

**Two Hermit Crabs of Genus *Pagurus* (Crustacea: Decapoda:
Anomura: Paguridae) from East Sea of Korea**

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ABSTRACT

Two pagurid hermit crabs of the genus *Pagurus*, *P. proximus* Komai, 2000 and *P. simulans* Komai, 2000, were collected from the East Sea of Korea are reported. Brief descriptions and illustrations of these two species are provided. Both have been confounded with *P. brachiomastus* (Thallwitz, 1891) until recently Komai (2000a) reviewed the taxonomic status of this species complex. Kim's (1973) record of *P. brachiomastus* from Korea was synonymized to *P. proximus* by Komai (2000a) and the latter in Korean waters is confirmed through this study. *P. simulans* is recorded for the first time from Korea as well as the East Sea (Sea of Japan).

Key words: hermit crab, Paguridae, *Pagurus*, Korea, new record

INTRODUCTION

In the Korean waters, 19 species of the hermit crabs, genus *Pagurus* have been reported by Oh (2000). Although taxonomy of *Pagurus* in East Asian waters has been clarified by a number of recent studies (Sandberg and McLaughlin, 1993; McLaughlin and Sandberg, 1995; Komai, 1996a, b, 1998, 1999, 2000a, b, 2003a, b; Komai and Imafuku, 1996; Komai and Yu, 1999; Komai and McLaughlin, 2001; Komai and Mishima, 2003), little information of *Pagurus* in Korea is available.

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Ongoing study on the Korean hermit crabs, two species of *Pagurus* were found. They are *P. proximus* Komai, 2000 and *P. simulans* Komai, 2000. These two species were previously confounded with *P. brachiomastus* (Thallwitz, 1891). Kim's (1973) record of *P. brachiomastus* from Korean waters was referred to *P. proximus* by Komai (2000a), though Komai did not actually examine specimens from Korea. *Pagurus simulans* was described from the Pacific coast of Japan (Komai, 2000a), and the present specimens are the first record of this species from Korea, as well as the East Sea (Sea of Japan).

Specimens examined in this study are deposited in the Laboratory of Invertebrate Zoology, Department of Marine Biology, Pukyong National University (PUIZ). Terminology was mainly based on McLaughlin (1974). Shield length (sl) is used as an indication of the size of the specimens.

SYSTEMATIC ACCOUNTS

Family Paguridae Latreille, 1803

**Pagurus proximus* Komai, 2000 (Figs. 1, 2)

Eupagurus pectinatus: Balss, 1913, p. 60.

Eupagurus brachiomastus: Kikuchi, 1932, p. 8; Yokoya, 1939, p. 282, fig. 12. Not *Eupagurus brachiomastus* Thallwitz, 1891.

Pagurus brachiomastus: Kim, 1964, p. 4, 5 (table), 8 (table), 11 (table), pl. 1, fig. 5; 1970, p. 7 (list); 1973, p. 236, 601, pl. 70, fig. 36.

Pagurus proximus Komai, 2000, p. 241, 258 (table), figs. 1C, 7-10.

Material examined. 1 ♂ (sl 6.6 mm), East Sea (Jeong dong jin), Aug. 2003 (M. H. Son), by SCUBA diving in 15 m depths, PUIZ 162.

Description. Shield (Fig. 1A) slightly longer than broad; rostrum broadly triangular, terminating in blunt or acute point, slightly overreaching lateral projections. Lateral projections obsolete, with small submarginal spine. Ocular peduncle (Fig. 1A) 0.50 times as long as shield, with row of tufts of moderately short setae dorsomesially; corneas not dilated, diameter 0.33 peduncular length. Antennular peduncle (Fig. 1A) moderately long and slender, exceeding ocular peduncles by half length of ultimate segment. Antennal peduncle (Fig. 1A) moderately short, slightly overreaching distal margin of corneas.

