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References

- Forest, J., de Saint Laurent, M., McLaughlin, P.A., and Lemaitre, R. 2000. The marine fauna of New Zealand: Paguridea (Decapoda: Anomura) exclusive of the Lithodidae. *NIWA Biodiversity Memoir* 114: 1–250.
- Lemaitre, R. 1998. Revisiting *Tylaspis anomala* Henderson, 1885 (Parapaguridac), with comments on its relationships and evolution. *Zoosystema* 20: 289–305.
- McLaughlin, P.A. 1997. Crustacea Decapoda: Hermit crabs of the family Paguridae from the KARUBAR Expedition in Indonesia. In: Crosnier, A. (ed.), Résultats des Campagnes MUSORSTOM, Volume 16. *Mémoires du Muséum national d'Histoire naturelle* 172: 433–572.
- McLaughlin, P.A., and de Saint Laurent, M. 1998. A new genus for four species of hermit crabs formerly assigned to the genus *Pagurus* Fabricius (Decapoda: Anomura: Paguridae). *Proceedings of the Biological Society of Washington* 111: 158–187.
- de Saint Laurent, M. 1972. Sur la famille des Parapaguridae Smith, 1882. Description de *Typhlopagurus foresti* gen. nov., et de quinze espèces ou sous-espèces nouvelles de *Parapagurus* Smith (Crustacea, Decapoda). *Bijdragen tot de Dierkunde* 42: 97–123.
- de Saint Laurent-Dechancé, M. 1966. Remarques sur la classification de la famille des Paguridae et sur la position systématique d'*Iridopagurus* de Saint Laurent. Diagnose d'*Anapagrides* gen. nov. *Bulletin du Muséum national d'Histoire naturelle, Paris, 2e séries*, 38: 257–265.