New Report of Two Species of Crabs, *Cycloes granulosa* and *Pugettia vulgaris* (Crustacea: Decapoda) Collected from Korea

Kea Cheong Yang¹, Seok Hyun Lee², Hyun Sook Ko²,*

¹Folklore and Natural History Museum, Jeju 690-834, Korea
²Department of Biological Science, Silla University, Busan 617-736, Korea

ABSTRACT

Two species of crabs, *Cycloes granulosa* and *Pugettia vulgaris*, are described and illustrated for the first time in Korea. The former is the first species of calappoid genus *Cycloes* and characterized by having a minute lateral spine on the margin of carapace. The latter is a species of majoid crab and similar to *P. pellucens*. However, it can be distinguished by shorter rostral spines, a smaller hepatic spine, and a carapace entirely covered with short setae. In Korea the calappoid crab now includes seven species of three genera (*Calappa, Mursia, and Cycloes*) and the majoid genus *Pugettia* consists of six species.

**Keywords:** calappoid, crabs, *Cycloes granulosa*, majoid, *Pugettia vulgaris*, Korea

INTRODUCTION

During a visit to the Folklore and Natural History Museum in Jeju Special Self-governing Province, the authors found in its arthropod collection dried specimens of *Cycloes granulosa* De Haan, 1837, which were originally collected by a fisherman at Port Hallim. As the Korean calappoid crab has been reported for six species of two genera (four species of *Calappa* Weber, 1795 and two species of *Mursia* Desmarest, 1823), it is the first species of the genus *Cycloes* De Haan, 1837.

The majoid genus *Pugettia* Dana, 1851 has been recorded for five species from Korean waters (Kim and Kim, 1997; Lee, 2007; Lee et al., 2014): *P. incisa* (De Haan, 1839), *P. intermedia* Sakai, 1938, *P. minor* Ortmann, 1893, *P. pellucens* Rathbun, 1932, and *P. quadridens* (De Haan, 1839). Recently, some specimens collected from the East Sea are identified as *P. vulgaris* Ohtsuchi, Kawamura, and Takeda, 2014. Therefore, the present paper describes and illustrates these two species with photographs.

Specimens were examined under a Leica EZ40 microscope (Leica Microsystems, Wetzlar, Germany) and digital photographs of crabs taken using an Olympus E-30 camera (Olympus, Tokyo, Japan). The following abbreviations are used in the present study: CL (carapace length) from the tip of rostrum to the posterior dorsal margin of the carapace, CW (carapace width) across the widest point of the carapace excluding branchial spine, and in majoid crab PCL (postrostral carapace length) carapace length excluding rostrum. Measurements were made by using digital vernier caliper (CD-15APX, Mitutoyo, Kawasaki, Japan) to 0.1 mm. The brachyuran classification follows that of Ng et al. (2008). All the specimens are deposited at the corresponding author’s collection of Silla University, Busan.

SYSTEMATIC ACCOUNTS

Superfamily Calappoidea De Haan, 1833
Family Calappidae De Haan, 1833
¹Genus *Cycloes* De Haan, 1837
²*Cycloes granulosa* De Haan, 1837 (Figs. 1A–D, 2)
*Cycloës granulosa* De Haan, 1837: 71, Pl. 19, fig. 3, Pl. E.
Fig. 1. *Cycloes granulosa* De Haan, 1837 (A–D): A, Female (CL 31.2 mm, CW 29.5 mm), dorsal view; B, Female (CL 36.6 mm, CW 35.9 mm), dorsal view; C, Ventral view; D, Frontal view. *Pugettia vulgaris* Ohtsuchi, Kawamura, and Takeda, 2014 (E, F), male (CL 22.1 mm, CW 14.2 mm): E, Dorsal view; F, Ventral view.
*Cycloes granulosa*: Sakai, 1976: 139, Pl. 43, fig. 3; Miyake, 1983: 199; Dai and Yang, 1991: 108, fig. 54, Pl. 12(3); Yamaguchi and Baba, 1993: 313, fig. 97; Galil and Clark, 1996: 194, figs. 9B, 10A–C, 11A, B; Minemizu, 2000: 195; Takeda and Manuel-Santos, 2006: 100, fig. 7E.

*Cryptosoma granulosum*: Lucas, 1844: 438; Miers, 1886: 293; Sakai, 1936: 49, Pl. 7, fig. 2; Takeda, 1982: 109, fig. 319.


**Material examined.** 2 ♀ ♀ dried, Korea: Jeju Special Self-Governing Province, Hallim-eup, Jeju-si, Hallim Port, 28 Oct 2007, coll. Yang KC.

