J. Natl. Hist. Mus. & Inst. Chiba Special Issue No. 6: 1–66. March 1999.

Hermit Crabs of the Families Diogenidae and Paguridae (Crustacea: Decapoda: Anomura) Collected during the Shin'yo-maru Cruise to the Ogasawara Islands and Torishima Island, Oceanic Islands in Japan

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Abstract During the TRV Shin'yo-maru expedition to the Ogasawara and Torishima Islands in 1997, a small, but diverse collection of hermit crabs of the families Diogenidae and Paguridae was obtained at depths ranging from 65 m to 210 m. Of the ten species present, eight represent new species belonging to five genera: *Paguristes brachytes* sp. nov., *P. taenia* sp. nov., *Anapagrides aequalis* sp. nov., *Nematopagurus pilosus* sp. nov., *N. shinnyoae* sp. nov., *Pagurus lophochela* sp. nov., *Turleania similis* sp. nov. and *T. spinimanus* sp. nov. *Pagurus lophochela* is, however, only provisionally assigned to the genus because of possession of the unsual features for *Pagurus*. Two known species, *Ciliopagurus krempfi* (Forest, 1952) and *Australeremus triserratus* (Ortmann, 1892), are also recorded. The latter species was found to show considerable morphological variation in the armature of the right palm, which has not been noted in the previous literature.

Key words: Decapoda, Anomura, Diogenidae, Paguridae, Ogasawara Islands, Torishima Island, new species.

The Ogasawara (=Bonin) Islands (Latitude 27°N, Longitude 142°E) are subtropical, oceanic islands, situated at about 1000 km south from the Japanese main islands. The Torishima Island (Latitude 30°31′N, Longitude 140°17′E) is located midway between the Japanese main islands and the Ogasawara Islands. Although about 23 shallow water species of hermit crabs, excluding Coenobitidae, have been recorded from the Ogasawara Islands (Stimpson, 1858; Balss, 1913; Melin, 1939; Imajima, 1970; Ooishi, 1970; Shigei, 1970; Takeda, 1981; Asakura, 1991; 1992; Asakura *et al.*, 1993) (see Table 1), the hermit crab fauna of this biogeographically important region still remains uncritically analyzed. Additionally, there is no available published information about the decapod fauna of the Torishima Island.

During the recent deep-water sampling expedition conducted in October 1997 on board the TRV "Shin'yo-maru" of the Tokyo University of Fisheries, altogether ten species of hermit crabs belonging to the families Diogenidae and Paguridae were obtained from the Ogasawara Islands and Torishima Island, at depths ranging from 65 m to 210 m. Although the collection is small, comprising only of 26 specimens, eight of ten species certainly represent new taxa: *Paguristes brachytes* sp. nov., *P. taenia* sp. nov., *Anapagrides aequalis* sp. nov., *Nematopagurus pilosus* sp. nov., *N. shinnyoae* sp. nov., *Pagurus lophochela* sp. nov., *Turleania similis* sp. nov., and *T. spinimanus* sp. nov. *Pagurus lophochela* has been only provisionally assigned to the genus, because it shows many unusual features for *Pagurus*. The genus *Turleania* is recorded from Japanese waters for the first time. All the new species are fully described and illustrated. Two known species are also recorded: *Ciliopagurus krempfi* (Forest, 1952a) and *Australeremus triserratus* (Ortmann, 1892). The latter species has been already recorded from the Ogasawara Islands by Melin (1939) (cf. McLaughlin and Gunn, 1992). Based on the specimens examined in this study, it was found that *A. triserratus*

Table 1. List of hermit crabs (excluding Coenobitidae) known from the Ogasawara Islands. From the photograph of Ooishi (1970), the specimen referred to *Calcinus seurati* seems to be rather similar to *C. vachoni* than *C. seurati*. The record of *C. seurati* needs to be verified.

Species	Literature
DIOGENIDAE	
Aniculus aniculus (Fabricius)	Ooishi (1970); Shigei (1970); Forest (1984)
Calcinus laevimanus (Randall)	Stimpson (1858) (as *C. tibicen*); Balss (1913) (as *C. herbstii*); Ooishi (1970); Shigei (1970); Asakura *et al.* (1993)
Calcinus elegans (H. Milne Edwards)	Ooishi (1970); Shigei (1970)
Calcinus gaimardii (H. Milne Edwards)	Ooishi (1970); Asakura *et al.* (1993)
Calcinus guamensis Wooster	Asakura (1992)
Calcinus latens (Randall)	Ooishi (1970); Asakura *et al.* (1993)
Calcinus seurati Forest =?*C. vachoni* Forest	Ooishi (1970)
Calcinus sp. 1	Asakura *et al.* (1993)
Calcinus sp. 2	Asakura *et al.* (1993)
Clibanarius humilis Dana	Ooishi (1970); Asakura *et al.* (1993)
Clibanarius pacificus Stimpson	Balss (1913)
Clibanarius virescens (Krauss)	Imajima (1970)
Dardanus impressus (De Haan)	Shigei (1970); Imajima (1970)
Dardanus scutellatus (H. Milne Edwards)	Ooishi (1970)
PAGURIDAE	
Anapagurides facetus (Melin)	Melin (1939); McLaughlin and Sandberg (1995)
Austrarelemus triserratus (Ortmann)	Melin (1939); McLaughlin and Gunn (1992)
Catapaguroides fragilis (Melin)	Melin (1939); de Saint Laurent (1968)
Nematopagurus vallatus (Melin)	Melin (1939); McLaughlin and Sandberg (1995)
Paguritta gracilipes Melin	Melin (1939); McLaughlin and Lemaitre (1993); Komai and Nishi (1996)
Pagurixus boninensis (Melin)	Melin (1939); Ooishi (1970); Imajima (1970)
Pagurus exiguus (Melin)	Melin (1939); McLaughlin and Sandberg (1995)
Pagurus insulae Asakura	Asakura (1991)
Porcellanopagurus truncatifrons Takeda	Takeda (1981)

Table 2. List of sampling data.

SY97 Station	Locality	Position	Depth	Date
1	Mukojima Island, Ogasawara Islands	27°48.52′ N, 142°02.62′ E	98–99 m	15 Oct 1997
2	Mukojima Island, Ogasawara Islands	27°47.72′ N, 142°02.97′ E	68–70 m	15 Oct 1997
3	Mukojima Island, Ogasawara Islands	27°47.37′ N, 142°03.29′ E	64–66 m	15 Oct 1997
13	Chichi-jima Islands, Ogasawara Islands	27°11.21′ N, 142°05.32′ E	151–154 m	16 Oct 1997
14	Chichi-jima Islands, Ogasawara Islands	27°10.91′ N, 142°07.97′ E	151 m	16 Oct 1997
16	Chichi-jima Islands, Ogasawara Islands	27°10.12′ N, 142°07.17′ E	154 m	16 Oct 1997
17	Yome-jima Island, Ogasawara Islands	27°24.58′ N, 142°10.21′ E	210–212 m	16 Oct 1997
22	Torishima Island	30°30.76′ N, 140°17.57′ E	172–192 m	17 Oct 1997
23	Torishima Island	30°30.48′ N, 140°17.19′ E	100–130 m	17 Oct 1997
25	Torishima Island	30°31.57′ N, 140°16.10′ E	130–150 m	17 Oct 1997
26	Torishima Island	30°30.44′ N, 140°17.19′ E	95–185 m	17 Oct 1997

exhibits considerable morphological variation in the armature of the right palm, which has not been reported in previous literature.

Materials and Methods

Samples were collected from 11 stations in the Ogasawara and Torishima Islands using

a dredge during SY97 cruise of the TRV Shin'yo-maru of Tokyo University of Fisheries (Table 2). Materials examined in this study are deposited in the following institutions: Natural History Museum and Institute, Chiba, Japan (CBM, with code ZC); Musée Zoologique, Strasbourg, France (MZS); Showa Memorial Institute, National Science Museum, Tsukuba, Japan (NSMT-R, with code of Cr); and Zoologische Staatssammlung München, Germany (ZSM). Shield length (sl), measured from the tip of the rostrum to the midpoint of the posterior margin of the shield, provides an indication of animal size. The abbreviation 'ovig' indicates ovigerous female(s). The general terminology used in the description is that of McLaughlin (1974), with the exception of the posterior carapace (see Lemaitre, 1995), the fourth pereopod (see McLaughlin, 1997) and gill structure (see McLaughlin & de Saint Laurent, 1998). The drawings were made with the aid of a drawing tube mounted on a Leica MZ8 stereomicroscope.

Systematics

Family Diogenidae

Genus *Ciliopagurus* Forest, 1995

Remarks. The genus *Trizopagurus* Forest, 1952a, was divided by Forest (1995) into three genera: *Trizopagurus* s.s., *Ciliopagurus* Forest, 1995, and *Strigopagurus* Forest, 1995. *Ciliopagurus* is the most speciose, including 16 species distributed in the Pacific and eastern Atlantic Oceans (Forest, 1995). From Japanese waters, the following five species are known: *C. strigatus* (Herbst, 1804); *C. krempfi* (Forest, 1952a); *C. liui* Forest, 1995; *C. alcocki* Forest, 1995; and *C. babai* Forest, 1995. The genus is characterized by the following features: the stridulatory structures on the palm of the cheliped appears as fine, corneous, parallel rods, grouped in several neatly separated patches; the chelipeds and ambulatory pereopods are ornamented by transverse ciliated striae; there are four unpaired pleopods in both sexes, and the fifth pleopod is developed as equally as the other three pleopods and is always oviferous in females.

Ciliopagurus krempfi (Forest, 1952a)

Restricted synonymy.

Trizopagurus krempfi Forest, 1952a: 256; 1952b: 24, figs. 6, 15, 22; Miyake, 1982: 104 (part), pl. 35, fig. 2, right.

Trizopagurus strigatus: Miyake, 1978: 18, pl. 3, fig. 5. Not *Trizopagurus strigatus* (Herbst, 1804).

Ciliopagurus krempfi: Forest, 1995: 59, figs. 10c, 11, 12c, 31d, 37g, h.

Material examined. SY97, st 23; off Torishima Island, 100–130 m; 1 male (sl 6.0 mm); CBM-ZC 4762.

Distribution. Widely distributed in the Indo-West Pacific: recorded from Kenya, Réunion, Arabia, Vietnam, Hong Kong, East China Sea, Japan, Indonesia, Philippines, New Caledonia, Marquisus Islands; 10–300 m (Forest, 1995).

Habitat. Conid shell.

Remarks. The present specimen agrees well with the redescription of *C. krempfi* by Forest (1995) both in morphology and coloration.

Genus *Paguristes* Dana, 1851

Remarks. The taxonomy of the genus remains in need of considerable study. Several points of confusion have only recently been documented (e.g., Forest and McLaughlin, 1998). Although a comprehensive review of the genus is necessary, such is beyond the scope of this paper. For the present, two new species are described, as they are clearly different from other described taxa from the Indo-Pacific region.

Paguristes brachytes sp. nov.

(Figs. 1–4)

Paguristes incomitatus: Miyake, 1978: 41 (part). Not *Paguristes incomitatus* Alcock, 1905.

Material examined. SY97, st 22; off Torishima Island, 172–192 m; paratype, 1 male (sl 1.8 mm); CBM-ZC 4760.–SY96, st. 18; Okinoyama Bank, Sagami-nada, 35°00.07′ N, 139°40.30′ E, 98-100 m; 24 Oct 1996; dredge; coll. T. Komai; holotype, male (sl 3.9 mm); CBM-ZC 4834.–Same station; paratype, 1 male (sl 3.1 mm); CBM-ZC 4835.–SY96, st 19;

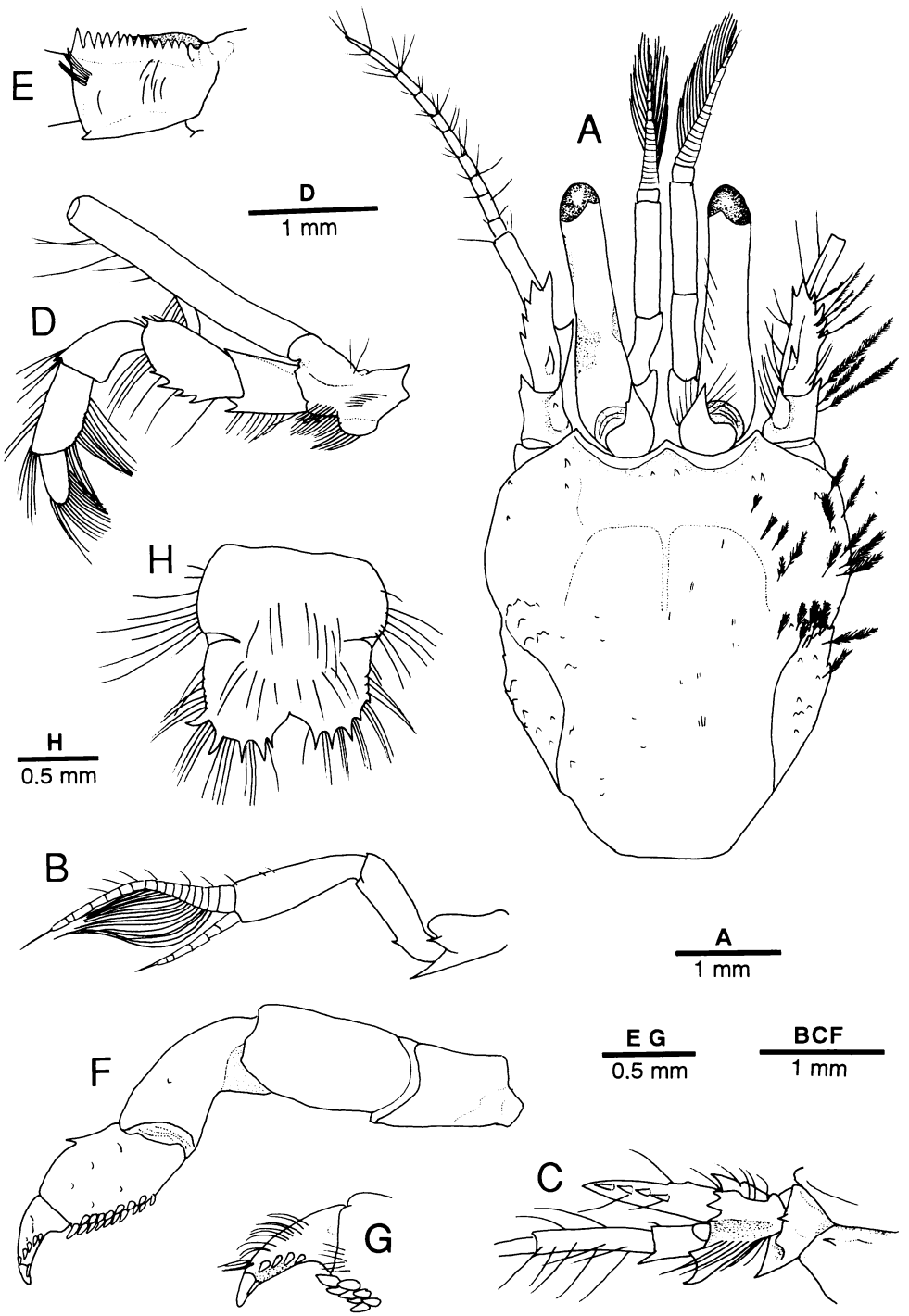

Fig. 1. *Paguristes brachytes* sp. nov. Holotype male (CBM-ZC 4834; sl 3.9 mm) from the Okinoyama Bank, Sagami-nada. A, shield and cephalic appendages, dorsal, setae omitted from left side, color pattern is indicated on the left antennular peduncle; B, left antennule, lateral; C, left antenna and anterior part of branchiostegite, lateral, setae partially omitted; D, left third maxilliped, lateral; E, same, ischium, dorsal, setae partially omitted; F, left fourth pereopod, lateral, setae omitted; G, same, dactyl, lateral, setae partially omitted; H, telson, dorsal.

similar locality, 34°58.47′N, 139°34.13′E, 121–129 m; 24 Oct 1996; dredge; coll. T. Komai; paratypes, 1 female (sl 1.9 mm), 1 ovig. female (sl 3.0 mm); CBM-ZC4837.– Sagami Bay, 3.5 km off southwest of Jogashima Islet, 92–97 m; 13 Feb 1968; paratype, 1 male (sl 3.7 mm); identified as *Paguristes incomitatus* by Miyake (1978), det. no. 635; NSMT-CrR 3554.

Description of holotype (male). Thirteen pairs of biserial phyllobranchiae.

Shield (Fig. 1A) longer than broad (1.14 times longer than broad); anterolateral margins sloping; anterior margin between rostrum and lateral projections concave; posterior margin truncate; dorsal surface with few scattered small spines or tubercles and moderately short pulmose setae laterally, gastric region slightly elevated with short shallow median sulcus. Rostrum short, broadly triangular with subacute tip, weakly deflexed, not reaching lateral projections; dorsal surface not carinate. Lateral projections triangular, each with small marginal spine. Branchiostegites calcified anteriorly and dorsally, unarmed on anterodorsal and distal margins.

Ocular peduncles (Fig. 1A) moderately slender (5.4 times longer than corneal width), 0.6 times as long as shield, cylindrical, weakly inflated basally; corneas not dilated; dorsomesial surfaces with row of moderately short setae. Ocular acicles subtriangular, terminating in acute spine (left with tiny additional spinule on lateral margin); mesial margins weakly convex, with row of pulmose setae; separated by 0.5 of basal width of one acicle.

Antennular peduncles (Fig. 1A, B) moderately long, overreaching ocular peduncles by 0.25 length of ultimate segment. Ultimate segment moderately stout, 1.3 times longer than penultimate segment; intermediate segment with 1 small ventral spine proximally; basal segment with ventrodistal margin deeply notched, ventromesial distal angle produced, terminating in acute spine, distolateral margin with small spine; lateral face unarmed.

Antennal peduncles (Fig. 1A, C) moderately short, reaching 0.7 length of ocular peduncle by fifth segment, with supernumerary segmentation. Fifth segment with tiny ventrodistal spinule and stiff setae on lateral and mesial surfaces. Fourth segment with strong spine at ventrodistal margin. Third segment with ventrodistal margin produced, terminating in strong spine. Second segment with dorsolateral distal angle weakly produced, with 2 small spines; dorsomesial distal angle with small spine; dorsomesial margin distinctly ridged, with pulmose setae. First segment with small spine on laterodistal margin; ventromesial distal angle produced in strong spine. Antennal acicles moderately short, reaching midlength of fifth segment, terminating in strong simple or bifid spine; mesial margin with 1 spine proximally, lateral margin with 4 prominent spines. Antennal flagella shorter than shield, composed of 10 articles, each article with short to long setae on distal margin, distalmost article with apical setae.

Third maxilliped (Fig. 1D, E) with basis and ischium partially fused; basis unarmed on dorsomesial margin, but with few setae; ischium with well developed crista dentata, teeth becoming stronger distally, distalmost tooth weakly curved, ventrodistal margin and dorsodistal angle each with prominent spine; merus with 4 prominent spines on ventral margin and 1 spine on dorsodistal margin; carpus with small spine at dorsodistal margin; dactyl short.

Chelipeds equal or subequal with left cheliped slightly stouter. Chela (Fig. 2C) subovate in dorsal view, about 1.8 times longer than wide. Dactyl (Fig. 2A, C) 1.7 times longer than palm, not curved ventrally; cutting edge with row of small calcareous teeth, proximalmost tooth noticeably enlarged; terminating in small corneous claw; slightly overlapped by fixed finger; dorsomesial margin with row of moderately strong, blunt spines, becoming small distally, dorsal surface with 2 irregular rows of moderately small tubercles and tufts of moderately long pulmose setae; mesial surface with row of small tubercles dorsally and row of low protuberances ventrally, accompanied by tufts of pulmose setae; ventral surface unarmed, but with few tufts of stiff setae distally. Palm (Fig. 2A–C) shorter than carpus; dorsomesial margin with 6 strong spines (distalmost spine with additional smaller spine basally), dorsal surface with 3 irregular rows of strong spines, decreasing in

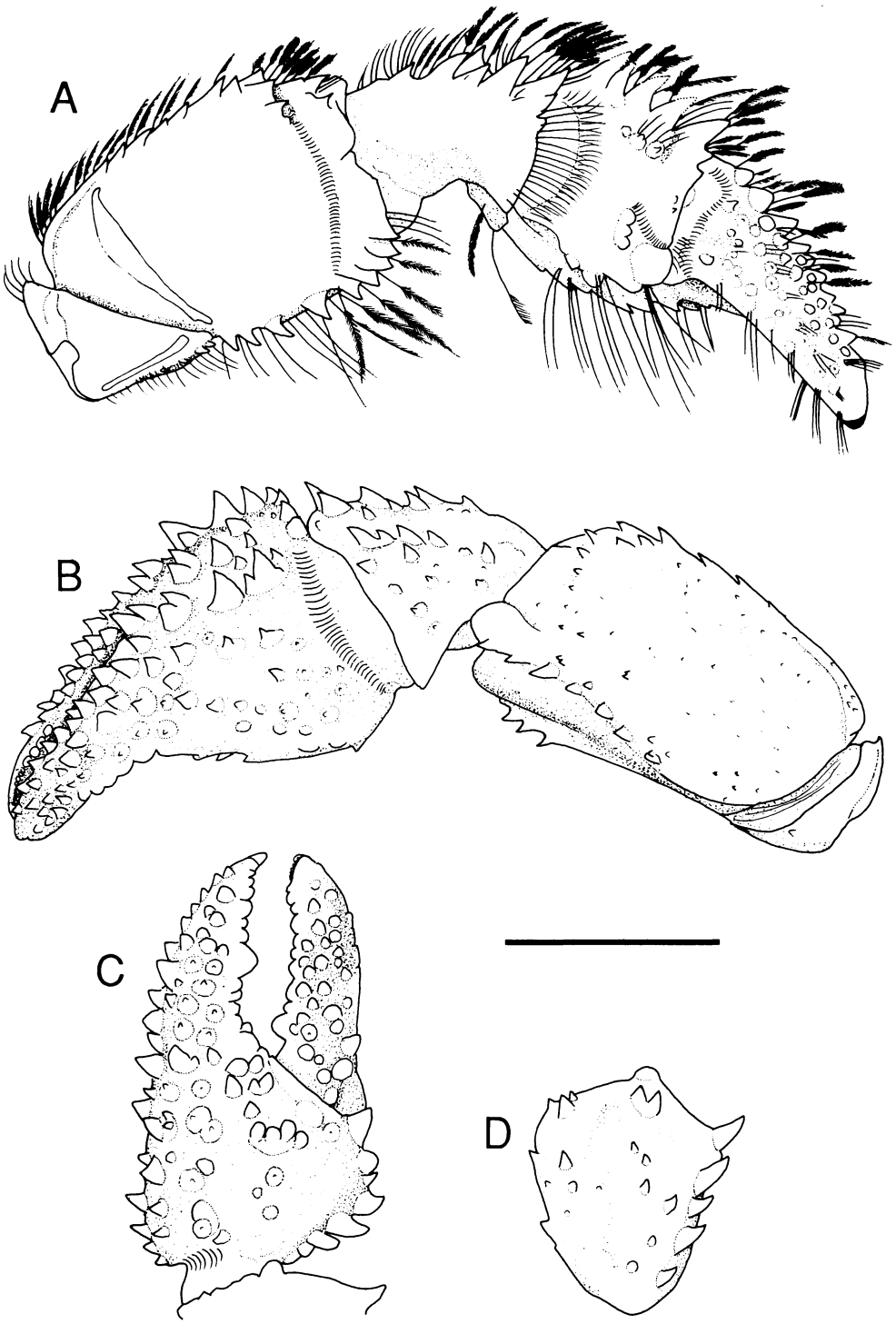

Fig. 2. *Paguristes brachytes* sp. nov. Holotype male (CBM-ZC 4834; sl 3.9 mm) from the Okinoyama Bank, Sagami-nada. A, left cheliped, mesial, setae partially removed; B, same, lateral, setae omitted; C, chela of left cheliped, dorsal, setae omitted; D, carpus of left cheliped, dorsal, setae omitted. Scale bar indicates 2 mm.

size on fixed finger, sometimes forming cluster, and tufts of long pulmose setae; dorsolateral margin with row of moderately strong spines, becoming smaller distally; lateral surface with scattered small to moderately small spines or spinulose tubercles, accompanied by tufts of pulmose setae; mesial surface with few small spinulose tubercles near dorsal margin, accompanied by tufts of pulmose setae, remaining surface naked, ventromesial distal angle (proximal to base of fixed finger) noticeably inflated, distomesial margin not denticulate; ventral surface inflated, with row of small spinulose tubercles on midline, extending onto fixed finger, scattered smaller tubercles ventrolaterally and few tubercles mesially, accompanied by tufts of long setae. Fixed finger weakly curved ventrally; cutting edge slightly concave, with row of small calcareous teeth in proximal 0.8 and row of small corneous teeth in distal 0.2, terminating in small corneous claw; leaving prominent hiatus when closed. Carpus (Fig. 2A, B, D) about 0.6 times as long as merus; dorsomesial margin with row of 5 strong spines; dorsal surface with 2 irregular rows of sparse small spines mesially, accompanied by tufts of pulmose setae,dorsodistal margin produced; dorsolateral margin not sharply delineated, but with row of small spines accompanied by tufts of pulmose setae; lateral surface with few small spinulose tubercles accompanied by tufts of short pulmose setae, laterodistal margin unarmed, but with row of long pulmose setae; mesial surface unarmed, mesiodistal margin with few small spines dorsally and row of pulmose setae; ventral face unarmed. Merus (Fig. 2A, B) moderately deep; dorsal surface with row of spines, becoming stronger distally, and short pulmose setae, distinctly ridged in proximal 0.3; subdistal spinulose ridge with row of pulmose setae, extending to mesial and lateral faces; lateral surface with scattered tiny tubercles and very short setae, laterodistal margin with row of small spines and pulmose setae, ventrolateral margin sinuous, with row of small spines or tubercles, accompanied by tufts of pulmose setae, in distal 0.6; mesial surface naked, with shallow vertical sulcus near distomesial margin, ventromesial margin with row of moderately strong spines, none distinctly curved) and row of long pulmose setae; ventral face with few scattered spinules and obliquely transverse row of tufts of pulmose setae. Ischium (Fig. 2A, B) with row of small acute spines on ventromesial margin; ventrolateral distal angle and dorsal margin each with spinule. Coxa unarmed.

Second pereopods (Fig. 3A, B) relatively long and slender, similar from right to left. Dactyls moderately long, 1.4 times longer than propodi; in lateral view, slightly curved ventrally, in dorsal view, nearly straight; terminating in strong, curved, corneous claw; dorsal surface unarmed, but with row of short pulmose setae; lateral faces with row of tufts of short setae on midline; mesial faces unarmed, with 2 rows of tufts of sparse setae; ventral margins with 11(right) or 13 (left) small corneous spines. Propodi distinctly longer than carpi; dorsal surfaces each with row of strong spines mesially, decreasing in size distally, and numerous tufts of long pulmose setae; lateral surfaces with row of long pulmose setae near dorsal margin and tufts of short stiff setae on midline; mesial surfaces with row of tiny tubercles accompanied by tufts of short setae ventrally and row of short pulmose setae dorsally; ventral surfaces each with row of spinules and long pulmose setae, distal margin unarmed. Carpi with double row of strong spines and tufts of long setae on dorsal surfaces; lateral faces convex, with faint longitudinal sulcus accompanied by row of pulmose setae and few tufts of pulmose setae ventrally; mesial surfaces with few short setae, distal margins unarmed; ventral surfaces with few pulmose setae, distoventral margin with long pulmose setae. Meri strongly compressed laterally; dorsal surfaces each with short row of small spines in proximal 0.25 and row of tufts of moderately short to long pulmose setae (becoming shorter distally); lateral and mesial surfaces with few short setae; ventral surfaces each with row of moderately small spines obscured by long pulmose setae, ventrolateral margins each with small subdistal spine. Ischia with 2 spines distally and row of long pulmose setae on dorsal surfaces; ventral surfaces spinulose, obscured by long pulmose setae. Coxae unarmed.

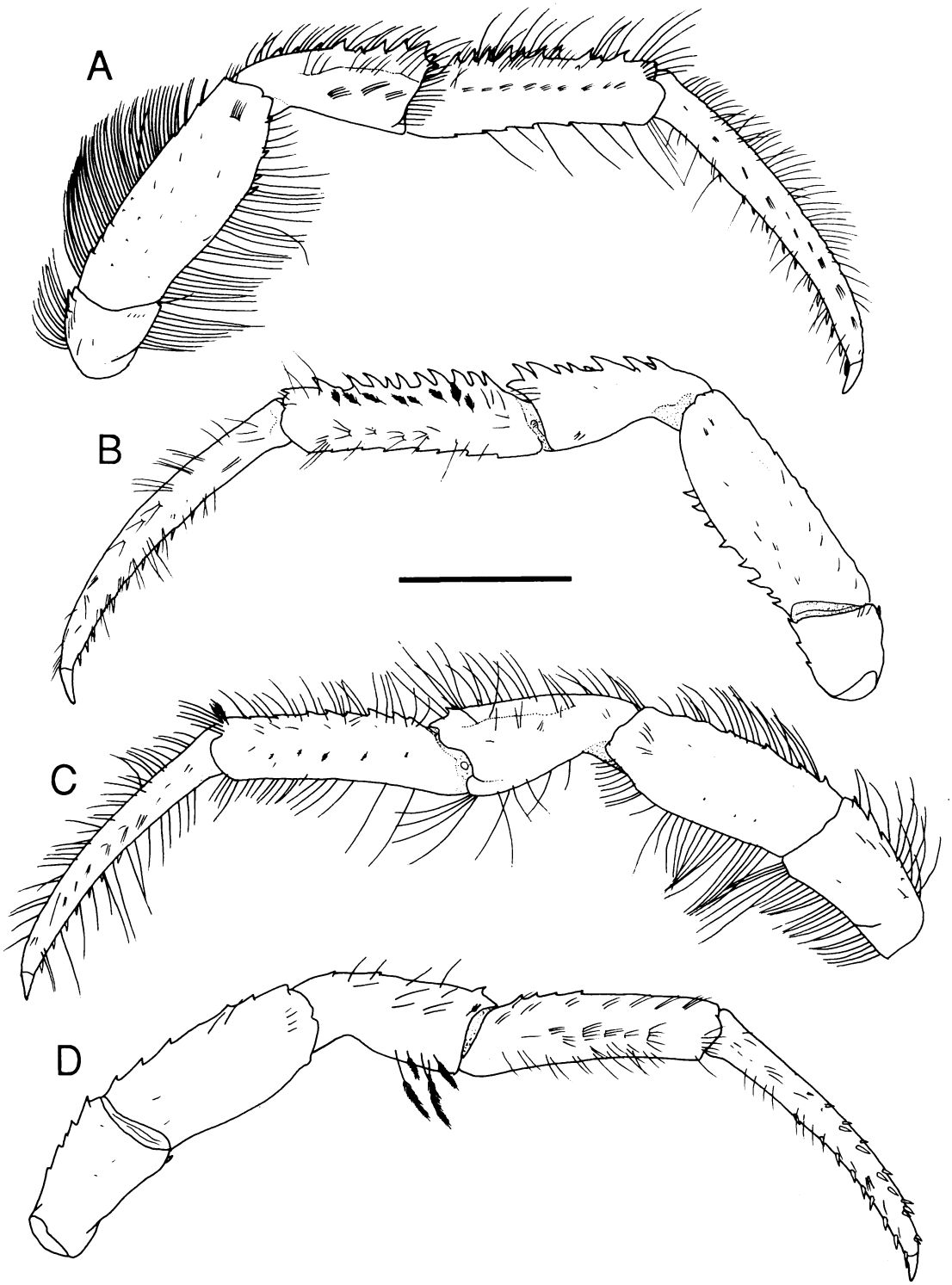

Fig. 3. *Paguristes brachytes* sp. nov. Holotype male (CBM-ZC 4834; sl 3.9 mm) from the Okinoyama Bank, Sagami-nada. A, right second pereopod, lateral, setae partially omitted; B, same, mesial, setae partially omitted; C, left third pereopod, lateral, setae partially omitted; D, same, mesial, setae partially omitted. Scale bar indicates 2 mm.

