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CRABS FROM THE MARIANA ARCHIPELAGO: *BOTHROMAIA GRIFFINI* NEW GENUS AND SPECIES (BRACHYURA: MAJIDAE), AND REMARKS ON *POUPINIA HIRSUTA* GUINOT (HOMOLOIDEA, POUPINIIDAE)

Austin B. Williams and Robert B. Moffitt

Abstract.—Deepwater trapping in the Mariana Archipelago, western North Pacific Ocean, included incidental catches of a spider crab and a homoloid crab with novel characteristics. *Bothromaia griffini,* new genus and species, family Majidae, subfamily Inachinae, represented by a male and female, seems most closely related to the genus *Pleistacantha* Miers, containing several species distributed in Indo-Pacific waters. The new species resembles members of this genus with respect to presence of pseudorostral horns, and shape of eyestalks, basal antennal article, epistome, third maxilliped, male sternites and pleopod 1, but differs from them in shape of pseudorostral horns, carapace, male pleopod, and in proportions of the ambulatory legs. Descriptions, illustrations, and comparative discussion are presented. Notes on the homoloid crab, *Poupinia hirsuta* Guinot, include locality data, measurements, remarks on distribution, and discussion of features distinguishing the families of Homoloidea, including a key for their identification.

During 1982–1984 field studies of the Resource Assessment Investigation of the Mariana Archipelago (RAIOMA) program in the western North Pacific Ocean, conducted by the National Marine Fisheries Service Southwest Fisheries Science Center Honolulu Laboratory, deepwater trapping operations concentrated on the pandalid shrimp species *Heterocarpus laevigatus* Bate, 1888 (see Polovina et al. 1985, Moffitt & Polovina 1987). Included in incidental trap catches was a female spider crab and a male homoloid crab with novel characteristics. Examination of additional preserved material from a 1971 trip to the same area yielded a male specimen of the spider crab that was collected in a shrimp trawl. The two spider crabs are herein described as a new genus and species of the family Majidae. The homoloid crab belongs to a species described from Raiatea, Society Islands, Polynesia, *Poupinia hirsuta* Guinot, 1991, that was placed in a new family Poupiniidae. Notes on the specimen reported here include locality data, measurements, discussion of structure and relationships, and a key to the homoloid families.

The specimens are deposited in the crustacean collection of the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM). Comparative studies were made using collections of the USNM, the Australian Museum, Sydney (AMS), Bernice P. Bishop Museum, Honolulu, Hawaii (BPBM), and the Queensland Museum, Brisbane, Australia (QM).

Family Majidae Samouelle, 1819
Subfamily Inachinae MacLeay, 1838
Bothromaia, new genus

Diagnosis.—Carapace pyriform, moderately broad, surface unevenly granular;

branchial regions swollen, deeply recessed urogastric region partly covered by projecting cardiac region and confluent anterolaterally with excavate cervical groove; conspicuous, slender spines on frontal, gastric, cardiac and branchial regions, and along anterolateral margins. Rostrum triangular, abruptly deflexed dorsally, ending in slender median spine; pseudorostral lobe near apex of antennular fossa distally ornamented with cluster of radiating spines. Supraorbital eave spinose, posterior margin of orbit open, allowing retraction of eyestalk. Eyestalks stout, small spine on corneal emargination. Basal antennular article broad, that of antenna long and not fused to front, both with ventral spines. Epistome broad. Merus of third maxilliped extended distally at distolateral corner, slightly narrower than ischium, merus and ischium spined ventrally. Cheliped of female (unknown in male) longer than carapace but only ⅔ length of first ambulatory leg. Ambulatory legs moderate in length, diminishing successively from first to last, somewhat flattened, setose, spiny, and granular on nearly all surfaces. First pleopod of male with shaft tapered, essentially straight except for distal section directed anterolaterally, subterminal aperture on mesial surface preceded by longitudinal tract of fine setae and succeeded by small spinelike process.

Type species.—*Bothromaia griffini* new species.

Etymology.—From the Greek, "bothros," trench, pit, hollow, and "maia," a kind of crab, with reference to the deep pit in the urogastric region. The gender is feminine.

Bothromaia griffini, new species
Figs. 1–4

Material.—Commonwealth of the Northern Mariana Islands: USNM 250884, holotype ♂, W of Saipan Island, 15°10.1′N, 145°39.9′E, 366–379 m, *Townsend Cromwell* cruise 53, sta 94, 30 Apr 1971, shrimp trawl (chelipeds missing, ambulatory legs separated from body).—250885, allotype ♀, Esmeralda Bank, 14°58.4′N, 145°15.8′E, 377 m, *Townsend Cromwell* cruise 82-02, sta 23 string 3, 23 Apr 1982, shrimp trap.

Measurements of carapace (mm).—Holotype ♂, overall length 33.3, fork length in midline 29, width to base of lateral spines 22, width including lateral spines (tips broken) 25.8; allotype ♀, same measurements 37.8, 36.7, 26.7, width including lateral spines 28.8.

