

Two Species of the Genus *Discorsopagurus* (Malacostraca: Decapoda: Paguridae) New to Korea

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ABSTRACT

The genus *Discorsopagurus* and two species belonging to this genus, *Discorsopagurus maclaughlinae* and *Discorsopagurus tubicola*, are herein first reported in Korean waters. Species belonging to *Discorsopagurus* are easily distinguished from other hermit crabs of the family Paguridae by their telsons that lack indentations and other characteristics such as straight abdomens, fused third and fourth abdominal tergites, and symmetrical uropods. *Discorsopagurus maclaughlinae* and *D. tubicola* were found to live in a tube made by a polychaete tubeworm. The two species differ in the shape of the posterior margin of the telson, the length of the pereopod, and the presence of setae on the antennal flagellum. *Discorsopagurus tubicola* is reported for the second time in the world. In this paper, there will be provided plates and descriptions of the two species.

Keywords: new record, tube of polychaete tubeworm, *Discorsopagurus maclaughlinae*, *Discorsopagurus tubicola*, Crustacea, Anomura

INTRODUCTION

The genus *Discorsopagurus* McLaughlin, 1974 is a member of the family Paguridae Latreille, 1802, and is similar to *Orthopagurus* Stevens, 1927 and *Pylopagurus* A. Milne-Edwards & Bouvier 1893 in having a straight abdomen and symmetrical uropods. This genus can be differentiated from *Orthopagurus* by its telson that lacks indentations and by the fused third and fourth abdominal tergites, which suggest a connection to the family Parapaguridae Smith, 1882 (McLaughlin, 1974). The genus *Discorsopagurus* contains only 4 known species in the world (McLaughlin et al., 2010). Species of the genus *Discorsopagurus* appear in the subtidal water of the northern Pacific and inhabit tubes made by polychaete tubeworms or holes bored in rocks (Stevens, 1925; Komai, 1995, 2003; Komai and Takeda, 1996). The genus *Discorsopagurus* and two of its species, *D. maclaughlinae* Komai, 1995 and *D. tubicola* Komai, 2003, are newly reported in Korea as a result of carcinology studies on Korean Pagurid fauna. In this paper, descriptions and illustration of the two species will be presented.

MATERIALS AND METHODS

The samples in this paper were observed using a dissecting microscope (Leica MZ8; Leica, Wetzlar, Germany) and preserved in 72% ethanol and 28% formalin-free fixative concentrate (FineFIX; Milestone, Sorisole, Italy). Figures were drawn with a stereoscopic microscope and camera lucida (Nikon SMZ800; Nikon, Tokyo, Japan). We took photos of the specimens with a digital camera (Nikon D200). The photos advanced with a focus stacking program (Helicon Focus; Helicon Soft Ltd., Kharkov, Ukraine). The shield length (sl) indicates the size of each specimen as measured from the distal tip of the rostrum to the end of the posterior margin of the shield with a slide caliper. The terminology is mostly after McLaughlin et al. (2007). The specimens used in this study were deposited in the Marine Arthropod Depository Bank of Korea, Seoul National University (MADBK).

For comparative study, the following materials were examined:

D. schmitti (Stevens, 1925): 1 ♂, USA: Washington State, Fidelgo Island, Burrows Channel, 1 Jan 1993, coll., Cassidy P, formerly USNM 103772, CBM-ZC 3795.

D. maclaughlinae Komai, 1995: 1 ♂, 1 ♀, Japan: Hokkai-



Fig. 1. *Discorsopagurus maclaughlinae* Komai, 1995 (male, sl 3.8 mm). sl, shield length.

do Prefecture, Wakkanai, Nosappu-misaki, 28 Mar 1990, gill net (20–30 m), coll., Sato O, HUMZ-C 976.

