BULLETIN OF MARINE SCIENCE, 32(4): 823–855, 1982

REVISION OF *PYLOPAGURUS* AND *TOMOPAGURUS* (CRUSTACEA: DECAPODA: PAGURIDAE), WITH THE DESCRIPTIONS OF NEW GENERA AND SPECIES:

PART III, *AGARICOCHIRUS* McLAUGHLIN, *ENALLOPAGURUS* McLAUGHLIN, AND *ENALLOPAGUROPSIS* McLAUGHLIN

Patsy A. McLaughlin

ABSTRACT

In this third of a six part series, the recently established genera *Agaricochirus*, *Enallopagurus*, and *Enallopaguropsis* and their respective species are diagnosed in detail and illustrated. In addition to keys to the species, two new species of *Agaricochirus* and one of *Enallopaguropsis* are described.

A. Milne Edwards and Bouvier (1891) briefly described the genus *Pylopagurus* and assigned to it only the species *Eupagurus discoidalis* A. Milne Edwards, 1880 and *E. ungulatus* Studer, 1883. In a subsequent report (A. Milne Edwards and Bouvier, 1893), these authors again described *Pylopagurus* as a new genus, this time including in it not only the two previously mentioned species, but also three additional species originally described by A. Milne Edwards (1880) in *Eupagurus* and three new species. With the exception of *P. discoidalis*, these species all were reported to have the dorsal surfaces of the chelae ornamented with mushroom-shaped tubercles. Miyake (1978) designated *P. discoidalis* as the type of the genus, and McLaughlin (1981a) pointed out that the specimens A. Milne Edwards and Bouvier (1893) had identified as *P. ungulatus* were not Studer's (1883) species but instead Benedict's (1892) *Eupagurus corallinus*. In part I of this revision *Pylopagurus* was restricted to species typified by *P. discoidalis*; the remainder of A. Milne Edwards and Bouvier's (1893) species were reassigned to new genera. Benedict's *E. corallinus* has been designated the type species of *Manucomplanus* (McLaughlin, 1981a) and *Pylopagurus rosaceus* A. Milne Edwards and Bouvier has been redescribed in part II of this series (McLaughlin, 1981b). Four of the remaining five A. Milne Edwards and Bouvier (1893) species, one other described and two new species, as well as species of two small Pacific genera, are the subject of part III.

Mushroom-shaped tubercles, although characteristic of *Agaricochirus*, cannot be considered diagnostic, as some members of *Anisopagurus* also possess this distinctive ornamentation (McLaughlin, in prep.[1]). Another character, the symmetry of the uropods, initially was thought to be of generic significance. For example, species of *Pylopagurus* and *Agaricochirus* typically have symmetrical uropods; whereas, in most of the remaining genera the uropods are markedly asymmetrical. An exception is found in *Enallopagurus* where both symmetrical and asymmetrical uropods occur. Neville (1976; 1977) has suggested that the former character state reflects a primitive condition associated with a noncochlean habitat, and that a series of degrees of asymmetry, related to habitat, prevails among hermit crabs. Phylogenetic considerations (McLaughlin, in press and limited observations on correlations between morphology and habitat would

[1] Revision of *Pylopagurus* and *Tomopagurus* (Crustacea: Decapoda: Paguridae), with the descriptions of new genera and species: Part IV. *Anisopagurus* McLaughlin and *Manucomplanus* McLaughlin. In preparation.

tend to support this view, although nothing is known of the mechanisms, genetic or adaptive, influencing asymmetry in pagurids. Among species of *Agaricochirus* not only are the uropods typically symmetrical, the abdomens are usually very short and squat. Species of this genus most frequently are found occupying coral or sponge shelters. In the course of the present study a few specimens have been observed that, when collected, actually were occupying gastropod shells. In these animals the abdomens are elongate and slightly flexed and the exopods of the right uropods are slightly smaller than the left. Whether this tendency toward asymmetry is a response to the right uropod being wrapped around the columella of the shell and the shell's weight being borne on the hermit's right side, as reported by Chapple (1969) for the typically asymmetrical *Pagurus pollicaris* Say is, for the present, a matter of conjecture. Most morphological and behavioral studies on pagurids have been confined to strongly asymmetrical species that routinely occupy dextral gastropod shells (Bott, 1949; Brightwell, 1951; Reese, 1962; 1963; Chapple, 1966a; b; 1973; Elwood et al., 1979). Clearly more detailed studies of form, function, biological adaptation and behavior, as they relate to symmetry and asymmetry, are needed.

Materials

Specimens included in part III have come from the collections of the Allan Hancock Foundation, University of Southern California (AHF); Dauphin Island Sea Lab, University of Alabama (DISL); Florida Department of Natural Resources (DNR); Museum of Comparative Zoology, Harvard University (MCZ); National Marine Fisheries Service (NMFS); National Museum of Natural History, Smithsonian Institution (USNM); Rosenstiel School of Marine and Atmospheric Science, University of Miami (UMML, RSMAS); and Texas A&M University (TAM). Specimens have been deposited in these institutions and at the Rijksmuseum van Natuurlijke Historie, Leiden (RMNH).

Agaricochirus McLaughlin, 1981

Pylopagurus: A. Milne Edwards and Bouvier, 1893: 74 (in part). Not *Pylopagurus* A. Milne Edwards and Bouvier, 1891.

Agaricochirus McLaughlin, 1981a: 5. Type species, by original designation: *Pylopagurus boletifier* A. Milne Edwards and Bouvier, 1893. Gender: masculine.

Diagnosis.—Eleven pairs of phyllobranch gills. Ocular acicles triangular, with usually strong submarginal spine; separated basally by slightly less to considerably more than basal width of 1 acicle. Sternite of 3rd maxillipeds with strong spine on either side of midline. Third maxillipeds each with well developed crista dentata with prominent accessory tooth; merus with or without small spine at dorsodistal margin. Maxillule with internal lobe of endopod moderately well developed and with 1 stiff bristle terminally; external lobe somewhat produced, not recurved.

Right cheliped with chela generally subovate; dorsal surface typically with numerous mushroom-shaped tubercles variously shaped and armed. Left cheliped with chela well developed, sometimes somewhat operculate; angle of articulation of chela and carpus varying from 30° to 80° from perpendicular; carpus subtriangular, dorsomesial margin obsolete. Carpi of 2nd and 3rd pereopods without dorsodistal spine; dactyls with dorsal and ventral row(s) of strong corneous spines. Sternite of 3rd pereopods with anterior lobe absent, very much reduced and styliform, or moderately well developed and subquadrate. Sternites of pereopods 3–5 often with capsulate setae. Fourth pereopods with propodal rasp consisting of several rows of corneous scales; dactyl usually short, claw short to moderately long; preungual process small and often lateral.

Males and females both with paired gonopores; in males partially obscured by tufts of long, moderately stiff setae. Males without sexual tubes; however, in

preserved specimens vas deferens frequently extruded slightly, giving impression of pair of very short sexual tubes.

Abdomen straight or flexed, typically quite short. Uropods symmetrical or nearly so; exopods considerably larger than endopods, protopods produced posteriorly, sometimes bilobed. Telson usually with weak transverse suture, sometimes obsolete, but usually indicated by indentations or sparse tufts of setae; posterior lobes usually symmetrical; terminal margins unarmed, usually excavated or concave, sometimes with median cleft, rarely straight. Males without paired pleopods, with 3 unpaired, uniramous or weakly biramous pleopods. Females with paired 1st pleopods modified as gonopods, with 2nd–4th unpaired pleopods well developed and biramous, 5th uniramous or weakly biramous.

Distribution.—Eastern Gulf of Mexico, Straits of Florida, Caribbean Sea and northern coast of South America; 35–640 m.

Etymology.—*Agaricochirus* is from the Greek *agarikon*, a mushroom, and *cheir* meaning hand, and refers to the mushroom-shaped tubercles ornamenting the chelae.

KEY TO THE SPECIES OF *AGARICOCHIRUS*

1a. Dorsal surface of palm of right chela markedly concave ..... *A. cavimanus*
1b. Dorsal surface of palm of right chela not markedly concave 2
2a. Dorsal surface of right chela with very prominent horn ..... *A. hispidus*
2b. Dorsal surface of right chela without very prominent horn 3
3a. Tergite of 5th abdominal somite with distinct patch of short, stiff setae 4
3b. Tergite of 5th abdominal somite without distinct patch of short, stiff setae 5
4a. Anterior lobe of sternite of 3rd pereopods well developed, subquadrate ..... *A. gibbosimanus*
4b. Anterior lobe of 3rd sternite minute, slender ..... *A. echinatus* n. sp.
5a. Mushroom-shaped tubercles of dorsal surface of right chela with margins irregularly notched ..... *A. erosus*
5b. Mushroom-shaped tubercles of dorsal surface of right chela with margins not irregularly notched 6
6a. Dorsolateral margin of carpus of right cheliped with row of strong spines, at least distally ..... *A. alexandri*
6b. Dorsolateral margin of carpus of right cheliped with row of low protuberances or unarmed 7
7a. Dorsal surface of dactyl of right cheliped with longitudinal ridge of broad tubercles; margins of mushroom-shaped tubercles unarmed ..... *A. boletifer*
7b. Dorsal surface of dactyl of right cheliped with longitudinal rows of simple tubercles; margins of mushroom-shaped tubercles armed with tiny spines ..... *A. acanthinus* n. sp.

Agaricochirus boletifer (A. Milne Edwards and Bouvier, 1893)
Figures 1a, 2a, 3a

Pylopagurus boletifer A. Milne Edwards and Bouvier, 1893: 84, pl. 6, figs. 19–22 (type locality: BLAKE station 231, off St. Vincent, W.I.).—Alcock, 1905: 189.—Gordan, 1956: 340.
Agaricochirus boletifer: McLaughlin, 1981a: 6 (by implication).

Holotype.—♀ (SL = 3.4 mm) MCZ.

Material Examined.—See Table 1.

Diagnosis.—Shield approximately as long as wide, occasionally slightly longer; rostrum triangular, with or without small terminal spine; lateral projections triangular, with marginal or submarginal spine. Ocular peduncles long, moderately slender, with corneae slightly dilated; ocular acicles triangular, moderately slender, with strong submarginal spine; separated basally by basal width or less of 1 acicle. Right cheliped with ventromesial, or occasionally ventrolateral, margin of merus armed with short row of acute or blunt spines or spinules. Carpus with row of strong spines on dorsomesial margin; dorsolateral margin with row of

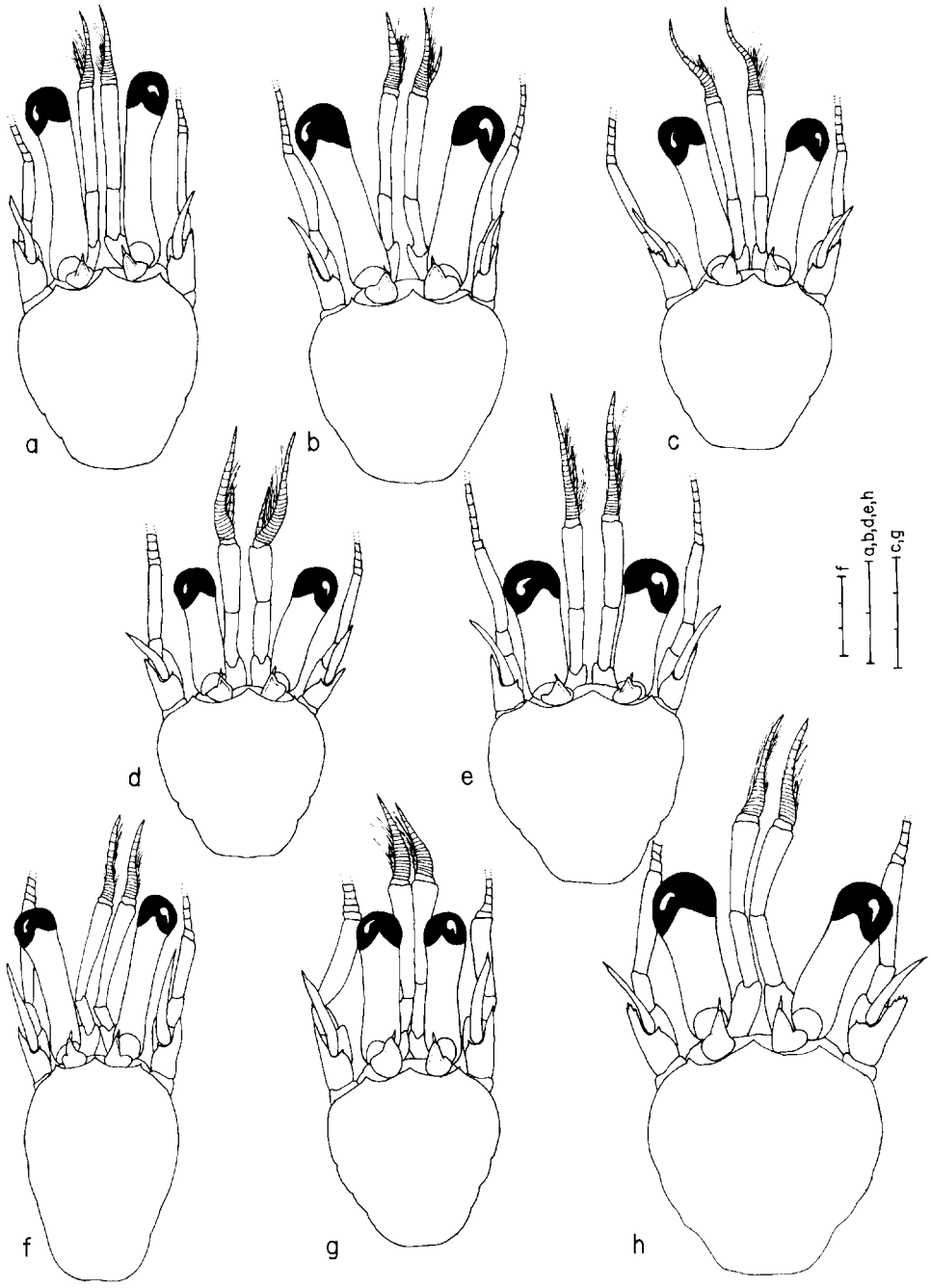

Figure 1. Diagrammatic shields and cephalic appendages: (a) *Agaricochirus boletifer*; (b) *Agaricochirus alexandri*; (c) *Agaricochirus erosus*; (d) *Agaricochirus hispidus*; (e) *Agaricochirus gibbosimanus*; (f) *Agaricochirus cavimanus*; (g) *Agaricochirus acanthinus* n. sp.; (h) *Agaricochirus echinatus* n. sp. Scales equal 3 mm (c, f, g) and 2 mm (a, b, d, e, h).

