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Hexactinosida *incertae sedis*

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Five monospecific genera (Hexactinellida, Hexactinosida), all based upon original specimens lacking loose spicules, are generally regarded as too inadequately known for family placement. They are here included in Hexactinosida as *incertae sedis. Cyathella lutea* Schmidt, is a distinctive and well-characterized West Indian species (specimens known), but its dictyonal construction has not yet been assignable to euretoid, aulocalycoid, or some other as yet undefined pattern. *Deanea virgultosa* Bowerbank, is based upon two small, eroded West Indian (?) fragments (specimens known) with rotulate dictyonal frameworks, and may thus have affinity to Dactylocalycidae. *Diaretula cornu* Schmidt, is based upon a single West Indian specimen (specimen location unknown) with only body form as a questionably distinctive character. *Fieldingia lagettoides* Kent, based upon a single specimen from off Portugal (specimen known), has many distinctive features including external multi-lamellar crust and internal spherical siliceous bodies, but the basic pattern of dictyonal construction remains undetermined. *Hyalocaulus simplex* Marshall & Meyer, is based upon a severely eroded dictyonal framework with no distinctive features noted in its original description. The specimen was probably destroyed and its identity will probably remain unresolved.
Keywords: Hexactinellida; Hexactinosida; *incertae sedis*; *Cyathella*; *Deanea*; *Diaretula*; *Fieldingia*; *Hyalocaulus*.

CYATHELLA SCHMIDT, 1880

Synonymy

Cyathella Schmidt, 1880b: 46.

Type species

Cyathella lutea Schmidt, 1880b: 46 (by monotypy).

Definition

Hexactinosida (?), a small, solitary, stalked-tube sponge with irregular basal expansion; wall of thin upper tube unchannelized, with main framework of hexactine dictyonalia forming rectangular meshes aligned in ranks to form transverse septa; dictyonal framework of stalk and outer surface of body tube constructed of longitudinal strands joined by small fused hexactins and synapticula; small attached hexactins numerous throughout framework; loose spicules unknown.

Diagnosis

Monospecific (see type species description).

Remarks

A monospecific genus (see type species remarks).

Description of type species

Cyathella lutea Schmidt (Fig. 1A–K).

Synonymy. *Cyathella lutea* Schmidt, 1880b: 46, pl. VII, fig. 2.

Material examined. Lectotype (here designated): MCZ 465A – Bequia, West Indies. Paralectotypes (here designated): MCZ 465B – same location. Other material. MCZ 135 – Bequia, West Indies.

Description. Known specimens are completely macerated, broken fragments of small, stalked-tubular sponges; total length 30–40 mm, half or less as thin, solid, sturdy stalk 2.5–5 mm diameter with irregular basal inflation or bend; attachment on/insertion in substrate unknown; tubular upper body fragile and brittle, to 12 mm (estimated) diameter; upper tube wall 1–*1.5*–1.8 mm thick; framework of stalk and outer body tube composed of long dictyonal strands 18–*37*–76 μm in diameter, oriented mainly longitudinally, with a few oblique and transverse; strands fused into framework by transverse rays, interposed small and medium-size hexactins and synapticula; nature of strands uncertain – may be prolonged single hexactin rays (aulocalycoid) or serially joined hexactins (euretoid); strands several mm long end abruptly as broken tips extending from outer surface at low angle; main wall of tube body unchannelized, composed of hexactins arranged in prismatic (not cubic) pattern, with primary nodes and longitudinal rays aligned in straight longitudinal strands and nodes and transverse rays aligned in transverse septa; transverse rays not aligned in radial strands; main rectangular meshes 87–*232*–438 μm wide by 122–*592*–839 μm long; main rectangular meshes of tube wall, especially at inner and outer surfaces, subdivided into triangular meshes by interposed small and medium-size hexactins and synapticula; nodes simple; beams 13–*22*–32 μm diameter; spination of all framework components highly variable from entirely smooth to sparsely spined to coarsely spined; small oxyhexactins with rays 23–*47*–102 μm long joined to all parts of framework, singly or in series; loose spicules entirely unknown; loose broken silica rods several mm occupying main wall meshes may be foreign or residual prostalia parts; known only from Bequia, West Indies at depths of 2757–2910 m.