Right cheliped considerably larger than left. Chela (Fig. 1B) 1.56 times longer than broad, subtriangular in dorsal view. Dactylus slightly flattened distally, 1.10 times longer than palm, usually leaving narrow hiatus when closed; dorsal surface with few small spines proximally; dorsomesial margin delimited by single row of moderately small spines; mesial face with single row or small spines; cutting edge with row of low calcareous teeth, terminating in small corneous claw. Fixed finger flattened distally; cutting edge with row of calcareous teeth terminating in small corneous or calcareous claw. Palm distinctly shorter than carpus, weakly inflated ventrally; dorsal surface with numerous small to large spines arranged in 7 or 8 irregular rows; dorsomesial margin with irregular rows of moderately strong spines; dorsolateral margin distinctly delimited with row of moderately

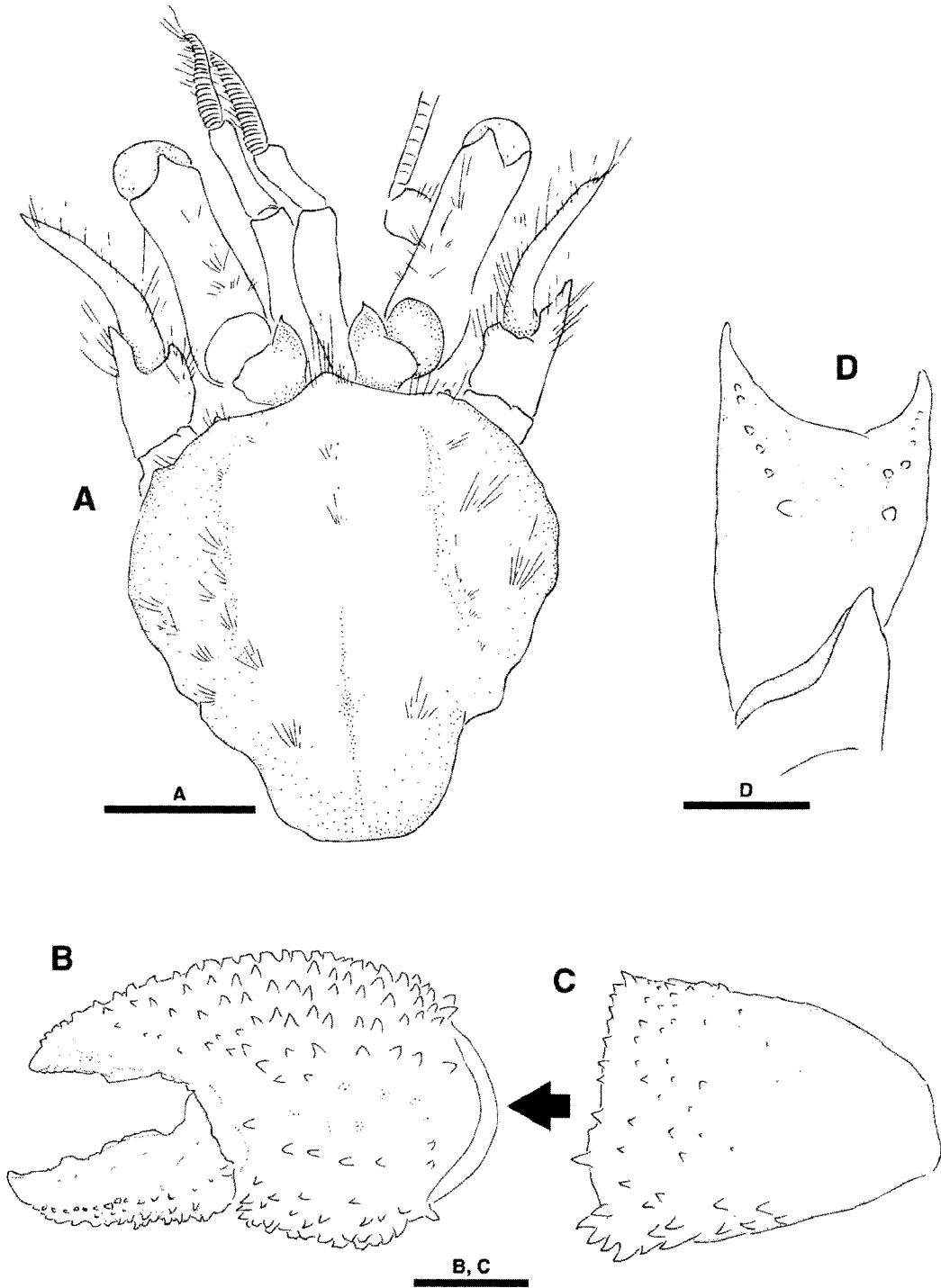
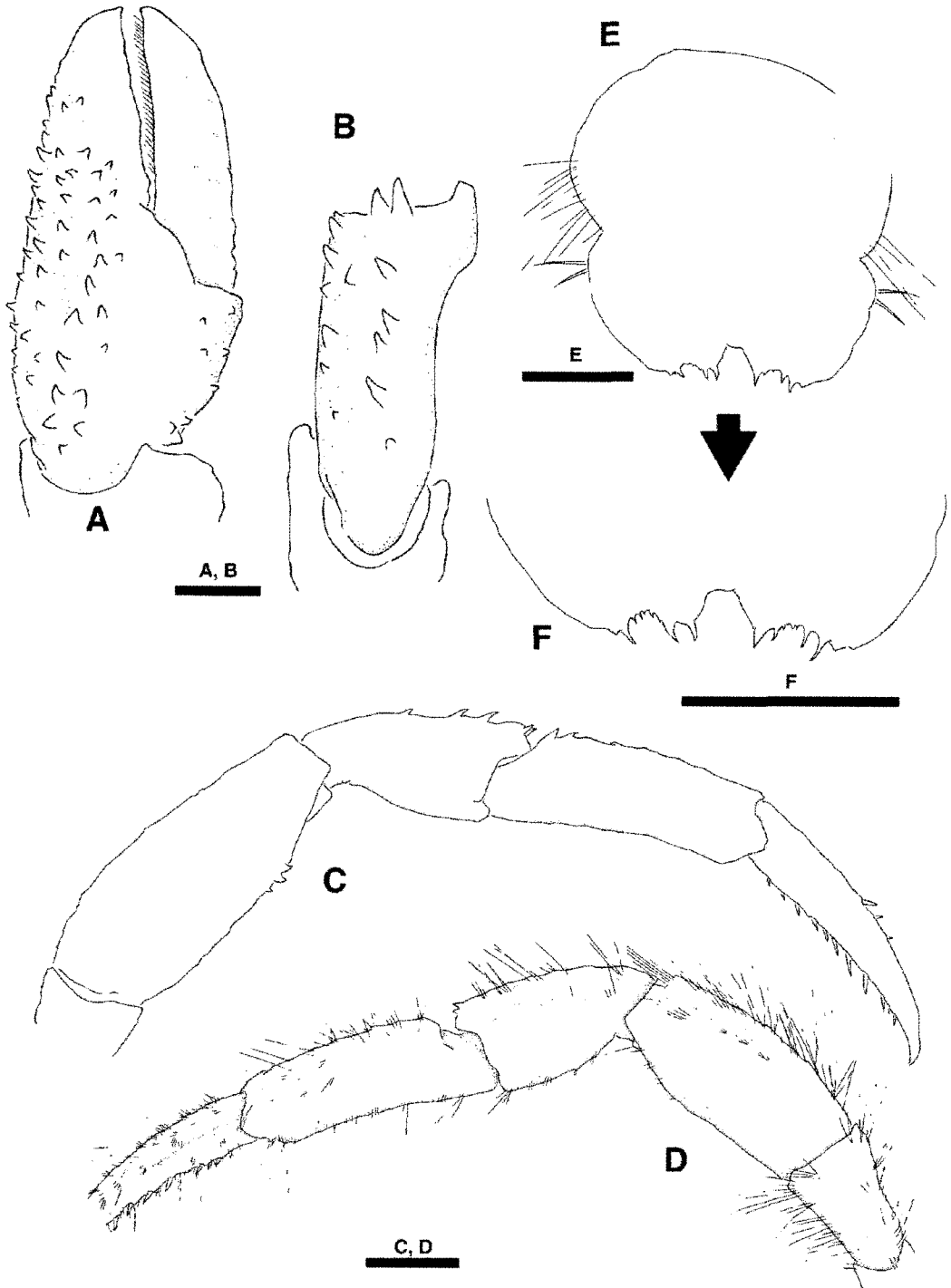