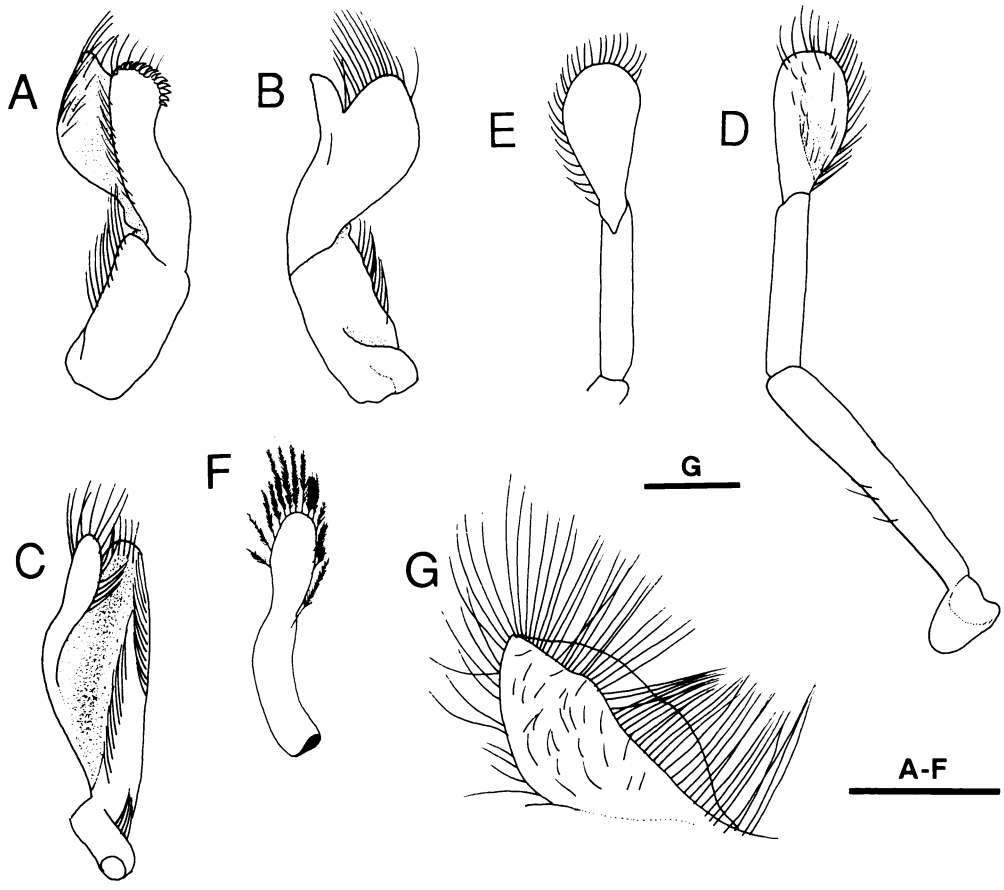

Fig. 4. *Paguristes brachytes* sp. nov. A–E, holotype male (CBM-ZC 4834; sl 3.9 mm) from the Okinoyama Bank, Sagami-nada; F, G, paratype female (CBM-ZC 4837; sl 3.0 mm) from the Okinoyama Bank. A, left first pleopod, ventral; B, same, dorsal; C, same, mesial; D, left second pleopod, ventral; E, same, distal segment and appendix masculina, dorsal; F, left first pleopod, ventral; G, brood pouch, external. Scale bars indicate 0.5 mm.

Third pereopods (Fig. 3C, D) generally similar to second in setation. Dactyls each with double row of small corneous spines or spinules near dorsal margin on mesial surface; ventral surfaces each with 9 small corneous spines. Propodi with row of small spines or spinules on dorsal surfaces; mesial faces slightly protuberant ventrally; ventral surfaces unarmed. Carpi unarmed on dorsal surfaces, except for small spine near dorsodistal angle. Meri with row of small spines on dorsal surfaces; ventral surfaces unarmed. Ischia with row of spinules on dorsal surface; ventral surfaces each with subdistal spinule mesially.

Fourth pereopods (Fig. 1F, G) not chelate, setose. Dactyl noticeably curved, terminating in strong corneous claw; ventrolateral margin with 4 small corneous teeth and small tube-like preungual process arising from base of terminal claw; dorsal margin unarmed. Propodus relatively stout, with weakly convex ventral margin; propodal rasp composed of 2 rows of small corneous scales (distalmost scale much larger than others), extending to 0.7 length of ventral margin; dorsal margin convex, with 1 small spine arising from slightly proximal to mid-length. Carpus unarmed on dorsodistal margin.

Fifth pereopods chelate, slender, setose (right much shorter than left). Coxae with paired gonopores.

First and second pleopods in males paired,

modified as gonopods. First pleopod (Fig. 4A–C) with row of numerous long setae on mesial surface of basal lobe. Inferior lamella with rounded distal margin, bearing single row of moderately strong, sparse, hooked corneous spines; mesial margin with numerous bristles. External lobe well developed, rounded, overreaching distal margin of inferior lamella. Internal lobe rounded distally, extending as far as internal lobe.

Second pleopod (Fig. 4D, E) with few setae on basal segment. Endopodite without setae. Appendix masculina expanded, distinctly broader than endopodite, slightly twisted; distal and convex lateral margins with single row of moderately short setae; ventral surface with 2 rows of short setae.

Third to fifth pleopods in males unpaired, exopodites well developed, but endopodites absent; protopodite of third pleopod with distolateral angle produced in small process; protopodites of fourth and fifth pleopods lacking such distolateral process.

Uropods strongly asymmetrical; left protopodite with row of tiny spinules on posterolateral margin, right protopodite unarmed on that margin.

Telson (Fig. 1H) with posterior lobes somewhat asymmetrical, left larger than right; subquadrate; separated by small median cleft; transverse indentation deep; terminal margins rounded, each with 5 strong spines (spines on left lobe much stronger than those on right lobe); anterior lobes unarmed on lateral margins.

Description of paratypes. Rostrum reaching or slightly falling short of lateral projections.

Ocular peduncles moderately slender (4.4–5.4 times longer than corneal width), 0.6–0.7 times as long as shield. Ocular acicles usually simple, but sometimes with additional spinule on lateral margin.

Antennular peduncles moderately long, overreaching ocular peduncles by 0.25–0.3 length of ultimate segment. Ultimate segment 1.3–1.4 times longer than penultimate segment. Ventral spine on penultimate segment sometimes very small.

Ventrodistal spine on fifth segment of antennal peduncle usually prominent, but sometimes vestigial. Antennal acicles terminating in simple or bifid spine, mesial margin unarmed or armed with 1 spine proximally, lateral margin with 3 or 4 spines. Antennal flagella composed of 8–11 articles, distalmost article sometimes with long apical setae.

Chela 1.8–2.0 times longer than wide. Cutting edge of dactyl with row of small corneous teeth at least in distal half, 1 teeth at midlength often noticeably enlarged; dorsal surface with 2 irregular rows of moderately small tubercles in larger specimens, with scattered tubercles in smaller specimens; mesial surface with row of small tubercles dorsally and row of low protuberances ventrally in lager specimens, only with few tiny tubercles in smaller specimens. Dorsomesial margin of palm with 4–6 strong spines, dorsal surface with 3 irregular rows of strong spines, decreasing in size on fixed finger, spines sometimes forming cluster. Cutting edge of fixed finger slightly concave, with row of small calcareous teeth at least in proximal half. Carpus with 4 or 5 strong spines on dorsomesial margin. Merus with row of moderately strong spines on ventromesial margin, some of them sometimes strongly curved.

Dactyls of second and third pereopods with 6–10 small corneous spines on ventral surfaces; dactyls of third pereopods with single or double row of corneous spines near dorsal margin. Coxae of third pereopods with paired gonopores in female.

Dactyl of fourth pereopod with 2–4 small corneous teeth on ventrolateral margin. Propodus armed with 1 spine or unarmed on dorsal surface.

Fifth pereopods equal.

Pleopods of females with first (Fig. 4F) paired, modified; basal segment curved, with 1 setae on distolateral angle; distal segment ovate, with marginal plumose setae. Second to fifth pleopods unpaired; second to fourth with both rami well developed, setose; fifth pleopod with exopod moderately well developed, endopod vestigial. Brood pouch (Fig. 4G) small, subtriangular; margins with long pulmose setae; outer face with scattered short setae. Second and third abdominal tergites in females not calcified laterally, each with fringe of moderately short setae on lateral margins; fourth abdominal tergite with tuft of setae at base of fourth pleopod.

Terminal margins of posterior lobes of telson rounded, each with 3–5 moderately strong to strong spines; anterior lobes unarmed laterally.

Coloration (in preservative). Shield pale brown, with specks of maroon or orange. Ocular peduncle with characteristic marking of dark orange on pale yellowish brown ground color; on dorsal and mesial surfaces, marking sometimes showing as transverse band at about midlength of peduncle, or interrupted dorsally; on lateral surface, marking extending near corneal base as longitudinal band; on ventral surface proximal 0.6 of peduncle dark reddish brown, distal 0.4 with tinge of orange. Proximal two segments of antennular peduncle orange, distal segment colorless. Antennal peduncle with tinge of orange; flagellum without marking. Cheliped generally pale orange-brown, dorsal margin of merus darker. Ambulatory pereopods generally pale orange-brown; distal parts of propodi and dactyls (except for corneous distal unguis) whitish.

Distribution. Sagami-nada; Torishima Island; at depths of 92–192 m.

Habitat. Gastropod shells. No association with other invertebrates was recorded.

Etymology. From the Greek, *brachytes*, smallness. The name is considered as a noun in apposition.

Remarks. The four specimens collected from the Okinoyama Bank, Sagami-nada, during the Shin'yo-maru expedition to the Izu Islands and Sagami-nada in 1996, have shown to be the same species as the single specimen from Torishima Island. In addition, during a reexamination of the material of *Paguristes* reported by Miyake (1978), it has been found that a specimen identified as *Paguristes incomitatus* by Miyake (NSMT-CrR 3554) belongs to the same. This new species is described herein based on these six specimens.

The presence of spines on the terminal margin of the telson places *Paguristes brachytes* in the group A of *Paguristes* (cf. McLaughlin and Provenzano, 1974). The new species appears similar to *P. laurentae* Morgan and Forest, 1991, known from Rottnest Island, Western Australia, in the combined character states of the short rostrum, short antennal flagella, spination of the cheliped merus and shape and spination of the telson. However, there are numerous differences between the two species. The antennular peduncle is shorter in the new species than in *P. laurentae*; this appendage overreaches the distal margin of the ocular peduncle only by 0.25–0.3 length of the ultimate segment in *P. brachytes*, rather than 0.67–0.75 length of that segment in *P. laurentae*. The ocular acicles are usually simple in the new species, but they bear 2 or 3 marginal spines in *P. laurentae*. The middle segment of the antennular peduncle, which is unarmed in *P. laurentae*, bears a small spine on the ventral face in *P. brachytes*. The dactyls of the ambulatory pereopods are armed with small corneous spines on the ventral margins in *P. brachytes*, while unarmed in *P. laurentae*. Although the specimen reported by Miyake (1978) was incorrectly identified with *P. incomitatus*, *P. brachytes* does not appear close to *P. incomitatus*. The reexamination of Miyake's (1978) material has revealed that three species of *Paguristes*, including *P. brachytes*, were confused under the name of *P. incomitatus* and that any of them does not represent true *P. incomitatus*. This problem will be clarified in a separate paper (Komai, in prep.).

The holotype has unequal fifth pereopods (the left is much longer than the right), but in the paratypes, the fifth pereopods are equal and symmetrical. Thus the condition of the holotype is attributable to abnormality.

The eggs are relatively very large, measuring 0.8×1.1 mm, but the number is unknown because of some loss during preservation. It is suggested that there is some level of abbreviated development as has been definitely reported for some species of *Paguristes* (e.g., Dechancé, 1963; Morgan, 1987).

***Paguristes taenia* sp. nov.**

(Figs. 5–7)

Material examined. SY97, st 13; Chichi-jima Island, Ogasawara Islands, 151–154 m; holotype, female (sl 2.8 mm); CBM-ZC 4836.

Description of holotype (female). Thirteen pairs of biserial phyllobranchiae.

Shield (Fig. 5A) longer than broad (1.21 times longer than broad); anterolateral mar-

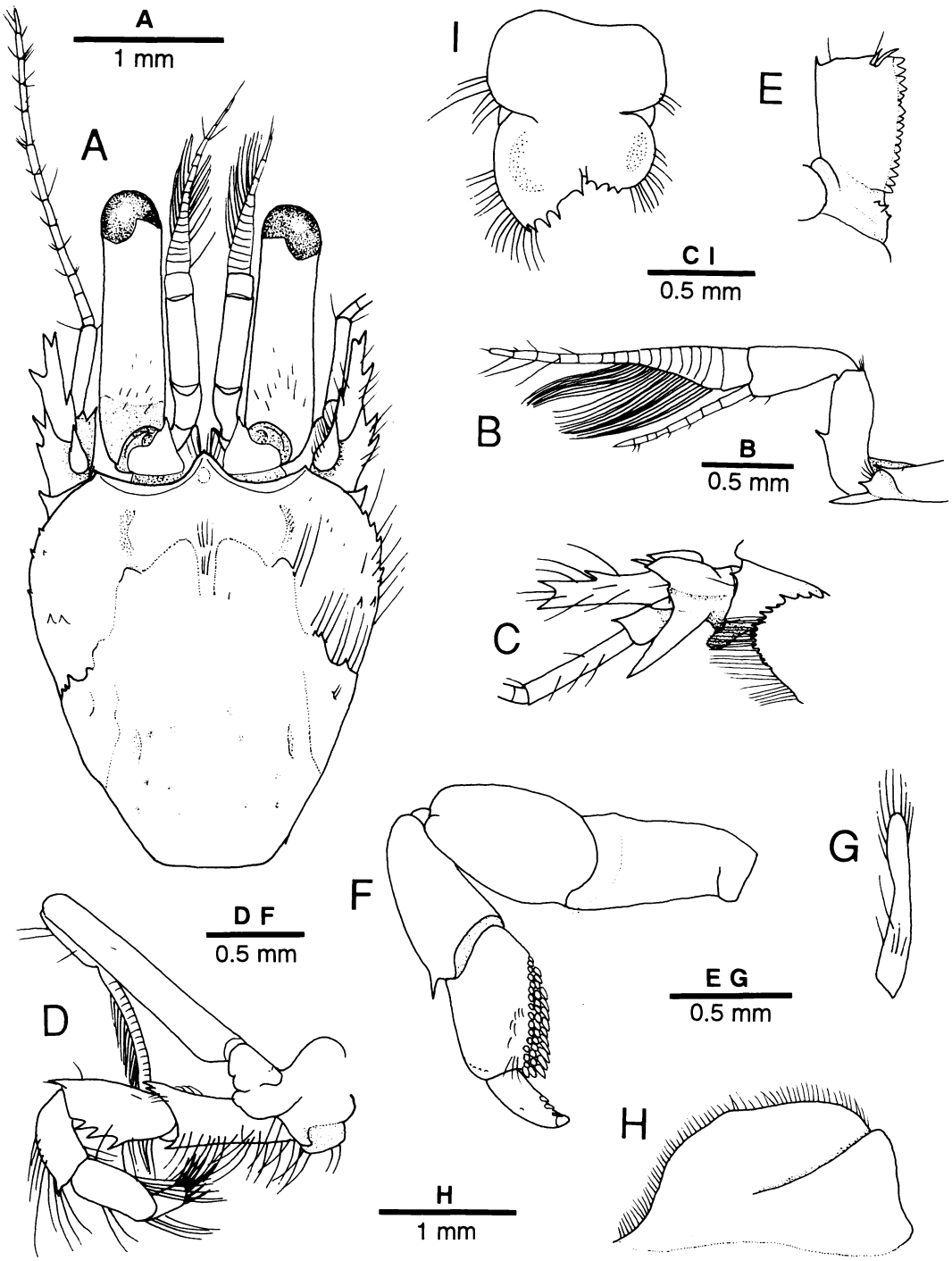

Fig. 5. *Paguristes taenia* sp. nov. Holotype female (CBM-ZC 4836; sl 2.8 mm) from Chichi-jima Islands, Ogasawara Islands. A, shield and cephalic appendages, dorsal, setae omitted from left side, color pattern is indicated on the left antennular peduncle; B, left antennule, lateral; C, left antenna, lateral; D, left third maxilliped, lateral; E, same, ischium, dorsal, setae omitted; F, left fourth pereopod, lateral, setae omitted; G, left first pleopod, ventral; H, brood pouch, external.

gins sloping; anterior margin between rostrum and lateral projections concave; posterior margin rounded; dorsal surface not noticeably rugose, with several small spines or spinules and moderately short setae laterally and median tuft setae on gastric region. Rostrum moderately long, triangular, terminating in tiny spinule, slightly depressed, distinctly overreaching lateral projections; dorsal surface with few small spines and tufts of setae laterally, gastric region slightly elevated, with short, shallow median sulcus. Lateral projections obtusely triangular, each with moderately small submarginal spine. Branchiostegite calcified anteriorly and dorsally, with row of tiny spinules on anterior margin.

Ocular peduncles (Fig. 5A) moderately slender (4.5 times longer than corneal width), 0.66 times as long as shield, cylindrical, corneas not dilated and bases weakly inflated; dorsal surfaces with scattered short setae proximally. Ocular acicles subtriangular, terminating in acute spine; mesial margins nearly straight, without row of setae; separated by 0.7 of basal width of one acicle.

Antennular peduncles (Fig. 5A, B) short, overreaching base of corneas by distal margin of ultimate segment, but not reaching distal margins of corneas. Ultimate segment short and stout, 0.9 times as long as penultimate segment, with few short setae on dorsal surface. Penultimate segment with 1 small ventral spine arising from midlength. Basal segment with ventrodistal margin deeply notched, ventromesial distal angle produced, terminating in acute spine; distolateral margin with tiny spinule; statocyst lobe with prominent distal spine.

Antennal peduncles (Fig. 5A, C) moderately short, reaching 0.6 length of ocular peduncles by fifth segment, with supernumerary segmentation. Fifth segment unarmed, but with few short setae on lateral and mesial surfaces. Fourth segment with strong spine at laterodistal margin. Third segment with ventromesial distal angle produced, terminating in strong spine, mesial face with few setae. Second segment with dorsolateral distal angle weakly produced, terminating in bifid spine; lateral surface with 1 small spine; dorsomesial margin strongly elevated, with prominent dorsomesial distal spine. First segment with ventromesial distal angle somewhat produced, but unarmed; laterodistal margin with spinule. Antennal acicles moderately short, not reaching distal margin of fifth segment, terminating in strong bifid spine; mesial margin with 1 prominent spine proximally, lateral margin with 1 prominent spine subdistally. Antennal flagella shorter than shield, composed of 13 articles, each article with short to long setae on distal margin, distalmost article with short apical setae.

Endopod of maxillule with internal lobe strongly produced, bearing 4 terminal bristles; outer lobe elongate, strongly recurved, with 3 setae at distolateral margin. Third maxilliped (Fig. 5D, E) with basis and ischium partially fused; basis unarmed on dorsomesial margin, but with few setae; ischium (Fig. 5E) with well developed crista dentata, teeth becoming stronger distally, distalmost tooth not curved, ventrodistal margin and laterodistal angle each with prominent spine; merus with 3 strong spines on ventral margin and 1 strong spine on dorsodistal margin; carpus with prominent spine on dorsodistal margin; dactyl short.

Chelipeds (Fig. 6A–C) subequal, with left cheliped slightly stouter. Chela (Fig. 6A) generally subovate in dorsal view, about 1.8 times longer than wide. Dactyl (Fig. 6A, B) 1.7 times longer than palm, weakly curved ventrally; mesial margin weakly convex in dorsal view; cutting edge with row of small calcareous teeth in proximal half and row of small corneous teeth in distal half, terminating in strong corneous claw; overlapped by fixed finger; dorsomesial margin with row of moderately strong spines in proximal half, becoming smaller distally, distal half unarmed; dorsal surface with few small spines and tufts of pulmose setae proximally and tufts of simple stiff setae distally; mesial surface with scattered calcareous spinules or small spinulose tubercles and few stiff setae; ventral surface unarmed, ventromesial margin with few stiff setae in distal half. Palm (Fig. 6A–C) distinctly shorter than carpus; dorsomesial margin with 4 strong, corneous-tipped spines; dorsal surface (including fixed finger) with scattered small

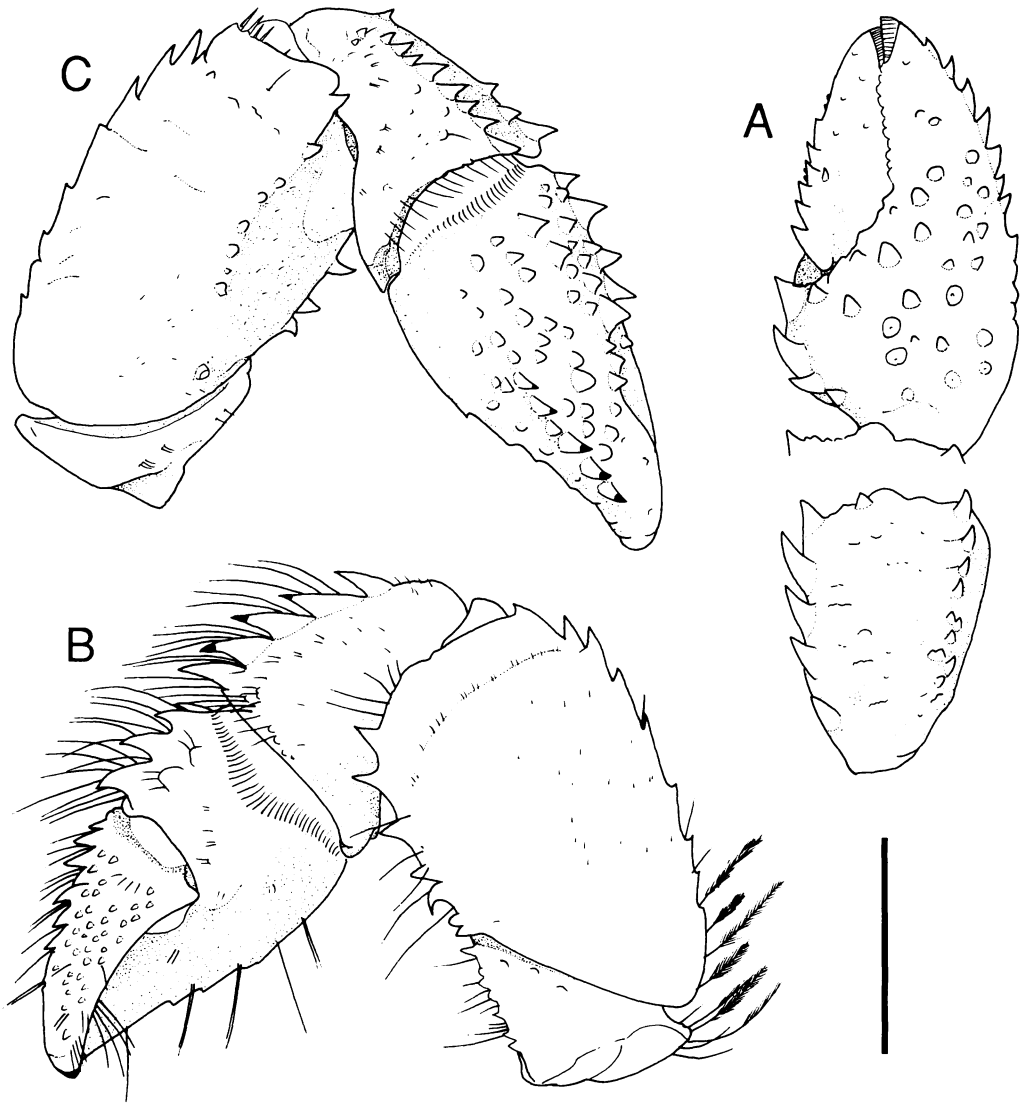

Fig. 6. *Paguristes taenia* sp. nov. Holotype female (CBM-ZC 4836; sl 2.8 mm) from Chichi-jima Islands, Ogasawara Islands. A, Chela and carpus of right cheliped, dorsal, setae omitted; B, right cheliped, mesial, setae partially omitted; C, same, lateral, setae omitted. Scale bar indicates 1 mm.

spines or tubercles, becoming smaller or obsolete on fixed finger, and numerous tufts of long pulmose setae obscuring surface; dorsolateral margin not delimited; lateral surface with row of spines, becoming stronger and corneous-tipped on fixed finger, and scattered small blunt tubercles ventrally; mesial surface with few low protuberances near dorsal margin and few tufts of short setae, distal margin not denticulate; ventral surface with row of small spines extending to fixed finger, accompanied by tufts of long setae. Fixed finger (Fig. 6A, C) almost straight; cutting edge with row of small calcareous teeth in proximal 0.8 and corneous plate in distal 0.2, terminating in corneous claw; without hiatus when closed. Carpus (Fig. 6A–C) about 0.6 times as long as merus; dorsomesial margin with row of 5 strong, corneous-tipped spines; dorsal surface unarmed, but with numerous tufts of pulmose setae obscuring surface, dorsodistal margin protuberant; dorsolateral margin with row of moderately small spines and moderately long pulmose setae;

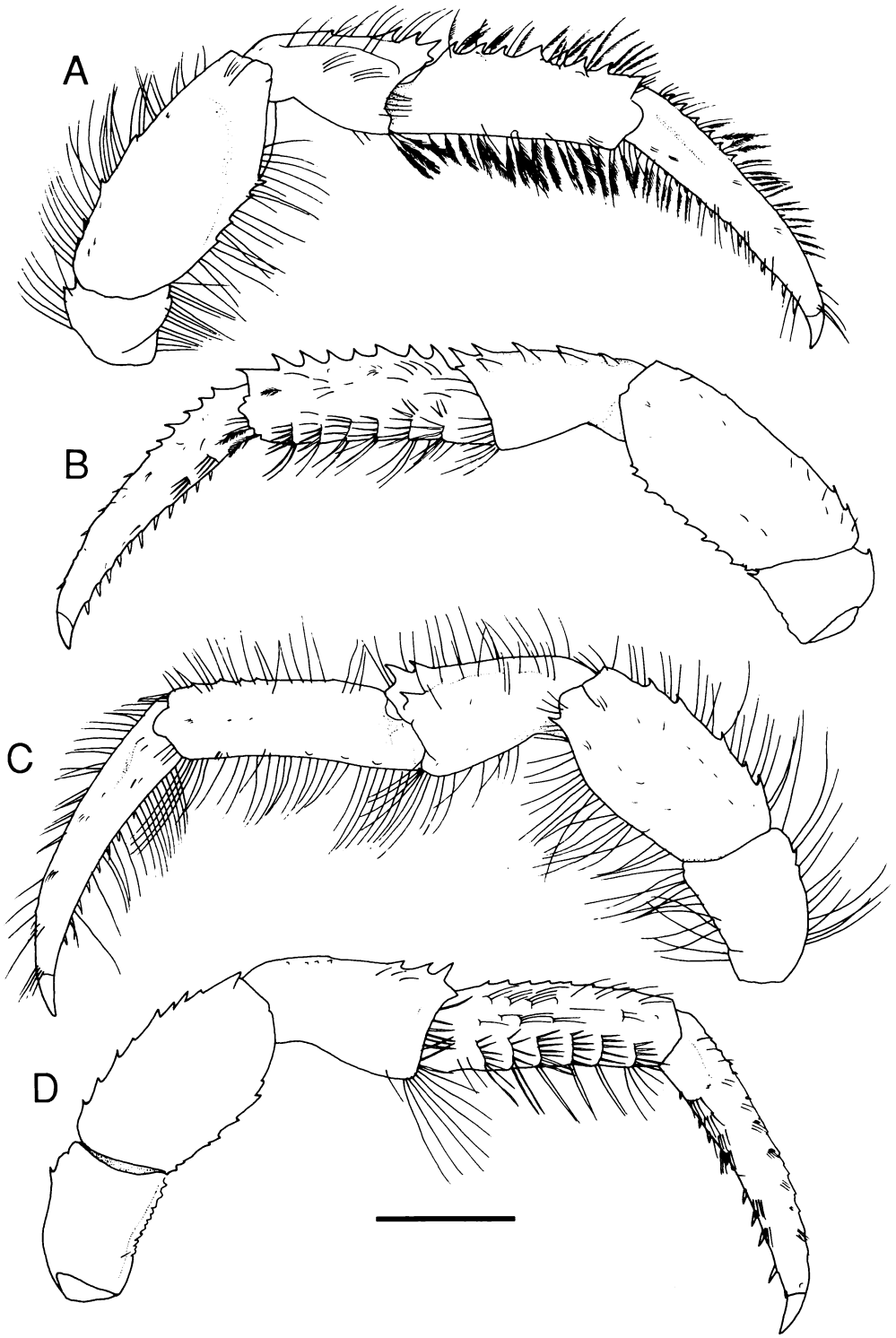

Fig. 7. *Paguristes taenia* sp. nov. Holotype female (CBM-ZC 4836; sl 2.8 mm) from Chichi-jima Islands, Ogasawara Islands. A, right second pereopod, lateral, setae partially omitted; B, same, mesial, setae partially omitted; C, left third pereopod, lateral, setae partially omitted; D, same, mesial, setae partially omitted. Scale bar indicates 1 mm.

lateral surface with few small tubercles and scattered tufts of short setae, laterodistal margin unarmed, with row of longer pulmose setae; mesial surface with small tubercles near distal margin and few short setae, mesiodistal margin unarmed; ventral face unarmed. Merus (Fig. 6B, C) relatively deep; dorsal surface with subdistal transverse ridge bearing 2 or 3 small spines and row of small spines becoming obsolete proximally and sparse setae, dorsodistal margin with row of bristles; lateral surface with few very short setae, laterodistal margin unarmed, ventrolateral margin sinuous, with row of small spinulose tubercles and 1 prominent spine near distal angle; mesial surface with scattered very short setae and vertical row of short setae near distal margin, ventromesial margin with row of moderately small, slender spines; ventral face oblique, unarmed, with few moderately short setae. Ischium (Fig. 6B, C) with row of small spines on ventromesial margin, ventrolateral distal angle unarmed. Coxa unarmed.

Second pereopods (Fig. 7A, B) moderately short. Dactyls moderately long, 1.35 times longer than propodi; in lateral view, weakly curved ventrally, in dorsal view, nearly straight; terminating in strong, curved, corneous claw; dorsal surfaces with row of moderately small corneous-tipped spines, becoming smaller distally, and single or double row of numerous long pulmose setae; lateral faces with rows of tufts of short setae near dorsal and ventral margins; mesial faces unarmed, with few tufts of short pulmose setae; ventral margins with row of 13 small corneous spines and single or double row of short pulmose setae. Propodi distinctly longer than carpi; dorsal surface with row of strong, corneous-tipped spines mesially and row of tufts of moderately long pulmose setae; lateral surfaces with few short setae; mesial surfaces unarmed, but with scattered short setae, mesiodistal margins denticulate; ventral surfaces protuberant, with short transverse, sometimes denticulate ridges; ridges extending to mesial surface, accompanied by dense long pulmose setae. Carpi with double row of spines on dorsal surfaces, becoming stronger distally, and tufts of moderately long pulmose setae; lateral faces convex, with faint longitudinal sulcus accompanied with row of tufts of setae; mesial surfaces naked; ventral surfaces with few short setae, ventrodistal margins with tuft of long pulmose setae. Meri strongly compressed laterally; dorsal surfaces with 2 small spines proximally and tufts of long pulmose setae (becoming shorter distally); lateral surfaces with 1 tuft of short setae distally; mesial surfaces with few short setae; ventral margins with row of small spines or spinulose tubercles and tufts of long pulmose setae, ventrolateral margins each with small subdistal spine. Ischia with 1 small subdistal spine and row of long pulmose setae on each dorsal surface; ventral surfaces unarmed but with row of long pulmose setae. Coxae unarmed.

Third pereopods (Fig. 7C, D) similar to second in setation. Dactyls unarmed on dorsal surfaces; mesial surfaces each with row of small corneous spinules near dorsal margin and row of low transverse protuberances accompanied by short pulmose setae near ventral margin; ventral surfaces with 9 small corneous spines. Propodi with row of small spinulose tubercles on dorsal surfaces; mesial surfaces each with low protuberances accompanied by short pulmose setae; ventral surfaces each with low transverse ridges, extending to mesial face, accompanied by numerous short to long pulmose setae. Carpi with 3 small spines on dorsal surface subdistally; lateral surfaces each with submarginal spine distally; ventrodistal margin with numerous long pulmose setae. Merus with row of small spines or spinulose tubercles on dorsal surface; ventral surface mesially with row of small spinulose tubercles. Ischium with spinule on dorsal surface subdistally; ventral surface minutely denticulated mesially. Coxae with paired gonopores.

Fourth pereopods (Fig. 5F) not chelate. Dactyl not noticeably curved, terminating in strong corneous claw; ventrolateral margin with 2 small corneous teeth and small tube-like preungual process arising from base of terminal claw. Propodus stout, unarmed on dorsal suface, ventral margin weakly convex; propodal rasp composed of 3 rows of small corneous scales, extending to 0.75 length of ventral margin. Carpus with prominent

spine on dorsodistal margin.

Fifth pereopods chelate, setose.

First pleopods (Fig. 5G) paired, modified as gonopods; distal lobe moderately long and broad, margins with long setae. Second to fourth pleopods unpaired, with endopodites about half length of exopodites, bi-articulated; both rami with fine long pulmose setae on margins. Fifth pleopod much smaller than preceding ones, exopodite developed, but endopodite rudimentary. Brood pouch (Fig. 5H) arising from base of fourth pleopod, subsemicircular, with short setae on margin. Second and third abdominal tergites moderately calcified in left, contiguous, with fringe of moderately long setae on left margin.

Uropods strongly asymmetrical; protopodites with few spinules on posterior surface.

Telson (Fig. 5I) with posterior lobes strongly asymmetrical, left larger than right; left with 5 moderately strong spines (lateral 2 spines strongly curved ventrally), right with 4 small spines; anterior lobes unarmed on lateral margins.

Coloration (in preservative). Only remaining color: ocular peduncles (Fig. 5A) with reddish brown band basally, remaining dorsal surface with tint of pale purple. Distal segment of antennular peduncles with tinge of purple distally. Dactyls of ambulatory pereopods with tinge of brown proximally.

Distribution. Known only from the type locality, Chichi-jima Island, Ogasawara Islands, at depths of 151–154 m.

Habitat. Gastropod shell. No association with other invertebrates was recorded.

Etymology. From the Greek, *taenia*, band, in reference to proximal reddish brown band on the ocular peduncles. The name is considered as a substantive in apposition.

Remarks. The holotype is a small female specimen, but it bears fully developed pleopods, including paired first pleopods and brood pouch, suggesting maturity.

