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Reexamination of the Type Material of *Pagurus sagamiensis* Miyake (Decapoda: Anomura: Paguridae)

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Abstract The type material of *Pagurus sagamiensis* Miyake, 1978, has been found to contain the three species assigned to *Pagurus*, *P. constans* (Stimpson, 1858), *P. imaii* (Yokoya, 1939) and *P. brachiomastus* (Thallwitz, 1891). The holotype of this taxon is conspecific with *P. constans*, and therefore *Pagurus sagamiensis* should be treated as a junior subjective synonym of the latter species. Further examination revealed that *Pagurus constans* had short sexual tubes on both coxae of the fifth pereopods in males and that *Pagurus imaii* has a short sexual tube on the right coxa in males. Based on these characters, these two species are transferred to the genus *Parapagurodes* McLaughlin and Haig, 1973, with minor emendation to the generic diagnosis. *Parapagurodes constans*, new combination, is redescribed and illustrated in order to clarify its taxonomic status, and additional information is given for *Parapagurodes imaii*, new combination.

Key words: *Pagurus*, *Parapagurodes*, new synonym, new combination, Paguridae, Anomura.

During an ongoing revision of Japanese species assigned to the hermit crab genus *Pagurus* Fabricius, 1775, the type material of *Pagurus sagamiensis* Miyake, 1978, was reexamined for the first time. The original description of this taxon is brief, and the color illustration is rather diagrammatic and uninformative. There is no subsequent record of this taxon since the original description. Although *P. sagamiensis* was included in the identification key offered by Miyake (1978; 1982), its taxonomic status has remained rather obscure. Miyake (1978) included 14 specimens in the type series, of which 11, including the holotype, have been available for study. I have found that the type series includes specimens of the three previously described species that have been assigned to *Pagurus*: *P. constans* (Stimpson, 1858); *P. brachiomastus* (Thallwitz, 1891); and *P. imaii* (Yokoya, 1939). The holotype, an ovigerous female, is clearly conspecific with *P. constans*, and therefore, *P. sagamiensis* must be treated as a junior subjective synonym of *P. constans*. Further examination shows that *Pagurus constans* has short sexual tubes on both coxae of the fifth pereopods in males, and that *P. imaii* has a short sexual tube on the right coxa of the fifth pereopod in males. When Komai (1994) redescribed *Pagurus imaii* from southern Hokkaido, Japan, he failed to detect the presence of the short right sexual tube in males and did not indicate gill structure. These two species are transferred to the genus *Parapagurodes* McLaughlin and Haig (1973), with minor emendation to the generic diagnosis given by McLaughlin and Jensen (1996). Although *Parapagurodes constans* has been reported by a number of authors (see synonymy), no detailed description of this species has been published. In order to clarify the taxonomic status of *Parapagurodes constans*, it is redescribed and illustrated in detail.

Materials and Methods

Materials for this study have come from the following institutions: Natural History Museum and Institute, Chiba, Japan (CBM, with a code ZC); Laboratory of Marine Zoology, Faculty of Fisheries, Hokkaido University, Hakodate, Japan (HUMZ, with a code of C); Musée Zoologique in Strasbourg, France (MZ); Showa Memorial Institute, National

Science Museum, Tsukuba, Japan (NSMT-R, with a code of Cr). Shield length (sl), measured from the tip of the rostrum to the midpoint 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 exception of the posterior carapace (see Lemaitre, 1995), the fourth pereopod (see McLaughlin, 1997) and gill structure (see McLaughlin and de Saint Laurent, 1998). The drawings were made with the aid of a drawing tube mounted on a Leica MZ8 stereomicroscope.

Systematics

Family Paguridae
Parapagurodes McLaughlin and Haig, 1973

Diagnosis (*emended*). Eleven pairs of biserial gills, but gill lamellae sometimes with shallow median indentation, cleft or concavity. Antennal peduncle with supernumerary segmentation. Crista dentata on third maxilliped well developed, with accessory tooth. Maxillule with external lobe of endopod not recurved. Fourth pereopods with propodal rasp consisting of more than one row of corneous scales. Males with short to very short sexual tube developed on coxa of right fifth pereopod; left usually without, occasionally with short sexual tube; three unpaired, unequally biramous left pleopods in males. Females with paired gonopores; without paired pleopods; with four biramous left pleopods. Telson with transverse indentation; posterior lobes separated by small median cleft; terminal margins armed with small spines or spinules.

Remarks. The minor emendations made to the generic diagnosis given above pertain to such interspecifically variable characters as the presence or absence of the short male sexual tube on the left fifth pereopod and the gill structure. McLaughlin and Haig (1973) already pointed out the occasional development of the left sexual tube in *Parapagurodes makarovi* McLaughlin and Haig, 1976. The present examination has revealed the presence of very short sexual tubes developed from both coxae of the fifth pereopods in *P. constans*. The sexual tubes are similar in development between the right and left, and there is no marked intraspecific variation in the development. In other species of *Parapagurodes*, i.e., *P. laurentae* McLaughlin and Haig, 1976, *P. hartae* McLaughlin and Jensen, 1996, *P. gracilipes* (Stimpson, 1858), *P. nipponensis* (Yokoya, 1933) and *P. imaii*, the left sexual tube is always absent.

This study has also revealed that the gill lamellae sometimes have a shallow median indentation in *P. imaii*, approaching "quadriserial" lamellae (cf. McLaughlin and de Saint Laurent, 1998). However, the lamellae structure is different from the typical quadriserial structure in the possession of a shallow median indentation that separates equally or subequally the distal part of the lamella. As discussed by McLaughlin and de Saint Laurent (1998), there are many variations in the lamellae structure. The distal or subdistal indentation is narrow and distinctly separates unequally the distal part of the lamellae in typical quadriserial lamellae, equivalent to the "intermediate" condition defined by Lemaitre (1989). As may be seen in Fig. 5E, the lamellae structure in *P. imaii* varies from one level to another, and the indentate lamellae are restricted to the ventral portion. Dr. P. A. McLaughlin confirmed the presence of the similar gill structure in *P. laurentae* (personal communication). I have confirmed that all the lamellae are typically biserial, lacking distal indentation, in *P. gracilipes*, *P. nipponensis* and *P. constans*.

Parapagurodes constans (Stimpson, 1858), new combination
(Figs. 1–4)

Eupagurus constans Stimpson, 1958: 248(86) [type locality: Hakodate, southern Hokkaido, Japan]; 1907: 218, pl. 24, fig. 3; Henderson, 1888: 67, pl. 6, fig. 8; Ortmann, 1892: 310; Doflein, 1902: 647; Alcock, 1905: 177; Balss, 1913: 55; Terao, 1913: 366; Parisi, 1918: 113; Yokoya, 1933: 81; 1939: 285; Kamita, 1955: 33, fig. 12.

