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Short communication

Taxonomic Review of Genus *Chelyosoma* (Phlebobranchia: Corellidae) from Korea

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ABSTRACT

The genus *Chelyosoma* is clearly distinguished from other taxa of sea squirts by a presence of the branchial sac with curved stigmata and the dorsal side of the body modified into a bounded disk. Solitary ascidians, *Chelyosoma siboja* and *Chelyosoma yezoense*, are reported for the first time in Korean waters with description and illustration. *Chelyosoma siboja* and *Chelyosoma yezoense* have intermediate plates and unpaired central plates. The former has two intermediate plates while the latter has four or more intermediate plates regardless of the size of the individual. Specimens of the genus *Chelyosoma* collected from 1961 to 2021 and stored in the Natural History Museums of Ewha Womans University and Marine Tunicate Resources Bank of Korea were morphologically reviewed. These samples were collected from coastal waters of the South Sea and the East Sea. As a result of this study, three species of the genus *Chelyosoma* are now recorded in Korean fauna.

Keywords: review, solitary ascidians, *Chelyosoma*, plates, Korean fauna

INTRODUCTION

The genus *Chelyosoma* Broderip & Sowerby, 1830 has 9 valid species worldwide (WoRMS, 2024). It is characterized by having a branchial sac with curved stigmata and the dorsal side of the body modified into a bounded disk covered by thin plates (Oka, 1928; Van Name, 1945; Nishikawa, 1991). The number and arrangement of plates on a disk are important characteristics that distinguish the species of this genus. The location of the intestine is of subordinate importance since it depends not only on the species of the genus *Chelyosoma*, but also on individual (Hartmeyer, 1906).

This genus has been recorded from the Arctic Ocean to the southern tropical latitudes of the eastern Pacific and as far as Indonesia in the western Pacific (Oka, 1928; Van Name, 1945; Tokioka, 1953, 1967; Kott, 1985; Nishikawa, 1991). *Chelyosoma dofleini* Hartmeyer, 1906 has been reported so far in Korea (Rho, 1968, 1971, 1975, 1977; Rho and Huh, 1984; Rho and Lee, 1991). Nishikawa (1991) has reassigned 1971 and 1975 samples as *C. siboja* based on the Rho's description that there is only one center plate. Since then, two scientific names have been used for the same Korean name without detailed descriptions or illustrations (Rho and Park, 1998). Therefore, a reexamination of *Chelyosoma* samples collected in Korean waters is necessary.

In this study, specimens of the genus *Chelyosoma* collected from 1961 to 2021 and stored in Ewha Womans University Natural History Museum and Marine Tunicate Resources Bank of Korea were morphologically reviewed. These samples were collected from coastal waters of the South Sea and the East Sea by Scuba diving or fishing net.

For identification, specimens were examined for morphological characteristics under a stereoscopic microscope (SMZ 745T; Nikon, Tokyo, Japan). Images of preserved specimens were taken with a microscopic camera (UHCCD05000KPA; Touptek Photonics, Zhejiang, China) and a digital camera (WG-4; Ricoh, Tokyo, Japan). The size of the zooid was then measured using an image analyzer (Toupview 3.7; Touptek Photonics) and a ruler.

All specimens examined in this study were deposited at the Natural History Museum of Ewha Womans University (EWNHMAS580-622, 980, 2067, 2083), the National Marine Biodiversity Institute of Korea (MABIK IV00175005, MABIK IV00175006) and Marine Tunicata Resources Bank of Korea (MTRBK245-246).

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SYSTEMATIC ACCOUNTS

Class Ascidiacea Blainville, 1824
Order Phlebobranchia Lahille, 1886
Family Corellidae Lahille, 1888
Genus *Chelyosoma* Broderip & Sowerby, 1830

[1]**Chelyosoma yezoense* Oka, 1928 (Fig. 1)

Chelyosoma yezoense Oka, 1928: 397−399, fig. C; Nishikawa, 1991: 70−71, fig. 20C.

Material examined. Korea: 1 individual (MABIK IV0017 5005), Gangwon-do: Goseong, 38°18′06″N, 128°34′16″E, Scuba diving at a depth of 29 m, 6 May 2021, coll. Ra SG, Song KY; 1 individual (EWNHMAS2067), Goseong, 38°21′16″N, 128°30′45″E, fishing net, 4 May 2021, coll. Seo SY, Kang DW.