**Description.** Carapace (Figs. 1A, B, 2A) convex, longitudinally ovate, slightly longer than broad. Dorsal surface densely granulate, with longitudinal rows of low tubercles anteriorly; regions indistinct except furrows bordering cardiac region. Front narrow (Fig. 1A, B, D), with 2 triangular teeth. Anterolateral margin (Figs. 1A, B, 2A) granulate; lateral spine minute, indistinct; posterolateral margin sharply convergent, minutely granulate.

Eye (Fig. 1A, B, D) filling orbit; eyestalk short, smooth, cornea large; orbital margins with long plumose setae; supraorbital margin swollen medially.

Chelipeds (Figs. 1, 2B–D) massive, densely granulate, subequal in size. Merus (Fig. 1A, B, D) with lanceolate tooth distally. Upper margin of carpus (Figs. 1A, B, D, 2D) with 3 teeth increasing in size distally. Palm (Figs. 1A, B, D, 2B, C) crested on upper margin, cut into 9 teeth; outer surface densely granulate, with larger granules below crest; lower margin with 2 parallel rows of acute tubercles, bearing keel-like lobe proximally. Movable finger (Figs. 1C, D, 2B, C) granulose on outer surface, with acute tubercles on upper margin; right one with proximal molariform tooth fitting into shallow depression.

Ambulatory legs (Fig. 1A–C) smooth, laterally compressed; dactyl long, styliiform.

Abdomen of female (Fig. 1C) with 6 segments; segment 2 with bifissured, medially concave crest. Telson (Fig. 1C) triangular, slightly longer than abdominal segment 6.

**Habitat.** The crab was found on the sandy bottom at 5–100 m in depths (Minemizu, 2000).

**Distribution.** Singapore, Vietnam, Taiwan, China, Japan, Philippines, and now Korea.

**Remarks.** These crabs are the first species of the genus *Cycloes* in Korea and collected by a local fisherman. Two species, *Cycloes granulosa* De Haan, 1837 and *Cycloes marisrubri* Galil and Clark, 1996, of the genus *Cycloes* are reported in the world. *Cycloes granulosa* is distinguished from *C. marisrubri* by having a granulate carapace with rows of low tubercles and in chelipeds each carpus with three teeth on upper margin and each palm without knob-like tubercles on outer surface. In Korean waters this species is similar to the species of *Mursia (M. armata* De Haan, 1837 and *M. trispinosa* Parisi, 1914) by having a denticulate crest on each propodus of the chelipeds, a proximal tooth fitting into a depression in a dactylus of the larger cheliped, and long styliiform dactyli of the ambulatory legs. However, it can be characterized as having a minute lateral spine on margin of the carapace (vs. a well developed spine in the two species of *Mursia*). Although, our specimens dried, they have yellow with reddish brown spots on whole body, inner surface of the cheliped with orange markings, and ambulatory legs with orange stripes.

Superfamily Majoidea Samouelle, 1819
Family Epialtidae MacLeay, 1838
Subfamily Epialtinae MacLeay, 1838
Genus *Pugettia* Dana, 1851

*Pugettia vulgaris* Ohtsuchi, Kawamura, and Takeda, 2014 (Figs. 1E, F, 3)


*Pugettia quadridens pellucens*: Lee, 2007: 39, fig. 10.

*Pugettia pellucens*: Lee et al., 2014: 47, fig. 4B.

**Material examined.** 5♂♂, Korea: Gangwon-do, Gangeung-si, Jumunjin-eup, 31 Mar 2011, SCUBA at 25 m depth, Lee SH.

**Description.** Carapace (Figs. 1E, 3A) elongated pear-shaped; rostrum with 2 spines, which divergent at 50°, covered with hooked setae, approximately 0.3 PCL; dorsal surface entirely covered with club-shaped setae; regions relatively indistinct; gastric, cardiac, and intestinal regions convex, without tubercle; branchial region slightly convex, without tubercle; hooked setae on protogastric region and anterolateral margin; tufts of a few longer setae on mesogastric, cardiac, branchial, and intestinal regions and tips of hepatic and epibranchial spines; lower margin with 2 small acute tubercles anterolaterally; preorbital spine (Figs. 1E, F, 3A, B) acute; orbital hiatus between blunt antorbital angle and postorbital spine U-shaped; postorbital spine triangular, subequal to or slightly smaller than hepatic spine; hepatic spine fused at base with postorbital spine, tip slightly curved; epibranchial spine small, acute.

Korean name: 18한남봉봉바다감게(신칭)
Eye (Figs. 1E, F, 3B) non-retractile, orbit incomplete.

Basal antennal article (Fig. 3B) with distal spine on outer lateral margin; antennal peduncle consisting of 2 articles; ultimate article shorter than penultimate article, proximal end as broad as distal end.

