

A New Record of *Sertularella acutidentata* (Hydrozoa: Leptothecata: Sertularellidae) from Korea

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ABSTRACT

In 2021, during a survey of cnidarian fauna around Geomundo located in the Dadohaehaesang National Park in the South Sea, complete pinnated hydroid colonies attaching on vertical rocky surface at depth of 45 m were collected by SCUBA diving. Through taxonomic examination, unrecorded species, *Sertularella acutidentata* Billard, 1919, is newly added to the hydrozoan fauna of Korea. Recently, taxonomic position of the genus *Sertularella* has been relocated into the new family Sertularellidae Maronna et al., 2016 and six species from Korean waters have been synonymized or transferred to new genera. Thus, a total of 17 species belonging to genus *Sertularella*, including the species reported in this study, have been reported in Korean waters so far.

Keywords: sertularellid, unrecorded species, taxonomy, morphology, Korean fauna

INTRODUCTION

Historically, the genus *Sertularella* Gray, 1848 belonging to family Sertulariidae was established by Lamouroux (1812) with type species *Sertularella polyzonias* (Linnaeus, 1758) originally described as *Sertularia polyzonias*. In 1920, Stechow divided Sertulariidae into three subfamilies, Sertomminae, Sertulariinae, and Thyroscyphinae, mainly based on whether hydrothecae were pedicellate (Thyroscyphinae) or sessile (Sertomminae and Sertulariinae) and whether hydranths had blind caecum (Sertulariinae) or not (Sertomminae). Molecular phylogenetic classification on Leptothecata performed based on rRNA gene sequences (16S, 18S, and 28S) split sertulariid species into three families, Sertularellidae, Thyroscyphidae, and Sertulariidae (Maronna et al., 2016). Through that study, newly established Sertularellidae included the speciose genus *Sertularella*. Most genera that belonged to Sertulariinae (e.g., *Abietinaria*, *Sertularia*, and *Thuiaria*, excluding *Symplectoscyphus*) and Sertomminae (e.g., *Diphasia*, *Dynamena*, and *Salacia*) in the family Sertulariidae were included in the redefined Sertulariidae having hydrothecae with non-pyramidal operculum. Sertularellidae could be distinguished from Sertulariidae by having hydro-

thecae with four marginal cusps and a pyramidal operculum with four triangular valves. Species with pedicellate hydrotheca were included in Thyroscyphidae (Maronna et al., 2016). Song et al. (2018) have established new a genus *Xingyurella* characterized by having three marginal cusps and opercular valves on hydrothecae and strong spines on gonothecae in Sertularellidae based on rRNA data (16S, 18S and 28S).

Sertularella hydroids are branched or unbranched with monosiphonic or polysiphonic stems. They have hydrothecae arranged in two longitudinal rows with four marginal cusps and operculum covered with four valves. Up to now, 142 valid species have been accepted in the genus *Sertularella* (Schuchert, 2022). These species have been found all over the oceans, including the Antarctic, Arctic, Atlantic, Indian, and Pacific (Yamada, 1959; Hirohito, 1995; Gravier-Bonnet and Bourmaud, 2006; Calder and Cairns, 2009; Galea et al., 2017). In Korea, 21 species [*S. areyi* Nutting, 1904, *S. diaphana* (Allman, 1885), *S. distans* (Allman, 1877), *S. gayi* (Lamouroux, 1821), *S. gigantea* Hincks, 1874, *S. gotoi* Stechow, 1913, *S. lagenoides* Stechow, 1919, *S. levigata* Stechow, 1931, *S. mirabilis* Jäderholm, 1896, *S. miurensis* Stechow, 1921, *S. natalensis* Millard, 1968, *S. obtusa* Stechow, 1931, *S. pedrensis* Torrey, 1904, *S. polyzonias* (Linnaeus, 1758), *S. quin-*