Pagurus constans: Makarov, 1938: 221, fig. 73; 1962: 210, fig. 73; Miyake, 1957: 87; 1960: 93, pl. 46, fig. 2; 1961a: 12; 1961b: 169; 1965: 647, fig. 1094; 1978: 87, fig. 32; 1982:132,

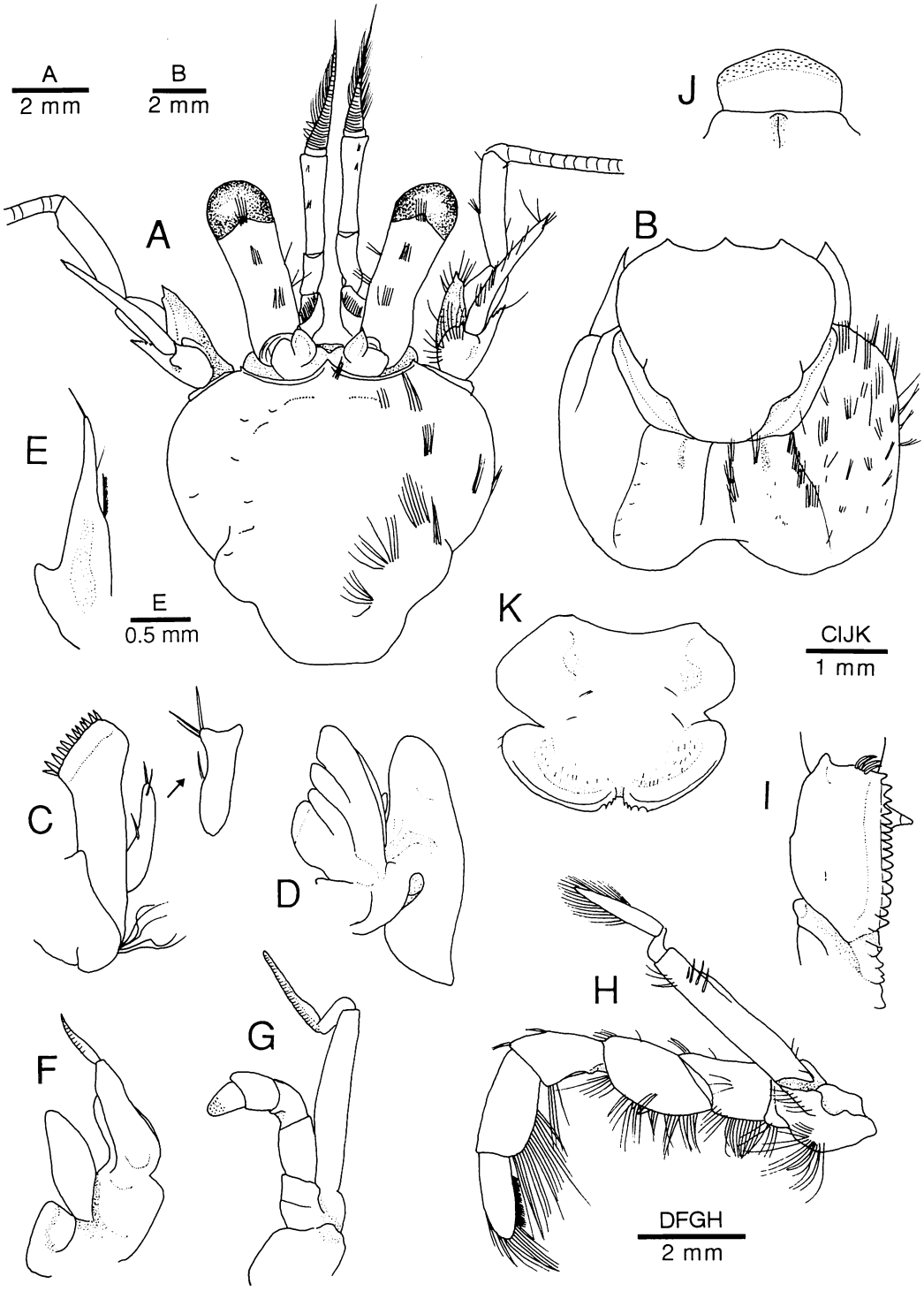

Fig. 1. *Parapagurodes constans* (Stimpson, 1858), new combination. Male (sl 7.7 mm) from off Takeoka, Boso Peninsula, central Japan, CBM-ZC 431. A, shield and cephalic appendages, dorsal, setae on left side partially omitted; B, carapace, dorsal, setae partially omitted; C, left maxillule, external, setae omitted; inset, endopod, lateral; D, left maxilla, external; E, same, endopod, internal; F, left first maxilliped, external; G, left second maxilliped, external; H, left third maxilliped, lateral; I, same, ischium and basis, dorsal (internal); J, anterior lobe of sixth thoracic sternite, ventral.

pl. 44, fig. 4; Miyake et al., 1962: 125; Igarashi, 1970: 8, pl. 5, fig. 18; Suzuki, 1970: 96, pl. 33, fig. 7; Kim, 1970: 7; 1973: 244, 604, fig. 62, pl. 72, fig. 41a, b; Miyake and Imafuku, 1980: 59; Takeda, 1982: 70, fig. 208; Komai et al., 1991: 197; Okutani, 1994: 227, fig. 9; Asakura, 1995: pl. 97, fig. 6, 362.

Pagurus sagamiensis Miyake, 1978: 116 (part), pl. 4, fig. 3(?) (see "Remarks") [type locality: Kannonzuka-dashi, Amadaiba, Sagami Bay, central Japan]. Syn. nov.

Material examined. Type material of *Pagurus sagamiensis*. Kannonzuka-dashi, Amadaiba, Sagami Bay, 65 m; 17 July 1964; dredge; 1 juv. (sl 1.7 mm); Miyake det. no. 274; NSMT-CrR 1579.–Same locality; 17 July 1964; dredge; 1 juv. (sl 1.5 mm); Miyake det no. 275; NSMT-CrR 1580.–Same locality, 66–72 ml 20 July 1964; dredge; 1 female (sl 2.3 mm); Miyake det. no. 285; NSMT-CrR.–Same locality. 65 m; 5 Dec 1964; dredge; 1 ovig. (sl 3.4 mm), holotype; Miyake det. no. 303; NSMT-CrR 1648.