Remarks. Although loose spicules of *Cyathella lutea* remain unknown, the species is clearly distinctive and recognizable with the description provided here. The type series (MCZ 465A & B) is from 'Blake' stn 236Ag, "1591fm" as reported by Schmidt (1880b); it is accompanied by Schmidt's handwritten label. The non-type set (MCZ 135), erroneously labelled "holotype", is from "1507fm", a depth not reported by Schmidt, but consistent with 'Blake' stn 235Ag. Each set (MCZ 465A+B and 135) consists of four stalk+lower cup units and six fragments of upper body wall. The specimen figured by Schmidt (1880b) is not among either set and can be considered either poorly drawn, a combination figure,

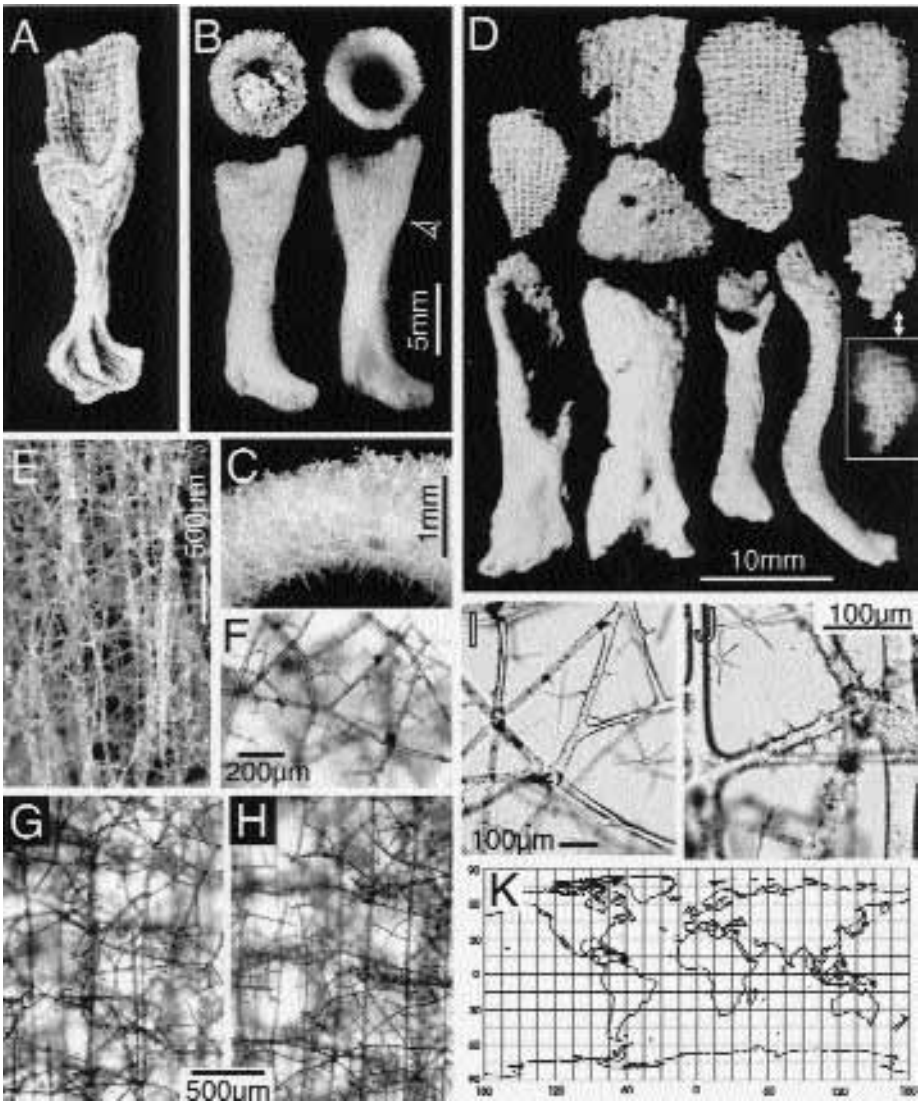

Fig. 1. *Cyathella lutea*. A, original figure of Schmidt (1880b, pl. VII, fig. 2). B, the lectotype MCZ 465A in lateral and apical view, uncleaned (left) and after cleaning (right). C, portion of wall edge of B showing hirsute inner cup surface. D, complete set of non-type MCZ 135 mud-filled fragments, including 4 stalks and 6 pieces of body tube; inset of one cleaned piece. E, aulocalycoid-like frame of longitudinal strands on outer lectotype body cup surface (at arrowhead in B, growth direction upwards). F, plane view of irregular dictyonal network of a transverse septum (paralectotype, viewed from distal growth surface). G–H, outer and inner views, respectively, of main body wall surfaces, (non-type fragment) growth direction upwards, showing thin longitudinal