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quelaminata Stechow, 1931, *S. robusta* Coughtrey, 1876, *S. sagamina* Stechow, 1921, *S. sinensis* Jäderholm, 1896, *S. solidula* Bale, 1882, *S. tenella* (Alder, 1857), and *S. tongensis* Stechow, 1919] have been reported from all sea areas (Park and Rho, 1986; Park, 2010). Among these species, *Sertularella distans*, *S. robusta*, and *S. solidula* have been synonymized as *Sertularella diaphana* (Allman, 1885), *Sertularella quasiplana* Trebilcock, 1928 and *Symplectoscyphus indivisus* (Bale, 1882), respectively (Calder, 1991; Vervoort and Watson, 2003; Calder and Faucci, 2021). Recently, *S. gotoi* and *S. pedrensis* were transferred to the new genus *Xingyurella* (Song et al., 2018) and *S. tongensis* was newly designated as a type species of the new genus *Bicaularia* in the family Symplectoscyphidae based on both morphological and molecular data (Song et al., 2019). Consequently, 16 valid species from the genus *Sertularella* are currently reported in Korea.

In this study, a taxonomic examination was performed for hydroids collected from Geomundo located in the Dadohaehaesang National Park in the South Sea. One unrecorded species, *Sertularella acutidentata* Billard, 1919, is newly added to the hydrozoan fauna of Korea.

MATERIALS AND METHODS

Specimens were collected from Geomundo belonging to Dadohaehaesang National Park in the South Sea at depth of 45 m by SCUBA diving in 2021. Living colonies attaching on a rock were taken with a digital camera (DSC-RX100M5; Sony Corporation, Tokyo, Japan) to record the color and shape of colonies before fixation. After collection, they were transferred to a plastic container with seawater, and then anesthetized with finely ground menthol powder for 6–8 h. Anesthetized specimens were fixed with 99% alcohol (v/v) for further examination after removing the menthol powder with running water.

For identification, detailed morphological characteristics of colony, stem, hydrocladium, and hydrothecae were examined under a stereomicroscope (SteREO Discovery V8; Carl Zeiss, Jena, Germany). During the examination, all images in detail were captured using CMOS sensor microscope digital cameras (KCS-2000SS; Korea Lab Tech, Seongnam, Korea). Parts of stem, hydrocladium, and hydrothecae were measured with an image analyzer (OptiView; Korea Lab Tech).

Specimens were deposited in the National Marine Biodiversity Institute of Korea, Seocheon (MABIK CN0008 1225), and Cnidaria Bioresources Bank of Korea, Woosuk University, Jincheon (CBB21CnHyE096).

SYSTEMATIC ACCOUNTS

Phylum Cnidaria Hatschek, 1888

Class Hydrozoa Owen, 1843

Subclass Hydroidolina Collins, 2000

Order Leptothecata Cornelius, 1992

¹*Family Sertularellidae Maronna et al., 2016

Diagnosis. Colonies branched or unbranched, stems monosiphonic or polysiphonic, hydrothecae arranged in two longitudinal rows on both sides of hydrocladia, with four marginal cusps and a pyramidal operculum with four triangular valves.

Genus *Sertularella* Gray, 1848

²**Sertularella acutidentata* Billard, 1919

(Table 1, Figs. 1, 2)

Sertularella acutidentata Billard, 1919: 20–21, figs. IE, II; Hirohito, 1995: 188–189, fig. 61a–b; Galea, 2016: 23, fig. 7I.

Sertularella acutidentata acutidentata: Vervoort, 1993: 193–196, figs. 38c–e, 39b; Vervoort and Watson, 2003: 154–155, fig. 35b–e.

Sertularella acutidentata profunda Vervoort, 1993: 197–198, figs. 39c–d, 40a.

Sertularella philippensis Hargitt, 1924: 496, Pl. 6, fig. 22.

Material examined. Korea: 4 colonies, Jeollanam-do, Yeosu-si, Samsan-myeon, Geomum-ri, Geomundo (34°01'17"N, 127°17'23"E), 27 Oct 2021, Hwang SJ, Jeong SC, Lee KH, Lee SJ, Park SH, 45 m depth by SCUBA diving.