Description.—Carapace pyriform, width about ⅔–¾ length, surface unevenly granular. Deeply recessed urogastric region confluent anterolaterally with excavate cervical groove.

Frontal region strongly depressed, triangular, ending in slender median (interantennular) spine directed anteriorly and slightly ventrad, tip slightly exceeding spine-tipped pseudorostral lobes at distolateral corner of each antennular fossa; pseudorostral lobes short (basal length 1.5 mm), blunt, bearing cluster of 4 radiating short spines apically; well developed spine below these near lateral margin of each antennular fossa flanked dorsally by smaller similar spine on lateral margin of pseudorostral lobe, and preceded by graduated series of spines on lateral margin of fossa, increasing to ventrolaterally projecting spine near its base.

Several spines on nearly semicircular supraorbital eave; margin bearing about 7 closely crowded small spines on anterior ⅓, much more scattered small spines on central and posterior ⅓; 3 much stronger submarginal spines (moderate anterior, very strong dorsal, smaller posterolateral); postorbital spine obscurely compound, but posterior margin of orbit open to allow retraction of eyestalk. Pair of strong epigastric spines posteromesial to pseudorostral lobes, pair of protogastric spines at anterior part of swollen gastric region; latter with 4 prominent spines at apices of rhombic array, anterior-most medial in middle of mesogastric region followed by 2 metagastrics projecting posterolaterally over right and left cervical

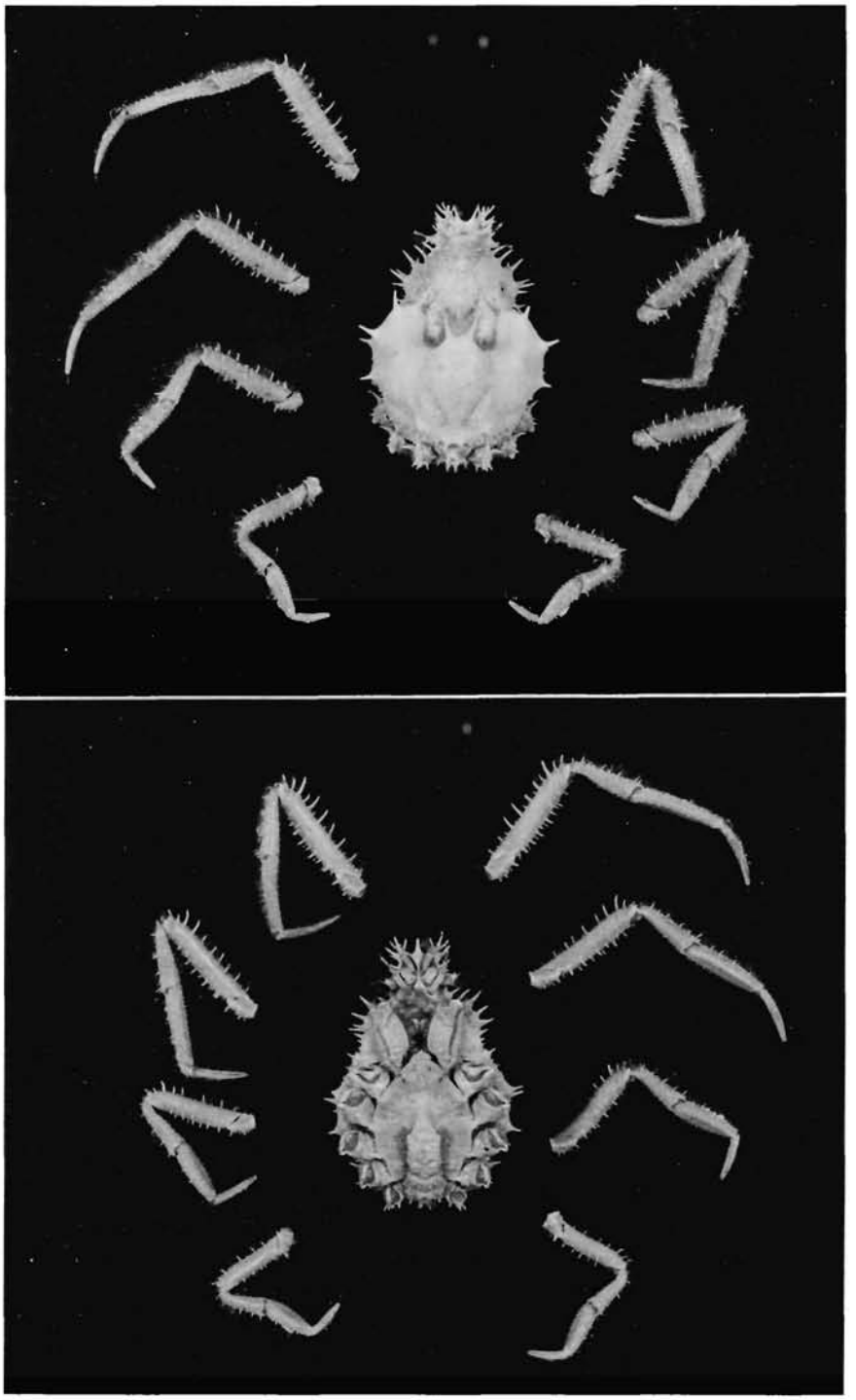

Fig. 1. *Bothromaia griffini*, new genus and species. Holotype ♂: upper, dorsal; lower, ventral (chelipeds missing, disarticulated legs arranged in order of succession).

