Nat. Hist. Res., Special Issue No. 7: 323–337, March 2000

Redescription of *Pagurus pectinatus* (Crustacea: Decapoda: Anomura: Paguridae)

Tomoyuki Komai

Natural History Museum and Institute, Chiba
955–2 Aoba-cho, Chuo-ku, Chiba 260–8682, Japan

Abstract *Pagurus pectinatus* (Stimpson, 1858) is redescribed based on material from Asian waters, and differences between *P. pectinatus* and the very similar, *P. kennerlyi* (Stimpson, 1864), are documented for the first time. Although the two species are very similar, the poorly developed corneous teeth on the cutting edges of the dactyl and fixed finger of the right cheliped, and in males the less elongate spines on the right cheliped will distinguish *P. pectinatus* from *P. kennerlyi*. A reexamination of the holotype of *Clibanarius japonicus* Rathbun, 1902, has shown that it represents a specimen of *P. pectinatus* with an abnormally small right cheliped in the process of regeneration. Thus, *Clibanarius japonicus* is regarded as a junior subjective synonym of *P. pectinatus*. The available material suggests that *P. pectinatus* is restricted to Asian waters. The occurrence of *P. kennerlyi* in Asian waters is represented only by a single specimen from Muroran, Hokkaido, and it is doubtful that the species is normally distributed in Asian waters.

Key words: Decapoda, Anomura, Paguridae, *Pagurus pectinatus*, redescription, new synonym.

Pagurus pectinatus (Stimpson, 1858) was first described from Hakodate, Hokkaido, Japan, and has been reported from northern Japan, Russian Far East, Korea and northeastern China (Makarov, 1938b; 1962; Kim, 1973; Miyake, 1982; Wang, 1994). It is very common in local waters and is relatively well known because of its commensalism with a sponge, *Suberites domuncula* (cf. Makarov, 1938a; 1938b; Miyake, 1982). As noted by McLaughlin (1974), this species is very similar to *Pagurus kennerlyi* (Stimpson, 1864), known from the Aleutians to the State of Washington, northwest coast of North America, and Hokkaido, Japan, but differences between the two have remained undocumented. In this study, I have compared material from Asian waters with topotypic specimens of *P. kennerlyi* from Puget Sound, and found that there are a few minor differences which would seem to justify recognition of two distinct species. The specimen from Muroran, Hokkaido, identified as *P. kennerlyi* by McLaughlin (1974), was also reexamined, and the identification was verified. A reexamination of the holotype of *Clibanarius japonicus* Rathbun, 1902, originally described based on a single specimen from Muroran, Hokkaido, has disclosed that it represents *P. pectinatus* with an abnormally small right cheliped in the process of regeneration. Thus, Rathbun's taxon should be regarded as a junior subjective synonym of *P. pectinatus*. In order to clearly define *P. pectinatus*, it is herein 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); Laboratory of Marine Zoology, Faculty of Fisheries, Hokkaido University, Hakodate, Japan (HUMZ); Kitakyushu Museum of Natural History, Kitakyushu (KMNH); National Museum of Natural History, Smithsonian Institution, Washington, D. C. (USNM); and Zoologische Staatssammlung München (ZSM). 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). General terminology used in the description follows McLaughlin (1974), with exception of the posterior carapace (see Le-

maitre, 1995), the fourth pereopod (see Mc Laughlin, 1997) and gill structure (see Mc Laughlin and de Saint Laurent, 1998). The drawings were made with the aid of a drawing tube mounted on an OLYMPUS SZH stereomicroscope.

For comparative purposes, the following specimens of *Pagurus kennerlyi* were examined: Friday Harbor, Washington, USA; IX.1923; coll B. Stevens; 2 males (sl 14.7, 17.2 mm), 1 female (sl 10.2 mm); USNM 57582.—Muroran, southern Hokkaido, Japan; coll. N. Grebnitzkii: 1 male (sl 18.3 mm); USNM 51178 [reported by McLaughlin (1974)].

Taxonomy

Pagurus pectinatus (Stimpson, 1858)
(Figs. 1–4, 3A, 5)

Eupagurus pectinatus Stimpson, 1858: 249 (type locality: Hakodate, Hokkaido, Japan); Alcock, 1905: 177; Stimpson, 1907: 220; Balss, 1913: 60 (part), text-fig. 35, pl. 1, fig. 8; Terao, 1913: 371; Yokoya, 1939: 280.

Eupagurus seriespinosus Thallwitz, 1891: 34 (type locality: "Japan oder China"); Terao, 1913: 372.

Clibanarius japonicus Rathbun, 1902: 35, figs. 2–5 (type locality: Muroran, Hokkaido, Japan); Terao, 1913: 361; Makarov, 1938 b: 163, fig. 65; Kobjakova, 1955: 241; Makarov, 1962: 154, fig. 65; Miyake, 1978: 49 (key); 1982: 216 (key); Komai et al., 1992: 196 (list).

?*Eupagurus pectinatus*: Yokoya, 1933: 83 (? part). See "Remarks".

Pagurus pectinatus: Makarov, 1937: 57, fig. 4; 1938a: 411, fig. 2; 1938b: 214, pl. 4, fig. 3; Derjugin and Kobjakova, 1935: 142; Vinogradov, 1950: 231, fig. 23; Gordan, 1956: 333 (bibliography); Miyake, 1957: 89; Kobjakova, 1958: 232; 1967: 240; Makarov, 1962: 203, pl. 4, fig. 3; Igarashi, 1970: 7, pl. 5, fig. 17; Kim, 1973: Miyake, 1982: 131; Takeda and Miyauchi, 1992: 144; Komai et al., 1992: 197; Wang, 1994: 570; Asakura, 1995:; Komai, 1997: 121, fig. 5C.

?*Pagurus pectinatus*: McLaughlin, 1974: 130. See "Remarks".

Pagurus brachiomastus: Miyake, 1982: pl. 43, fig. 6; Takeda, 1994: 228, fig. 4. Not *Pagurus brachiomastus* (Thallwitz, 1891). See "Remarks".

Not *Pagurus pectinatus*: Urita, 1942: 42; Miyake, 1975: 116, unnumbered fig.; Miyake, 1982: pl. 44, fig. 3; Takeda, 1994: 228, figs. 1, 2. See "Remarks".

Type material. The type of *Eupagurus pectinatus* Stimpson, 1858, is no longer extant. It was presumably destroyed by the great fire of Chicago in 1871 (Evans, 1967).

The type of *Eupagurus seriespinosus* Thallwitz, 1891, kept in the Dresdener Museum, Germany, was lost during the last year of the World War II (K. Schniebs of the Staatliches Museum für Tierkunde, Dresden, personal communication).

Holotype of *Clibanarius japonicus* Rathbun, 1902: Muroran, Hokkaido; 1900; coll. D. S. Jordan and J. O. Snyder; 1 female (sl 15.7 mm); USNM 26151.

Other material examined. Off Usujiri, Pacific coast of Oshima Peninsula, southern Hokkaido, 15–25 m; 18. VI. 1988; dredge; coll. F. Muto; 2 males (sl 5.3, 6.9 mm), 1 female (sl 4.6 mm); CBM-ZC 94.—Same locality, 20–25 m; 28 May 1993; dredge; coll. F. Muto; 1 female (sl 5.3 mm); CBM-ZC 583.—Akkeshi, eastern Hokkaido; 14. VII. 1988; 1 male (sl 13.7 mm); CBM-ZC 821.—Same data as CBM-ZC 821; 1 male (sl 9.5 mm); CBM-ZC 880.—Ohtsuchi Bay, Iwate Prefecture, 28 m; 2. V. 1995; crab trap; coll. I. Takeuchi; 1 male (sl 11.5 mm); CBM-ZC 1742.—Hakodate Bay, southern Hokkaido, 10–20 m; 17.III.1995; commercial gill net; coll. T. Komai; 1 female (sl 9.1 mm); topotypic specimen; CBM-ZC 2363.—Nemuro Bay, eastern Hokkaido, 43°34.3′N, 145°27.4′E, 8–13 m; RV "Tansei-maru", KT95-13 cruise, stn 1; 15. IX. 1995; beam trawl with 2 m span opening; coll. T. Komai; 2 females (sl 10.9, 12.2 mm), infested by *Peltogastrella sociallis*; CBM-ZC 2427.—Akahama, Ohtsuchi Bay, Iwate Prefecture, 5–6 m; 15. X. 1996; crab trap; coll. T. Komai; 1 male (sl 11.7 mm), 1 female (sl 9.5 mm); CBM-ZC 4844.—Aikappu, Akkeshi, eastern Hokkaido, 3–4 m; 16. XII. 1991; SCUBA diving; 1 male (sl 14.7 mm); CBM-ZC 4948.—Tengu-Iwa, Ochiishi, eastern Hokkaido, 15 m; 22. VIII. 1980; 1 male (sl 12.7 mm); CBM-ZC 4949.—Off Kuji, Iwate Prefecture, 40°18.23′N,