Description. Colony pinnate with long, straight main stem, branched in complete one plane (Fig. 1A). Colonies connected with stolonial hydrorhiza (Fig. 2A). Colony 11.8–14.2 cm in height, 3.2–5.0 cm in width. Largest colony with 41 hydrocladia (Fig. 1B). Distance between hydrocladia on same side 2.26–3.72 mm, on opposite side 0.53–2.44 mm. Stem long, straight, somewhat flexible, unfascicled (Fig. 2B), stalk without hydrocladia for a half to two thirds of total height with diameter 0.81–0.92 mm at base, 0.67–0.90 mm at middle, 0.52–0.60 mm at upper. Internodes indistinct on stalk, regular on stem having hydrocladia, up to 26 in number on largest colony, 1.18–5.41 mm long. Each internode usually with one or two hydrocladia, sometimes up to three, three or four hydrothecae, sometimes up to six (Fig. 2E). Distance between hydrothecae within internode 0.56–0.80 mm, between internode 0.74–0.94 mm. Hydrocladia regularly alternate at an angle of 47–88° to stem, more

Korean name: ¹*가뿔뚜껍테히드라과 (신칭), ²*뿔죽협니테히드라 (신칭)

Table 1. Comparison of detailed measurements of axillary and hydrocladial hydrothecae, and gonothecae in type specimen, taxonomic documents, and this study

	Korea (This study)	Indonesia (Billard, 1925, type specimen)	Japan (Hirohito, 1995)	New Caledonia (Vervoort, 1993)	New Zealand (Vervoort and Watson, 2003)
Axillary hydrothecae					
Length abcauline wall	299–392	–	–	375–445	290–405
Length free adcauline wall	86–125	–	–	85–220	50–110
Length adnate adcauline wall	366–442	–	–	390–445	465–590
Total depth	298–461	–	–	540–555	530–595
Diameter at rim	204–239	–	–	230–260	205–275
Maximum diameter	235–297	–	–	245–265	205–295
Hydrocladial hydrothecae					
Length abcauline wall	324–405	–	500–650	505–615	405–480
Length free adcauline wall	71–127	165–410	–	185–335	35–140
Length adnate adcauline wall	335–438	350–410	–	440–605	460–630
Total depth	378–444	–	–	590–675	480–630
Diameter at rim	220–261	235–395	270–320	295–375	220–305
Maximum diameter	212–281	–	–	310–400	275–370
Gonothecae					
Length	1,897–2,499	2,000–2,400	2,700–2,800	–	4,340–4,450
Maximum diameter	614–766	690–875	850–950	–	825–1,040

All measurements are in μm .

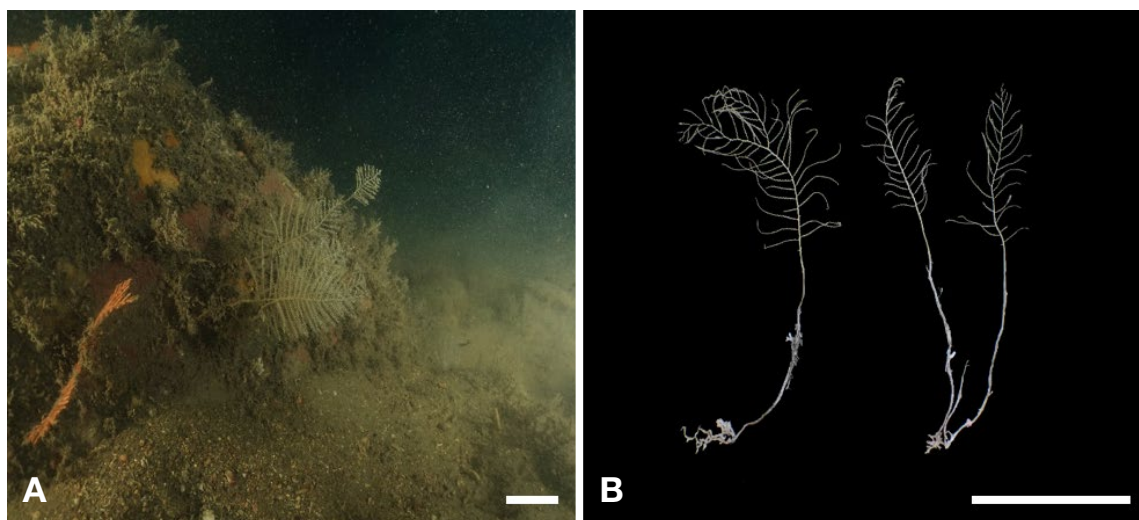


Fig. 1. Colonies of *Sertularella acutidentata*. A, Colonies attached on rocky substratum; B, Preserved pinnate colonies branched in one plane. Scale bars: A, B=5 cm.