strands and more widely spaced transverse septa. I, irregular triangular meshwork formed by interpolated hexactins and numerous small oxyhexactins (paralectotype). J, apposition of smooth strands and coarsely-spined connecting rays, with common attached oxyhexactins (paralectotype). K, distribution of *Cyathella lutea*.

or lost specimen. Placement of the genus is considered inadvisable until the nature of the aulocalycoid-like outer strand system and euretoid-like prismatic wall reticulum are analyzed more thoroughly. The apparent channelization of mud-filled body wall (Fig. 1A, D) is indicative of the arrangement of transverse septa and support components – not skeletal channelization. Although the method of insertion/attachment to the sea bottom remains unknown, lack of indication of firm attachment in any of the eight stalks supports supposition that the stalk functions as a root in sediments. The substrate at both 'Blake' stations were recorded as light brown ooze. Since the entire framework is dictyonine, the stalk cannot grow at the top but must be lengthened by addition to the bottom tip. Such rooting is unique among Recent Hexactinosida. This interpretation leads to the conclusion that the framework of the stalk and outer cup is secondary, and the euretoid-like network of the atrial lining and inner body wall is the primary framework.

DEANEA BOWERBANK, 1875

Synonymy

Deanea Bowerbank, 1875a: 274.

Type species

Deanea virgultosa Bowerbank, 1875a: 275 (by monotypy).