Other material. Nakanose, Tokyo Bay; 10 May 1984; coll. T. Furota; 1 male (SL 9.1 mm), 2 females (SL 6.1, 6.7 mm); CBM-ZC 27.–Off Choshi, 35°45′ N, 140°58′ E, 60 m; 21 Oct 1991; trawl: 1 male (SL 8.7 mm); CBM-ZC 59.–Off Takeoka, Uchibo coast of Boso Peninsula, 30–40 m; 9 May 1994; gill net; coll. T. Komai; 2 males (SL 5.7, 7.7 mm); CBM-ZC 431.–Off Takeoka, 30–40 m; 18 Feb 1995; gill net; coll. T. Komai; 2 males (sl 8.3, 8.6 mm), 2 ovig. (sl 6.7, 8.3 mm); CBM-ZC 1057.–Off Katsuyama Ukishima Islet, Uchibo coast of Boso Peninsula, 120–200 m; 5 Apr 1995; gill net; coll. T. Komai; 1 male (sl 10.9 mm); CBM-ZC 1221.–Hakodate Bay, southern Hokkaido, 10–20 m; 17 Mar 1995; gill net; coll. T. Komai; 2 males (sl 6.3, 10.7 mm), topotypic specimens; CBM-ZC 2362.—Kominato, Sotobo coast of Boso Peninsula, 10–15 m; 27 Feb 1997; gill net; coll. T. Komai; 1 male (sl 4.5 mm); CBM-ZC 3536.–Funakoshi Bay, Iwate, 39°23.099′ N, 141°58.888′ E, 69 m; 25 May 1995; dredge; coll. T. Komai; 1 female (sl 3.7 mm); CBM-ZC 1923.–Off Katsuyama Ukishima Islet, Boso Peninsula, 100–150 m; 10 Apr 1997; gill net; coll. T. Komai; 1 ovig. (sl 10.5 mm); CBM-ZC 3966.–Miyako Bay, Iwate, 10–20 m; 3 Apr 1986; gill net; coll. T. Komai; 1 male (sl 12.2 mm), 2 females (sl 10.5, 11.7 mm); HUMZ-C 75.–Off Usujiri, Oshima Peninsula, southern Hokkaido, 10–20 m; 15 Nov 1989; dredge; coll. T. Komai; 1 male (sl 5.0 mm); inhabited in sponge; HUMZ-C 1130.–Tokyo Bay; 1880–1881; coll. L. Döderlein; 1 female (sl 7.8 mm); examined by Ortmann (1892); MZ 482 (spirit).–Sagami Bay, 90–180 m; 1881; coll. L. Döderlein; 1 male (size not measured); examined by Ortmann (1892); MZ 483 (spirit).

Type material. Type material was presumably destroyed in the great fire of Chicago in 1871 (Evans, 1967). The type locality is Hakodate, southern Hokkaido, Japan (originally spelled as "Hakodati").

Redescription. Shield (Fig. 1A) as broad as long or slightly wider than long; anterior margin between rostrum and lateral projections concave; anterolateral margins sloping; lateral margins strongly convex; posterior margin truncate; dorsal surface with longitudinal row of tufts of setae laterally. Rostrum triangular, with or without small subterminal spine, slightly overreaching lateral projections, partially obscured by paired tufts of setae. Lateral projections triangular, prominent, with small submarginal spine. Interocular process with concave anterior surface. Posterior carapace (Fig. 1B) membraneous except for calcified posteromedian plate, with scattered tufts of short to long setae on branchial region; posteromedian plate defined by subparallel cardiac sulci, with 2 or 3 pairs of tufts of setae along cardiac sulci; sulci cardiobranchialis represented by short longitudinal depression.

Ocular peduncles (Fig. 1A) moderately short, 0.6–0.8 times as long as shield; corneal region slightly dilated; dorsal or dorsomesial surface with row of tufts of stiff setae. Ocular acicles subovate, terminating subacutely and with moderately small subterminal spine; separated basally by basal width of one acicle; dorsal surface concave, without tufts of short setae.

Antennular peduncles (Fig. 1A) overreaching ocular peduncles by 0.4–0.6 of ultimate segment. Ultimate segment 1.3–1.5 times longer than penultimate segment, with row of short setae on dorsal surface, no setae on ventral surface. Basal segment with or without lateral spine.

Antennal peduncles (Fig. 1A) reaching or overreaching distal margin of corneae by 0.3–0.4 length of fifth segment; with supernumerary segmentation. Fifth and fourth segments with few scattered setae. Third segment with moderately strong spine at ventrodistal angle partially obscured by tufts of long stiff setae. Second segment with dorsolateral distal angle prominently produced, reaching mid-length of fourth segment, terminating in simple or bifid spine and with some spinules on mesial margin partially obscured by setae; dorsomesial distal angle with moderately strong spine. First segment with or without small spine on lateral surface, ventrodistal margin produced, with 3 or 4 spinules laterodistally. Antennal acicle moderately long, overreaching mid-length of fifth segment of peduncle and reaching or exceeding beyond distal margin of cornea; weakly curved, terminating in acute spine, mesial margin with row of tufts of stiff setae. Antennal flagellum usually longer than outstretched right cheliped, with very short setae on every article.

Mandible without distinctive feature. Maxillule (Fig. 1C) with external lobe of endopod moderately well developed, triangular, not recurved; internal lobe with 3 apical bristle. Maxilla (Fig. 1D) with endopod (Fig. 1E) extending as far as distal margin of anterior lobe of scaphognathite, bearing prominent subtriangular lateral lobe basally. First maxilliped (Fig. 1F) with endopod not reaching distal margin of distal endite. Second maxilliped (Fig. 1G) with partially fused basis and ischium; basal segment of exopod moderately stout. Third maxilliped (Fig. 1H) moderately stout; carpus unarmed on dorsodistal margin; merus unarmed on dorsodistal margin, but with prominent ventromesial spine; crista dentata on ischium (Fig. 1I) composed of row of relatively strong corneous teeth and 1 accessory tooth; basis with 4 denticles on mesial surface.

