Twelve new species of two genera *Smenospongia* and *Cacospongia* (Demospongia: Dictyoceratida: Thorectidae) from Korea

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Twelve new species of two genera *Smenospongia* and *Cacospongia* (Demospongia: Dictyoceratida: Thorectidae) are described from Gageodo Island and Ulleungdo Island, Korea. Of these, ten new species of the *Smenospongia* are distinguished from the other nine reported species of the genus by the skeletal structure and sponge colour. Primary fibres of the genus *Smenospongia* are mostly dense, dark colour, and invisible inside of fibres, but they are mostly cored detritus and echinated with spicules. Especially, the end of primary fibres at the surface shows densely cored with spicules. All these new species changed the colour. Two new species of the genus *Cacospongia* are compared with nine other reported species. In skeletal structure, primary fibres of the genus *Cacospongia* are light colour, visible inside and more heavily cored with spicules and sands. The skeleton of this genus has large meshes. The colour of the genus *Cacospongia* does not change.

Keywords: *Cacospongia*, Demospongia, Korea, new species, *Smenospongia*, Thorectidae

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INTRODUCTION

The genus *Smenospongia* in subfamily Thorectinae (Thorectidae) erected by Wiedenmayer (1977) is not well known throughout the field. Wiedenmayer defined that the genus is characterized by an aerophobic chemical properties, fibres conspicuously stratified but not pithed. The skeleton is characterized by wide, trellised primary systems, well developed secondary fibre reticulum, and distinctly honeycombed surface (Wiedenmayer, 1977).


The colour of *Smenospongia coreana* (*Cacospongia coreana* at the World Porifera Database) from Korea changed very slowly to almost dark brown. This species is not determined as *Cacospongia* due to its changed colour (Fig. 13A, B). Sandes and Pinheiro (2014) reported one new species, *Smenospongia ramosa* from Brazil, and compared it with all other reported *Smenospongia* species.

The genus *Cacospongia* in subfamily Thorectinae (Thorectidae) was erected by Schmidt (1862). Diagnosis of the genus is that the skeleton is comprised of fine laminated, primary and secondary fibres. Primary fibres are cored, and secondary fibres are uncored. The secondary reticulum is well developed relative to primary fibre (Bergquist, 1980). Polejaeff (1884) is reported 15 species in the genus *Cacospongia*, but most of them are moved to other genera except three species, *C. amorpha*, *C. intermediata*, and *C. levis*. Von Lendenfeld (1889), Schmidt (1864) and Burton (1952, 1959) reported *Cacospongia* species. Recently, *Cacospongia mycofijiensis* (Kakou et al., 1987) was reported from the Fiji.

MATERIALS AND METHODS

Sponge collections were made from Gageodo Island...
and Ulleungdo Island, Korea. They were collected from depth 15-30 m using SCUBA diving during the period 2001-2013. Collected specimens were preserved in 95% ethyl alcohol and were identified based on their morphological characters. The external feature of sponges was observed with stereo microscope (Stemi SV.6, Carl Zeiss, Germany). The skeletal fibres were studied under a light microscope (Axioskope II, Carl Zeiss, Germany). The type specimens were deposited in the National Institute of Biological Resources (NIBR), Incheon, Korea.

**SYSTEMATIC ACCOUNT**

Phylum Porifera Grant, 1836  
Class Demospongiae Sollas, 1885  
Order Dictyoceratida Minchin, 1900  
Family Thorectidae Bergquist, 1978  
Subfamily Thorectinae Bergquist, 1978  
Genus Smenospongia Wiedenmayer, 1977