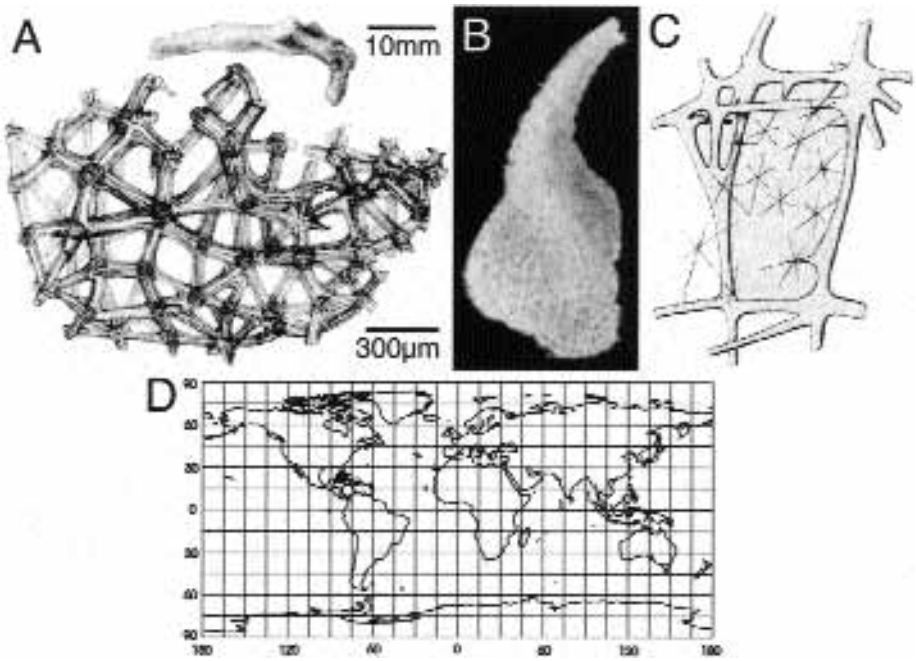

Fig. 2. *Deanea virgultosa* and *Diaretula cornu*. A, *Deanea virgultosa*, larger fragment (above) and magnified framework (from Bowerbank, 1875a, pl. XL, figs 1–2). B–C, *Diaretula cornu* holotype, whole specimen and framework fragment (from Schmidt, 1879, pl. III, fig. 9 and pl. IV, fig. 3, respectively). D, known distribution of *Deanea virgultosa* (white-filled circle) and *Diaretula cornu* (black-filled circle).

Definition

Hexactinosida (?), a small, solid, irregularly cylindric fragment of dictyonal sponge with rotulate arrangement of beams around nodes; axial filaments severely eroded to wide canals; loose spicules unknown.

Diagnosis

Monospecific (see type species description).

Remarks

Soon after Bowerbank (1875a) described *Deanea virgultosa*, he (Bowerbank, 1876a) added a second species, *D. favoides*. On the basis of figures (Bowerbank, 1876, pl. LVI, figs 1 & 2; the specimen has not been reviewed), *D. favoides* is here considered a fragment of *Aphrocallistes beatrix* Gray. The genus *Deanea* is hereby made monospecific, containing only the type species, *D. virgultosa*.

Description of type species

Deanea virgultosa Bowerbank (Fig. 2A, D).

Synonymy. *Deanea virgultosa* Bowerbank, 1875a: 275, pl. XL, figs 1–2.

Material examined. Holotype (not examined): BMNH 1877.5.21.2111 – ? West Indies.

Description (from literature). Known from two small eroded fragments; the largest a solid, irregular cylinder 32 mm long by 4.2 mm diameter, without indication of attachment to substrate; surface smooth, without channelization; dictyonal meshwork evenly rotulate in all orientations, with triangular and quadrangular meshes; beams smooth, 38–*73*–76 µm diameter; axial canals severely eroded; loose spicules entirely unknown; source location uncertain, probably West Indies.

Remarks. The two fragments described by Bowerbank as *Deanea virgultosa* have been considered unrecognizable by all later workers and may be so severely eroded that they can never be referred with certainty to an adequately described and recognizable hexactinosan species. The rotulate framework suggests placement within the Dactylocalycidae, but no species of that group has morphological features comparable to the cylindric form of *D. virgultosa*. The larger fragment, upon which Bowerbank based his description and figures, was included with other hexactinosans supplied by Mr. H. Deane. Bowerbank supposed, but had no proof, that all of Deane's fragments derived from a single source, a collection taken by Captain Hunter on 22 July 1872 at 14°08′N, 77°38′W, 1423–1829 m depth.

DIARETULA SCHMIDT, 1879

Synonymy

Diaretula Schmidt, 1879: pl. III, fig. 9, pl. IV, fig. 3; Schmidt, 1880b: 45.

Type species

Diaretula cornu Schmidt, 1879: pl. III, fig. 9, pl. IV, fig. 3 (by monotypy).

Definition

Hexactinosida (?), a small sponge with broad base carrying a horn-like upper body; framework meshes rectangular; numerous microxyhexactins attached to frame.