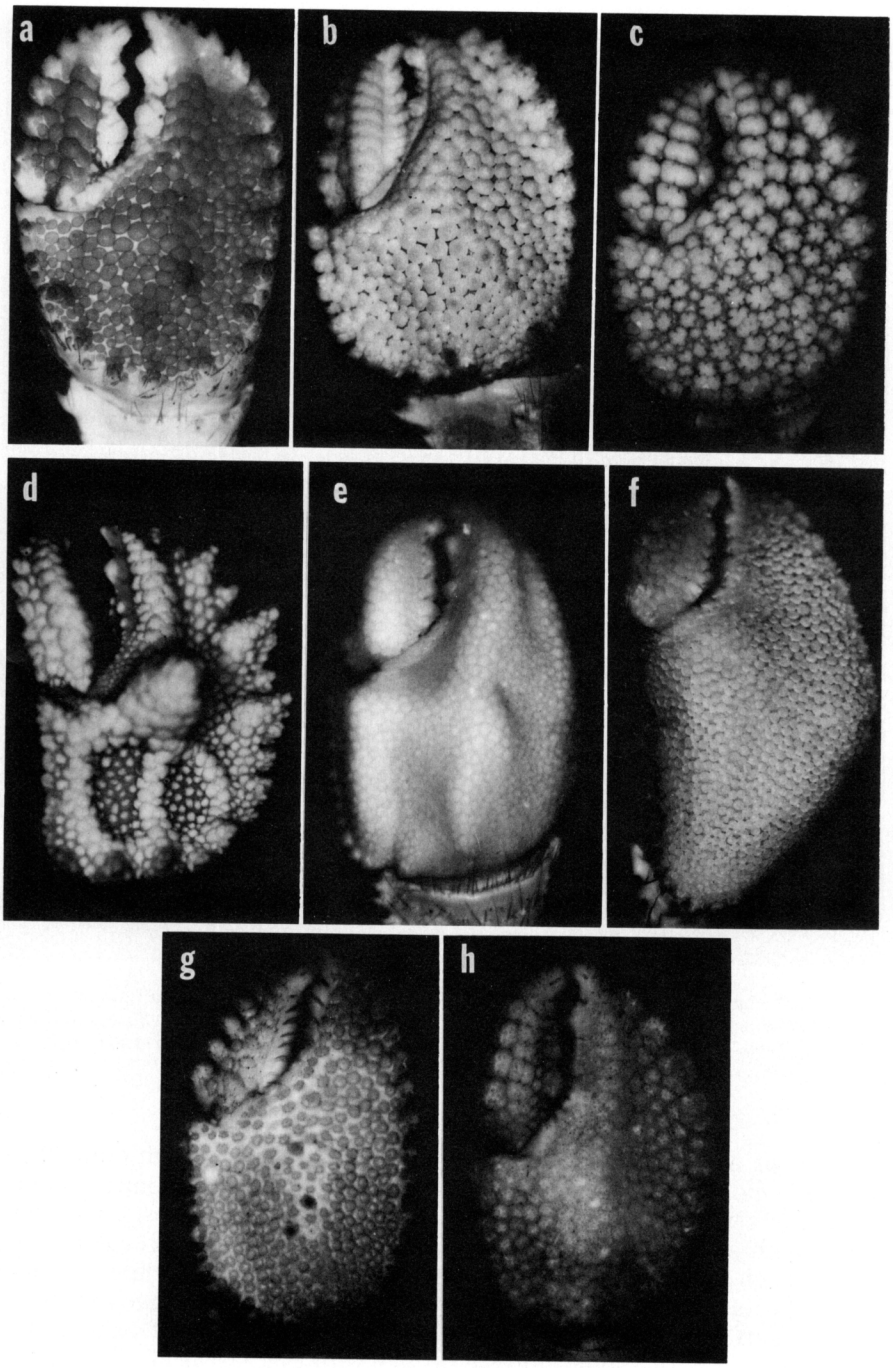

Figure 2. Right chelae: (a) *Agaricochirus boletifer* (5.2×); (b) *Agaricochirus alexandri* (6.3×); (c) *Agaricochirus erosus* (6.7×); (d) *Agaricochirus hispidus* (10.9×); (e) *Agaricochirus gibbosimanus* (7.7×); (f) *Agaricochirus cavimanus* (5.3×); (g) *Agaricochirus acanthinus* n. sp. (6.0×); (h) *Agaricochirus echinatus* n. sp. (8.7×).

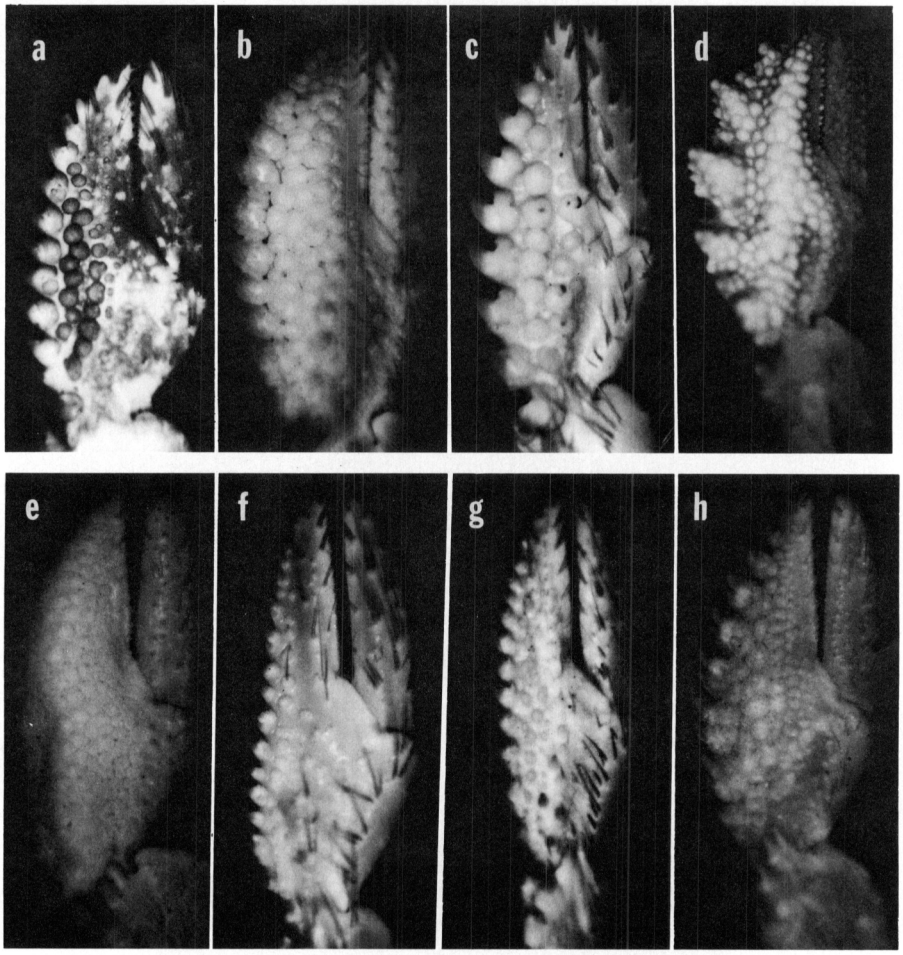

Figure 3. Left chelae: (a) *Agaricochirus boletifer* (11.6×); (b) *Agaricochirus alexandri* (9.7×); (c) *Agaricochirus erosus* (11.1×); (d) *Agaricochirus hispidus* (12.5×); (e) *Agaricochirus gibbosimanus* (13.5×); (f) *Agaricochirus cavimanus* (8.6×); (g) *Agaricochirus acanthinus* n. sp. (11.8×); (h) *Agaricochirus echinatus* n. sp. (12.3×).

protuberances and tufts of long setae. Palm and fixed finger with dorsal surface armed with closely-spaced, mushroom-shaped, flattened or conical tubercles; dorsal margins with strong, broad, usually multidenticulate spines; dorsal surface of dactyl with strong, longitudinal ridge of broad, somewhat irregularly-shaped tubercles, each often with very small median spinule. Left cheliped with small spine on ventrolateral margin of merus distally. Carpus with oblique row of strong spines and stiff setae on dorsal surface. Dorsolateral margin of palm and fixed finger with row of strong spines; dorsal surface with 2 or 3 rows of raised, rounded or conical tubercles and few small spinules laterally, tufts of long setae mesially. Dactyls of 2nd and 3rd pereopods moderately short and broad; dorsal margins and/or mesial faces dorsally with 2 rows of strong corneous spines; ventral margins of dactyls and propodi each with row of corneous spines, surfaces with numerous tufts of long stiff setae. Sternite of 3rd pereopods with anterior lobe

Table 1. Material examined

Locality	Depth (m)	Station Deposition	Date	Sex ♂	Sex ♀	SL (mm)	Collector
	Agricochirus boletifer (A. Milne Edwards and Bouvier)						
Gulf of Mexico							
29°40′05″N, 86°15′48″W	78	2534 DISL	10/31/77	1		4.4	DISL
29°39′59″N, 86°16′59″W	83	0007 DISL	2/7/78	1		2.6	DISL
29°34′59″N, 87°20′07″W	95	2645 RMNH	9/2/77	1		3.9	DISL
29°34′59″N, 87°20′07″W	95	2645 DISL	2/8/78	2		2.4, 3.5	DISL
29°32′45″N, 87°23′30″W	91	DC-22-51 DISL	—		1	2.9	DISL
29°32′00″N, 87°23′30″W	100	2645 DISL	6/27/76	1		2.6	DISL
29°26′03″N, 84°56′02″W	92	0003 DISL	10/29/77	1		1.4	DISL
27°49′15″N, 84°30′30″W	91	DC-15-51 DISL	7/27/75		1	5.2	DISL
27°36′50″N, 84°31′56″W	112	0001 RMNH, DISL	8/24/77	2	1	1.9–2.6	DISL
27°24′12″N, 84°07′11″W	78	2747 DISL	10/26/77		1	2.1	DISL
27°24′11″N, 84°07′10″W	76	2747 AHF, DISL, FIU	8/23/77	2	3	1.9–2.3	DISL
27°23′59″N, 84°07′04″W	85	2747 DISL	7/17/76	1		1.6	DISL
27°23′59″N, 84°07′04″W	85	2747 USNM	8/23/77	1	1	1.9, 1.9	DISL
26°25′30″N, 83°50′15″W	91	DC-33-51 DISL	—		1	1.9	DISL
26°25′00″N, 83°50′00″W	91	DC-22-51 DISL	—		1	1.5	DISL
26°24′56″N, 83°49′58″W	91	2105 DISL	10/25/77		1	2.1	DISL
Florida west coast	—	EJ-65-340 DNR	—		1	2.4	DNR
85 mi W of Eggmont Key	80	EJ-66-48 DNR	2/8/66		2	2.3, 2.8	DNR
Caribbean							
16°06′00″N, 81°10′30″W	165	Oregon 4932 FIU	6/9/64		1	4.0	NMFS
13°12′10″N, 61°17′18″W	174	Blake 231 MCZ	2/21/79		1	3.4	Coast Survey
	Agaricochirus alexandri (A. Milne Edwards and Bouvier)						
Straits of Florida 24°05′N, 80°19′W	137–241	Gerda 986 RSMAS	3/6/68		1	3.0	RSMAS

Table 1. Continued

Locality	Depth (m)	Station Deposition	Date	Sex ♂	Sex ♀	SL (mm)	Collector
Caribbean							
21°12′N, 86°20′W	36	Gerda 882 USNM	9/9/67	1		3.4	RSMAS
17°37′55″N, 64°54′20″W	214	Blake 132 MCZ	1/5/78		1	3.2	Coast Survey
16°48′24″N, 62°14′06″W	68–73	Pillsbury 950 RSMAS	7/18/69		1	2.6	RSMAS
14°10′36″N, 60°55′48″W	135–201	Pillsbury 887 RMNH	7/7/69	1		3.9	RSMAS
13°41′N, 60°53′W	165	Oregon 5955 USNM	3/10/66		1	3.2	NMFS
13°03′50″N, 59°37′05″W	172	Blake 276 MCZ 2609	3/5/79	1		2.0	Coast Survey
11°57′54″N, 66°55′00″W	62–65	Pillsbury 745 RSMAS	7/24/68		1	1.5	RSMAS
11°24′42″N, 62°40′30″W	66–73	Pillsbury 708 FIU	7/19/68	1		5.9	RSMAS
11°21′N, 62°21′W	79	Pillsbury 707 RMNH	7/19/68		1	4.0	RSMAS
11°01′48″N, 65°34′12″W	60–65	Pillsbury 734 AHF, FIU	7/22/68	1	2	2.4–2.6	RSMAS
10°52′N, 66°08′W	102	Oregon 5624 USNM	9/25/65		1	3.1	NMFS
10°50′N, 66°58′W	97	Oregon 4459 USNM	10/13/63	1		4.2	NMFS
10°50′N, 66°55′W	97	Oregon 4461 RMNH	10/13/63	1		4.5	NMFS
10°44′N, 66°07′W	60–73	Pillsbury 737 RSMAS	7/22/68	1		2.3	RSMAS
10°04′N, 76°06′W	183–219	Oregon 4903 RSMAS	5/20/64	1		3.4	NMFS
09°45′24″N, 76°10′48″W	135–142	Pillsbury 392 USNM, FIU	7/16/66	4	1	1.6–3.0	RSMAS
Caribbean	*Agaricochirus erosus* (A. Milne Edwards)						
21°10′N, 86°21′W	177–220	Gerda 893 RSMAS	9/10/67	4		5.0–7.5	RSMAS
21°07′N, 86°21′W	155–205	Pillsbury 598 USNM, RSMAS	3/15/68	6	4	3.7–7.3	RSMAS
14°53′48″N, 61°04′54″W	84–88	Pillsbury 931 FIU	7/10/69		1	5.2	RSMAS
14°29′45″N, 61°05′56″W	347	Blake 202 MCZ 4088	2/9/79	1		3.4	Coast Survey
13°41′N, 60°53′W	165	Oregon 5955 RSMAS	3/10/66		2	3.8–5.0	NMFS
13°40′N, 60°54′W	228	Oregon 5956 AHF, RMNH, USNM	3/10/66	5	4	3.8–5.7	NMFS

