

# Reexamination of *Pagurus minutus* Hess, 1865, and *Pagurus filholi* (de Man, 1887) (Crustacea: Anomura: Paguridae)

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Sandberg, L. & P.A. McLaughlin. Reexamination of *Pagurus minutus* Hess, 1865, and *Pagurus filholi* (de Man, 1887) (Crustacea: Anomura: Paguridae).

Zool. Med. Leiden 67 (13), 30.vii.1993: 197-206, figs. 1-4. —ISSN 0024-0672.

Key words: Crustacea; Anomura; Paguridae; *Pagurus minutus* Hess; *Pagurus filholi* (de Man).

The type specimens of *Pagurus minutus* Hess, 1865 and *P. filholi* (de Man, 1887) have been reexamined. Both are valid species, correctly assigned to *Pagurus*. *Pagurus filholi* has proved to be the senior synonym of *Pagurus geminus* McLaughlin, 1976.

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## Introduction

In a little known work, Hess (1865) reported on a collection of decapod and stomatopod crustaceans purportedly from the west coast of Australia. Included in his account were two, presumably new species of hermit crabs, i.e., *Pagurus minutus* Hess and *Birgus hirsutus* Hess. The type localities for both were given as Sydney. Hess' descriptions were very cryptic; however, his figure of *B. hirsutus* (pl. 7, fig. 16) in a gastropod shell was quite good. It was from this figure that Hilgendorf (1869) concluded that *B. hirsutus* could not belong to the genus *Birgus*. He suggested that it represented a species of the related genus *Coenobita*. Subsequently, Haswell (1882) placed *B. hirsutus* in synonymy with *C. brunnea* Dana. In his catalog, Haswell also included *P. minutus*, but provided only a translation of Hess' (1865) description. The inadequacy of Hess' description was apparent when Haswell (1882) retained this taxon in *Pagurus* while transferring other species to Brandt's (1851) *Eupagurus*.

As a supplement to his review of the brachyuran genus *Sesarma*, de Man (1887) presented a critical review of Hess' (1865) work, based upon his own personal reexamination of all of Hess' material housed at the Göttingen Museum. Of Hess' hermit crab species, de Man (1887) concluded that Hess had confounded two species under the name *P. minutus*. One of the two syntypes lacked a rostral projection, whereas a rostral spine was well developed in the second. De Man (1887) redescribed and figured *P. minutus* (as *Eupagurus*) as the species lacking a rostral projection. The second specimen was described under the name *Eupagurus filholi* de Man.

Other than the bibliographic citations of Alcock (1905) and Gordan (1956), *P. filholi* has not been reported since de Man's original description. The chronology of *P. minutus* became somewhat confused when Benedict (1892) described two new taxa from the eastern Pacific under the names *Eupagurus minutus* Benedict and *E. munitus* Benedict. Bouvier (1898) recognized that *E. minutus* was preoccupied by Hess' (1865) taxon and renamed the species *Eupagurus benedicti* [= *Pagurus benedicti*

(Bouvier)]. As noted by McLaughlin (1974) and discussed by McLaughlin and Haig (1993), Makarov (1938) confused Benedict's two names in his synonymy of another northeastern Pacific species.

The types of both species, *P. filholi* from the Nationaal Natuurhistorisch Museum (formerly Rijksmuseum van Natuurlijke Historie), Leiden (RMNH), and *P. minutus* from the Naturhistoriska Riksmuseet (Swedish Museum of Natural History), Stockholm (SMNH), have now been reexamined. *Pagurus filholi* has been found to be the senior synonym of *P. geminus* McLaughlin, a commonly occurring species throughout southeast Asia. Although McLaughlin (1976) described and illustrated *P. geminus*, for balance and completeness, the type of *P. filholi* is illustrated and a differential diagnosis of the species is presented here, together with a limited synonymy. A complete description of *P. minutus*, with synonymy and illustrations, is also provided.