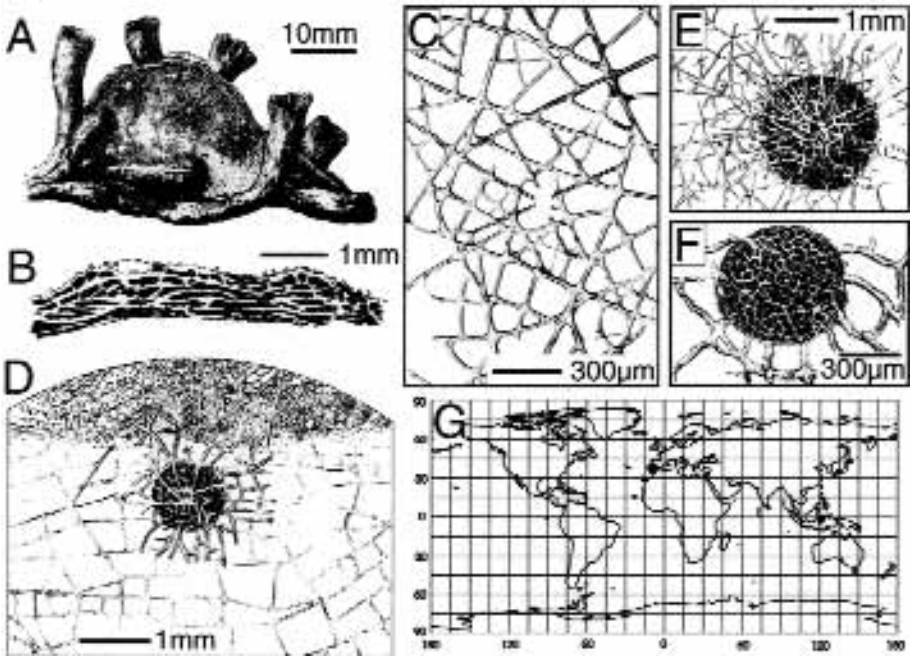

Fig. 3. *Fieldingia lagettoides*. A, holotype in section with several spherical bodies supported in internal framework. B, magnified view of outer crust in transverse section. C, surface view of part of one lamellar component of the outer crust (BMNH slide 1909.8.24.1). D, detail representation of a spherical body supported in the internal dictyonal framework just inside the crust seen in inner view above. E, large spherical body (external view) and dictyonal framework. F, small spherical body in section showing internal continuity of main frame elements and dense net of more closely-spaced synapticulae. G, distribution of *F. lagettoides*. (A–B, D–F, from Kent, 1870a, pl. XV.)

Diagnosis

Monospecific (see type species description).

Remarks

Immediately following description of *D. cornu*, Schmidt (1880b) added a second species, *D. muretta*. His description of the latter is trivial and is accompanied by no figure. Until a specimen bearing Schmidt's hand-written label is discovered and examined for usable characters, *D. muretta* must be regarded as unrecognizable.

Description of type species

Diaretula cornu Schmidt (Fig. 2B–D).

Synonymy. *Diaretula cornu* Schmidt, 1879: pl. III, fig. 9, pl. IV, fig. 3; Schmidt, 1880b: 45.

Material examined. None. Location of holotype unknown – off Morro Light, Havana, Cuba, 1473 m depth.

Description (from literature). Small dictyonine (size unrecorded) of two parts, a broad basis and an upright, narrow, bent head piece; dictyonal framework meshes as 4-sided prisms; small oxyhexactins attached to dictyonal beams and other oxyhexactins, abundant; loose spicules unknown.

Remarks. The original specimen of *D. cornu* has not been located, thus Schmidt's nearly useless description cannot yet be amplified. A specimen, MCZ 6797, bearing the name, *D. cornu*, on its label, was not determined by Schmidt, and is, indeed, a demosponge. The form of the sponge and its framework as figured by Schmidt (1879) is similar to an inverted *Cyathella lutea*, suggesting the two may be conspecific. This suspicion must remain as conjecture until the *D. cornu* type specimen is discovered.

FIELDINGIA KENT, 1870

Synonymy

Fieldingia Kent, 1870a: 222.

Type species

Fieldingia lagettoides Kent, 1870a: 222 (by monotypy).

Definition

Hexactinosida (?), with sponge globular, internally filled by coarse dictyonal framework with reticulate siliceous spherical bodies integrated into framework at regular intervals; external surface covered by multi-lamellar crust composed of stacked 2-dimensional networks of pentactins (?) and stauractins fused by direct silicification and synapticula; free spicules unknown.

Diagnosis

Monospecific (see type species description).

Remarks

A monospecific genus (see type species remarks).

Description of type species

Fieldingia lagettoides Kent (Fig. 3A–G).