142° 06.05′E, 155–156 m; RV "Tanshu-maru", stn B2–1; 21. X. 1997; otter trawl; coll. K. Uchikawa; 1 female (sl 5.6 mm); CBM-ZC 5191.—Tomakomai Port, southern Hokkaido, 28. VI. 1988; coll. F. Muto; 4 males (sl 12.4–14.0 mm); HUMZ-C 403.—Off Esashi, Okhotsk coast of Hokkaido, 44°56′N, 142°55′E, 29. IX. 1975; 2 males (sl 17.7, 17.9 mm); HUMZ-C 434.—Off Usujiri, southern Hokkaido, 23–30 m; 30. IV. 1992; dredge; coll. T. Komai; 1 male (sl 4.8 mm); CBM-ZC 2133.—East China Sea, 37°30.7′N, 123°30.07E, 71 m; 20. X. 1962; trawl; coll. H. Yamashita; 1 female (sl 12.2 mm); KMNH 9599.—Yellow Sea; 26. I. 1965; trawl; coll. H. Yamashita; 3 males (sl 5.5–6.4 mm), 3 ovig (4.5–5.4 mm); KMNH 10623.—Yellow Sea, 68 m; 29. II. 1965; trawl; coll. H. Yamashita; 1 female (sl 4.5 mm); KMNH 10634.—Onagawa Bay, Miyagi Prefecture; 19. IX. 1904; coll. F. Doflein; 1 male (sl 5.7 mm); ZSM 291/2.—Vladivostok, Prymorie, Russia; 1908; coll. von Wittenberg; 1 male (not measured); ZSM 296/2.

Redescription. Eleven pairs of biserial phyllobranchiae.

Shield (Fig. 1A) longer than broad (1.1–1.2 times longer than broad); anterolateral margins sloping; anterior margin between rostrum and lateral projections weakly concave; lateral margins convex; posterior margin roundly truncate; dorsal surface with paired tufts of setae circumscribing gastric region and 3 median tufts of setae on anterior 0.4. Rostrum triangular, overreaching lateral projections, triangular, terminating in acute or subacute spine; partially obscured by paired tufts of long setae. Lateral projections each with small marginal spine, directed laterally. Posterior carapace poorly calcified except for moderately calcified posteromedian plate, with scattered tufts of stiff setae, becoming more numerous on lateral faces; posteromedian plate with longitudinal rows of tufts of setae laterally; cardiac sulci extending to posterior 0.2 of posterior carapace, subparallel; sulci cardiobranchiales slightly divergent posteriorly, reaching midway of cardiac sulci.

Ocular peduncles (Fig. 1A) moderately short and slender (ratio of ocular peduncle length/shield length 0.55–0.65; ratio of ocular peduncle length/corneal width 5.0–6.0), noticeably inflated basally, corneal region not dilated; dorsal and mesial faces with longitudinal rows of sparse tufts of stiff setae. Ocular acicles subovate, each with small submarginal terminal spine.

Antennular peduncles (Fig. 1A) moderately long and slender, exceeding ocular peduncles by 0.3–0.4 length of ultimate segment. Ultimate segment about 1.3 times longer than intermediate segment, with longitudinal row of tufts of very short bristles on dorsal and mesial faces. Basal segment laterally unarmed; statocyst lobe defined by shallow sulcus.

Antennal peduncles (Fig. 1A) moderately long, reaching or slightly overreaching distal margin of cornea of ocular peduncles; supernumerary segmentation present. Fifth and fourth segments with few tufts of short setae. Third segment with ventromesial distal angle produced, terminating in strong acute spine, obscured by tufts of setae. Second segment with dorsolateral distal angle produced, terminating in simple or bifid spine obscured by stiff setae, mesial margin occasionally with 1 additional small subdistal spine, lateral margin with row of setae; dorsomesial distal angle usually with small spine, mesial surface with numerous setae. First segment with or without spine on lateral face distally; ventromesial margin unarmed. Antennal acicle moderately long, reaching or slightly falling short of mid-length of fifth peduncular segment, weakly arcuate, terminating in acute spine; dorsomesial surface with row of tufts of stiff setae; mesial margin unarmed. Antennal flagellum long, far overreaching tip of right cheliped, each article with few minute bristles laterally and mesially.

Mandible without distinguishing character. Maxillule (Fig. 1B) with proximal endite subquadrate; endopod (Fig. 1C) with 2 setae on produced inner lobe, outer lobe tapering distally, rounded, not recurved. Maxilla (Fig. 1D) with endopod bearing prominent basal lobe on dorsal margin, falling slightly short of anterior margin of scaphognathite; external surface of distal endite setose. First maxilliped (Fig. 1E) with endopod approximately 0.7 length of exopod; exopod not strongly inflated proximally. Second maxilliped (Fig.