D. cavicola Komai & Takeda, 1996: 1♂, 1♀, Japan: Aomori Prefecture, Asamushi, Yunoshima, Mutsu Bay, 40° 53.42'N, 140°51.16'E, 2–3 m, 26 Jul 1992, coll., Takeda S, CBM-ZC 2190.

D. tubicola Komai, 2003: 1♂, 1♀, Japan: Chiba Prefecture, Futtsu, off Takeoka, Uruga Strait, 28 Oct 2008, commercial gill net (20–30 m), coll., Komai T, CBM-ZC 9609.

SYSTEMATIC ACCOUNTS

Class Malacostraca Latreille, 1802

Order Decapoda Latreille, 1803

Family Paguridae Latreille, 1802

¹*Genus *Discorsopagurus* McLaughlin, 1974

²**Discorsopagurus maclaughlinae* Komai, 1995

(Figs. 1, 2)

Orthopagurus schmitti: Makarov, 1962: 217, Pl. 2, fig. 1.

Discorsopagurus schmitti: McLaughlin, 1974: 354.

Discorsopagurus maclaughlinae Komai, 1995: 617–627, figs. 1–4 (type locality: Usujiri, Pacific coast of southern Hokkaido, Japan); Petryashev, 2005: 13; Marin et al., 2012: 276–277, fig. 1.

Material examined. 1 ovig. ♀ (sl 2.09 mm), Korea: Gangwon-do: Samcheock-si, Port Imwon, 28 Jan 2002, collected by commercial bottom trawl from a tubeworm tube; 2♂♂ (sl 2.84–4.07 mm), 1♀ (sl 2.81 mm), Gangneung-si, Port Jumunjin, 21 May 2002, obtained by netting; 7♂♂ (sl 2.92–5.02 mm), Gangneung-si, Port Jumunjin, 22 May 2002, found by a fishing ship (MADBK160746_001); 1♂ (sl 2.48 mm), Yangyang-gun, Port Namyea, 25 Feb 2003, collected by commercial bottom trawl; 1 ovig. ♀ (sl 3.85 mm), Samcheock-si, Port Jangho, 26 Feb 2003 (MADBK160746_002).

Description. Shield (Fig. 2A) slightly longer than broad; rostrum triangular, terminating subacutely; lateral projection triangular, with small submarginal spine. Ocular peduncle 0.7–0.8 times as long as shield; dorsomesial margin with row of setae; cornea not dilated. Antennular peduncle exceeding ocular peduncles by 0.4 times the length of the ultimate segment. Antennal peduncle slightly overreaching distal end of cornea. Antennal flagellum with short setae.

Right cheliped (Fig. 2B) larger than left one, 4–5 times as long as shield. Chela 2.0–2.2 times as long as broad. Dactylus shorter than palm when measured along mesial margin; dorsomesial margin with 2 rows of spines and tufts of setae; dorsal surface with scattered small tubercles and tufts of setae; cutting edge with row of calcareous teeth, terminating in small corneous claw. Dorsal surface of palm slightly convex; dorsomesial margin with row of strong spines; dorsolateral margin with row of small spines; lateral and mesial