Synonymy. *Fieldingia lagettoides* Kent, 1870a: 222, pl. XV, figs 8–15; Schulze (in part), 1886: 82; Schulze (in part), 1887a: 335, not pl. XCVII figs1–9.

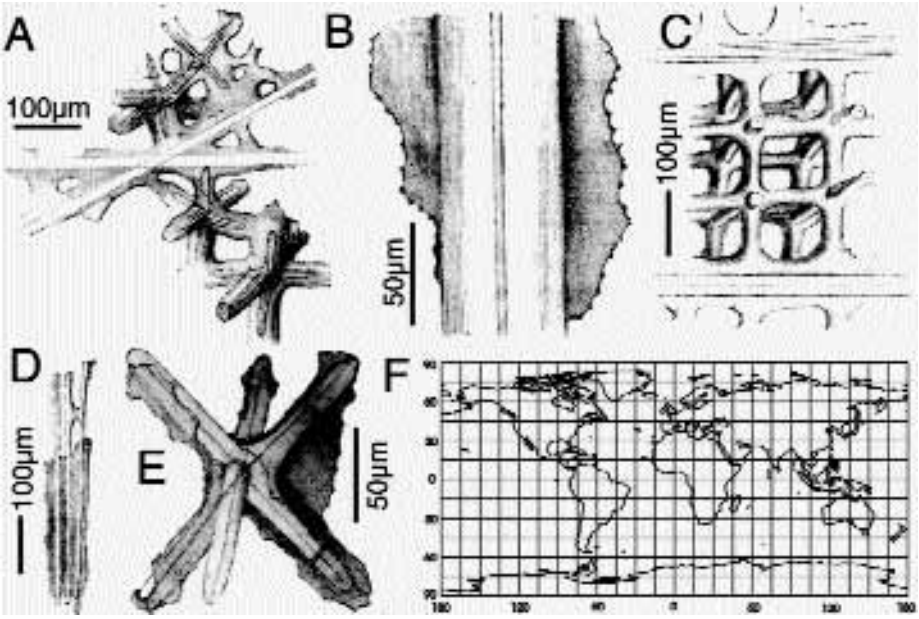

FIG. 4. *Hyalocaulus simplex*. A, older part of stalk framework. B, secondary silica deposit as anchorage onto the substrate – a *Euplectella* spicule. C, younger euretoid-like framework of the club-like body part. D, three monaxon spicules enveloped by secondary silica deposits. E, stout-rayed hexactin with extensive secondary silica cement broken out of old framework. F, distribution of *H. simplex*. (A–E, from Marshall & Meyer, 1877, pl. XXV.)

Material examined. Holotype: BMNH 1872.02.03.178 (dry), BMNH 1872.2.3.178a, 1901.8.24.1 (slides) – off Portugal, 915 m depth.

Description. Known from a single long-dead, macerated, adherent, globular sponge attached to coral (*Lophohelia prolifera*); externally encased in 0.7–1.0 mm-thick multi-lamellar crust of irregularly coarse outer layer lined internally by numerous thin, delicate, reticulate laminae of fused pentactins (?), stauractins, and synapticula; lamina joined by occasional hexactin rays; constituent spicules of laminae without regular arrangement, mesh sides (node-to-node) 46–*153*–348 µm long, smooth beams 6–*21*–62 µm in width; without osculum, atrium or channelization; internally filled by a crude dictyonal framework of irregularly fused hexactins, without recognizable dictyonal strands; dictyonal beams entirely minutely spined; reticulate siliceous spheres 0.85–1.7 mm diameter evenly spaced throughout internal framework; spheres composed of close-spaced synapticula (?) formed around (traversed by) main dictyonal elements; small oxyhexactins attached to all internal components but not to cortical laminae.

