New Records of Two Genera Leptoseris and Phyllangia (Anthozoa: Hexacorallia: Scleractinia) from Korea

Eunae Choi, Jun-Im Song*
College of Natural Sciences, Ewha Womans University, Seoul 120-750, Korea

ABSTRACT

Two scleractinian species are newly recorded in Korea: Leptoseris mycetoseroides Wells, 1954 and Phyllangia hayamaensis (Eguchi, 1968). The two genera Leptoseris Milne Edwards and Haime, 1849 and Phyllangia Milne Edwards and Haime, 1848 are also newly recorded in Korea. The specimens were collected from the subtidal zones of Jeju-do Island, Korea by SCUBA diving from 1991 to 2007. Leptoseris mycetoseroides is characterized by its platelike growth form, intratentacular budding, irregularly developed collines, single styliform columella, and even septa and septocostae. Phyllangia hayamaensis is distinguished by its encrusting and plocoid growth form of corallites basally united with common coenosteum, trabecular columella, and irregular septal arrangements and paliform lobes.

Keywords: Anthozoa, Scleractinia, Agariciidae, Caryophylliidae, Leptoseris, Phyllangia, Korea

INTRODUCTION

The family Agariciidae Gray, 1847 includes seven genera and 47 species (Kitahara et al., 2012), 18 species of which belong to the genus Leptoseris Milne Edwards and Haime, 1849 (World Register of Marine Species, 2015a). The family Caryophylliidae Dana, 1846 comprises 43 genera and 294 species (Roberts et al., 2009), eight species of which belong to the genus Phyllangia Milne Edwards and Haime, 1848 (Roberts et al., 2009; World Register of Marine Species, 2015b).

On the other hand, no species of the family Agariciidae and six species of the family Caryophylliidae have been recorded in Korea (Song, 1982, 1988, 1991, 2004; Song and Lee, 1998): Caryophyllia (C.) japonica Marenzeller, 1888, Crispaturothlus niinoi (Yabe and Eguchi, 1942), Heterocytthus aequicostatus Milne Edwards and Haime, 1848, Heterocytthus japonicus (Verrill, 1866), Stephecnocytthus (A.) spiniger (Marenzeller, 1888), and Goniocorella dumosa (Alcock, 1902).

This study describes two new records of scleractinian species from Korea: Leptoseris mycetoseroides of the family Agariciidae and Phyllangia hayamaensis of the family Caryophylliidae.

MATERIALS AND METHODS

The specimens were collected from the subtidal zones off Mara-do, Chagwi-do, and Seopseom in Jeju-do Island, Korea by SCUBA diving from 1991 to 2007. The specimens were dissolved in sodium hypochlorite solution with distilled water for 24 hours to remove all soft parts, washed in distilled water, and dried to examine the skeletal structures. The growth forms and shapes of coralla were photographed with digital cameras (G12; Canon Inc., Tokyo, Japan and Optio WG2; Pentax Ricoh Imaging Co. Ltd., Tokyo, Japan). The skeletal structures of corallites were observed with a stereomicroscope (Leica S8APO; Leica Microsystems, Wetzlar, Germany), photographed with a mounted camera (Leica Microsystems), and measured with an image analyzer (LAS Ver. 3.6; Leica Microsystems). Multi-focused images were taken in series and combined with an image editing program (HeliconFocus 5.3 Pro; Helicon Soft Ltd., Kharkov, Ukraine) to provide clear images of the detailed skeletal structures. The classification of scleractinians in the present study partly followed Wells (1956), Veron (2000), and Roberts et al. (2009). The morphological terms were referenced from Wells (1956), Dinesen (1980), and Cairns and Kitahara (2012). The specimens examined in this study are deposited at the
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Ewha Womans University Natural History Museum, Korea.

SYSTEMATIC ACCOUNTS

Phylum Cnidaria Hatschek, 1888
Class Anthozoa Ehrenberg, 1834
Subclass Hexacorallia Haeckel, 1866
Order Scleractinia Bourne, 1900
Family Agariciidae Gray, 1847

Diagnosis. Corallum solitary or colonial, attached. Growth form encrusting, massive, columnar, foliose, branching mainly by intratentacular budding. Septa rarely porous. Septal faces covered by granules. Columella present or absent.