Fig. 2. *Bothromaia griffini,* new genus and species. Allotype ♀: upper, dorsal; lower, ventral.

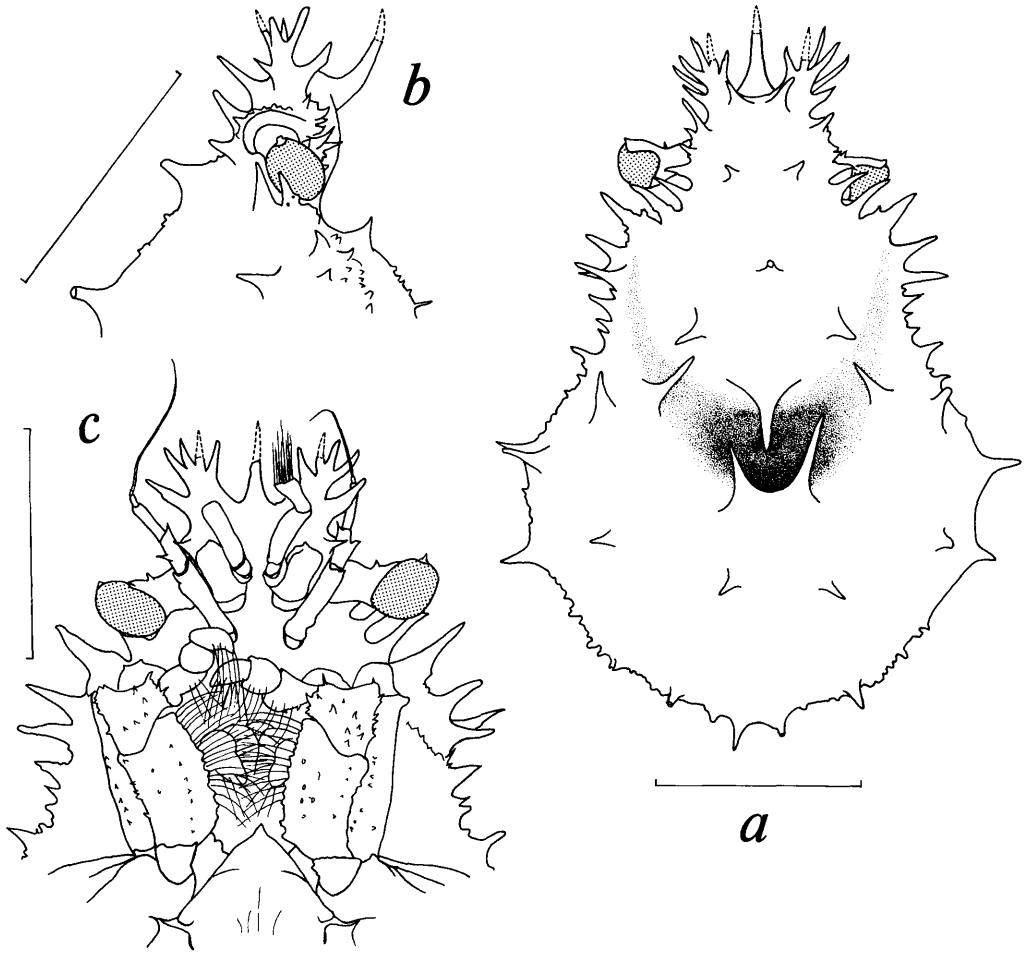

Fig. 3. *Bothromaia griffini,* new genus and species. Holotype ♂: a, carapace, dorsal; b, same, right lateral; c, cephalic region, ventral. Scales = 1 mm.

grooves, and posterior-most median extending posteriorly over recessed urogastric region. Cardiac region swollen and bearing 2 unequal pairs of spines; stronger anterior pair horizontally divergent from edge of regional extension over urogastric pit, shorter posterior pair near middle of region erect but laterally divergent. Intestinal region bearing pair of posteriorly projecting spines, stronger in male than in female. Each branchial region bearing 7 spines; large spine on anterior part of epibranchial region extending anteromesially over cervical groove, posterolateral to it another spine; mesobranchial region with dorsal spines at level of urogastric pit and cardiac region, and 2 others obliquely and lateroventrally in line with these respectively at perimeter of region; posterior-most spine near intestinal spines and well separated from preceding. Margin variably spiny in dorsal view, bearing 2 strong protogastric, 4 strong hepatic, and many smaller spines along branchial, posterolateral and intestinal sectors.