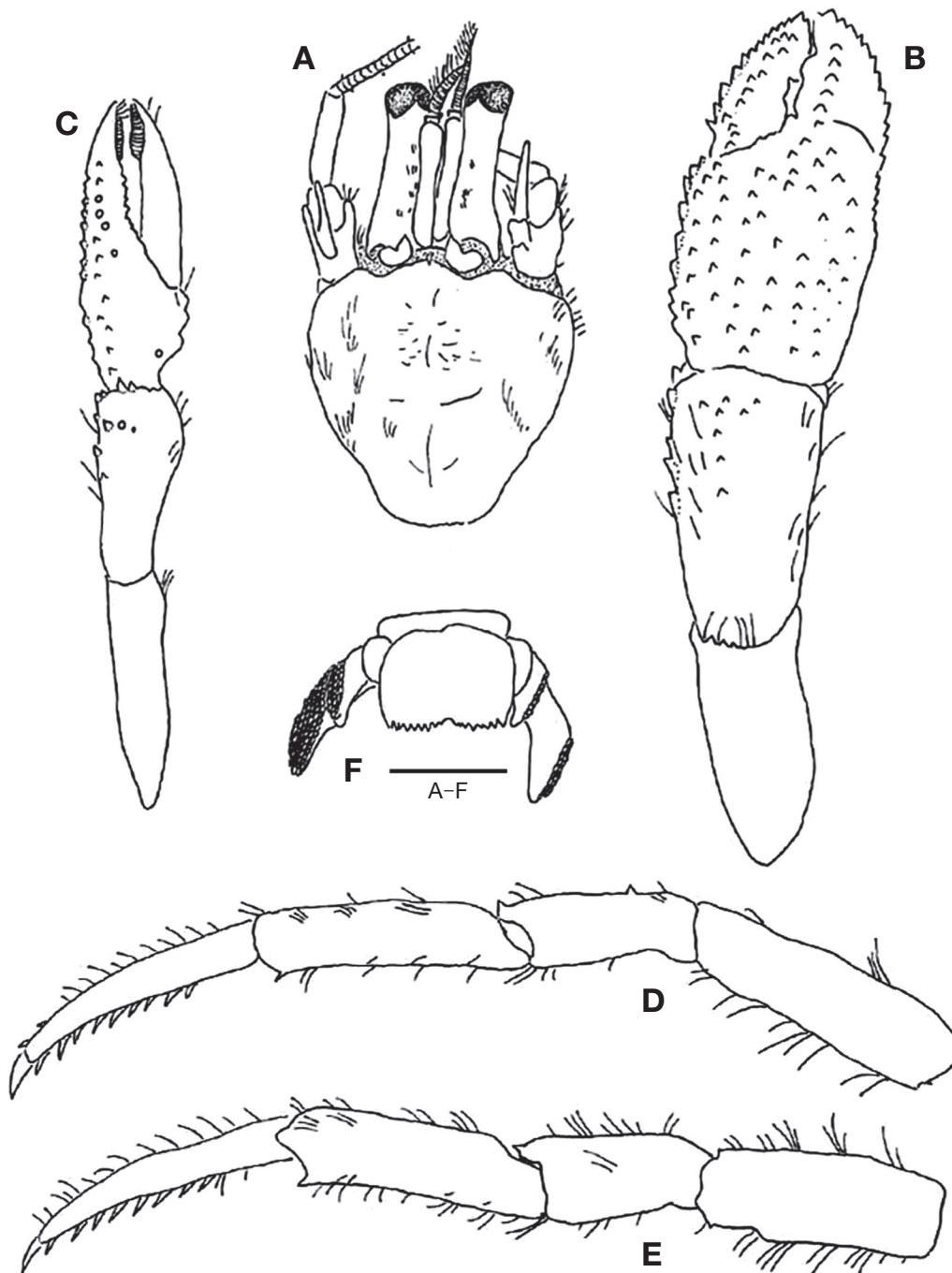


Fig. 2. *Discorsopagurus maclaughlinae* Komai, 1995, male. A, Shield and cephalic appendages; B, Right cheliped, dorsal; C, Left cheliped, dorsal; D, Right second pereopod, lateral; E, Right third pereopod, lateral; F, Telson, dorsal. B, C, F, Setae partially omitted. Scale bar: A-F=2.0 mm.

margins and ventral surface with scattered tufts of setae. Carpus as long as merus; dorsomesial margin with 2 strong spines distally; mesial margin with row of strong spines; dorsal surface with few small spines. Dorsal surface of merus with tufts of long setae; ventral surface with scattered strong

spines and tufts of long setae.