**Key to the species of Korean Smenospongia**  
(The key is illustrated by Figs. 1-10 and Table 1)

1. Colour in life beige turns to black ............................... 2  
   - Colour in life yellow or beige turns to dark brown ...... 6
2. Colour turns to black very slowly ................................. S. nigra  
   - Colour turns to black soon after exposure to air ...... 3
3. Without ladder-like fasciculate primary fibres .......... 4  
   - Ladder-like fasciculate Primary fibres ................... 5
4. Primary fibres cored with dense spicules and echinating ................................................................. S. spinulosa  
   - Primary fibres cored with rare spicules and echinating ................................................................. S. gageoensis
5. Diameter of ladder like fascicule 500 μm at the surface ................................................................. S. scalaris  
   - Diameter of ladder like fasciculate 850-1000 μm, throughout the sponge ................................. S. duokyeo
6. Yellow in life turns to dark brown ............................... 7  
   - Gray or beige in life turns to dark brown ................. 8
7. Regular skeletal structure ............................................. S. flavia  
   - Irregular skeletal structure, rare secondary fibres ..........  
     - Primary fibres have uncored, no echinating spicules ................................................................. S. dokdoensis  
     - Primary fibres have echinating ................................ 9
9. Primary fibres have numerous echinating spine ........  
   - Primary fibres have rare long echinating spine ........  
     - Primary fibres have rare long echinating spine ................................................................. S. wiedenmayeri

1. **S. spinulosa** n. sp. (Fig. 1)

**Type specimen.** Holotype (NIBRIV0000321365), Korea: Jeollanam-do, Shinan-gun, Heuksan-myeon, Gageodo Island (Jakeunganyeo), 14 Oct 2013, Kim HS, by SCUBA diving, Depth 20 m, deposited in the NIBR.

**Description.** Thick mass, size up to 13 × 8 × 6 cm. Surface, honeycomb patterned and conules distinct, with slimy dermal membrane. Several oscules, 1-5 mm in diameter, open on surface of sponge. Colour in life, beige turns to black soon after exposure to air. Texture, soft and compressible. Choanosome, lightly cavernous like bread.

Skeleton: Primary fibres, 100-140-250 μm in diameter, fasciculated fibres, 400-500 μm in diameter, cored with dense spicules which come out from fibres like rose spine. Regularly arranged at surface and dark colour. Choanosomal fibres, irregularly arranged, and light colour. Secondary fibres, 10-50-100 μm in diameter, irregularly arranged at choanosome, 160 μm in diameter at base. Fibres cored with round mass like egg.

**Etymology.** The specific name, *spinulosa*, is named after that the figures of primary fibres with spicules.

**Remark.** This species is similar to *S. nuda* (in Levi 1969) in shape and colour but it differs in its fibres. Primary and secondary fibres of the new species are thicker than them of Levi’s specimen (Primary fibres 90-180 μm, secondary fibres 20-45 μm in diameter). It is not easy to find cored in fibres, because they are too thick and dark brown colour except large spicules coming out from the fibres. Many large sands are contained in the choanosome. The spine of primary fibres is distinctly protruding at the surface, but they are indistinct at the choanosome fibres.

2. **S. nigra** n. sp. (Fig. 2)

**Type specimen.** Holotype (NIBRIV0000321366), Korea: Jeollanam-do, Shinan-gun, Heuksan-myeon, Gageodo Island (Jakeunganyeo), 14 Oct 2013, Kim HS, by SCUBA diving, Depth 20 m, deposited in the NIBR.

**Description.** Thick mass, size up to 13 × 8 × 6 cm. Surface, honeycomb pattern with short and sharp conules, covered with slimy membrane. Oscules open at surface of sponge. Colour in life light beige, change grey after exposure to air and turn to black very slowly in alcohol. Texture soft and compressible, cavernous.

Skeleton: Primary fibres, 200-250 μm in diameter, regularly arranged at surface and have dark colour. Fasciculated primary fibres, 400-600 μm in diameter. Choanosomal primary fibres, 100-250 μm in diameter, cored with rare spicules and small sands, but easy to find spicules at end of surface primary fibres.

Secondary fibres, 30-50 μm in diameter at surface. Choanosomal secondary fibres, 100-150 μm in diameter, irregularly arranged. Some part of enlarged secondary fibres cored with material like egg. Lateral side of sponge
has thin secondary fibres network. Secondary fibres at base of sponge attached to substrate (Fig. 2G).

**Etymology.** The specific name, _nigra_, is named after the black color in spirit.

**Remark.** This new species is similar to _Smenospongia coreana_ Lee and Sim, 2005 in that the colour changed very slowly, but differs in skeletal structure. Secondary fibres of _Smenospongia coreana_ are distributed only at the ectoderm and changed its colour to dark brown. This new species has secondary fibres throughout the sponge and changed its colour to black.