Eyestalks stout, bearing 2 small anterior spines on anterior surface of laterally extended eye, and 1 on corneal emargination, cornea twice width of stalk. Antennule with broad basal article spined ventrally. Basal antennal article slender, extending to basal

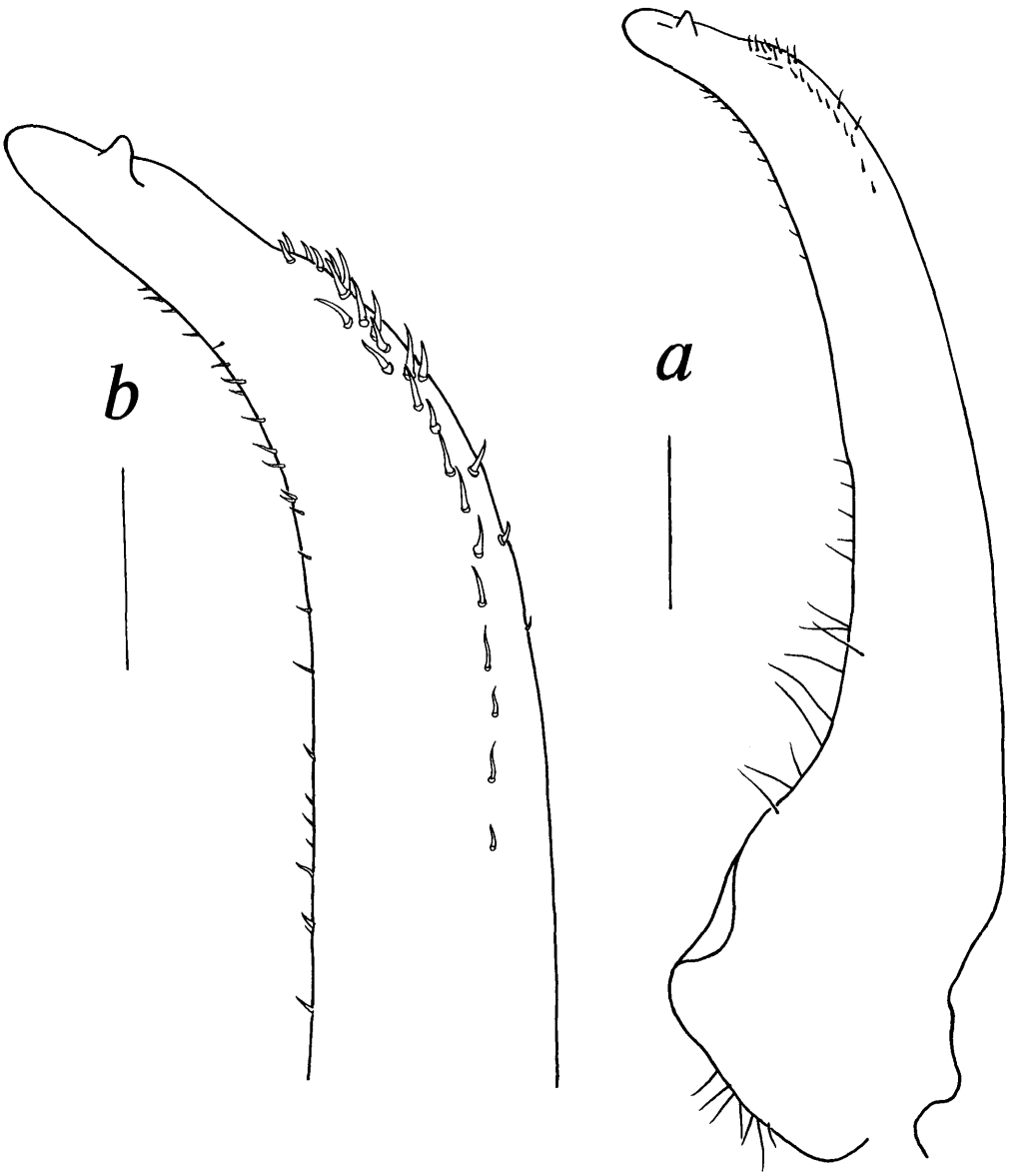

Fig. 4. *Bothromaia griffini* new genus and species. Holotype ♂ pleopod 1: a, abdominal view, b, magnified tip. Scales = 1 mm (a), 2.5 mm (b).

part of eyestalk, not fused to carapace, variably spined ventrally along mesial and lateral margins; middle and distal articles together reaching base of radiating spines on pseudorostral horn, middle article bearing ventral spine near middle of lateral margin and another spine variably developed at anteromesial corner.