***Pagurus filholi* (de Man, 1887)**  
(figs. 1, 3)

*Eupagurus samuelis*; Stimpson, 1858: 250; Ortmann, 1892: 301, pl. 12, fig. 12; Shiino, 1958: 68, ? pl. 3, fig. 5 (not pl. 3, fig. 10). [Not *Eupagurus samuelis* Stimpson, 1857: 482].

*Pagurus minutus* Hess, 1865: 160 (in part); [also issued separately, 1865: 34.]; Haswell, 1882: 156 (in part).

*Eupagurus filholi* de Man, 1887: 707, fig. 3.

*Pagurus samuelis*; Makarov, 1937: 62, fig. 13; 1938: 189 (in part, not pl. 3, fig. 6); 1962: 179 (in part, not pl. 3, fig. 6); Vinogradov, 1950: 227, fig. 118; Okada & Uchida et al., 1962: 90, pl. 45, fig. 7; Utinomi, 1968: 65, pl. 33, fig. 4; Miyake, 1978: figs. 46, 47, pl. 1, fig. 3; 1982: 126, pl. 42, fig. 6.

Material.— Holotype, ♂, shield length = 4.4 mm, RMNH D 914.

Differential diagnosis.— Rostrum triangular, acute, overreaching lateral projections, terminating in small spine. Lateral projections weakly developed, obsolete or broadly triangular, usually with small terminal spine or spinule (lacking in holotype).

Dactyl of left cheliped armed with row of small spines or tubercles on dorsomesial margin, dorsal surface somewhat tuberculate or spinulose proximally. Dorsal surface of palm with irregular rows of small tubercles or spines more prominent in two rows of somewhat elevated midline.

Second and third right pereopods similar. Dactyls moderately short and broad in small specimens, longer and more slender in larger specimens, one-half to slightly longer than propodi; in lateral view, straight; in dorsal view, straight; lateral faces each with longitudinal sulcus; ventral margins each with seven to nine corneous spines. Propodi each with row of corneous spines on ventral surface (at least in distal half). Third left pereopod with one to four rows of small spines or spinules on lateral face of dactyl ventrally; propodus with one or two irregular rows of small spines ventrally and usually several small spines at distal margin. Carpi with row of spines on dorsal margin (second right), one to three small spines (third right) or single spine at dorsodistal margin (second and third left). Meri of third each with one to three small spines on ventral margin.

Remarks.— McLaughlin (1976) expressed the belief that Makarov's (1938, pl. 3, fig. 6; 1962, pl. 3, fig. 6) figures did not represent *P. geminus* (as *P. samuelis*). The sug-

