Systema Porifera: A Guide to the Classification of Sponges, Edited by John N.A. Hooper and Rob W.M. Van Soest

Family Ianthellidae Hyatt, 1875

Patricia R. Bergquist & Steve de C. Cook

Department of Anatomy, School of Medicine, University of Auckland, Private Bag 92019, Auckland, New Zealand.
(pr.bergquist@auckland.ac.nz; cooknz@bigfoot.com)

Ianthellidae Hyatt (Demospongiae, Verongida) is characterised by the presence of a strongly collagenous dermal/cortical region, a strongly anastomosing skeleton when present with fibres containing pith and bark elements which incorporate cellular elements, and eurypylous choanocyte chambers, spherulous secretory cells and complex brominated, tyrosine-derived compounds among the secondary metabolites. Three genera are recognised, extending from the Mediterranean, the British Isles to the eastern Pacific.
Keywords: Porifera; Demospongiae; Verongida; Ianthellidae; *Ianthella*; *Anomoianthella*; *Hexadella*.

DEFINITION, DIAGNOSIS, SCOPE

Synonymy

Ianthellidae Hyatt, 1875.

Definition

Verongida in which the fibre skeleton when present is strongly anastomosing, frequently compressed into two dimensions, and radiating from a contracted base of attachment. Fibres contain cellular elements in concentric annuli; these occur mainly in bark elements, but can also be dispersed in pith as well. The fibres are of typical construction for the order with bark and pith elements represented, neither component is emphasised. Individual fibres can attain great thickness, particularly towards the base of the sponge. The skeleton makes up the major bulk of the sponge. A thick firm skin-like dermis is common to all species as is the inclusion of spherulous cells among the secretory cell content. The choanocyte chambers are large, and sac-shaped (*Ianthella, Hexadella*), to slightly ovate-elongate and occasionally branched (*Anomoianthella*). Colour in life ranges from sulphur yellow through deep orange, blue to deep purple or purple brown. All species show a characteristic oxidation reaction upon damage or death, and reach a final deep purple colouration. Soft tissue pigmentation is always uniform throughout the sponge. Biochemical characteristics are similar to those of the Aplysinidae, Pseudoceratinidae and Aplysinellidae with respect to the occurrence of brominated metabolites but highly complex variants of these molecules occur in the Ianthellidae. No aplystane sterols are known from any species of Ianthellidae.

Scope and distribution

Three nominal genera, *Ianthella, Anomoianthella Hexadella*. Distribition is Indian Ocean, South East Asia, Australia, Lord Howe Island, New Caledonia, West Central Pacific, Guam to West coast USA, Mediterranean and the British Isles. The thin, encrusting *Hexadella* is easily overlooked and may occur more widely than is known at present.

History and biology

The family was established by Hyatt (1875) to receive the genus *Ianthella* Gray, 1869 which Gray had surmised merited family status. The type genus *Ianthella* remained the sole member of the family until *Anomoianthella* was described (Bergquist, 1980a). Sponges belonging to *Ianthella* are easy to recognise, being of large size, with striking colour and a skeleton which dries well and endures in beach stranded specimens. General acceptance of the family status of the Ianthellidae is recent: Poléjaeff (1884) referred *Ianthell*a to Darwinellidae; Lendenfeld (1889a) referred it to Aplysillidae; and de Laubenfels (1948) ascribed it to Dysideidae. *Hexadella* Topsent (1896a) is transferred from Darwinellidae to Ianthellidae on the basis of histology, secondary metabolite chemistry (Morris & Andersen, 1989) and 28s ribosomal DNA sequence analysis (Bergquist, Boury Esnault, unpublished data).

Remarks

The history of taxonomic assignments for this family provides a good example of the difficulty of recognising affinities on the basis of morphology and light microscopy alone. Affiliation of the Ianthellidae with the Verongida required knowledge of ultrastructure, secondary metabolite chemistry and reproductive behaviour. Resolving the composition of the family required further data from sequence analysis.

Previous reviews

Topsent, 1905b; de Laubenfels, 1948; Bergquist, 1980a; Bergquist & Kelly-Borges, 1995; Bergquist, 1995.