Thoracic sternites of male bearing spines of varying sizes, most of them with seta originating near apex, and tendency to arrangement in submarginal row on each plate along radiating sutures; sternites of female not spinose, with raised thin lip where expanded 6th abdominal segment fits against them.

Abdomen of both sexes 6-segmented. That of female ampulliform in outline, with

narrow neck lodged between coxae of fifth legs, narrowest point at suture between segments 1 and 2 (5.6 mm), widest point at approximate midlength of broadly cupped, operculiform telson (17.7 mm); midlength of successive segments 1–6 (3.5, 3.0, 2.2, 2.3, 2.6, 14.9 mm); exposed surface of segments 2–6 sparsely but unevenly setose, densest on 2–4, becoming quite sparse on distal ⅓ of telson; segment 1 bearing submarginal median tubercle anteriorly, submedian pair of spines succeeding it, and scattered granules; segment 2 with 2 pairs of submedian setose granules and remote setose granule laterally, segments 3–5 with same pattern, but submedian granules successively more suppressed and lateral granule successively more remote from midline; margin of telson narrowly reflected distally, less definitely so laterally, broad subterminal depression near shallow terminal concavity (asymmetrical on allotype), definite marginal notch at coxal level of first ambulatory leg, faint tract of median ornamentation on anterior half reminiscent of that on preceding segments.

Abdomen of male not broadened but more or less parallel sided except for sinuosities of individual segments, ornamentation as in female except spines and granules magnified; segment 3 broadest (5.5 mm); telson subrectangular, as wide as long (4.1 mm), bearing posterolateral notch, narrowly reflected terminal margin concave and broadly sunken, pattern of ornamentation in proximal half resembling that on preceding segments. First pleopod reaching level of suture between sternites adjacent to coxae of first and second ambulatory legs; shaft tapered, essentially straight except for distal section curved anterolaterad, subterminal aperture on mesial surface preceded by longitudinal tract of fine setae and succeeded by short spinelike process.

Third maxilliped with ischium bearing ventral row of moderate spines along ventrolateral rib, few spines and setose granules scattered over remainder of exposed surface, mesial margin heavily setose and armed with few small stout spines more numerous in proximal than distal half of length; exognath armed with ventral row of rather strong spines and lateral row of much smaller spines. Merus slightly narrower than ischium, extended distally into subtriangular lobe at distolateral corner, margin irregularly spined, ventral surface with 2 curved rows of spines originating near articulation with ischium, each terminating in slender marginal spine at either side of articulation with carpus. Flexed carpus-propodus-dactyl reaching halfway along length of ischium.

Cheliped of female (missing on male specimen) densely setose except on fingers, slightly longer than carapace but only ⅔ length of first ambulatory leg; merus bearing 1 mesiodorsal row of strong spines, tract of shorter spines dorsolaterally tending to arrangement in 2 obscure rows, 2 rows of spines ventrally and row of irregular spines mesioventrally, stoutest spines on each merocarpal condyle and longest spines distally on dorsolateral row; carpus bearing scattered spines tending to arrangement in obscure rows; palm slender, somewhat flattened, bearing scattered small spines strongest on extensor surface; fingers just over ½ length of palm, nearly straight, leaving only small proximal gap when closed, uniformly crenulate on cutting edges of left hand (cutter), teeth slightly stronger in basal half of right dactyl (crusher), fingers of crusher worn or broken at tips, perhaps slightly spooned.

Ambulatory legs setose, spiny, and granular on nearly all surfaces, moderate length diminishing successively from first to last, somewhat flattened; coxae strongly spined anterolaterally, a few spines on ventromesial surface; ambulatory leg 1 about 1.5 times carapace length (basis to tip of dactyl in male ~51 mm), merus with 3 terminal spines, 2 of these lateral at apex of triangular merocarpal condyles, rows of spines on dorsal and ventral margins, dorsal row strongest, posterior surface bearing many scattered spinules, anterior surface less ornamented; carpus and propodus bearing single row of

small spines interspersed with longer spines on dorsal margin and scattered spines on posterior surface, crowded short spines and spiniform tubercles on ventral surface, many of them setose, anterior surface bearing few rows of setose granules; dactylus nearly as long as propodus and bearing many setae (sparse on anterior surface), but few small spines on prehensile surface, tip corneous. Succeeding ambulatory legs similar in ornamentation but successively shorter (length basis to tip of dactyl of male: leg 2, 50 mm; leg 3, 37 mm; leg 4, 33 mm).

Color.—A photograph of the allotype, taken against a light gray background at the time the specimen was collected, shows the overall color in dorsal view to be salmon; the frontal and gastric regions are darkest, but decorated by contrastingly lighter spines and tubercles of the same hue as the remainder of the body, including the legs; the cornea appears transparent.

Etymology.—The specific name honors D. J. G. Griffin, authority on majid crabs of the Pacific, and Director of the Australian Museum, Sydney.