Table 1. Continued

Locality	Depth (m)	Station Deposition	Date	Sex ♂	Sex ♀	SL (mm)	Collector
13°11′54″N, 59°38′45″W	133	Blake 290 MCZ 6334	3/9/79		1	4.2	Coast Survey
13°06′30″N, 59°39′20″W	150	Blake 300 MCZ 2617	3/10/79		1	—	Coast Survey
13°05′24″N, 59°38′45″W	154	Blake 296 MCZ 2627	3/10/79		1	3.5	Coast Survey
13°03′05″N, 59°36′18″W	188	Blake 273 MCZ 2710, 4087	3/5/79		2	2.7, 3.4	Coast Survey
Straits of Florida	*Agaricochirus hispidus* (Benedict)						
Off Havana Cuba	133	Albatross 2163 USNM 7759	1884	1		3.6	U.S. Fish Commission
Caribbean							
21°07′N, 86°21′W	155–205	Pillsbury 598 RMNH	3/15/68	1	1	3.3, 3.6	RSMAS
21°05′N, 86°23′W	146–265	Pillsbury 581 RSMAS	5/22/67		1	2.8	RSMAS
21°02′N, 86°26′W	320–350	Gerda 952 FIU	1/28/68		1	3.0	RSMAS
21°00′N, 86°23′W	175–347	Pillsbury 592 AHF	3/15/68		1	3.6	RSMAS
14°15′30″N, 80°27′06″W	219–238	Oregon 4832 USNM	5/12/64		1	2.3	NMFS
Caribbean	*Agaricochirus gibbosimanus* (A. Milne Edwards)						
21°13′N, 86°25′W	247–283	Gerda 947 RSMAS	1/27/68		1	3.5	RSMAS
21°10′N, 86°18′W	284–485	Pillsbury 582 RSMAS	5/22/67		1	2.3	RSMAS
21°08′30″N, 80°27′00″W	329–585	Pillsbury 595 RSMAS	3/15/68	1		4.4	RSMAS
21°04′N, 86°19′W	338–366	Gerda 898 FIU	9/10/67		1	3.1	RSMAS
21°00′30″N, 86°23′00″W	307–329	Pillsbury 594 AHF, RMNH, USNM	3/15/68	8	8	1.9–4.1	RSMAS
14°26′18″N, 60°55′00″W	310	Blake 206 MCZ 4095	2/10/79		1	2.6	Coast Survey
13°13′54″N, 61°04′42″W	231–258	Pillsbury 876 USNM	7/6/69	1	1	1.8, 1.9	RSMAS
Western Atlantic							
20°01′N, 68°29′W	200–800	Pillsbury 1160 FIU	1/17/70		1	3.4	RSMAS
Caribbean	*Agaricochirus cavimanus* (Chace)						
22°07′N, 81°08′W	275–311	Atlantis 2963 MCZ 10233	2/25/38		1	7.5	U Havana Harvard U
Western Atlantic							
20°48′N, 70°46′W	384–430	Oregon 5432 USNM	5/28/65		1	8.2	NMFS

Table 1. Continued

Locality	Depth (m)	Station Deposition	Date	Sex ♂	Sex ♀	SL (mm)	Collector
Straits of Florida		*Agaricochirus acanthinus* new species					
24°57′N, 80°14′W	256–274	Gerda 1301 AHF, RSMAS, USNM	3/27/71	3	1	1.8–5.8	RSMAS
Caribbean							
15°17′48″N, 81°21′54″W	247–256	70A10-26 TAM, RMNH	7/13/70	3	1	4.4–5.6	Pequegnat TAM
14°21′N, 81°55′W	192–263	Pillsbury 1354 FIU	1/31/71		1	5.5	RSMAS
Caribbean		*Agaricochirus echinatus* new species					
21°08′30″N, 80°27′00″W	329–585	Pillsbury 595 RSMAS	3/15/68	1		5.0	RSMAS
21°02′N, 86°29′W	123–240	Gerda 1275 USNM 180385	8/21/70	1		4.5	RSMAS
21°00′30″N, 86°23′00″W	307–329	Pillsbury 594 AHF	3/15/68	1		4.5	RSMAS
Baja California, Mexico (west coast)		*Enallopagurus spinicarpus* (Glassell)					
3.75 mi NNW Punta Eugenia	37	Valero IV 1702-49 AHF	3/5/49		1	2.3	AHF
Bahia San Cristobal	71–75	Valero IV 1949–50 AHF	4/27/50	2	4	1.6–2.8	AHF
6.5 mi SSW Punta San Hipolito	66–71	Valero IV 1952-50 AHF	4/29/50	1		2.4	AHF
SE Punta Tosca, Isla Santa Margarita	110	Searcher 40 AHF	2/1/71		2	1.6, 1.9	LA Co. Mus. U Costa Rica
Gulf of California, Mexico							
N Angel de la Garda	65–128	Velero III 546-36 AHF	3/5/36		1	1.4	AHF
Puerto Refugio, Angel de la Guarda I.	110	Velero III 541-36 AHF	3/4/36	1	1	2.2	AHF
Puerto Refugio, Angel de la Guarda I.	119	Velero III 544-36 AHF 366	3/4/36	1	1	2.1, 2.3	AHF
Puerto Refugio, Angel de la Guarda I.	91–137	Velero III 712-37 AHF	3/21/37	1		2.2	AHF
Puerto Refugio, Angel de la Guarda I.	142–165	Velero III 1054-40 AHF	1/28/40	1		1.6	AHF
Puerto Refugio, Angel de la Guarda I.	93–102	Velero III 1057-40 AHF	1/29/40	1	1	1.9, 2.2	AHF
Puerto Refugio, Angel de la Guarda I.	99–124	Velero III 1058-40 AHF	1/29/40	1		2.2	AHF
Panama							
S Isla Ladrones	99	Velero III 943-49 AHF	3/27/39		1	1.9	AHF

Table 1. Continued

Locality	Depth (m)	Station Deposition	Date	Sex ♂	Sex ♀	SL (mm)	Collector
07°50′42″N, 78°58′18″W	60–62	Pillsbury 558 USNM	5/8/67		1	2.9	RSMAS
Colombia							
Bahia Octavia	55–64	Velero III 429-35 AHF	1/27/35	1		2.2	AHF
N Isla Gorgona	18–36	Velero III 851-38 AHF	2/24/38	4	1	2.0–2.9	AHF
Panama	*Enallopagurus affinis* (Faxon)						
Gulf of Panama	155	Albatross 3397 MCZ 4521	—	1		3.1	U.S. Fish Commission
Baja California, Mexico	*Enallopagurus coronatus* (Benedict)						
Off Cape St. Lucas	57	Albatross 2829 USNM 16699	1880	1		2.0	U.S. Fish Commission
Gulf of California, Mexico							
S Isla Partida	82	Velero III 559-36 AHF	3/9/36	1		1.6	AHF
California	*Enallopaguropsis guatemoci* (Glassell)						
3.5 mi NE San Pedro Pt, Santa Cruz I.	84–86	Velero III 1418-41 AHF	9/17/41	2	1	2.2–3.8	AHF
Gulf of California							
Off San Francisquito Bay	229	Velero III 534-36 AHF 362	3/2/36	1		1.8	AHF
22°52′N, 109°55′W	—	— USNM 110997	5/1/88	1		2.4	—
Costa Rica	*Enallopaguropsis janetae* new species						
1.6 mi WNW Punta Gissler, Cocos I.	146	Searcher 521 AHF	4/3/71		1	3.0	LA Co. Mus. U Costa Rica

very small and slender. Sternites of 3rd, 4th and 5th pereopods often with capsulate setae. Telson with posterior lobes rounded, usually well separated, with terminal margins unarmed; occasionally lobes indistinct, terminal margin only slightly concave.

Distribution.—Eastern Gulf of Mexico, central Caribbean, St. Vincent, W.I.; 76–174 m.

Remarks.—*Agaricochirus boletifer* is most closely related to *A. alexandri,* but may be distinguished from that species by the absence of a dorsolateral row of spines on the carpus of the right cheliped. Young's (1900) report of *A. boletifer* from St. Vincent cannot be confirmed because of the brevity of his remarks.

Agaricochirus alexandri (A. Milne Edwards and Bouvier, 1893)
Figures 1b, 2b, 3b

Pylopagurus alexandri A. Milne Edwards and Bouvier, 1893: 87, pl. 6, figs. 23–26 [type locality: BLAKE station 132, off Santa-Cruz (St. Croix), Virgin Islands].—Alcock, 1905: 189.—Gordan, 1956: 340.

Agaricochirus alexandri: McLaughlin, 1981a: 6 (by implication).

Holotype.—♀ (SL = 3.2 mm) MCZ 4086.

Material Examined.—See Table 1.

Diagnosis.—Shield as long or longer than broad; rostrum triangular, with or without terminal spine; lateral projections obtusely triangular, with marginal or submarginal spine. Ocular peduncles moderately long, with corneae slightly dilated; ocular acicles triangular, with very strong submarginal spine; separated basally by slightly less than or basal width of 1 acicle. Right cheliped with merus unarmed or with small spine or spinule on ventrolateral margin distally. Carpus with row of strong spines on both dorsomesial and dorsolateral margins. Dorsal surface of palm and fixed finger with closely-spaced, flat or conical, mushroom-shaped tubercles; dorsal margins mesially and laterally with large, usually multidenticulate spines; dorsal surface of dactyl with prominent longitudinal ridge of broad, usually bi- or trilobed tubercles, dorsomesial margin with row of broad, usually simple, blunt spines. Left cheliped with merus unarmed. Carpus with generally oblique row of strong spines on dorsal surface and 1 or 2 small spines on laterodistal margin dorsally. Dorsal surface of palm and fixed finger with closely-spaced, mushroom-shaped, flat or conical tubercles laterally and scattered small spines and spinules mesially; dorsolateral margin with row of strong, simple or multidenticulate spines; dactyl unarmed or with irregular row of small spines on dorsal surface mesially and with tufts of long setae on dorsomesial margin. Dactyls of 2nd and 3rd pereopods moderately short and broad, dorsal and ventral margins and ventral margins of propodi each with row of strong corneous spines, surfaces with tufts of long stiff setae. Sternite of 3rd pereopods with anterior lobe absent or extremely small. Sternites of 4th and 5th pereopods sometimes with capsulate setae. Telson with posterior lobes weakly defined, rarely widely separated; transverse sutures sometimes obsolete, but indicated by indentations or sparse tufts of setae; terminal margins concave or less frequently almost straight, unarmed.

Distribution.—Straits of Florida, Caribbean to Barbados and northern coast of South America; 36–241 m.

Remarks.—A small male specimen (SL = 2.0 mm) from Barbados, BLAKE station 276, MCZ 2609, carried the label *Eupagurus bartletti,* and presumably had been identified by A. Milne Edwards. However, he did not include this specimen in his list of syntypes in his original description of this species (A. Milne Edwards, 1880), nor in its subsequent redescription as *Pylopagurus bartletti* (A. Milne Edwards and Bouvier, 1893). From personal examination it has been determined that this specimen should be referred to *A. alexandri.* As previously indicated, *A. alexandri* is most closely related to *A. boletifer,* but may be distinguished from that species by the presence of a row of spines on the dorsolateral margin of the carpus of the right cheliped. Both species may be distinguished from the superficially similar *A. acanthinus* n. sp. by the lack of spinules on the margins of the mushroom-shaped tubercles of their chelae.

Agaricochirus erosus (A. Milne Edwards, 1880)
Figures 1c, 2c, 3c

Eupagurus erosus A. Milne Edwards, 1880: 42 (type locality: BLAKE station 290, off Barbados, restricted by lectotype selection by A. Milne Edwards and Bouvier, 1893: 90).

Pylopagurus erosus: A. Milne Edwards and Bouvier, 1893: 89, pl. 6, figs. 27–30.—Alcock, 1905: 189.—Gordan, 1956: 340.
Agaricochirus erosus: McLaughlin, 1981a: 6 (by implication).

Lectotype.—♀, ovigerous (SL = 4.2 mm), by subsequent selection by A. Milne Edwards and Bouvier (1893: 90), MCZ.

Material Examined.—See Table 1.

Diagnosis.—Shield approximately as wide as long; rostrum triangular, with or without small terminal spine; lateral projections obtusely triangular, with small marginal or submarginal spine. Ocular peduncles moderately long, slender, and with corneae somewhat dilated; ocular acicles triangular, moderately slender, with strong submarginal spine; separated basally by basal width or less of 1 acicle. Right cheliped with row of small tubercles or denticles on ventromesial margin of merus, ventrolateral margin with 1 to several spines. Carpus with row of spines on dorsomesial margin, dorsolateral margin with row of low protuberances and occasionally 1 strong spine; ventrodistal margin sometimes denticulate or spinulose. Dorsal surface of palm and fixed finger with moderately closely-spaced, raised, flattened or conical, mushroom-shaped tubercles with erose margins; dorsomesial and dorsolateral margins with blunt, simple or multidenticulate spines, sometimes obsolete; dactyl with longitudinal row of broad, raised, irregularly scalloped tubercles, dorsomesial margin with row of broad, blunt tubercles. Left cheliped with merus unarmed. Carpus with oblique row of strong spines on dorsal surface and 1 smaller spine at dorsolateral distal angle. Palm and fixed finger with 2 to 4 irregular rows of raised, flattened or conical tubercles, dorsolateral margin with row of simple or multidenticulate tubercles; dactyl with scattered tufts of long setae. Dactyls of 2nd and 3rd pereopods moderately short and broad; dorsal and ventral margins and ventral margins of propodi each with row of strong corneous spines, surfaces with tufts of long stiff setae. Sternite of 3rd pereopods with anterior lobe small, slender and subtriangular to subovate. Sternites of 3rd, 4th, and 5th pereopods often with capsulate setae. Telson with posterior lobes generally rounded, usually broadly separated; terminal margins unarmed.