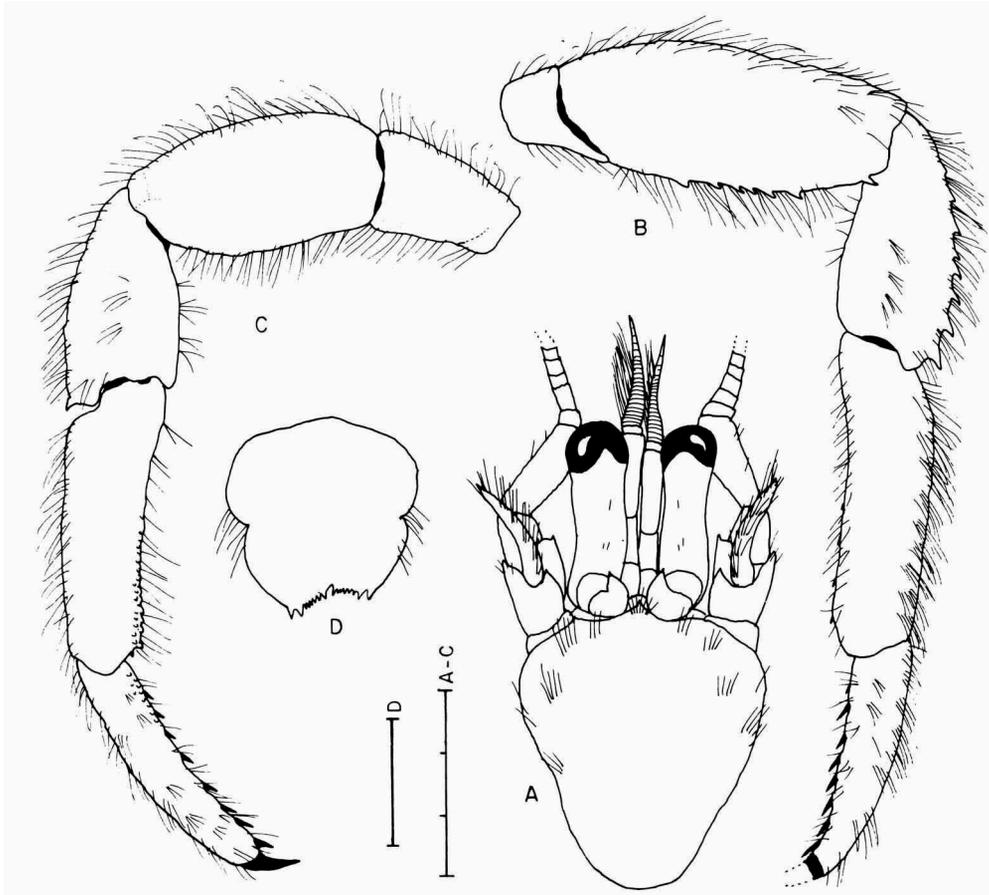


Fig. 1. *Pagurus filholi* (de Man, 1887), holotype. A, shield and cephalic appendages; B, right second pereopod (lateral view); C, left third pereopod (lateral view); D, telson. Scales equal 3 mm (A-C) and 1 mm (D).

gestion at that time was that Makarov's figures might be referable to *P. middendorffii* Brandt. There has been no evidence to contradict this view.

Shiino (1958) attributed infections by the bopyrid isopod *Alhetge takanoshimensis* Ishii to *Pagurus samuelis* (as *Eupagurus*) from Kasaoka and Tokyo Bay. However, Shiino's figure labels disagree profoundly with his figure legend. Plate 3, figure 10 does not represent a *Pagurus* species. It is most probable that figure 10 depicts *Diogenes edwardsii* (de Haan) and that *P. samuelis* is the specimen in figure 5 that is listed in the legend as *Upogebia acclivis* (Rathbun).

***Pagurus minutus* Hess, 1865**  
(figs. 2, 4)

*Pagurus minutus* Hess, 1865: 180 (in part); [also issued separately, 1865: 34]; Haswell, 1882: 156 (in part).

*Eupagurus minutus*; de Man, 1887: 705, fig. 2; Alcock, 1905: 175.

*Pagurus minutus*; Gordan, 1956: 332.

Not *Eupagurus minutus*; Benedict, 1892: 14 [= *Pagurus benedicti* (Bouvier, 1898)].

Not *Pagurus minutus*; Makarov, 1938: 320 [misspelling of *Pagurus munitus* (Benedict) = *Elassochirus gilli* (Benedict, 1892)].

Material.— Holotype, ♂, shield length = 4.2 mm, SMNH 4377.

Description.— Shield longer than broad; anterior margin between rostral region and lateral projections slightly concave; posterior margin rounded truncate. Rostrum weakly developed, broadly rounded, with row of short setae subterminally. Lateral projections broadly triangular, without terminal spine or spinule. Ocular peduncles approximately two-thirds shield length, moderately stout, with corneae slightly dilated. Ocular acicles ovate, with submarginal spine; separated basally by approximately half basal width of one acicle; interocular lobes with weak lateral thickenings. Third maxillipeds with one accessory spine on crista dentata.

Antennular peduncles, when extended, overreaching ocular peduncles by length of flagella, peduncular segments with few, scattered very short setae.

