

First Record of *Synoicum clavatum* (Ascidiacea: Aplousobranchia: Polyclinidae) from Korea

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ABSTRACT

A colonial ascidian, *Synoicum clavatum* has previously been reported from Japan. Here, we provide detailed descriptions and illustrations of *S. clavatum* as the first record in Korea. *Synoicum clavatum* is characterized by club-shaped colonies with oval head and elongate stalk, circular cloacal systems, a branchial sac with 14–16 stigmata rows of 10–17 stigmata per row and a stomach with smooth surface. The specimens of *S. clavatum* were collected in the subtidal zone (15–25 m depth) at Beomseom and Mumseom in Jeju-do while SCUBA diving from 2000 to 2014.

Keywords: taxonomy, Ascidian, Polyclinidae, *Synoicum clavatum*, Korean waters

INTRODUCTION

The genus *Synoicum* is a colonial subgroup of the Polyclinidae and is dissimilar to other genera in that its zooid lack constriction between abdomen and posterior abdomen, branchial sac has 14–16 rows of stigmata with up to 20 stigmata per row, stomach wall is not longitudinally folded, and ovaries are not in the thorax (Kott, 1992). Presently, about 81 species of the genus *Synoicum* are known worldwide (Monniot, 2001), while only single species, *S. pulmonaria* has been reported in Korean waters (Rho and Huh, 1984; Rho and Lee, 1989).

Specimens of *Synoicum clavatum* examined in this study were collected in the subtidal zone (15–25 m depth) at Beomseom and Mumseom in Jeju-do while SCUBA diving from 2000 to 2014.

For identification, each specimen was examined for morphological characteristics such as colony, system, stigmata, stomach, gut, gonad and coloration under stereomicroscope (SMZ 745T; Nikon, Tokyo, Japan). The color of each part was recorded in accordance to a color chart (Pantone color formula guide 747XR). Images of the collected living *Synoicum* colonies, prior to fixation, were taken using a digital camera (WG2; Pentax, Tokyo, Japan). The images of zooids were taken with a stereomicroscope with camera (UHCCD05000KPA; Touptek Photonics, Zhejiang, China).

The size of zooids was then measured using an image analyzer (Toupview 3.7; Touptek Photonics).

The systematic scheme of ascidians was adopted from Kott (1992), Monniot (2001), and Sanamyan (2015). The specimens were deposited in Natural History Museum, Ewha Womans University, Seoul, Korea (EWNHMAS 13–17).

SYSTEMATIC ACCOUNTS

Order Aplousobranchia Lahille, 1886

Family Polyclinidae Milne Edwards, 1841

Genus *Synoicum* Phipps, 1774

***Synoicum clavatum* (Oka, 1927) (Fig. 1)**

Polyclinum clavatum Oka, 1927: 501, fig. 965; Tokioka, 1953: 184–185.

Synoicum clavatum: Tokioka, 1954: 69–70, Pl. 4, figs. E, F; Nishikawa, 1980: 99, tab. 1; 1990: 97–99, fig. 3.

Material examined. Korea: Jeju-do: 4 colonies, Munseom, 7 Nov 2000, 15–25 m deep by SCUBA diving (EWNHMAS 13); 1 colony, Beomseom, 6 Jun 2001, 25 m deep by SCUBA diving (EWNHMAS 14); 3 colonies, Munseom, 27 Nov 2011, Song JI, Whang SJ, 20–25 m deep by SCUBA diving

Korean name: ¹*곤봉만두멍게 (신칭)

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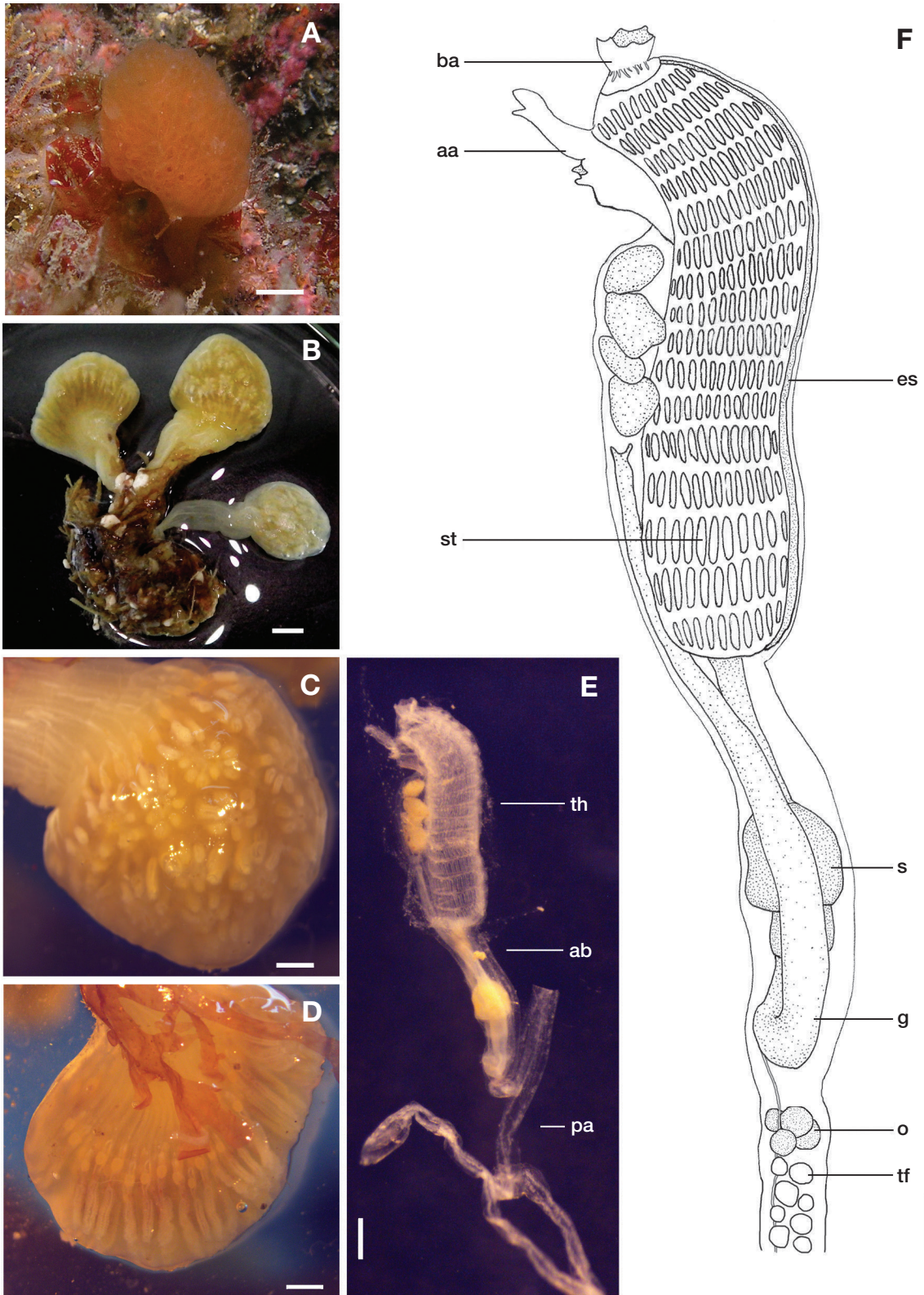