Distribution.—Yucatan Channel, Windward Islands, and Barbados; 84–347 m.

Remarks.—It is improbable that Young (1900) actually had specimens of *A. erosus*, as he reported "teeth" on the dorsal margins of the pereopodal propodi. His description is too brief to permit speculation as to what taxon he did have. Among the species of *Agaricochirus*, only *A. erosus* has the margins of the mushroom-shaped tubercles of the chelae irregularly notched.

Agaricochirus hispidus (Benedict, 1892)
Figures 1d, 2d, 3d

Eupagurus hispidus Benedict, 1892: 26 (type locality: ALBATROSS station 2163, off Havana, Cuba).—Alcock, 1905: 181.
Pagurus hispidus: Gordan, 1956: 330.
Agaricochirus hispidus: McLaughlin, 1981a: 6 (by implication).

Holotype.—♂ (SL = 3.6 mm), USNM 7759.

Material Examined.—See Table 1.

Diagnosis.—Shield slightly broader than long; rostrum broadly triangular, blunt, with or without terminal spine; lateral projections triangular, with small marginal or submarginal spine. Ocular peduncles moderately long, cylindrical, and with corneae somewhat dilated; ocular acicles broadly triangular, with strong submarginal spine; separated basally by more than basal width of 1 acicle. Right cheliped with row of small spines on ventromesial margin of merus. Carpus with

1 to several spines on anterior third to half of dorsomesial margin. Dorsal surface of palm with flattened tubercles, mesial, median and lateral tuberculate ridges proximally and extremely prominent tuberculate horn; dorsolateral margin with broad, tuberculate, multifid spines. Left cheliped with ventral margins of merus usually spinose or tuberculate. Carpus with oblique row of strong spines on dorsal surface. Palm and fixed finger with middorsal tuberculate ridge, 2 or 3 irregular rows of flattened tubercles laterad and scattered corneous-tipped spines mesiad; dorsolateral margin with several broad, tuberculate, multifid spines. Dorsal surface of dactyl with scattered small corneous-tipped spines; dorsomesial margin with row of small, corneous-tipped spines. Dactyls of 2nd and 3rd pereopods short, dorsal and ventral margins and ventral margins of propodi each with row of strong corneous spines. Sternite of 3rd pereopods with minute anterior lobe. Sternites of 3rd, 4th and 5th pereopods often with capsulate setae. Tergites of at least 5th and 6th abdominal somites with short stiff setae. Posterior lobes of telson symmetrical, terminal margins unarmed.

Distribution.—Cuba, Yucatan Channel and western Caribbean, 133–350 m.

Remarks.—The distinctive setation of the 5th and 6th abdominal somites is a character that *A. hispidus* shares with *A. gibbosimanus* and *A. echinatus* n. sp. The prominent tuberculate horn on the right cheliped of *A. hispidus* distinguishes it not only from the latter two species, but from all other members of the genus.

Agaricochirus gibbosimanus (A. Milne Edwards, 1880)
Figures 1e, 2e, 3e

Eupagurus gibbosimanus A. Milne Edwards, 1880: 42 (type locality: BLAKE station 206, off Martinique, restricted by lectotype selection by A. Milne Edwards and Bouvier, 1893: 101).—Alcock, 1905: 189.

Pylopagurus gibbosimanus: A. Milne Edwards and Bouvier, 1893: 99, pl. 7, figs. 18–20.—Gordan, 1956: 340.

? *Pylopagurus gibbosimanus*: Young, 1900: 370.

Agaricochirus gibbosimanus: McLaughlin, 1981a: 6 (by implication).

Lectotype.—♀ (SL = 2.6 mm); subsequent selection by A. Milne Edwards and Bouvier (1893: 101); MCZ 4095.

Material Examined.—See Table 1.

Diagnosis.—Shield broader than long; rostrum obtusely triangular or rounded, usually with small terminal spine; lateral projections triangular, with marginal or submarginal spine. Ocular peduncles short, corneae dilated; ocular acicles slender, triangular, with strong submarginal spine; separated basally by approximately one and one-half basal width of 1 acicle. Right cheliped with row of small spines on ventromesial margin of merus. Carpus with row of strong spines on dorsomesial margin, dorsal surface with tufts of setae. Palm with broad, entire or broken tuberculate ridges dorsolaterally and medially; tubercles of dorsal surface of palm and fixed finger, including ridges, closely-spaced, mushroom-shaped, flattened or weakly conical; dorsomesial margin with row of widely spaced blunt spines, dorsolateral margin not distinctly delimited; dactyl with dorsomesial row of small blunt spines. Left cheliped with ventromesial row of small spines and occasionally few spinules distally on ventral margin of merus. Carpus with oblique row of spines on dorsal surface distally. Dorsal surface of palm elevated in midline and provided with closely spaced, blunt or conical tubercles and 1 or 2 blunt spines proximally; dorsolateral margin with row of blunt spines, few small corneous-tipped spines near dorsomesial margin; dactyl with dorsomesial row of corneous-tipped spines, dorsal midline with single or double row of small, often corneous-tipped spines. Dactyls and propodi of 2nd and 3rd pereopods short and moderately broad; dorsal and ventral margins of dactyls and ventral margins of

propodi each with row of corneous spines. Dorsal surfaces of dactyls, propodi and carpi with tufts of long setae. Sternite of 3rd pereopods with anterior lobe subquadrate. Sternites of 3rd, 4th and 5th pereopods sometimes with capsulate setae. Tergite of 5th abdominal somite chitinous or weakly calcified, 3rd and 4th sometimes also delimited, but not calcified; 5th, and often also 3rd and 4th provided with patches of short stiff setae; 6th tergite and uropods also usually hirsute. Telson with posterior lobes usually well separated; terminal margins unarmed.

Distribution.—Western Atlantic off Dominican Republic; Yucatan Channel and northern Caribbean; Windward Islands; 200–800 m.

Remarks.—As previously indicated, *A. gibbosimanus* shares with *A. hispidus* and *A. echinatus* n. sp. the distinctive setation of the abdominal tergites. *A. gibbosimanus* is easily distinguished from the latter species by the presence of well developed anterior lobe on the sternite of the 3rd pereopods. In *A. echinatus* n. sp. this lobe is very tiny or completely wanting. The prominent horn on the right chela of *A. hispidus* sets it apart from both species.

Agaricochirus cavimanus (Chace, 1939)
Figures 1f, 2f, 3f

Pylopagurus cavimanus Chace, 1939: 48 (type locality: Bahia de Cochinos, Cuba, 22°07'N, 81°08'W).

Agaricochirus cavimanus: McLaughlin, 1981a: 6 (by implication).

Holotype.—♀ (SL = 7.5 mm), MCZ 10233.

Material Examined.—See Table 1.

Diagnosis.—Shield considerably longer than broad; rostrum obtusely triangular, with small terminal spinule; lateral projections broadly rounded, with small marginal spine. Ocular peduncles long, cylindrical, with corneae slightly dilated; ocular acicles acutely triangular, narrow, with very strong submarginal spine; separated basally by basal width of 1 acicle. Right cheliped with ventromesial and ventrolateral margins of merus each with row of spines or spinules. Carpus with single or double row of strong spines on dorsomesial margin, double row of smaller spines on dorsal surface medianly and row of spines on dorsolateral margin. Dorsal surface of palm extremely concave, dorsolateral and dorsomesial margins almost perpendicular and armed with strong, sometimes corneous-tipped spines, dorsal surfaces of palm, fixed finger and dactyl all with closely spaced, typically flattened, mushroom-shaped tubercles, each often armed with 1 or 2 small corneous spinules. Left cheliped with rows of spines or protuberances on ventral margins of merus. Dorsal surface of carpus with somewhat oblique row of strong spines. Dorsolateral margin of palm and fixed finger with row of strong corneous-tipped spines, dorsal surface with 2 or 3 irregular rows of smaller spines medially and laterally and row of protuberances and tufts of long stiff setae mesially; dorsal surface and dorsomesial margin of dactyl with tufts of long stiff setae and few corneous-tipped spinules distally. Dactyls of 2nd and 3rd pereopods moderately short and broad; dorsal surfaces of dactyls, propodi and carpi each with row of tufts of long stiff setae, ventral margins of dactyls each with row of strong corneous spines. Sternite of 3rd pereopods with anterior lobe very small, subcircular or subovate. Sternites of 3rd, 4th and 5th pereopods with capsulate setae. Telson with posterior lobes generally symmetrical, widely separated, terminal margins unarmed.

Distribution.—Cuba and Dominican Republic; 275–430 m.

Remarks.—Although males have not been reported, there is no reason to believe

that this very distinctive species is not correctly assigned to *Agaricochirus*. The very concave right chela immediately distinguishes *A. cavimanus* from all other species in the genus.

Agaricochirus acanthinus new species
Figures 1g, 2g, 3g, 4, 5a, b, e

Holotype.—♀, ovigerous (SL = 5.8 mm), USNM 180383; type locallity: GERDA station 1301, 24°57'N, 80°14'W.

Material Examined.—See Table 1.

Description.—Shield longer than broad, anterolateral margins sloping, anterior margin between rostrum and lateral projections concave, posterior margin truncate; dorsal surface with very few tufts of short setae. Rostrum short or moderately short, sometimes exceeding lateral projections, obtusely triangular or rounded, with or without small terminal spine. Lateral projections obtusely triangular, with small marginal or submarginal spine.

Ocular peduncles long, moderately slender, with corneae slightly dilated, dorsal and mesial faces with few scattered tufts of setae. Ocular acicles triangular, dorsal surface somewhat concave, with strong submarginal spine; separated basally by approximately basal width of 1 acicle.

Antennular peduncles moderately long, exceeding ocular peduncles by approximately two-third length of ultimate segment. Ultimate and penultimate segments unarmed; basal segment with small spine on lateral face in distal half.

Antennal peduncles moderately short, approximately equalling length of ocular peduncles; with supernumerary segmentation. Fifth, fourth and third segments unarmed. Second segment with dorsolateral distal angle produced, terminating in small spine, mesial margin with 1 or 2 small spinules distally; dorsomesial distal angle with or without small spine, mesial margin with few setae. First segment with ventral margin produced and with few small spinules laterally. Antennal acicle not noticeably arcuate, terminating in small spine and with scattered tufts of long stiff setae. Antennal flagella with 1 or 2 long setae every 3rd to 8th article.

Mandible without distinguishing characters. Maxillule (Fig. 4a) with 1 stiff bristle on moderately well developed internal endopodal lobe, external lobe somewhat produced, proximal endite generally subcircular. Maxilla (Fig. 4b) with endopod approximately equalling scaphognathite in distal extension. First maxilliped (Fig. 4c) with basal segment of exopod weakly protuberant. Second maxilliped (Fig. 4d) without distinguishing characters. Third maxilliped (Fig. 4e) with crista dentata well developed, accessory tooth present, merus without dorsodistal spine. Sternite of 3rd maxillipeds with well developed spine on each side of midline.

Chelipeds unequal, right considerably larger than left. Right cheliped with dactyl approximately one-third longer than palm; cutting edge with row of strong calcareous teeth, terminating in very small corneous claw and overlapped by fixed finger; dorsal surface with median row of raised, blunt or spinulose tubercles, few additional flattened or mushroom-shaped tubercles laterally, dorsomesial margin with row of widely spaced, basally broadened, simple or multifid spines; tubercles and basal portions of spines each provided with several thorn-like spinules, mesial and ventral surfaces with few tufts of stiff setae. Palm as long as or slightly shorter than carpus; dorsomesial and dorsolateral margins each with row of broad, simple or multifid spines armed basally with thorn-like spinules; dorsal surface of palm and fixed finger with moderately closely-spaced, mushroom-shaped tubercles usually dorsally flattened and marginally armed with thorn-like spinules, 1 or 2 tubercles usually with dorsally projecting calcareous spine;

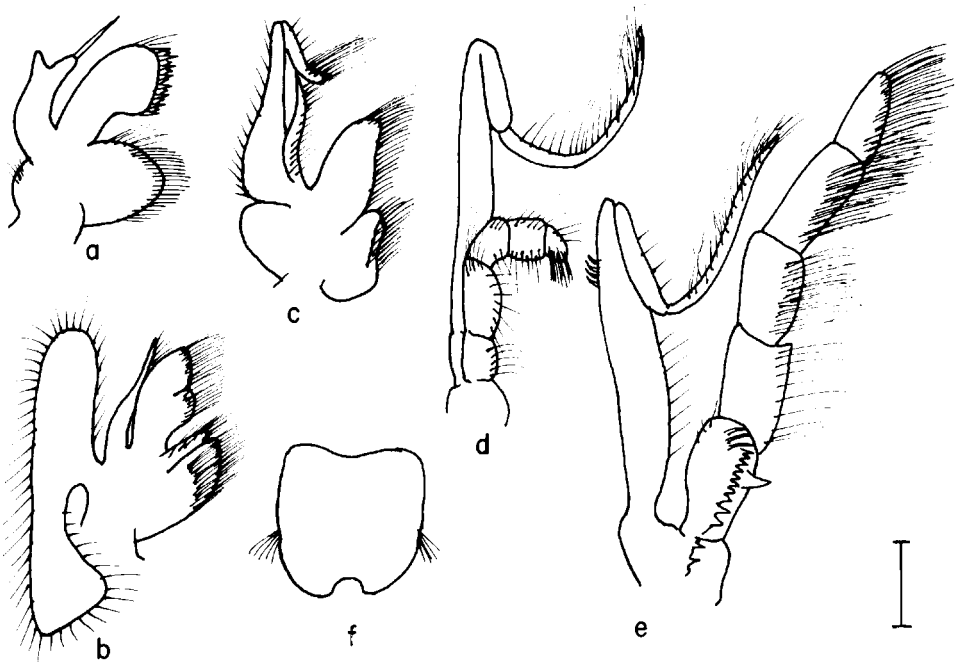

Figure 4. *Agaricochirus acanthinus* new species: a–e, mouthparts (left, internal view)—(a) maxillule; (b) maxilla; (c) 1st maxilliped; (d) 2nd maxilliped; (e) 3rd maxilliped; (f) telson. Scale equals 1 mm.

lateral, mesial, and ventral surfaces with scattered tufts of stiff setae; cutting edge of fixed finger with row of calcareous teeth, terminating in minute corneous claw. Carpus approximately equalling length of merus; dorsomesial margin with row of strong spines and tufts of stiff setae, dorsolateral margin with row of low protuberances and tufts of long stiff setae, mesial and lateral faces with scattered tufts of setae. Merus triangular; dorsal margin with row of tufts of stiff setae; ventromesial margin with few low spinulose protuberances, particularly proximally, ventrolateral margin with small spine distally. Ischium with row of blunt spines on ventral margin. Basis and coxa not fused, each with few tufts of setae.