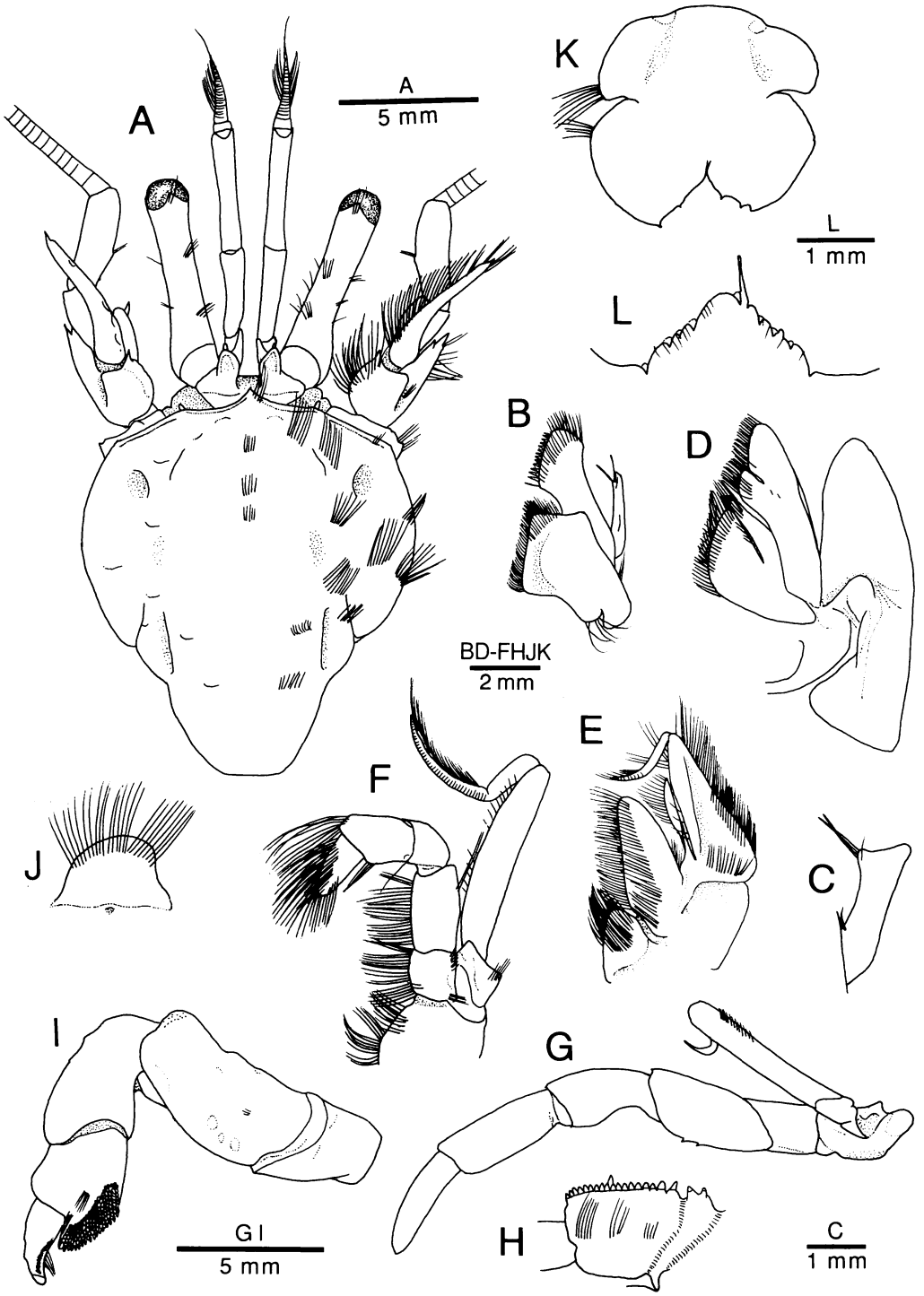

Fig. 1. *Pagurus pectinatus* (Stimpson, 1858). Male from Akkeshi, eastern Hokkaido (sl 14.7 mm; CBM-ZC 4948). A, shield and cephalic appendages, dorsal, setae omitted from left; B, maxillule, external; C, endopod of maxillule, lateral; D, maxilla, external, setae partially omitted; E, first maxilliped, external; F, second maxilliped, external; G, third maxilliped, lateral, setae omitted; H, ischium of third maxilliped, dorsal (internal), setae omitted; I, left fourth pereopod, lateral, setae omitted; J, anterior lobe of sixth thoracic sternite; K, telson, dorsal; L, terminal margins of posterior lobe of telson, dorsal.

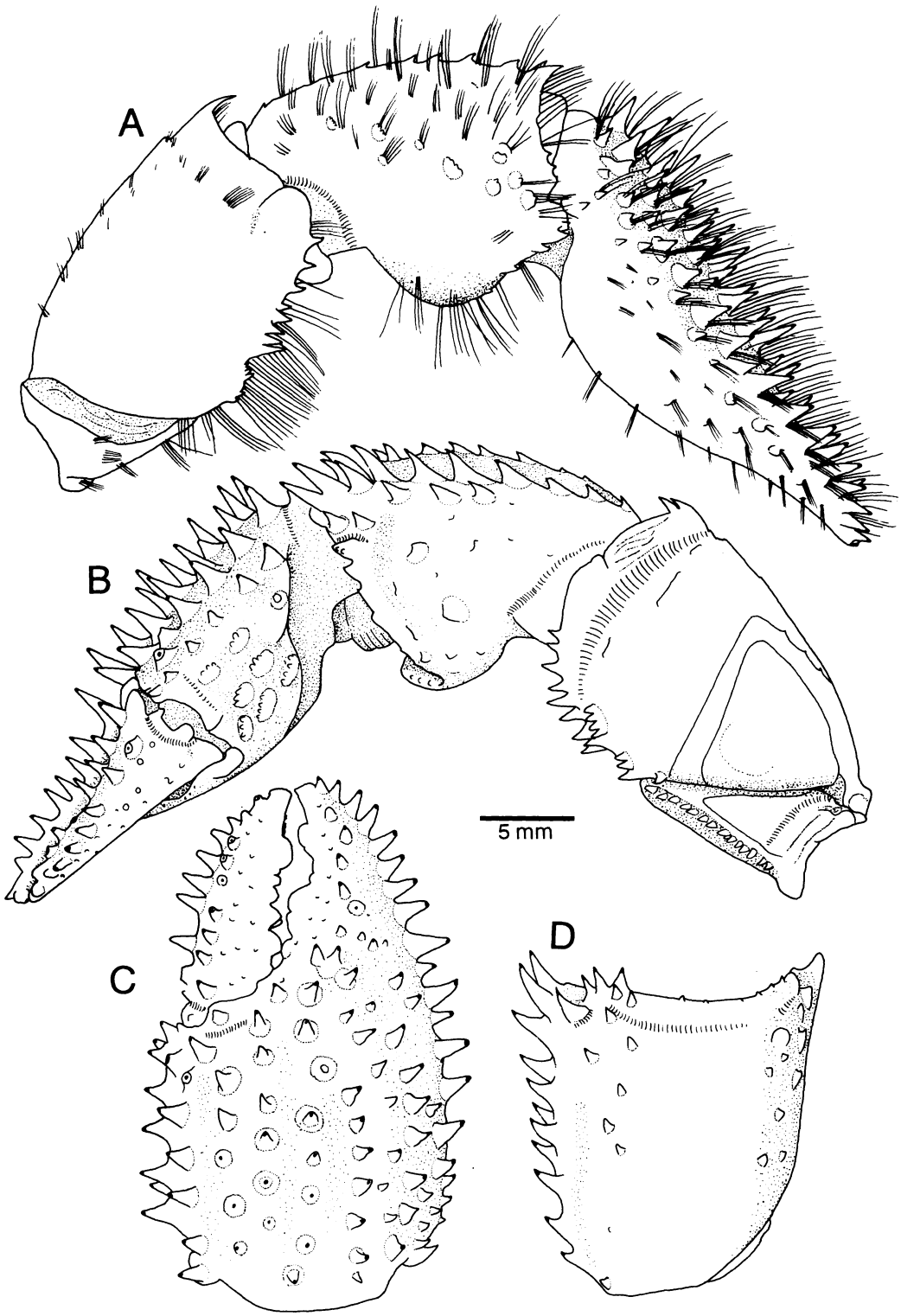

Fig. 2. *Pagurus pectinatus* (Stimpson, 1858). Male from Akkeshi, eastern Hokkaido (sl 14.7 mm; CBM-ZC 4948). Right cheliped. A, entire cheliped, lateral; B, same, mesial, setae omitted; C, chela, dorsal, setae omitted; D, carpus, dorsal, setae omitted.

1F) with incomplete basis-ischium fusion. Third maxilliped (Fig. 1H) with ischium bearing well developed crista dentata, teeth subequal in size, and 1 strong accessory tooth; merus with 1 or 2 dorsodistal and 1 or 2 ventromesial spinules; carpus with dorsodistal spine or spinule; dactyl relatively long.

Right cheliped (Fig. 2A-D) considerably stronger than left, becoming more elongate and slender in males with growth. Chela 1.6–1.9 times longer than broad. Dactyl flattened distally, subequal to or slightly shorter than palm, without prominent hiatus when closed, surfaces with tufts of long setae; dorsal surface with row of strong corneous-tipped spines mesially; dorsomesial margin with single or double row of strong corneous-tipped spines, becoming shorter distally; mesial face with few spinulose tubercles proximally; ventral surface unarmed; cutting edge (Fig. 3A) with row of strong calcareous teeth in proximal 0.8, short row of usually rudimentary corneous teeth in distal 0.2, terminating in rudimentary or small corneous claw. Palm slightly shorter than carpus, weakly inflated ventrally, surfaces and margins with numerous tufts of long setae; dorsal surface weakly convex, with 6 or 7 rows of moderately strong to strong, corneous-tipped spines; spines occasionally elongate in large males, nearly perpendicular to dorsal surface, inflated basally, accompanied by tufts of setae; dorsomesial margin with row of strong spines, dorsolateral margin with row of strong, erect spines decreasing in size distally and proximally; lateral and ventral surfaces unarmed, with scattered tufts of short setae; mesial face generally weakly concave, and with large multidenticulate protuberances; ventral surface with moderately strong or small spines or spinulose tubercles. Fixed finger flattened distally, surfaces with tufts of long setae; cutting edge (Fig. 3A) with large calcareous teeth on proximal 0.8 (distal tooth widely separated from proximal teeth with prominent hiatus) and with or without row of small corneous teeth and interspersed short row(s) of tiny corneous teeth in distal 0.2, terminating in small calcareous or rudimentary corneous claw. Carpus moderately short, usually equaling length of merus, moderately inflated ventrally; dorsomesial margin with row of very strong, slender corneous-tipped spines and tufts of long stiff setae, dorsomesial distal angle slightly produced, with 2–4 long spines, dorsal surface with few small spines and spinulose tubercles mesially and scattered tufts of short to long setae, distal margin with moderately small spines mesially, small spines or tubercles laterally and row of long stiff setae, dorsolateral margin not delimited; lateral face with small spines, multidenticulate protuberances and tufts of setae, distal margin with row of small spines, ventrolateral margin with row of small spines increasing in size distally; mesial face with short row of strong spines adjacent to dorsomesial margin and few low protuberances accompanied by setae and scattered tufts of long setae; distal margin protuberant or broadly denticulate, with tufts of long setae; ventral surface with