Antennal peduncles equaling or slightly overreaching ocular peduncles. Fifth and fourth segments with few scattered short setae. Third segment with small spine on ventral margin distally and tuft of setae. Second segment with dorsolateral distal angle developed into short, somewhat ovate projection, terminating in small spine, dorsomesial distal angle with small spine. First segment with spine on ventrolateral margin. Antennal acicle moderately short; mesial face with short transverse rows of setae, terminating in small spine. Antennal flagella not overreaching ambulatory legs, articles naked or with occasional very short setae.

Right cheliped elongate, markedly larger than left, dactyl and fixed finger somewhat compressed dorsoventrally. Dactyl slightly shorter than palm; cutting edge with several prominent calcareous teeth, slightly overlapped by fixed finger; dorsal surface generally flattened and with two rows of tufts of stiff setae and longitudinal low, very weakly tuberculate ridge laterad of midline, dorsomesial margin with row of small tubercles; mesial and ventral surfaces with tufts of short setae. Palm approximately as long as carpus; dorsomesial margin not delimited, dorsal surface slightly convex and covered with small, often tuberculate granules, strongest in lateral half, but absent on dorsal surface of fixed finger, dorsolateral margin with row of small spines slightly increased in size on fixed finger; rounded mesial and lateral faces and ventral surface weakly tuberculate. Carpus approximately as long as merus; dorsomesial and dorsolateral margins not delimited, all surfaces and distal margins tuberculate. Merus subtriangular; dorsodistal margin with row of small spines, dorsal surface with short, transverse spinose or spinulose ridges and long to short setae; ventromesial and ventrolateral margins each with row of spines, strongest laterally, ventral surface with few scattered small tubercles and one very large tubercle in proximal third, mesial and lateral faces with scattered tubercles proximally.

Left cheliped with dactyl approximately twice length of palm, unarmed but all surfaces with longitudinal rows of widely-spaced tufts of setae; cutting edge with row of corneous spines; terminating in corneous claw. Palm one third length of carpus; weakly elevated in midline and with slight depression mesially, dorsal midline and dorsolateral surface with few irregular rows of moderately widely-spaced,