acute at distal end, always with one axillary hydrotheca at base from stem, 3.49–34.00 mm long, 0.20–0.27 mm width, 0.16–0.25 mm diameter at apophysis, oblique node between apophysis and hydrocladium (Fig. 2E). Hydrocladia divided into internodes, each internode usually with four to six hydrothecae (Fig. 2F), sometimes more or less, 1.12–3.77 mm long. Distance between hydrothecae 0.44–0.71 mm. Hydro-

thecae alternated, smooth, large, widen at upper, slightly curved outward. Adcauline wall adnate for three fourths to four fifths of total length, free portion sharply curved and rarely exceeds one fourth. Abcauline wall slightly curved outward from upper portion, sometimes with indentation under marginal rim. Marginal rim with four short acute cusps; one adcauline, two lateral, and one abcauline, without inner

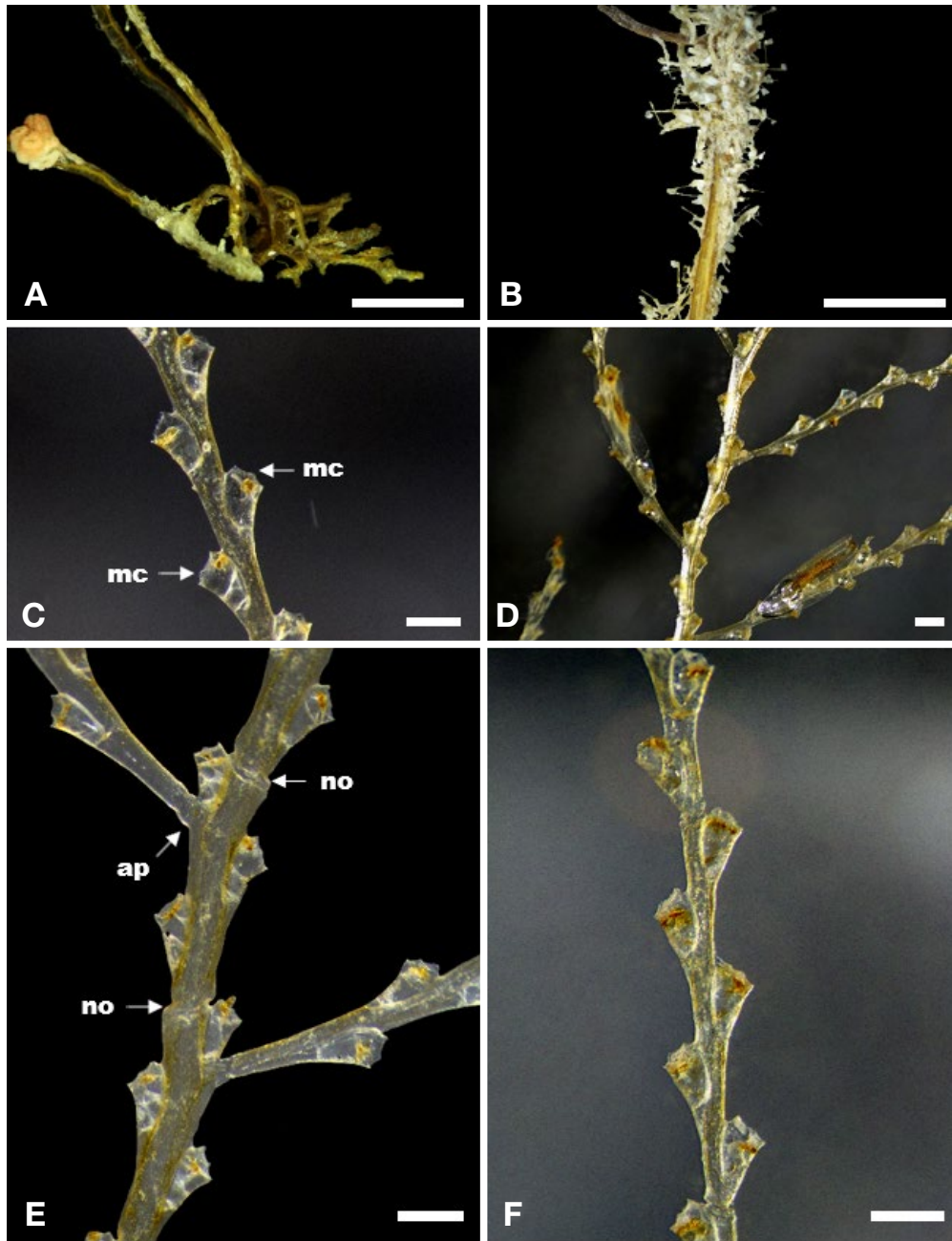


Fig. 2. Stereo microscope images of *Sertularella acutidentata*. A, Basal part of stems connected by stolonial hydrorhiza; B, Mono-siphonic stem covered with Entoprocta (*Barentsia* sp.); C, Hydrothecae with pointed marginal cusps (mc); D, Elongated champagne glass-shaped gonothecae; E, Stem with distinct nodes (no) and alternated hydrocladia with apophysis (ap); F, Hydrocladia with internode. Scale bars: A, B=5 mm, C-F=500 μ m.

teeth, operculum covered with four valves (Fig. 2C). Perisarc thick and hydranths with abcauline caecum distinct. Little differences in shape and size between hydrothecae on hydrocladia and axils. Hydrocladial hydrothecae 324–405 μ m in abcauline length, 212–281 μ m in maximum diameter, axillary hydrothecae 299–392 μ m in abcauline length, 235–

297 μ m in maximum diameter. Gonothecae arising just below hydrothecae, smooth, large, elongated, narrow at base and wider at distal end, generally champagne glass-shaped, with three short spines at margin, 1,897–2,499 μ m in length, 614–766 μ m in maximum width (Fig. 2D).

Comparison of detailed measurements between this study

and previous documents in Table 1.