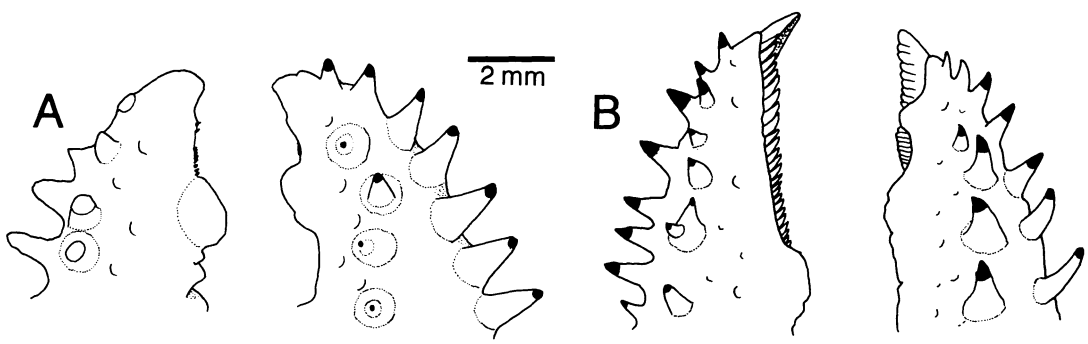

Fig. 3. Distal part of dactyl and fixed finger of right cheliped in dorsal view. A, *Pagurus pectinatus* (Stimpson, 1858), male from Akkeshi, eastern Hokkaido (sl 14.7 mm; CBM-ZC 4948); B, *Pagurus kennerlyi* (Stimpson, 1864), male from Friday Harbor, Washington State (sl 17.2 mm; USNM 57582).

scattered tufts of long setae. Merus moderately short and relatively deep; dorsal surface with transverse ridges increasing in size distally and becoming multidenticulate and spinulose, also with tufts of moderately short to moderately long setae, distal margin with 1–3 moderately long slender spines; lateral face spinulose or unarmed, with few tufts of short setae subdistally, ventrolateral margin with irregular row of small spines or spinulose tubercles proximally, becoming strong, corneous-tipped spines distally; mesial face with vertical or transverse rows of ridges bearing tufts of short setae, often spinulose or multidenticulate, ventromesial margin with multidenticulate or spinulose ridges or broad tubercles proximally and row of strong corneous-tipped spines distally, decreasing in size distally, also tufts of setae; ventral surface nearly unarmed or with multidenticulate protuberances or tubercles, and tufts of long setae. Ischium with row of small spines or tubercles on ventromesial margin, ventrolateral distal angle unarmed; lateral and ventral faces with scattered tufts of short setae. Coxa occasionally with row of small tubercles on ventromesial margin, ventrodistal margin with dense tufts of long setae.

Left cheliped (Fig. 4A-D) moderately short and slender, exceeding base of dactyl of right cheliped. Chela about 1.9–2.0 times as long as greatest breadth and 1.3 times as long as carpus. Dactyl long, about 2.5 times as long as palm measured along mesial margin, slightly curved laterally, surfaces and margins with tufts of long stiff setae; dorsal surface with few small to moderately small slender spines proximally, dorsomesial margin with sparse row of small spines decreasing in size or becoming obsolete distally; mesial surface unarmed or armed with few small spines proximally; ventral face unarmed; cutting edge with row of small corneous teeth in distal 0.7–0.8, terminating in small corneous claw, slightly overlapped by fixed finger; with prominent longitudinal hiatus when closed. Palm short, about 0.4–0.5 times as long as carpus, slightly inflated ventrally; dorsolateral margin with single or double row of strong spines decreasing in size on fixed finger, and tufts of long setae, dorsal surface with irregular longitudinal row of strong spines laterally and few strong spines adjacent to dorsomesial margin, weakly elevated in midline and with single or double row of strong, slender spines extending onto fixed finger as single row of moderately strong spines and with tufts of long setae, dorsomesial margin with row of moderately strong spines or tubercles and tufts of long setae; lateral face with few small tubercles and tufts of long setae; mesial face with few protuberances and tufts of setae; ventral surface unarmed, but with scattered tufts of long setae. Cutting edge of fixed finger with row of small rounded calcareous teeth in proximal 0.7–0.8 and row of small corneous teeth in distal 0.2–0.3, terminating in small corneous claw. Carpus subequal in length to merus; dorsal surface slightly oblique, usually unarmed or with few spines distally, dorsolateral margin with row of long, slender, often corneous-tipped, spines, dorsomesial margin with row of strong spines and tufts of long setae, distal margin with 1–4 strong spines; lateral face with spinulose protuberances accompanied by tufts of long setae and short vertical row of long setae dorsally, distal margin unarmed or with few small spines, ventrolateral margin with irregular row of small spines and tufts of long setae; mesial face slightly concave, with scattered low protuberances and tufts of long setae, distal margin with row of small spines; ventral surface with scattered, low protuberances or spinulose tubercles and tufts of long setae, distal margin with few small spines. Merus slightly compressed laterally; dorsal surface with irregular row of low protuberances or ridges, becoming spinulose distally and with tufts of short setae, distal margin usually with 1 or 2 strong slender spines; lateral face spinulose or unarmed, with few tufts of very short to short setae, ventrolateral margin with single or double row of strong spines; mesial face with few low protuberances, multidenticulate protuberances near ventromesial margin and few tufts of setae, ventromesial margin with row of strong spines; ventral surface with few small to moderately small spines and tufts of long setae. Ischium with row of small to strong denticles and small spines on ventromesial margin. Coxa unarmed or with