Left cheliped elongate, approximately equallying length of right; angle of articulation of chela and carpus approximately 30°. Dactyl one-third longer than palm; cutting edge with row of fine corneous teeth, terminating in small corneous claw; dorsal and ventral surfaces and dorsomesial margin each with tufts of stiff setae or bristles. Palm moderately long, approximately half length of carpus; dorsal surface of palm and fixed finger laterad of midline with mushroom-shaped tubercles provided with marginal thorn-like spinules or small spines, decreasing in size distally, dorsolateral margin with row of strong spines, each usually with spinose projections basally also provided with thorn-like spinules, dorsal surface of palm mesially unarmed, but with scattered stiff setae; cutting edge of fixed finger with row of small calcareous teeth. Carpus approximately equalling merus in length; dorsolateral margin with row of strong spines becoming oblique row distally, dorsomesial margin with row of transverse low protuberances and long, quite stiff setae; lateral and mesial faces and ventral surface with scattered tufts of setae. Merus triangular; dorsal margin with few stiff setae; ventromesial and ventrolateral margins each with low, occasionally spinulose protuberances and

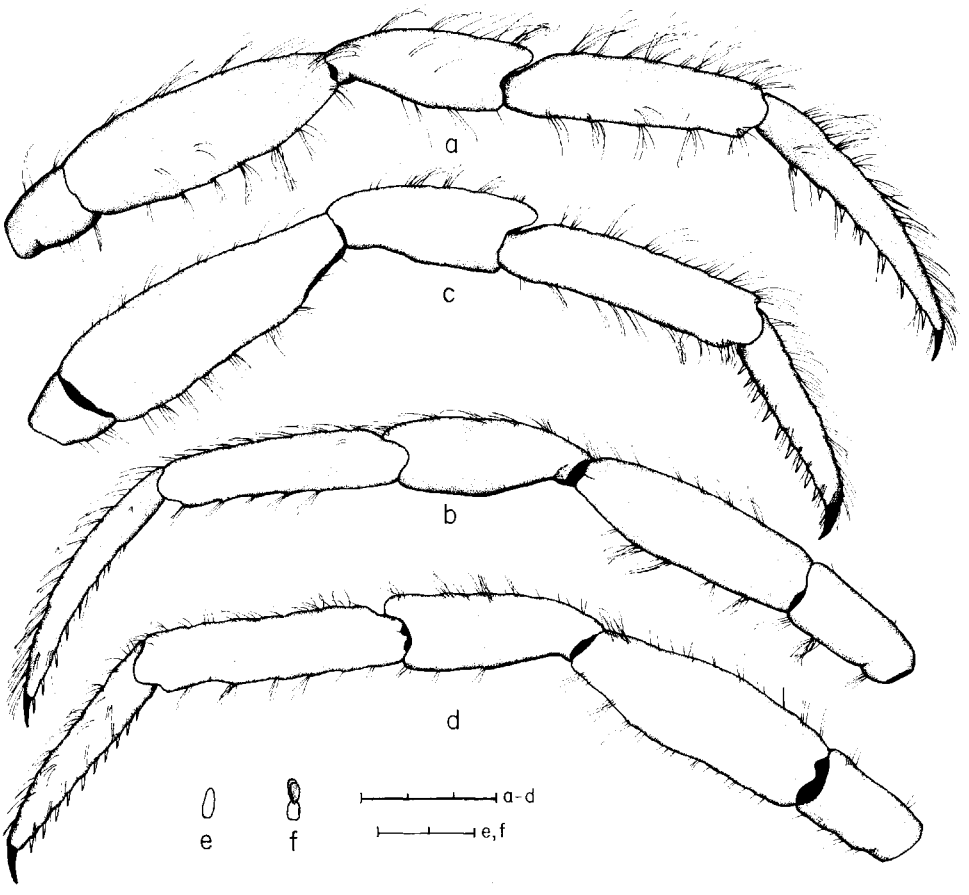

Figure 5. Pereopods and anterior lobes of 3rd sternites: (a) right 2nd pereopod, *Agaricochirus acanthinus* new species (lateral view); (b) left 3rd pereopods, *A. acanthinus* new species (lateral view); (c) right 2nd pereopod, *Agaricochirus echinatus* new species (lateral view); (d) left 3rd pereopod, *A. echinatus* new species (lateral view); (e) anterior lobe, *A. acanthinus* new species; (f) anterior lobe, *A. echinatus* new species. Scales equal 3 mm (a–d) and 1 mm (e, f).

long stiff setae. Ischium with row of small blunt spines or tubercles on ventral margin. Coxa and basis distinct; each with scattered setae.

Ambulatory legs slightly overreaching right cheliped, generally similar from left to right. Dactyls moderately long, one-fifth to one-fourth longer than propodi, moderately broad; in lateral view slightly curved ventrally, in dorsal view straight, terminating in strong corneous claw; dorsal margins with low protuberances and long, very stiff, spiniform bristles; ventral margins each with row of very strong corneous spines; mesial faces with transverse rows of stiff setae or bristles, more prominent ventrally; lateral faces with few scattered setae. Propodi moderately short, approximately equalling carpi in length; dorsal and ventral margins with low protuberances and long, very stiff setae. Carpi moderately long, approximately two-thirds length of meri; dorsal and ventral surfaces with tufts of stiff setae, most numerous dorsally. Meri laterally compressed; dorsal surfaces with few fine setae, ventral surfaces with long stiff setae. Ischia with setae on dorsal

and ventral margins, stiffer ventrally. Coxae and bases distinct; mesial margins with few setae. Sternite of 3rd pereopods with very small, almost spine-like anterior lobe. Fourth pereopods with propodal rasp of 4 or 5 rows of corneous scales; claw of dactyl moderately long, preungual process small.

Fifth pleopod of females not appreciably reduced in size but uniramous. Protopods of uropods with posterior protuberance prominent, bilobed. Telson with transverse suture usually weak, posterior lobes with or without median cleft, terminal margins unarmed.

Distribution.—Straits of Florida, western Caribbean; 190–274 m.

Remarks.—One female paratype was observed to have the uropodal exopods slightly asymmetrical and the abdomen somewhat more elongate than the remainder of the type series. *Agaricochirus acanthinus* superficially resembles *A. boletifer* and *A. alexandri*, but may be distinguished from these latter two species by the armature of the dactyl of the right cheliped and by the presence of thorn-like spinules on the margins of most of its mushroom-shaped tubercles.

The specific name is derived from the Greek *akanthinos* meaning thorny, and refers to the thorn-like spinules arming the margins of the tubercles giving them a thorny appearance.

Agaricochirus echinatus new species
Figures 1h, 2h, 3h, 5c, d, f, 6

Holotype.—♂ (SL = 4.6 mm), USNM 180385; type locality: GERDA station 1275, 21°02'N, 86°29'W.

Material Examined.—See Table 1.

Description.—Shield slightly broader than long, anterolateral margins slightly terraced, anterior margin between rostrum and lateral projections concave, posterior margin truncate; dorsal surface with few tufts of moderately long setae. Rostrum obtusely triangular, with very small terminal spine. Lateral projections obtusely triangular, with small marginal or submarginal spine. Ocular peduncles moderately short and stout, with corneae strongly dilated. Ocular acicles triangular, with strong submarginal spine; separated basally by approximately one and one-fourth basal width of 1 acicle.

Antennular peduncles moderately long, exceeding ocular peduncles by approximately one-half length of ultimate segment. Ultimate and penultimate segments with few scattered short setae; basal segment with small spine on lateral face dorsally.

Antennal peduncles moderately long, nearly equalling length of antennular peduncles; with supernumerary segmentation. Fifth, fourth and third segments with few scattered short setae. Second segment with dorsolateral distal angle produced, terminating in bi- or multifid spine, lateral margin unarmed or with 1 small spinule, mesial margin usually with 2 to 5 small spines or spinules; dorsomesial distal angle with acute spine, mesial margin with few scattered setae. First segment with ventral margin produced, with 2 or 3 small spinules laterally. Antennal acicles somewhat arcuate, terminating in small acute spine, mesial margin with few tufts of moderately long setae. Antennal flagella with few moderately long setae every 3rd to 8th article.

Mandible without distinguishing characters. Maxillule (Fig. 6a) with 1 stiff bristle on moderately well developed internal endopodal lobe, external lobe produced slightly, proximal endite subtriangular. Maxilla (Fig. 6b) with endopod approximately equalling scaphognathite in distal extension. First maxilliped (Fig. 6c) with basal segment of exopod weakly produced. Second maxilliped (Fig. 6d) with

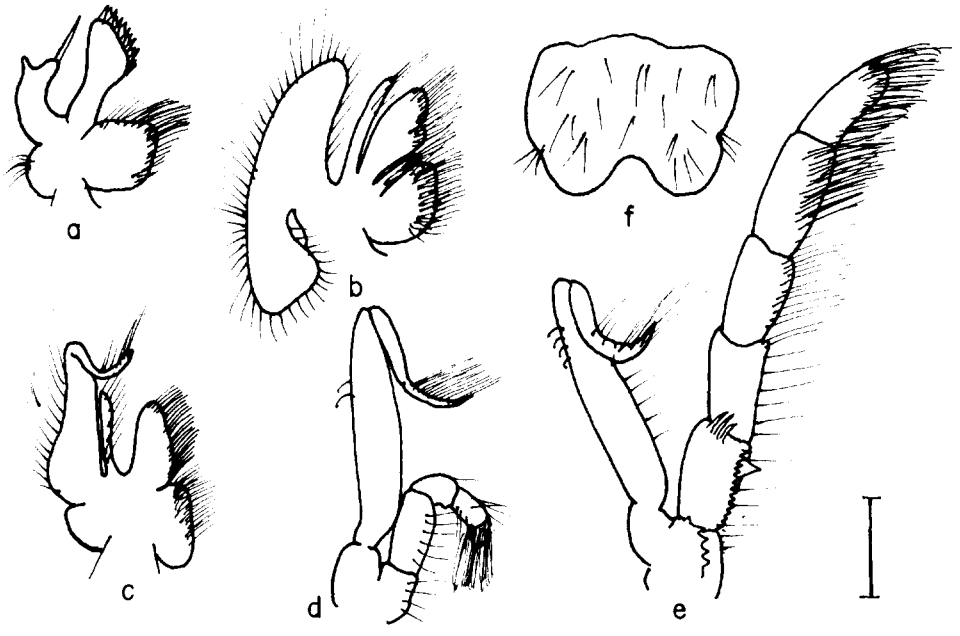

Figure 6. *Agaricochirus echinatus* new species: a–c, mouthparts (left, internal view)—(a) maxillule; (b) maxilla; (c) 1st maxilliped; (d) 2nd maxilliped; (e) 3rd maxilliped; (f) telson. Scale equals 1 mm.

exopodal flagellum very short. Third maxilliped (Fig. 6e) with crista dentata well developed, accessory tooth present, merus without dorsodistal spine, exopodal flagellum short. Sternite of 3rd maxillipeds with strong spine on either side of midline.

Chelipeds unequal, right considerably stronger than left. Right cheliped with dactyl moderately long, approximately one-third longer than palm; cutting edge with row of strong calcareous teeth, terminating in small corneous claw and slightly overlapped by fixed finger; dorsal surface with 3 or 4 rows of closely spaced, dorsally flattened, mushroom-shaped tubercles, each usually with few dorsally directed tiny spinules, dorsomesial margin with row of broad multifid spines usually basally confluent with most mesiad row of tubercles; mesial and ventral surfaces with few scattered tufts of setae. Palm moderately long, equalling length of carpus; dorsomesial and dorsolateral margins with broad multifid spines, dorsal surface of palm and fixed finger with very closely spaced, generally dorsally flattened, mushroom-shaped tubercles, each usually with several dorsally directed tiny spinules; mesial, lateral and ventral surfaces with scattered tufts of setae. Carpus as long or slightly longer than merus; dorsomesial margin with row of strong spines, at least distally and frequently with low protuberances and tufts of setae proximally, dorsal surface with scattered setae, dorsolateral margin with row of low protuberances and tufts of setae and 1 moderately strong spine; mesial, lateral and ventral surfaces each with few tufts of setae. Merus subtriangular; dorsal margin with row of low protuberances and tufts of long setae; ventromesial and ventrolateral margins each with row of spines, stronger and almost teardrop-shaped on mesial margin. Ischium with row of similar spines on ventral margin and with tufts of long setae. Basis and coxa distinctly separated; both with few tufts of long setae.

Left cheliped reaching approximately to base of dactyl of right; angle of artic-

ulation of chela and carpus 75° to 80°. Dactyl moderately long, approximately twice length of palm; cutting edge with row of small corneous teeth, terminating in moderately strong corneous claw and somewhat overlapped by fixed finger; dorsal surface with 1 or 2 irregular rows of minute spinules and tufts of setae, dorsomesial margin with row of low protuberances proximally becoming small spines distally and tufts of long setae. Palm approximately two-thirds length of carpus; dorsal surface of palm and fixed finger laterad of midline with 3 or 4 irregular rows of closely spaced, dorsally flattened, mushroom-shaped tubercles, each usually with several dorsally directed spinules, dorsolateral margin with row of very strong, usually multifid, corneous-tipped spines, broadened basally; cutting edge of fixed finger with row of small calcareous teeth, distally interspersed by corneous teeth; dorsomesial face of palm with few scattered tufts of long setae; lateral and ventral surfaces with tufts of long stiff setae. Carpus approximately equalling length of merus; dorsal surface with oblique row of strong spines and tufts of long setae, dorsomesial margin proximally with transverse low ridges and tufts of long setae; ventral and mesial surfaces also with low transverse ridges and tufts of long setae. Merus subtriangular; dorsal margin with low transverse ridges and tufts of moderately fine setae; ventrolateral and ventromesial margins each with row of small, simple or bifid spines and tufts of long setae. Ischium with row of small spines on ventral margin. Basis and coxa distinct, each with tufts of long setae.