The presence of marginal spines on the terminal margins of the telson places *Paguristes taenia* in the group A of the genus (cf. McLaughlin and Provenzano, 1974). This new species can be distinguished from all other described congeners from the Indo-Pacific by the combination of the following character states: the rostrum is moderately broadly triangular but distinctly overreaches the lateral projections; the antennular peduncles are short, only reaching base of the corneas; the ultimate segment of the antennular peduncle is shorter than the penultimate segment; the penultimate segment of the antennular peduncle is armed with a spine on the ventral surface; the antennal flagella are distinctly shorter than the shield, comprising only of 13 articles, which bear only short setae; the cheliped dactyl bears scattered small spines on the mesial surface; there is no hiatus between the dactyl and fixed finger; the fixed finger of the chela bears a lateral row of strong, corneous-tipped spines; the merus of the cheliped is armed with a row of spines on the dorsal surface; the mesial surfaces of the propodi of the third pereopods bear low transverse ridges ventrally, each accompanied with a row of plumose setae; and the carpus of the fourth pereopod is armed with a prominent spine at the dorsodistal margin.

In many characters this new species appears closest to *P. incomitatus* Alcock, 1905, *P. puniceus* Henderson, 1896, and *P. miyakei* Forest and McLaughlin, 1998, notably in the general shape, spination and setation of the chelipeds, and the relatively short antennal flagellum (see Henderson, 1896; Alcock, 1905). The short antennular peduncle, however, immediately separates *P. taenia* from the three species. In *P. taenia*, the distal margin of the ultimate antennular segment reaches only to the base of the cornea, while in *P. incomitatus* and *P. puniceus*, this extends beyond the distal margin of the cornea by the half to nearly full length of the ultimate segment. Further, the more strongly produced rostrum and more robust ambulatory pereopods will distinguish *P. taenia* from *P. incomitatus* and *P. miyakei*. From *P. puniceus*, the new species also differs in the much shorter antennal flagellum bearing only short setae. According to Henderson (1896), the antennal flagellum of *P. puniceus* extends to the tips of the chelipeds and is fringed with long setae.

Family Paguridae

Genus *Anapagrides* de Saint Laurent-Dechancé, 1966

Remarks. McLaughlin and Sandberg (1995) reviewed three species of hermit crabs described by Melin (1939), including *Anapagrides facetus*, the type species of the genus *Anapagrides* de Saint Laurent-Dechancé. These authors found that Melin's species differed from de Saint Laurent-Dechancé's (1966) generic

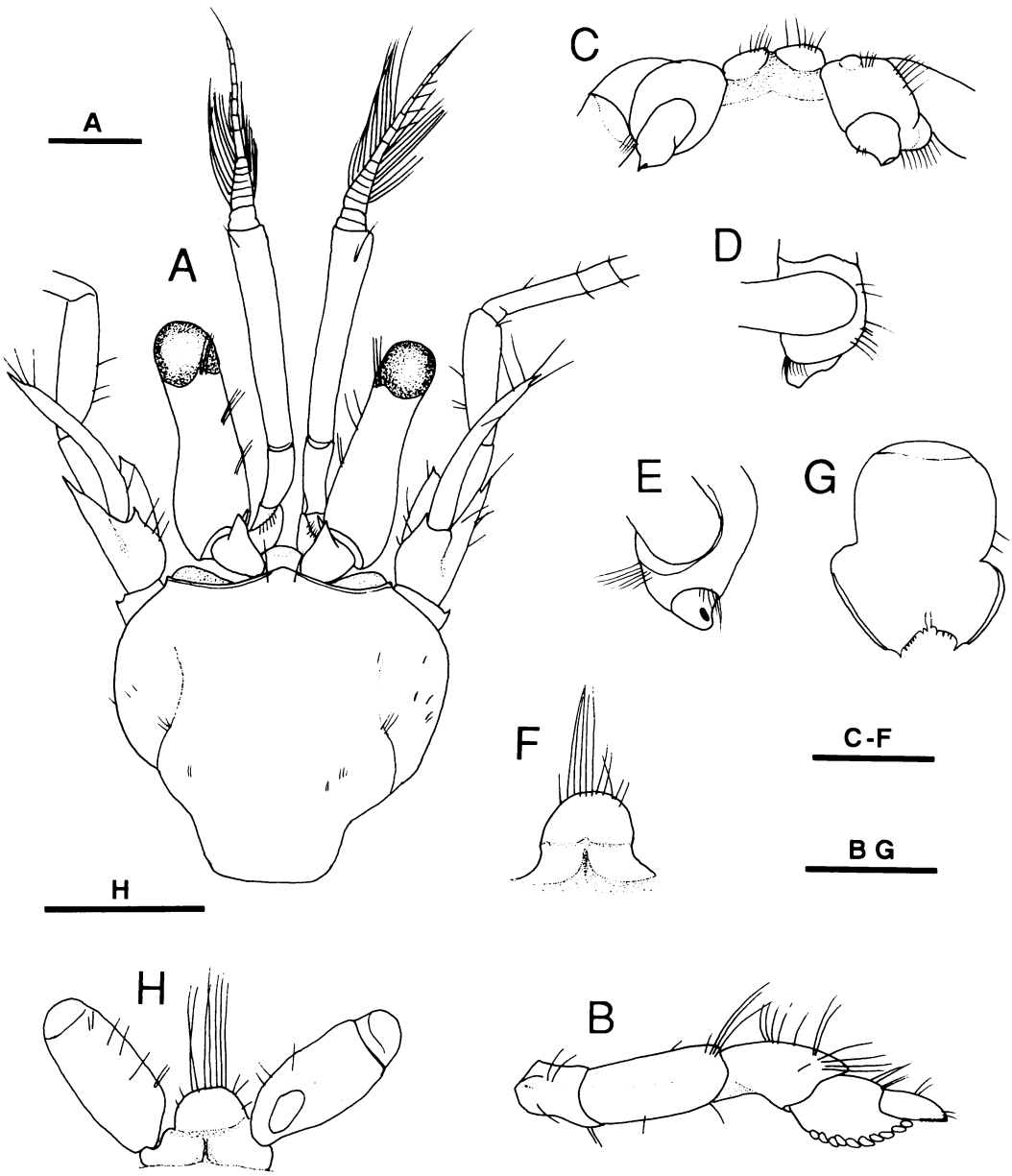

Fig. 8. *Anapagrides aequalis* sp. nov. A–G, holotype male (CBM-ZC 4764; sl 1.7 mm) from off Torishima Island; H, paratype female (CBM-ZC 4763; sl 1.15 mm) from off Torishima Island. A, shield and cephalic appendages, dorsal; B, right fourth pereopod, lateral; C, coxae of fifth pereopods and eighth thoracic sternite, ventral; D, coxa of left fifth pereopod, lateral; E, coxa of right fifth pereopod, lateral; F, sixth thoracic sternite, ventral; G, telson, dorsal. Scale bars indicate 0.5 mm.

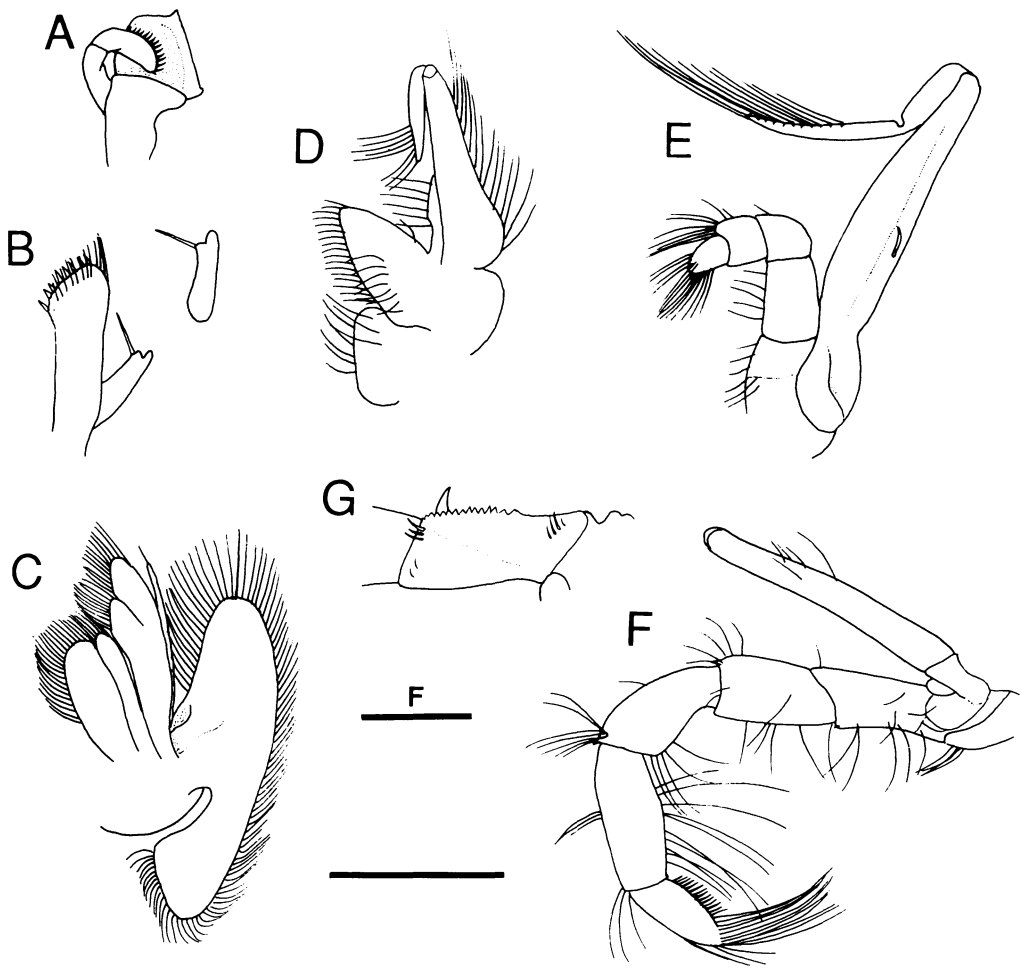

Fig. 9. *Anapagrides aequalis* sp. nov. Holotype male (CBM-ZC 4764; sl 1.7 mm) from off Torishima Island. Left mouthparts. A, mandible, internal; B, maxillule, external; inset, endopod, lateral; C, maxilla, external (endopod not visible); D, first maxilliped, external; E, second maxilliped, external; F, third maxilliped, lateral; G, same, ischium, dorsomesial. Scale bars indicate 0.5 mm.

diagnosis to such a significant extent, that a major emendation of *Anapagrides* was required. The species agreeing with *Anapagrides* sensu de Saint Laurent-Dechané were transferred to a newly established genus, *Laurentia*, by McLaughlin and Haig (1996). McLaughlin (1997) renamed the latter genus as *Turleania*, because of a problem of homonymy. *Anapagrides* is characterized by the presence of 11 pairs of biserial phyllobranchiae (cf. McLaughlin and de Saint Laurent, 1998); semichelate fourth pereopods, each with a single row of corneous scales in the propodal rasp; males with a short right sexual tube; females with single gonopore on the coxa of the left third pereopod; and no first pleopods modified as gonopods. The genus appears similar to *Parapagurodes* McLaughlin and Haig, 1973. The presence of more than two rows of corneous scales of the propodal rasp of the fourth pereopod and of paired female gonopores will distinguish *Parapagurodes* from *Anapagrides*. *Anapagrides* has been represented by two species, *A. facetus* (Melin, 1939) from the Ogasawara Islands and *A. reesei* (McLaughlin, 1986) from the Hawaiian Islands, and one unidentified species, *Anapagrides* sp. sensu McLaughin, 1997, from Indonesia.

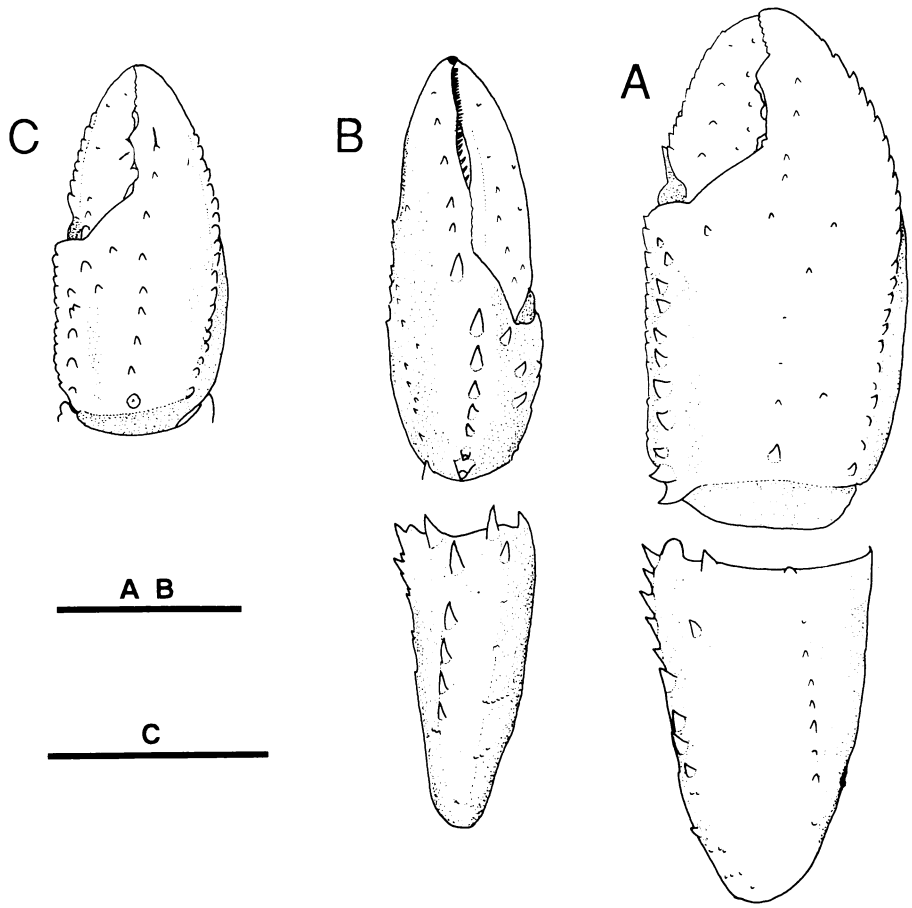

Fig. 10. *Anapagrides aequalis* sp. nov. A, B, holotype male (CBM-ZC 4764; sl 1.7 mm) from off Torishima Island; C, female paratype (CBM-ZC 4763; sl 1.15 mm) from off Torishima Island. A, chela and carpus of right cheliped, dorsal, setae omitted; B, same parts of left cheliped, dorsal, setae omitted; C, chela of right cheliped, dorsal, setae omitted. Scale bars indicate 1 mm.

Anapagrides aequalis sp. nov.
(Figs. 8–12)

Material examined. SY97, st 26; off Torishima Island, 95–185 m; holotype, male (cl 1.7 mm); CBM-ZC 4764.–SY97, st 25; off Torishima Island, 130–150 m; paratype, female (cl 1.15 mm); CBM-ZC 4763.

Description of holotype (male). Eleven pairs of biserial phyllobranchiae.

Shield (Fig. 8A) slightly broader than long (0.93 times as long as broad); anterior margin between rostrum and lateral projections concave; anterolateral margins sloping; posterior margin truncate; dorsal surface with scattered tufts of short setae laterally. Rostrum broadly triangular, slightly overreaching lateral projections, with pair of moderately short setae. Lateral projections subtriangular, with small submarginal spine. Interocular lobe with slightly concave anterior surface. Posterior carapace membranous except for somewhat calcified posteromedian plate, with few tufts of setae dorsally; accessory portions of carapace smooth; cardiac sulci subparallel, extending nearly to posterior margin of carapace; sulci cardiobranchiales short.

Ocular peduncles (Fig. 8A) 0.75 times as long as shield, moderately stout, somewhat inflated basally; corneal regions not dilated; dorsal surface with row of tufts of moderately short setae mesially, distalmost tuft at base of cornea. Ocular acicles narrowly trian-

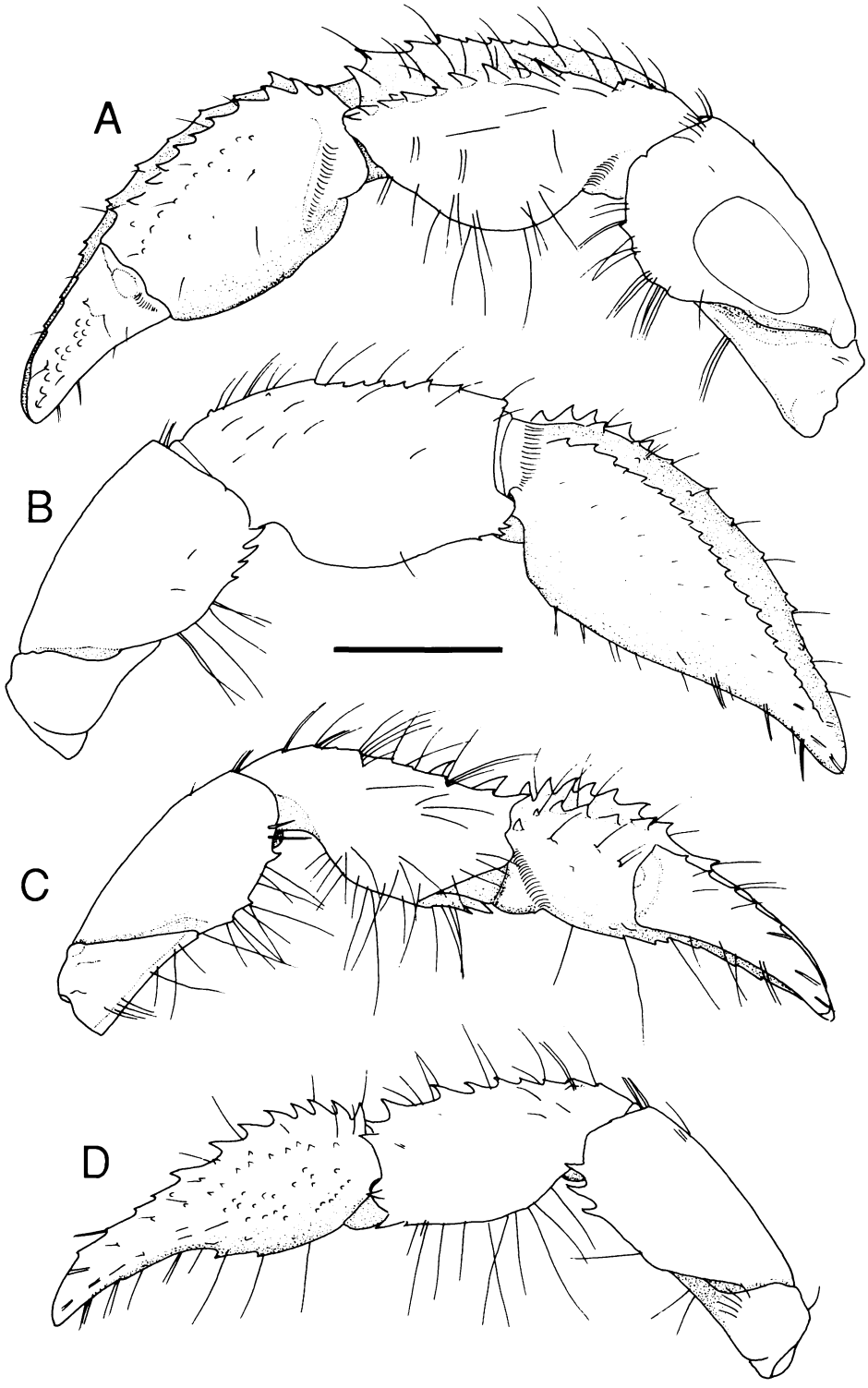

Fig. 11. *Anapagrides aequalis* sp. nov. Holotype male (CBM-ZC 4764; sl 1.7 mm) from off Torishima Island. A, right cheliped, mesial; B, same, lateral; C, left cheliped, mesial; D, same, lateral. Scale bar indicates 1 mm.

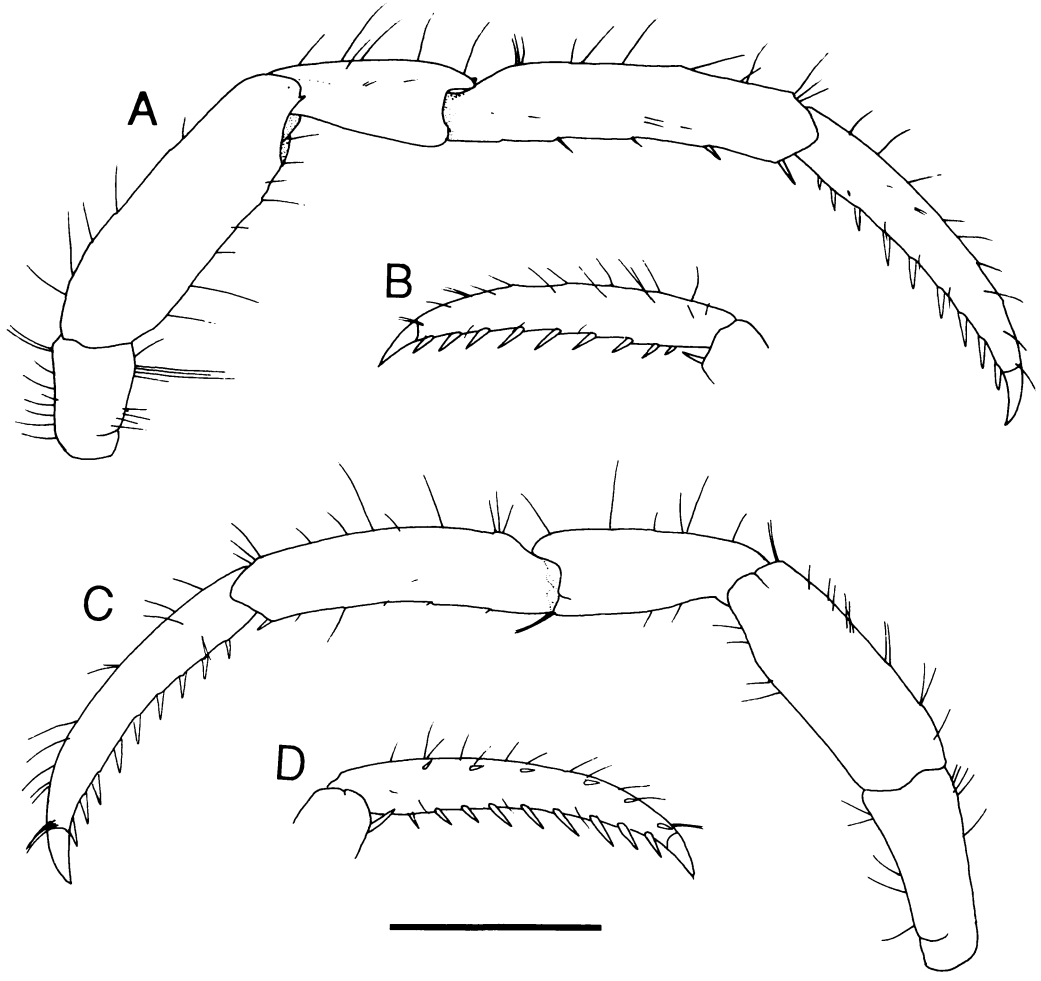

Fig. 12. *Anapagrides aequalis* sp. nov. Holotype male (CBM-ZC 4764; sl 1.7 mm) from off Torishima Island. A, right second pereopod, lateral; B, same, dactyl, mesial; C, left third pereopod, lateral; D, same, dactyl, mesial. Scale bar indicates 1 mm.

gular, with moderately strong submarginal spine.

Antennular peduncles (Fig. 8A) overreaching distal margins of corneas by distal 0.6 length of ultimate segment. Ultimate segment slender, 2.2 times longer than penultimate segment, with subdistal tuft of short setae. Basal segment with well-developed distolateral lobe; statocyst-bearing lateral lobe armed with acute spine.

Antennal peduncles (Fig. 8A) reaching beyond distal margin of corneas; with supernumerary segmentation. Fifth and fourth segments with few stiff setae on mesial surfaces. Third segment with moderately strong spine at ventromesial distal angle. Second segment with dorsolateral distal angle moderately well produced, not reaching to distal margin of fourth segment, terminating in simple spine, with small subdistal spine; dorsomesial distal angle with prominent spine; mesial surface with few stiff setae. First segment with small spine on laterodistal margin; ventromesial distal margin produced, with small spine laterally. Antennal acicles long, nearly reaching distal margins of corneas, weakly arcuate, terminating in acute spine, with tufts of stiff setae subdistally. Antennal flagellum long, with articles bearing short bristles on each distal margin.

Mandible (Fig. 9A) without distinctive fea-

tures. Maxillule (Fig. 9B) with external lobe of endopod rounded; internal lobe weakly produced, with 1 bristle. Maxilla (Fig. 9C) with endopod reaching distal margin of scaphognathite (not visible from external view). First maxilliped (Fig. 9D) with endopod about half length of exopod; exopod inflated basally. Second maxilliped (Fig. 9E) with ischium and basis partially fused; exopod long. Third maxilliped (Fig. 9F) with ischium and basis partially fused; ischium (Fig. 9G) with crista dentata composed of small corneous teeth and with 1 strong accessory tooth; merus with small spine on dorsodistal margin, ventromesial margin unarmed; carpus with small spine on dorsodistal margin; exopod long, overreaching distal margin of merus.

Right cheliped (Figs. 10A, 11A, B) distinctly longer and stouter than left cheliped. Chela (Fig. 10A) 1.8 times as long as broad, greatest breadth at about midlength of palm. Dactyl (Figs. 10A, 11A) distinctly shorter than palm; dorsal surface with 3 small, widely spaced spines on weakly elevated midline; dorsomesial margin with double row of tiny spines; mesial and ventral faces unarmed, latter with few tufts of short setae; cutting edge with row of calcareous teeth in proximal 0.8 and row of small corneous teeth subdistally, terminating in small corneous claw; overlapped by fixed finger. Palm (Figs. 10A, 11A, B) slightly shorter than carpus; dorsomesial margin with row of moderately small to strong spines, becoming smaller distally; dorsolateral margin convex, delineated by row of small spines extending to distal 0.3 of fixed finger, curving mesially on palm; dorsal surface of palm slightly convex, with few small spines and short stiff setae distally; mesial surface with row of small tubercles adjacent to dorsomesial margin and few short setae; ventral surface unarmed, with tufts of short setae. Fixed finger (Figs. 10A, 11B) with row of sparse small spines on dorsal surface; cutting edge with row of small calcareous teeth distal to low, broadly based calcareous tooth at about midlength, terminating in calcareous claw. Carpus (Figs. 10A, 11A, B) distinctly longer than merus, noticeably becoming broader distally; dorsomesial margin with row of moderately strong spines and moderately long setae; dorsolateral margin not distinctly delimited, but with row of tiny spines; dorsodistal margin with 1 prominent spine mesially, dorsal surface with 1 smaller spine somewhat proximal to dorsodistal spine; lateral surface with few scattered short setae; mesial surface with scattered tufts of moderately long setae; ventral surface well inflated, with tufts of long setae. Merus (Fig. 11A, B) with smooth dorsal surface, dorsodistal margin unarmed; lateral and mesial faces with very few short setae; ventrolateral margin with row of spines in distal half, noticeably becoming stronger distally; ventromesial margin with 1 spine, few tiny tubercles and tufts of long setae; ventral surface unarmed, but with scattered tufts of long setae. Ischium (Fig. 11A, B) without row of tiny spines on ventromesial margin; lateral and mesial surfaces unarmed; ventral surface with few tufts of long setae. Coxa unarmed.

Left cheliped (Figs. 10B, 11C, D) with chela 2.8 times as long as broad, greatest breadth slightly proximal to base of dactyl. Dactyl (Figs. 10B, 11C) distinctly longer than palm, dorsal surface with row of 4 tiny spines in proximal half, dorsomesial margin not delimited; mesial surface unarmed, but with few moderately short setae dorsally; ventral surface with few tufts of long setae; cutting edge with row of small corneous teeth in distal 0.4, terminating in small corneous claw, overlapped by fixed finger. Palm (Figs. 10B, 11C, D) about 0.6 times as long as carpus; dorsolateral margin not distinctly delimited, but with row of tiny spines extending nearly to midlength of fixed finger; dorsomesial margin not distinctly delimited, but with row of moderately strong spines; dorsal surface strongly elevated in midline and armed with row of moderately strong spines becoming smaller distally and extending onto fixed finger, and with few scattered setae; lateral surface minutely spinulose, with scattered single or tufts of short setae on fixed finger; mesial surface almost unarmed, but with row of moderately short setae; ventral surface few small spines and scattered long setae. Cutting edge of fixed finger (Fig. 10B) weakly sinuous, with row of small corneous teeth in distal 0.6, terminating in small corneous claw. Carpus (Figs. 10B, 11C, D) approxi-

mately equal to merus in length, becoming broader distally; dorsolateral margin with 5 spines and 2 low protuberances accompanied with fine setae, becoming stronger distally, dorsomesial margin with 1 small spine subdistally and some low protuberances accompanied by tufts of setae, dorsal surface unarmed, dorsodistal margin with 2 strong spines; lateral surface with few short setae, laterodistal margin with 2 spines, ventrolateral margin distally with 2 spines (spine at ventrolateral corner much stronger than second spine); mesial surface with few tufts of long setae dorsally and ventrally, mesiodistal and ventromesial margins unarmed; ventral surface with tufts of long setae. Merus (Fig. 11C, D) unarmed dorsally; dorsodistal margin with row of short setae; lateral and mesial surfaces without setae; ventrolateral margin with 3 prominent spines distally; ventromesial margin with 2 spines and stiff setae; ventral surface unarmed, with tufts of long setae. Ischium (Fig. 11C, D) unarmed on ventromesial margin, but with few setae.

Second and third pereopods (Fig. 12A, C) moderately long, slightly overreaching right cheliped. Dactyls slightly longer than propodi; in lateral view slightly curved ventrally; in dorsal view virtually straight; terminating in strong corneous claws; dorsal surfaces with moderately short setae; lateral surfaces with row of setae dorsally; mesial surfaces unarmed in second (Fig. 12B), armed with row of corneous spinules dorsally in third (Fig. 12D); ventral margin with 9 moderately strong corneous spines. Propodi distinctly longer than carpi; dorsal surfaces with row of tufts or simple long setae; lateral and mesial surfaces with few short setae; ventral surfaces with few small corneous spines and short setae, ventrodistal margins each with 1 or 2 moderately strong corneous spines. Carpi with row of sparse long setae on dorsal surfaces, dorsodistal margins each with spinule in second, unarmed in third; lateral, mesial and ventral surfaces with few short setae. Meri with row of tufts of setae on dorsal surfaces; lateral and mesial surfaces without setae; ventral surface with row of long setae, ventrolateral margins each with small distal spine in second, unarmed in third. Ischia with sparse setae on dorsal and ventral margins.

Fourth pereopods (Fig. 8B) semichelate. Dactyl not curved, apparently lacking preungual process. Propodal rasp composed of single row of corneous scales. Dorsal surfaces of propodus and carpus with tufts of long setae.

Coxae of fifth pereopods subequal (Fig. 8C–E), both with very short sexual tube directed ventrally or posteroventrally.

Third thoracic sternite with tiny spinules on either side of shallow median notch on anterior margin. Anterior lobe of sixth thoracic sternite (Fig. 8F) subsemicircular, with row of short to long setae on anterior surface. Eighth thoracic sternite (Fig. 8C) with paired rounded lobes, bearing row of setae on anteroventral margin.

Abdomen with 3 unpaired, markedly unequal biramous pleopods; no paired pleopods. Uropods strongly asymmetrical.

Telson (Fig. 8G) with distinct lateral indentations; posterior lobes broader than anterior lobe, terminal margins oblique, each with 1 small spine at posterolateral corner and 2 snall spines at posteromesial corner, margin between posterolateral and posteromesial corners with row of tiny bristles, lateral margins with weakly delimited, smooth edges.

Description of female paratype. Shield without setae on dorsal surface. Rostrum broadly triangular, slightly overreaching lateral projections, with minute terminal spinule.

Ocular peduncles relatively stout, dorsomesial surfaces with row of setae.

Right chela (Fig. 10C) about 2.0 times as long as broad, somewhat narrower than that of holotype. Palm with row of small spines in dorsal midline.

Palm of left cheliped with row of spines on elevated midline, not extending onto fixed finger. Carpus with only 2 spines on dorsolateral margin.

Single gonopore on coxa of left third pereopod (Fig. 8H).

No paired pleopods, 4 unpaired pleopods.

Telson with terminal margins of posterior lobes oblique, armed with 4 and 7 small spines, no serrate marginal edge on lateral margins.

Coloration (in preservative). Ocular peduncles each with faint orange band near base.

Chelipeds faint orange. Ambulatory pereopods faint orange generally, propodi white in distal half.

Habitat. Gastropod shell.

Distribution. Known only from off Torishima Island; 95-185 m.

Etymology. From the Latin *aequalis* (= equal), referring to the equally developed male sexual tubes.

Remarks. The present new species differs markedly from the two previously described species of *Anapagrides* in the possession of a short left sexual tube, though it agrees well with the diagnosis of *Anapagrides* in other respects, such as the gill formula, the shape of the ocular acicles and of the telson and the structure of the fourth pereopod. In the case of *Parapagurodes*, although the the generic diagnosis mentions only a right sexual tube, variations were noted, including the occasional presence of a left sexual tube (McLaughlin and Haig, 1973: 119). A similar situation was noted by McLaughlin and Jensen (1996: 842) in the generic diagnosis. Komai (1999) discovered the equally developed short sexual tubes in *Pagurus constans* (Stimpson, 1858), then transferred the species from *Pagurus* to *Parapagurodes*. Therefore, I have referred the present new species to *Anapagrides*.