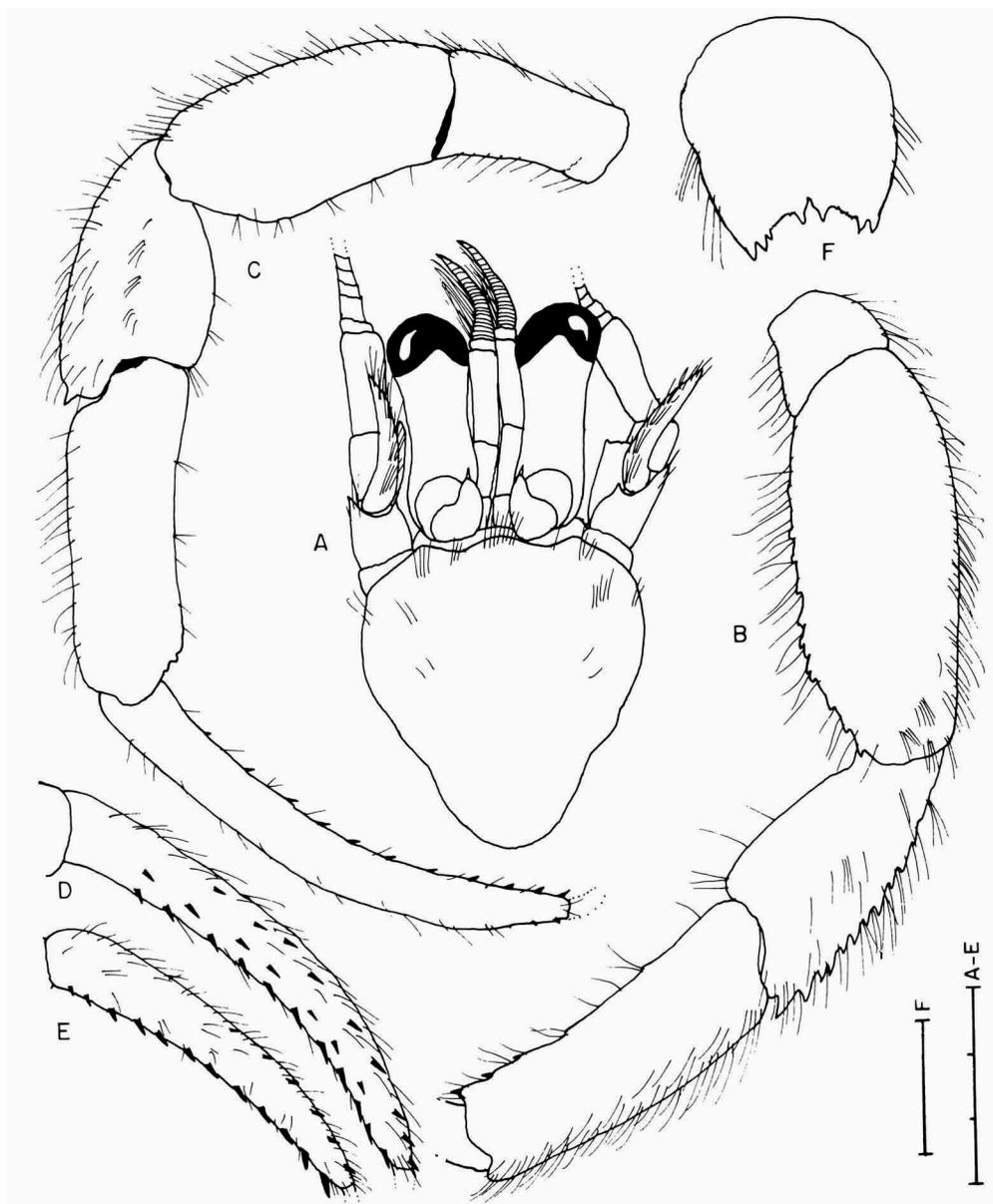


Fig. 2. *Pagurus minutus* Hess, 1865, holotype. A, shield and cephalic appendages; B, right second pereopod (lateral view); C, left third pereopod (lateral view); D, dactyl of second left pereopod (mesial view); E, dactyl of third left pereopod (mesial view); F, telson. Scales equal 3 mm (A-E) and 1 mm (F).

sometimes spinulose tubercles and tufts of setae, extending onto fixed finger in proximal half, dorsolateral margin with irregular row of small tuberculate spines, lateral and ventral surfaces weakly tuberculate; mesial face and dorsomesial surface with few low protuberances and tufts of setae. Carpus approximately as long as merus; dorsolateral and dorsomesial margins each with row of strong spines and tufts of long setae, distal margins spinose dorsally, laterally, and to lesser extend mesially;

mesial and lateral faces and ventral surface with low, sometimes spinulose protuberances and tufts of long setae. Merus with few transverse rows of setae on dorsal surface and mesial and lateral faces, ventrolateral margin with row of spines, ventromesial margin with row of small tubercles, one appreciably larger tubercle on ventral surface proximally. Ischium with row of small tubercles on ventral margin.

Ambulatory legs approximately as long as right cheliped; dactyl of second right atrophied; carpus of second left with dorsal growth-like protuberance. Dactyls at least one and one-half times longer than propodi; in dorsal view slightly twisted; in lateral view slightly curved ventrally; dorsal surfaces with tufts of long setae and one or two corneous spinules distally; mesial faces with row of corneous spines dorsally (second) or dorsal and ventral rows of corneous spines (third); ventromesial margin proximally and ventral margin distally each with row of 11 or 12 corneous spines. Propodi each with one or two corneous spines on ventral surfaces, left third also with three small blunt calcareous spines on distolateral margin; dorsal surfaces with tufts of long setae. Carpi with dorsal surfaces variably armed: row of strong spines (second right), two spines (second left), single distal spine (third right and left). Dorsal and lateral surfaces also with tufts of setae and few setae on ventral surfaces. Meri with tufts of setae on dorsal surfaces; ventral margins of second each with single (left) or double (right) row of small spines in distal half, tufts of long setae proximally, right second also with one spine on distolateral and distomesial margins respectively, third unarmed but with tufts of setae. Ischia with tufts of long setae dorsally and ventrally.