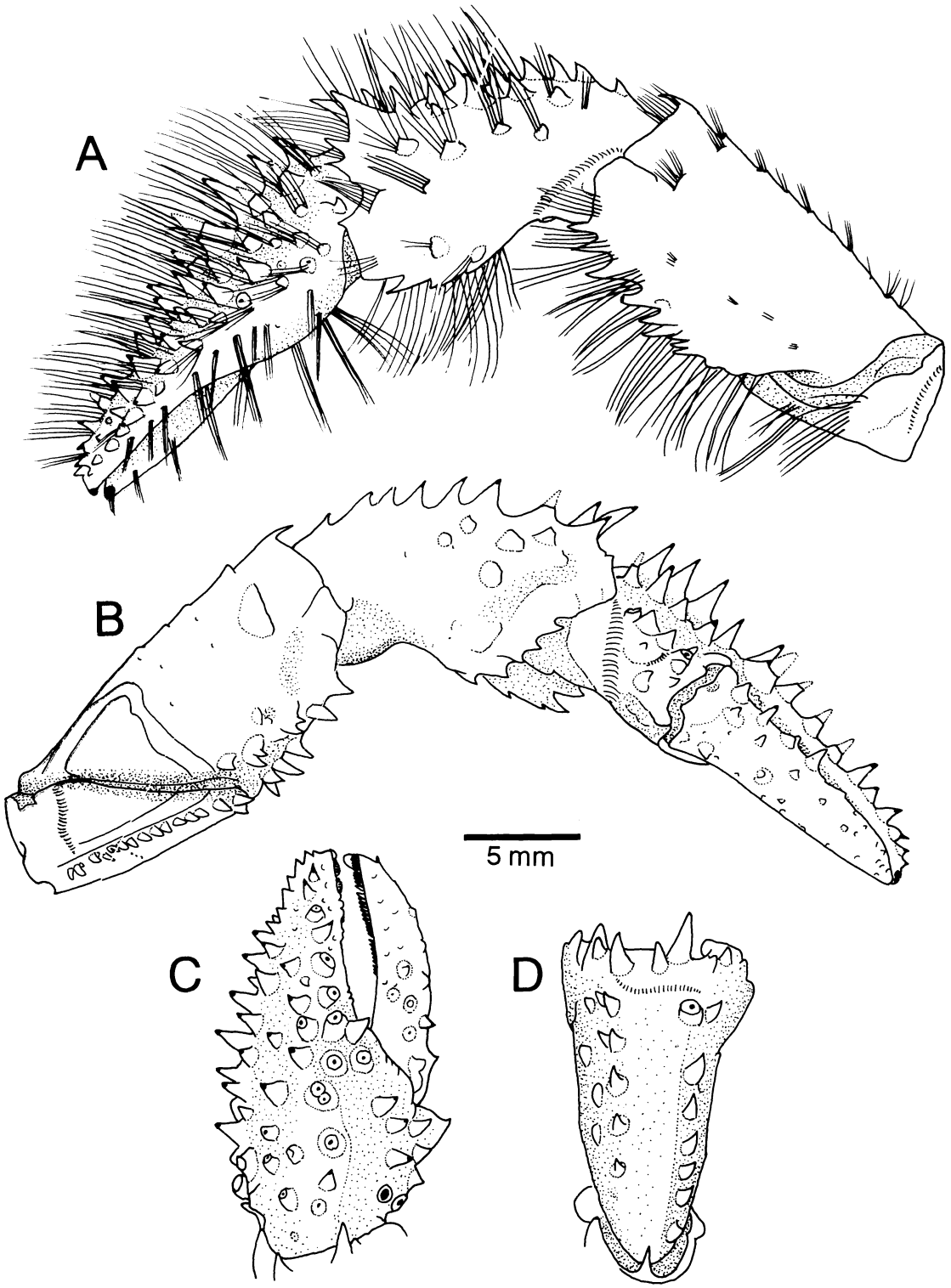

Fig. 4. *Pagurus pectinatus* (Stimpson, 1858). Male from Akkeshi, eastern Hokkaido (sl 14.7 mm; CBM-ZC 4948). Left cheliped. A, entire cheliped, lateral; B, same, mesial, setae omitted; C, chela, dorsal, setae omitted; D, carpus, dorsal, setae omitted.

row of small denticles on ventrolateral margin, ventromesial distal angle with clump of long setae.

Second pereopods (Fig. 5A) moderately long, overreaching right cheliped. Dactyls (Fig. 5A, B) moderately short, 1.1–1.3 times longer than propodi, terminating in strong corneous claws; in lateral view, slightly curved ventrally; in dorsal view, straight or slightly twisted; dorsal surfaces each with single or double row of small, slender corneous spines in distal half and rows of tufts of long stiff setae; lateral faces each with prominent median sulcus flanked by single or

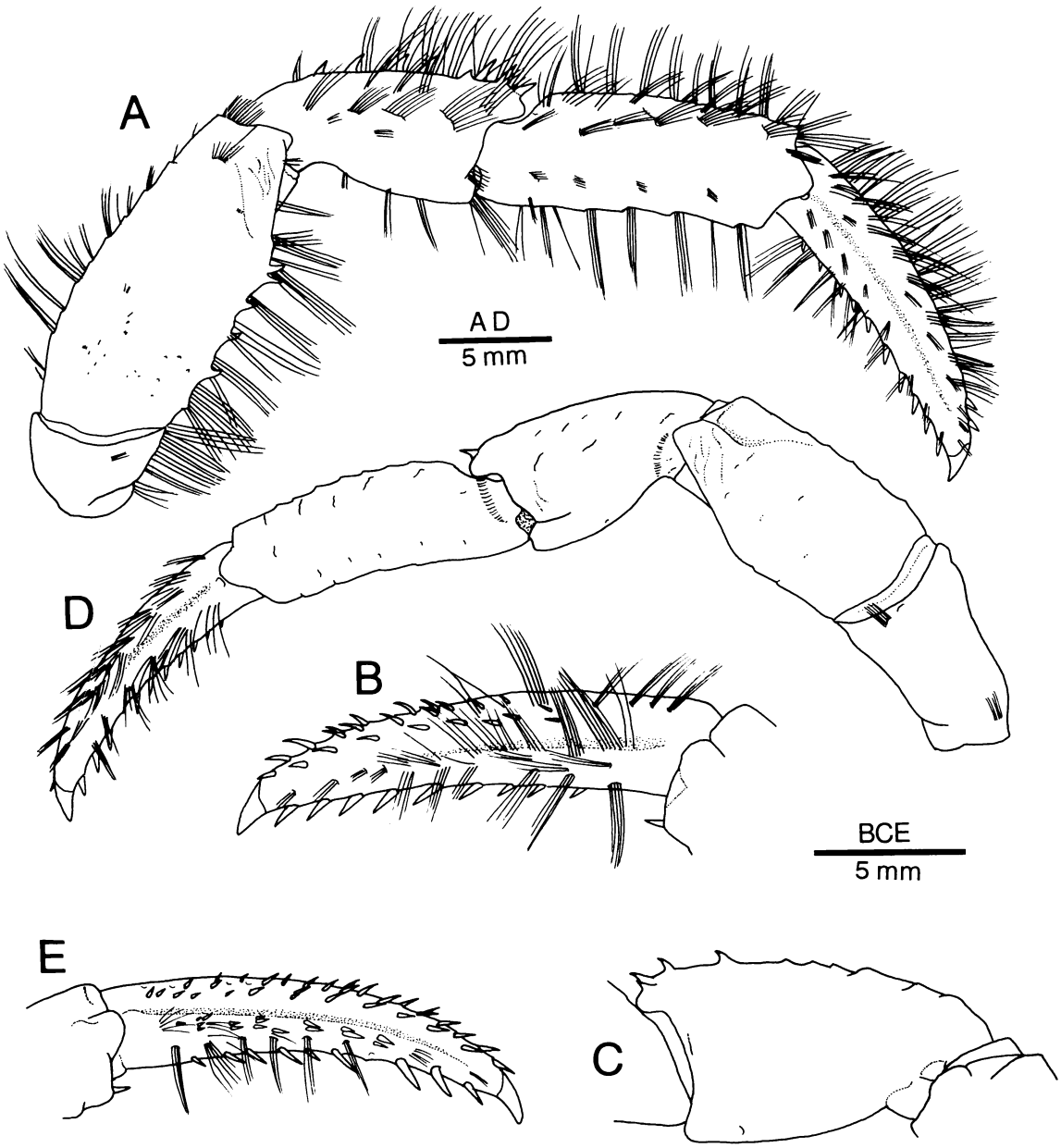

Fig. 5. *Pagurus pectinatus* (Stimpson, 1858). Male from Akkeshi, eastern Hokkaido (sl 14.7 mm; CBM-ZC 4948). A, right second pereopod, lateral; B, same, dactyl, mesial, setae partially omitted; C, carpus of right third pereopod, mesial, setae omitted; D, left third pereopod, lateral, setae omitted; E, same, dactyl, mesial, setae partially omitted.

double row of tufts of short setae; mesial faces each with prominent median sulcus and with row of small corneous spines dorsal to sulcus and irregular double row of tufts of long setae ventrally; ventral margins each with row of 9–12 corneous spines increasing in size distally and tufts of log setae. Propodi distinctly longer than carpi; dorsal surfaces slightly protuberant, with row of tufts of long setae; lateral faces each with 2 longitudinal rows of tufts of setae (setae of ventral row much shorter than those of dorsal row); mesial faces each with longitudinal row of tufts of short setae; ventral surfaces slightly protuberant with tufts of long setae, ventrodistal margins each with 1 or 2 small corneous spines. Carpi with single or double row of strong, corneous-tipped spines increasing in size distally, and tufts of long setae, on dorsal surfaces; lateral faces each with longitudinal row of short obliquely transverse ridges bearing tufts of long setae on midline and few small spines or tubercles and tufts of long setae dorsally; ventral surfaces unarmed, with few tufts of short to long setae. Meri laterally compressed; dorsal surfaces slightly protuberant, each with row of tufts of short to long setae; lateral faces usually minutely spinulose, with few tufts of short setae; mesial faces with scattered tufts of short setae; ventral surfaces each with single or double row of small spines and tufts of long setae, ventrolateral distal margins unarmed. Ischia unarmed or with minute spinulose tubercles on dorsal surfaces; ventral surfaces each with row of small denticles obscured by tufts of long setae. Coxa with rows of long setae on ventrolateral and ventromesial margins.