In addition to the development of the left sexual tube, the new species differs from the two congeneric species in armature of the right palm. In *A. aequalis*, the right palm bears a row of moderately strong, spaced spines on the dorsomesial margin and an additional row of very small tubercles on the mesial surface near the dorsomesial margin; the carpus of the right cheliped bears a row of small spines on the dorsolateral margin. In *A. facetus* and *A. reesei*, the dorsomesial margin of the right palm is armed with a single row of low tubercles or blunt spines and a single row of closely spaced small spines respectively; there is no additional row of small tubercles on the mesial surface; the carpus is unarmed on the dorsolateral margin. Further, the subsemicircular, anterior lobe of the sixth sternite and oblique terminal margins of the telson immediately separate *A. aequalis* from *A. facetus*. In the latter species, the anterior lobe of the sixth thoracic sternite is subrectangular, and the terminal margins of the telson are nearly horizontal. *Anapagrides* sp. sensu McLaughlin (1997) is similar to the new species in the armature of the right palm. Nevertheless, the less produced rostrum, which does not overreach the lateral projections, and horizontal terminal margins of the telson seem to distinguish *A.* sp. from *A. aequalis*.

The female paratype differs from the holotype in the more slender right chela with a median row of small spines on the palm and left chela lacking a row of spines on the fixed finger. The terminal margins of the telson are armed with 2 spines and minute bristles in the holotype, but it bears 3 spines on left and 5 spines on right. These differences may be referable to sexual dimorphism.

Genus *Australeremus* McLaughlin, 1981

Remarks. The generic diagnosis of *Australeremus* was emended by McLaughlin and Gunn (1992), as the symmetry of the telson, which was initially considered as one of the key characters by which *Pylopagurus sensu stricto* was distinguished from other genera, including *Australeremus*, was proved to be unreliable. *Australeremus* is reliably distinguished from *Pylopagurus* by the shape and armature of the chelae (see McLaughlin and Gunn, 1992). Nevertheless, among the genera occurring in the Indo-West Pacific, *Australeremus* can be recognized by 11 pairs of biserial phyllobranchiae, females with paired first pleopods modified as gonopods, no sexual modification in males, and no sharply keeled dorsal surface of the left chela. Among the eight previously described species, *A. triserratus* and *A. indonesiensis* McLauglin, 1997, are known from the western Pacific Ocean (McLaughlin, 1997).

Australeremus triserratus (Ortmann, 1892) (Fig. 13)

Restricted synonymy.

Eupagurus triserratus Ortmann, 1892: 308, pl. 12, fig. 15.

Eupagurus (*Eupagurus*) *triserratus*: Melin, 1939: 29, figs. 9, 10.

Pylopagurus serpulophilus Miyake, 1978: 120, pl. 4, fig. 4; 1982: 120, pl. 40, fig. 5.

?*Pagurus triserratus*: Miyake, 1978: 101, fig.

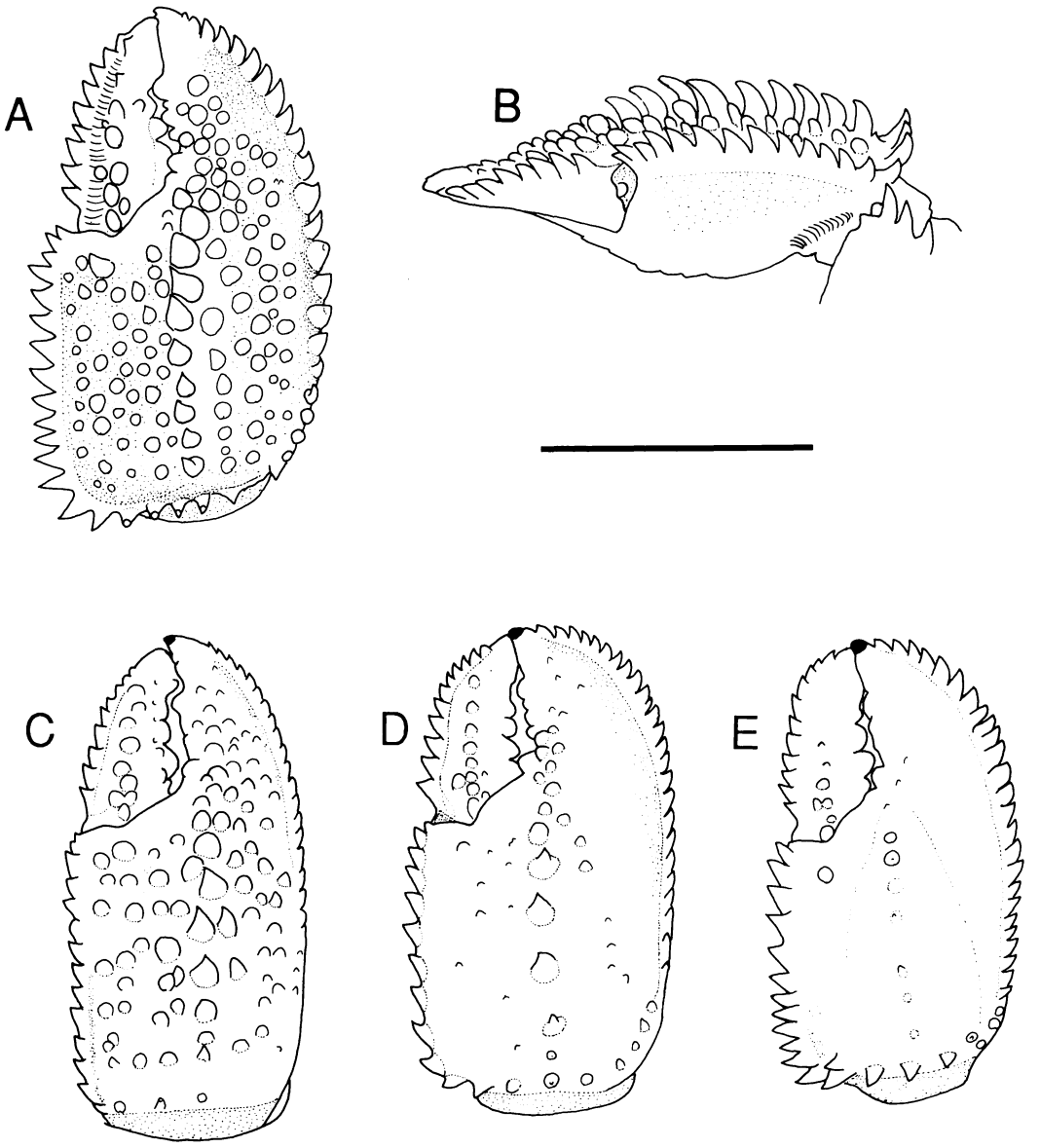

Fig. 13. *Australeremus triserratus* (Ortmann, 1892). A, C–E, chelae of right chelipeds in dorsal view; B, same in mesial view. A, B, male (CBM-ZC 4759; sl 2.2 mm) from Yome-jima Island, Ogasawara Islands; C, male (CBM-ZC 288; sl 2.3 mm) from Banda, Tateyama Bay, Boso Peninsula; D, male (sl 2.2 mm), same lot; E, ovig female (sl 2.5 mm), same lot. Scale bar indicates 2 mm.

39.

Australeremus triserratus: McLaughlin and Gunn, 1992: 87, fig. 14, pl. 1; McLaughlin, 1997: 521, fig. 24a, c.

Material examined. SY97, st 1; Muko-jima Island, Ogasawara Islands, 98–99 m; 15 Oct 1997; 2 males (sl 1.9 mm); CBM-ZC 4747.–SY 97, st 16; off Chichi-jima Island, Ogasawara Islands, 154 m; 1 male (sl 1.6 mm), 1 female (sl 1.3 mm); CBM-ZC 4758.–SY97, st 17; Yome-jima Island, Ogasawara Islands, 210–212 m; 1 male (sl 2.2 mm); CBM-ZC 4759.

Additional material.–SY92; off Izu Ohshima Island, 34°34.28′ N, 139°29.52′ E, 120 m; 15 Oct 1992; dredge; coarse sand bottom; coll. T. Komai; 5 males (sl 1.5–2.5 mm), 10 females (sl 1.6–2.3 mm); CBM-ZC 278.–Off Banda, Tate-

yama, Boso Peninsula, 30–60 m; 22 May 1990; dredge; sandy mud bottom; coll. M. Osawa; 9 males (sl 1.9–2.7 mm), 8 females (sl 1.5–2.5 mm); CBM-ZC 288.–Off Shionomisaki, Kii Peninsula, 120 m; 27 Mar 1992; dredge; coll. S. Nagai; 1 male (sl 3.2 mm), 4 females (sl 1.7–2.9 mm); CBM-ZC 1143.–KT95-5, st TB18-2 (RV Tansei-maru); Okinoyama Bank, Sagami-nada, 34°59′ N, 139°39′ E, 105–113 m; 21 Apr 1995; dredge; coarse sand mixed with shell fragments; coll. T. Komai; 3 males (sl 1.7–2.2 mm); CBM-ZC 1985.–Off Kochi, Tosa Bay, 33°17.0′ N, 133°40.0′ E, 150–160 m; 6 Jan 1993; RV Toyohata-maru, beam trawl; coll. S. Sasaki; 1 female (sl 2.5 mm); CBM-ZC 3405.–Similar locality, 33°16.35′ N, 133°38.32′ E, 144–150 m; 11 Nov 1992; RV Toyohata-maru, beam trawl; coll. K. Sasaki; 1 male (sl 3.3 mm); CBM-ZC 3850.–Off Kominato, Boso Peninsula, 100–150 m; 27 Feb 1997; rocky bottom; gill net; coll. T. Komai; 2 females (sl 2.7, 3.1 mm); CBM-ZC 3532.–SY96, st 5; Hyotan-se Bank, Izu Islands, 34°20.73′ N, 139°03.03′ E, 125–160 m; 22 Oct 1996; dredge; coll. T. Komai; 1 male (sl 1.7 mm), 1 female (sl 1.3 mm); CBM-ZC 4612.–SY96, st 18; Okinoyama Bank, Sagami-nada, 35°00.07′ N, 139°40.30′ E, 98–100 m; 24 Oct 1996; dredge; coll. T. Komai; 1 male (sl 2.8 mm); CBM-ZC 4716.–SY96, st 19; similar locality, 34°58.47′ N, 139°34.13′ E, 121–129 m; 24 Oct 1996; dredge; coll. T. Komai; 3 males (sl 1.7–2.4 mm); CBM-ZC 4774.–Sabane, Maruyama-dashi Bank, Sagami Bay, 200 m; 18 Mar 1956; coll. Emperor Showa; holotype of *Pylopagurus serpulophilus* Miyake, 1978, male (sl 3.3 mm); Miyake det. no. 136a; NSM-T-CrR 1086.–Sagami Bay, 100 m; 1881; coll. L. Döderlein; lectotype of *Eupagurus triserratus* Ortmann, 1892, male (sl 3.6 mm); MZS 477/1 (spirit).–Same lot; 1 male (sl 3.3 mm); paralectotype of *Eupagurus triserratus*; MZS 477/2 (spirit).

Description.–See McLaughlin and Gunn (1992).

Color (*in preservative*). Ground color of body and pereopods light reddish brown. Shield with pair of dark red-brown spots in front of cervical groove adjacent to accessory portion; posterior carapace also with paired dark red-brown spots on lateral to posteromedian plate. Ocular peduncle with broken red-brown stripe on dorsal surfaces. Antennal flagellum with light and dark red-brown segments alternately. Right chela with white and red-brown spines on dorsolateral margin of palm alternately; dactyl with dark-brown spots proximomesially; carpus with tinge of dark red-brown on distal margin and dorsomesial spines, dorsolateral spines also deep red-brown; merus with obscure white band subdistally. Color of left cheliped generally similar to that of right cheliped. Dactyls of ambulatory pereopods obscurely banded with red-brown on white back ground; propodi with red-brown dorsal margin, medially with tinge of brown on lateral surfaces; carpi each with submedian longitudinal stripe.

Distribution. Pacific coast of Japan from Boso Peninsula to Kyushu; Ogasawara Islands; Korea; East China Sea; South China Sea; Tanimbar Islands, Indonesia; 60–400 m.

Habitat. Found to live in polychaete tubes, scaphopod shells, or gastropod shells.

Remarks. In addition to the specimens from the Ogasawara Islands, abundant material from various sources has been examined. The present study has shown that *Australeremus triserratus* exhibits considerable variations in the armature of the right palm. The spines on the dorsal midline of the right palm are strongly variable in size and shape. They are enlarged, somewhat flattened and anteriorly curved and sometimes tear drop-shaped (Fig. 13A, B); conical, sometimes blunt or sometimes with an acute apex (Fig. 13C, D); or reduced to small, sometimes obsolete, tubercles (Fig. 13E). The dorsal surface of the right palm are variable from being armed with numerous rounded tubercles or small spines (Fig. 13A, C, D) to being nearly unarmed except for the small tubercles on the midline (Fig. 13E). Further, there is a tendency that the spines and tubercles on the right palm are weaker in females than in males. With regard to the presence of such a wide variation in the armature of the right palm in *A. triserratus* a question about the validity of *A. indonesiensis* McLaughlin, 1997, which is said to be different from the former in the lack of a median row of large spines on the dorsal surface of the right palm (McLaughlin, 1997), may arise. Although I

compared carefully the present material of *A. triserratus* and the original description of *A. indonesiensis*, there is no significant differences between the two nominal taxa. The question about the identity of the latter taxon cannot be decided satisfactorily until more careful comparison is made.

Although McLaughlin and Gunn (1992) synonymized *Pylopagurus serpulophilus* Miyake, 1978, with *A. triserratus*, they commented on the differences between their material of *A. triserratus* and the original description of *P. serpulophilus*. The holotype of *P. serpulophilus* has been reexamined (see "Material examined"), and it has been confirmed that it is conspecific with *A. triserratus*. Miyake (1978) overlooked the dorsoproximal spines on the right palm and the second spine on the carpi of the second pereopods. As has been pointed by Komai (1999), the line drawings and color illustrations published by Miyake (1978) are rather diagrammatic, and not very informative.

McLaughlin and Gunn (1992) suspected that *Eupagurus tricarinatus* reported by Balss (1913) might actually represent *A. triserratus*, rather than true *Nematopagurus tricarinatus* (Stimpson, 1858) (cf. McLaughlin and Sandberg, 1996). A reexamination of the Balss's specimen (Sagami Bay, stn. 14; coll. F. Doflein; 1 male, sl 5.1 mm; No. 2661; ZSM 306/1) has disclosed that it actually represents *Parapagurodes nipponensis* (Yokoya, 1933) (cf. Komai, 1998), with an artificially transformed right chela. The integument of this specimen is soft , and thus it is assumed that the specimen was preserved just after molting. The right palm of this specimen is severely shrunken, with a longitudinal depression on both sides of the midline on the dorsal surface, giving a "tricarinate" condition.

Genus *Nematopagurus*
A. Milne Edwards and Bouvier, 1892

Remarks. So far, 20 species are currently assigned to *Nematopagurus*, of which 19 are found in the Indo-Pacific region (McLaughlin, 1997; 1998; McLaughlin and Hogarth, 1998). Two additional new species are described herein, increasing the total number of the members to 22. When the host of additional new species of this genus awaiting description (McLaughlin, 1997; 1998) have been fully added, *Nematopagurus* will be one of the most speciose genera in the entire region. This genus is characterized by the presence of 11 pairs of biserial phyllobranchiae (cf. McLaughlin and de Saint Laurent, 1998); a broadly rounded rostral lobe; generally subequal chelipeds; semichelate fourth pereopods, each with a single row of corneous scales in the propodal rasp; males with a long filamentous right sexual tube orientated from right to left across the ventral thorax, and short left sexual tube; and females with paired first pleopods modified as gonopods.

From Japanese waters, the following five species are known (Miyake, 1978; McLaughlin and Sandberg, 1996; McLaughlin, 1998); *N. tricarinatus* (Stimpson, 1858); *N. gardineri* Alcock, 1905; *N. squamichelis* Alcock, 1905; *N. vallatus* (Melin, 1939); and *N. spinulosensoris* McLaughlin and Brock, 1974 (=*N. muricatus* sensu Miyake, 1978). However, it still remains unclear whether the species assigned to those described by Alcock actually represent Alcock's taxa.

Nematopagurus pilosus sp. nov.
(Figs. 14–18)

Material examined. SY97, st 1; Muko-jima Island, Ogasawara Islands, 98-99 m; holotype, male (sl 2.7 mm); CBM-ZC 4748.–SY97, st 2; Mukojima-Island, Ogasawara Islands, 68–70 m; paratypes, 2 females (sl 2.3, 3.1 mm); CBM-ZC 4751.

Description of holotype (male). Eleven pairs of biserial phyllobranchiae.

Shield (Fig. 14A) slightly broader than long; anterolateral margins sloping; anterior margin between rostrum and lateral projections concave; posterior margin truncate; dorsal surface with tufts of long setae generally circumscribing gastric region. Rostrum very broadly rounded, not reaching level of lateral projections. Lateral projections subtriangular with rounded distal margins, strongly produced, armed each with strong submarginal spine. Accessory portions of carapace moderately narrow, each with 1 tuft of short setae. Posterior carapace with few scattered tufts of short setae; posteromedian plate not strongly calcified, with pair of tufts

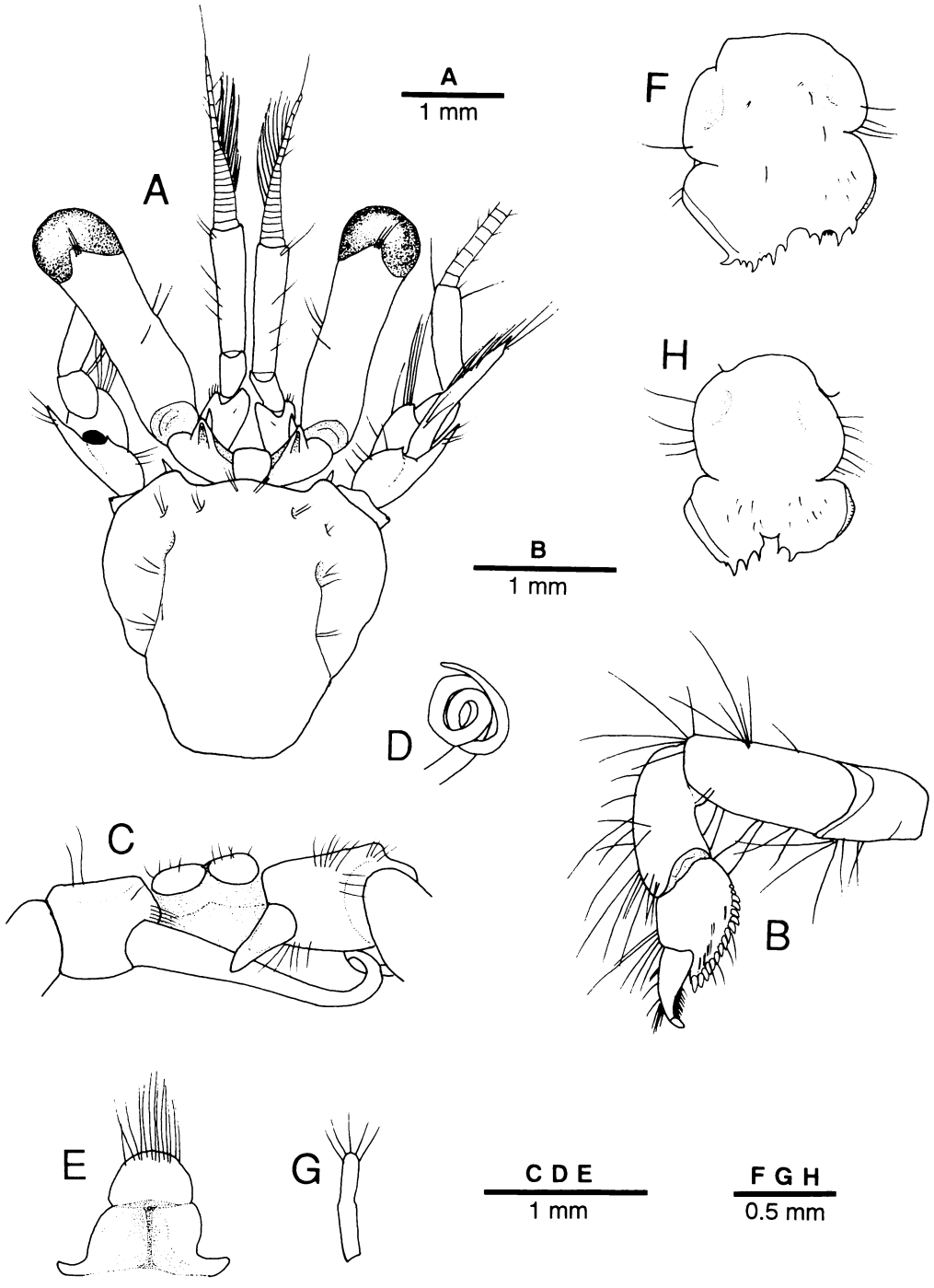

Fig. 14. *Nematopagurus pilosus* sp. nov. A–F, holotype male (CBM-ZC 4748; sl 2.7 mm) from Muko-jima Island, Ogasawara Islands; G, H, paratype female (CBM-ZC 4751; sl 2.3 mm) from Muko-jima Island. A, shield and cephalic appendages, dorsal, left antennal acicle missing; B, left fourth pereopod, lateral; C, coxae of fifth pereopods and eighth thoracic sternite, ventral; D, distal part of right sexual tube; E, sixth thoracic sternite, ventral; F, telson, dorsal; G, left first pleopod, ventral; H, telson, dorsal.

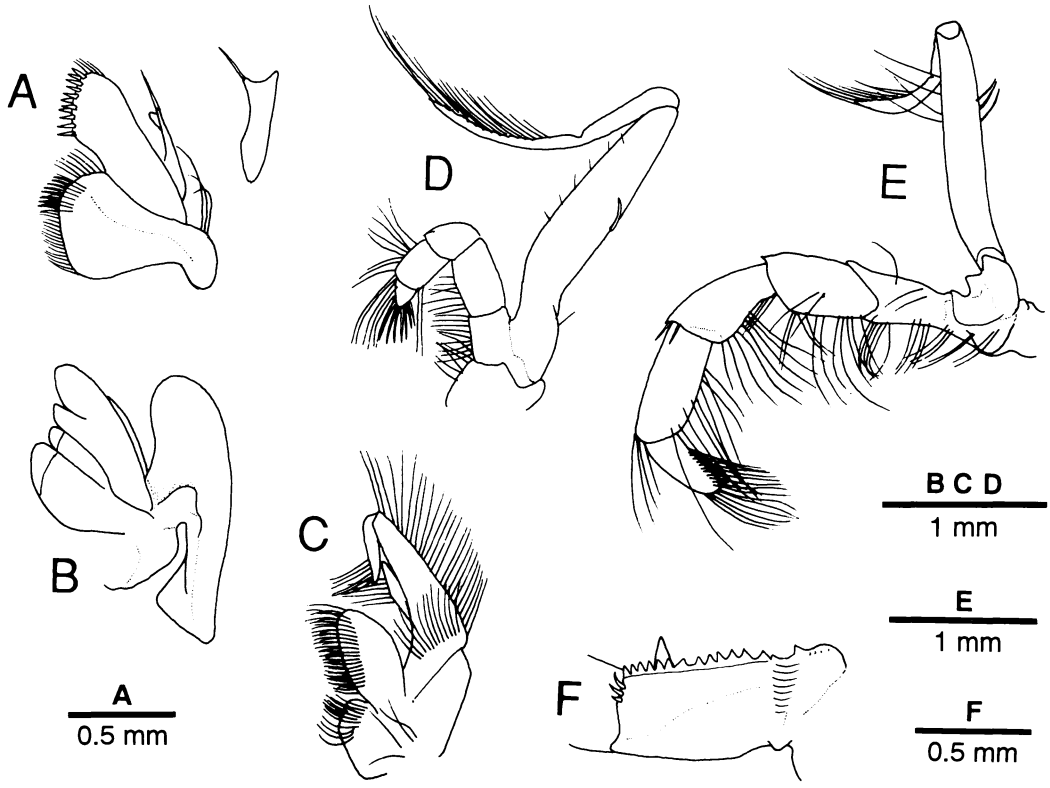

Fig. 15. *Nematopagurus pilosus* sp. nov. A–F, holotype male (CBM-ZC 4748; sl 2.7 mm) from Muko-jima Island, Ogasawara Islands. Left mouthparts. A, maxillule, external; inset, endopod, lateral; B, maxilla, external, setae omitted; C, first maxilliped, external; D, second maxilliped, external; E, third maxilliped, lateral; F, same, ischium, dorsomesial, setae omitted.

of short setae anteriorly; cardiac sulci subparallel, extending nearly to posterodorsal margin of carapace; sulci cardiobranchiales short, reaching midway between posterior margin of shield and posterodorsal margin of carapace.

Ocular peduncles (Fig. 14A) 0.9 times as long as shield; dorsal surfaces each with 1 tuft of stiff setae at base of cornea and 1 short seta slightly posterior to midlength; mesial face with 1 tuft of stiff setae at midlength; cornea slightly dilated, width about 0.3 peduncular length. Ocular acicles small, triangular, terminating subacutely, with prominent submarginal spine; dorsal surface concave; separated basally by width of more than 1 acicle. Interocular lobe well developed; dorsal surface slightly concave.

Antennular peduncles (Fig. 14A) overreaching distal margin of corneas by 0.25 length of ultimate segment. Ultimate segment moderately stout, 1.4 times longer than penultimate segment, with sparse row of setae on dorsal surface laterally. Basal segment with moderately well developed distolateral lobe; statocyst-bearing lateral lobe with small distal spine.

Antennal peduncles (Fig. 14A) not reaching distal margins of corneas; with supernumerary segmentation. Fifth and fourth segments with few stiff setae. Third segment with row of long setae on mesial surface, ventromesial distal angle bearing small spine. Second segment with dorsodistal lateral angle produced, reaching to midlength of fourth segment, terminating in strong spine; dorsomesial distal angle with small spine. First segment unarmed laterally; ventrodistal margin produced, armed with small bifid spine laterally. Antennal acicle moderately long, reaching base of cornea; arcuate, terminating in acute spine; mesial margin

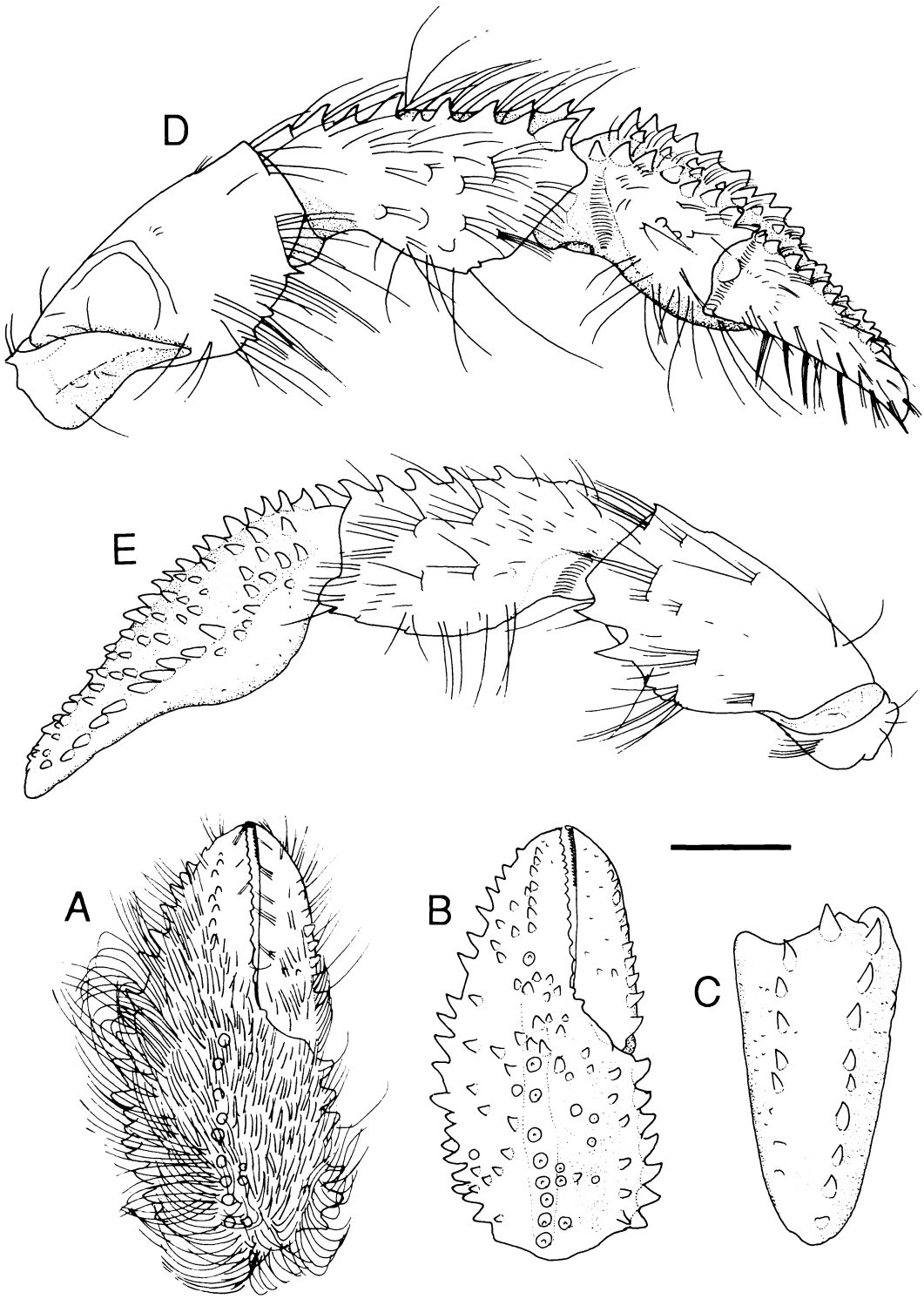

Fig. 16. *Nematopagurus pilosus* sp. nov. A–F, holotype male (CBM-ZC 4748; sl 2.7 mm) from Muko-jima Island, Ogasawara Islands. A, chela of left cheliped, dorsal; B, same, setae omitted; C, carpus of left cheliped, dorsal, setae omitted; D, left cheliped, mesial, setae partially omitted; E, same, lateral, setae partially omitted. Scale bar indicates 1 mm.

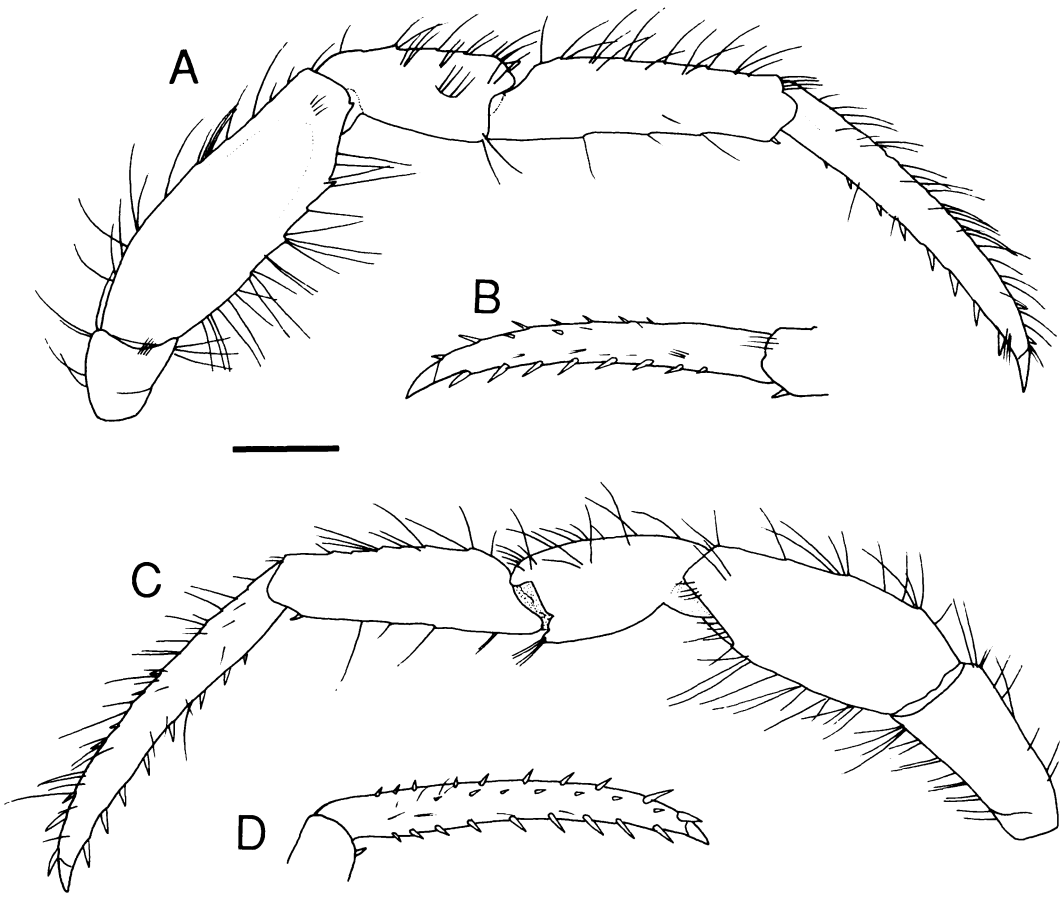

Fig. 17. *Nematopagurus pilosus* sp. nov. Holotype male (CBM-ZC 4748; sl 2.7 mm) from Muko-jima Island. A, right second pereopod, lateral; B, same, dactyl, mesial, setae partially omitted; C, left third pereopod, lateral; D, same, dactyl, mesial, setae partially omitted. Scale bar indicates 1 mm.

row of tufts of moderately long setae. Antennal flagellum very long, far overreaching outstretched left cheliped; each article with very short setae on distal margin.