Sternite of third pereopods with semisubovate anterior lobe, anterior margin with long, dense setae.

Uropods markedly asymmetrical. Telson with transverse suture; anterior lobes with marginal tufts of setae; posterior lobes separated by distinct median cleft, each with one to several stiff bristles laterally; terminal margins with one prominent spine adjacent to cleft, separated from two or three outer strong spines by series of very small spinules.

### Discussion

As previously indicated, *P. minutus* sensu stricto has not been reported since de Man's (1887) redescription. Both of Hess' (1865) syntypes occupied shells of the gastropod *Turbo coronatus* Gmelin. This is an intertidal gastropod with a broad range throughout the tropical Indo-Pacific, from Japan all the way to South Africa (Dr J. H. McLean personal communication). While it is possible that a tropical species such as *T. coronatus* might be transported southward to the south Australian east coast by the East Australian, East Tasman or Notonectian Current during the summer months (cf. Knox, 1960), no hermit crab species reported from this region appears to be conspecific with *P. minutus*. *Pagurus geminus* (= *P. filholi*) has never been encountered in eastern Australian waters. Consequently, it is highly probable that the type locality of Sydney given by Hess (1865) for *Pagurus minutus* s. l. is inaccurate. A similar situation has been documented for his *Birgus hirsutus* [= *Coenobita* ? *variabilis* (cf. Harvey, 1992)]. No species of semiterrestrial *Coenobita* are known from the region surrounding Sydney (cf. McCulloch, 1909; Morgan, 1987).