Left cheliped (Fig. 2C) reaching to proximal end of right cheliped dactyl. Dactylus longer than palm, all surfaces with tufts of setae, leaving hiatus when closed; cutting edge with row of small corneous teeth. Palm shorter than carpus; dorsal

surface convex, with irregular row of small tubercles and some long setae; lateral margin with a few short setae. Carpus nearly as long as merus; dorsal surface with few spines and tufts of setae; dorsolateral margin with a row of spine. Merus slender; dorsal surface almost smooth; ventral surface with row of spines and tufts of long setae.

Second and third pereopods long and slender. Second pereopod (Fig. 2D) shorter than right cheliped by about half of right cheliped dactyl. Dactylus almost as long as propodus; ventral margin with 9–10 strong spines. Dorsal and ventral margins of propodus with long setae; ventral margin bearing 1 spine distally. Carpus with tufts of long setae; dorsal margin of right one bearing 1 spine distally and 1–3 spines proximally, that of left one lacking spines. Merus nearly unarmed.

Dactylus of third pereopod (Fig. 2E) almost as long as propodus; ventral margin with 8–9 strong spines. Dorsal and ventral margins of propodus with long setae; ventral margin bearing 1 spine distally. Carpus partially covered with tufts of long setae; dorsal margin of right one bearing 1 spine distally, that of left one with no spines. Merus with tufts of setae.

Abdomen large, inflated, and mostly straight but slightly curved.

Lateral margin of telson (Fig. 2F) slightly convex, with row of setae; terminal margin concave, with 18–22 small spines. Uropod symmetrical; exopod 1.5–1.7 times as long as telson, slightly curved; endopod stout, shorter than telson.

Distribution. Hokkaido, Japan (type locality); Vostok Bay, Russia; East Sea, Korea (present study).

Habitat. The tube of a polychaete tubeworm.

Remarks. The present specimens of *D. macLaughlinae* have no distinct differences from the original description by Komai (1995). In his description, Komai did not mention the number of spines on the dorsal margins of the carpi of the right second and third pereopods. In the present specimens, we observed one distal spine and 1–3 proximal spines on the dorsal margin of the carpus of the right second pereopod and 1 distal spine on the right third pereopod. By this paper, the known geographical range of this species extends southward.

¹**Discorsopagurus tubicola* Komai, 2003 (Figs. 3–6)

Material examined. 1 ♂ (sl 4.64 mm), Korea: Gyeongsangnam-do: Geoje-si, Jangseungpo-dong, about 2 km to the northeast (34°52'4"N, 128°44'6"E), 27 Sep 1981, collected by SCUBA diving at a depth of 10–11 m; 1 ♀ (sl 3.51 mm), Gangwon-do: Goseong-gun, Songjiho, 24 Jun 2010, by SCUBA diving, coll., Park TS (MADBK160747_001); 1 ♂ (sl 2.09 mm), Gyeongsangnam-do: Namhae-gun, Mijomyeon, Mijo-ri, 8 Aug 2009, collected by SCUBA diving at a depth of 19.8 m, coll., Park TS.

Description. Shield (Fig. 4A) as long as wide; rostrum triangular, terminating subacutely; lateral projection degraded, with small submarginal spine. Ocular peduncle 0.7 times



Fig. 3. *Discorsopagurus tubicola* Komai, 2003 (female, sl 3.51 mm). sl, shield length.