Mandible without distinctive feature. Maxillule (Fig. 15A) with well developed, triangular external lobe of endopod; internal lobe well produced, with apical bristle. Maxilla (Fig. 15B) with endopod nearly reaching anterior margin of scaphognathite. First maxilliped (Fig. 15C) with endopod about 0.6 length of exopod. Second maxilliped (Fig. 15D) with basis and ischium partially fused; exopod moderately stout. Third maxilliped (Fig. 19E) with basis and ischium partially fused; ischium (Fig. 15F) with well developed crista dentata, composed of small, relatively widely spaced corneous teeth, and 1 strong accessory tooth; merus with small spine at dorsodistal margin, ventromesial margin unarmed; carpus with small dorsodistal spine; exopod overreaching distal margin of merus.

Right cheliped small, in process of regeneration.

Left cheliped (Fig. 16A–E) moderately slender. Chela stout, about 2.2 times longer than broad. Dactyl (Fig. 16A, B, D) 1.1 times longer than palm; cutting edge with row of small corneous teeth in distal 0.3, terminating in small corneous claw; flat dorsal surface with 2 rows of widely-spaced tufts of short setae and numerous setae proximally and few small tubercles; dorsomesial margin with row of moderately small spines, becoming weaker distally; mesial surface with scattered moderately long setae; ventral surface with row of tufts of long setae. Palm (Fig. 16A, B, D, E) about half length of carpus,

dorsal surfaces obscured by moderately short to long, thick pulmose setae (setae on lateral side particularly very long); dorsomesial margin with row of strong spines; dorsal surface convex, with 5 irregular rows of moderately small to strong spines, median row extending onto fixed finger, dorsolateral margin with row of strong spines, extending nearly to tip of fixed finger; mesial face with few small tubercles and scattered tufts of setae; lateral face with scattered small spines and low tubercles, accompanied by tufts of long setae; ventral surface with scattered tufts of long setae. Cutting edge of fixed finger (Fig. 16A, B) with row of small calcareous teeth, terminating in tiny corneous claw. Carpus (Fig. 16C–E) slightly longer than merus; dorsomesial and dorsolateral margin each with row of strong spines and tufts of long setae; dorsodistal margin with 1 strong spine medially; dorsal surface unarmed, with few short setae; lateral and mesial surfaces with scattered low protuberances, accompanied by short row or tuft of long stiff setae, distal margins unarmed; ventrolateral margin with 3 small spines distally, ventromesial margin not delineated; ventral surface with scattered tufts of long setae. Merus (Fig. 16D, E) with few low protuberances accompanied by row of setae distally and few tufts of setae proximally on dorsal surface, dorsodistal margin unarmed, but with row of stiff setae; lateral surface with few short vertical row of stiff setae, ventrolateral margin with 2 moderately strong spines in distal half; mesial surface with vertical row of long setae ventrally, ventromesial margin with row of 3 widely-spaced moderately strong spines; ventral surface with few small spinulose tubercles accompanied by tufts of setae and transverse row of long setae at midlength. Ischium (Fig. 16D, E) with very small tubercles on ventromesial margin proximally; ventrolateral distal angle with small spine.

Ambulatory pereopods (Fig. 17A, C) moderately long, left second pereopod overreaching tip of left cheliped by nearly half length of dactyl. Dactyls 1.3–1.4 times longer than propodi; dorsal surfaces slightly protuberant, with row of short to moderately long stiff setae and row of corneous spinules (spinules more numerous in third than in second); lateral faces with few short setae dorsally; mesial faces each with row of small corneous spinules (spinules more numerous in third than in second) (Fig. 17B, D); ventral margin each with 8–10 corneous spines. Propodi distinctly longer than carpi; dorsal surfaces slightly protuberant, with widely-spaced tufts of long setae; lateral and mesial faces with few stiff setae ventrally; ventral surfaces with sparse long setae and 1 subdistal corneous spinule in second, unarmed in third, ventrodistal margins each with 1 corneous spinule. Carpi slightly protuberant on dorsal surfaces, with row of widely-spaced stiff setae and moderately small dorsodistal spine on second, unarmed on third; lateral faces with few tufts of stiff setae dorsally; mesial faces nearly naked; ventral surfaces with few stiff setae. Meri with widely-separated tufts of stiff setae on dorsal surfaces; lateral surfaces with 1 tufts of setae distally, mesial surfaces naked; ventral surfaces of second pair each with small spine and row of low protuberances accompanied by tufts of setae, those of third pair only slightly protuberant, with row of tufts of stiff setae. Ischia unarmed, but with tufts of stiff setae dorsally and ventrally.

Fourth pereopods (Fig. 14B) semichelate. Dactyl weakly curved, terminating in small corneous claw; ventral margin with row of small corneous teeth, without preungual process. Propodus with weakly convex ventral margin, propodal rasp composed of single row of corneous scales; dorsal margin with tufts of long setae distally. Carpus with tufts of stiff setae on dorsal surface.

Fifth pereopod chelate; palm not inflated. Right coxa (Fig. 14C) with long, filamentous sexual tube, orientated from left to right across ventral body surface, strongly coiled in distal part (Fig. 14D). Left coxa (Fig. 14C) with short sexual tube directed posteromesially.

Anterior margin of third thoracic sternite straight, unarmed. Anterior lobe of sixth thoracic sternite (Fig. 14E) subsemicircular, anterior margin with numerous long setae. Eighth thoracic sternite (Fig. 14C) with 2 rounded, distinctly separated lobes, each with setae on anteroventral margin.

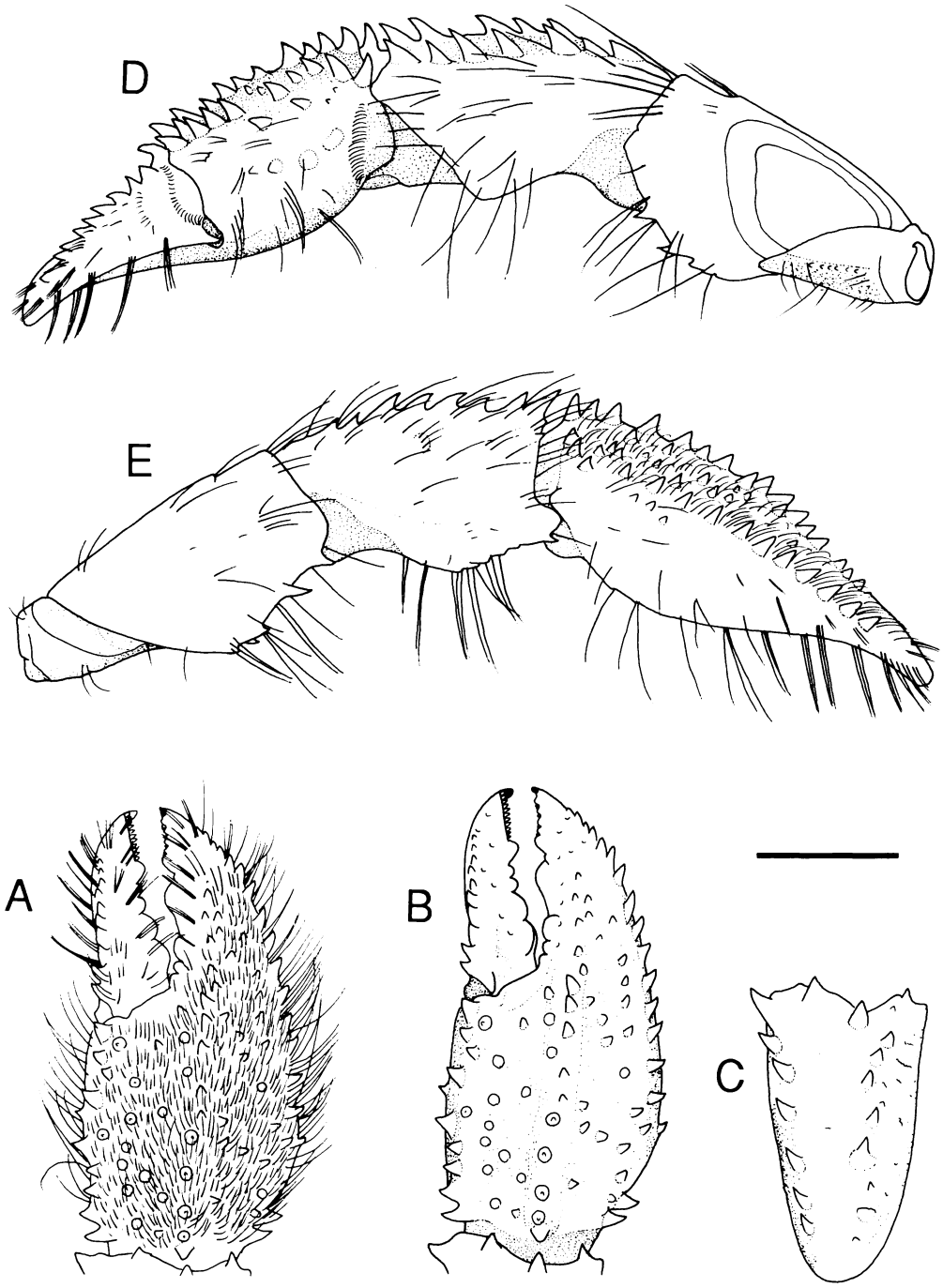

Fig. 18. *Nematopagurus pilosus* sp. nov. Paratype female (CBM-ZC 4751; sl 2.3 mm) from Muko-jima Island. A, chela of right cheliped, dorsal; B, same, setae omitted; C, carpus of right cheliped, dorsal, setae omitted; D, right cheliped, mesial, setae partially omitted; E, same, lateral, setae partially omitted. Scale bar indicates 1 mm.

Abdomen with 3 unpaired, unequally biramous pleopods in males; second and third pleopods each with exopodite elongate, approximately twice length of endopodite; fourth pleopod with exopod about 4 times longer than protopodite, endopodite rudi-

mentary. Uropods strongly asymmetrical.

Telson (Fig. 14F) with distinct lateral indentations; anterior lobes slightly narrower than posterior lobes; latter slightly unequal, separated by distinct median cleft; terminal margins oblique, each with row of 4 moderately strong spines and insterspersed tiny spinules; lateral margins forming thin plate.

Description of paratypes. In general, the paratypes are similar to the holotype.

Chelipeds subequal, right slightly longer and stouter than left. Right cheliped (Fig. 18A–E) relatively stout. Chela stout, about 2.0 times longer than broad. Dactyl (Fig. 18A, B, D) slightly shorter than palm; cutting edge with row of strong calcareous teeth in proximal 0.7 and row of small corneous teeth in distal 0.3, terminating in small corneous claw; flat dorsal surface unarmed, but with tufts of stiff setae and numerous setae proximally, dorsomesial margin with row of moderately strong spines, becoming weaker distally; mesial surface with 2 rows of tufts of moderately long setae; ventral surface with row of tufts of long setae. Palm (Fig. 18A, B, D, E) about 1.8 times longer than carpus; dorsal surface convex, with 5 irregular rows of moderately small to strong spines, median row extending onto fixed finger, and generally obscured by dense pulmose setae, becoming noticeably longer laterally (surface adjacent to dorsomesial margin with few setae); dorsomesial margin with row of strong spines; dorsolateral margin generally convex, with row of strong spines, extending nearly to tip of fixed finger and tufts of long setae; mesial face with row of few spines near dorsomesial margin and row of low protuberances, accompanied by tufts of setae; lateral face with short row of small spines near dorsolateral margin and few tufts of setae; ventral surface moderately well inflated, with scattered tufts of long setae. Cutting edge of fixed finger (Fig. 18A, B) with row of strong calcareous teeth in proximal 0.7 and row of small calcareous teeth, interspersed by few small corneous teeth, in distal 0.3, terminating in tiny corneous claw. Carpus (Fig. 18C–E) almost as long as merus; dorsodistal margin with 3 strong spines; dorsomesial and dorsolateral margin each with row of strong spines, accompanied by tufts of stiff setae, dorsal surface unarmed, naked; lateral and mesial surfaces with scattered low protuberances, accompanied by short row or tufts of stiff setae, distal margins unarmed; ventrolateral margin protuberant, with 1 spine at ventrolateral distal angle; ventral surface with scattered tufts of long setae. Merus (Fig. 18D, E) with few low protuberances accompanied by row of stiff setae distally on dorsal surface, dorsodistal margin unarmed, but with row of stiff setae; lateral surface with few tufts of stiff setae, ventrolateral margin with 3 moderately strong spines distally; mesial surface with few stiff setae, ventromesial margin with row of 2 moderately strong spines distally; ventral surface with few small spinulose tubercles accompanied by tufts of setae. Ischium (Fig. 18D, E) with few very small tubercles on ventromesial margin proximally; ventrolateral distal angle with spinule.

Abdomen with paired first pleopods in females (Fig. 14G); distal segment slightly shorter than basal segment, with marginal setae. Four unpaired pleopods on second to fifth somites in females; second to third pleopods with both rami rami well developed, exopods longer and slenderer than endopods; fifth pleopod with elongate exopod and rudimentary endopod, protopodite very short.

Terminal margins of telson (Fig. 14H) with 2–4 moderately strong spines.

Coloration (in preservative). Shield reddish brown (paler centrally). Ocular peduncle pale reddish brown generally, with distinct band of dark reddish brown proximally. Antennular peduncle entirely pale color. Antennal flagellum banded with reddish brown. Ground color of chelipeds pale reddish brown, with markings or tinge of dark reddish brown; dactyls with transverse bands subdistally; mesial surface of dactyls with short longitudinal stripe proximally; palms with tinge of reddish brown on ventral surfaces, spines on dorsal surface dark reddish brown; carpi with tinge of dark reddish brown on all surfaces; meri with 3 longitudinal stripes on each lateral and mesial surfaces. Dactyls of ambulatory pereopods generally pale purple, with reddish brown band at about distal 0.2, subdistal part between band and corneous claw colorless; pro-

podi, carpi, meri and ischia each with longitudinal stripes of reddish brown on white back ground on lateral surfaces; propodi with 3 stripes, dorsal and ventral bands interrupted at about midlength of propodi; dorsal and ventral margins of propodi reddish brown; carpi with five stripes; meri with four stripes, dorsal and ventral stripes interrupted at about midlength, ventral surface white; ischia with three stripes.

Distribution. So far known only from the Ogasawara Islands, at depths of 68–99 m.

Habitat. Gasropod shells.

Etymology. From the Latin, *pilosus* (= hairy), and referring to the heavily hairy chelae of this species.

Remarks. The presence of irregular rows of spines on the cheliped palms links *N. pilosus* to *N. muricatus* Alcock, 1905, *N. spinulosensoris* McLaughlin and Block, 1974, *N. lewinsohni* Türkay, 1986, and *N. holthuisi* McLaughlin, 1998, but the extremely dense setation of the palms of the chelipeds immediately distinguish the new species from the four relatives. The strongly produced lateral projections of the shield, which exceed the rostrum, will separate the new species from *N. muricatus* and *N. lewinsohni*. Spines on the palms are generally much stronger in the new species than those in *N. spinulosensoris*, *N. lewinsohni* and *N. holthuisi*. Additionally, the antennal acicle reaches only the base of the conea in *N. pilosus*, rather than reaching distal margin of the cornea in *N. muricatus*.

Nematopagurus shinnyoae sp. nov.
(Figs. 19–22)

Material examined. SY97, st 13; off Chichijima Island, Ogasawara Islands, 151–154 m; holotype, female (sl 1.4 mm); CBM-ZC 4754.–Same station; paratype, male (sl 1.4 mm); CBM-ZC 4755.–SY97, st 14; off Chichi-jima Island, 151 m; paratype, male (sl 1.2 mm); CBM-ZC 4756.–SY97, st 26; off Torishima Island, 95-185 m; holotype, ovig. female (cl 1.9 mm); CBM-ZC 4765.

Description of holotype (female). Eleven pairs of biserial branchiae.

Shield (Fig. 19A) broader than long; anterolateral margins sloping; anterior margin between rostrum and lateral projections slightly concave; posterior margin truncate; dorsal surface with tufts of long setae generally circumscribing gastric region. Rostrum very obtusely and roundly triangular, reaching level of lateral projections. Lateral projections obscure, unarmed. Accessory portions of carapace moderately narrow, each with 1 tuft of short setae. Posterior carapace with few scattered tufts of short setae; posteromedian plate not strongly calcified, with pair of tufts of short setae anteriorly; cardiac sulci extending nearly to posterolateral margin of carapace; sulci cardiobranchiales not discernible.

Ocular peduncles (Fig. 19A) 0.8 times as long as shield; dorsal surfaces each with sparse tufts of stiff setae mesially and 1 tuft of longer, fine setae at base of cornea; cornea not noticeably dilated, width about 0.2 peduncular length. Ocular acicles small, triangular, terminating acutely, with prominent submarginal spine; dorsal surface concave; separated basally by width of more than 1 acicle.

Antennular peduncles (Fig. 19A) overreaching distal margin of corneas by 0.3–0.4 length of ultimate segment. Ultimate segment moderately slender, 1.7 times longer than penultimate segment, with 1 subterminal setae. Basal segment with well developed, setose distolateral lobe; statocyst-bearing lateral lobe with small spine.

Antennal peduncles (Fig. 19A) reaching distal margins of corneas by distal margin of fifth segment; with supernumerary segmentation. Fifth and fourth segments with few tufts of short stiff setae. Third segment with few setae on mesial surface, ventromesial distal angle unarmed. Second segment with dorsolateral distal angle produced, reaching to midlength of fourth segment, terminating in simple spine; dorsomesial distal angle with small spine. First segment unarmed laterally; ventrodistal margin produced, armed with 2 small spinules. Antennal acicle moderately long, slightly overreaching midlength of fifth segment, arcuate, terminating in acute spine; mesial margin row of tufts of moderately long setae. Antennal flagellum very long; each article with very short setae on distal margin.

Mouthparts generally similar to those of *N. pilosus*. Third maxilliped (Fig. 19B) with basis and ischium partially fused; ischium

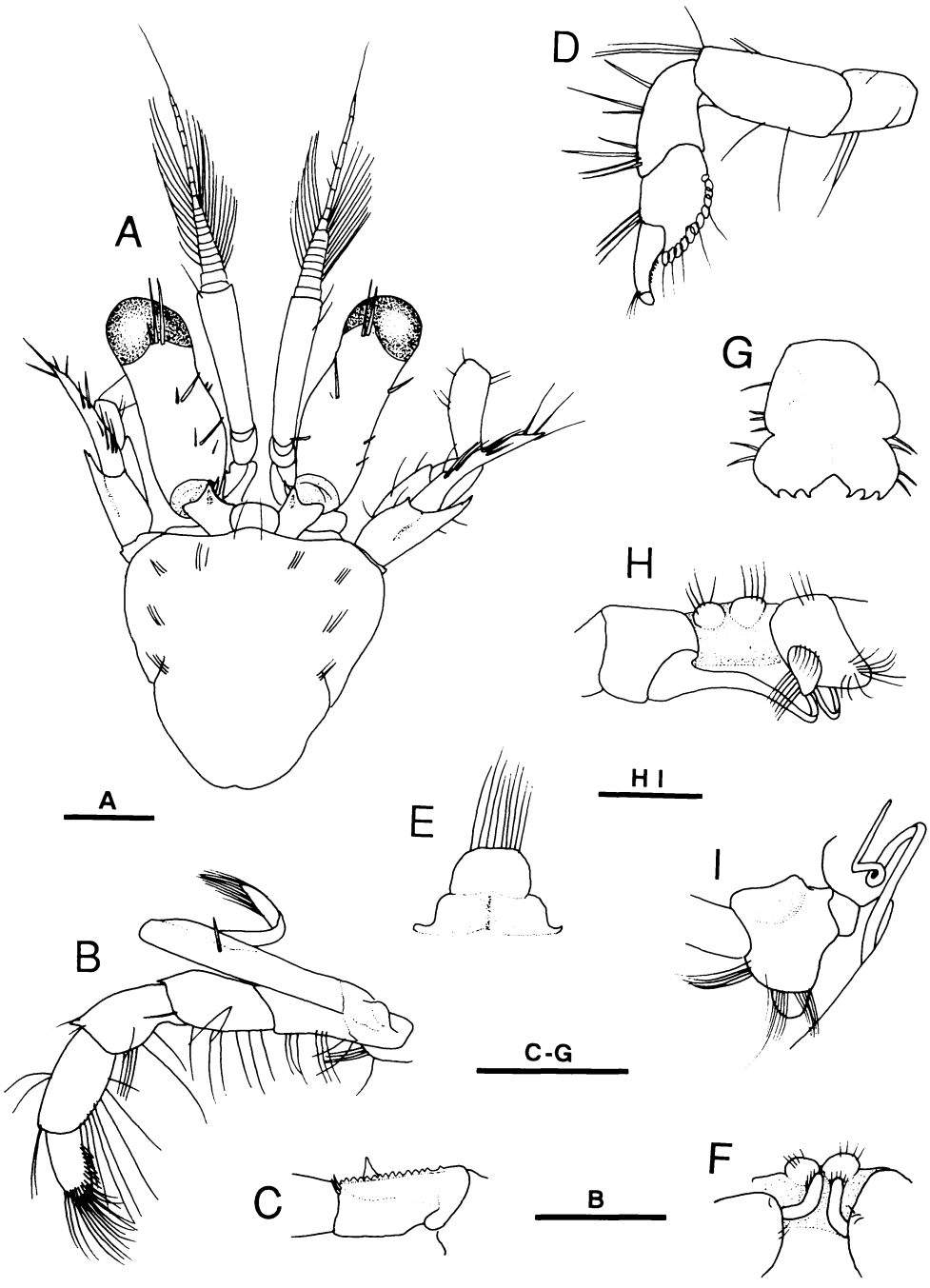

Fig. 19. *Nematopagurus shinnyoae* sp. nov. A–G, holotype female (CBM-ZC 4754; sl 1.4 mm) from Chichi-jima Island, Ogasawara Islands; H, I, paratype male (CBM-ZC 4755; sl 1.4 mm) from same locality. A, shield and cephalic appendages, dorsal; B, left third maxilliped, lateral; C, same, ischium, dorsomesial; D, left fourth pereopod, lateral; E, sixth thoracic sternite, ventral; F, eighth thoracic sternite and first pleopods, ventral; G, telson, dorsal; H, coxae of fifth pereopods and eighth thoracic sternite, ventral; I, left coxa of fifth pereopod and distal part of right sexual tube, lateral. Scale bars indicate 0.5 mm.

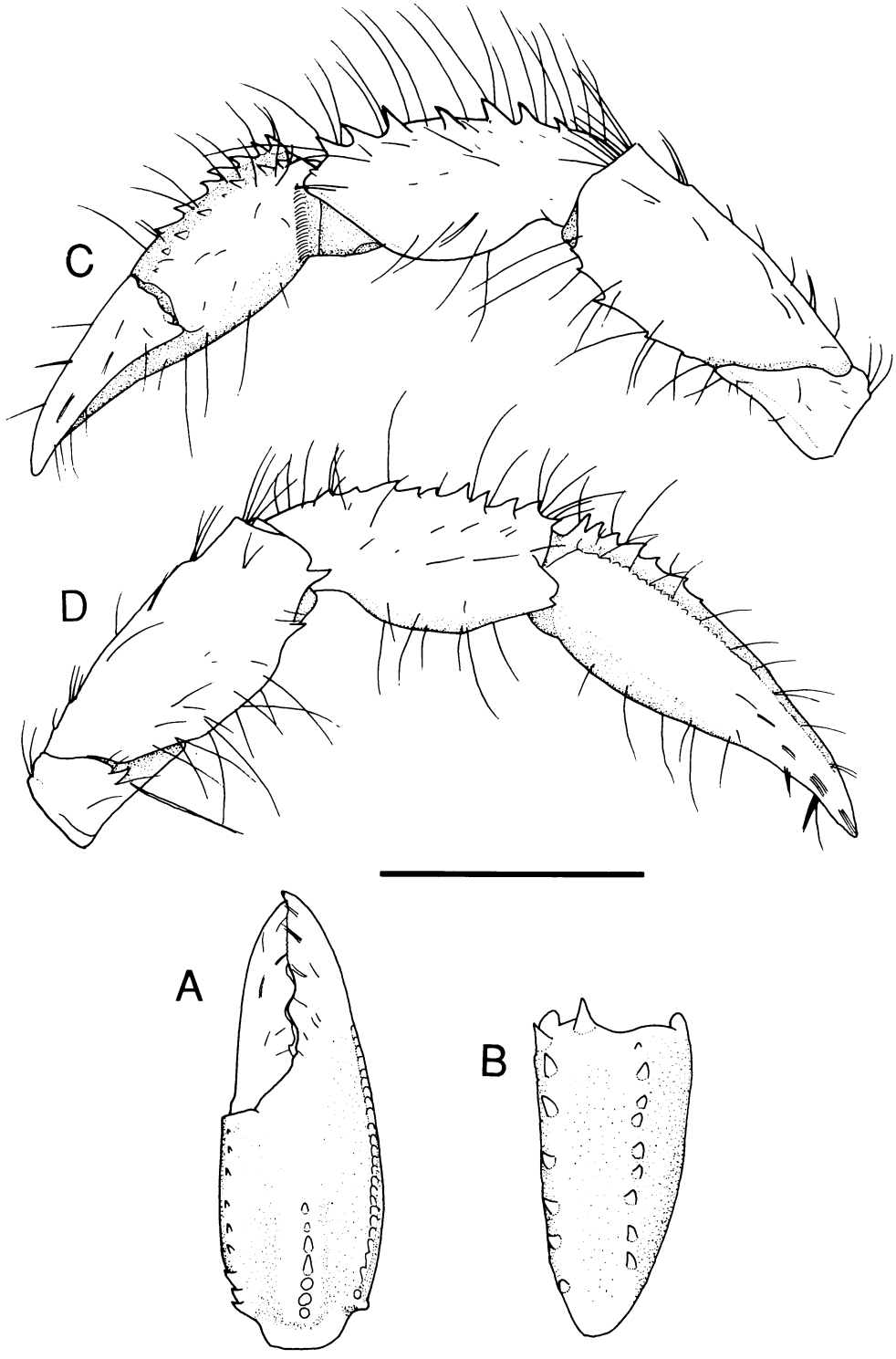

Fig. 20. *Nematopagurus shinnyoae* sp. nov. Holotype female (CBM-ZC 4754; sl 1.4 mm) from Chichi-jima Island, Ogasawara Islands. A, right chela, dorsal, setae omitted; B, carpus of right cheliped, dorsal, setae omitted; C, right cheliped, mesial; D, same, lateral. Scale bar indicates 1 mm.

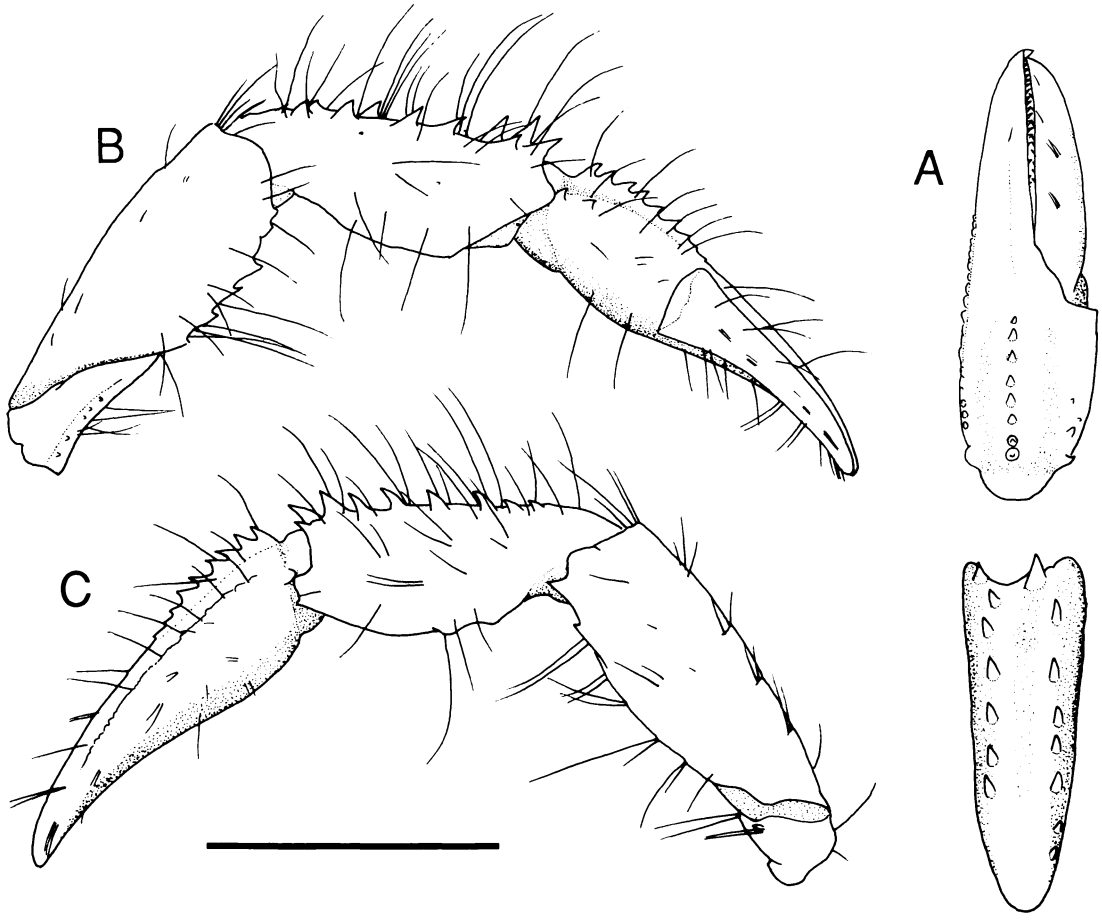

Fig. 21. *Nematopagurus shinnyoae* sp. nov. Holotype female (CBM-ZC 4754; sl 1.4 mm) from Chichi-jima Island, Ogasawara Islands. A, chela and carpus of left cheliped, dorsal, setae omitted; B, left cheliped, mesial; C, same, lateral. Scale bar indicates 1 mm.

(Fig. 19C) with well developed crista dentata, composed of row of small corneous teeth, and 1 strong accessory tooth; merus with small spine on dorsodistal margin, ventromesial margin unarmed; carpus with small spine on dorsodistal margin; exopod overreaching distal margin of merus.