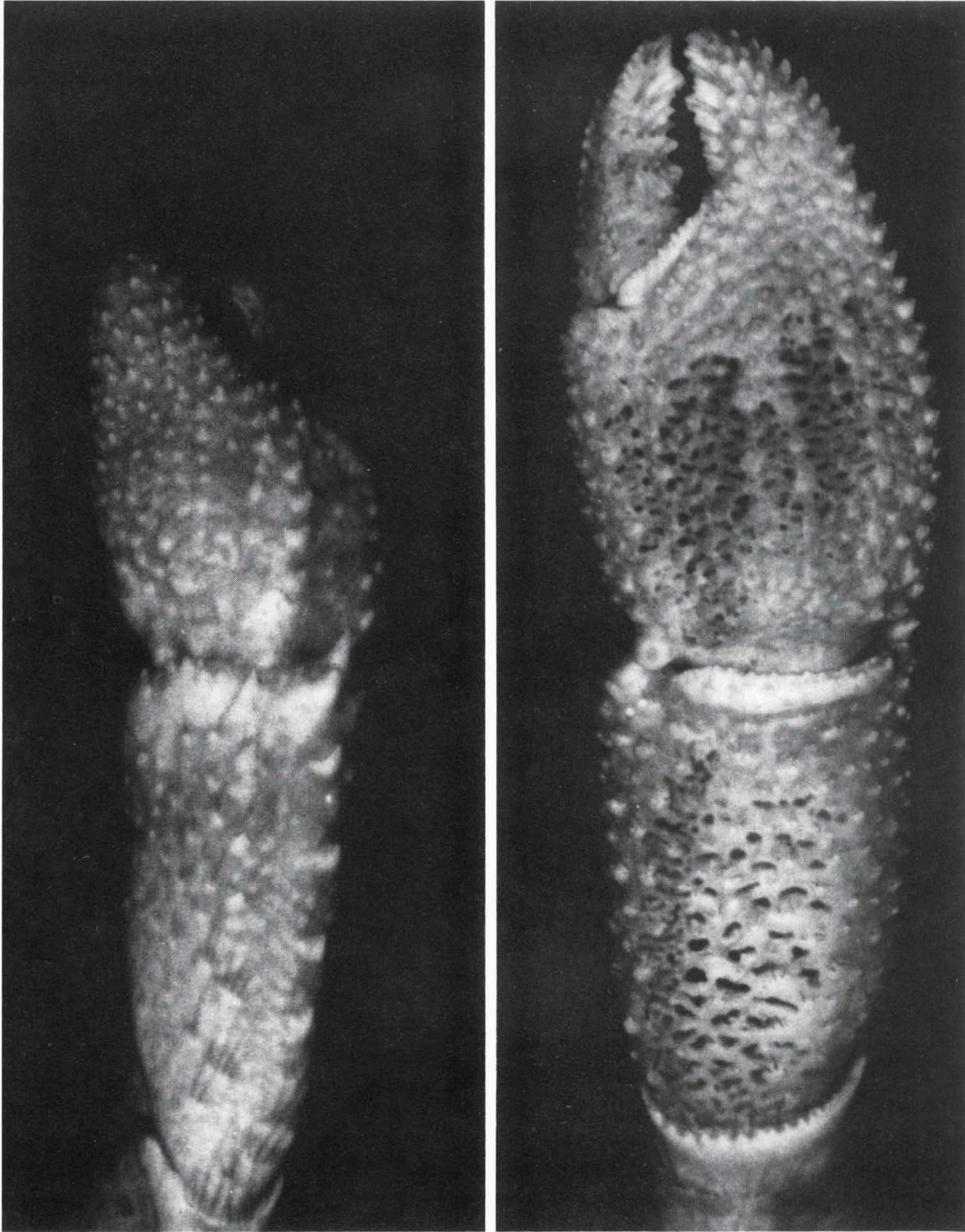


Fig. 3. *Pagurus filholi* (de Man), holotype. Left cheliped (left figure) and right cheliped (right figure). Magnifications equal 12x (left) and 7x (right).

*Pagurus geminus* has been reported to be the most common hermit crab in shallow Japanese waters (Utinomi, 1965). The considerable superficial similarities between *P. filholi* and *P. minutus* make it probable that the two taxa have remained confounded under the name *P. geminus* [formerly *P. samuelis* Stimpson, 1858 (not *P. samuelis* Stimpson, 1857)]. McLaughlin (1976) presented a detailed synonymy,