Ambulatory legs overreach right cheliped; generally similar from left to right. Dactyls moderately long, slighly shorter than propodi, moderately broad; in lateral and dorsal views almost straight, terminating in moderately strong claw; ventral margins and mesial faces dorsally each with row of strong corneous spines; dorsal margins each with row of long stiff setae. Propodi slightly longer than carpi; dorsal surfaces with tufts of long setae; ventral surfaces each with row of corneous spines and tufts of long setae. Dorsodistal margins of carpi unarmed. Meri with tufts of setae on dorsal and ventral margins. Ischia, coxae and bases all with scattered setae on ventral margins. Anterior lobe of sternite of 3rd pereopods very small. Sternites of 3rd and 4th pereopods often with capsulate setae. Fourth pereopods with propodal rasp usually of 5 rows of corneous scales; preungual process small.

Pleopods of females unknown; pleopods of males uniramous. Protopods of uropods with posterior protuberance prominent but simple. Tergite of 4th abdominal somite marked by row of short setae; tergite of 5th delineated, weakly chitinized and ornamented with patches of short setae; 6th tergite and uropods also with short stiff setae. Telson with transverse suture often weakly delineated, posterior lobes symmetrical, terminal margins unarmed.

Distribution.—Off Yucatan Peninsula and Cuba; 123–585 m.

Remarks.—This species currently is known only from males; therefore, the presence of paired 1st pleopods modified as gonopods in females can only be hypothesized. In all other characters this species agrees with the generic diagnosis of *Agaricochirus*.

The specific name is derived from the Latin *echinatus* meaning prickly, and refers to the prickly appearance of the mushroom tubercles imparted by their numerous dorsally directed tiny spinules.

Enallopagurus McLaughlin, 1981

Pylopagurus: Walton, 1954: 140 (in part).—Scanland and Hopkins, 1969: 257 (in part). [Not *Pylopagurus* A. Milne Edwards and Bouvier, 1891.]

Enallopagurus McLaughlin, 1981a: 7. Type species, by original designation: *Pylopagurus spinicarpus* Glassell, 1938. Gender: masculine.

Diagnosis.—Eleven pairs of phyllobranch gills. Ocular acicles triangular or subovate, usually with strong submarginal spine; separated basally by three-quarters to one and one-quarter basal width of 1 acicle. Sternite of 3rd maxillipeds with spine on either side of midline. Third maxillipeds each with well developed crista dentata with prominent accessory tooth; merus with or without small spine at dorsodistal margin. Maxillule with internal lobe of endopod moderately well developed and with 1 stiff bristle terminally; external lobe weakly produced.

Right cheliped with chela subovate; angle of articulation of chela and carpus approximately 15° from perpendicular. Left cheliped with chela triangular in cross-section, but not elevated into prominent keel or crest; angle of articulation of chela and carpus 15°–30° from perpendicular. Sternite of 3rd pereopods with anterior lobe subcircular to subovate or subquadrate. Sternites of 3rd–5th pereopods often with capsulate setae. Fourth pereopod with propodal rasp of single row of corneous scales; dactyl moderately short, claw short; preungual process moderately small, at base of claw.

Males and females both with paired gonopores; in former, usually accompanied by small tufts of setae. Males without sexual tubes.

Abdomen straight or flexed, typically moderately long. Uropods symmetrical or asymmetrical; exopods considerably larger than endopods, ventral margins of exopods often with long, moderately stiff setae. Telson without transverse suture; terminal margin entire, convex, unarmed. Males without paired pleopods, with 3 unpaired, uniramous or weakly biramous pleopods. Females with paired 1st pleopods modified as gonopods, with 2nd–4th unpaired pleopods well developed and biramous, 5th typically uniramous.

Distribution.—Pacific Ocean: West coast of Baja California, Mexico; Gulf of California, Mexico; Panama and Colombia; 57–229 m.

Etymology.—*Enallopagurus* is from the Greek *enallos* meaning changed or contrary, and refers to the unpagurid-like development of the telson.

Key to the Species of *Enallopagurus*

1a. Dorsal proximal margin of right chela with strong spines ..... *E. coronatus*
1b. Dorsal proximal margin of right chela unarmed 2
2a. Dorsal surface of palm of right chela with relatively closely-spaced small spines or spinules ..... *E. affinis*
2b. Dorsal surface of palm of right chela unarmed or rarely slightly tuberculate ..... *E. spinicarpus*

Enallopagurus spinicarpus (Glassell, 1938)
Figures 7a, 8a, d

Pylopagurus spinicarpus Glassell, 1937: 256 [*nomen nudum*]; 1938: 1 (type locality: Puerto Refugio, Angel de la Guardia I., Gulf of California, Mexico).—Walton, 1954: 151, pl. 43, fig. C.—Gordan, 1956: 340.—Scanland and Hopkins, 1969: 260.
Enallopagurus spinicarpus: McLaughlin, 1981a: 7 (by implication).

Holotype.—♂ (SL = 2.3 mm), AHF 366.

Material Examined.—See Table 1.

Diagnosis.—Shield length approximately equalling width, or longer than broad; rostrum obtusely triangular, sometimes produced as small lobe, with or without small terminal spine; lateral projections triangular, with weak to moderately strong marginal or submarginal spine. Ocular peduncles moderately long or long, mod-

erately slender, with corneae dilated and basal region somewhat bulbous; ocular acicles triangular or ovate, with strong submarginal spine; separated basally by slightly less than or basal width of 1 acicle. Right cheliped sometimes with small spinule at ventrolateral distal angle of merus. Carpus with 2 moderately strong spines, and occasionally additional smaller spine, separated by concavity from prominent distal spine on dorsomesial margin; mesiodistal margin minutely spinulose. Palm with dorsomesial margin raised and armed with irregular row of small to moderately strong spines; dorsal surface convex, unarmed, or rarely slightly tuberculate; dorsolateral margin produced as minutely spinulose ridge, stronger on fixed finger; dactyl strongly overlapped by fixed finger, dorsal midline and dorsomesial margin each with row of small spines or spinules. Left cheliped with spine or spinules on ventrolateral margin of merus. Carpus with row of moderate to strong spines on dorsolateral margin and tufts of stiff setae on dorsomesial margin. Dorsolateral margin of palm with row of small spines, dorsal midline elevated and armed with row of small spines extending length of fixed finger; dactyl with row of very small spines or spinules in dorsal midline, dorsomesial margin unarmed. Dactyls of 2nd and 3rd pereopods long, moderately broad, ventral margins and mesial faces dorsally each with row of strong corneous spines; propodi with pair of corneous spines at each ventrodistal margin; carpi and meri unarmed; surfaces with scattered tufts of setae. Sternite of 3rd pereopods with anterior lobe trapezoidal, often with 1 capsulate seta. Abdomen generally straight; uropods asymmetrical. Telson not divided into anterior and posterior lobes; terminal margin entire, convex, unarmed.

Distribution.—West coast of Baja California, Mexico; Gulf of California, Mexico; Pacific coasts of Panama and Colombia; 19–175 m.

Remarks.—Of the three species assigned to *Enallopagurus*, *E. spinicarpus* appears most closely allied to *E. affinis*, but may be distinguished from that species by the lack of spines or spinules on the dorsal surface of the right chela.

Enallopagurus affinis (Faxon, 1893)
Figures 7b, 8b, e

Pylopagurus affinis Faxon, 1893: 169 (type locality: Gulf of Panama. ALBATROSS station 3397); 1895: 64, pl. 12, figs. 2–2e.—Alcock, 1905: 189.—Gordan, 1956: 340.
Pylopagurus (?) *affinis*: Walton, 1954: 160.
Enallopagurus affinis: McLaughlin, 1981a: 7 (by implication).

Holotype.—♂ (SL = 3.1 mm), MCZ 4521.

Material Examined.—See Table 1.

Diagnosis.—Shield broader than long; rostrum obtusely triangular, with small terminal spine; lateral projections broadly rounded, with small submarginal spine. Ocular peduncles moderately long, stout, with corneae somewhat dilated; ocular acicles subovate, terminating subacutely and with strong submarginal spine; separated basally by slightly more than basal width of 1 acicle. Right cheliped with merus unarmed. Carpus with 2 acute spines on dorsomesial margin, dorsal surface with median longitudinal row of spines. Dorsomesial and dorsolateral margins of palm and fixed finger each with row of strong, conical, corneous-tipped spines; dorsal surface with closely spaced, small, usually corneous-tipped spines or spinules; dactyl with row of corneous-tipped spines on dorsomesial margin, dorsal surface with low, conical or tuberculate spines. Left cheliped with merus unarmed. Carpus with row of moderately strong spines on dorsolateral margin, 2 prominent spines at distal margin; ventromesial margin with acute spine distally.

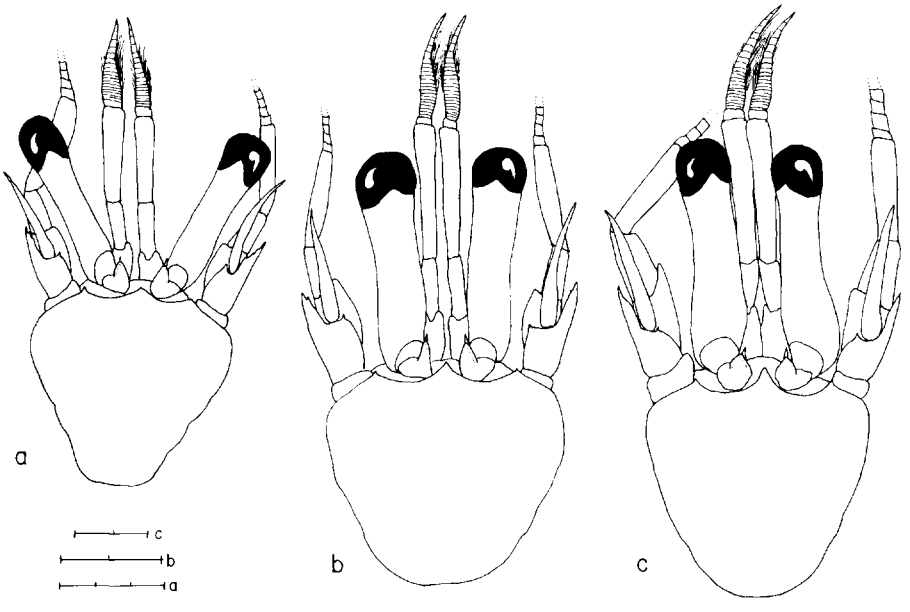

Figure 7. Shields and cephalic appendages: (a) *Enallopagurus spinicarpus*; (b) *Enallopagurus affinis*; (c) *Enallopagurus coronatus*. Scales equal 3 mm (a), 2 mm (b), and 1 mm (c).

Dorsolateral margin of palm and fixed finger with row of strong, corneous-tipped spines; dorsal surface elevated in midline proximally and armed with short row of spines, 2 irregular rows of smaller spines laterally, dorsomesial margin with row of tufts of long, stiff setae. Dactyls of 2nd and 3rd pereopods moderately short, terminating in strong corneous claws; ventral margins and mesial faces dorsally each with row of corneous spines; ventral margins of propodi with 1 to several corneous spines distally. Sternite of 3rd pereopods with anterior lobe obscured by large subovate capsulate seta. Sternites of 4th and 5th pereopods each with 2 smaller capsulate setae. Telson not subdivided into anterior and posterior lobes; terminal margin entire, convex, unarmed. Uropods generally symmetrical.

Distribution.—Known only from type locality.

Remarks.—In his description of the single male specimen of this species known, Faxon (1893, 1895, pl. 12, fig. 2e) reported and illustrated the vas deferens as ". . . extruded from the base of the fifth legs on each side. They appear as slender threads, the one on the right side much longer than its fellow, and twisted into a small bunch." On the basis of the description of extruded vas deferens, Walton (1954) was reluctant to include Faxon's species in *Pylopagurus* and did so only questionably for completeness in his review of the Pacific representatives of this genus. I have examined Faxon's specimen and found his description to be inaccurate. The gonopores are partially circumscribed by fine hairs and the vas deferens on each side are slightly protruded, as is frequently observed in preserved material in which no sexual tubes are present. In casual observation it would appear that the hairs may arise at the the terminal ends of the vas deferens, but this is actually not the case.