Right cheliped (Fig. 20A–D) somewhat stouter and longer than left. Chela slender, 2.7 times longer than broad. Dactyl (Fig. 20A, C) almost as long as palm; cutting edge with 3 broad calcareous teeth in proximal 0.6 and row of small corneous teeth in distal 0.4, terminating in small corneous claw, slightly overlapped by fixed finger; dorsal surface slightly convex, without delineation of dorsomesial margin, with tufts of moderately long stiff setae; mesial and ventral surfaces unarmed, but with scattered tufts of moderately long setae. Palm (Fig. 20A, C, D) distinctly shorter than carpus; dorsomesial margin with row of small spines and tiny tubercles; dorsal surface slightly convex, with 4 rows of tufts of long setae, midline with longitudinal row of small spines in proximal half; dorsolateral margin distinctly delineated by row of small tubercles, extending to half length of fixed finger, and sparse tufts of long setae; lateral, mesial, ventral faces unarmed, but with scattered tufts of short to long setae. Cutting edge of fixed finger (Fig. 20A) with 2 low, broad calcareous teeth in proximal 0.7 and row of small calcareous teeth interspersed by few small corneous teeth in distal 0.3, terminating in small corneous claw. Carpus (Fig. 20B–D) about as long

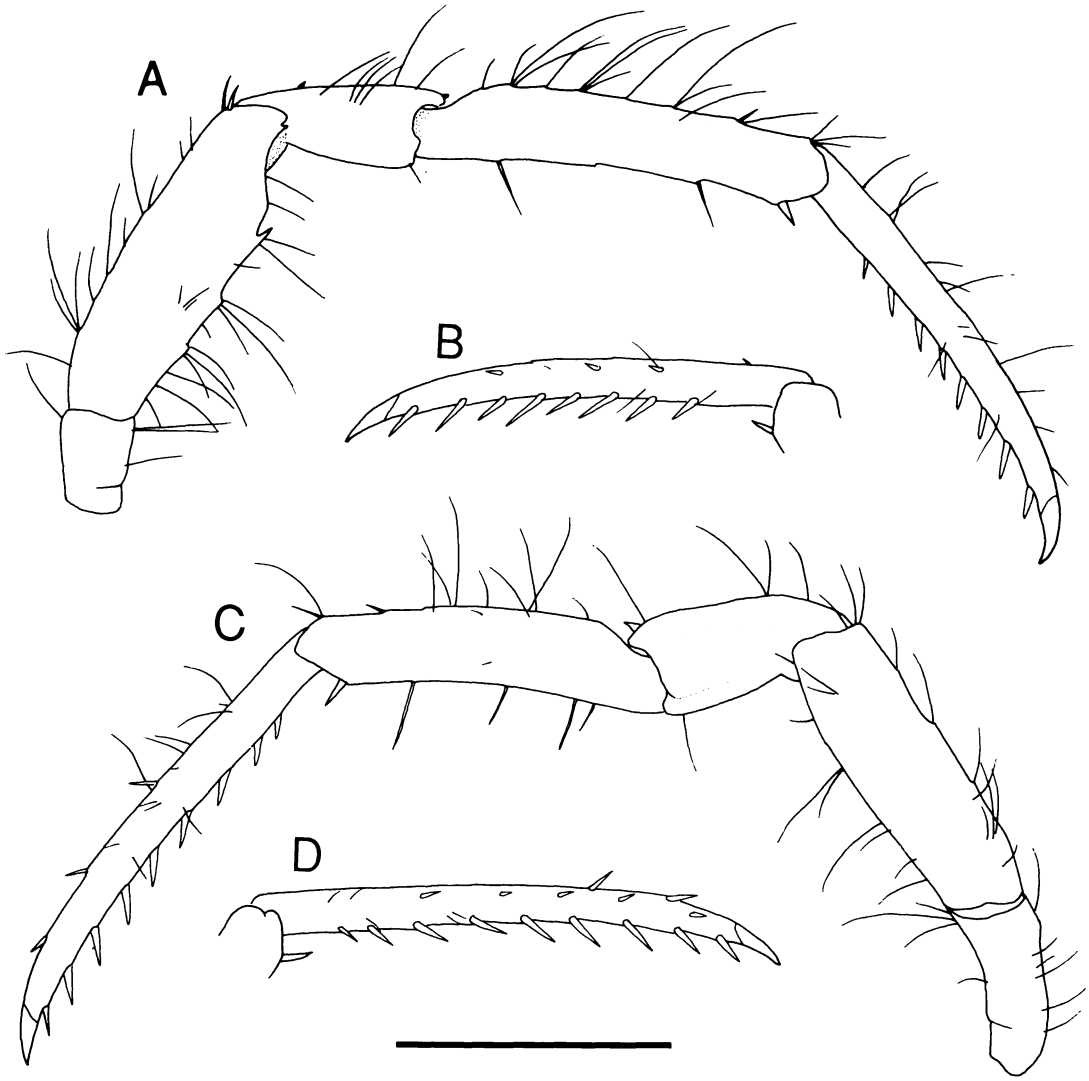

Fig. 22. *Nematopagurus shinnyoae* sp. nov. Holotype female (CBM-ZC 4754; sl 1.4 mm) from Chichi-jima Island, Ogasawara Islands. A, right second pereopod, lateral; B, same, dactyl, mesial, setae partially omitted; C, left third pereopod, lateral; D, same, dactyl, mesial, setae partially omitted. Scale bar indicates 1 mm.

as merus; dorsodistal margin with 1 prominent spine, dorsomesial and dorsolateral margins each with row of moderately strong spines and tufts of long setae; dorsal surface with few scattered long setae; lateral and mesial surfaces with stiff setae, ventrolateral margin with small spine distally; ventral surface unarmed, but with scattered tufts of long setae. Merus (Fig. 20C, D) with transverse rows of short stiff setae on dorsal surface, dorsodistal margin unarmed, but with row of setae; lateral surface with long stiff setae dorsally and ventrally, ventrolateral margin with 2 strong spines distally; mesial surface with row of stiff setae dorsally, ventromesial margin with row of 5 small spines; ventral surface with few low protuberances and tufts of long setae. Ischium (Fig. 20C, D) unarmed on ventromesial margin; ventrolateral distal angle with 1 small spine. Coxa unarmed.

Left cheliped (Fig. 21A–C) overreaching midlength of dactyl of right cheliped, slender. Chela slender, 3.3 times longer than broad.

Dactyl (Fig. 21A, B) 1.4 times longer than palm; cutting edge with row of small corneous teeth, terminating in small corneous claw; rounded dorsal surface with rows of widely-spaced tufts of setae; mesial and ventral surfaces with tufts of long setae. Palm (Fig. 21A–C) about half length of carpus; dorsomesial margin not delineated, but with 1 prominent spine proximally; dorsal surface with longitudinal row of moderately small spines in slightly elevated midline, not extending onto fixed finger; dorsal surface laterad of midline not noticeably rugose, dorsolateral margin with row of very small tubercles or spinules, extending to midlength of fixed finger; all surfaces with scattered long setae. Cutting edge of fixed finger (Fig. 21A) with row of small corneous teeth, terminating in small corneous claw. Carpus (Fig. 21A–C) nearly as long as merus; dorsodistal margin with 2 prominent spines; dorsomesial and dorsolateral margin each with row of strong spines and tufts of long setae, dorsal surface unarmed, with tufts of long setae; lateral, mesial and ventral surfaces unarmed, but with short transverse rows or tufts of long setae; ventrolateral margin with 1 small spine distally. Merus (Fig. 21B, C) with short transverse ridge accompanied by row of setae, slightly extending on lateral surface, dorsodistal margin unarmed; lateral surface with few setae, ventrolateral margin with 2 strong spines distally; mesial surface with row of long setae ventrally, ventromesial margin with row of 5 small spines; ventral surface with scattered tufts of long setae. Ischium (Fig. 21B, C) with tiny spinules on ventromesial margin; ventrolateral distal angle with small spine. Coxa unarmed.

Ambulatory pereopods (Fig. 22A, C) elongate, right second pereopod overreaching tip of right cheliped by nearly half length of dactyl. Dactyls 1.2–1.5 times longer than propodi; dorsal surfaces each with row of short to moderately long setae and few small corneous spinules (second) or row of slender corneous spinules (third); lateral faces with row of setae dorsally; mesial faces (Fig. 22B, D) each with row of small corneous spinules (3 in second, 5 or 6 in third); ventral margin each with 8–10 corneous spines. Propodi distinctly longer than carpi; dorsal surfaces slightly protuberant, with tufts of long setae; lateral and mesial faces with few scattered short setae; ventral surfaces with sparse long setae and 1 small subdistal corneous spine in second, unarmed in third; ventrodistal margins with 1 corneous spine. Carpi each with small dorsodistal spine and tufts of long setae, second pair bearing 1 additional spine arising from proximal 0.3; lateral faces with short oblique row of setae; mesial faces with few short setae; ventral surfaces with row of few long setae. Meri with tufts of setae on dorsal surfaces; lateral and mesial faces with few short setae; ventral surfaces of second pair each with small spine at distolateral angle and 1 additional spine arising from distal 0.3 length, those of third pair unarmed. Ischia unarmed, with tufts of setae dorsally and ventrally. Paired gonopores on coxae of third pereopods.

Fourth pereopods (Fig. 19D) semichelate. Dactyl weakly curved, terminating in small corneous claw; cutting edge with row of small corneous teeth, without preungual process. Propodus with convex ventral margin, propodal rasp composed of single row of corneous scales; dorsal margin with tufts of long setae distally. Carpus with numerous tufts of setae on dorsal surface.

Fifth pereopod chelate; palm somewhat inflated. Coxae large, ventral surface flattened.

Anterior margin of third thoracic sternite straight, unarmed. Anterior lobe of sixth thoracic sternite (Fig. 19E) subsemicircular, anterior margin with numerous long setae. Eighth thoracic (Fig. 19F) sternite with 2 rounded, distinctly separated, lobes, each with setae on anteroventral margin.

Abdomen with paired first pleopods (Fig. 19F); distal segment slightly longer than basal segment, with short setae on margins. Four unpaired pleopods on second to fifth somites; second to third pleopods with both rami rami well developed, exopodites longer and slenderer than endopodites; fifth pleopod with elongate exopodite and rudimentary endopodite, protopodite very short. Uropods strongly asymmetrical.

Telson (Fig. 19G) with distinct lateral indentations; anterior lobes slightly narrower than posterior lobes; latter slightly unequal, separated by small median cleft; terminal

margins rounded, each with 3 moderately strong spines; lateral margins smooth.

Descriptions of paratypes. The paratypes agree generally with the female holotype.

Ocular peduncles with corneal diameter 0.2–0.3 peduncular length.

Right palm with row of small spines or very small spinules on entire length of dorsomesial margin. Lateral and mesial faces of carpus with single setae or tufts or short vertical rows of stiff setae.

Dactyls of second and third pereopods each with 9–12 corneous spines on ventral margin.

Coxa of right fifth pereopod in males (Fig. 19H) with long, filamentous sexual tube, orientated from left to right across ventral body surface, strongly coiled in distal part (Fig. 23I). Coxa of left fifth pereopod in males (Fig. 19I) with small papilla, partially obscured by tufts of setae.

Abdomen with 3 unpaired, unequally biramous pleopods in males; second and third pleopods with elongate, approximately twice length of endopodites; fourth pleopod with exopod about 4 times longer than protopodite, endopodite rudimentary.

Terminal margins of telson with 3 or 4 small spines, sometimes interspersed with very small spinules; lateral margins of posterior lobe sometimes forming thin plate.

Color (in preservative). Shield and appendages generally pale yellowish brown. Ocular peduncles with red transverse band proximally. Palms of chelipeds with 3 reddish brown stripes on dorsal surface, including dorsolateral stripe; stripe on mesial surface of dactyls continuous with dorsomesial stripe on palm; carpi with 2 (including dorsolateral) stripes on dorsal surfaces, 2 stripes on each lateral and mesial surfaces. Propodi of second and third pereopods each with 1 stripe on dorsal and lateral surfaces; carpi each with 1 lateral stripe on lateral surface; meri each with 1 stripe on lateral surface.

Distribution. So far known only from Chichi-jima Island, Ogasawara Islands, and Torishima Island; at depths of 95–185 m.

Habitat. Gastropod shells.

Etymology. The species is named for the vessel "Shin'yo-maru", on which deep-water sampling expeditions have been carried out in the Izu-Ogasawara Islands.

Remarks. In the armature of the chelipeds and the shape of the ocular peduncles, the new species most closely resembles *N. kosiensis* McLaughin, 1998, from South Africa. However, *N. shinnyoae* differs from *N. kosiensis* in the shorter antennular peduncles and the armature of the telson. The antennular peduncle overreaches the distal margin of the cornea only by 0.3–0.4 length of the ultimate segment in *N. shinnyoae*, while in nearly 0.8 length in *N. kosiensis*. In the new species, the terminal margins of the telson are armed with three or four strong acute spines with few interspersed small additional spinules; and the lateral margins of the posterior lobes of telson is smooth. While in *N. kosiensis*, the terminal margins are armed with row of moderately strong calcareous spines interspersed with smaller spines; the lateral margins of the posterior lobes are spinose.

There is also superficial similarity between *N. shinnyoae* and *N. longicornis* A. Milne Edwards and Bouvier, 1892, from the Atlantic and *N. alcocki* McLaughlin, 1997, recently described from Indonesia. The armature of the chelipeds is very similar in the three species, but the stout ocular peduncles with strongly dilated corneas immediately distinguishes the latter two species from *N. shinnyoae.*

Genus *Pagurus* Fabricius, 1775

Remarks. Pagurus is the "catch-all" genus for any hermit crab having 11 pairs of biserial phyllobranchiate gills, but lacking secondary sexual modifications or similar exclusive characters, as such is the most specious, albeit heterogeneous, of all pagurid genera (McLaughlin, 1997). The taxonomy of the members of the genus in the northwest Pacific still remains in need of considerable study, though several points of confusion have been clarified by recent studies (Sandberg and McLaughlin, 1993; McLaughlin and Forest, 1997; McLaughlin and de Saint Laurent, 1998; Komai, 1996; 1997; 1998; 1999; Komai and Imafuku, 1996; Komai and Yu, 1999). The distinctive new species described in this study is only provisionally assingned to *Pagurus*. Future study may eventually prove that the species belongs in a separate genus.

Pagurus lophochela sp. nov.
(Figs. 23–26)

Material examined. SY97, st 3; Muko-jima Island, Ogasawara Islands, 64–66 m; holotype, male (sl 1.7 mm); CBM-ZC 4752.–Same locality; paratypes, 1 male (sl 1.7 mm), 1 young female (sl 1.2 mm); CBM-ZC 4753.–SY 97, st 2; off Muko-jima Island, 68–70 m; paratype, 1 female (sl 1.7 mm); CBM-ZC 4750.

Description of holotype (male). Eleven pairs of biserial phyllobranchiae.

Shield (Fig. 23A) 1.2 times as long as broad; anterior margin between rostrum and lateral projections weakly concave; anterolateral margins sloping; posterior margin slightly emarginate; dorsal surface with few short setae laterally. Rostrum broadly triangular, distinctly overreaching lateral projections, terminating in very small spinule, with pair of short setae dorsally. Lateral projections weak, with small submarginal spine. Interocular lobe not visible from dorsal view. Posterior carapace with accessory portions very narrow; cardiac sulci nearly parallel anteriorly, extending posteriorly along posterior margin of carapace; posteromedian plate not calcified, with pair of short setae; sulci cardiobranchiales not discernible; branchial region membraneous, with few setae.

Ocular peduncles (Fig. 23A) 0.77 times as long as shield, moderately stout, noticeably inflated basally; corneas slightly dilated; dorsal surface with 2 tufts of short setae mesially, mesial surface with short bristle at about midlength. Ocular acicles subtriangular with rounded apex, bearing small submarginal spine; separated basally by slightly less than basal width of 1 acicle.

Antennular peduncles (Fig. 23A) overreaching distal margin of corneas by half length of ultimate segment. Ultimate segment moderately slender, 1.8 times longer than penultimate segment, with tuft of long setae distally and row of very short setae on dorsal surface. Basal segment with well-developed, somewhat elongate distolateral lobe; statocyst-bearing lateral lobe armed with acute spine.

Antennal peduncles (Fig. 23A) not reaching distal margin of corneas, with supernumerary segmentation. Fifth and fourth segments with few short setae. Third segment with spinule at ventromesial distal angle, partially obscured by tufts of setae. Second segment with dorsolateral distal angle produced, terminating in simple spine; dorsomesial distal angle with small spine; mesial surface with few short setae. First segment unarmed on laterodistal margin; ventromesial distal margin produced, with small spinule. Antennal acicles moderately long, nearly reaching midlength of fifth segment, arcuate, terminating in acute spine, with tufts of long setae obscuring terminal spine. Antennal flagellum long, with articles bearing short bristles or setae on each distal margin.

Maxillule with external lobe of endopod (Fig. 23B) elongate, not recurved; internal lobe weakly produced, with 1 apical bristle. Third maxilliped (Fig. 23C) with ischium and basis partially fused; carpus unarmed on dorsodistal margin; merus with small spine on dorsodistal margin, ventromesial margin unarmed; ischium (Fig. 23D) with crista dentata composed of small corneous teeth and 1 strong accessory tooth; exopod long, overreaching distal margin of merus.

Right cheliped (Fig. 24A–D) with chela 2.0 times longer than broad; slight degree of angle of propodal-carpal articulation. Dactyl (Fig. 24A, C) slightly shorter than palm; cutting edge with 3 strong calcareous teeth and 1 much smaller calcareous tooth in proximal 0.8 and row of small corneous teeth in distal 0.2, terminating in small corneous claw; slightly overlapped by fixed finger; dorsal surface with distinct, spinulose carina extending nearly to tip, dorsomesial margin with row of small spines or spinulose tubercles; mesial and ventral surfaces unarmed, with long setae. Palm (Fig. 24A, C, D) about 0.6 times as long as carpus; dorsomesial margin crested and armed with single row of small blunt spines or tubercles; dorsal surface minutely granular, faintly elevated longitudinally proximal to base of dactyl, and in midline, extending onto fixed finger (adjacent to cutting edge), with row of sparse small tubercles on ridges; dorsolateral margin (including fixed finger) strongly convex, noticeably elevated and crested, with row of small, often blunt, spines; lateral sur-

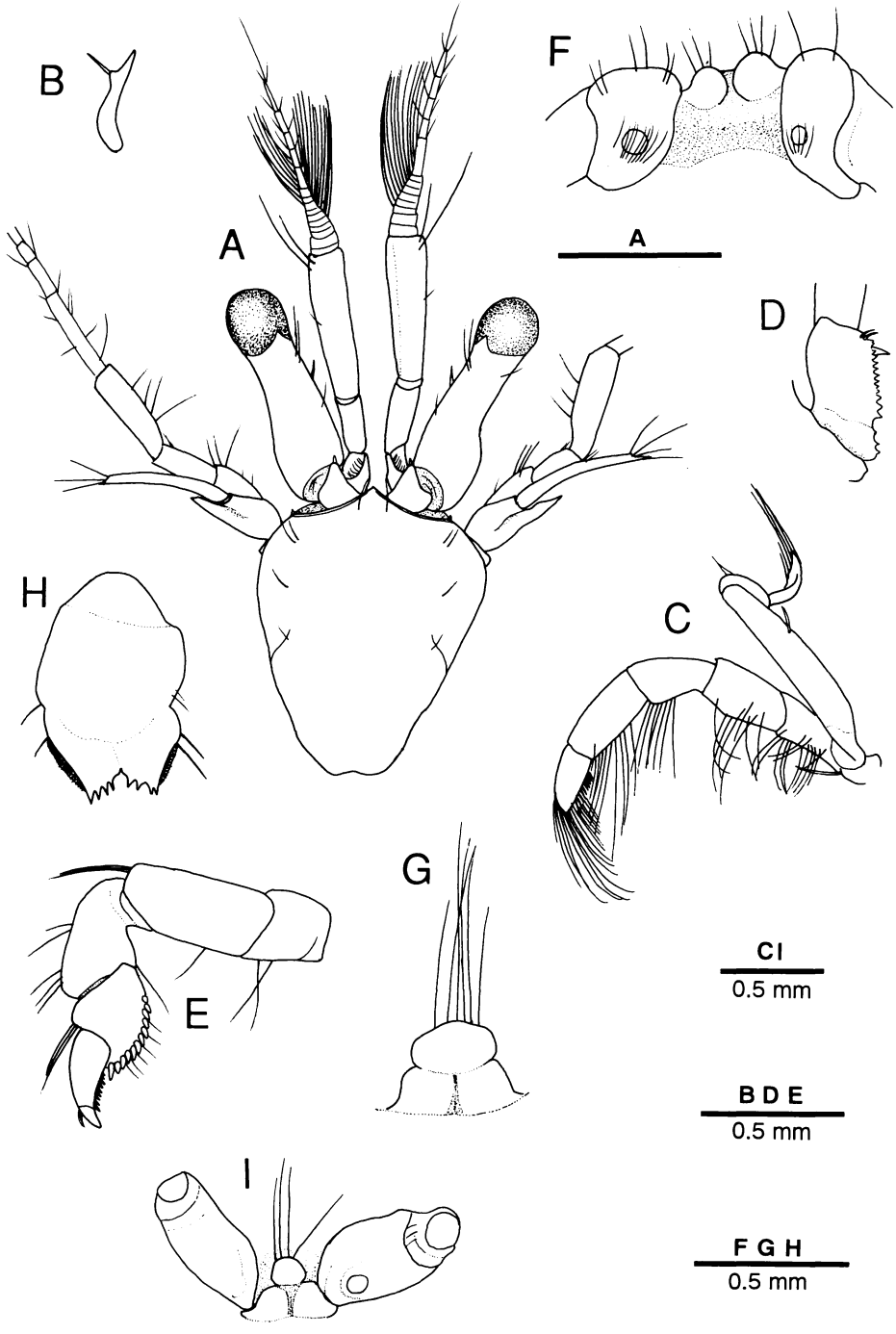

Fig. 23. *Pagurus lophochela* sp. nov. A–H, holotype male (CBM-ZC 4752; sl 1.7 mm) from Muko-jima Island, Ogasawara Islands; I, paratype female (CBM-ZC 4750) from similar locality. A, shield and cephalic appendages, dorsal; B, endopod of left maxillule, lateral; C, left third pereopod, lateral; D, same, ischium, dorsomesial; E, left fourth pereopod, lateral; F, coxae of fifth pereopods and eighth thoracic sternite, ventral; G, sixth thoracic sternite, ventral; H, telson, dorsal; I, coxae of third pereopods, ventral.

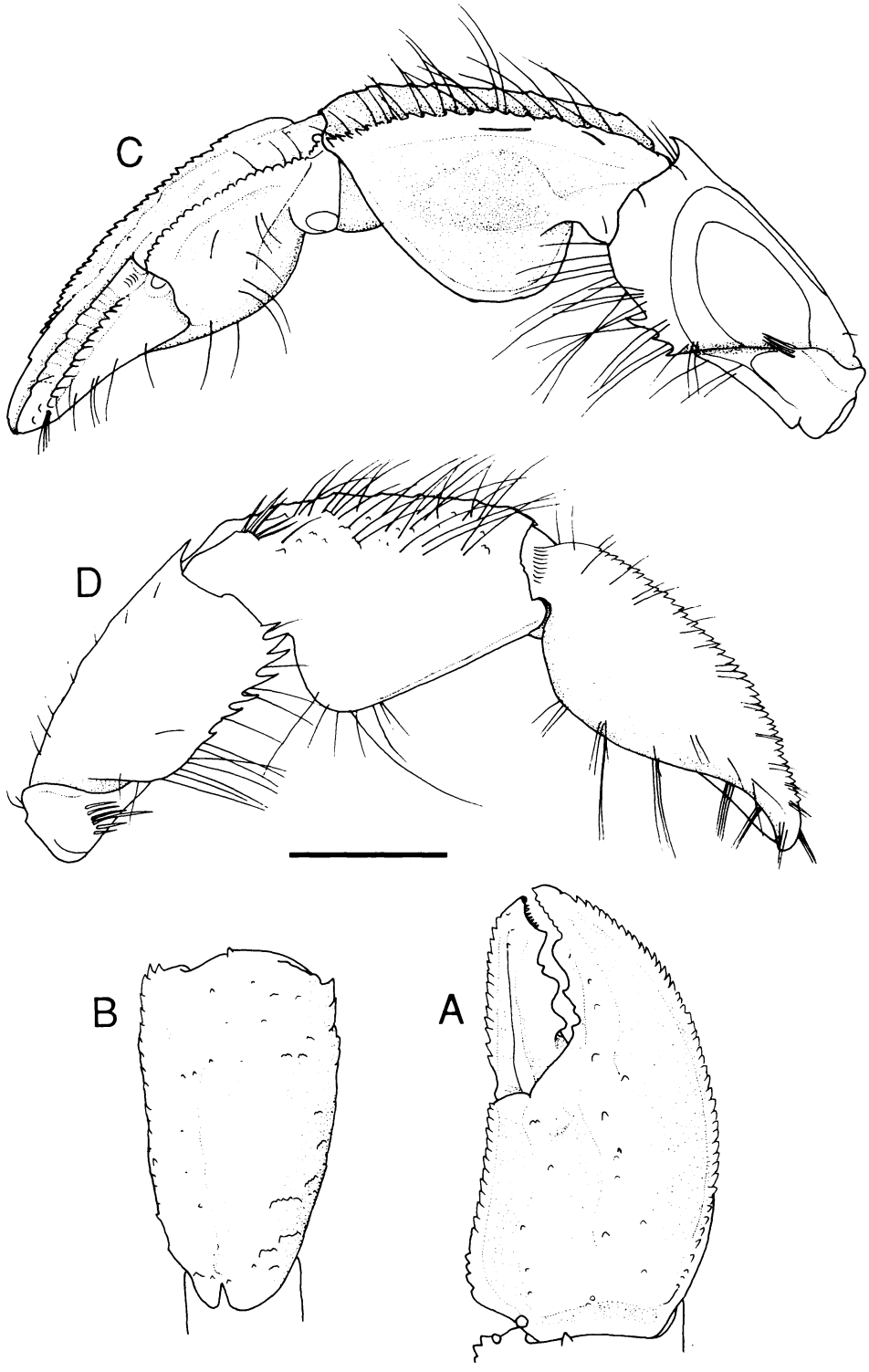

Fig. 24. *Pagurus lophochela* sp. nov. Holotype male (CBM-ZC 4752; sl 1.7 mm) from Muko-jima Island, Ogasawara Islands. A, right chela, dorsal, setae omitted; B, carpus of right cheliped, dorsal, setae omitted; C, right cheliped, mesial; D, same, lateral. Scale bar indicates 1 mm.

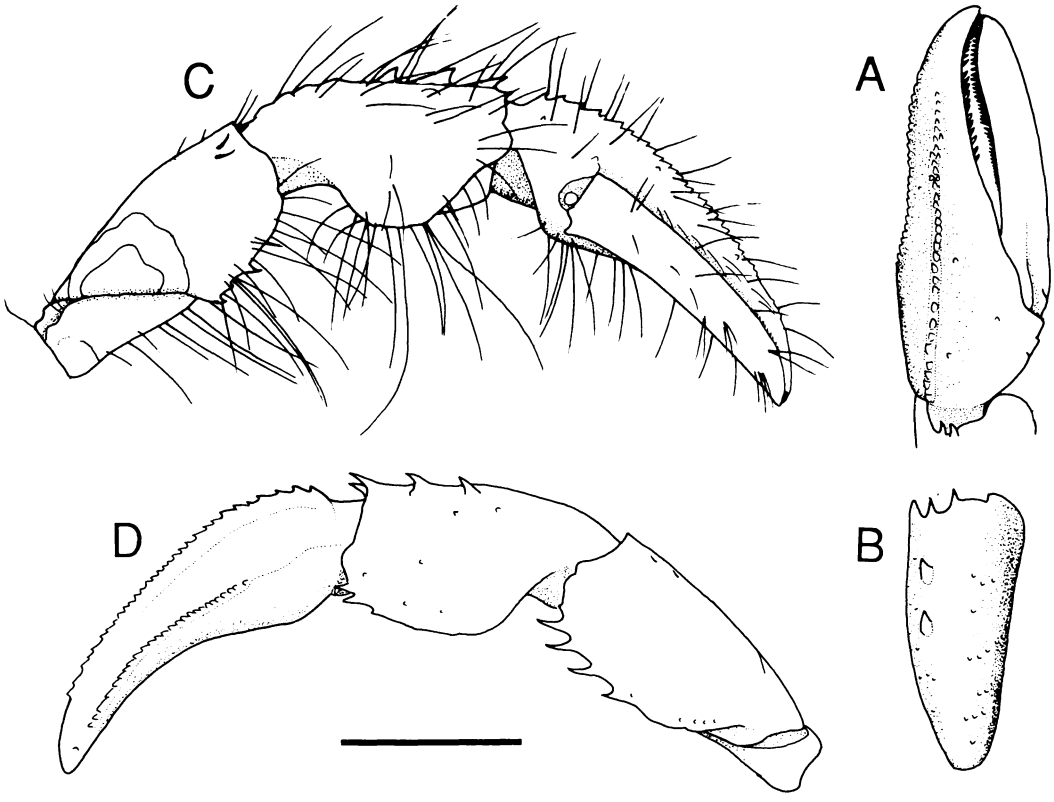

Fig. 25. *Pagurus lophochela* sp. nov. Holotype male (CBM-ZC 4752; sl 1.7 mm) from Muko-jima Island, Ogasawara Islands. A, left chela, dorsal; B, carpus of left cheliped, dorsal; C, left cheliped, mesial; D, same, lateral. Scale bar indicates 1 mm.

face unarmed, but with few tufts of short to moderately long setae; mesial surface concave, unarmed, but with few long setae; ventral surface convex, with tufts of long setae. Cutting edge of fixed finger (Fig. 24A) with row of calcareous teeth of various size in proximal 0.6 and row of very small calcareous teeth in proximal 0.4, terminating in small calcareous claw. Carpus (Fig. 24B–D) distinctly longer than merus; dorsomesial margin sharply delimited, with row of long setae and small spines or spinulose tubercles, becoming obsolete proximally; dorsal surface without delineation of dorsolateral margin, with scattered very small tubercles and low protuberances accompanied by tufts of stiff setae (particularly numerous on lateral part), dorsodistal margin with 1 small spine medially and row of setae; lateral surface naked, unarmed and flattened, ventrolateral margin rather acutely convex, sharply edged, unarmed; mesial surface noticeably concave, with scattered long setae, ventromesial margin strongly convex, sharply edged, unarmed; ventral surface strongly produced and concave, unarmed but with scattered long setae. Merus (Fig. 24C, D) with 1 strong spine at dorsodistal margin; dorsal surface nearly smooth, with few tufts of short setae; lateral and mesial surfaces unarmed, with few setae; ventrolateral margin with row of spines becoming stronger distally and sparse setae; ventromesial margin with row of 3 spines on proximal half, unarmed on distal half, entire margin with row of very long setae; ventral surface concave with few tufts of long setae proximally. Ischium (Fig. 24C, D) without low of spinules on ventromesial margin; mesial surface inflated, with tufts of stiff setae; lateral surface with short oblique row of flattened, scale-like, bristles. Coxa unarmed.

Left cheliped (Fig. 25A–D) with propodal-carpal articulation about 10° from horizontal

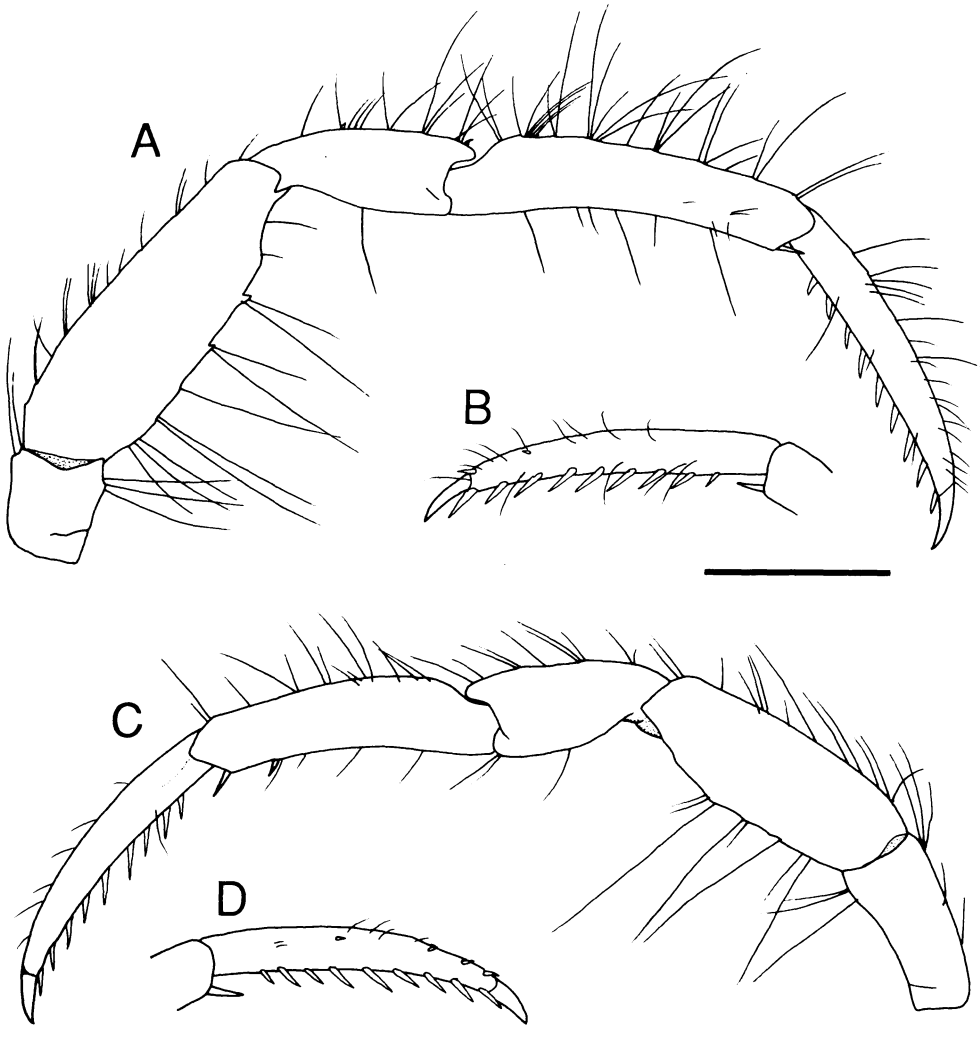

Fig. 26. *Pagurus lophochela* sp. nov. Holotype male (CBM-ZC 4752; sl 1.7 mm) from Muko-jima Island, Ogasawara Islands. A, right second pereopod, lateral; B, same, dactyl, mesial; C, left third pereopod, lateral; D, same, dactyl, mesial. Scale bar indicates 1 mm.

plane. Dactyl (Fig. 16A, C) 2.5 times as long as palm; cutting edge sinuous, with row of small corneous teeth, terminating in small corneous claw; dorsal surface slightly elevated in proximal midline, unarmed, dorsomesial margin not delimited; all surfaces with scattered tufts of moderately short to long setae. Palm and fixed finger (Fig. 25A, C, D) strongly elevated in laterad to midline and bearing row of small spines and setae; dorsolateral face unarmed, dorsolateral margin slightly depressed, with row of small tubercles or spines on fixed finger, unarmed on palm; dorsomesial face with few small tubercles and stiff setae; ventral surface with tufts of long setae. Fixed finger (Fig. 25A, D) weakly curved, thus leaving narrow hiatus between dactyl when closed; cutting edge with row of relatively strong corneous teeth, terminating in small calcareous claw. Carpus (Fig. 25B–D) becoming broader distally, moderately inflated ventrally; dorsolateral margin with 2 strong spines, dorsomesial margin not delineated, dorsodistal margin with 2 strong spines, dorsal surface unarmed; lateral surface with long stiff setae near dorsolateral margin, ventrolateral margin with 2 small spines at distal corner and row of short

to long setae, laterodistal margin unarmed; mesial surface with long stiff setae dorsally, mesiodistal and ventromesial margins unarmed; ventral surface with numerous long setae. Merus (Fig. 25C, D) with row of stiff setae on dorsodistal margin; dorsal surface with few short setae; lateral surface naked, with few small tubercles near ventrolateral margin proximally, ventrolateral margin with 4 strong, slender spines in distal half and row of long setae; mesial surface with few short setae, ventromesial margin with 2 small spines in proximal half and row of long setae; ventral surface unarmed, but with numerous long setae. Ischium (Fig. 25C, D) unarmed on ventromesial margin, but with row of long setae. Coxa unarmed.