Fig. 1. *Pagurus proximus*, male, sl 6.6 mm. A, shield and cephalic appendages, dorsal; B, chela, cheliped, dorsal; C, carpus, right cheliped, dorsal; D, merus, right cheliped, ventral. Setae partly omitted. Scale bars = 2 mm (A-D).



Limulus, male, sl 6.6 mm. A, chela, left cheliped, dorsal; B, carpus, left cheliped, dorsal; C, lateral; D, left third pereopod, lateral; E, telson, dorsal; F, posterior lobes of telson. Scale bars = 2 mm (A-E), 4 mm (F).

strong spines; mesial face with scattered moderately small spines and spinulose tubercles; lateral face with numerous scattered spinulose tubercles. Carpus (Fig. 1C) slightly shorter than merus; dorsomesial margin with single or double row of strong spines; dorsal surface convex, with scattered small spines; dorsodistal margin with row of spines; dorsolateral margin not distinctly delimited. Merus moderately short; dorsal surface with multidenticulate protuberances and tufts of long setae, ventral surface (Fig. 1D) with 2 prominent tubercles and few additional small spines.

Left cheliped slightly short, overreaching base of dactylus of right cheliped. Dactylus (Fig. 2A) long, 1.62 times longer than palm, slightly curved laterally; dorsomesial, mesial and ventral faces unarmed; cutting edge with row of small corneous teeth over entire length. Cutting edge of fixed finger with small calcareous teeth. Palm 0.50 times as long as carpus; dorsal surface with irregular rows of small spines and few scattered small spines mesially; lateral margin delineated by row of strong spines; dorsomesial margin not distinctly delimited. Carpus (Fig. 2B) almost equal to merus in length; dorsal surface unarmed, dorsomesial and dorsolateral margins each with strong spines; dorsodistal margin with two spines.

Second pereopod (Fig. 2C) moderately long and slender, overreaching right cheliped. Dactylus as long as propodus; ventral margins each with row of 11 strong corneous spines. Propodus unarmed or with few small spines on dorsal surfaces. Carpus with row of strong spines. Merus each with row of small spines on ventral surface, ventrolateral and ventromesial distal margins unarmed.

Third pereopod (Fig. 2D) moderately long and slender. Dactylus as long as propodus; dorsal surface with tiny spine proximally; ventral margin with 8 moderately small corneous spines. Propodus unarmed or with small calcareous spines on ventral surface. Carpus only with dorsodistal spine on dorsal surface. Merus unarmed on ventral margin.

Telson (Fig. 2E, F) with posterior lobes divided by narrow median cleft; terminal margins each with 2 or 3 strong corneous spines and with 3 or 4 minute spinules on hiatus between strong spines.

Coloration. Shield, chelipeds, and ambulatory pereopods generally bluish gray. Chelipeds gray-brown; dactylus and fixed finger distally tinged with light brown.

Distribution. Jeong dong jin, Korea, East Sea (Sea of Japan) from Peter the Great Bay, Russian Far East, Niigata, Japan, Hakodate Bay, Japan, and Pacific coast of northern Japan; from intertidal to 15 m depths (Komai, 2000a; present study).

****Pagurus simulans* Komai, 2000 (Figs. 3, 4)**

Eupagurus brachiomastus: Yokoya, 1939, p. 282.

Paugrus brachiomastus: Miyake, 1978, p. 97, text-figs. 36-37.

Pagurus sagamiensis: Miyake, 1978, p. 116.