Chelipeds markedly unequal. Right cheliped (Figs. 2A, B, 3A) with chela about 2.0 times as long as wide, suboval in dorsal view; dactyl shorter than palm measured along mesial margin; cutting edge with row of strong calcareous teeth, of these proximal two enlarged and short distal row of corneous teeth, terminating in small corneous claw, slightly overlapped by fixed finger; dorsal surface nearly flat, with submedian row of strong spines decreasing in size distally but extending nearly to tip and numerous tufts of moderately short stiff setae; dorsomesial margin with row of strong spines also decreasing in size distally and not extending nearly to base of terminal claw; mesial and ventral surfaces unarmed, but with scattered tufts of setae. Palm subequal in length to carpus; dorsomesial margin with almost straight in dorsal view, distinctly delimited with row of moderately strong to strong spines, slightly convex dorsal surface with 2 rows of strong spines (mesial row along dorsomesial margin and submedian row extending onto fixed finger) and 4 or 5 irregular rows of obtuse tubercles, dorsolateral margin also clearly delimited with row of strong spines, becoming double row proximally; spines frequently with inflated basal part, encircled by moderately short stiff setae, tubercles with tufts of stiff setae; mesial, lateral and ventral surfaces with few low protuberances and tufts of long setae, ventral surface inflated posterior to base of dactyl. Fixed finger very broadly based, cutting surface with 2 or 3 pairs of calcareous teeth in proximal 0.5 and single strong corneous tooth distal to mid-length, distal 0.3 obscurely dentate, terminating in small corneous claw. Carpus slightly shorter than merus, noticeably becoming broader distally; dorsomesial margin with single row of strong spines becoming strong distally, dorsal surface with 2 irregular rows of moderately strong to strong spines and few irregular rows of obtuse tubercles, distal margin with few strong submarginal spines; dorsolateral margin not delimited, lateral face with scattered low protuberances each bearing transverse row of stiff setae, laterodistal angle produced, rounded, laterodistal ventral margin with 1 small subdistal spine; mesial face slightly concave,with scattered tufts of stiff setae, mesiodistal margin unarmed; ventral surface inflated, unarmed, with few tufts of setae. Merus subtriangular; dorsodistal margin with 2–4 slender spines, dorsal surface with some short transverse rows of bristle-like setae; lateral face smooth, with scat-

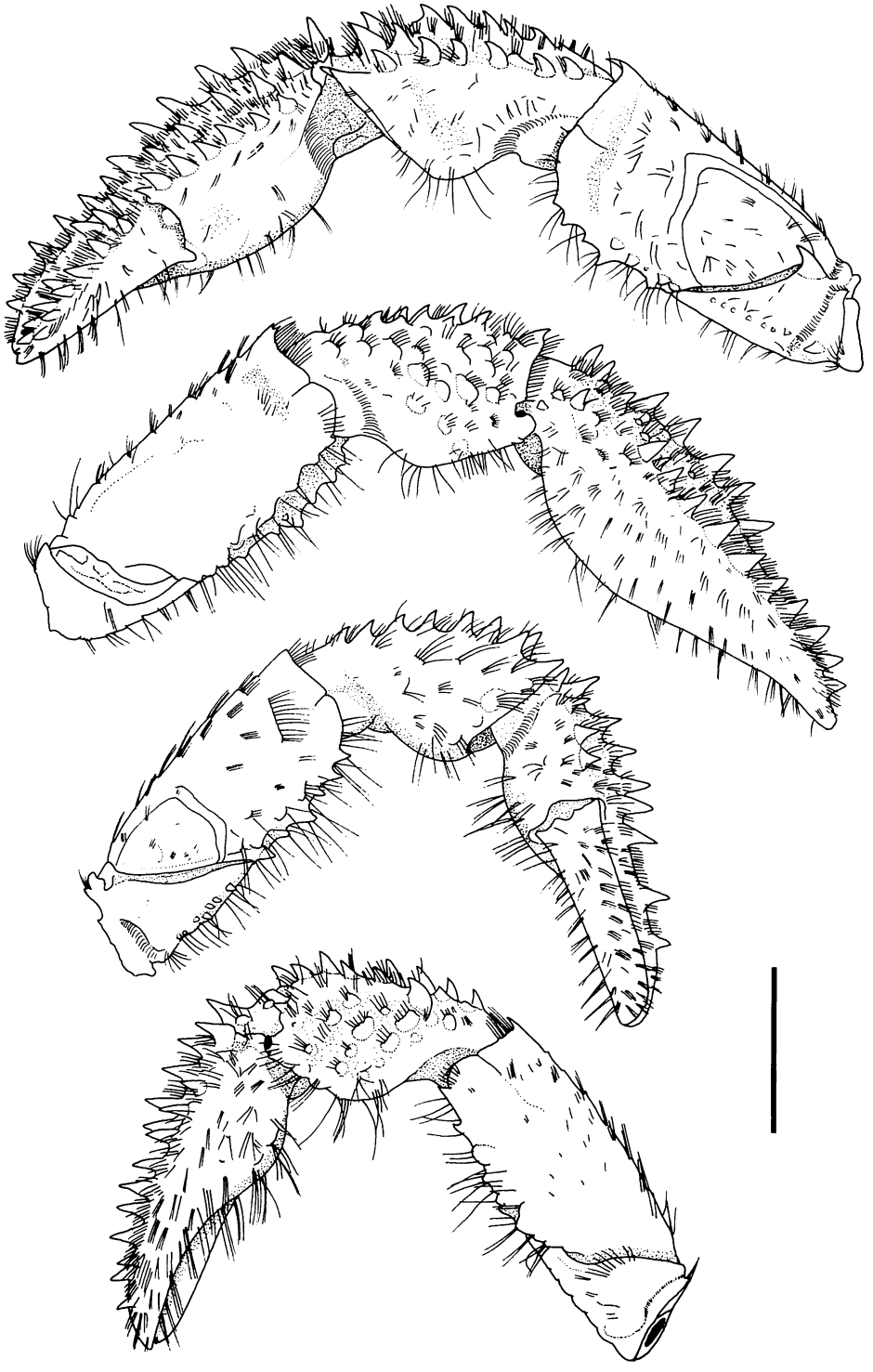

Fig. 2. *Parapagurodes constans* (Stimpson, 1858), new combination. Male (sl 7.7 mm) from off Takeoka, Boso Peninsula, central Japan, CBM-ZC 431. A, right cheliped, mesial; B, same, lateral; C, left cheliped, mesial; D, same, lateral. Scale bar equals 5 mm.