Ambulatory pereopods (Fig. 26A, C) moderately slender, similar from right to left. Dactyls 1.1–1.2 times longer than propodi; in lateral view, slightly curved ventrally; in dorsal view, nearly straight; terminating in strong corneous claw; dorsal surfaces row of setae, becoming shorter distally; lateral surfaces not sulcated medially, unarmed, with few setae; mesial surfaces (Fig. 26B, D) with row of few corneous spinules and of setae near dorsal margin; ventral margin each with 9 strong corneous spines. Propodi distinctly longer than carpi; dorsal surface with row of tufts of long setae; lateral and mesial surfaces with few short setae; ventral surfaces with sparse setae, unarmed in second, armed with 1 strong corneous spines subdistally in third, ventrodistal margins each with 1 strong corneous spine. Carpi each with tiny dorsodistal spine and tufts of long setae on dorsal surfaces, second pair bearing 1 additional spine arising from proximal 0.4; lateral and mesial faces with few short setae; ventral surfaces each with long setae at midlength and ventrodistal margin. Meri with tufts of long setae on dorsal surfaces; lateral and mesial surfaces without setae; ventral surface with small spines (including subdistal spine on ventrolateral margin) and low protuberances in second, unarmed in third, each with row of tufts moderately short to long setae. Ischia with few setae dorsally and ventrally.

Fourth pereopod (Fig. 23E) semichelate. Dactyl flattened, terminating in strong corneous claw; ventral margin with row of small corneous teeth, apparently lacking preungual process. Propodus with convex ventral margin; propodal rasp composed of single row of corneous scales. Carpus with 2 tufts of setae on dorsal surface.

Fifth pereopod chelate, with paired gonopores on coxae (Fig. 23F), partially obscured by tufts of setae arising from posterior to gonopores.

Anterior margin of third thoracic sternite nearly straight, unarmed. Anterior lobe of sixth thoracic sternite (Fig. 23G) subsemicircular, anterior surface with unarmed, but with long setae. Eighth thoracic sternite (Fig. 23F) with paired rounded lobe, bearing few setae on anteroventral margin.

Abdomen coiled; no paired pleopods, 3 unpaired, unequally biramous left pleopods. Uropods noticeably asymmetrical.

Telson (Fig. 23H) with distinct lateral indentations; posterior lobes slightly asymmetrical, terminal margins oblique, each with 4 prominent spines, lateral margins with fine row of tiny corneous spinules.

Description of paratypes. The male paratype agrees well with the holotype. The female paratype from the station 2 is briefly described below.

Left palm less slender than that of holotype, with dorsomesial margin not depressed, delineated by row of small tubercles, dorsomesial surface with scattered small tubercles mesially. Carpus with 3 strong spines on dorsolateral margin, dorsodistal margin with 1 prominent spine; lateral surface with few small tubercles, ventrolateral margin with row of spines, becoming blunt, obsolete proximally.

Dactyls of ambulatory pereopods each with 9 or 10 corneous spines on ventral margin. Unpaired gonopore on left coxa of third pereopod (Fig. 23I).

No paired first pleopods. Four unpaired pleopods; second and third pleopods with well developed, but unequally biramous pleopods (exopodites 1.6 times longer than endopodites), protopodites bearing tufts of setae distally; fourth pleopod with exopodite 3.3 times longer than endopodite, protopodite with tuft of short setae distally; fifth pleopod much smaller than preceding ones, exopodite well developed, endopodite very

small, but with setae marginally.

Lateral margins of posterior lobes of telson minutely denticulate.

Coloration (in preservative). Ground color of body and pereopods light yellow-brown. Ocular peduncle brown in distal half, proximal half with 2 red longitudinal stripes, basal part red. Antennal flagellum with light and dark red-brown segments alternatively. Right cheliped with palm generally light yellow-brown, with red small tubercles on dorsal surface, dorsolateral and dorsomesial margins with red spots; carpus with dorsal surface reddish brown; merus mottled with reddish brown in distal at least in distal half. Left palm with red spots on dorsal keel and lateral margin; carpus and merus with red spines, merus mottled by reddish brown in distal part. Dactyls, propodi, carpi and meri of ambulatory pereopods bordered by reddish brown on dorsal and ventral surfaces, propodi and carpi each with submedian reddish brown stripe, meri each with 2 submedian stripes of same color; propodi each with obscure reddish brown band slightly distal to mid-length.

Distribution. Known only from the Ogasawara Islands; at depths of 64–70 m.

Habitat. Gastropod shells.

Etymology. A combination of the Greek words *lophos*, meaning crested, and *chela*, meaning pincer, referring to the sharply crested left chela.

Remarks. This new species is only provisionally assigned to *Pagurus*. It shows superficial resemblance to the members of *Lophopagurus* McLaughlin, 1981, in the strongly crested dorsal surface of the left chela, weakly twisted propodal-carpal articulation of the left cheliped and somewhat operculate right chela. The lack of the paired first pleopods and the absence of the right gonopore in female set apart this new species from *Lophopagurus*. The strongly produced and crested ventromesial margin of the carpus of the right cheliped and the single row of corneous scales of the propodal rasp may relate the new species to *P. headleyi* (Grant and McCulloch, 1906), *P. liochele* (Barnard, 1947), *P. kulkarnii* Sankolli, 1962, and *P. boriaustraliensis* Morgan, 1990. However, the shaply crested left chela, obtusely quadricarinate palm of the right cheliped and the different conformation of the telson immediately separate *P. lophochela* from these four species. In *P. lophochela*, the terminal margins of the telson are strongly oblique, bearing four prominent spines, and the lateral margins of the posterior lobe bears a fine row of small corneous teeth. While in the latter four species, the posterior lobes of the telson are rounded, bearing numerous marginal spines, and lacks a row of corneous teeth on the lateral margins.

The female specimen from the station 3 (CBM-ZC 4753, sl 1.2 mm) is very small, with an incompletely developed gonopore only on the left coxa of the third pereopod and strongly unequally biramous second to third pleopods, suggesting immaturity. Another female from the station 2 (CBM-ZC 4750, sl 1.7 mm) is much larger than the female from the station 3, with well developed left gonopore and pleopods, but it is infested by an unidentified bopyrid. Additionally, *P. lophochela* exhibits variation in the armature of the left palm. The dorsomesial margin of the left palm is not delineated in males, while it is delineated by a single row of small tubercles in females; the dorsomesial surface of the same segment bears scattered small tubercles near the dorsomesial margin in females, while such tubercles are absent in males.

Genus *Turleania* McLaughlin, 1997

Remarks. McLaughlin (1997) gave a replacement name *Turleania* for *Laurentia* McLaughlin and Haig, 1996, because of a problem of homonymy (see McLaughlin, 1997). This genus is characterized by a set of the following character states; the presence of 11 pairs of quadriserial phyllobranchiae; the absence of the accessory tooth from the third maxilliped; nonchelate fourth pereopods, each with a single row of corneous scales in the propodal rasp; males with a moderately long or long, sometimes coiled, left sexual tube, which has a sparse terminal tufts of stiff setae, and no right sexual tube development; paired gonopores in females; and no paired first pleopods modified as gonopods in females. All five originally described species, type species *T. albatrossae* (McLaughlin and Haig, 1996), *T. balli* (McLaughlin and Haig, 1996), *T. sibogae* (McLau-

ghlin and Haig, 1996), *T. senticosa* (McLaughlin and Haig, 1996), and *T. multispinosa* McLaughlin, 1997, are known from Philippines and Indonesian waters. In this study, two new species are additionally recognized.

Turleania similis sp. nov.
(Figs. 27–31)

Material examined. SY97, st 14; off Chichijima Island, 151 m; holotype, male (sl 1.8 mm); CBM-ZC 4757.–SY97, st 1; Muko-jima Island, Ogasawara Islands, 98–99 m; paratype, female (sl 1.9 mm); CBM-ZC 4749.

Description of holotype (male). Eleven pairs of quadriserial phyllobranchiae.

Shield (Fig. 27A) slightly longer than broad; anterior margin between rostrum and lateral projections concave; anterolateral margins slightly terraced; posterior margin emarginate; dorsal surface weakly convex, with rows of few tufts of short setae laterally. Rostrum triangular, well developed, distinctly overreaching lateral projections, terminating bluntly. Lateral projections well developed, triangular, with small submarginal spine. Accessory portions of carapace moderately narrow, with very short setae. Posterior carapace membraneous entirely; posteromedian plate with pair of tufts of short setae; cardiac sulci subparallel, extending nearly to posterodorsal margin; sulci cardiobranchiales extending posteriorly along posterior margin of branchiostegite; posterior branchiostegite only with few very short setae.

Ocular peduncles (Fig. 27A) subcylindrical, about 0.8 times as long as shield; dorsal surface with row of few short setae mesially; corneas noticeably dilated. Ocular acicles subtriangular, terminating subacutely, with small submarginal spine.

Antennular peduncles (Fig. 27A) overreaching ocular peduncles by about 0.8 length of ultimate segment. Ultimate segment elongate, 2.7 times longer than penultimate segment, with 2 long pulmose setae on dorsodistal margin. Penultimate segment glabrous. Basal segment (Fig. 27B) with statocyst region strongly inflated laterally and dorsoventrally flattened, dorsolateral margin with small spine.

Antennal peduncles (Fig. 27A) overreaching ocular peduncles by about 0.3 length of fifth segment. Fifth and fourth segments with few long setae. Third segment with ventromesial distal angle produced, but unarmed. Second segment with dorsolateral distal angle produced, terminating in simple spine; dorsomesial distal angle with prominent spine. First segment with small spinule on ventrolateral margin distally; ventrodistal margin produced, with 1 small spine distally. Antennal acicle reaching to base of cornea, terminating in acute spine and with few setae on mesial margin. Antennal flagellum moderately long, with 1 or 2 short or long setae every 1–4 articles.

Mouthparts (Fig. 28A–E) as illustrated (mandible not illustrated). Inner lobe of endopod of maxillule (Fig. 28A) moderately produced, with 1 terminal bristle; outer lobe broadly triangular, with 1 apical pulmose setae. Maxilla with endopod reaching anterior margin of scaphognathite (not visible from external view). First maxilliped with endopod 0.4 length of exopod. Second maxilliped (Fig. 28D) with basis-ischium fusion incomplete; exopod elongate. Third maxilliped (Fig. 28E) slender, basis and ischium fusion incomplete; ischium (Fig. 28F) somewhat flattened, mesial margin generally convex, with crista dentata composed of row of small, relatively few, corneous teeth, becoming stronger proximally; no accessory tooth; merus with small spine on dorsodistal margin; carpus unarmed on dorsodistal margin; exopod long, distinctly overreaching distal margin of merus.

Right cheliped (Fig. 29A–D) moderately long and stout; with very narrow hiatus between dactyl and fixed finger. Chela (Fig. 28 A) subovate in dorsal view, 2.3 times longer than broad. Dactyl (Fig. 29A, C) 0.8 times as long as palm, weakly curved ventrally; cutting edge with 3 widely spaced, strong, calcareous teeth in proximal 0.7 and very small calcareous teeth in distal 0.3, terminating in small corneous claw; dorsomesial margin with row of spinules, dorsal surface convex, with rows of long setae, midline with irregular row of small spinules; mesial and ventral surfaces with scattered tufts of long setae. Palm (Fig. 29A, C, D) slightly longer than carpus; dorsomesial margin not delimited,

dorsal surface convex, armed with scattered small spines or spinules extending onto mesial face dorsally, fewer on lateral side, and scattered tufts of short to long setae, dorsolateral margin not delimited; dorsal surface of fixed finger with small spines proximally and scattered tufts of setae; lateral surface (including fixed finger) unarmed, with row of tufts of stiff setae dorsally; mesial surface with short to long stiff setae; ventral surface weakly inflated, with scattered tufts of long setae. Cutting edge of fixed finger (Fig. 29A) with 4 broad calcareous teeth, terminating in small corneous claw. Carpus (Fig. 29B–D) almost as long as merus; dorsomesial margin with row of moderately strong spines and long setae, dorsal surface with scattered spines laterally in distal half and scattered tufts of long setae, dorsodistal margin unarmed; dorsolateral margin not delimited; mesial face with obliquely vertical short row of long setae, lateral and ventral surfaces with scattered tufts of short to long setae. Merus (Fig. 29C, D) with transverse rows of setae on dorsal surface, dorsodistal margin unarmed; lateral surface with few tufts of stiff setae ventrally, ventrolateral margin with 2 subdistal spines; mesial surface mostly naked, ventromesial margin with 1 strong distal spine and 1 additional spine arising from slightly distal to midlength; ventral surface with scattered tufts of long setae. Ischium (Fig. 29C, D) unarmed, with tufts of long setae. Coxa with prominent spine on ventrolateral distal angle.

Left cheliped (Fig. 30A–C) slender, somewhat shorter than right. Chela (Fig. 30A) 3.3 times longer than broad. Dactyl (Fig. 30A, B) almost equal to palm in length; cutting edge with row of small corneous teeth, terminating in small corneous claw; dorsal surface convex, midline unarmed, but with tufts of short setae; dorsomesial margin not clearly delineated; mesial surface with scattered short setae, ventral surface with tufts of long setae. Palm (Fig. 30A–C) about 0.8 times as long as carpus; dorsal surface convex, with few scattered very small spines or spinules and tufts of long setae, dorsolateral and dorsomesial margins not delineated; lateral face (including fixed finger) with row of tufts of long setae ventrally; mesial and ventral faces with scattered long setae. Dorsal surface of fixed finger with scattered small spinules proximolaterally; cutting edge with row of widely spaced corneous teeth, terminating in small corneous claw. Carpus (Fig. 30A–C) as long as merus; dorsolateral margin with row of 2 moderately strong spines in distal half, dorsomesial margin with row of 3 spines, both rows partially obscured by long setae; dorsal surface unarmed, dorsodistal margin with 2 strong spines (mesial spine strongest); lateral face with few setae, ventrolateral margin with small spine distally; mesial surface with scattered tufts of long setae in distal half; ventral surface with scattered tufts of long setae. Merus (Fig. 30B, C) with tufts of long setae on dorsal surface, dorsodistal margin unarmed; lateral surface with few setae ventrally, ventrolateral margin with 2 strong spines distally; mesial surface with tufts of long setae near ventromesial margin, ventromesial distal angle with 1 slender spine; ventral surface unarmed, with few tufts of long setae. Ischium (Fig. 30B, C) with row of few very tiny tubercles on ventromesial margin. Coxa with prominent spine at ventrolateral distal angle.

Second and third pereopods (Fig. 31A, C) generally similar from left to right. Dactyls 1.3–1.4 times longer than propodi, slender, in lateral view, slightly curved; in dorsal view, slightly twisted; terminating in long corneous claws; dorsal margins each with row of elongate bristles and of short to long setae; lateral surfaces almost naked; mesial surfaces (Fig. 31B, D) with row of sparse setae near dorsal and ventral margins; ventral margins each with 5 or 6 long corneous spines and sparse setae. Propodi with 1 or 2 small corneous spines on ventrodistal margin; dorsal surfaces with numerous tufts of moderately long setae; lateral and mesial faces naked; ventral surfaces with widely spaced tufts of very long setae. Carpi each with 1 subdistal spine on dorsal surface (third) and 1 additional spine on dorsal surface proximally (second); few tufts of setae on dorsal surfaces. Meri with tufts of moderately long setae on dorsal surfaces; lateral and mesial surfaces naked; ventral surfaces with tufts of setae and 1 spine arising from distal 0.2 (second) or unarmed (third). Ischia elongate, unarmed,

with setae on dorsal and ventral margins.

Fourth pereopods (Fig. 27C) not chelate. Dactyl weakly curved, with row of tiny corneous teeth on ventral margin, apparently no preungual process at base of terminal claw; dorsal surface with few tufts of short setae. Propodus with weakly convex ventral margin; few setae on dorsal surface; propodal rasp composed of single row of closely set corneous scales, becoming larger distally. Carpus with few long setae on dorsal surface.

Fifth pereopods chelate. Left coxa (Fig. 27D) with elongate, basally stout sexual tube directed exteriorly and curved dorsally, with tufts of long stiff setae terminally (Fig. 27E). Right coxa (Fig. 27D) with gonopore, but no sexual tube, obscured by tufts of setae.

Third thoracic sternite broken during dissection. Anterior lobe of sixth thoracic sternite (Fig. 27F) small, subovate, armed with 2 marginal spines distally. Eighth thoracic sternite (Fig. 27D) composed of single rounded lobe, bearing setae on anterior margin.

Abdomen well developed, coiled, with 3 unpaired, unequally biramous pleopods. Third and fourth pleopods each with exopodite about twice length of endopodite; fifth pleopod with endopodite strongly reduced, about 0.25 times as long as exopodite. Uropods strongly asymmetrical.

Telson (Fig. 27G) without lateral indentations; posterior lobes slightly asymmetrical, each outer angle acutely developed and 1 or 2 small protuberances and tufts of setae on oblique terminal margins; posterolateral margins delineated.

Description of female paratype. The female paratype agrees well with the holotype.

Dactyls of second and third pereopods each with 4 corneous spines on ventral margin. Paired gonopores on coxae of third pereopods.

Abdomen with 4 unpaired pleopods. Second to fourth pleopods with both rami well developed, setose; fifth pleopod with exopodite elongate, but endopodite greatly reduced.

Coloration (in preservative). Body and appendages generally cream. Ocular peduncles pale orange, fading toward bases; ocular acicles with orange spot distally. Chelipeds with iridescence on mesial surfaces of palms, carpi and meri. Chela with bands of orange proximally on dorsal and mesial surfaces of dactyls and dorsal surfaces of fixed finger and near tip of dactyls and fixed fingers; carpi with orange spot at distalmost spine of dorsomesial row and distomesial projection. Band of orange present subdistally on dactyls of ambulatory pereopods; propodi with faint orange band distal to midlength; carpi with tint of orange dorsodistally and iridescence ventrally.

Distribution. Known only from Ogasawara Islands, at depths of 98–151 m.

Habitat. Gastropod shells.

Etymology. The species is named from the Latin *similis* (similar), referring to the close similarity to *T. senticosa.*

Remarks. This new species very closely resembles *Turleania senticosa* known from Indonesia. However, it is distinguished form the latter species by the different armament of the left chela. In *T. similis*, the dactyl of the left cheliped lacks a median row of small slender spines on the dorsal surface; and the dorsolateral margin of the left palm is not clearly delimited, lacking a row of small spines. While in *T. senticosa*, the dactyl of the left cheliped bears a median row of small spines; the dorsolateral margin of the left palm is clearly delineated with a row of small spines. In addition, the spines on the left palm is smaller and fewer in *T. similis* than in *T. senticosa*. The ultimate segment of the antennular peduncle seems to be more elongate in *T. senticosa* than in *T. similis*. *Turleania spinimanus* sp. nov., described below, is also similar to *T. similis*, but the shape of the sixth thoracic sternite, armature of the chelae and coloration immediately distinguish these two species (see "Remarks" of *T. spinimanus*).

The anterior lobe of the sixths thoracic sternite of the female paratype seems to be aberrant: the distolateral angle is strongly produced, and the anterior margin lacks spines.

***Turleania spinimanus* sp. nov.**

(Figs. 32–35)

Material examined. SY97, st 22; off Torishima Island, 172–192 m; holotype, ovig female (sl 2.7 mm); CBM-ZC 4761.

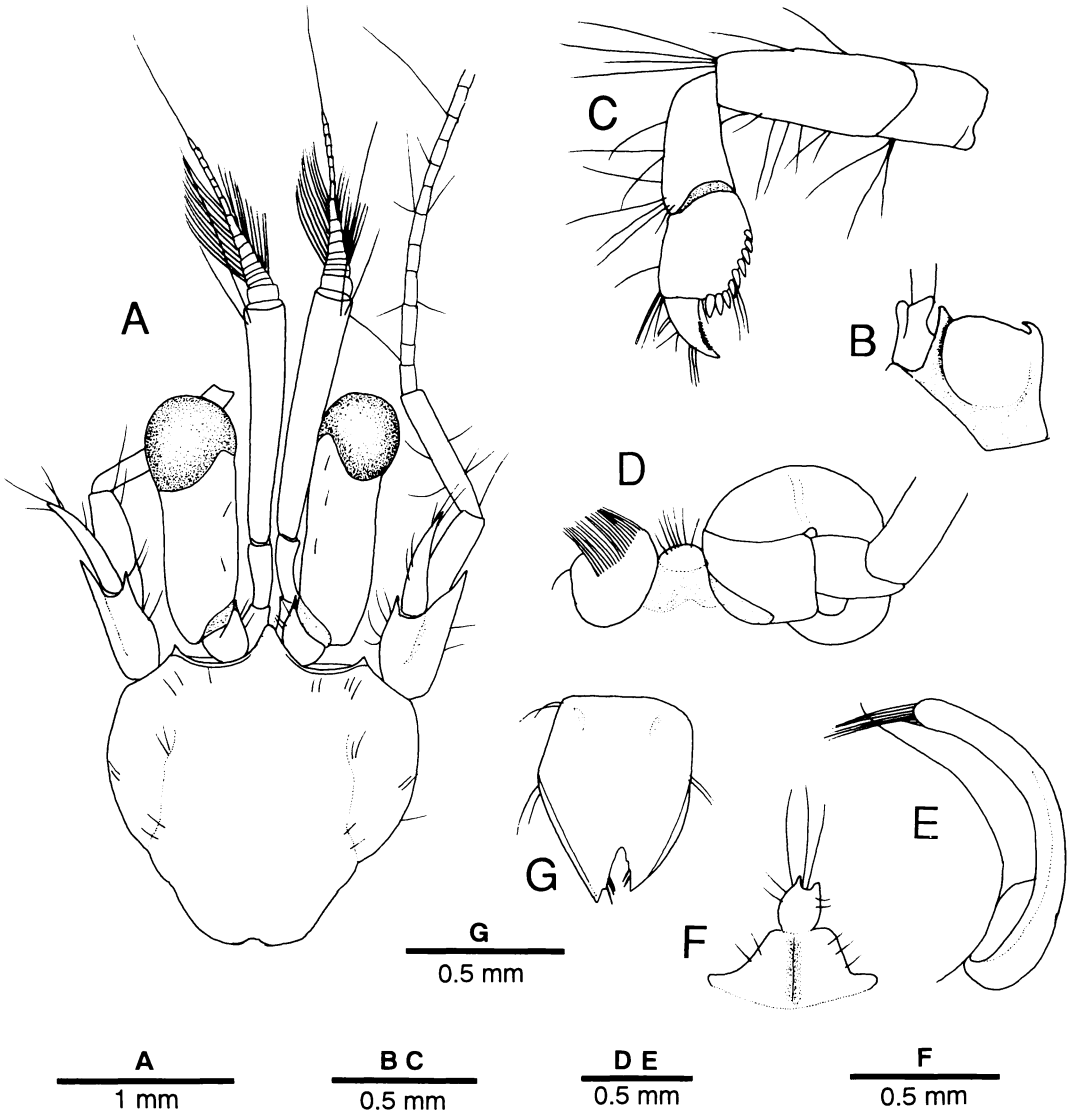

Fig. 27. *Turleania similis* sp. nov. Holotype male (CBM-ZC 4757; sl 1.8 mm) from Chichi-jima Islands, Ogasawara Islands. A, shield and cephalic appendages, dorsal; B, basal segment of left antennule, ventral; C, left fourth pereopod, lateral; D, coxae of fifth pereopods and eighth thoracic sternite, ventral; E, distal part of left sexual tube, dorsolateral; F, sixth thoracic sternite, ventral; G, telson, dorsal.

Description of holotype (female). Eleven pairs of quadriserial phyllobranchiae.

Shield (Fig. 32A) 1.1 times longer than broad; anterior margin between rostrum and lateral projections concave; anterolateral margins slightly terraced; posterior margin emarginated; dorsal surface weakly convex, with few tufts of short setae laterally. Rostrum triangular, well developed, distinctly overreaching lateral projections, terminating bluntly. Lateral projections well developed, triangular, with small submarginal spine.

Ocular peduncles (Fig. 32A) subcylindrical, about 0.6 times as long as shield; dorsal surface with row of few short setae mesially; corneas dilated. Ocular acicles subtriangular, terminating subacutely, with moderately long submarginal spine.

Antennular peduncles (Fig. 32A) overreaching ocular peduncles by about 0.8

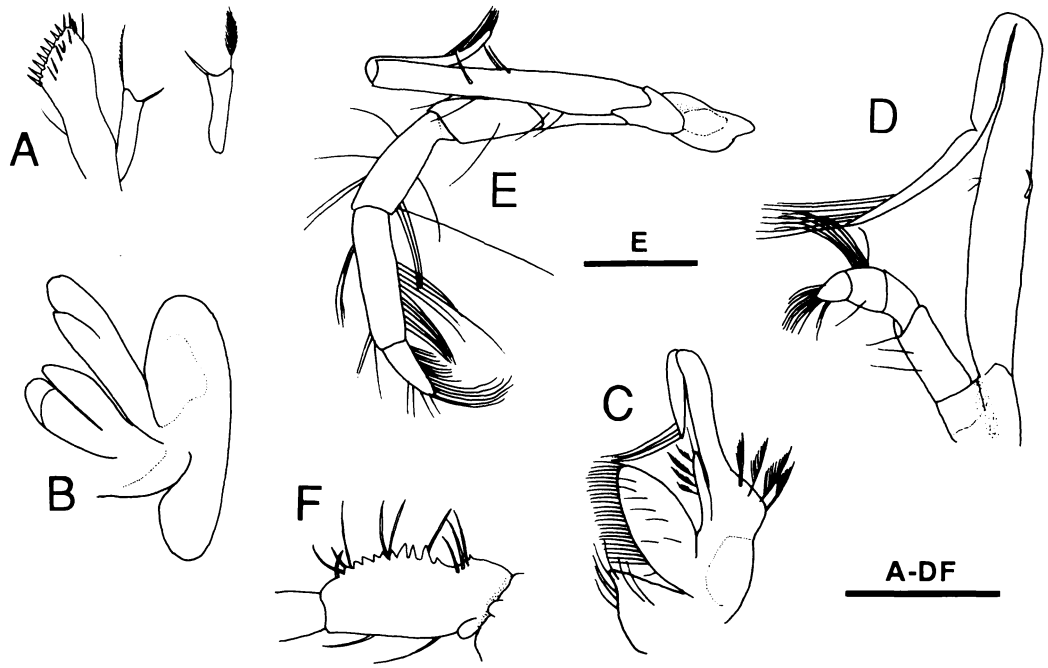

Fig. 28. *Turleania similis* sp. nov. Holotype male (CBM-ZC 4757; sl 1.8 mm) from Chichi-jima Islands, Ogasawara Islands. Left mouthparts. A, maxillule, external; inset, endopod, lateral; B, maxilla, external, setae omitted (endopod not visible);C, first maxilliped, external; D, second maxilliped, external; E, third maxilliped, lateral; F, same, ischium, dorsal. Scale bars indicate 0.5 mm.

length of ultimate segment. Ultimate segment elongate, 2.3 times longer than penultimate segment, with 2 long pulmose setae on dorsodistal margin. Penultimate segment glabrous. Basal segment with statocyst region expanded laterally and dorsoventrally flattened, dorsolateral margin with small spine.

Antennal peduncles (Fig. 32A) overreaching ocular peduncles by about half length of fifth segment. Fifth and fourth segments with few long setae. Third segment with ventromesial distal angle produced, but unarmed. Second segment with dorsolateral distal angle produced, terminating in simple spine; dorsomesial distal angle with strong spine. First segment with small spinule on ventrolateral margin distally; ventrodistal margin produced, with 1 small spine. Antennal acicles reaching to base of corneas, terminating in acute spine and with few setae on mesial margins. Antennal flagella long, with 1 or 2 short or long setae every 1–4 articles.

Mouthparts similar to those of *T. similis*. Inner lobe of endopod of maxillule moderately produced, with 1 terminal bristle; outer lobe broadly triangular, with 1 terminal bristle. Third maxilliped (Fig. 32B, C) slender; ischium somewhat flattened, mesial margin generally convex, with crista dentata composed of row of relatively strong, corneous teeth, no accessory tooth; merus and carpus unarmed on dorsodistal margin; exopod slender, overreaching distal margin of merus.

Right cheliped (Fig. 33A–D) moderately long and stout; with very narrow hiatus between dactyl and fixed finger. Chela (Fig. 33A) subovate in dorsal view, 2.0 times longer than broad. Dactyl (Fig. 33A, C) 0.7 times as long as palm, weakly curved ventrally; cutting edge with 4 low, broad, calcareous teeth in proximal half and minutely denticulate in distal half, terminating in small corneous claw; dorsal surface convex, with scattered small spines, extending onto mesial face dorsally (spines becoming fewer distally and mesially), dorsomesial margin not clearly delimited; mesial and ventral surfaces with scattered short to long setae. Palm (Fig. 33A, C, D) slightly shorter than carpus;

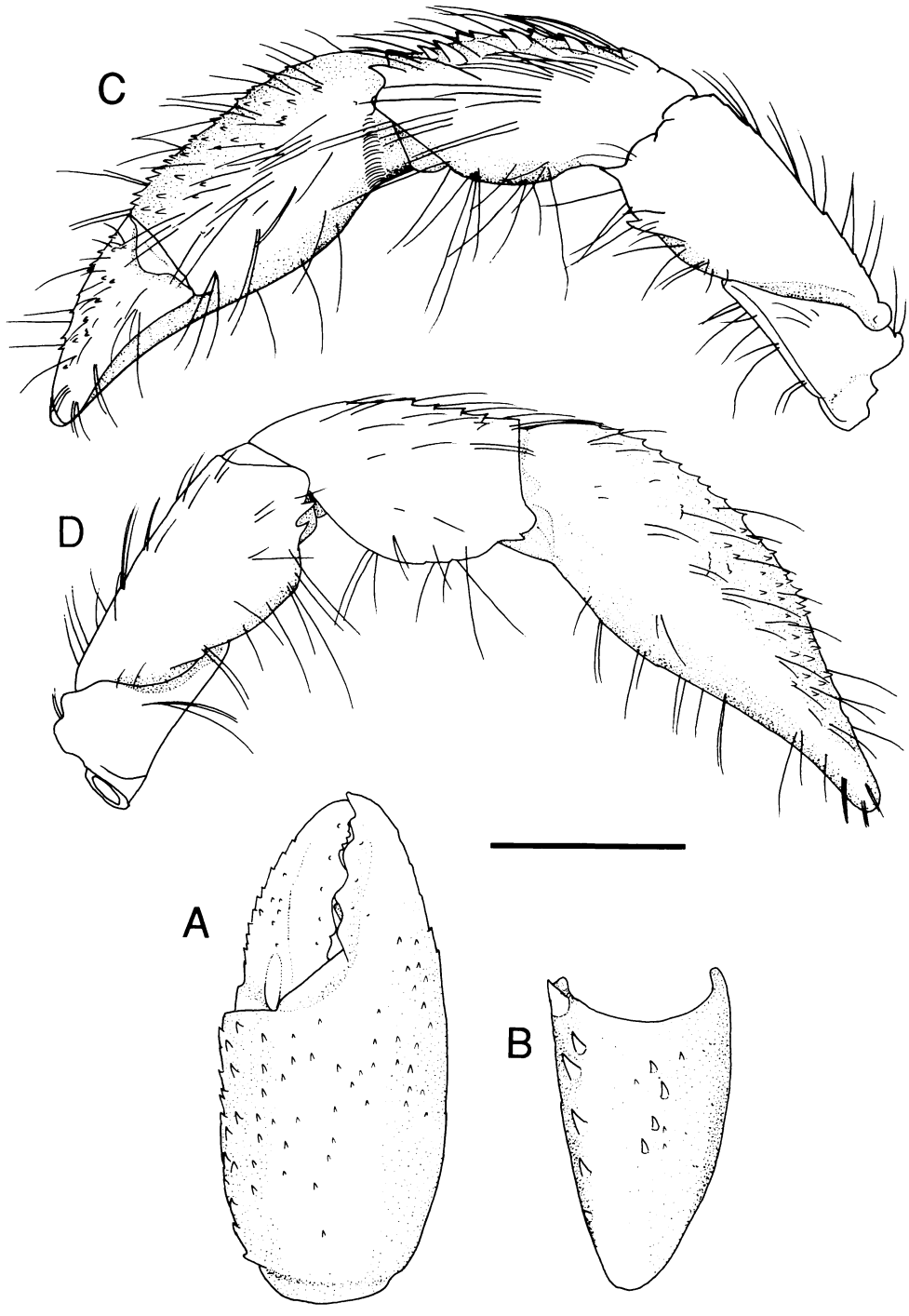

Fig. 29. *Turleania similis* sp. nov. Holotype male (CBM-ZC 4757; sl 1.8 mm) from Chichi-jima Islands, Ogasawara Islands. A, right chela, dorsal, setae omitted; B, carpus of right cheliped, dorsal; C, right cheliped, mesial; D, right cheliped, lateral. Scale bar indicates 1 mm.