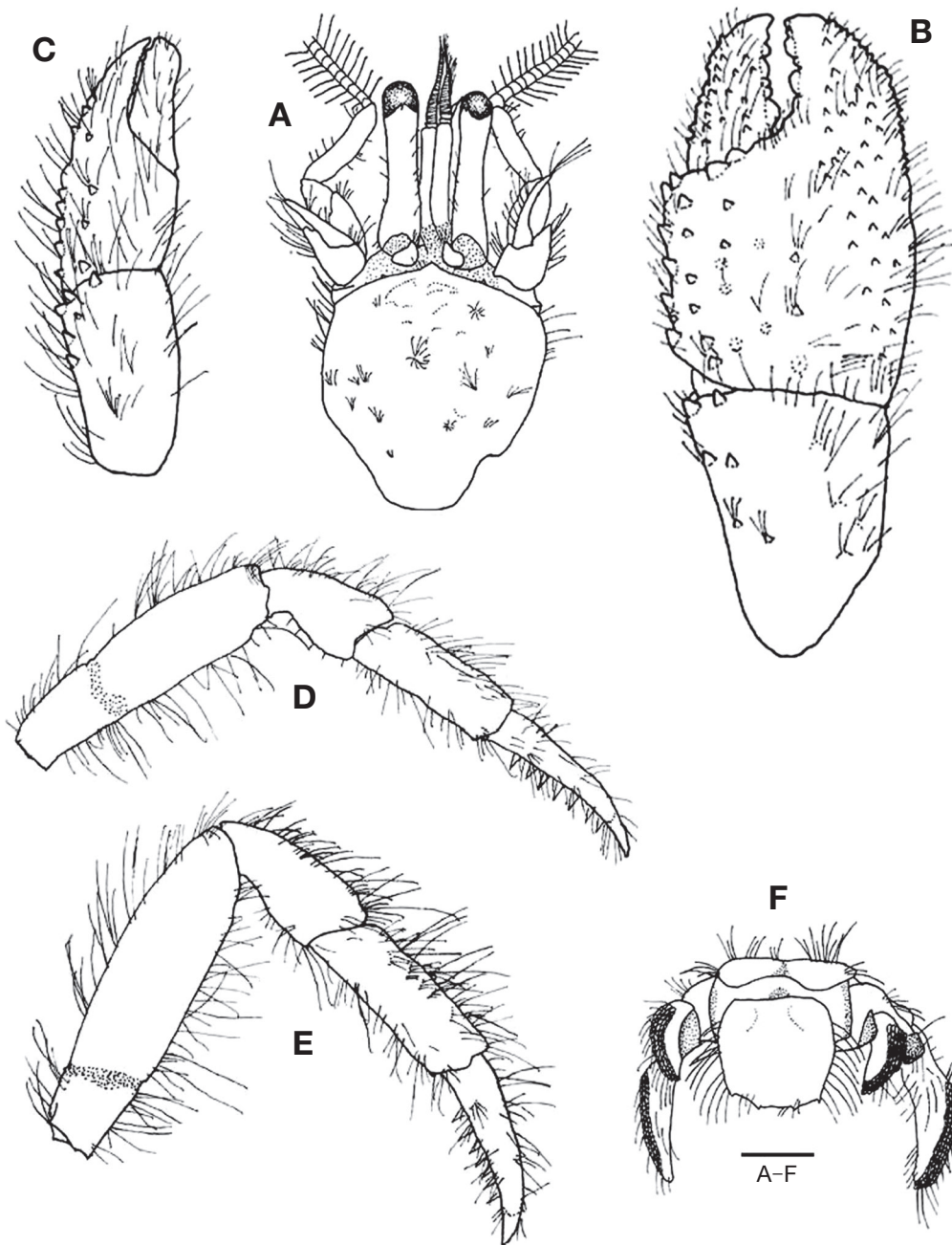


Fig. 4. *Discorsopagurus tubicola* Komai, 2003, female. A, Shield and cephalic appendages; B, Right cheliped chela and carpus, dorsal; C, Left cheliped chela and carpus, dorsal; D, Left second pereopod, lateral; E, Left third pereopod, lateral; F, Telson, dorsal. Scale bar: A-F=2.0 mm.

as long as shield; dorsomesial margin with row of setae; corneas not dilated. Antennular peduncle exceeding ocular peduncles by 0.4 times the length of the ultimate segment. Antennal peduncle slightly overreaching the distal end of the corneas. Antennal flagellum with long setae.