Pagurus pilosipes: Miyake, 1978, p. 91.

Pagurus simulans: Komai, 2000a, p. 249, 258 (table), figs. 1D, 11-14.

Material examined. 2 ♂ (sl 6.0, 6.7 mm respectively), 1 ovig. ♀ (sl 5.1 mm), East sea (Yangpo), Sept. 1999, by trap from 30-40 m depths, PUIZ 163.

Description. Shield (Fig. 3A) slightly longer than broad; rostrum broadly triangular,

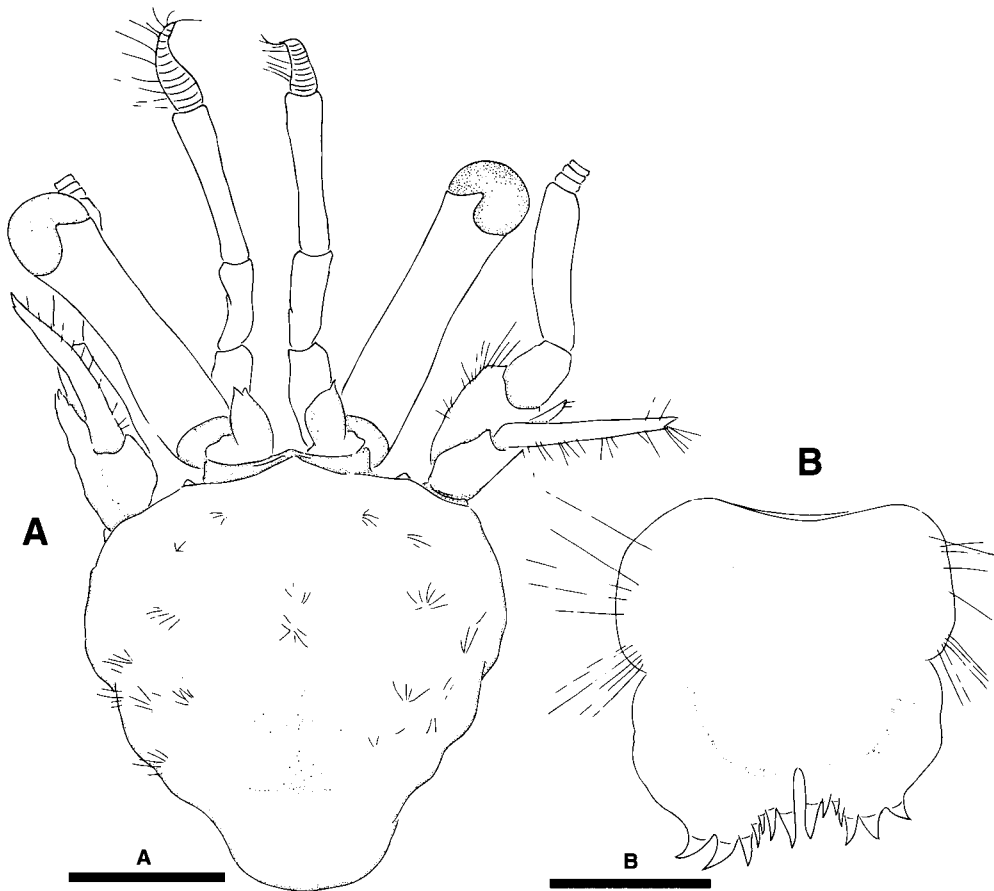


Fig. 3. *Pagurus simulans*, female, sl 5.1 mm. A, shield and cephalic appendages, dorsal, setae partly omitted; B, telson, dorsal. Scale bars= 2 mm (A), 4 mm (B).

terminating in blunt point, slightly overreaching lateral projections. Lateral projections obsolete, each with small marginal spine. Posterior carapace with numerous tufts of setae. Ocular peduncle (Fig. 3A) 0.58-0.61 times as long as shield; corneas slightly dilated, diameter about 0.36 peduncular length. Antennular peduncle (Fig. 3A) moderately long and slender, exceeding ocular peduncle by half length of ultimate segment. Ultimate segment 0.60 times longer than penultimate segment. Basal segment laterally unarmed; laterodistal process of statocyst lobe not developed. Antennal peduncle (Fig. 3A) moderately short, slightly overreaching distal margin of cornea of ocular peduncles. Antennal acicle moderately long, reaching midlength of fifth segment.