Description. Solitary. Body attached to other sea squirts laterally. Test gelatinous, firm, semi-translucent and light tan color. Test on upper body slightly bumpy. Body oval and small. Height of body viewed from side about 21.0 mm and width of body about 15.8 mm (n = 2) (Fig. 1A). Siphonal field on the dorsal side of the body squamoisty and not sunken (Fig. 1B). Heights of branchial siphon and atrial siphon 6.7 mm and 4.1 mm respectively. Disk covered by thin plates. Disk consist of 1 central plate, 2 intermediate plates, 17 marginal plates and 12 siphonal plates. Size of disk about 15 × 11 mm in diameter. Disk does not have thick rim formed along all edges (Fig. 1F). Mantle semi-transparent. Major mantle muscles band thick and short, measuring about 25−42 mm in length. Muscles band arranged along edge of disk in mantle, extending slightly upwards on side of body (Fig. 1C). Branchial aperture and atrial aperture located at top of body and opened upward. Each aperture has 6 pointed lobes. Branchial tentacles simple and numerous. Branchial sac has no folds. Internal longitudinal vessels well developed. Stigmata curved and form irregularly small spirals. Dorsal languets pointed, flat and triangle shape (Fig. 1G). Oesophagus long. Stomach long oval form and have surface with plications (Fig. 1E). Intestine forms simple loop. Rectum runs long. Anus has smooth margin. Gonads covers densely on surface of intestinal loop (Fig. 1D).

Distribution. Korea (present study), Japan.

Remarks. The present specimens showed typical characteristics of the major key of *Chelyosoma yezoense*: 1 central plate, 2 intermediate plates, and 17 marginal plates. The present specimen's body size was approximately 21 mm, consistent with the 1928 record of Oka, which described that the body length was up to 50 mm. The present specimen was similar to *Chelyosoma siboja*, but differed in number and arrangement of plates on a disk, squamoisty of the siphonal field and the absence of a bread-like disk's frame (Oka, 1928).

[2]**Chelyosoma siboja* Oka, 1906 (Fig. 2)

Chelyosoma siboja Oka, 1906: 51−52; 1928: 397−399, fig. D; 1935: 460−461, fig. 30; Nishikawa, 1984: 150; 1991: 67−69, table 6, figs. 20A, B; Rho and Park, 1998: 177.

Chelyosoma dofleini: Rho, 1968: 90−93, fig. 2; 1971: 112−113; 1975, 133; 1977: 325, fig. 40; Rho and Huh, 1984: 10; Rho and Lee, 1991: 201.

Material examined. Korea: 3 individuals (MABIK IV00175 006, MTRBK245-246), Gangwon-do: Goseong-gun, 38°18′ 04″N, 128°34′26″E, Scuba diving at a depth of 29 m, 6 May 2021, coll. Ra SG, Song KY; 1 individual (EWNHMAS580), Gyeongsangnam-do: Busan-si, fishing net, 10 Jun 1967, coll. Rho BJ; 1 individual (EWNHMAS581), Namhae-gun, fishing net, 11 Jul 1967, coll. Rho BJ; 2 individuals (EWNHMAS 583), Tongyeong-si, fishing net, 6 Jul 1968, coll. Rho BJ; 2 individuals (EWNHMAS584), Pohang-si, fishing net, 21 Jul 1968, coll. Rho BJ; 1 individual (EWNHMAS585), Jeollanam-do: Yeosu-si, fishing net, 13 Jul 1969, coll. Rho BJ; 1 individual (EWNHMAS586), ibid; 9 individuals (EWNHMAS587), Yoesu-si, fishing net, 15 Jun 1969, coll. Rho BJ; 6 individuals (EWNHMAS588), Gangwon-do: Gangneung-si, fishing net, 4 Aug 1971, coll. Rho BJ; 3 individuals (EWNHMAS589), Jeollanam-do: Yeosu-si, fishing net, 8 Aug 1973, coll. Rho BJ; 3 individuals (EWNHMAS590); Gyeongsangnam-do: Namhae-gun, fishing net, 8 Jun 1974, coll. Rho BJ; 3 individuals (EWNHMAS591), ibid; 1 individual (EWNHMAS592); Busan-si, fishing net, 16 Jul 1974, coll. Rho BJ; 1 individual (EWNHMAS593), Namhae-gun, fishing net, 29 Jul 1980, coll. Song JI; 3 individuals (EWNHMAS594), Namhae-gun, fishing net, 23 May 1981, coll. Huh MK; 3 individuals (EWN HMAS595); Busan-si, fishing net, 10 Dec 1981, coll. Huh MK; 1 individual (EWNHMAS597), Gangwon-do: Samcheok-si, fishing net, 7 Aug 1983, coll. Rho BJ; 3 individuals (EWN HMAS598), Gyeongsangnam-do: Samcheonpo-si, fishing net, 23 Jul 1984, coll. Rho BJ; 1 individual (EWNHMAS599), Namhae-gun, fishing net, 8 Aug 1983, coll. Song JI, Yun SJ; 11 individuals (EWNHMAS601), Sacheon-si, fishing net, 21 Jul 1984, coll. Rho BJ; 18 individuals (EWNHMAS602), Sacheon-si, fishing net, 27 Dec 1986, coll. Song JI; 2 individuals (EWNHMAS603), Samcheok-si, fishing net, 14 Aug 1987, coll. Rho BJ, Lee JW; 2 individuals (EWNHMAS604), Gangwon-do: Goseong-gun, fishing net, 19 Jun 1988, coll. Lee JE, Lee JW; 3 individuals (EWNHMAS614); Gyeongsangnam-do: Geoje-si, Scuba, 8 Jul 1996; 3 individuals (EWNHMAS 615), Geoje-si, Scuba, 3 Jul 1997; 1 individual (EWNHMAS