Right cheliped (Fig. 4B) larger than left one, 3 times as

long as shield. Chela 2 times as long as broad. Dactylus shorter than palm when measured along mesial margin; dorsomesial margin delimited by 2 rows of small spines and tufts of setae; dorsal surface with a few scattered tubercles and tufts of setae; cutting edge with row of calcareous teeth, terminating in a small corneous claw. Dorsal surface of palm



Fig. 5. *Discorsopagurus tubicola* Komai, 2003, female. Abdomen and tergites of fifth and sixth abdominal somite, dorsal. Scale bar=2.0 mm.



Fig. 6. *Discorsopagurus tubicola* Komai, 2003 (male, sl 4.64 mm). Eighth sternite, sexual tubes and coxae and ischia of fifth pereopods, ventral. sl, shield length. Scale bar=2.0 mm.

slightly convex; lateral and mesial margins with irregular row of small spines and tufts of stiff setae; dorsomesial margin with row of strong spines; dorsolateral margin with row of small spines; lateral and mesial margins and ventral surface with scattered tufts of setae. Carpus as long as merus, wide distally; dorsomesial margin not distinctly delimited, with 2 strong distal spines; dorsal surface with tufts of setae; lateral margin with row of spines. Dorsal surface of merus with tufts of long setae; ventral surface nearly flat, with a few tufts of long setae.

Left cheliped (Fig. 4C) reaching to proximal end of right cheliped dactyl. Dactylus slightly longer than palm; all surfaces with tufts of setae; cutting edge with row of small corneous teeth. Palm shorter than carpus; dorsal surface almost

flat, with irregular row of small tubercles and numerous long setae; dorsomesial margin not distinctly delimited; lateral margin with a few short setae. Capus with tufts of setae except ventral surface; dorsolateral margin with 2 strong spines distally; lateral margin with 3 strong spines. Merus with tufts of setae except ventral surface; dorsolateral margin with 4 spines.

Second pereopod (Fig. 4D) stout, shorter than right cheliped by about half of right cheliped dactyl. Dactylus almost as long as propodus; ventral margin with 7–8 strong spines. Propodus nearly unarmed, with long setae on dorsal and ventral margins. Dorsal margin of carpus unarmed, partially covered by tufts of long setae. Merus nearly unarmed. Third pereopod (Fig. 4E) similar to second pereopod in shape and length.

Abdomen (Fig. 5) large, inflated, and mostly straight but slightly curved.

In male, proximal margin of coxa of fifth pereopod (Fig. 6) with sexual tube.

Lateral margin of telson (Fig. 4F) slightly convex, with row of setae; terminal margin convex, with 6 small spines. Uropod symmetrical; exopod 1.5 times as long as telson, slightly curved; endopod stout, shorter than telson.

Coloration. Chelipeds mottled brown. Ocular peduncles pale brown. Pereopods with reddish-brown bands.

Habitat. The tube of a polychaete tubeworm.

Distribution. Uraga Channel and Tokyo Bay, Japan (type locality); East Sea and South Sea, Korea (present study).

Remarks. *Discorsopagurus tubicola* is quite similar to *D. maclaughlinae* in Korea both morphologically and ecologically. However, they can be distinguished from each other by the following characteristics: (1) The length of the setae of the antennal flagellum: the setae of *D. tubicola* is longer than that of *D. maclaughlinae*. (2) The relative length of the cheliped and pereopods: the right cheliped and second and third pereopods of *D. tubicola* are 3 times as long as the shield, while those of *D. maclaughlinae* are 4–5 times as long as the shield. (3) In male, proximal margin of coxa of fifth pereopod bears sexual tube in *D. tubicola*, but that of *D. maclaughlinae* bears with gonopore. (4) The posterior margin of the telson of *D. tubicola* is convex, but that of *D. maclaughlinae* is concave. (5) There are 6 spines on the posterior margin of the telson of *D. tubicola*, but 18–22 spines on that of *D. maclaughlinae*. The present species is reported for the second time in the world and the known geographical distribution has been extended northwestward.

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