3. _Smenospongia flavia_ n. sp. (Fig. 3)

**Type specimen.** Holotype (NIBRIV0000321367), Korea: Gyeongsangbuk-do, Ulleung-gun, Ulleungdo Island (Neunggul), 23 Oct 2001, Lee KJ, by SCUBA diving, Depth 20 m, deposited in the NIBR.

**Description.** Thick mass, size up to 9 × 8 × 3 cm. Surface with low round oscules, honeycomb pattern. Rare oscules, 1 mm in diameter. Colour in life orange yellow turns to dark brown. Texture firm and compressible. Sponge with many large sands and other animals in their body.

Skeleton: Primary fibres, 250–400 μm in diameter, dark brown colour. Fasciculated primary fibres uncored. Secondary fibres, 50–120 μm in diameter, light colour, thin, uncored, and regularly arranged with reticulated network.

**Etymology.** The specific name, _flavia_, is named after yellow colour in life.

**Remark.** This new species easily distinguished with other smenospongian by regular skeletal structure. This new species is similar to genus _Dactylospongia_ in yellow colour in life but differs in changing colour in the air. This new species changes its colour to dark brown, but
Genus *Dactylospongia* changes to dark purple or reddish brown.

4. *Smenospongia arbuscula* n. sp. (Fig. 4)

**Type specimen.** Holotype (NIBRIV0000321368), Korea: Gyeongsangbuk-do, Ulleung-gun, Ulleungdo Island (Neunguel), 1 Aug 2001, Lee KJ, by SCUBA diving, Depth 25 m, deposited in the NIBR.

**Description.** Thick encrusting, size up to $6 \times 5 \times 2$ cm. Surface with low conules and covered with many other animals and seaweed. Oscules opened on surface. Colour in life golden yellow turns to dark brown in air. Texture firm and compressible.

Skeleton: Primary fibres, 200-300 μm in diameter, branched, dark colour, heavily cored with spicules. Some part of primary fibres, cored with round mass like egg or spore, 20 μm in diameter. Several egg-like mass free appeared in mesohyl. Fibres easily broken like seaweed. Second fibres rare, uncored, 50-100 μm in di-
Fig. 2. Smenospongia nigra n. sp. A, entire animal; B, closed surface; C, end of primary fibre; D, surface primary and secondary fibre; E, choanosome secondary fibres enclosed egg ball; F, choanosome skeletal structure; G, base secondary fibres; H, echinating primary fibres. Scale bars: A = 3 cm, C-H = 200 μm.
ameter. In choanosome, many primary fibres, branched without secondary fibres.

**Etymology.** The specific name, *arbuscula*, is named after the shape of branched primary fibres.

**Remark.** This new species is distinguished by its branching primary fibres, which is thick and dark colour. They have no mesh of secondary fibres except a few on the surface. This new species is similar to *Smenospongia flavia* n. sp. in colour in life, but differs in skeletal structures. *Smenospongia flavia* has crowded secondary fibres, but this new species has very rare secondary fibres and primary fibres are cored egg-like material.

5. *Smenospongia dokdoensis* n. sp. (Fig. 5)

**Type specimen.** Holotype (NIBRIV0000321369), Korea: Gyeongsangbuk-do, Ulleung-gun, Ulleung-eup, Dokdo Island, 10 Oct 2008, SCUBA diving, Depth 15-25 m, deposited in the NIBR.

**Description.** Thick encrusting, size up to $9 \times 5 \times 1$ cm.
Surface with low sharp cionules and honeycomb pattern. Several oscules, 1-2 mm in diameter, open at surface of sponge. Surface colour, dark brown. Texture firm and compressible.

Skeleton: Regularly arranged primary fibres, 100-300 μm in diameter, cored with spicules but invisible except end of primary fibres near surface. Secondary fibres, 50-100 μm in diameter.

**Etymology.** The specific name, *dokdoensis*, is named after locality Dokdo, Korea.

**Remark.** This new species is very different from other species, in regularly arranged primary and secondary fibres. All fibres are uncored but end of primary fibres near the surface are cored with spicules.

**6. Smenospongia scalaris n. sp.** (Fig. 6)

**Type specimen.** Holotype (NIBRIV0000321370), Korea: Jeollanam-do, Shinan-gun, Heuksan-myeon, Gageodo Island (Baganyeo), 27 Jul 2005, Lee KJ, by SCUBA
diving. Depth 25 m, deposited in the NIBR.