Right cheliped (Fig. 4A) considerably larger than left. Chela about 1.60 times longer than broad, elongate suboval in dorsal view. Dactylus slightly flattened distally, 1.02-1.10 times longer than palm, usually leaving narrow hiatus when closed; dorsal surface with row of strong spines, extending near to tip; dorsomesial margin with single or double row of spines; cutting edge with row of low calcareous teeth, terminating in small corneous claw. Fixed finger flattened distally; cutting edge with row of corneous teeth, terminating in small corneous or calcareous claw. Palm

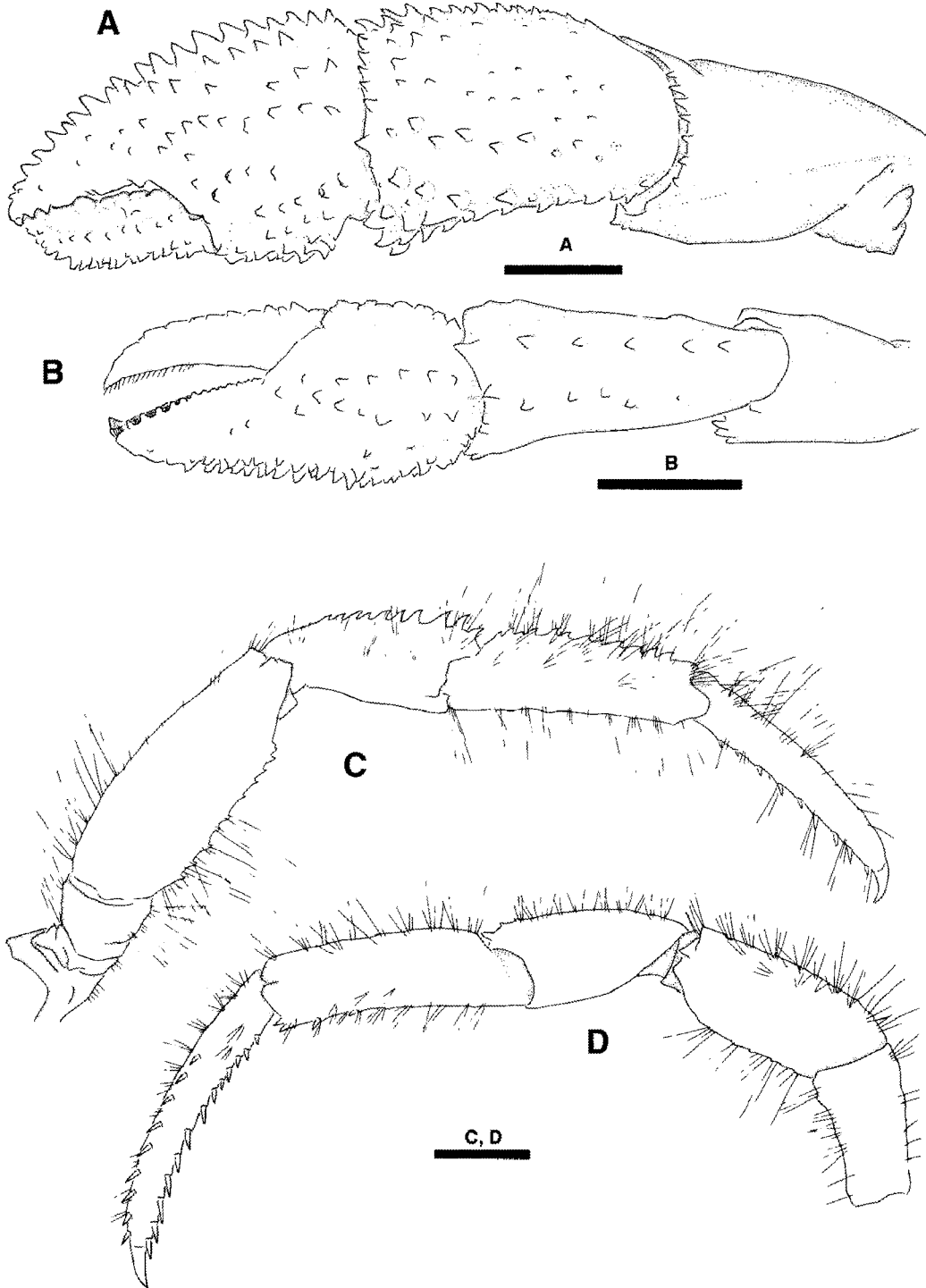


Fig. 4. *Pagurus simulans*, female, sl 5.1 mm. A, right cheliped, dorsal; B, left cheliped, dorsal; C, right second pereopod, lateral; D, left third pereopod, lateral. Setae partly omitted. Scale bars= 2 mm (A-D).

shorter than carpus, weakly inflated ventrally; dorsal surface with strong spines arranged in 5 or 6 irregular rows; dorsomesial margin with single or double row of spines, dorsolateral margin distinctly delimited with row of moderately strong spines; mesial face with scattered moderately small spines; lateral face with scattered small tubercles. Carpus slightly shorter than merus, moderately inflated ventrally; dorsomesial margin with single or double row of strong spines; dorsal surface convex, with row of strong spines mesially and scattered small spines laterally; dorsodistal margin with row of spines; dorsolateral margin not distinctly delimited. Merus moderately short; dorsal surface with multidenticulate protuberances and tufts of long setae, distal margin with 6-8 small spines; ventral surface with 2 prominent tubercles and few additional small spines.