Korean name: [1]*찬거북등안장멍게 (신칭), [2]*홀거북등안장멍게 (신칭)

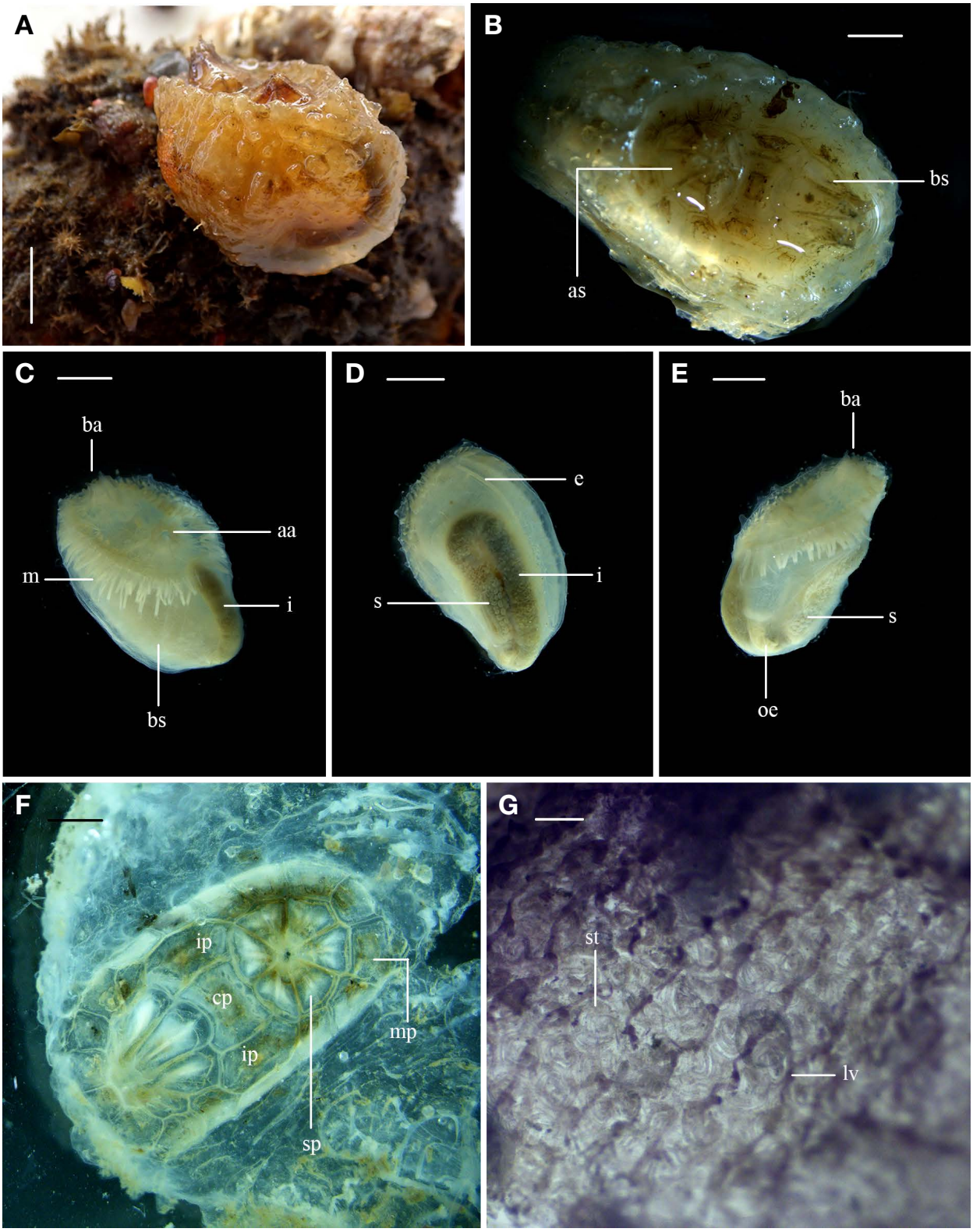

Fig. 1. *Chelyosoma yezoense* (A–G). A, Individual out of water; B, Siphonal part of dorsal side; C–E, Individual with removed test; F, Disk; G, Branchial sac with coiled stigmata. aa, atrial aperture; as, atrial siphon; ba, branchial aperture; bs, branchial siphon; cp, central plate; e, endostyle; i, intestine; ip, intermediate plate; m, muscle; mp, marginal plate; oe, oesophagus; lv, longitudinal vessle; s, stomach; sp, siphonal plate; st, stigmata. Scale bars: A=10 mm, B, F=2 mm, C–E=5 mm, G=0.2 mm.