Third pereopods (Fig. 5D) generally similar to second in setation. Dactyls (Fig. 5D, E) 1.1–1.3 times longer than propodi; in dorsal view, sometimes more strongly twisted than second pair; dorsal surfaces with single or double row of small, slender, corneous spines in distal 0.7–0.8; lateral faces each with row of tufts of moderately long setae flanking median sulcus; mesial faces each with longitudinal rows of small corneous spines (spines sometimes in pairs or triplet) flanking median sulcus, and irregular double row of tufts of moderately short to long setae ventral to sulcus. Propodi similar to those of second pair. Carpus of left (Fig. 5D) unarmed on dorsal surface except for small dorsodistal spine; right (Fig. 5C) with 1–6 small, occasionary corneous-tipped spines, and 1 prominent dorsodistal spine on dorsal surface. Meri unarmed or with few small protuberances on ventral surfaces. Ischia unarmed on dorsal and ventral surfaces. Coxae each with gonopore in females.

Third thoracic sternite with small median notch obscured by dense stiff setae and pair of submedian spines on anterior margin. Anterior lobe of sixth thoracic sternite (Fig. 1J) subsemicircular, slightly skewed, anterior face with dense long setae.

Fourth pereopod (Fig. 1I) semi-chelate. Dactyl moderately long; dorsal surface with few tufts of short setae; ventral surface with row of small corneous scales; preungual process absent. Propodus with convex ventral margin; propodal rasp well developed, consisting of several rows of corneous scales. Dorsal margins of propodus, carpus and merus with tufts of dense long setae.

Fifth pereopods chelate; males with paired gonopores, each partially encircled by short setae. Eighth thoracic sternite with 2 setose, rounded anterior lobes separated by shallow median groove.

Abdomen usually strongly twisted, but rarely flexed, and with 3 unpaired left pleopods in males, 4 in females. Uropods strongly asymmetrical.

Telson (Fig. 1K) with posterior lobes slightly asymmetrical, left slightly larger than right, separated by narrow median cleft; transverse indentations deep. Posterior lobes generally rounded; terminal margins (Fig. 1 K, L) oblique, each with row of 2–12 minute spinules increasing in size laterally; lateral margins with stiff setae; anterior lobes with strongly convex lateral margins, frequently bearing tufts of long setae.

Coloration. Shield generally brown, with paired dark spots lateral to gastric region and posterior part. Posterior carapace brown or reddish brown, with scattered light spots laterally. Ocular peduncles generally brown, without distinct markings, but with longitudinal row of light spots dorsolaterally. Antennular peduncles generally brown,

distal part of ultimate and penultimate segments whitish. Antennal peduncles brown; flagella banded with brown and much shorter white. Chelipeds mottled with brown; spines on chelae whitish distally; meri irregularly spotted on lateral faces, mesial faces with scattered whitish spots. Ambulatory pereopods generally brown; dactyls becoming paler distally; propodi with light brown blotch proximally; meri obscurely banded, with scattered whitish spots on lateral faces.

Size. Largest male: sl 17.9 mm; largest female: sl 15.7 mm; smallest ovigerous female: sl 4.5 mm.

Habitat. Frequently lives in colony of the sponge, *Suberites domuncula* (e.g., Makarov, 1938a; 1938b; Miyake, 1982). Also uses gastropod shells and calcareous polychaete tubes (unpublished data).

Distribution. So far, known only from Asian waters: Hokkaido; Pacific coast of northeastern Honshu mainland southward to Onagawa Bay, Miyagi Prefecture; Sea of Japan coast of Honshu mainland; continental coast of Russian Far East; southern Sakhalin; Korea; Yellow Sea; East China Sea; at depths of 4–71 m.

Remarks. Stimpson (1858) described *Eupagurus pectinatus* pparently based upon a single specimen from Hakodate (originally spelled as "Hakodati"), southern Hokkaido. The type was presumably destroyed by the great fire of Chicago in 1871 (Evans, 1967). Therefore, in order to confirm its identity, I have examined a topotypic specimen from Hakodate Bay (1 female sl 9.1 mm; CBM-ZC 2363) that closely agrees with Stimpson's brief original description.

Pagurus pectinatus is very similar to *P. kennerlyi*, a species placed in the *capillatus* group of *Pagurus* (cf. McLaughlin, 1974). A comparison of the Asian specimens with the material from Puget Sound has shown that the armature of the cutting edges of the dactyl and fixed finger of the right cheliped is different between the two taxa. In *P. pectinatus* (Fig. 3 A), the row of corneous teeth on the distal 0.2 of the cutting edge of the dactyl is usually rudimentary, and the terminal corneous claw is very small or rudimentary; the short row(s) of corneous teeth, sometimes interspersed between the small calcareous teeth on the distal 0.2 of the cutting edge of the fixed finger, are rudimentary or absent, and the fixed finger terminates in a rudimentary corneous or small calcareous claw. In *P. kennerlyi* (Fig. 3 B), the distal row(s) of corneous teeth are well developed, and both dactyl and fixed finger terminate in a small but well-developed corneous claw. The spines on the right palm of large males seem to be much more elongate and slender in the North American specimens than in the Asian specimens; however, the shortness of spines in small specimens can be very misleading (McLaughlin, 1974). Additionally, the spines on the palms of the chelipeds are whitish distally in Asian specimens, while they have been described as bluish distally in the North American specimens (McLaughlin, 1974). Based on these differences, *P. pectinatus* and *P. kennerlyi* are herein recognized as distinct species. The specimen from Muroran, Hokkaido, identified as *P. kennerlyi* by McLaughlin (1974) (USNM 51178), has been reexamined, and the identification confirmed.

Pagurus setosus (Benedict, 1892) and *P. brachiomastus* (Thallwitz, 1891) species complex (see Komai, 1999) are also similar to *P. pectinatus*. The absence of small dorsal spines from the carpus of the right third pereopod in *P. setosus* easily distinguish it from *P. pectinatus*. The presence of two prominent tubercles on the ventral face of the right cheliped merus and of a ventral row of small calcareous spines or tubercles on the propodus and dactyl of the left third pereopod immediately separates specimens assigned to the *P. brachiomastus* species complex from *P. pectinatus*. Additionally, *P. pectinatus* is distinguished from the other species of the *capillatus* group of *Pagurus*, i.e., *P. capillatus* (Benedict, 1892), *P. arcuatus* Squires, 1964, *P. parvispina* Komai, 1997, and *P. confusus* Komai and Yu, 1999, by the possession of a row of corneous spines, instead of a row of tiny corneous spinules, on each ventral margin of the ambulatory dactyl.

During this study, I examined the holotype of *Clibanarius japonicus* Rathbun, 1902 (female sl 15.7 mm; USNM 26151) and found that it actually represents a specimen of *Pagurus pectinatus* with an abnormally small right cheliped. The right cheliped is distinct-

ly smaller than the left cheliped, and there is little doubt that it was in the process of regeneration. It is probable that the abnormality of the right cheliped led Rathbun to incorrectly assign the specimen to the diogenid genus *Clibanarius*. Therefore, *Clibanarius japonicus* should be regarded as a junior subjective synonym of *Pagurus pectinatus*. Although there has been no subsequent discovery of *Clibanarius japonicus*, some authors (Terao, 1913; Makarov, 1938b; 1962; Kobjakova, 1955; Miyake, 1978; 1982; Komai *et al.*, 1992) have mentioned this taxon based on Rathbun's original description.