Left cheliped (Fig. 4B) moderately short. Dactylus moderately short, 1.20-1.34 times longer than palm; dorsomesial margin with row of small tubercles; mesial faces unarmed; cutting edge with row of small corneous teeth. Cutting edge of fixed finger with small calcareous teeth. Palm 0.61-0.70 times as long as carpus; dorsal surface with 2 rows of moderately strong spines on median area; lateral margin delineated by 1 or 2 rows of strong spines; dorsomesial margin not delimited. Carpus slightly shorter than merus; dorsomesial and dorsolateral margins each with strong spines; dorsodistal margin with few spines; mesial face with few small protuberances; ventrodistal margin with few protuberances.

Second pereopod (Fig. 4C) moderately long, slender, overreaching right cheliped. Dactylus 1.04-1.12 times longer than propodus; lateral and mesial faces each with faint median sulcus; ventral margins each with row of 10-12 strong corneous spines. Propodus with row of strong spines. Carpus with row of strong spines. Merus with row of small spines on ventral margin.

Third pereopod (Fig. 4D) long, slender. Dactylus 1.12-1.20 times longer than propodus; dorsal surface with row of small spines distally; lateral face with row of calcareous spines ventrally; ventral margin with 11-13 strong spines. Propodus with small calcareous spines on ventral surface. Carpus with few small spines distally, dorsodistal margin with spines. Merus unarmed on ventral margin.

Telson (Fig. 3B) with posterior lobes divided by narrow median cleft; terminal margin each with 6-8 strong corneous spines, and additional 1 or 2 small corneous spinules between strong spines.

Coloration. Shield, chelipeds, and ambulatory pereopods generally brown. Chelipeds generally brown with scattered dark brown spots; dactylus and fixed finger distally tinged with whitish brown.

Distribution. Yangpo, East Sea of Korea and Pacific coast of Japan from Iwate Prefecture to the Bungo Strait; 30-258 m.