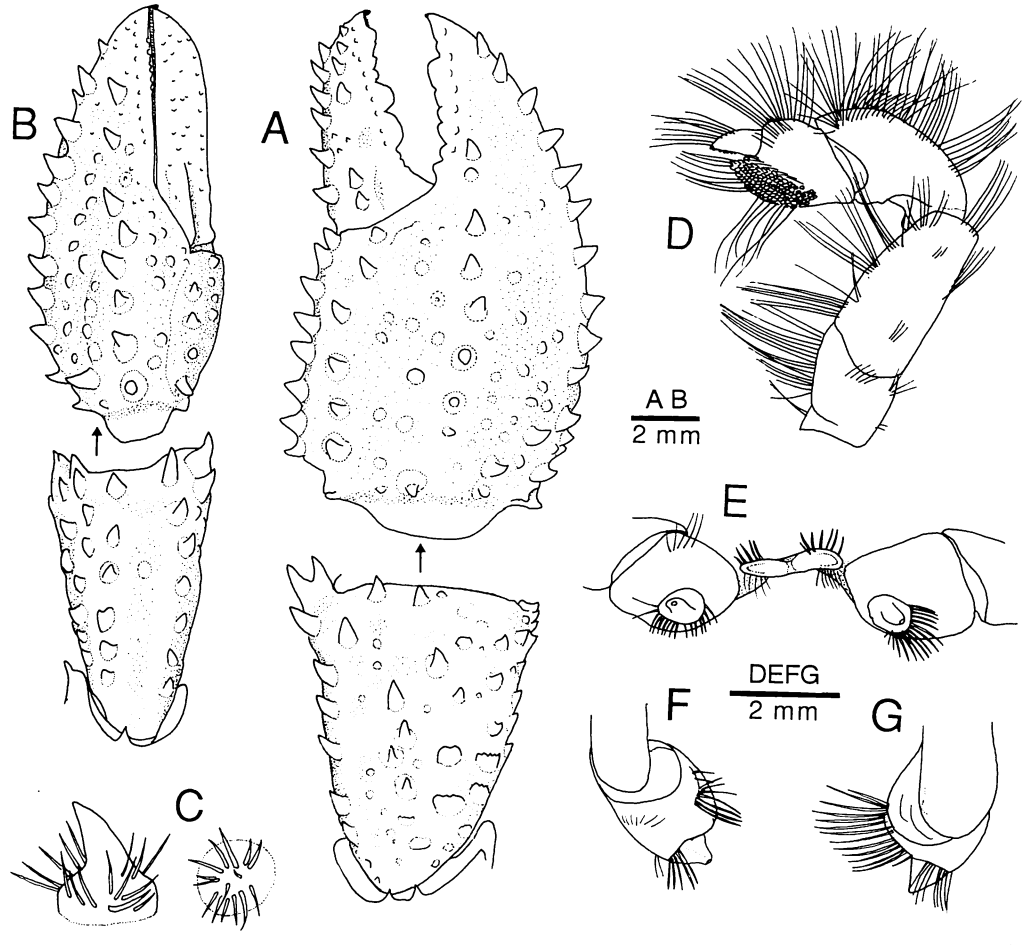

Fig. 3. *Parapagurodes constans* (Stimpson, 1858), new combination. Male (sl 7.7 mm) from off Takeoka, Boso Peninsula, central Japan, CBM-ZC 431. A, chela and carpus of right cheliped, dorsal, setae omitted; B, chela and carpus of left cheliped, dorsal, setae omitted; C, left, semidiagrammatic spine on palms; right, semidiagrammatic tubercle on palms scale bar is the same as figs AB or DEFG; D, left fourth pereopod, lateral; E, coxae of fifth pereopods and eighth thoracic sternite, ventral; F, coxa of right fifth pereopod, lateral; G, coxa of left fifth pereopod, lateral.

tered tufts of bristle-like setae, ventrolateral margin with short row of few small spines or spinulose tubercle distally; mesial face with blunt tubercles ventrally, few transverse rows and scattered tufts of bristle-like setae, ventromesial margin with row of small to moderately strong spines distally; ventral surface with scattered small spinulose tubercles and tufts of bristle-like setae. Ischium with very strong spine mesiodorsally; ventromesial margin with row of small tubercles becoming strong distally. Basis with 1 prominent spine on ventromesial margin. Coxa unarmed on ventrolateral margin.

Left cheliped (Figs. 2C, D, 3B) with propodal-carpal articulation with slight degree of clockwise torsion; chela moderately broad, greatest breadth across at base of dactyl, about 2.5 times as long as broad; dactyl 1.8 times to more than twice length of palm; cutting edge with fine row of small corneous teeth almost over entire length, terminating in strong corneous claw; dorsomesial not delimited, dorsal midline unarmed; dorsal, mesial and ventral surfaces with scattered tufts of moderately short stiff setae. Palm nearly half length of carpus; dorsal surface with row of strong spines along mid-line, extending onto fixed finger and single or double longitudinal row of obtuse tubercles

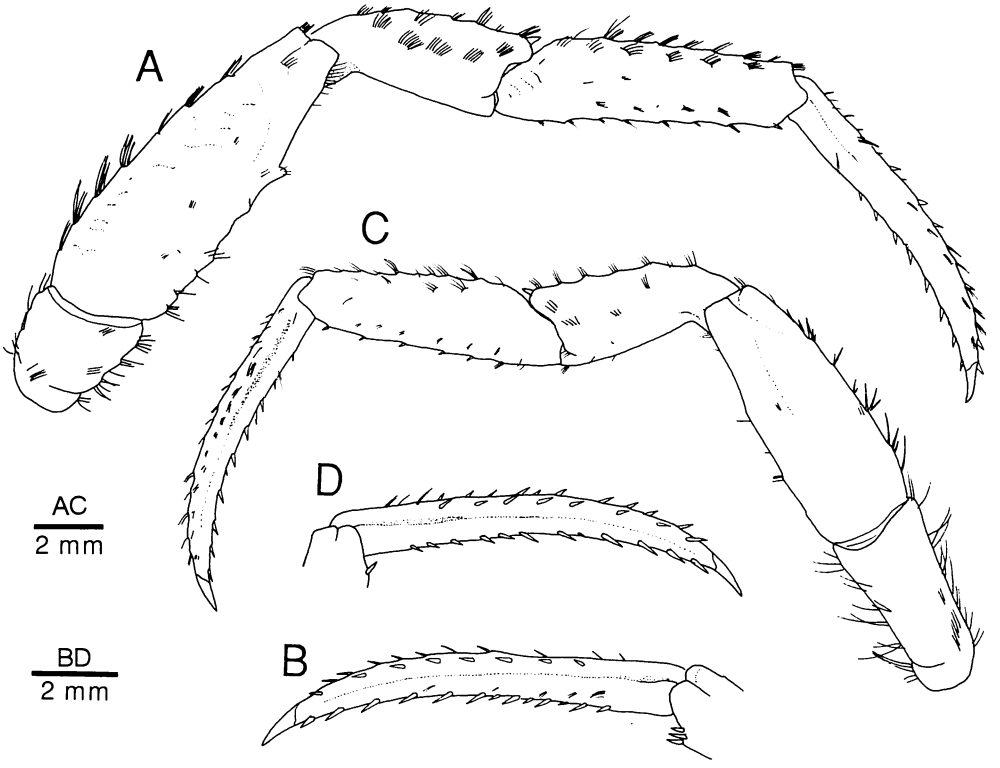

Fig. 4. *Parapagurodes constans* (Stimpson, 1858), new combination. Male (sl 7.7 mm) from off Takeoka, Boso Peninsula, central Japan, CBM-ZC 431. A, right second pereopod, lateral; B, same, dactyl, mesial, setae omitted; C, left third pereopod, lateral; D, same, dactyl, mesial, setae omitted.