1st Genus Leptoseris Milne Edwards and Haime, 1849

Diagnosis. Corallum solitary or colonial, attached. Growth form encrusting, massive, columnar, foliose, branching mainly by intratentacular budding. Collins present or absent. Proximal cushions or hydnophoroid projections present or absent. Central corallite present or absent. Septa and septocostae even or alternating. Columella present or absent.

2st Leptoseris mycetoseroides Wells, 1954 (Fig. 1)

Agaricia minikoiensis: Yabe et al., 1936: 55, Pl. 42, figs. 5–7.

Diagnosis. Corallum solitary or colonial, attached. Growth form encrusting, massive, columnar, foliose, branching mainly by intratentacular budding. Collins present or absent. Proximal cushions or hydnophoroid projections present or absent. Central corallite present or absent. Septa and septocostae even or alternating. Columella present or absent.


Description. Corallum colonial, attached. Growth form platelike or explanate by intratentacular budding from corallite margins. Corallum part of thin plate, unifacial, 35–60 mm in width, 1–3 mm in thickness. Upper surface striated distinctly, thinner towards margins of corallum. Under surface glossy, smooth, striated indistinctively at inner parts of corallum, but striated distinctly at margins of corallum. Corallites sunken, concave, irregularly scattered or in series of 2–7 centers (average 3.4 centers) per row enclosed by collines, inclined towards margins of corallum. 2–6 corallites (average 4 corallites) in 5×5 mm, but corallites rarer at margins of corallum. Central or parent corallite absent or indistinguishable. Collines enclosing corallites irregularly, but well developed. Distance between collines 1.47–6.29 mm (average 3.40 mm). Intercorallite distance within series 0.60–3.01 mm (average 1.54 mm). Intercorallite distance between series 2.16–5.23 mm (average 3.23 mm). Calice elliptical or circular or slightly polygonal or irregular, 1.57–3.10×1.94–4.46 mm (average 2.46×3.09 mm) in diameter. Fossa elliptical or circular, 0.18–0.26×0.25–0.70 mm (average 0.23×0.38 mm) in diameter, approximately 0.4 mm or shallow in depth. Columella single styliform, 0.06–0.12×0.09–0.47 mm (average 0.09×0.19 mm) in diameter. Corallite wall not developed. Exsertness and thickness of septa and septocostae vary. Septa thin, even or subequal or moderately unequal, imperforate, spiny, straight in general, contorted, thickened near outer calicular margins. 16–30 septa (average 19.8–23.3 septa) per corallite. 5–14 septa (average 10.5 septa) reaching columella. Septal upper margins rounded. Septocostae 3–7 (average 5.5) in 1 mm, 0.08–0.22 mm (average 0.14 mm) in thickness (including thickness of septal lateral spines) at inner parts of corallum, 5–6 (average 5.8) in 1 mm, 0.08–0.15 mm (average 0.10 mm) in thickness at margins of corallum. Space between septocostae 0.03–0.07 mm (average 0.05 mm) in thickness at inner parts of corallum, 0.09–0.15 mm (average 0.12 mm) in thickness at margins of corallum.

Color. Coenosarc brown.

Habitat. This species inhabits subtidal zones of 10 m in depth. Tube worms, and hydroids live in ecosymbiosis on the corallum.

Remarks. Leptoseris mycetoseroides Wells, 1954 is known as the most variable species within the genus, due to variations in corallite size, septal number, and the development of collines (Wells, 1954; Dinesen, 1980). The specimen examined in this study is similar to those in previous studies, with irregularly developed collines, sunken or concave corallites, and even septa and septocostae (Table 1). L. mycetoseroides differs from L. hawaiiensis Vaughan, 1907 by its well-developed collines, absent or indistinguishable central corallite, and numerous septocostae in 5 mm, and from L. foliosa Dinesen, 1980 by its explanate growth form with large corallites (Veron and Pichon, 1979; Dinesen, 1980; Veron, 1986, 2000; Nishihira and Veron, 1995; Benzoni et al., 2012).

Distribution. Pacific Ocean: Korea (Jeju-do Island), Japan (Southern Honshu, Southern Shikoku, Southern Kyushu, Okinawa), Taiwan, Philippines, Indonesia, Celebes, Australia (Great Barrier Reef), Houtman Abrolhos Island, Solomon Islands; Marshall Islands; Indian Ocean: Madagascar, Reunion, Mauritius, Saya de Malha, Chagos Archipelago.
Family Caryophylliidae Dana, 1846

**Diagnosis.** Corallum solitary or colonial, free or attached. Colony formed mainly by extratentacular budding. Theca well developed. Septa exsert. Septa laminar with smooth inner edges. Septal arrangement usually hexamerous. Pali or paliform lobes present or absent. Columella present or absent.