Remarks.—*Bothromaia griffini* was studied with the aid of comparative reference to the discussions of *Pleistacantha* and *Cyrtomaia* species by Guinot (1985), Guinot & Richer de Forges (1982a, 1982b, 1985), Griffin & Tranter (1986), and Richer de Forges & Guinot (1988), and by comparisons with specimens in museum collections mentioned above. Depending on authority, *Pleistacantha* is regarded as containing 11 species and *Cyrtomaia* 24, all of which occur in deep waters of the Indo-Pacific.

Bothromaia seems closely allied to *Pleistacantha* Miers, 1879 in respect to: (1) shape of abruptly deflexed interantennular spine, although tip is bifurcate in some species of latter; (2) presence of armed pseudorostral horns; (3) well-developed eyestalks bearing expanded ovate cornea, with small spines on anterior surface of stalk and at corneal emargination; (4) basal antennal article slender, not fixed to front and bearing ventral spines; (5) epistome broad; (6) shape of ischium and merus of third maxilliped, (7) spined sternites on males; and (8) general conformation of male first pleopods.

Bothromaia differs from *Pleistacantha* in having: (1) short lobular pseudorostral horns, each bearing radiating cluster of spines at tip rather than being elongate horns armed with spines along length; (2) carapace rather inflated and relatively smooth on gastric and branchial regions bearing few conspicuous spines, and with deep urogastric pit confluent with excavated cervical groove overhung by extension of cardiac region as well as spines from it and neighboring regions, whereas that of *Pleistacantha,* somewhat depressed and lacking any evidence of urogastric pit, is densely armed with short spines; (3) ambulatory legs moderate in length, somewhat flattened, having rather stout meri, densely clothed with setae, spined, and fairly coarsely granulate, whereas those of *Pleistacantha* are long, cylindrical and spidery; (4) male first pleopods generally shaped as those in *Pleistacantha* species, but more obliquely angled terminal part, with aperture preceded by linear cluster of small setae, and process distal to aperture much shorter than in *Pleistacantha.*

Bothromaia griffini resembles species of *Cyrtomaia* Miers, 1886, in the generally rather smooth inflated carapace with its conspicuous slender spines, though not in the position and relative lengths of the spines, but many other features of *Cyrtomaia* species, such as shape of the carapace and its marginal spination, the rostrum, basal antennal article fused to front, eyes, and shape and dimension of legs, are quite different.

Superfamily Homoloidea de Haan, 1839
Family Poupiniidae Guinot, 1991
Poupinia hirsuta Guinot, 1991
Fig. 5