on either other side of median row; dorsolateral margin convex, with single row of strong spines, decreasing in size distally; spines frequently each with inflated basal portion bearing short stiff setae and tubercles obscured by tufts of short stiff setae; mesial face protuberant, with few tufts of longer setae; ventral and lateral surfaces with scattered tufts of longer setae. Cutting edge of fixed finger with very small calcareous teeth in distal 0.5, interspersed by row of small corneous teeth, terminating in strong corneous claw. Carpus slightly shorter than merus, becoming broader distally; dorsolateral and dorsomesial margins with row of strong spines, becoming stronger distally; laterodistal margin with few spines dorsally, lateral face with scattered moderately small spines or low protuberances, each bearing tufts of obliquely transverse row of stiff setae, ventrolateral margin slightly protuberant, with 1 distal spine; mesial face with scattered low protuberances each bearing tufts of stiff setae, ventromesial margin unarmed; ventral surface moderately well inflated, with few tufts of long setae. Merus with low protuberances each bearing transverse row of bristle-like setae on dorsal surface; mesial face with scattered tufts of bristle-like setae and low obtuse tubercles bearing stiff setae ventrally, ventromesial margin with row of moderately strong spines, none particularly enlarged; lateral face smooth, mostly naked, ventrolateral margin with row of moderately strong spines or spinulose tubercles, proximal 1 or 2 sometimes multidenticulate; ventral surface with few small spines and tufts of stiff setae. Ischium unarmed mesiodorsally; ventromesial margin with row of small spines and tufts of stiff setae; ventral surface protuberant. Basis with 1 small spine on ventromesial margin. Coxa with row of small spinules on ventrolateral margin.

Ambulatory pereopods (Fig. 4A, C) with dactyls (Fig. 4B, D) 1.1–1.3 times longer than propodi; in dorsal view, slightly twisted; in

lateral view weakly curved ventrally; terminating in moderately strong corneous claws; dorsal faces each with row of moderately small corneous spines and tufts of short stiff setae; lateral faces each with rows of tufts of short setae flanking faint median sulcus; mesial surfaces each with row of moderately small corneous spines dorsally and row of tufts of short stiff setae ventrally, faintly sulcate medially; ventral margin each with 10–13 moderately strong corneous spines, increasing in length distally, occasionally interspersed by small corneous spinules. Propodi distinctly longer than carpi; dorsal surfaces each with row of low transverse protuberances bearing short transverse row of short bristle-like setae; lateral faces each with 2 or 3 short transverse rows of bristle-like setae; mesial faces with longitudinal row of short transverse rows of bristle-like setae dorsally and tufts of very short setae ventrally; ventrodistal margins each with 2–4 small corneous spines, ventral surfaces with row of small corneous spines obscured by tufts of short setae. Carpi distinctly shorter than meri; dorsal surfaces each with row of low protuberances bearing short transverse row of short bristle-like setae and 1 distal spine; lateral faces with scattered tufts or short rows of short bristle-like setae; mesial faces naked; ventral surfaces each with few tufts of short setae. Meri each with several transverse rows of longer bristle-like setae on dorsal surfaces; ventral surface protuberant or tuberculate (more strongly in second than in third), with tufts of short bristle-like setae, ventrolateral distal margins unarmed; lateral and mesial faces each with few tufts of very short setae. Ischia with dorsal and ventral tufts of longer setae, ventral margin weakly protuberant in second, smooth in third. Paired gonopores on coxae of third pereopods in female.

Fourth pereopods (Fig. 3D) semichelate, thickly setose on dorsal and ventral faces of propodus, carpus, merus and ischium; dactyl relatively stout, weakly curved, preungual process apparently absent; propodus with convex ventral margin, propodal rasp well developed, composed of several rows of corneous scales.

Fifth pereopods chelate; coxae (Fig. 3E–G) nearly symmetrical, with short sexual tubes on both, partially obscured by short setae.

Third thoracic sternite with 1 pair of submedian spines on anterior margin. Sixth thoracic sternite (Fig. 1J) with subrectangular anterior lobe, with dense long setae anteriorly, but unarmed. Eighth thoracic sternite developed ventrally as 2 somewhat flattened rounded lobes separated by shallow median depression, anteroventral margins each with row of setae.

Males with 3 unequally biramous unpaired pleopods, all with exopods moderately well developed, endopods rudimentary. Females with 4 unpaired biramous pleopods; endopods of second to fourth similarly developed, somewhat flattened, exopods slenderer than endopods; fifth pleopod smaller than preceding pleopods, with rudimentary endopod. Uropods noticeably asymmetrical; exopods and endopods both with well developed rasp; protopods each with few small corneous spinules on posterolateral margins.

Telson (Fig. 1K) broader than long, with strong transverse suture; anterior lobe with strongly convex lateral margin, bearing row of bristle-like setae; posterior lobes nearly symmetrical, rounded, separated by small median cleft; terminal margins short, oblique, each with row of 3–5 small spines; lateral margins strongly convex, with few bristles.

Coloration. In life: shield generally brown, with median and 2 lateral pairs of dark spots; branchiostegite with reticulate pattern of brown; posterior carapace sometimes reddish, with white spots. Ocular peduncles generally yellow brown, with pale brown band proximally. Antennal flagella uniformly brown. Chelipeds light brown generally, with dark brown markings on palms and carpi; merus with reticulated markings. Ambulatory legs light or yellowish brown generally, with broad dark brown bands on propodi, carpi and meri.

In preservative: faded into straw color entirely; markings on chelipeds and bands on ambulatory legs may be preserved in specimens in alcohol.

Size. Largest male: sl 10.9 mm; largest female: sl 10.5 mm; ovig: sl 3.4–10.5 mm.

Distribution. Sea of Japan, from Korean Strait to Hokkaido; Pacific coast of Japan

from southern Hokkaido to Kii Peninsula; 5–150 m.

Symbiotic associations. Usually found living in shelters formed by colonies of hydractinid hydorozoan, *Hydrissa sodalis* (Stimpson). This species is also sometimes associated with the sponge *Suberites* sp., and is rarely found living in gastropod shells.

Remarks. In addition to the sexual tube development on both fifth pereopods, *Parapagurodes constans* is characterized by the presence of a strong spine on the dorsomesial surface of the ischium of the right cheliped, the characteristic armature of the right palm and the slightly symmetrical, rounded posterior lobes of the telson. The short sexual tubes of *P. constans* may be not easily discernible in casual observation, as evidenced by the previous author's assignment of the species to *Pagurus*.