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**Fig. 1.** *Leptoseris mycetoseroides*. A, Growth form, platelike; B, Margins of corallum; C, Collines (c); D, Series of corallites by intratentacular budding (se); E, Septocostae (sc) and septa (s); F, Columella (co), single styliform. Scale bars: A, C = 1 cm, B, D–F = 1 mm.
Table 1. Comparison of Leptoseris mycetoseroides morphological characters with two similar species

<table>
<thead>
<tr>
<th>Morphological character</th>
<th>L. mycetoseroides</th>
<th>L. hawaiiensis</th>
<th>L. foliosa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth form</td>
<td>Thin, platelike</td>
<td>Thin, explanate; encrusting</td>
<td>Encrusting</td>
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<tr>
<td></td>
<td></td>
<td>1.0−4.0×1.0−7.0 (mean 1.0−3.0×1.0−5.0)</td>
<td>1.0−2.0×1.0−4.0 (mean 1.0−1.5×1.0−2.0)</td>
</tr>
<tr>
<td>Calicular diameter: LCD×GCD (mm)</td>
<td>1.57−3.10×1.94−4.46 (average 2.46×3.09)</td>
<td>1.0−5.0×1.0−7.0</td>
<td>1.0−2.0×1.0−4.0</td>
</tr>
<tr>
<td>Central corallite</td>
<td>Absent or indistinguishable</td>
<td>Rarely distinguishable</td>
<td>Rarely distinguishable</td>
</tr>
<tr>
<td>Collines</td>
<td>Well developed, irregular</td>
<td>Well developed, highly variable</td>
<td>Absent or very poorly developed</td>
</tr>
<tr>
<td>Septa/septocostae</td>
<td>Even or subequal or moderately unequal</td>
<td>Equal or subequal; even</td>
<td>Equal, close; unequal/equal</td>
</tr>
<tr>
<td>No. of septa/no. of septa reaching columnella</td>
<td>16−30 (average 19.8−23.3)/5−14 (average 10.5)</td>
<td>25−35/12−16; 6−32 (mean 17)/most or sometimes half septa reach columnella</td>
<td>8−48 (mean 21)/septa reaching columnella vary</td>
</tr>
<tr>
<td>No. of septocostae in 5 mm</td>
<td>15−35 (average 27.3)</td>
<td>20−30; 14−32 (mean 24)</td>
<td>15−26 (mean 19)</td>
</tr>
</tbody>
</table>

LCD, lesser calicular diameter; GCD, greater calicular diameter.

18 Genus Phyllangia Milne Edwards and Haine, 1848


28 Phyllangia hayamaensis (Eguchi, 1968) (Fig. 2)
Astrangia hayamaensis Eguchi, 1968: C26, Pl. C27, figs. 8−10, Pl. C28, fig. 7.
Phyllangia hayamaensis: Cairns, 1994: 62; Ogawa et al., 1996: 41, Pl. 2, fig. 1, Pl. 4, fig. 4; 1997: 51, fig. 4.


Description. Corallum colonial, attached. Growth form encrusting mainly by extratentacular budding forming plocoid or reptoid colony of corallites, united basally with thick common coenosstum. Intratentacular budding observed. Corallum 45−60 mm in width, 4−40 mm in height. 13−17 corallites (average 14.8) in 30×30 mm. Intercorallite distance 4−14 mm (average 8.56 mm). Corallite cylindrical, 2.0×0.7×2.5−11.0 mm (average 5.68×6.59 mm) in calicular diameter, 1−12 mm (average 4.55 mm) in height from common coenosstum. Calice elliptical or circular. Fossa 2−4 mm (average 3.45 mm) in depth. Columella trabecular or fusions of septal inner edges or spongy, 0.85−2.01×1.03−2.85 mm (average 1.47×1.77 mm) in diameter. Theca thick, minutely granulated. Costae weakly present at upper outer thecal margins. Coenosteum non-costate, well developed. Septa irregularly, but hexamericly arranged in general from 19 to 44 in 3−4 cycles (average 34.2 in 4 incomplete cycles). Up to 56 (23+33) septa developed in enlarged corallite of intratentacular budding. All septal upper margins exsert above thecal wall. Inner edges of S1, S2 entire, vertical, smooth, those of S3 dentate. S1>S2>S3>|S4 or S1>S3>S2>|S4. Pairs of S3 curved towards, united before common S2. S4 rudimentary. All septa except S4 fused with columella. Paliform lobes irregularly shaped and arranged before S3. Septal lateral faces minutely granulated.