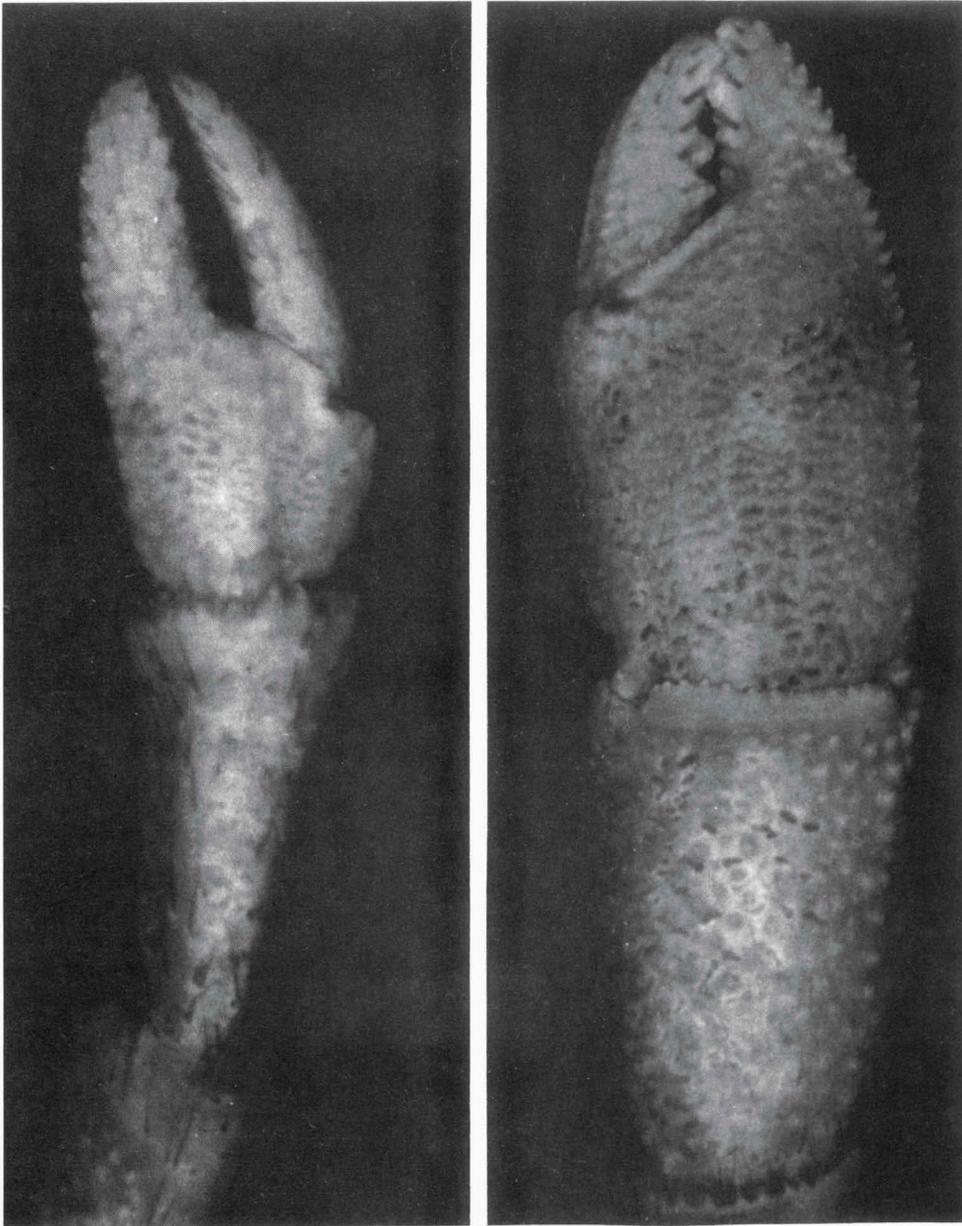


Fig. 4. *Pagurus minutus* Hess, holotype. Left cheliped (left figure) and right cheliped (right figure). Magnifications equal 10x (left) and 6.9x (right).

description, and illustrations of *P. filholi* (as *P. geminus*), but compared it only with *P. dubius* (Ortmann) from the western Pacific and *P. samuelis* from the eastern Pacific. It is clear after reexamining both type specimens and considering the variation reported by McLaughlin (1976) for *P. geminus*, that only a critical comparison of characters afforded by rostral development, length ratios of dactyls to propodi of the ambulatory

ry legs, and similarity/dissimilarity of armature of the third left pereopod can these taxa be distinguished with confidence.

### Acknowledgements

The type specimen of *P. filholi* was provided by Mr C. H. J. M. Fransen, Nationaal Natuurhistorisch Museum, Leiden. Identification and information on the gastropod shells were provided by Dr J. H. McLean, Los Angeles County Museum of Natural History. The photographs are the work of E. J. McGeorge. Their assistance is gratefully acknowledged. This research was supported, in part, by grants from the Royal Swedish Academy of Sciences to L. Sandberg and, in part, by National Science Foundation grant BSR 9006574 to P.A. McLaughlin. This is a scientific contribution from the Shannon Point Marine Center, Western Washington University.

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Received: 6.vii.1992

Accepted: 19.x.1992

Edited: C.H.J.M. Fransen