**Description.** Thick mass, size up to $10 \times 6 \times 2.5$ cm. Surface, smooth with round conules and slimy membrane, associated with bryozoan and other sponge. Oscules, 1-2 mm in diameter, open at top of sponge. Colour, dark gray in life turns to black. Texture soft and compressible.

Skeleton: Regularly arranged primary fibres, 100-150 μm in diameter, weakly cored with detritus, but fibres's colour too dark to see cored detritus. Ladder-like fasciculate fibres 500 μm in diameter at surface. Secondary fibres, 50-80 μm in diameter, regularly arranged. Connected secondary fibres with primary fibres, 20-25 μm in diameter. Choanosomal primary fibres, 200-250 μm in diameter, thicker than fibres near surface and almost uncored. Choanosomal secondary fibres, 60-100 μm in diameter and 30-50 μm in diameter at base.

**Etymology.** The specific name, *scalaris*, is named after the shape of ladder-like skeletal structure.

**Remark.** This new species is characterized by having ladder-like skeletal form at the surface. This form is similar to *Smenospongia duokyeo* n. sp. in skeletal form but differs in diameter of fasciculated ladder-like form, they

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**Fig. 5.** *Smenospongia dokdoensis* n. sp. A, entire animal; B, closed surface; C, D, surface skeletal structure; E, choanosome skeletal structure; F, end of primary fibres cored spicules. Scale bars: A = 2 cm, C-E = 200 μm, F = 100 μm.
are much larger than this new species.

7. *Smenospongia wiedenmayeri* n. sp. (Fig. 7)

**Type specimen.** Holotype (NIBRIV000321371), Korea: Jeollanam-do, Shinan-gun, Heuksan-myeon, Gageodo Island (Gukhuldo), 11 Jul 2001, Lee KJ, by SCUBA diving, depth 25 m, deposited in the NIBR.

**Description.** Thick mass, size up to 14×9×3 cm. Surface with indistinct conules, and slimy membrane. Surface covered with many bryozoan animals. Oscules open at top of sponge, 1.5-3 mm in diameter. Colour in life gray and beige turns to dark brown. Texture firm and compressible.

**Skeleton:** Primary fibres, 100-170 μm in diameter, regularly arranged at surface and invisible cored debris with rare echinating spicules. Secondary fibres, 30-70 μm in diameter, irregularly arranged. Choanosomal primary fibres, 100-150-200 μm in diameter. Choanosomal secondary fibres 50-100 μm in diameter, easily broken.

**Etymology.** The specific name, *wiedenmayeri*, is named after the Wiedenmayer who erected the genus name.

**Remark.** This new species is distinguished from other species. Surface is not clear the conules. Primary fibres
are difficult to see the cored debris. Echinating spine of primary fibres is thick and long.

8. *Smenospongia varispina* n. sp. (Fig. 8)

**Type specimen.** Holotype (NIBRIV0000321372), Korea: Jeollanam-do, Shinan-gun, Heuksan-myeon, Gageodo Island (Gukhuldo), 20 Jul 2007, Lee KJ, by SCUBA diving, depth 20 m, deposited in the NIBR.

**Description.** Thick cushion shape, size up to 13 × 8 × 3 cm. Surface, have low sharp conules, without membrane, and covered with many algae and other animals. Small oscules, 1-2 mm in diameter, open at top of sponge. Colour, beige in life turns to dark brown. Texture firm and compressible.

**Skeleton:** Primary fibres near surface, 150-200-300 μm in diameter, cored with only spicules, and dense spicules protrude out of fibres. Secondary fibres, 70-100 μm in diameter. Choanosomal primary fibres, 100-300 μm in diameter, and secondary fibres, 40-100 μm in diameter with rare spine.

**Etymology.** The specific name, *varispina*, is named after cushion shape of the sponge.

**Remark.** This new species is similar to *Smenospongia*...
S. spinulosa n. sp. in primary fibres with spine, but differs in numerous spine.

9. *Smenospongia duokyeo* n. sp. (Fig. 9)

**Type specimen.** Holotype (NIBRIV0000321373), Korea: Jeollanam-do, Shinan-gun, Heuksan-Myeon, Gageodo Island (Duokyeo), 20 Jul 2007, Lee KJ, by SCUBA diving, depth 15 m, deposited in the NIBR.