KEY TO GENERA

(1) Fibre skeleton present 2
Fibre skeleton absent ..... ***Hexadella***
(2) Fibre reticulation two dimensional sometimes with fasciculate extensions vertical to that plane ..... ***Ianthella***
Fibre reticulation anastomosing in three dimensions ..... ***Anomoianthella***

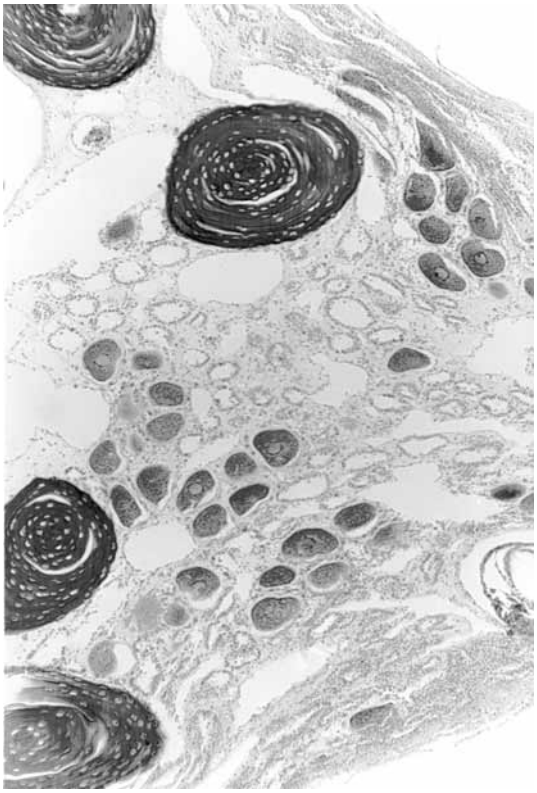

Fig. 1. *Ianthella flabelliformis*. Light micrograph of fibre showing concentric rings of cellular material enclosed in the bark region.

Fig. 2. *Ianthella flabelliformis*. Electron micrograph of fibre to show degenerate structure of enclosed cells.

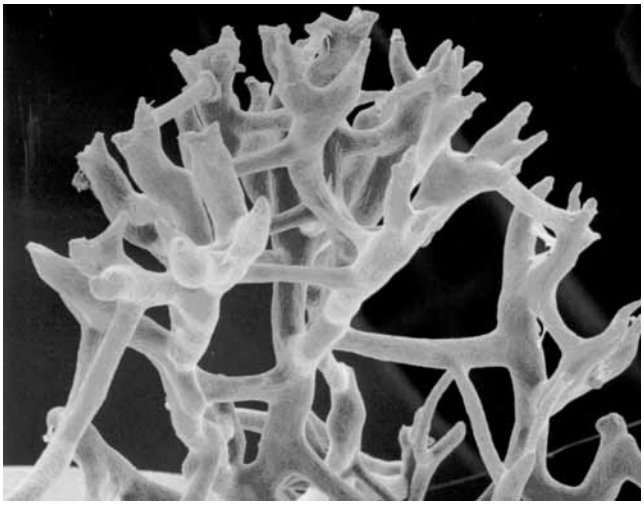

Fig. 3. *Ianthella flabelliformis*. Scanning electron micrograph of skeleton illustrating fascicular outgrowths at right angles to the main, planar skeleton.

IANTHELLA GRAY, 1869

Synonymy

[*Basta*] Oken, 1815: 77; Burton, 1934: 596 [invalid as an officially rejected published work; refer to Hooper & Wiedenmayer, 1994: 224]. *Ianthella* Gray, 1869: 49; Hyatt, 1875: 407; Poléjaeff, 1884: 37; Lendenfeld, 1888: 23: 1889a: 683; Wilson, 1925: 474; de Laubenfels, 1936: 31: 1948: 154; Bergquist, 1980a: 443; 1995: 47. *Haddonella* Sollas, 1903: 557 (type species *Haddonella topsenti* Sollas, 1903).

Type species

Spongia flabelliformis Pallas, 1776: 380 (by subsequent designation; Topsent, 1905b).

Definition

Ianthellidae in which fibres make up the bulk of the body and are developed as a planar two dimensional reticulum; in some species there are short fasciculate extensions at right angles to this flat plane.