Remarks. Family placement of Kent's original specimen is difficult due to absence of channelization, Reid's (1963b) unsupported claim of labyrinthic schizorhyses notwithstanding, and lack of knowledge on internal framework construction. Published figures of the dictyonal frame (Kent, 1870a; Tabachnick & Reiswig, 2000) are consistent with both euretoid and aulocalycoid patterns, but resemble more the recently recognized paraulocalycoid forms. A placement decision cannot be made until details of axial canals are determined. Suggestion by Tabachnick & Reiswig (2000) that *F. lagettoides* be assigned to the order Reticulosa on the basis of the presence of an external reticulated crust is here considered unwarranted. The irregular crust in *Fieldingia* does not resemble the regular quadrule system defined for Reticulosa. Schulze's (1886, 1887a) assignment of two spicule-bearing specimens from the Banda Sea to *F. lagettoides* has been rejected by Tabachnick & Reiswig (2000) and is reaffirmed here. The main characters shared by the Portugal and Banda Sea specimens, the external capsule of fused spicules and reticulate spheres on the internal framework, differ in details in the specimens, occur in other unrelated dictyonal sponges, and are not considered here to be of significant taxonomic value. Both characters may be senility features. Additionally, likelihood of members of the same species occurring in the two distant locations, without any known intermediates, is extremely low. Without taxonomically significant characters linking the Banda Sea specimens to the *F. lagettoides* holotype, they cannot even be considered members of *Fieldingia*. Reassignment of Schulze's (1886, 1887a) Banda Sea specimens must also await determination of their framework construction pattern.

HYALOCAULUS MARSHALL & MEYER, 1877

Synonymy

Hyalocaulus Marshall & Meyer, 1877: 264.

Type species

Hyalocaulus simplex Marshall & Meyer, 1877: 264 (by monotypy).

Definition

Hexactinosida (?), with club-shaped sponge body borne on a short stalk; body with regular cubic (euretoid?) dictyonal framework of hexactins joined to longitudinally oriented monaxons (diactins?); stalk with irregular dictyonal framework of hexactins joined to irregularly oriented monaxons (diactins?); main body penetrated by longitudinal channels opening on upper surface; stalk penetrated by irregular channel system; nature of channels undetermined; loose spicules include monaxons (diactins?) and regular hexactins.

Diagnosis

Monospecific (see type species description).

Remarks

A monospecific genus (see type species remarks).

Description of type species

Hyalocaulus simplex Marshall & Meyer (Fig. 4A–F).

Synonymy. *Hyalocaulus simplex* Marshall & Meyer, 1877: 264, pl. XXV, figs 1–5.

Material examined. None. Holotype unknown, probably destroyed.

Description (from literature). Known from one apparently long dead, eroded specimen attached to wall of dead *Euplectella aspergillum*; composed of club-shaped main body 40 mm long on a cuboid stalk 19 mm long; stalk penetrating through and cemented to *Euplectella* wall; surface of stalk with irregular apertures to 0.75 mm diameter leading into irregular channel system; main body with apertures to 1 mm diameter grouped apically, leading into longitudinal channels; skeleton of main body as combination of cubic dictyonal framework joined directly and by synapticula to scaffold of single and small bundles of monaxons (diactins?) oriented longitudinally; monaxons predominate and dictyonal frame not developed in upper body; skeleton of stalk likewise composed of dictyonal framework, but without cubic regularity, and more disoriented monactins (diactins ?); monactin elements mainly smooth; hexactins densely spined; loose spicules from main body include only monaxons (diactins?) 1 cm long ×0.1 mm thick and stout, spined, regular hexactins; known only from the Philippine Islands, depth unknown.

Remarks. Marshall & Meyer's (1877) unsophisticated and poorly figured description of a long-dead sponge with the unlikely combination of monaxons (diactins?) integrated into a cubic dictyonal framework remains too ambiguous to attempt placement of that form in present hexactinellid classification. It is possible that the residual skeleton was a combination, formed by deposition of two separate and different original specimens – a lyssacine and a dictyonine. Indeed, the authors commented on their difficulty of ascribing individual elements of the skeleton to the basal *Euplectella* and *Hyalocaulus* specimens. Unfortunately, the holotype, part of the Dresden Museum collection, is presumed to have been destroyed during World War II, and is unavailable for reassessment. The genus and species will probably remain unresolvable. It is clearly at least in part includable in Hexactinosida on the basis of its cubic dictyonal framework element.