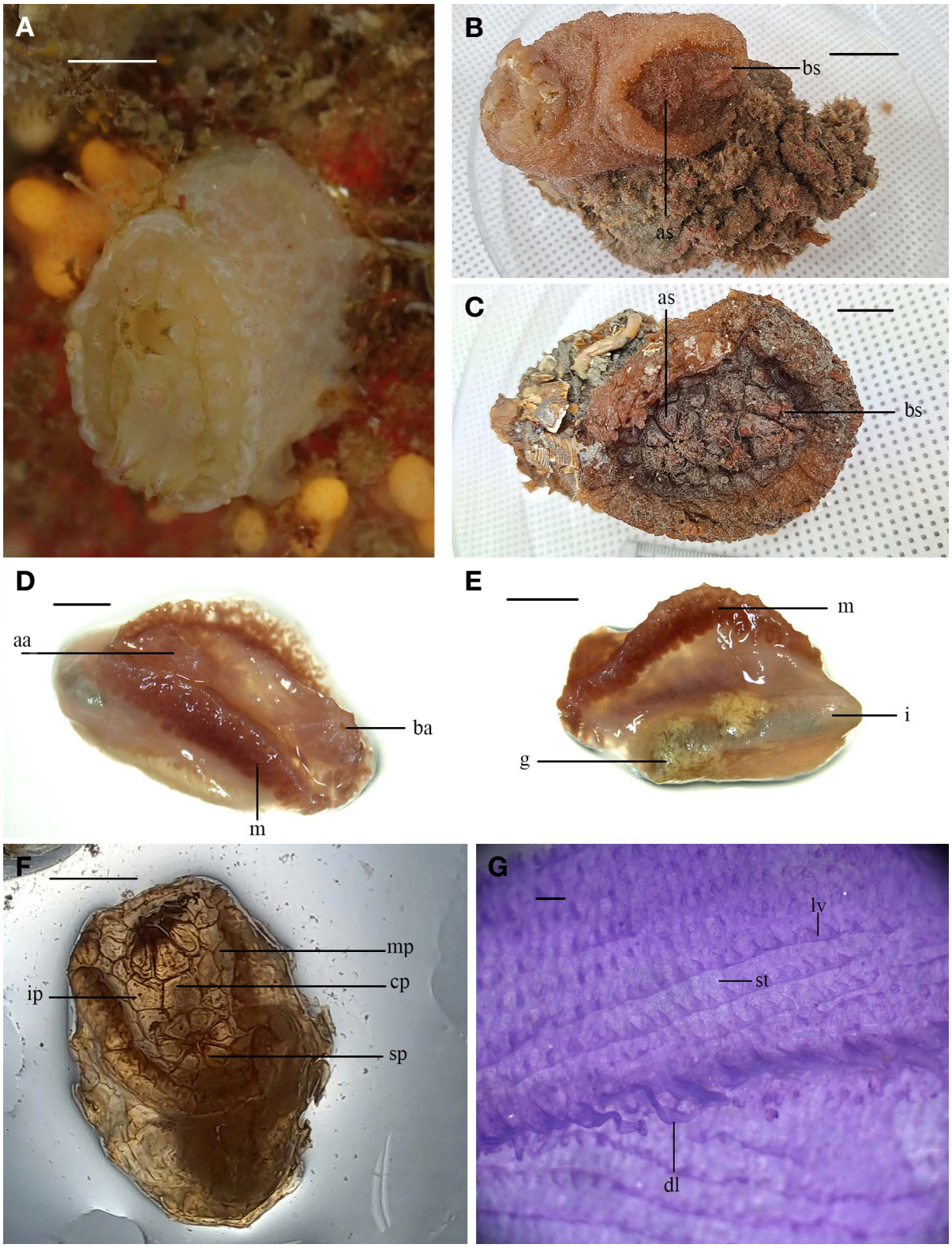

Fig. 2. *Chelyosoma siboja* (A–G). A, Small individual in living; B, C, Large individuals in preservative; D, E, Individual with removed test; F, Disk; G, Branchial sac with coiled stigmata. aa, atrial aperture; as, atrial siphon; ba, branchial aperture; bs, branchial siphon; cp, central plate; dl, dorsal languets; g, gonad; i, intestine; ip, intermediate plate; lv, longitudinal vessle; m, muscle; mp, marginal plate; sp, siphonal plate; st, stigmata. Scale bars: A = 5 mm, B–E = 20 mm, F = 5 mm, G = 0.1 mm.

619), Geoje-si, Scuba, 7 Jul 1996; 1 individual (EWNHMAS 620), Geoje-si, Scuba, 8 Jul 1996; 3 individuals (EWNHMAS 621), ibid; 2 individuals (EWNHMAS622), Geoje-si, 13 Feb 1998.

Description. Solitary. Body attached to rock, rope, shell or sea squirt of same or another species by ventral or lateral side (Fig. 2A). Body oval or cylindrical. Height of body viewed from side ranged from 14 to 70 mm (n = 130). Body surface irregularly grooved. Gelatinous test of smaller specimens less firm and whitish in color. As specimens grow larger, test harder, thicker, and reddish-brown or grayish in color. Hydrozoan, bryozoans, anthozoans, ascidians, sea shells, algae and small pebbles on surface of test in large specimens. Siphon part of dorsal side sunken. Diameter of disk ranges from approximately 10 × 15 mm to 60 × 70 mm. Disk have very thick rim formed along all edges. Disk covered by plates. Plate becomes thicker and harder as the individual size increases. Growth ribs developed on surface of plates (Fig. 2B, C). Disk consist of 1 central plate, 4−9 intermediate plates, 21−23 marginal plates and 12 siphonal plates (Fig. 2F). Configuration of plates in disk independent of individual size. Intermediate plate changes into horn shape in some large specimens (Fig. 2C). Mantle semi-transparent. Color of mantle white in small individuals and pale reddish brown in larger individuals. Major mantle muscles band thick, short and arranged