**Description.** Thick mass, size up to $11 \times 7 \times 4$ cm. Surface, smooth with membrane and indistinct conules. Several small oscules on top of sponge. Colour in life beige turns to dark brownish black. Texture firm and compressible.

Skeleton: Surface primary fibres, 140-200 μm in diameter, ladder-like form, 850-1000 μm in distance, core sands. Secondary fibres, 30-60-90 μm in diameter, uncored. Choanosomal primary fibres, 150-200 μm in dia-
meter, and secondary fibres, 70-120 μm in diameter.

**Etymology.** The specific name, *duokyeo*, is named after locality Duokyeo, Gageodo Korea.

**Remark.** This new species is similar to *Smenospongia scalaris* n. sp. in ladder-like skeletal structure throughout the sponge, but differs in distance of ladder-like form. This new species is much larger than that of *Smenospongia scalaris*.

10. *Smenospongia gageoensis* n. sp. (Fig. 10)

**Type specimen.** Holotype (NIBRIV0000321374), Korea: Jeollanam-do, Shinan-gun, Heuksan-myeon, Gageodo Island (Jakeunganye), 14 Oct 2013, Kim HS, by SCUBA diving, Depth 28 m, deposited in the NIBR.

**Description.** Thick encrusting, size up to 6 × 3.5 × 2 cm. Surface with conules and distinct honeycomb pattern. Several oscules, 1-3 mm in diameter open on top of

Skeleton: Primary fibres near surface, 200-300 μm in diameter, dark colour and fasciculated primary fibres, 600 μm in diameter. Choanosomal primary fibres, 220-300 μm in diameter. Secondary fibres near surface, 40-100 μm in diameter. Choanosomal secondary fibres, 60-150-200 μm in diameter, irregularly arranged.

**Etymology.** The specific name, *gageoensis*, is named after locality Gageodo Island, Korea.

**Remark.** This new species is similar to *Smenospongia spinulosa*, but differs in surface and skeletal structure. This new species have distinct honeycomb shape on the surface and have rare protruding spine in the fibres.

**11. Cacospongia bakusi** n. sp. (Fig. 11)

**Type specimen.** Holotype (NIBRIV0000321375), Korea: Jeollanam-do, Shinan-gun, Heuksan-myeon, Gageodo
Island (Baganyeo), 27 Jul 2005, Lee KJ, by SCUBA diving. Depth 20 m, deposited in the NIBR.

**Description.** Round mass, size up to $6 \times 5 \times 2$ cm. Surface honeycomb pattern with sharp conules. Several oscules, 1–4 mm in diameter, open at surface of sponge. Colour in life, black on surface and beige inside, not changed in spirit. Texture, sponge and compressible.

Skeleton: Primary fibres, 150–230 $\mu$m in diameter, regularly arranged, lightly fasciculated, heavily cored with spicules and rare sands. Secondary fibres, 100 $\mu$m in diameter, regularly arranged, and made large meshes, 800–1000 $\mu$m in diameter. Very rare thin secondary fibres, 20–30 $\mu$m in diameter, connected with primary fibres.

**Etymology.** The specific name, *bakusi*, is named for the late Dr. Gerald J. Bakus who was a professor in the department of biological sciences, University of Southern California, a marine ecologist and sponge taxonomist.

**Remark.** This new species is similar to *Cacospongia sysbiotica* Burton, 1959 in cored with spicules in primary fibres, but differs in diameter of fibres. Fibres of this new

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Fig. 11. *Cacospongia bakusi* n. sp. A, entire animal; B, closed surface; C, surface skeletal structure; D, choanosome skeletal structure; E, F, closed primary fibres. Scale bars: A = 2 cm, C, D = 200 $\mu$m, E, F = 100 $\mu$m.
species has thicker than Burton’s specimen, also colour is different.

12. Cacospongia dokdoensis n. sp. (Fig. 12)

**Type specimen.** Holotype (NBRIV0000321376), Korea: Gyeongsangbuk-do, Ulleung-gun, Ulleung-eup, Dokdo Island, 10 Oct 2008, SCUBA diving, Depth 15-25 m, deposited in the NIBR.

**Description.** Thin encrusting, small piece, size up to $3 \times 2 \times 1$ cm. Surface rough with conules. Colour black on surface, brown inside. Texture firm and compressible.