I have found that some authors (Urita, 1942; Miyake, 1975; 1982; Takeda, 1994) confused *P. pectinatus* with a species currently assigned to the *Pagurus brachiomastus* species complex. This complex consists of at least three taxa (see Komai, 1999). Unfortunately, the identity of the true *P. brachiomastus* still remains unclarified because the holotype of this species, which has been deposited in the Dresdener Museum, Germany, was lost during the last year of the World War II (K. Schniebs of the Staatliches Museum für Tierkunde, Dresden, personal communication). However, specimens of the one of the three taxon of this species complex are characterized in life by the red-colored distal parts of the dactyls and fixed fingers of the chelipeds and of the ambulatory dactyls, and can be easily recognized when color is known. Urita's (1942) statement that "which has hairy chela with a naked red coloured tip," clearly indicates that he was actually dealing with the *P. brachiomastus* species complex. The color photographs of *P. pectinatus* (cf. Miyake, 1975: 116, unnumbered fig.; Miyake, 1982: pl. 44, fig. 3; Takeda, 1994: 228, fig. 4) are actually representing *P. brachiomastus* species complex. The color photographs published by Miyake (1982: pl. 43, fig. 6) and Takeda (1994: 228, fig. 4) as *P. brachiomastus* clearly depict *P. pectinatus*. Miyake's (1982) short description of *P. pectinatus* is also confusing. I have been able to examine one of the five lots referred to *P. pectinatus* by Balss (1913: 60) (Aomori, Japan; female sl 7.3 mm; ZSM 296/2) and found that it actually represents the *P. brachiomastus* species complex. However, Balss's (1913: pl. 1, fig. 8) photographed specimen clearly represents *P. pectinatus*. McLaughlin (1974) examined nine specimens identified as *P. pectinatus*, including those from Hokkaido and Korea, and stated that of those specimens examined, at least two and possibly three, distinct species were represented. Although none of the nine specimens were reexamined, the material probably contains specimens of the *P. brachiomastus* species complex. The reference of Takeda and Hayashi (1992) to *P. pectinatus* from eastern Hokkaido could not be verified. However, as the occurrence of *P. pectinatus* in the intertidal zone is very rare, this citation should be referred to another taxon, most probably the *P. brachiomastus* species complex, specimens of which can be very common in intertidal zone of eastern Hokkaido (unpublished data).

The present study shows that *P. pectinatus* is a shallow water species ranging from subtidal depths to about 156 m. Yokoya's (1933) *Eupagurus pectinatus* may belong at least in part, to a species other than *P. pectinatus*, since his specimens were taken from the continental shelf depths of 91–219 m. I was unsuccessful in locating Yokoya's specimens in the collections of the Kitakyushu Museum of Natural History. Thus, Yokoya's reference is questionably included in the synonymy.

Balss (1913) examined the type of *Eupagurus seriespinosus* Thallwitz, 1891, and placed this taxon in synonymy with *E. pectinatus*. As mentioned before, the type of *E. seriespinosus* is no longer extant. Nevertheless, I confirmed that the Thallwitz's original description closely agrees with *P. pectinatus*, and there is no hesitation in following Balss (1913) in placing *Eupagurus seriespinosus* in synonymy with *Pagurus. pectinatus*.

Acknowledgments

I thank my colleagues who sent me material on donation or on loan: R. Lemaitre, Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution; F. Muto of the Laboratory of Marine Zoology, Faculty of Fisheries, Hokkaido University; J. Sasaki of the Kushiro Fisheries Experimental Station, Hokkaido; I. Takeuchi of the Ocean Research Institute, University of Tokyo; Y. Yabumoto and K.

Ueda of the Kitakyushu Museum of Natural History. Sincere thanks are also due to H. Fechter, E. Karl and P. Schneider for providing me with laboratory facility and for their kind hospitality during my visit to the Zoologische Staatssammlung München. K. Schniebs of the Staatliches Museum für Tierkunde, Dresden, provided information on material studied by Thallwitz (1891). P. A. McLaughlin and R. Lemaitre reviewed the manuscript and offered valuable comments on it. This study was partially supported by Grant-in-Aid for International Scientific Research (No. 09041155) from the Japanese Ministry of Education, Science and Culture (T. Nishikawa of Nagoya University, principal investigator).

References

Alcock, A. 1905. Anomura. Fasc. I. Pagurides. Catalogue of the Indian decapod Crustacea in the collection of the Indian Museum 2: i–xi, 1–197, pls. 1–16. Indian Museum, Calcutta.

Asakura, A. 1995. Anomura. In Nishimura, S. (ed.), Guide to seashore animals of Japan with color pictures and keys, Vol. II, pls. 93–100, pp. 347–378. Hoikusha, Osaka. (In Japanese)

Balss, H. 1913. Ostasiatische Decapoden. I. Die Galatheiden und Paguriden. Beiträge zur Naturgeschichte Ostasiens, herausgegeben von Pr. F. Doflein. Abhand. K. Bayer. Akad. Wiss., math.-physik. Klasse Suppl. 2(9): 1–85, pls. 1, 2.

Benedict, J. 1892. Preliminary descriptions of thirty-seven new species of hermit crabs of the genus *Eupagurus* in the U.S. National Museum. Proc. U.S. Natn. Mus. 15: 1–36.

Derjugin, K. M. and Z. I. Kobjakova. 1935. Zur Dekapodenfauna des japonischen Meeres. Zool. Anz. 112(5/6): 141–147.

Evans, A. C. 1967. Syntypes of Decapoda described by William Stimpson and James Dana in the collections of the British Museum (Natural History). J. Nat. Hist. 1: 399–411.

Gordan, J. 1956. A bibliography of pagurid crabs, exclusive of Alcock, 1905. Bull. Amer. Mus. Nat. Hist., New York 108(3): 253–352.

Igarashi, T. 1970. A list of marine decapod crustaceans from Hokkaido, deposited at the Fisheries Museum, Faculty of Fisheries, Hokkaido University. II. Anomura. Contr. Fish. Mus., Fac. Fish., Hokkaido Univ. 12: 1–15, pls. 1–9.

Kamita, T. 1955. Studies in the decapod crustaceans of Corea. Part 2. Hermit crabs, 3. Sci. Rep. Shimane Univ. (6): 58–76.

Kim, H.-S. 1970. A check list of the Anomura and Brachyura (Crustacea, Decapoda) of Korea. J. Seoul Natn Univ., Biol. Agr., ser. B 21: 1–29, pls. 1–5.

Kim, H.-S. 1973. Anomura and Brachyura. Illustrated encyclopedia of fauna and flora of Korea 14: 1–694, pls. 1–112. Samha Publishing Co., Seoul. (In Korean).

Kobjakova, Z. I. 1955. New species of Crustacea, Decapoda from the southern part of Kurile-Sakhalin region. Trudy Zool. Inst. Acad. Nauk SSSR 18: 235–242. (In Russian)

Kobjakova, Z. I. 1958. Systematic review of the Decapoda of the southern Kurile Islands. Issled. Dal'nevost. Morei SSSR 5: 220–248. (In Russian)

Kobjakova, Z. I. 1967. Systematic review of Crustacea Decapoda of Possjet Bay (Sea of Japan). Biocoenoses of the Possjet Bay of the Sea of Japan. Issled. Fauny Morei 5(13): 236–247. (In Russian)

Komai, T. 1997. *Pagurus parvispina*, a new species of hermit crab (Decapoda: Anomura: Paguridae) from northern Japan. Nat. Hist. Res. 4(2): 113–124.

Komai, T. 1999. Reexamination of the type material of *Pagurus sagamiensis* Miyake (Decapoda: Anomura: Paguridae). Nat. Hist. Res. 5(2): 79–92.

Komai, T. and H.-S. Yu. 1999. Identity of *Pagurus obtusifrons*, with description of a new species of *Pagurus* (Decapoda: Anomura: Paguridae). J. Crust. Biol. 19(1): 188–205.