Faxon related his species most closely to the taxon referred to by Milne Ed-

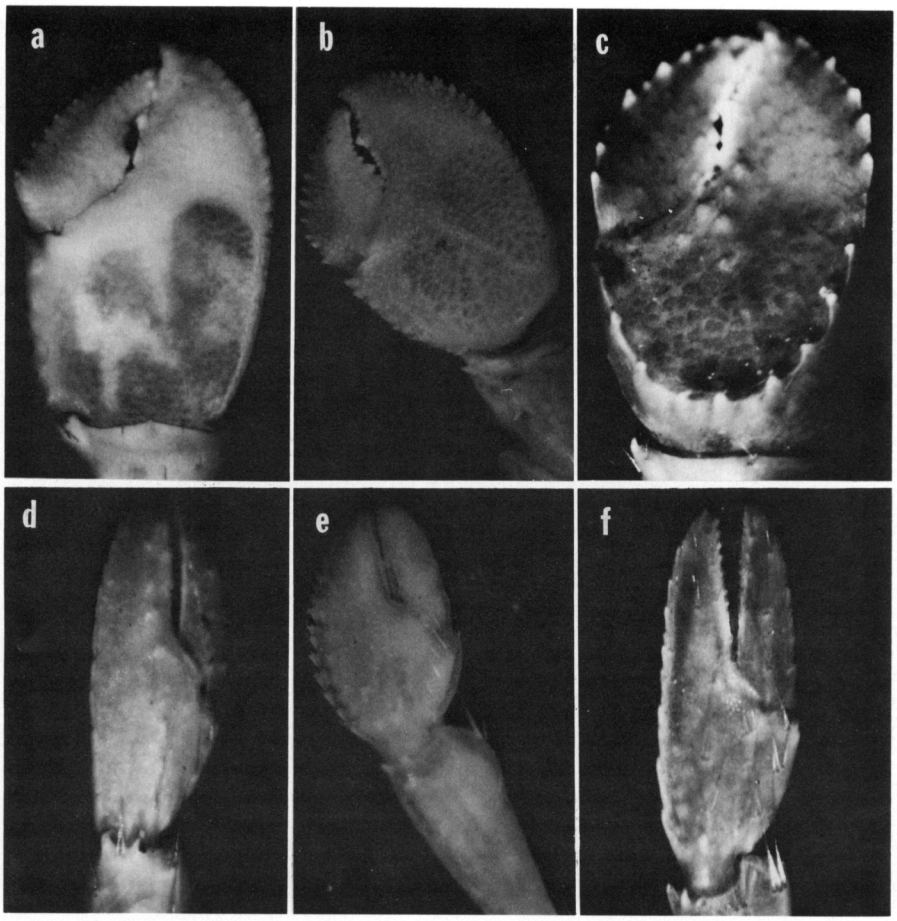

Figure 8. Right chelae (a–c) and left chelae (d–f): (a) *Enallopagurus spinicarpus* (6.5×); (b) *Enallopagurus affinis* (14.5×); (c) *Enallopagurus coronatus* (35×); (d) *Enallopagurus spinicarpus* (10.9×); (e) *Enallopagurus affinis* (15.1×); (f) *Enallopagurus coronatus* (56×).

wards and Bouvier (1891, 1893) as *Pylopagurus ungulatus* (Studer). As pointed out by McLaughlin (1981a), this taxon is in reality *Manucomplanus corallinus* (Benedict), and any relationship between Faxon's and Benedict's species is superficial, at best. Although females of *E. affinis* have yet to be reported, there is little doubt that this species is properly assigned to *Enallopagurus*.

Enallopagurus coronatus (Benedict, 1892)
Figures 7c, 8c, f

Eupagurus coronatus Benedict, 1892: 24 (type locality: off Cape San Lucas, Gulf of California, ALBATROSS station 2829).—Alcock, 1905: 180.
Pylopagurus coronatus: Glassell, 1937: 254.—Walton, 1954: 149, pl. 43, fig. A.—Gordan, 1956: 340.—Scanland and Hopkins, 1969: 259.
Pagurus coronatus: Gordan, 1956: 328.
Enallopagurus coronatus: McLaughlin, 1981a: 7 (by implication).

Holotype.—♂ (SL = 2.0 mm), USNM 16699.

Material Examined.—See Table 1.

Diagnosis.—Shield as long or slightly longer than broad; rostrum prominent, acutely triangular, with small terminal spine; lateral projections acutely or obtusely triangular, with marginal or submarginal spine. Ocular peduncles moderately long and slender, with corneae slightly dilated; ocular acicles subovate, with moderately strong or strong submarginal spine; separated by less than basal width of 1 acicle. Right cheliped with weakly protuberant crest or ridge on dorsal margin of merus. Carpus with 2 or 3 widely spaced spines on dorsomesial margin, dorsal midline with spinulose longitudinal ridge. Dorsal surface of palm and fixed finger with scattered low tubercles, dorsal margins (mesial, lateral, and proximal) with strong, widely-spaced spines; dorsomesial margin of dactyl spinulose, dorsal surface with few low tubercles. Left cheliped with merus usually unarmed. Carpus with pair of strong spines on dorsodistal margin and 1 spine on mid-dorsolateral margin. Dorsolateral margin of palm and fixed finger with row of low spines; dorsal surface elevated in midline and with 1 or 2 strong spines near proximal margin; dactyl with rows of tufts of long setae. Dactyls of 2nd and 3rd pereopods short, terminating in strong corneous claws; ventral margins of dactyls and propodi each with row of corneous spines, dorsal and ventral margins with tufts of setae. Sternite of 3rd pereopods with anterior lobe narrowly subovate. Uropods symmetrical. Telson not subdivided into anterior and posterior lobes; terminal margin entire, convex, unarmed.

Distribution.—Gulf of California, Mexico; 57–137 m.

Remarks.—*E. coronatus* is easily distinguished from the other species of the genus by the armature of the right chela. Strong marginal spines encircle the entire palm and lateral portion of the fixed finger in this species.

Enallopaguropsis McLaughlin, 1981

Pylopagurus: Walton, 1954: 140 (in part).—Scanland and Hopkins, 1969: 257 (in part). [Not *Pylopagurus* A. Milne Edwards and Bouvier, 1891.]

Enallopaguropsis McLaughlin, 1981a: 7. Type species, by original designation: *Pylopagurus guatemoci* Glassell, 1937. Gender: feminine.

Diagnosis.—Eleven pairs of phyllobranch gills. Ocular acicles acutely triangular, with moderately well developed submarginal spine; separated basally by approximate basal width of 1 acicle. Sternite of 3rd maxillipeds with strong spine on either side of midline. Third maxillipeds each with well developed crista dentata with prominent accessory tooth; merus with spine at dorsodistal margin. Maxillule with internal lobe of endopod moderately well developed and with 1 stiff bristle terminally; external lobe moderately well developed, not recurved.

Right cheliped with chela suboperculate; angle of articulation approximately perpendicular. Left chela subtriangular in cross-section, but without prominent keel or crest; angle of articulation of chela and carpus approaching 60° from perpendicular. Sternite of 3rd pereopods with anterior lobe represented by single large capsulate seta. Sternites of 4th and 5th pereopods often with 1 to several capsulate setae. Fourth pereopod with propodal rasp consisting of several rows of corneous scales; dactyl moderately long, claw well developed; preungual process small to moderately well developed at base of claw.

Males and females both with paired gonopores; males without sexual tubes.

Abdomen straight or slightly flexed, usually moderately long. Uropods asymmetrical; exopods usually considerably larger than endopods. Telson without transverse suture; terminal margin entire, convex, unarmed. Males without paired pleopods, with 3 unpaired pleopods with endopods reduced or absent. Females

with paired 1st pleopods modified as gonopods, with 4 unpaired pleopods, 2nd–4th well developed and biramous, 5th moderately well developed, uniramous or weakly biramous.

Distribution.—Pacific Ocean: Southern California to Baja California, Mexico; Gulf of California, Mexico to Costa Rica; 20–275 m.

Etymology.—*Enallopaguropsis* is from the Greek *enallos* meaning changed, *pagouros*, a crab, and *opseo*, appearance, referring to the changed structural development of the telson from the typical pagurid type.

KEY TO THE SPECIES OF *ENALLOPAGUROPSIS*

1a. Dorsolateral margin of carpus of right cheliped unarmed; dorsal surface of palm and fixed finger with closely spaced granules armed with small corneous spinules ..... *E. guatemoci*

1b. Dorsolateral margin of carpus of right cheliped armed with sparse row of spines; dorsal surface of palm and fixed finger with scattered unarmed tubercles ..... *E. janetae* n. sp.

Enallopaguropsis guatemoci (Glassell, 1937)
Figures 9a, 10a–c

Pylopagurus guatemoci Glassell, 1937: 254 (type locality: 31°25'N, 116°42'W, Baja California, Mexico).—Walton, 1954: 146, pl. 43, Fig. B.—Gordan, 1956: 340.—Scanland and Hopkins, 1969: 259.

Pylopagurus hancocki Walton, 1954: 148, pl. 41 (type locality: off San Francisquito Bay, Gulf of California, Mexico, VELERO III station 534-36).—Gordan, 1956: 340.—Scanland and Hopkins, 1969: 260.

Enallopaguropsis guatemoci: McLaughlin, 1981a: 8 (by implication).

Holotype (*P. guatemoci*).—♂ (SL = 3.0 mm), New York Zool. Soc. 36801.

Holotype (*P. hancocki*).—♂ (SL = 1.8 mm), AHF 362.

Material Examined.—See Table 1.

Diagnosis.—Shield as long as or longer than broad; rostrum obtusely triangular, sometimes as small lobe, with or without terminal spine; lateral projections obtusely triangular or broadly rounded, with small marginal or submarginal spine. Ocular peduncles moderately long and stout, corneae slightly dilated; ocular acicles narrowly triangular or subovate, with strong submarginal spine; separated basally by approximate basal width of 1 acicle. Right cheliped with merus unarmed. Carpus with 1 or 2 strong spines on dorsomesial margin separated from stronger distal spine by broad, shallow depression, occasionally with few accessory spinules proximally and on dorsal surface. Palm with dorsomesial, proximal and dorsolateral margins each with row of strong spines, more irregular in larger animals; dorsal surface of palm and fixed finger with closely spaced, irregular granules often provided with corneous spinules or short spiniform bristles. Dactyl with row of strong, sometimes irregular spines on dorsomesial margin, dorsal surface somewhat elevated in midline and provided with numerous irregular granules frequently armed with corneous spinules. Left cheliped sometimes with small spine at ventrolateral distal angle of merus. Carpus with row of moderate to strong spines on dorsolateral margin, occasionally also strong spine on dorsodistal margin. Palm and fixed finger somewhat elevated in midline and armed with irregular row of small spines, strongest proximally, dorsal surface with scattered granules, dorsolateral margin with row of strong spines; dactyl unarmed but with tufts of long stiff setae, particularly ventrally. Dactyls of 2nd and 3rd pereopods short, broad; ventral margins and mesial faces dorsally each with row of corneous spines; propodi with few corneous spines on ventral margins distally. Sternite of 3rd

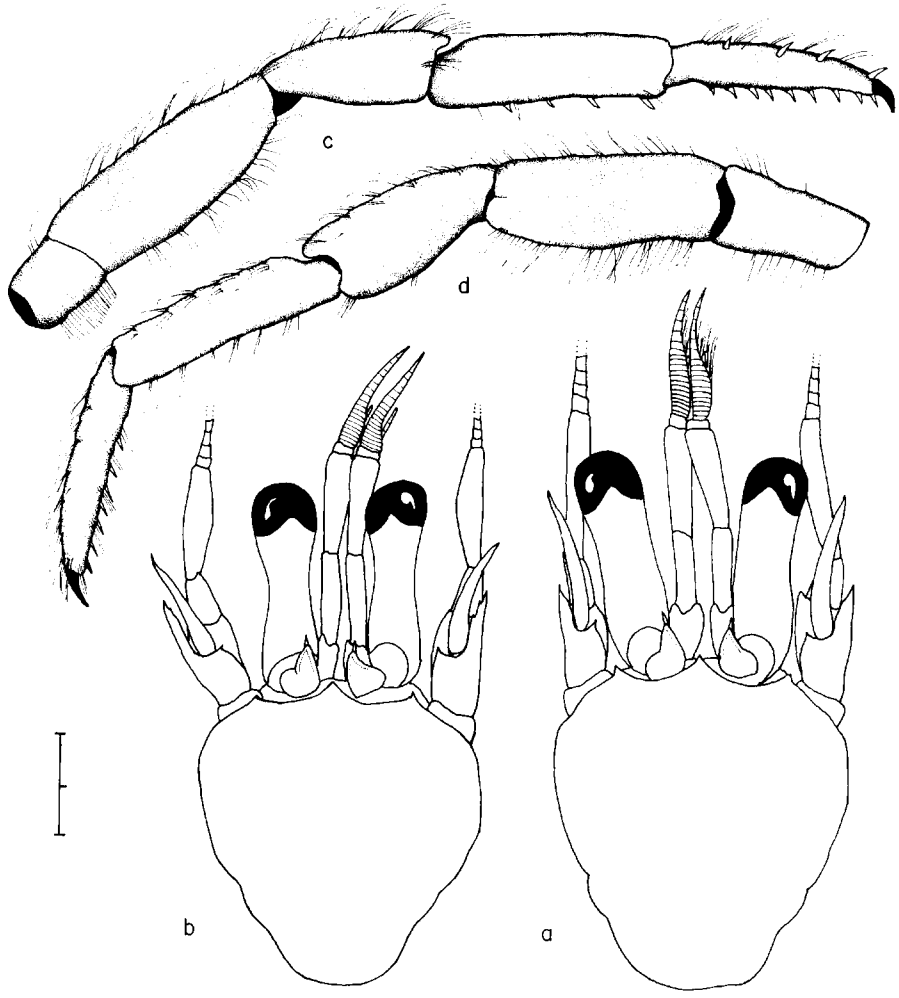

Figure 9. Shields, cephalic appendages and pereopods: (a) *Enallopaguropsis guatemoci*; (b–d) *Enallopaguropsis janetae* new species—(b) shield and cephalic appendages; (c) left 2nd pereopod (mesial view); (d) left 3rd pereopod (lateral view).

pereopods with anterior lobe replaced by very large capsulate setae. Sternites of 4th and 5th pereopods usually with 1 to several capsulate setae. Uropods somewhat asymmetrical. Telson without transverse suture; terminal margin entire, convex, unarmed.

Distribution.—Southern California to Baja California, Mexico; Gulf of California, Mexico; 20–275 m.