along edge of disk in mantle, extending slightly upwards on side of body. Branchial aperture and atrial aperture located at top of body and opened upward (Fig. 2D). Each aperture has 6 pointed lobes. Branchial tentacles filiform and numerous. Branchial sac thick without no folds. Internal longitudinal vessels in branchial sac numerous. Stigmata curved and form irregularly small spirals. Dorsal languets pointed, flat and triangle shape (Fig. 2G). Intestinal loop horizontal and occupied posterior part of branchial sac. Stomach long oval form and have surface with longitudinal plications. Rectum runs long. Anus has lobes. Gonads covers densely on surface of intestinal loop (Fig. 2D, E).

Distribution. Korea (present study), Japan.

Remarks. The present specimen is very similar to *Chelyosoma dolfeini*, but the former always has one central plate in configuration of disk's plates, and the latter has two (Oka, 1928; Nishikawa, 1991). When I re-examined all the samples in the literatures (Rho, 1968, 1971, 1975, 1977; Rho and Huh, 1984; Rho and Lee, 1991) described as *C. dofleini*, I found that they were *Chelyosoma siboja*, not *C. dofleini*. Most of the specimens of the genus *Chelyosoma* stored at the Natural History Museum of Ewha Womans University and Marine Tunicate Resources Bank of Korea are *C. siboja*. Some of the specimens labeled *C. dofleini* had damaged disc plates during previous dissections to study the copepods living in the tunic, making it difficult to re-identify species.

Key to the *Chelyosoma* species from Korean waters

1. Intermediate plates exists on disk. Central plates in pairs···· ····· *dofleini* Hartmeyer
− Intermediate plates exists on disk. Central plates unpaired ····· 2
2. Number of intermediate plates 2 ····· *yezoense* Oka
− Number of intermediate plates 4−9 ····· *siboja* Oka

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CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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