The type series of *Pagurus sagamiensis* consisted of 14 specimens (Miyake, 1978), of which 11 have been available during this study. As indicated, the present study found that the holotype of *Pagurus sagamiensis* Miyake, 1978 (ovigerous female; sl 3.4 mm), actually represents *Parapagurodes constans*. Three of 10 paratypic specimens (NSMT-CrR 1579; 1580; and no number) are also referred to *P. constans*; the five specimens (NSMT-CrR 2060; 2298; 2299; 2324; and no catalog number) are referred to *Parapagurodes imaii* (see Ramarks under than species). The color illustration of *Pagurus sagamiensis* published by Miyake (1978: pl. 4, fig. 3) is diagrammatic, and does not closely fit any of the three species in the type series.

The single small specimen (NSMT-CrR 1572) is referable to *Pagurus brachiomastus* (Thallwitz, 1892). It shows the following features: the chelipeds are setose and spiny, of which the meri possesses a prominent ventral tubercle; the carpus of the second pereopod bears a row of prominent spines; and has 11 pairs of biserial gills. I compared this specimen with those from Sagami Bay reported as *P. brachiomastus* by Miyake (1978), and found that they were clearly conspecific. However, the true identity of those specimens is unclear. Variations in both external morphology and coloration observed in Japanese specimens suggest the existence of a *P. brachiomastus* complex, which includes two or more species (Komai, in prep).

Miyake (1978: 88, text-fig. 32d) erroneously described the morphology of the telson as follows: "lateral and terminal margins each smooth and rounded". The terminal margins of the telson are actually armed with 3–5 small spines, as illustrated (Fig. 1K).

Parapagurodes imaii (Yokoya, 1939), new combination

(Fig. 5)

Eupagurus imaii Yokoya, 1939: 285, fig. 13 [type locality: Shiranezaki, Miyagi Prefecture, northern Japan].

Pagurus imaii: Gordan, 1956: 330 (list); Miyake, 1978: 72 (key, in Japanese), 81 (key, in English); 1982: 197 (list); 227 (key); Komai, 1994: 33, figs. 1–3.

Pagurus sagamiensis Miyake, 1978: 116 (in part).

Material examined. Paratypes of *Pagurus sagamiensis*. 1.5 km off southwest of Jogashima Islet, Sagami Bay, 70–75 m; 19 Dec 1962; dredge; 1 ovig. female (sl 1.7 mm); Miyake det. no. 482; NSMT-CrR 2060.–2 km off southsouth-by west of Jogashima Islet, 68 m; 24 Jan 1965; dredge;1 male (sl 2.4 mm); Miyake det. no. 568; NSMT-CrR 2298.–Same data; 1 female (sl 1.8 mm); Miyake det. no. 569; NSMT-CrR 2299.–2.5 km off westnorth-by-west of Jogashima Islet, 65–75 m; 13 Feb 1965; dredge; 1 male (sl 2.65 mm); Miyake det. no. 589; NSMT-CrR 2324.–2 km off west-south-by-west of Jogashima Islet, 78–85 m; 10 Feb 1963; dredge; 1 ovig. female (sl 1.6 mm); Miyake det. no. 486; NSMT-CrR.

Other material. Off Usujiri, Oshima Peninsula, southern Hokkaido, 10–20 m; 7 May 1992; dredge; coll. T. Komai; 7 males (sl 2.1–3.0 mm); CBM-ZC 344.–Funakoshi Bay, Iwate, Sanriku coast of Honshu, 39°23.634′ N, 141°57.181′ E, 66 m; sand mixed with shell fragments; 25 May 1995; dredge; coll. T. Komai; 1 male (sl 2.1 mm), 1 ovig (sl 1.6 mm); CBM-ZC 1911.–Same locality, 39°23.099′ N, 141°58.888′ E, 69 m; 25 May 1995; dredge; coll. T. Komai; 1 female (sl 1.1 mm); CBM-ZC 1922.–Same locality, 39°23.113′ N, 141°-58.493′ E, 50 m; 25 May 1995; dredge; coll. T. Komai; 1 female (sl 1.1 mm), 2 ovig (sl 1.1, 1.2 mm), 1 juv (sl 0.8 mm); CBM-ZC 1947.–Off

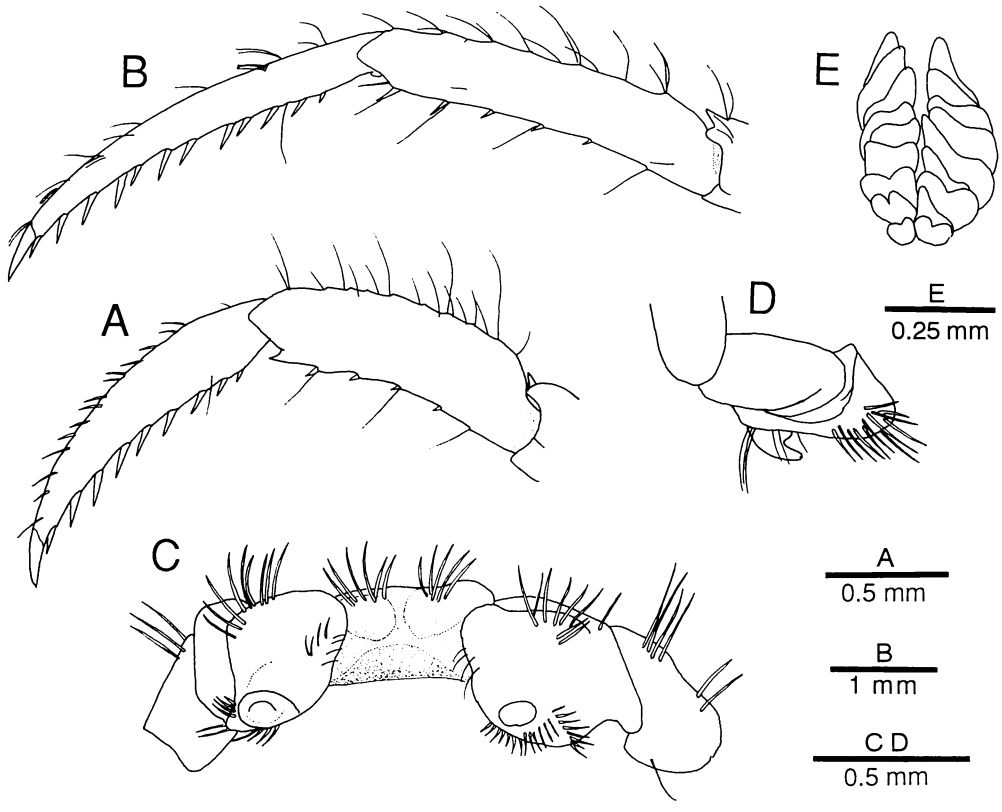

Fig. 5. *Parapagurodes imaii* (Yokoya, 1939), new combination. A, female from Sagami Bay (sl 1.6 mm), paratype of *Pagurus sagamiensis* Miyake, 1978, NSMT-CrR no number (Miyake det. no. 486); B-E, male from Sagami Bay (sl 2.65 mm), paratype of *Pagurus sagamiensis* Miyake, 1978, NSMT-CrR 2324. A, B, dactyl and propodus of left third pereopod, lateral; C, coxae of fifth pereopods and eighth thoracic sternite, ventral; D, coxae of right fifth pereopods, lateral; E, ventral part of arthrobranch on left fourth pereopod, ventrolateral.