Color. When alive, stems are light brown, and branches are pale yellow. Branches and hydrothecae become opaque in alcohol.

Ecology and habitat. Colonies inhabit on vertical rocky surface in deeper water at 45 m depth. Sessile invertebrates such as Entoprocta (*Barentsia* sp.) and Hydrozoa live on stems (Fig. 2B).

Distribution. Indo-Pacific Ocean: Indonesia (Sape Strait), Philippines; Pacific Ocean: Korea (Geomundo), Japan (Sagami Bay), New Caledonia, New Zealand.

Remarks. This species was first described by Billard (1919) in the Sape Strait, Indonesia. It has been reported from Japan, Philippines, New Caledonia, and north of New Zealand (Hargitt, 1924; Hirohito, 1995; Vervoort and Watson, 2003). Our materials consist of four complete colonies, the largest of which has well-developed gonothecae. Although adcauline walls of hydrothecae are somewhat more adnate than those of the type specimen, these materials agree with the original description, in particular the four pointed hydrothecal cusps and the shape of gonothecae with three marginal spines undoubtedly identify the species. According to Billard's description, Hargitt (1924), and Hirohito (1995), this species has large and elongated gonothecae over 2 mm long. Peculiarly greater than 4 mm in length was observed for the New Zealand specimen (Vervoort and Watson, 2003). This species is similar to *Sertularella diaphana* in the shape of colony and hydrothecae. However, the latter can be distinguished by having very adnate hydrothecae, gonothecae with longitudinal ridges, and strongly polysiphonic stem (Vervoort, 1993; Park, 2010). By documented distribution, this species inhabits at a depth of up to 550 m. Type specimen was collected at a depth of 69 m (Vervoort, 1993). In Korea (Geomundo) and Japan (Sagami Bay), specimens were collected at 45 m and 60–80 m, respectively. Thus, this species appears to live in rather deep waters (Hirohito, 1995).

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CONFLICTS OF INTEREST

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

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