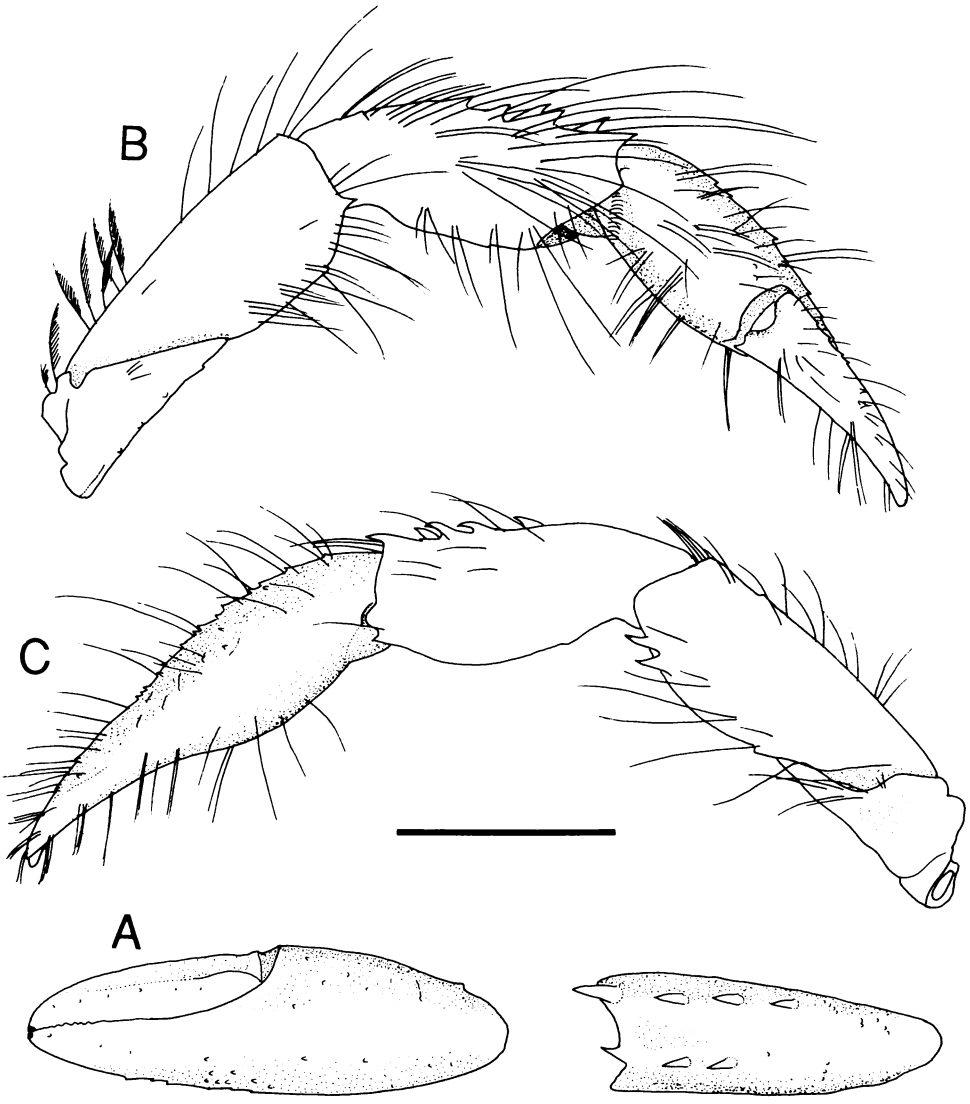

Fig. 30. *Turleania similis* sp. nov. Holotype male (CBM-ZC 4757; sl 1.8 mm) from Chichi-jima Islands, Ogasawara Islands. A, chela and carpus of left cheliped, dorsal, setae omitted; B, left cheliped, mesial; C, same, lateral. Scale bar indicates 1 mm.

dorsomesial margin not clearly delimited, dorsal surface convex, armed with scattered small spines or spinules extending onto mesial face dorsally (spines on lateral side blunt, forming transverse rows) and scattered short to long setae; dorsolateral margin not clearly delimited; dorsal surface of fixed finger with scattered numerous small spines and scattered setae; lateral surface (including fixed finger) with obliquely vertical rows of small tubercles and few tufts of short setae; mesial surface with row protuberances accompanied by long stiff setae; ventral surface weakly inflated, with scattered tufts of long setae. Cutting edge of fixed finger (Fig. 33A) with 2 broad and several small calcareous teeth in proximal 0.7 and row of very small calcareous teeth in distal 0.3, terminating in small corneous claw. Carpus (Fig. 33B–D) subequal to merus in length; dorsomesial margin with row of moderately strong spines and long setae, dorsal surface with scattered spines and setae laterally, dorsodistal margin unarmed; dorsolateral margin not delimited;

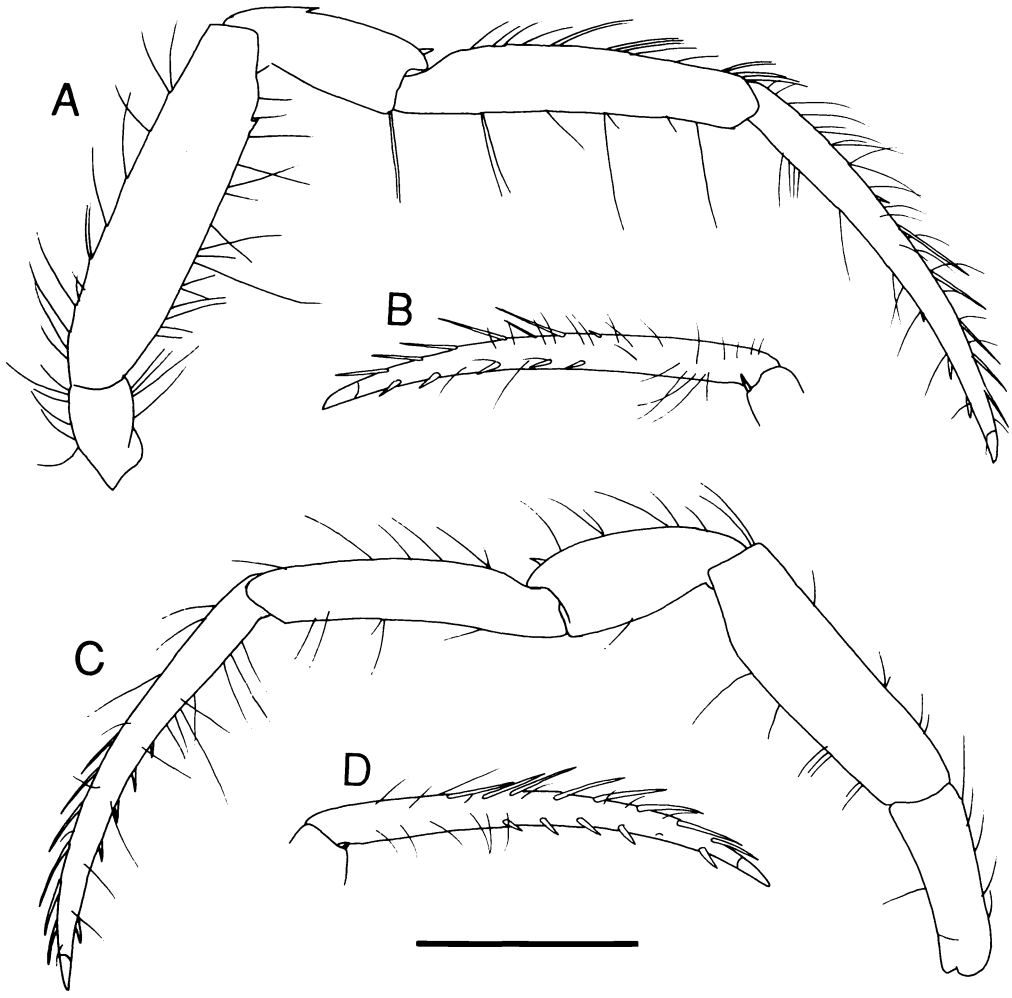

Fig. 31. *Turleania similis* sp. nov. Holotype male (CBM-ZC 4757; sl 1.8 mm) from Chichi-jima Islands, Ogasawara Islands. A, right second pereopod, lateral; B, same, dactyl, mesial, setae partially omitted; C, left third pereopod, lateral; D, same, dactyl, mesial, setae partially omitted. Scale bar indicates 1 mm.

mesial face with 2 rows of short, obliquely vertical rows of long setae dorsally, lateral and ventral surfaces with few stiff setae. Merus (Fig. 33C, D) with transverse rows of setae on dorsal surface, dorsodistal margin unarmed; lateral surface with few stiff setae, ventrolateral margin with 2 subdistal spines; mesial surface with few tufts of stiff setae ventrally, ventromesial margin with row of small spines or spinulose tubercles; ventral surface with few tufts of long setae. Ischium (Fig. 33C, D) unarmed, with tufts of long setae dorsally and ventrally. Coxa with prominent spine on ventrolateral distal angle.

Left cheliped (Fig. 34A–C) slender, somewhat shorter than right. Chela (Fig. 34A) 2.8 times longer than broad. Dactyl (Fig. 34A, B) slightly longer than palm; cutting edge with row of small corneous teeth, terminating in small corneous claw; dorsal surface convex, unarmed, but with short stiff setae; dorsomesial margin not clearly delineated; mesial surface with small spines dorsally in proximal half and tufts of short to moderately long setae, ventral surface with tufts of long setae. Palm (Fig. 34A–C) about 0.65 times as long as carpus; dorsal surface convex, with scattered long stiff setae, row of small spines on midline (extending onto proximal part of fixed finger) and short row of spines mesially, dor-

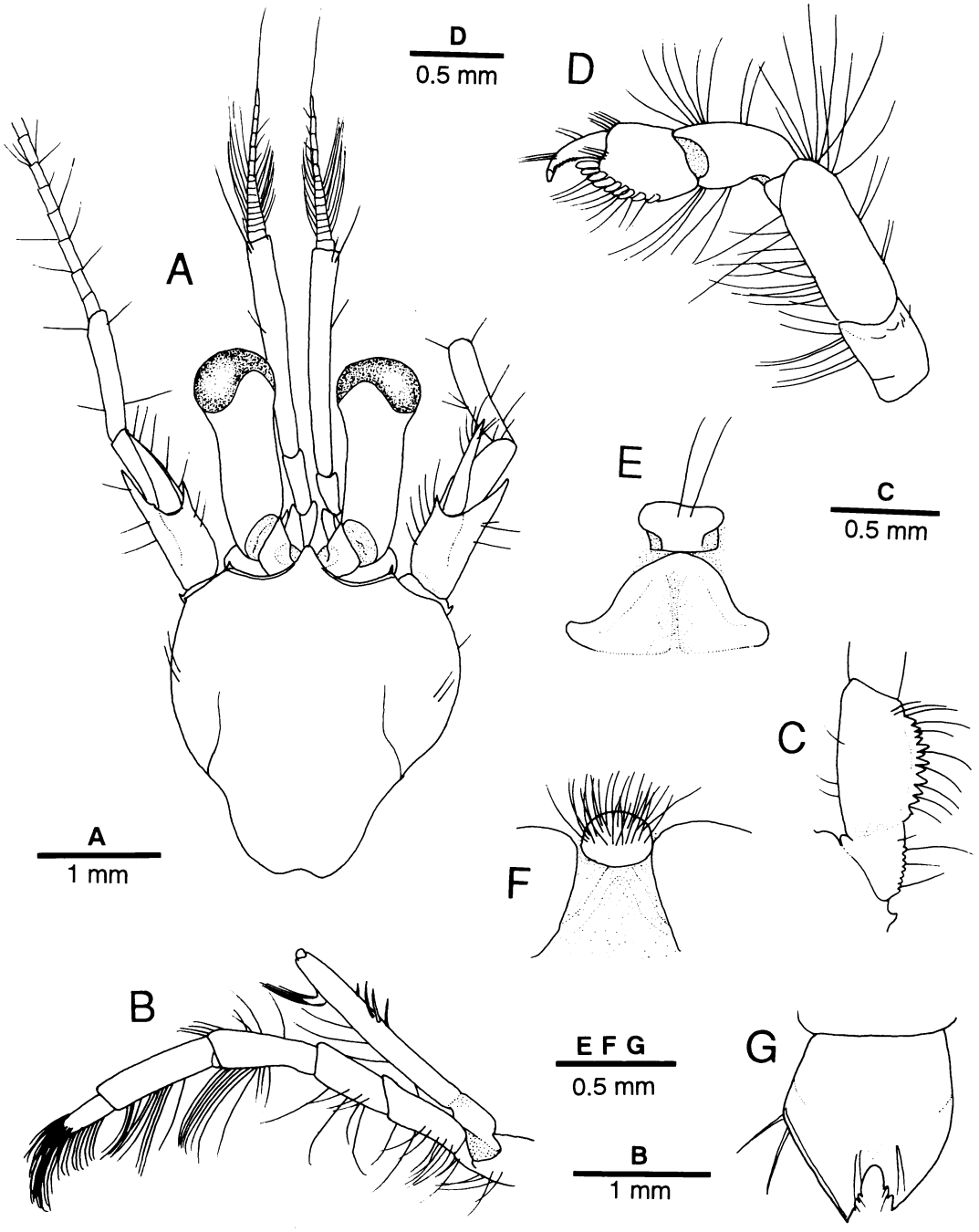

Fig. 32. *Turleania spinimanus* sp. nov. Holotype female (CBM-ZC 4761; sl 2.7 mm) from Torishima Island. A, shield and cephalic appendages, dorsal; B, left third maxilliped; C, same, ischium, dorsal; D, left fourth pereopod, lateral; E, sixth thoracic sternite, ventral; F, eighth thoracic sternite, ventral; G, telson, dorsal.

solateral side with small spinules; dorsolateral margin not delimited on palm, weakly delimited on fixed finger, with row of small spinules; dorsomesial margin not delimited; dorsal surface of fixed finger with scattered spinules proximally and few spinules dis-

tally; lateral and mesial faces with tufts of long setae; ventral surface weakly inflated, with scattered tufts of long setae. Cutting edge of fixed finger (Fig. 34A) with row of widely spaced small calcareous teeth, terminating in small corneous claw. Carpus (Fig. 34A–C) subequal to merus in length; dorsolateral and dorsomesial margins each with row of 5 moderately strong spines, partially obscured by long setae; dorsal surface unarmed, dorsodistal margin with 2 strong spines; lateral face with rows of tufts of stiff setae; mesial surface with 2 rows of tufts of long setae dorsally; ventral surface with scattered tufts of long setae. Merus (Fig. 34B, C) with tufts of long setae on dorsal surface, dorsodistal margin unarmed; lateral surface with few tufts of setae distoventrally, ventrolateral margin with row of moderately strong spines; mesial surface almost naked, ventromesial distal angle with 1 small spine; ventral surface unarmed, with numerous tufts of long setae. Ischium (Fig. 34B, C) with row of few very tiny tubercles on ventromesial margin. Coxa with prominent spine at ventrolateral distal angle.

Second and third pereopods (Fig. 35A, C) generally similar from left to right. Dactyls 1.3–1.4 times longer than propodi, slender, in lateral view, slightly curved; in dorsal view, slightly twisted; terminating in long corneous claws; dorsal margins each with row of elongate bristles and of short to long setae; lateral surfaces almost naked; mesial surfaces (Fig. 35B, D) with row of sparse setae near dorsal and ventral margins; ventral surfaces each with 7–10 long corneous spines and sparse setae mesially. Propodi with 1 or 2 small corneous spines on ventrodistal margin; dorsal surfaces with tufts of moderately long setae; lateral and mesial faces naked; ventral surfaces with widely spaced tufts of very long setae. Carpi each with 1 subdistal spine on dorsal surface (third) and 1 additional small spine on dorsal surface proximally (second); few tufts of setae on dorsal surfaces. Meri with tufts of moderately long setae on dorsal surfaces (tufts more numerous in second than in third); lateral and mesial surfaces naked; ventral surfaces with tufts of setae (tufts more numerous in second than in third) and 1 small spine arising from distal 0.2 (second) or unarmed (third). Ischia elongate, unarmed, with setae on dorsal and ventral margins. Paired gonopores on coxae of third pereopods.

Fourth pereopods (Fig. 32D) not chelate. Dactyl weakly curved, with row of tiny corneous teeth on ventral margin, apparently no preungual process at base of terminal claw; dorsal surface with few tufts of short setae. Propodus with weakly convex ventral margin; propodal rasp composed of single row of closely set corneous scales, becoming larger distally. Carpus with few long setae on dorsal and ventral surfaces.

Fifth pereopods chelate. Coxae with flattened ventral face.

Third thoracic sternite with shallow median notch on anterior margin, but unarmed. Anterior lobe of sixth thoracic sternite (Fig. 32E) small, double-headed hammer shaped, with pair of long setae anteriorly. Eighth thoracic sternite (Fig. 32F) composed of single rounded lobe, bearing numerous setae on anterior surface.

Abdomen well developed, coiled, with 4 unpaired pleopods. Second to fourth pleopods with both rami well developed, setose; fifth pleopod with exopodite elongate, but endopodite greatly reduced. Uropods strongly asymmetrical.

Telson (Fig. 32G) without lateral indentations, lateral margins convex; posterior lobes only slightly asymmetrical (left slightly larger), each outer angle acutely developed, with 3 small acute spines and short setae on oblique terminal margins; posterolateral margins delineated on left.

Coloration (*in preservative*). Body and appendages generally orange. Shield retaining tint of orange, with iridescens. Ocular peduncle pale orangish brown, with spot of orange proximally. Antennular peduncles colorless. Antennal peduncle generally colorless, with tint of orange around articulation between antennal acicle and second segment of peduncle; flagella banded by orange and white. Chelae with faint transverse band of deep orange across bases of dactyls and fixed fingers; dactyls and fixed finger whitish, with tint of orange on dorsal surfaces; palms orange on dorsal surface, tint of white near base of dactyls, iridescent on mesial surfaces;

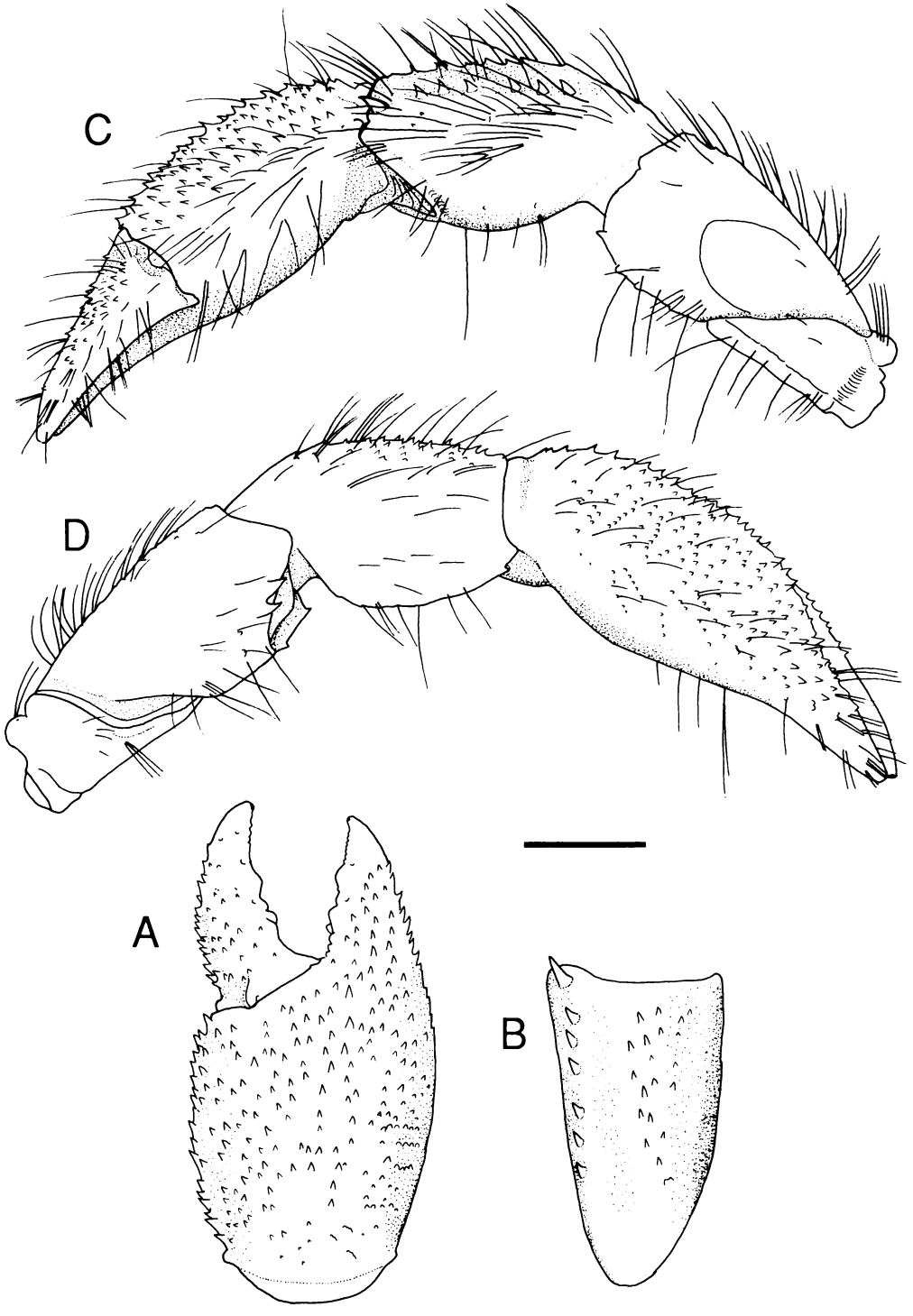

Fig. 33. *Turleania spinimanus* sp. nov. Holotype female (CBM-ZC 4761; sl 2.7 mm) from Torishima Island. A, right chela, dorsal, setae omitted; B, carpus of right cheliped, dorsal; C, right cheliped, mesial; D, right cheliped, lateral. Scale bar indicates 1 mm.

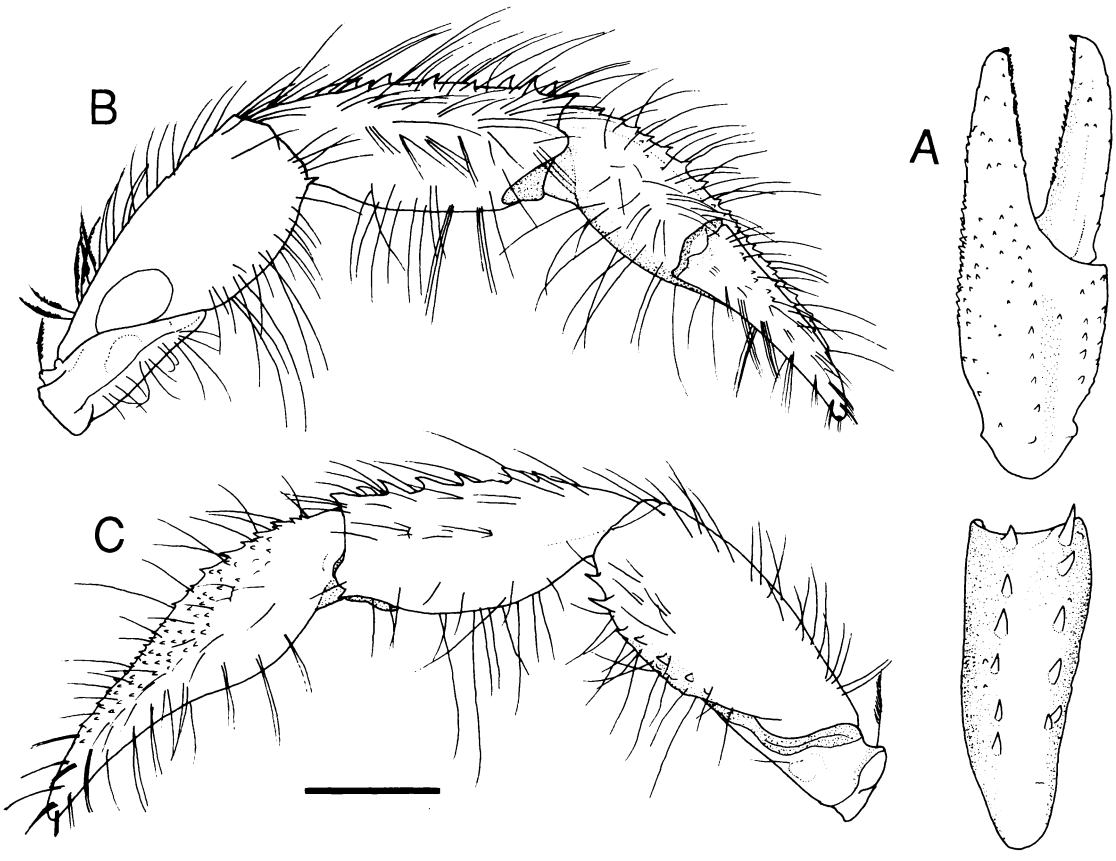

Fig. 34. *Turleania spinimanus* sp. nov. Holotype female (CBM-ZC 4761; sl 2.7 mm) from Torishima Island. A, chela and carpus of left cheliped, dorsal, setae omitted; B, left cheliped, mesial; C, same, lateral. Scale bar indicates 1 mm.

carpi and meri with irregular markings of orange and white. Dactyls of ambulatory pereopods pale orange, each with band of darker orange subdistally; propodi with faint broad band of orange distal to midlength, and with tint of orange proximally; carpi with irregular marking of orange; meri with tint of orange distally and proximally.

Distribution. Known only from the type locality, off Torishima Island at depths of 172–192 m.

Habitat. Gastropod shell.

Etymology. From the Latin, *spineous* (spiny) and *manus* (hand), and referring to the finely spinulose dorsal surfaces of the cheliped palms of this species.

Remarks. In the armament of the chelipeds and shape of the telson, the new species closely resembles *T. senticosa* and *T. similis*. Nevertheless, the hammer-shaped anterior lobe of the sixth thoracic sternite and the absence of subdistal strong calcareous tooth from the cutting edge of right fixed finger will distinguish *T. spinimanus* from the two close relatives. Further, *T. spinimanus* differs from *T. senticosa* in the armature of the left cheliped. The dactyl of the left chela of the new species lacks a row of slender spines on midline, which is present in *T. senticosa*. The spines on the palm and fixed finger of the left chela are less slender in *T. spinimanus* than in *T. senticosa*. From *T. similis*, *T. spinimanus* is distinguished by the more spinulose chelae and the orange, rather than cream, general color of the body and appendages.

Acknowledgments

I am most grateful to the scientific staff members, especially Prof. S. Segawa and Dr. K. Tsuchiya of Tokyo University of Fisher-

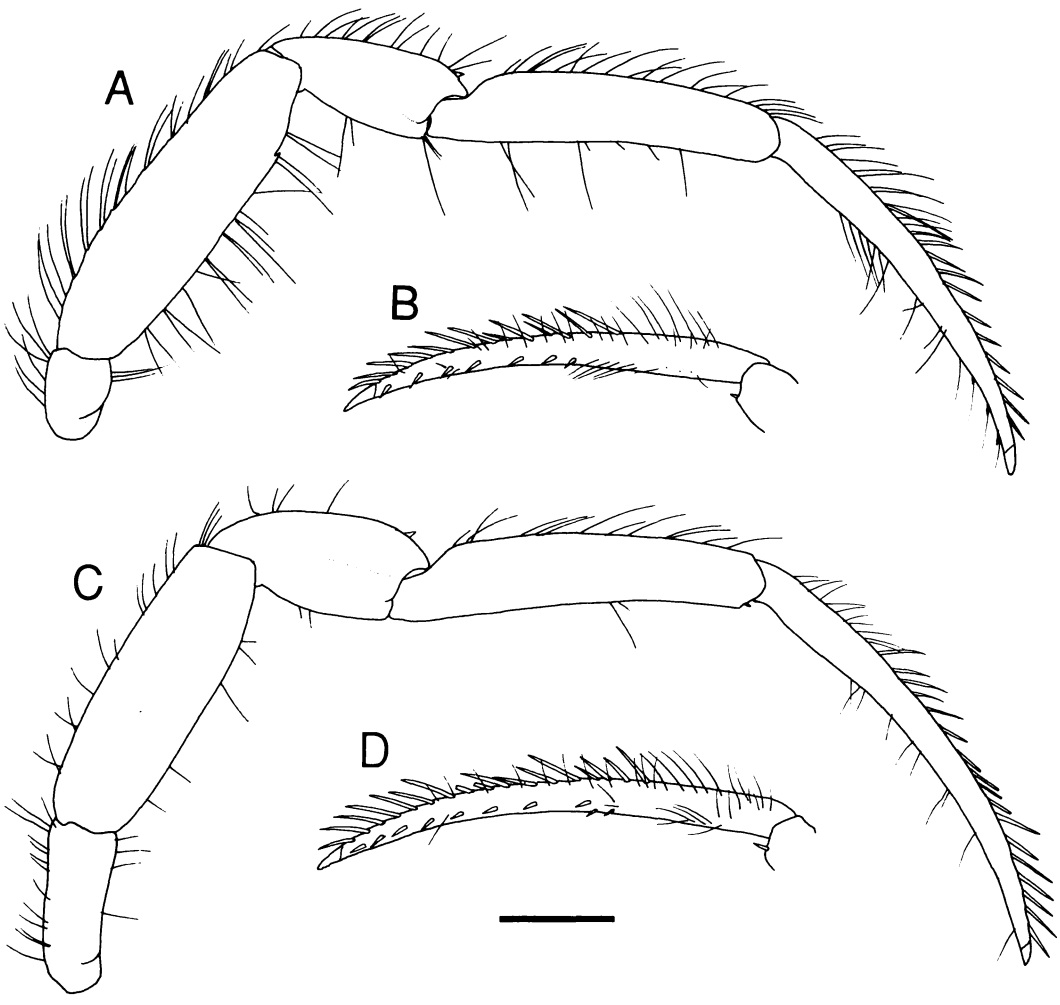

Fig. 35. *Turleania spinimanus* sp. nov. Holotype female (CBM-ZC 4761; sl 2.7 mm) from Torishima Island. A, right second pereopod, lateral; B, same, dactyl, mesial, setae partially omitted; C, right third pereopod, lateral; D, same, dactyl, mesial, setae partially omitted. Scale bar indicates 1 mm.

ies, and crews on board the SY97 cruise of the TRV Shin'yo-maru in collaborating to collect samples. I sincerely thank Drs. P. A. McLaughlin of the Shannon Point Marine Center, Western Washington University, and M. Osawa of the Ocean Research Institute, University of Tokyo, and my colleague, S. Naomi, for reviewing the manuscript. I am indebted to Drs. H. Namikawa and K. Hasegawa of the Showa Memorial Institute, National Science Museum, Tsukuba, for making the holotype of *P. serpulophilus* and material of *Paguristes* reported by Miyake (1978) available and to my colleague T. Kurozumi for his aid in bibliographic survey. The reexamination of the material studied by Ortmann (1892) and Balss (1913) was made while I visited the Musée Zoologique in Strasbourg, France, and the Zoologische Staatssammlung München, Germany, in September 1997 and 1998, respectively. I thank Mdm E. Lang and the staff of the Musée Zoologique and Dr. H. Fechter, Mrs. P. Schneider and E. Karl of the Zoologische Staatssammlung München for their generous support and help, and for kind hospitality. This research was partially supported by Grant-in-Aid for International Scientific Research (No. 09041155) from the Japanese Ministry of Education, Science and Culture (T. Nishikawa, principal investigator).

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(Accepted 26 Jonuary, 1999)

神鷹丸によって小笠原諸島および鳥島から採集されたヤドカリ科およびホンヤドカリ科

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1997年の東京水産大学練習船神鷹丸による小笠原諸島および鳥島海域における底生生物相調査の際，ドレッジによって採集された十脚甲殻類の標本を調査した結果，8新種を含む10種のヤドカリ科およびホンヤドカリ科ヤドカリ類が発見されたので報告する．小笠原諸島におけるヤドカリ相のうち，潮間帯に出現するものについては比較的多くの報告があるが，水深60mを越える深さのものについてはほとんど知見がない．鳥島海域については，十脚甲殻類相に関する情報はなかった．記録された種は以下のとおりである．ヤドカリ科（3種）：*Ciliopagurus krempfi* (Forest, 1952)（ユビナガワモンヤドカリ），*Paguristes brachytes* sp. nov.（新称：コビトヒメヨコバサミ），*Pagur-*

istes taenia sp. nov. (新称：リングヒメヨコバサミ)；ホンヤドカリ科 (7種)：*Austrarelemus triserratus* (Ortmann, 1982) (セルプラヤドカリ)，*Anapaguri-des aequalis* sp. nov. (新称：トリシマヒナヤドカリ)，*Nematopagurus pilosus* sp. nov. (新称：テブクロイトヒキヤドカリ)，*Nematopagurus shinnyoae* sp. nov. (新称：シンヨウイトヒキヤドカリ)，*Pagurus lophochela* sp. nov. (新称：トサカコテホンヤドカリ)，*Turleania similis* sp. nov. (新称：ネジレヤドカリ)，*Turleania spinimanus* sp. nov (新称：オロシネジレヤドカリ).

それぞれの新種について，詳細な記載と図を付した．*Pagurus lophochela* は，雄における精管の発達や，雌における対腹肢の発達が見られないので，*Pagurus* 属に暫定的に所属させたが，左鉗脚にとさか状の隆起が発達する，雌の生殖孔が左側にしか開口しないなどの特異な特徴をもつ．*Turleania* (新称：ネジレヤドカリ属) は本邦初記録となる．*Austrarelemus triserratus* については，後模式標本と，シノニムとされている *Pylopagurus serpurophilus* Miyake, 1978 の完模式標本も再査し，追加の標本も加えたうえで再検討を行い，個体変異についても新たな知見を得た．本航海で採集された標本数は少ないが，その多様性は特筆すべきものがある．伊豆・小笠原諸島海域の生物地理学的特性を明らかにするためにも，さらなる調査が期待される．