Diagnosis

Planar skeleton, degenerate spongocytes arranged in concentric layers within bark, extending to pith regions as dispersed cells (Figs 1–2). Sponges are large fans or vases, up to 2 m high and brightly coloured. The skeleton makes up the bulk of the sponge body and can be a rectangular reticulation of fascicles crosslinked by secondary fibres, or a simple reticulation of anastomosing fibres, developed in two dimensions. Fibre outgrowths at right angles to the basic two dimensional reticulum are present in several species (Fig. 3). The choanosome is cavernous with large, sac-shaped eurypylous choanocyte chambers. The mesohyl of the choanosome is usually lightly to moderately collagen reinforced, but the ectosomal region has strong collagen deposition. Sponges are yellow, green, orange, blue and purple in colour.

Previous reviews

Topsent, 1905b; de Laubenfels, 1948; Bergquist, 1980a; Bergquist & Kelly-Borges, 1995.

Description of type species

Ianthella flabelliformis (Pallas) (Figs 1–5).

Fig. 4. *Ianthella flabelliformis*. Whole specimen.

Fig. 5. *Ianthella flabelliformis*. Light micrograph to show eurypylous choanocyte chambers and oocytes.

Synonymy. *Spongia flabelliformis* Pallas, 1776: 380.

Material examined. Refer to Bergquist & Kelly-Borges (1995).

Description. Symmetrical single or bilamellate fan, up to 1000 cm high, 10–15 mm thick. Surface raised into narrow irregular ridges (Fig. 4). Texture harsh, colour in life greenish yellow, fibres dark red/purple. Fibres form a semi-regular reticulation, 20–500 μm thick and oriented in one plane; outgrowths from this plane are fasciculate extensions of the ascending fibres terminating in a flattened knob. Choanosome cavernous, ectosome heavily collagen reinforced. Sponge is oviparous (Fig. 5). Habitat, coral reef in areas with strong current.

Remarks. There are 5 valid species. The genus has been discussed extensively in the most recent revision by Bergquist & Kelly-Borges (1995).

Distribution

As for the family with the exception of the British Isles, Mediterranean, Ceylon and West coast USA.

ANOMOIANTHELLA BERGQUIST, 1980

Synonymy

Anomoianthella Bergquist, 1980a: 497.

Type species

Anomoianthella popeae Bergquist, 1980a (by original designation).

Definition

Ianthellidae with three dimensional, anastomosing skeleton and fibres in which pith and bark elements are both well developed.

Diagnosis

Ianthellidae with thickened fan-, club-, or cup-shaped growth form, with discrete oscular and poral surface or localised oscular regions. The sponge is cavernous, with extremely thick fibres which form an irregular three dimensional anastomosing reticulum, soft tissue is sparse in relation to fibrous material. The fibres have substantial pith and a bark component in which numerous degenerate spongocytes are arranged in concentric annuli. The choanocyte chambers are eurypylous elongate-oval and sometimes branched.

Previous reviews

Bergquist & Kelly-Borges, 1995.

Description of type species

Anomoianthella popeae Bergquist, 1980a (Figs 6–7).

Synonymy. *Anomoianthella popeae* Bergquist, 1980a: 497, Figs 3f, 25a–e.

Material examined. Holotype: AM Z3869 – Dongera, Port Denison, Western Australia.

Description. A thick, lamellate sponge up to 17 cm high; colour brownish orange throughout, turning purple black on death; texture coarse, brittle. Surface conulose, oscules and pores in groups (Fig. 6). Skeleton reticulate, fibres coarse, up to 3.5 mm thick (Fig. 7), bark and pith elements developed, cellular elements in annuli in bark. Choanocyte chambers eurypylous, elongate-oval.

Remarks. There are three described species. A notable feature of the type specimen is the presence of a structured cellularised cuticle (Bergquist, 1980a: fig. 25c). Cuticular structures of less elaborate nature have been reported from other Verongida (Vacelet, 1971), and there is a suggestion that its presence may be seasonal. Nonetheless, the structure provides one more example

Fig. 6. *Anomoianthella popeae*. Surface detail of holotype.