DISCUSSION

Recently, Komai (2000a) reviewed taxonomic status of *Pagurus brachiomastus* (Thallwitz, 1891) and described two new species, *P. proximus* and *P. simulans*, which had been confounded with *P. brachiomastus*. The present specimens agree well with Komai's (2000a) original descriptions of *P. proximus* and *P. simulans* except for the ratio of the length between the ocular peduncle and shield. In the present specimens, the ratio of the length between the ocular peduncle and shield is slightly shorter than that of Japanese material. The ratios of ocular peduncle length/shield length

of the present specimens are 0.50 in *P. proximus* and 0.58–0.61 in *P. simulans*, while those of Japanese material are 0.53–0.76 in *P. proximus* and 0.64–0.83 in *P. simulans*.

Pagurus brachiomastus s.l. was known as a hairy hermit crab with a pair of prominent tubercles on the ventral surface of the merus of the right cheliped (Yokoya, 1939; Kim, 1973; Miyake, 1978, 1982). However, these morphological characteristics of the *P. brachiomastus* s.l. are common among the three species, *P. brachiomastus* s.s., *P. proximus* and *P. simulans*. Although these three species have the similar morphological characteristics, *P. brachiomastus* s.s. is characterized by the clearly delimited ventrolateral margin of the palm of left cheliped, and the dark olive gray body and appendages and the red tips of the dactyli of the chelipeds and ambulatory legs (Komai, 2000a).

Pagurus proximus and *P. simulans* are also very similar to each other. However, these two species can be differentiated by morphological characteristics and coloration in life, as Komai (2000a) discussed. The corneal region of the eye of *P. proximus* is not dilated while that of *P. simulans* is slightly dilated. There are also differences in armature of the palm of right cheliped, spination of the propodus of the second pereopod, and the terminal margins of the telson. The dorsal spines on palm of the right cheliped of *P. proximus* are arranged in seven or eight irregular rows while those of *P. simulans* are fewer, and arranged in five or six irregular rows. The propodus of the second pereopod of *P. proximus* is unarmed or with few small spines while that of *P. simulans* has a row of strong spines. The telson is clearly different from each other. Each terminal margin of the telson in *P. proximus* has two or three strong corneous spines, and additional four or five small corneous spinules on the hiatus between strong spines, while these margins in *P. simulans* have 6–8 strong corneous spines, and additional 1 or 2 small corneous spinules between strong spines. In *P. proximus*, the body is bluish gray and the tips of the chelae are yellowish brown. However, in *P. simulans*, the body is generally brown and the tip of the chela is white.

In Korean waters, Kim (1964, 1973) reported *P. brachiomastus* from the east sea (Pohang) and west sea (Daehuksando Island and Bigumdo Island), and described and illustrated on the basis of one male (sl 6.9 mm) from Pohang. Based on the given drawings, Komai (2000a) concluded that Kim (1973, fig. 56, pl. 70, fig. 36) was acutally reporting *P. proximus*, instead of *P. brachiomastus* s.s. However, Kim (1973) noted that his specimen had the reddish brown body and sometimes the red tip of the chelae. As mentioned above, the coloration is the useful character distinguishing the three species. Concerning Kim's (1973) notes on the coloration, it is reasonable to consider that his material acutally contained *P. brachiomastus* s.s. and *P. simulans* as well as *P. proximus*.

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한국 동해안에서 채집된 참집게속 (갑강강: 십각목:
집게아목: 집게과)의 2미기록종

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요 약

한국 동해안에서 채집된 2종의 집게류가 검은털손참집게 (*Pagurus proximus*)와 갈색털손참집게 (*Pagurus simulans*)로 동정되었으며, 처음으로 한국에서 확인되어 보고한다. 2종은 그 동안 모두 털손참집게 (*P. brachiomastus*)로 인식되어오던 종으로, 최근 Komai (2000a)에 의해 이들 분류학적 관계가 재정립되었다. Komai (2000a)에 의하여, 한국에서 김 (1973)이 털손참집게로 보고한 종은 검은털손참집게의 동종이명으로 처리되었으며, 본 연구를 통하여 재확인되었다. 한편 갈색털손참집게는 한국에서는 처음으로 보고되는 종이다.