Fig. 1. *Synoicum clavatum*. A, Colony in living; B, Colony in preservative; C, D, Cormidia; E, F, Zoid. th, thorax; ab, abdomen; pa, post-abdomen; ba, branchial aperture; aa, atrial aperture; es, endostyle; st, stigmata; s, stomach; g, gut; o, ovaries; tf, testicular follicles. Scale bars: A=5 mm, B, C=2 mm, D=5 mm, E=0.5 mm, F=0.2 mm.

(EWNHMAS 15); 2 colonies, Munseom, 28 Nov 2011, Song JI, Whang SJ, 20 m deep by SCUBA diving (EWNHMAS 16); 1 colony, Beomseom, 28 Oct 2014, Whang SJ, Lee WK, 13–14 m deep by SCUBA diving (EWNHMAS 17).

Description. Colonies attached to substrate, consist of several club-shaped cormidia united one another at basal end. Each of cormidia comprises oval head (9.40–22.00 mm in diameter, 6.36–20.00 mm in length) and elongate stalk (up to 20 mm). Surface of colony smooth, sometimes bryozoa and hydra lived on stalk. Test soft, gelatinous, semi-transparent, light orange (Pantone 1375 C) in living and opaque milky white color in preservative (Fig. 1A, B).

Five to eleven zooids form a system encircling a small common cloacal aperture. Eight to thirty systems in oval head of each cormidium (Fig. 1C). Many zooids arranged parallel to axis of cormidium (Fig. 1D).

Zooids deep orange color (Pantone 1585 C) in living (Fig. 1A). Zooids slender and 9.44–16.40 mm in total length in preserved materials. Thorax (2.93–4.12 mm) longer than abdomen (1.63–2.67 mm). Post-abdomen 4.02–10.43 mm in length. Zooids lack constriction between abdomen and post-abdomen. Thin vascular canal is issued from posterior end of post-abdomen and reach deep into stalk. About 10 thin thoracic longitudinal muscles on each side of thorax. Branchial aperture has six lobes and atrial aperture has a slender languet. Branchial tentacles 16–30. Branchial sac has 14–16 stigmata rows of 10–17 stigmata (or rarely 20 stigmata) per row. Dorsal languet fine pointed tongue shape. Stomach yellow, elliptical, have smooth surface without longitudinally folded wall and situated nearly in middle of abdomen. Mid-intestine distinct and has no coecum. Anus opens at level as high as posterior fifth stigmata row and bilobed (Fig. 1E, F).

Several ovaries situated just behind intestinal loop and small testicular follicles arranged densely in post-abdomen of Munseom's sample collected on 7 Nov 2000.

Distribution. Pacific Ocean: Korea (Beomseom and Munseom, Jeju-do), Japan (Pacific coast of Honsyu; Shiranezaki, Isl. Dogo; Sagami Bay; off Wakayama Pref).

Remarks. This is the first record of *Synoicum clavatum* from Korean waters. *Synoicum clavatum* has been reported from Japan (Oka, 1927; Tokioka, 1953, 1954; Nishikawa, 1990). Our findings expand the distribution range to Korea.

The present specimens resemble Tokioka's (1954) redescription of *S. clavatum* in colony shape, system, zooid shape, intestinal loop, stigmata rows, and stomach. However the present specimens have 14–16 stigmata rows while Oka (1927) described 10–12 stigmata rows. The number of stigmata rows of the present specimens is similar to Tokioka's (1954) description (15–17) and Nishikawa's (1990) descrip-

tion (15–16). This species resembles *Synoicum suarenium* from Australia and Indonesia. But it differs in having not flat topped lobes but round topped lobes with narrow stalks.

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