Color. Coenosarc pink.

Habitat. This species inhabits subtidal zones of 20−25 m in depth. Bryozoans, tube worms, hydroids, oysters, sponges and barnacles live in ectosymbiosis on the corallum.

Remarks. In the original paper (Eguchi, 1968), this species was named as Astrangia hayamaensis, and was characterized by the octameric three incomplete cycles. However, the genus was changed from Astrangia to Phyllangia (Cairns, 1994).
1994; Ogawa et al., 1996) based on the presence of paliform lobes and the smooth septal inner edges (Cairns, 1994; Ogawa et al., 1996; Cairns and Kitahara, 2012). Furthermore, it was corrected and redescribed that the septal arrangement of the species is irregular, but basically hexamerous in four incomplete cycles (Ogawa et al., 1996). The specimen from Marado is distinguished by its greater number of septa (average 39.4) than those described in previous records from Japan.

Fig. 2. Phyllangia hayamaensis. A, Growth form, encrusting plocoid; B, Intratentacular budding; C, Theca, exsert, granulated, weakly costate; D, Septa, hexamerously arranged in 4 incomplete cycles; E, Paliform lobes (pl), irregularly arranged; F, Columella (c), trabecular. Scale bars: A, B = 1 cm, C-F = 1 mm.
Table 2. Comparison of Phyllangia hayamaensis and P. echinosepes morphological characters

<table>
<thead>
<tr>
<th>Morphological character</th>
<th>P. hayamaensis</th>
<th>P. echinosepes</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>EWZS 4123</td>
<td>EWZS 4114</td>
</tr>
<tr>
<td>Calicular diameter: LCD×GCD (mm)</td>
<td>2.0–7.0×2.5–11.0 (average 5.68×6.59)</td>
<td>2.0–7.0×3.0–11.0 (average 5.78×6.83)</td>
</tr>
<tr>
<td></td>
<td>(average 5.58×6.35)</td>
<td>(average 5.58×6.35)</td>
</tr>
<tr>
<td>Height from coenosteum (mm)</td>
<td>1–6 (average 4.45)</td>
<td>1–12 (average 4.55)</td>
</tr>
<tr>
<td></td>
<td>(average 3.47)</td>
<td>(average 3.47)</td>
</tr>
<tr>
<td>Depth of fossa (mm)</td>
<td>1–2 (average 4.00)</td>
<td>1–2 (average 4.00)</td>
</tr>
<tr>
<td>No. of septa</td>
<td>19–44 (average 34.2), up to 56</td>
<td>20–25; 24–32 (average 29)</td>
</tr>
<tr>
<td>Remarks</td>
<td>Extra-, intra-tentacular budding</td>
<td>–</td>
</tr>
</tbody>
</table>

LCD, lesser calicular diameter; GCD, greater calicular diameter.

(Eguchi, 1968; Ogawa et al., 1996, 1997), in addition to the intratentacular budding of an enlarged coralite with a calicular diameter of 7×11 mm and 56 septa (Table 2). Phyllangia hayamaensis (Eguchi, 1968) is similar to P. echinosepes Ogawa, Takahashi and Sakai, 1997 in the encrusting growth form of cylindrical corallites basally united with common coenosteum, and the hexamerous arrangement in four incomplete cycles. However, the latter species differs from the former species by its small calicular diameter, numerous septa, and distinctive spinous ornamentations of the septal lateral faces (Ogawa et al., 1997).

**Distribution.** Pacific Ocean: Korea (Jeju-do Island), Japan (Southern Honshu).

**ACKNOWLEDGMENTS**

This research was supported by a grant of the Marine Biotechnology Program from the Ministry of Oceans and Fisheries of Korean Government.

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Received February 17, 2015
Revised April 20, 2015
Accepted May 6, 2015