Remarks.—Walton (1954) described *Pylopagurus hancocki* as a species that could be distinguished from *E. guatemoci* because the former taxon had three spines on the dorsomesial margin of the carpus of the right cheliped, whereas the latter had only two. The only other distinguishing characters reported were a truncate rostrum and a partially cleft spine on the carpus of the left cheliped. As has been seen in species of *Enallopagurus* the number of proximal spines on the dor-

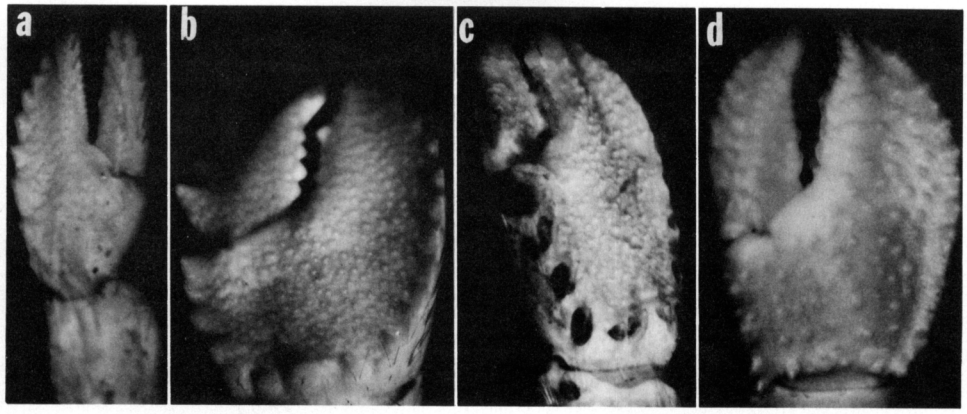

Figure 10. Left and right chelae: (a–c) *Enallopaguropsis guatemoci*—(a) left chela (20.6×); (b) right chela (19.8×); (c) right chela of *Pylopagurus hancocki* holotype (17.9×); (d) *Enallopaguropsis janetae* new species, right chela (12.4×).

somesial margin of the carpus of the right cheliped is subject to variation. Similarly, the shape of the rostrum is variable in many hermit crab taxa, and a bifid or cleft spine rarely can be considered diagnostic. Although the right chela is appreciably narrower in the single specimen known of *P. hancocki* than is typical of *E. guatemoci,* in this and all other characters, Walton's taxon is within the range of intraspecific variation that can be expected. Therefore, I believe that *P. hancocki* must be considered a junior subjective synonym of *E. guatemoci.*

Enallopaguropsis janetae new species
Figures 9b–d, 10d, 11

Holotype.—♀ (SL = 3.0 mm), AHF 725, type locality: 1.6 miles WNW of Punta Gissler, Cocos Island, SEARCHER station 521.

Material Examined.—See Table 1.

Description.—Shield longer than broad, anterior lateral margins sloping, anterior margins between rostrum and lateral projections slightly concave, posterior margin truncate; dorsal surface with few tufts of setae. Rostrum exceeding lateral projections, triangular, with median raised lobe, terminating in small spine. Lateral projections obtusely triangular with small submarginal spine.

Ocular peduncles moderately long, broadened somewhat basally and with corneae slightly dilated; dorsal and mesial faces with few scattered setae. Ocular acicles narrowly triangular, dorsal surface somewhat concave, with strong submarginal spine; separated basally by approximate basal width of 1 acicle.

Antennular peduncles moderately long, exceeding ocular peduncles by one-half length of ultimate segment. Ultimate and penultimate segments with scattered setae; basal segment with strong spine on lateral face medially.

Antennal peduncles moderately short, only slightly exceeding length of ocular peduncles; with supernumerary segmentation. Fifth, fourth, and third segments unarmed. Second segment with dorsolateral distal angle produced, terminating in strong spine, mesial margin with 1 or 2 acute spines, lateral margin unarmed; dorsomesial distal angle with small spine, mesial margin with few setae. First segment with ventral margin produced anteriorly and terminating in strong acute spine. Antennal acicle somewhat arcuate, terminating in small spine, and with

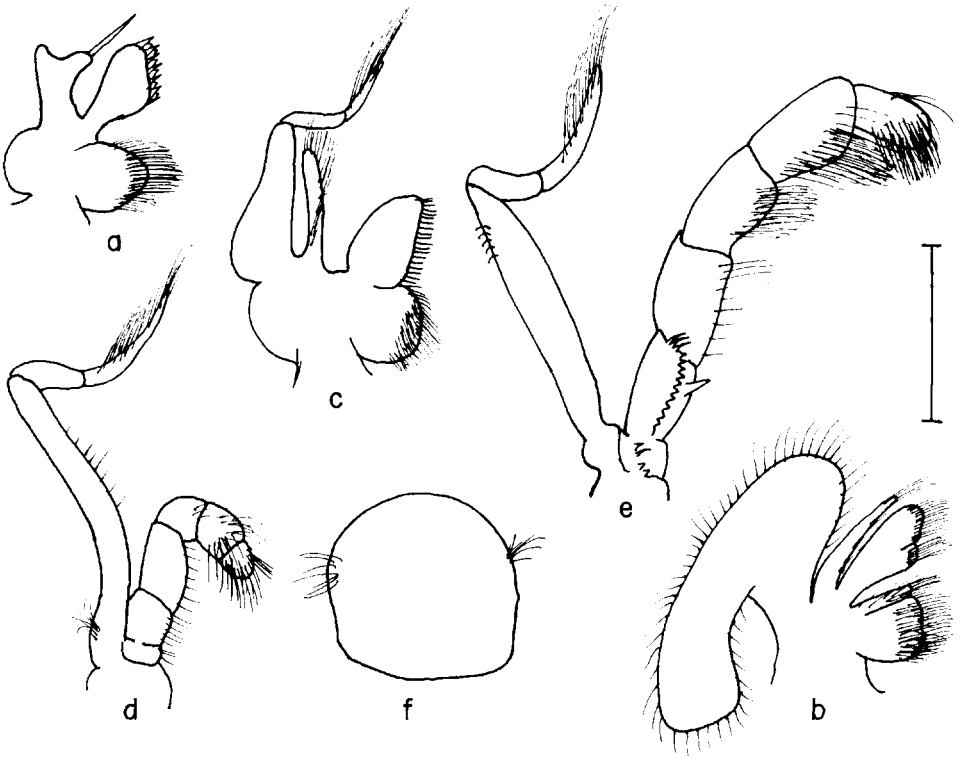

Figure 11. *Enallopaguropsis janetae* new species: a–e, mouthparts (left, internal view)—(a) maxillule; (b) maxilla; (c) 1st maxilliped; (d) 2nd maxilliped; (e) 3rd maxilliped; (f) telson. Scale equals 1 mm.

numerous tufts of setae. Antennal flagella with long (3–4 articles in length) and short setae every 2nd or 3rd article.

Mandible without distinguishing characters. Maxillule (Fig. 11a) with 1 stiff bristle on moderately well developed internal endopodal lobe, external lobe moderately well developed; proximal endite generally subcircular. Maxilla (Fig. 11b) with endopod approximately equalling scaphognathite in distal extension. First maxilliped (Fig. 11c) with basal segment of exopod slender. Second maxilliped (Fig. 11d) without distinguishing characters. Third maxilliped (Fig. 11e) with well developed crista dentata and accessory tooth, merus with dorsodistal spine. Sternite of 3rd maxillipeds with spine on either side of midline.

Right cheliped with dactyl exceeding length of palm, moderately broad; cutting edge with row of calcareous teeth, terminating in minute corneous claw; overlapped by fixed finger; dorsal surface slightly elevated in midline and armed with scattered small spines; dorsomesial margin with row of irregularly sized, blunt spines; ventral and mesial faces with scattered low protuberances and few short to moderately long setae. Palm slightly shorter than carpus; dorsal surface of palm and fixed finger with scattered tubercles, strongest proximally; dorsomesial and dorsolateral margins each with moderately strong or strong spines; ventral, mesial and lateral surfaces with low, sometimes spinulose protuberances and scattered tufts of setae; cutting edge of fixed finger with row of calcareous teeth, terminating in small corneous claw. Carpus approximately equalling merus in

length; dorsomesial margin with 2 prominent spines separated by broad, shallow depression, dorsal surface with proximal row of low protuberances laterad of midline, becoming small spines distally; ventral, lateral, and mesial faces with scattered setae. Merus subtriangular, unarmed. Ischium unarmed. Coxa with tuft of stiff bristles at ventromesial distal angle.

Left cheliped missing.

Ambulatory legs moderately long, slightly overreaching right cheliped. Right 2nd pereopod missing, left and 3rd pair similar. Dactyls approximately equalling length of propodi, moderately broad; in dorsal and lateral views, generally straight; terminating in moderately long, slightly curved claws; dorsal surfaces with few tufts of fine setae; ventral margins and mesial faces dorsally each with row of strong corneous spines; lateral faces with scattered setae. Propodi slightly longer than carpi; dorsal margins with tufts of moderately long setae; ventral margins each with row of corneous spines, at least in distal half. Carpi somewhat shorter than meri; dorsal surfaces each with row of tufts of fine setae; ventral margins with scattered setae. Meri laterally compressed; dorsal and ventral margins with tufts of setae. Ischia with tufts of setae on dorsal and ventral margins. Coxae and bases distinct, each with few fine setae. Sternite of 3rd pereopods with anterior lobe represented by large capsulate seta. Sternite of 4th pereopod with slender capsulate seta. Fourth pereopods with propodal rasp consisting of five rows of corneous scales; claw of dactyl stout, preungual process moderately small.

Fifth pleopod of female not appreciably reduced in size but uniramous. Male unknown. Uropods somewhat asymmetrical; protopods each with small spine-like projection; exopods each with ventral row of long, moderately stiff setae. Telson without transverse suture; terminal margin entire, convex, unarmed.

Distribution.—Known only from the type locality.

Remarks.—*E. janetae,* although known only from the female holotype, is clearly related to the other species assigned to *Enallopaguropsis*. It may be distinguished from that species by its tuberculate armature of the right chela, and by the lack of strong spines on the proximal margin of the palm.

This species is named for the eminent carcinologist, Janet Haig, who has contributed so much to our knowledge of Pacific hermit crabs, and who made this species available to me.

Interspecific Relationships

The eight species assigned to *Agaricochirus* are known from relatively few specimens; therefore, interspecific relationships have been difficult to assess. Each species has evolved its own distinctive armature and ornamentation of the chelae, although *A. boletifer* and *A. alexandri* are, at least superficially, quite similar and presumably closely related. Three species, *A. hispidus, A. gibbosimanus*, and *A. echinatus* must be considered closely allied species, despite the great diversity in the structure and ornamentation of their respective chelae. In these species the fifth abdominal tergite, and often also the fourth and third, is delineated by patches of stiff setae. Not uncommonly these tergites also may be reinforced with chitin or weakly calcified. Such demarcation of abdominal tergites is extremely rare among species of the Paguridae, thus it seems improbable that this condition would have evolved independently in three species of a single genus. The relationships of *A. erosus* and *A. acanthinus* with other members of the genus are not clear, but presumably both are more closely related to *A. boletifer* and *A. alexandri* than to members of the *A. hispidus* group. *A. cavimanus* is known from only two female specimens; however, the extremely vaulted

carapace, markedly concave right chela, and more slender ocular acicles suggest that this species is only distantly related to other members of the genus.

Morphological evidence suggests that species of *Enallopagurus* and *Enallopaguropsis* all are closely related. Major distinguishing characters are the structure of the anterior lobe of the sternite of the third pereopods and the development of the propodal rasp of the fourth pereopods. The uropods of *Enallopagurus* species may be symmetrical or asymmetrical, but those of *Enallopaguropsis* are asymmetrical. Species of both genera share the distinctive armature of the carpus of the right cheliped, which consists of 2 to 4 widely spaced spines on the dorsomesial margin, the distal-most spine often separated from the others by a broad concavity. With the exception of one other small Pacific genus, *Discorsopagurus*, the structure of the telson sets these genera apart from all other genera of the Paguridae; however, the terminal margin is armed in *Discorsopagurus* and unarmed in both *Enallopagurus* and *Enallopaguropsis*. In discussing the structure of the telson in *Discorsopagurus* (McLaughlin, 1974), I suggested that it might indicate a relationship with species of the Parapaguridae. In view of the numerous other morphological differences in parapagurids, any relationship that might have existed, would have to have occurred between sister groups that diverged quite early in the evolutionary history of paguroids. The lack of a well defined transverse suture in the telsons of some species of *Agaricochirus* is not homologous with the conditions in *Enallopagurus*, *Enallopaguropsis*, or the Parapaguridae.

Acknowledgments

I am particularly indebted to J. Haig, Allan Hancock Foundation, University of Southern California for providing the majority of the eastern Pacific specimens included in Part III. I also wish to acknowledge with thanks, the biologists and curators of the numerous institutions and museums cited in the materials section, particularly Drs. H. Levi, Museum of Comparative Zoology, Harvard University and G. Voss, Rosenstiel School of Marine and Atmospheric Science, University of Miami. A number of specimens from the Gulf of Mexico were collected under Bureau of Land Management Contracts #08550-CT5-30 and AA-550-CT-34 to Dr. T. Hopkins. All photographic credits belong to Mr. E. J. McGeorge. J. Haig and A. J. Provenzano, Jr. critically reviewed the manuscript. This study was supported, in part, by grant DEB 76-02552 from the National Science Foundation.

Literature Cited

Alcock, A. 1905. Catalogue of the Indian decapod Crustacea in the collection of the Indian Museum. Part II. Anomura. Fasc. I. Pagurides. Indian Museum, Calcutta. 197 pp.

Benedict, J. E. 1892. Preliminary descriptions of thirty-seven new species of hermit crabs of the genus *Eupagurus* in the U.S. National Museum. Proc. U.S. Natl. Mus. 15: 1–26.

Bott, R. 1949. Wie halten sich die Einsiedlerkrebse (Paguridea) in ihrem Schneckenhaus fest? Natur-Volk 79: 309–313.

Brightwell, L. R. 1951. Some experiments with the common hermit crab (*Eupagurus bernhardus* L.) and transparent univalve shells. Proc. Zool. Soc. Lond. 121: 279–283.

Chace, F. A., Jr. 1939. Reports on the scientific results of the first Atlantis expedition to the West Indies, under the joint auspices of the University of Havana and Harvard University. Preliminary descriptions of one new genus and seventeen new species of decapod and stomatopod Crustacea. Mem. Soc. Cubana Hist. Nat. 13: 31–54.

Chapple, W. D. 1966a. Sensory modalities and receptive fields in the abdominal nervous system of the hermit crab, *Pagurus granosimanus* (Stimpson). J. Exp. Biol. 44: 209–223.

———. 1966b. Asymmetry of the motor system in the hermit crab *Pagurus granosimanus* Stimpson. J. Exp. Biol. 45: 65–81.

———. 1969. Postural control of shell position by the abdomen of the hermit crab, *Pagurus pollicaris*. III. Analysis of movements and calculations of forces exerted by the muscles. J. Exp. Zool. 171: 417–424.

———. 1973. Role of the abdomen in the regulation of shell position in the hermit crab *Pagurus pollicaris*. J. Comp. Physiol. 82: 317–332.

Elwood, R. W., A. McClean, and L. Webb. 1979. The development of shell preferences by the hermit crab *Pagurus bernhardus*. Animal Behav. 27: 940–946.