Komai, T., S. Maruyama and K. Konishi. 1992. A list of decapod crustaceans from Hokkaido, northern Japan. Res. Crust. 21: 189–205. (In Japanese, with English abstract)

Lemaitre, R. 1995. A review of the hermit crabs of the genus *Xylopagurus* A. Milne Edwards, 1880 (Crustacea: Decapoda: Paguridae), including descriptions of two new species. Smith. Contr. Zool. 570: i–iii, 1–27.

Makarov, V. V. 1937. Contribution to the Paguridae-fauna of the Far-Eastern Seas. Issled. Morei SSSR 23: 55–67. (In Russian with English summary)

Makarov, V. V. 1938a. A contribution to the Paguridae fauna in the vicinity of Petrov Island (Japan Sea). Report of the J pan Sea Hydrobiological Expedition of the Zoological Institute of the Academy of Sciences, USSR, in 1934: 405–423. (In Russian with English summary)

Makarov, V. V. 1938b. Rakoobraznye. Anomura. [Crustacés Décapodes anomoures]. *In* A. A. Shtakel'berg (ed.), Fauna SSSR, (n. ser.) 16(10)(3).

x+324 pp., 5 pls. Akademie Nauk SSSR, Moscow and Leningrad. (In Russian)

Makarov, V. V. 1962. Crustacea Decapoda Anomura. Fauna of U.S.S.R. 10(3). 278 pp., 5 pls. Israel Program for Scientific Translation, Jerusalem. Published for the National Science Foundation and Smithsonian Institution, Washington, D.C.

McLaughlin, P. A. 1974. The hermit crabs (Crustacea, Decapoda, Paguridea) of northwestern North America. Zool. Verhand. 130: 1–396, pl. 1.

McLaughlin, P. A. 1997. Crustacea Decapoda: Hermit crabs of the family Paguridae from the KARUBAR Cruise in Indonesia. *In* A. Crosnier (ed.), Résultats des campagnes MUSORSTOM, Vol. 16. Mém. Mus. Natn. Hist. Nat. 172: 433–572.

McLaughlin, P. A. and M. de Saint Laurent. 1998. A new genus for four species of hermit crab heretofore assigned to the genus *Pagurus* Fabricius (Decapoda: Anomura: Paguridae). Proc. Biol. Soc. Wash. 111(1): 158–187.

Miyake, S. 1957. Anomuran decapod fauna of Hokkaido, Japan. J. Fac. Sci., Hokkaido Univ., Ser. 6, Zool. 13(1–4): 85–92.

Miyake, S. 1975. Anomura. *In*: Utinomi, H. (ed.), Freshwater and marine animals, pp. 185–239, pls. 72–81. Gakushu-Kenkyusha, Tokyo. (In Japanese)

Miyake, S. 1978. The crustacean Anomura of Sagami Bay. 200 pp. (English), 161 pp. (Japanese). Hoikusha, Tokyo.

Miyake, S. 1982. Japanese crustacean decapods and stomatopods in color, Vol. 1. vii+261 p., 56 pls. Hoikusha, Osaka. (In Japanese)

Rathbun, M. J. 1902. Japanese stalk-eyed crustaceans. Proc. U.S. Natn. Mus. 26: 23–55.

Squires, H. J. 1964. *Pagurus pubescens* and a proposed new name for a closely related species in the northwest Atlantic (Decapoda: Anomura). J. Fish. Res. Board Can. 21(2): 355–365.

Stimpson, W. 1858. Prodromus descriptionis animalium evertebratorum, quae in expeditione ad oceanum Pacificum septentrionalem, a Republica Federata missa, Cadwaldaro Ringgold et Johanne Rodgers ducibus, observavit et descripsit. VII. Proc. Acad. Nat. Sci. Philadelphia 1858: 225–252.

Stimpson, W. 1964. Descriptions of new species of marine Invertebrata from Puget Sound, collected by the naturalists of the North-west Boundary Commission, A. H. Campbell, esq., Commissioner. Proc. Acad. Nat. Sci. Philadelphia 1864: 153–161.

Stimpson, W. 1907. Report on the Crustacea (Brachyura and Anomura) collected by the Pacific Exploring Expedition, 1853–1856. Smiths. Misc. Coll. 49: 1–240, pls. 1–26.

Takeda, M. 1994. Anomura and Brachyura. *In* Okutani, T. (ed.), Seashore animals, pp. 222–264. Yama to Keikoku-sha, Tokyo. (In Japanese)

Takeda, M. and H. Hayashi. 1990. Biogeographical notes on the anomuran and brachyuran crustaceans from the Pacific coast of eastern Hokkaido, northern Japan. Bull. Biogeogr. Soc. Japan 45(7): 51–59.

Takeda, M. and T. Miyauchi. 1992. Anomuran and brachyuran crustaceans from the Soya Strait, northern Hokkaido. Mem. Natn. Sci. Mus., Tokyo 25: 143–153. (In Japanese with English summary)

Terao, A. 1913. A catalogue of hermit-crabs found in Japan (Paguridae excluding Lithodidae), with descriptions of four new species. Annot. Zool. Jap. 8(2): 355–391.

Thallwitz, J. 1891. Decapoden-Studien, inbesondere basirt auf A. B. Meyer's Sammlungen im Ostindischen Archipel, nebst einer Aufzählung der Decapoden und Stomatopoden des Dresdener Museums. Abhand. Ber. K. Zool. Anthro.-Ethnogr. Mus. Dresden 3: 1–55, pl. 1.

Urita, T. 1942. Decapod crustaceans from Saghalien, Japan. Bull. Biogeogr. Soc. Jap. 12(1): 1–77.

Vinogradov, L. G. 1950. A key to the shrimps, lobsters and crabs of the Far East. Izv. TINRO 33: 179–358, pls. 1–53. (In Russian)

Wang, F.-Z. 1994. Anomura. *In* Huang, Z.-G. (ed.), Marine species and their distributions in China's seas, pp. 568–576. China Ocean Press, Beijing. (In Chinese)

Yokoya, Y. 1933. On the distribution of decapod Crustacea inhabiting the continental shelf around Japan, chiefly based upon the materials collected by S.S. "Soyo Maru" during the years 1923–1930. J. Coll. Agr. Tokyo Imp. Univ. 12(1): 1–236.

Yokoya, Y. 1939. Macrura and Anomura of decapod Crustacea found in neighborhood of Onagawa, Miyagi-ken. Sci. Rep. Tohoku Imp. Univ. (4)4: 261–289.

カイメンホンヤドカリ（十脚目：異尾下目：ホンヤドカリ科）の再記載

駒井智幸

千葉県立中央博物館
〒260-8682 千葉市中央区青葉町 955-2

本邦各地，ロシア沿海州，東シナ海，および黄海か

ら採集された材料に基づき，*Pagurus pectinatus* (Stimpson, 1858)（カイメンホンヤドカリ）を再記載し，種の形態的特徴を明らかにし，分類学的混乱の解決を行った．本種は，北米西岸及び北海道室蘭より記録されている *Pagurus kennerlyi* (Stimpson, 1864) に酷似するが，右はさみの指節と不動指の合縁の革質小歯の発達が悪いこと，成長した雄においても右掌部背面の棘が強く伸長しないことなどの形態的特徴により識別されることが判明した．さらに，カイメンホンヤドカリにおいては，はさみ掌部背面の棘は先端に向かい白色を帯びるが，*P. kennerlyi* においては，青色を呈すると報告されており，この点も両者が別種であるという見解を支持するものと考えられる．北海道室蘭から McLaughlin (1974) により報告された *P. kennerlyi* の標本が再検討され，その同定結果は支持されたが，最近の採集例はなく，*P. kennerlyi* が本来，東アジア海域に分布するものなのかどうかは疑わしい．

また，北海道室蘭から採集された1個体の雌標本により記載された *Clibanarius japonicus* Rathbun, 1902（ニホンヨコバサミ）の完模式標本を再検討した結果，右はさみ脚が再生途上にある本種の標本であることが判明し，*Clibanarius japonicus* は *Pagurus pectinatus* のシノニムとされた．