Takeoka, Uchibo coast of Boso Peninsula, ca. 80 m; 2 Mar 1995; gill net; coll. T. Komai; 1 male (sl 2.5 mm); CBM-ZC 2699.–Nakanose, Tokyo Bay, depth unknown; 10 May 1984; coll. T. Furota; 1 male (sl 2.7 mm); CBM-ZC 4530.

Type material. Probably no longer extant. Type locality is Shiranezaki, Miyagi Prefecture, northeastern Honshu, Japan; at a depth of 34 m.

Description. See Komai (1994).

Distribution. Previously known only from the type locality and off Usujiri, southern Hokkaido. This study shows that the species is distributed in the Pacific coast of Japan from southern Hokkaido to Sagami Bay; 20–85 m.

Variation. As previously indicated by Komai (1994), males of *Parapagurodes imaii* exhibit a sexually dimorphic lengthening and narrowing of the carpus of the right cheliped, with corresponding narrowing of the chela and weakening of the armature. Large males exhibit differences in the length-breadth ratio of the dactyls of the ambulatory pereopods. The dactyls and propodi of the pereopods become more elongate in proportion relative to their depths. Additionally the present study found that the dactyl and propodus of the left third pereopod show a marked sexual dimorphism. In males (Fig. 5 B), the dactyl and propodus are relatively slender, and the ventral surface of the propodus is armed with a single row of corneous spines. In females (Fig. 5A), the dactyl is somewhat broadened subproximally and more strongly flattened; the dorsal surface bears more numerous setae; and the pro-

podus is not elongate, and its ventral surface is armed with a moderately strong calcareous spine distally, in addition to the row of corneous spines.

Remarks. My attempt to locate the holotype of *Eupagurus imaii* Yokoya, 1939, were unsuccessful, and it may be no longer extant.

The present study has revealed that the type material of *Pagurus sagamiensis* contains three previously described species, including *Parapagurodes imaii*. The following five paratypic specimens are assigned to *Parapagurodes imaii*: NSMT-CrR 2060 (ovig, sl 1.7 mm, Miyake det. no. 482); 2298 (male, sl 2.4 mm, Miyake det. no. 568); 2299 (female, sl 1.8 mm, Miyake det. no. 569); 2324 (male, sl 2.65 mm, Miyake det. no. 589); and no catalog number (ovig, sl 1.6 mm, Miyake det. no. 486).

The short right sexual tube in males is not easily discernible in casual observation, as evidenced by Komai's (1994) assignment of the species to *Pagurus*. It is curved anteriorly (Fig. 5C, D), being similar to that of *Parapagurodes gracilipes* (Stimpson, 1858) and *P. nipponensis* (Yokoya, 1933). Moreover, as discussed before, it has been shown that the gill lamellae sometimes have a shallow median indentation in *Parapagurodes imaii*, approaching the quadriserial gill lamellae (Fig. 5E). The overall body size of this species is small, and deliberate manipulation is necessary to make the lamellae apparent.

The genus *Parapagurodes* now contains the following six species, other than *P. imaii* and *P. constans*: *P. makarovi*; *P. laurentae*; *P.hartae*; *P. gracilipes*; and *P. nipponensis* (cf. McLaughlin and Jensen, 1996; Komai, 1998). *Parapagurodes imaii* appears similar to *P. laurentae* and *P. hartae* in the spinose right cheliped, which is noticeably elongate in large males, and the convex dorsal surface of the left palm with row of prominent spines. The fewer, stronger spines on the terminal margins of the telson separate *P. imaii* from the other two species. From *P. laurentae*, *P. imaii* further differs in the presence of a median row of spines on the dactyl of the right cheliped, the weaker, not tubular, spines on the right palm, and much shorter right sexual tube. From *P. hartae*, it is distinguished further by the absence of a median row of spines from the dactyl of the left cheliped, and the presence of a dorsolateral row of spines on the carpus of the right cheliped. As suggested by Komai (1994), *P. imaii* superficially resembles the species of the *capillatus* group of *Pagurus* (cf. McLaughlin, 1974) in the setose, spiny chelipeds, and the presence of a row of strong spines on the dorsal surface of the right second pereopod.

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サガミホンヤドカリ（十脚目：異尾下目：ホンヤドカリ科）の模式標本の再検討

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Miyake (1978) によって，相模湾の各地から採集された材料にもとづいて記載された *Pagurus sagamiensis* Miyake, 1978（サガミホンヤドカリ）の模式標本を再検討した結果，3既知種が混同されていることが判明した．完模式標本は *Pagurus constans* (Stimpson, 1858)（イガグリホンヤドカリ）と同種であり，したがって，*Pagurus sagamiensis* は *Pagurus constans* のシノニムとされた．副模式標本は，イガグリホンヤドカリのほかに，*Pagurus imaii* (Yokoya, 1939)（イマイホンヤドカリ）と *Pagurus brachiomastus* (Thallwitz, 1891)（イクビホンヤドカリ）から構成されていた．さらに，他地域からの標本も含めて詳細に検討した結果，イガグリホンヤドカリとイマイホンヤドカリの雄において第5胸脚の底節に短い精管が発達することが判明した．そのほかの形質も検討した結果，両種は *Parapagurodes* McLaughlin and Haig, 1973 に移されるべきであるという結論に達し，新組み合わせ *Parapagurodes constans* および *Parapagurodes imaii* を提唱した．イガグリホンヤドカリについては，模式標本が紛失した上，これまで詳細な記載がなかったので，模式産地である函館産の標本も加えて詳細な再記載を与えた．イマイホンヤドカリは，最近 Komai (1994) によって再記載されたが，本研究によって精管の発達の見落としが是正され，新たに性的二型に関する情報が得られた．イマイホンヤドカリは，これまで，模式産地である宮城県金華山付近と南北海道臼尻のみから記録されていたが，相模湾まで分布することが判明した．なお，イクビホンヤドカリについては，未記載種を含む少なくとも3種が混同されていることがわかっており，本論文では詳細な取扱は行わなかった．