Skeleton: Primary fibres, 100-200-300 $\mu$m in diameter, cored sands. Secondary fibres 30-50-100 $\mu$m in diameter, made large meshes, 730-1,000 $\mu$m in diameter.

**Etymology.** The specific name, *dokdoensis*, is named after its type locality, Dokdo, Ulleung-gun, Korea.

**Remark.** This new species is big different with other species in primary fibres. Cored sands are very clear in the fibres. This new species is similar to *Cacospongia*

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**Fig. 12. Cacospongia dokdoensis n. sp.** A, entire animal; B, skeletal structure; C, D, closed primary fibres; E, F, closed secondary fibres. Scale bars: A = 1 cm, B = 200 $\mu$m, C-F = 100 $\mu$m.
mollior Schmidt 1862 in skeletal structure but differs in diameter of fibres and colour. Fibres of new species are thicker than that of Schmidt's (1862) specimen which is changed colour black in spirits and air. New species not changed colour.

**DISCUSSION**

Wiedenmyer (1977) marked for genus Smenospongia by aerophobic chemical properties, changed colour, and fibres conspicuously stratified. In addition, our study also focused on the skeletal structures and fibre’s colour changing. All of our new species in Smenospongia changed colour to the black or dark brown either rapidly or slowly. Wiedenmyer’s study also reports that genus Smenospongia turns to black upon collection. We found that the fibre’s color of the Smenospongia turns to black after collection, but it is different from the specimen’s colour change to purple upon collection. The genus Smenospongia is characterized by colours turn to black, the primary and secondary fibres are clearly distinguishable and are not well developed. Additionally, we found primary fibres of the new species have dark amber to

![Fig. 13. Smenospongia coreana (A, B) and S. aurea (C-F: LA County Museum) A, entire animal; B, changed colour to blackish dark brown; C, entire animal; D, closed surface; E, F, skeletal structure (black colour is primary fibres). Scale bars: E= 200 μm, F= 100 μm.](image-url)
dark brown colour and mostly invisible, but at the end of primary fibres near the surface cored spicules are found. Most of them have echinated spicules.

De Laubenfels (1934, 1954) reported two species in the genus Smenospongia, S. dysodes (de Laubenfels, 1954) and S. echina (de Laubenfels, 1934), which are cored with primary and secondary fibres, but we found that the fibres of Smenospongia echina are not cored with detritus as the type specimen (U.S.N.M. No. 22315). We consider Smenospongia dysodes need for further studies because their colour is not changed. There have been few details for skeletal structure in reported papers up to now.

The colour of Smenospongia coreana Lee and Sim, 2005 changed very slowly to almost dark brown (Fig. 13A, B). This species is not determined as genus Cacospongia due to its changed colour. Korean Smenospongia species are light cavernous compared with other reported species, and have thick mass, partly honeycomb pattern. Several species have unknown egg-like material at the enlarged secondary fibres. Smenospongia arbuscula n. sp. shows the free egg-like material separated from primary fibres in sponges. We examined with Smenospongia aurea (Hyatt, 1875) from Turneff Island at LA County Museum (Tymlax et al., 1985). It consists of crowded primary and secondary fibres, so it is difficult to determine both fibres (Fig. 13C-F). It is significantly different from our specimen. They changed colour from yellow to purple like genera Aplysina and Dictyospongia.

Ten Korean Smenospongia species are from Gageodo Island, and Ulleungdo Island. Of these, seven species are collected from Gageodo Island, and it is showing high diversity of Smenospongia.

The skeleton of the genus Cacospongia is comprised of relatively fine, concentrically laminated, cored primary fibres and uncored secondary fibres. The secondary reticulum is well developed (Schmidt, 1862). The two new Korean Cacospongia species have distinct cored primary fibres. The skeleton of genus Cacospongia has large meshes. The color in life is black in exterior, and beige in interior. The colour is not changed upon collection. The genus Cacospongia is similar to genus Smenospongia in skeletal structure, but differs in larger mesh and no colour changing.

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REFERENCES


Van Soest, R.W.M., N. Boury-Esnault, J.N.A. Hooper, K. Ruetzler, N.J. de Voogd, B. Alvarez de Glasby, E. Hajdu,


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