Material.—USNM 250886, ♂, Commonwealth of the Northern Mariana Islands,

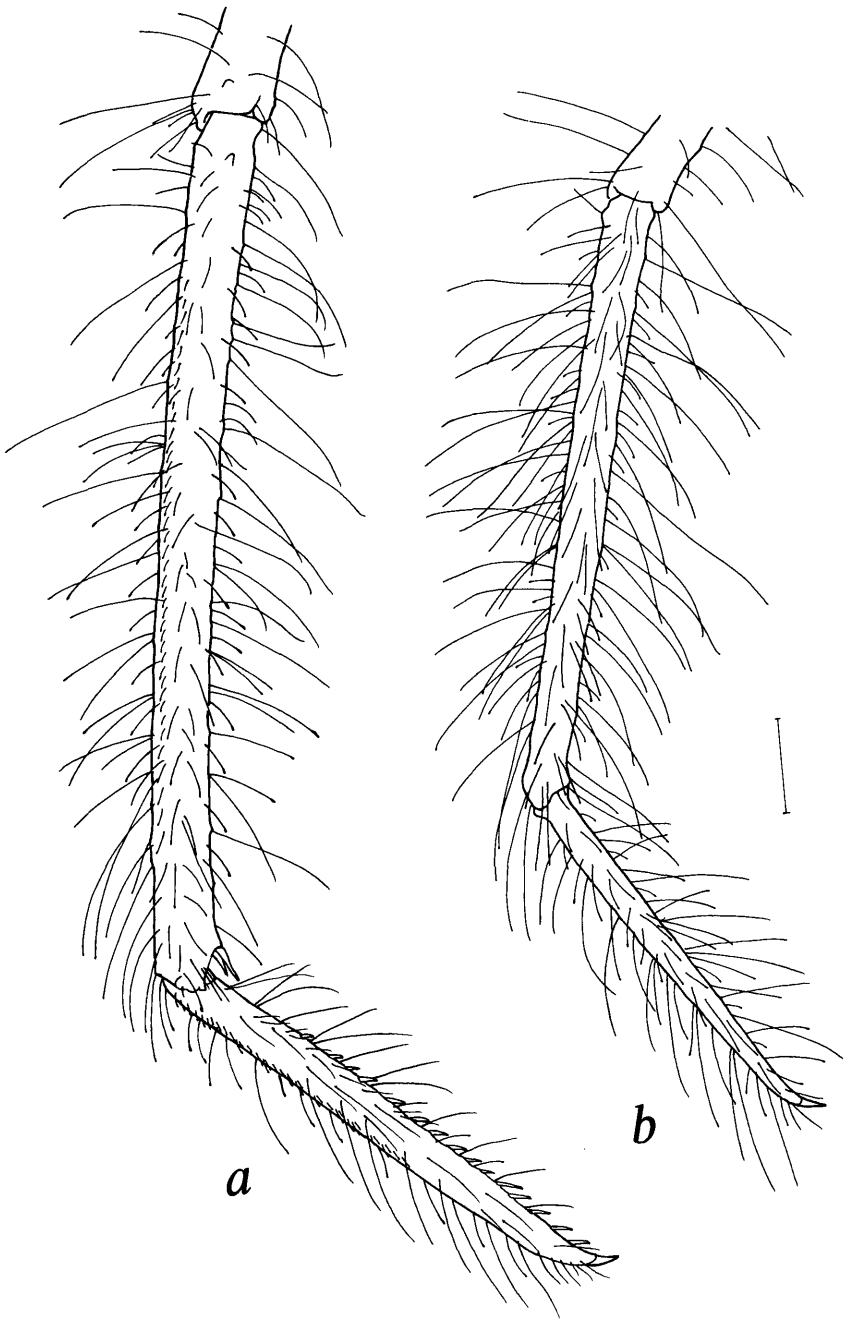

Fig. 5. *Poupinia hirsuta.* Male, semidiagrammatic dorsal view of distal articles on left fourth and fifth legs, ornamentation includes scattered setae with minutely spatulate tips: a, fourth leg with dactyl spined on flexor surface; b, fifth leg with spineless dactyl. Scale = 5 mm.

Table 1.—*Poupinia hirsuta* ♂, length in mm of articles in legs 1–5, right side.

Leg	Merus	Carpus	Propodus	Dactyl	Total
1	19	11	23	~11	53
2	33	28	29	18	108
3	43	23	35	22	123
4	48	20	41	25	135
5	44	16	32	22	114

Arakane Reef, 15°38.2'N, 142°46.3'E, 366–421 m, *Townsend Cromwell* cruise 83–05, sta 152, 16–17 Oct 1983, shrimp trap.

Measurements (mm).—Fork length of carapace in midline 33.4, maximum width 29.0; length legs, proximal end of merus to tip of dactyl, cheliped 41, 2nd leg 108, 3d leg 123, 4th leg 135, 5th leg 114.

Remarks.—The adult male specimen reported here is immediately recognizable as the striking homoloid species described by Guinot (1991) from baited trapping at similar depth in the Society Islands. The locality, however, is over 7000 km northwest of Raiatea, suggesting that the distribution of this species is widespread in the tropical southern and western Pacific.

Before establishment of the Poupiniidae, the Homoloidea were characterized as having the fifth legs dorsal in position, reduced, and subchelate or chelate. Discovery of *Poupinia hirsuta,* changes this definition. The new crab has fifth legs that originate in a dorsal position, but their length is intermediate beween that of the first, second, and third ambulatory legs (Table 1). The fifth legs are somewhat more slender than the preceding ambulatory legs, but not subcheliform, and they are less adapted for grasping than their antecedents, for the spineless dactyl does not close against spines on the flexor surface of the propodus, whereas each of the preceding ambulatories has its dactyl spined on the flexor surface, the proximal part of which closes between a pair of movable spines on the distal flexor surface of the propodus. The relatively unmodified and presumably primitive structure of this limb sets the new genus and species apart from all other members of the Homoloidea, which possess variously reduced and specialized subcheliform fifth legs.

The family Homolidae, often attributed to Henderson (1888) who gave the first comprehensive diagnosis, was actually authored by de Haan (1839) (International Commission on Zoological Nomenclature 1987). Alcock (1900, 1901) restricted the family Homolidae when he diagnosed the family Latreilliidae proposed by Stimpson (1858) (International Commission on Zoological Nomenclature 1987). Since then, students of these crabs have viewed the inclusiveness of these families in two ways (Williams 1982). Ihle (1913), Gordon (1950), Monod (1956), Balss (1957), Sakai (1965), and Serène & Lohavanijaya (1973), subsumed the Latreilliidae within the Homolidae. Griffin (1965), Glaessner (1969), Guinot (1979), Eldredge (1980), Guinot & Richer de Forges (1981), and Zarenkov & Khodkina (1981) did not concern themselves with this question, but Rathbun (1937), Wright & Collins (1972), Sakai (1976), Manning & Holthuis (1981), Williams (1982), Wicksten (1985), Melo (1990), and Guinot (1991) agreed with Alcock on distinctiveness of the two families. Collectively, these authors have recognized 38 living species of Homolidae and 9 species of Latreilliidae, although other undescribed species of the latter are known.