Pterigostomial region (Fig. 3B) with 4 small tubercles.

Third maxilliped (Fig. 3C): Ischium subrectangular, about 1.2 times longer than broad, inner margin with setae and spinules, antero-inner margin produced; merus with setae on margins; dactylus setose. Outer margin of exopod with setae and spinules.

Chelipeds (Figs. 1E, F, 3A, D, E) equal in size. Merus prismatic; upper crest distinct, with 2 small teeth proximally and larger tooth subdistally; lower surface with 3 small tubercles; inner and outer margins without tubercle. Carpus sharply crested on inner and outer margins, upper surface with shorter crest including 2–3 tubercles. Palm crested on upper surface.

Ambulatory legs (Figs. 2, 3A, F, G) with short dense setae, scattering of longer setae; each merus with distal tooth; each carpus with 2 ridges on upper surface; each dactylus with 2 rows of spinules on posterior margin.

Abdomen of male (Fig. 3H) with 6 segments.

Habitat. These crabs were found in a scallop farm.

Distribution. Japan and now Korea.

Remarks. These specimens agree well with those of *P. vulgaris* described by Ohtsuchi et al. (2014) based on the following characteristics: 1) the carapace is covered with setae

---

**Fig. 2. Cycloes granulosa** De Haan, 1837, female (CL 36.6 mm, CW 35.9 mm). A, Dorsal view of left part of carapace; B, Chela of right cheliped; C, Chela of left cheliped; D, Carpus of left cheliped, outer view. Scale bars: A–C = 10 mm, D = 5 mm.
Fig. 3. *Pugettia vulgaris* Ohtsuchi, Kawamura, and Takeda, 2014, male (CL 22.1 mm, CW 14.2 mm). A, Dorsal view; B, Right anterior carapace, ventral view; C, Right third maxilliped, ventral view; D, Right cheliped, inner view; E, Merus of right cheliped, ventral view; F, Right ambulatory leg 1, outer view; G, Merus and carpus of right ambulatory leg 1, upper view; H, Abdomen; I, Left gonopod 1, ventral view; J, Distal part of left gonopod 1, upper view. Scale bars: A, B = 5 mm, C, I = 1 mm, D–H = 2.5 mm, J = 0.5 mm.
and has no tubercles, 2) the relative length of the rostral spines against the PCL is 0.29–0.31, 3) the hepatic spine is subequal to or slightly larger than the postorbital spine, 4), the merus of the cheliped has 3 teeth on the upper crest, 5) the carpus of the cheliped has 3 crests, and 6) the dorsal lobe of the gonopod is 1.5 times longer than the ventral lobe. However, P. pellucens figured by Lee (2007: fig. 10A, as P. quadridentis pellucens) and Lee et al. (2014: fig. 4B) is significantly differs from that of Ohtsuchi et al. (2014) and similar to P. vulgaris because 1) the ratio of length of rostral spine to PCL is not 0.40–0.50, 2) the rostral spines are not widely divergent in the distal half, and 3) the hepatic spine is not much larger than the postorbital spine. Therefore, it is necessary to re-examine their specimens.

Including the present study, six species of the genus Pugettia are reported from Korea. Their identification keys are following:

**Key to species of the genus Pugettia from Korea**

Eye with incomplete orbit. Basal antennal article short, truncate. Carapace subtriangular or pear-shaped, rostrum with 2 slender spines, preorbital and postorbital spines distinct, hepatic and branchial margins produced with spine. Chelipeds prismatic in meri. All abdominal segments distinct, hepatic and branchial margins produced with spine.

1. Postorbital spine and hepatic lobe fused as wing-shaped plate
   - Pugettia incisor
2. Cardiac region of carapace with prominent spine
   - Pugettia minor
3. Postorbital spine much smaller than hepatic spine
   - Pugettia quadridens
4. Carapace subtriangular
   - Pugettia intermedia
5. Carapace regions well defined
   - Pugettia vulgaris

**ACKNOWLEDGMENTS**

This research was supported by the project on survey of indigenous biological resources of Korea (NIBR No. 2014-02-001).

**REFERENCES**


MacLeay WS, 1838. On the Brachyurous Decapod Crustacea brought from the Cape by Dr. Smith. In: Illustrations of the Annulosa of South Africa; being a portion of the objects of natural history chiefly collected during an expedition into
the interior of South Africa, under the direction of Dr. Andrew Smith, in the years 1834, 1835, and 1836; fitted out by The Cape of Good Hope Association for Exploring Central Africa (Ed., Smith A). London, pp. 53-71.


Received December 19, 2014
Revised July 2, 2015
Accepted July 3, 2015