Wright & Collins (1972) observed that the essential characteristic distinguishing the Homolidae from the Latreilliidae is presence of the *linea homolica* in the former and its absence in the latter. They considered that other attributes such as number of gills and epipodites, relative lengths of basal and terminal articles of the eyestalks, and the more or less continuous range of carapace shapes, from rectangular (homolids) to acute-angled isosceles triangular (latreilliids), pale into insignificance when presence or absence of the *linea homolica* is

considered. That seemingly essential dichotomy, represented among 25 recognized fossil species in 7 genera collectively summarized by Glaessner (1929, 1969), Wright & Collins (1972), Jenkins (1977), Bishop (1982, 1983, 1986), Takeda & Fujiyama (1983), and Förster & Stinnesbeck (1987), has existed since the early Upper Cretaceous, and was foretold in the Late Jurassic.

Although Wright & Collins (1972) characterized the Homolidae as having long slender legs, except for the reduced and dorsal fifth pair, fossil remains have either no legs preserved, or rare vestiges of them preserved. They described fossil *Homolopsis edwardsii* Bell, for example (paraphrasing, pp. 47–48), as having: chelipeds rather small; merus as long as carapace, longitudinally sulcate and slightly granulate; carpus cuboid; propodus as long as width of orbitofrontal margin; hands as long as wide, and oval in section; fingers slender and as long as or longer than hand. Ambulatory legs long and slender; meri angular in section, granulated and spinous on both borders. Nothing was said of the carpi, propodi, or dactyls, nor was reference made to characters of the fifth legs, but this species apparently offers no evidence to abridge the current family definition. Bishop (1983) figured his *Zygastrocarcinus griesi* with rather stout, coarsely granulated proximal articles on the chelipeds, and ambulatory legs 1, 2, and possibly 3, with rather stout, flattened, sulcate meri, but there is no evidence of the fifth pair of legs, although he did show them as reduced in dorsal position in a reconstruction drawing (fig. 2:901).

The significance of bilateral branchial count in the Homoloidea has received varied interpretation. Alcock (1900, 1901) perceived a clear distinction in branchial count between the Latreilliidae (8 gills and an epipodite on each of the 3 maxillipeds, although he did not analyze the count in *Latreillopsis* which he included in this family) and the Homolidae (14 gills and 6 epipodites, 1 on each of the 3 maxillipeds, the chelipeds, and ambulatory legs 1–2). Gordon (1950) found these differences in branchial count less clear-cut, for there is variation in branchial development among genera that Alcock grouped in the Homolidae, some having only 13 gills and 5 epipodites. Certain gills of some species tend to be reduced as well. *Latreillopsis* has only 10 gills and 4 epipodites, hence is intermediate in this respect between Alcock's standard for latreilliids and homolids. Griffin (1965) concurred that branchial count may be an unreliable character that needs further study. Still, latreilliids seem to be characterized by an essentially triangular carapace lacking the *linea homolica,* 8 gills and 3 epipodites, and fifth legs reduced and dorsal. Homolids have a subrectangular or ovoid carapace with *linea homolica,* 10 to usually 14 gills, 4 to usually 6 epipodites, and fifth legs reduced and dorsal.

The branchial formula of *Poupinia hirsuta* is incompletely known. Guinot (1991) observed epipodites on the first three legs, but possibly was reluctant to dissect rare perfect specimens to determine the full branchial formula, as are we. As a substitute for dissection, radiographs of our specimen indicate epipodites on maxilliped 3, the cheliped, and ambulatory legs 1–2. Faint outlines of gills seem to be evident on somites associated with maxilliped 3, the cheliped, and ambulatory legs 1–3, but the actual gill count cannot be ascertained from these images. The images indicate that the count may conform with that of the Homolidae rather than the Latreilliidae, or lie between these extremes.

Poupinia hirsuta, in the Poupiniidae, thus bridges these two groups in that it has an ovoid carapace with no *linea homolica,* epipodites on maxilliped 3, chelipeds, and ambulatory legs 1–2 (based on radiographs), seems to have a high gill count, and fifth legs normal in size, the most primitive condition, though originating in dorsal position. The suite of characters is set forth in the following:

Key to Families of Homoloidea

1. *Linea homolica* present .. Homolidae
– *Linea homolica* absent 2
2. Carapace ovate in dorsal outline, anterior part not extended into "neck" and prominent rostral horns; leg 5 normal, neither subchelate nor conspicuously diminished in length ..... Poupiniidae
– Carapace sub-isosceles-triangular in dorsal outline, anterior part extended into "neck" and prominent divergent rostral horns; leg 5 conspicuously diminished in length, usually subchelate ..... Latreilliidae

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(ABW) National Marine Fisheries Service Systematics Laboratory, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, (RBM) National Marine Fisheries Service, Southwest Fisheries Science Center Honolulu Laboratory, 2570 Dole Street, Honolulu, Hawaii 96822-2396.