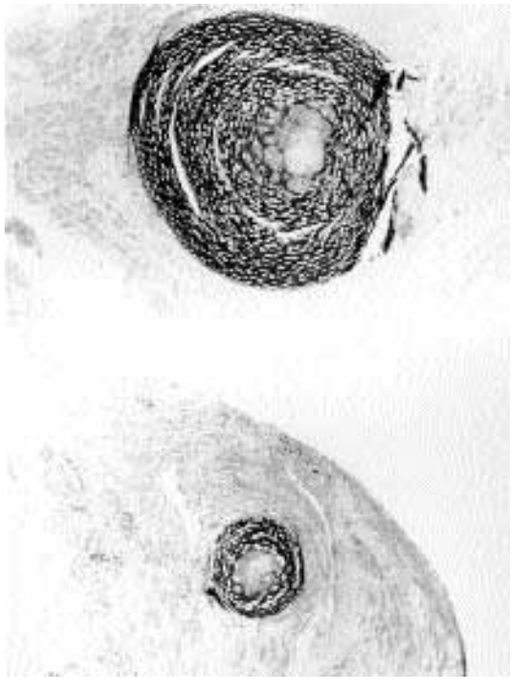

Fig. 7. *Anomoianthella popeae*. Cross section of fibre, light micrograph.

of the ability of verongiids to organise tissue-like structures and emphasises their distinctness within the Porifera.

Distribution

Australia, New Caledonia, Papua New Guinea.

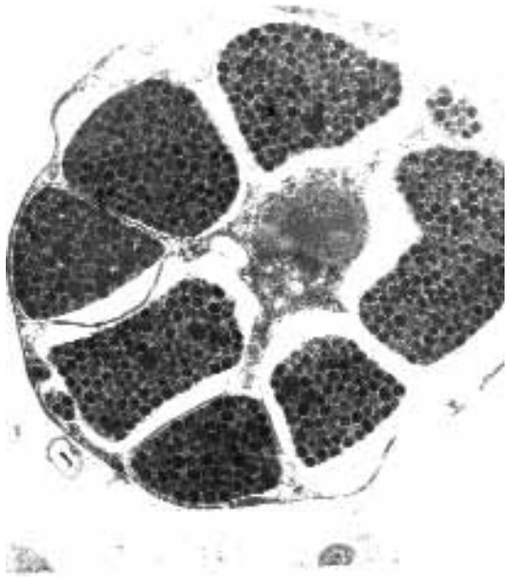

Fig. 8. *Hexadella racovitzai*. Electron micrograph of spherulous cell (×9000).

HEXADELLA TOPSENT, 1896

Synonymy

Hexadella Topsent, 1896a: 119.

Type species

Hexadella racovitzai Topsent, 1896: 119 (by original designation).

Definition

Ianthellidae which lack a fibrous skeleton.

Diagnosis

Encrusting Ianthellidae which lack a fibrous skeleton. The ectosome is strongly collagen reinforced and bounded by a distinct skin which, acting in some measure as an external skeleton, allows the sponge to attain a thickness of up to 5 mm.

Previous reviews

Topsent, 1905b; Dendy, 1905; de Laubenfels, 1948; Vacelet *et al*., 1976.

Description of type species

Hexadella racovitzai Topsent (Fig. 8).

Synonymy. *Hexadella racovitzai* Topsent 1896: 119. *Hexadella purpurea* Burton, 1937: 43.

Material examined. Holotype MNHN (only slide preparation). Preserved material courtesy of N. Boury-Esnault from the Banyuls, Mediterranean.

Description. The sponge is encrusting, up to 5 mm thick, spreading in plaques about the size of a hand. Colour uniform

throughout, rose pink to slightly yellow in the type series, yellow to bright yellow or brownish in other Mediterranean specimens. Surface marked by wrinkles disposed in parallel sometimes in star-like fashion around foreign objects, pores small, scattered, oscules few, extending into short membranous tubes. Ectosome collagenous, slightly flexible texture, providing the only mechanical support for the body. Underlying choanosome extremely soft and fragile, mesohyl much reduced in relation to the aquiferous system. Spherulous cells, 10 μm in diameter, are common throughout the mesohyl but are particularly concentrated in the ectosome (Fig. 8). Fibrous skeleton absent. Choanocyte chambers eurypylous, 65–75 m in longest dimension. The sponge is most frequently associated with melobesian conglomerates.

Remarks. While it can now be confirmed by electron microscopy that spherulous cells of Ianthellid type occur in *Hexadella* it should be noted that Topsent drew attention to their presence in his original description, as did Dendy (1905) in his review. Hence the inclusion of this genus at least within the Verongida has been long overdue. Eight species have been described, four are valid. One, *H. pleochromata*, is a synonym of *Pseudoceratina purpurea*; *H. purpurea* is a synonym of *H. racovitzai*; *H. pruvoti* is retained as a distinct species; and one, *H. kirkpatricki*, with stipitate form and thick cortex, certainly is not *Hexadella*.

Distribution

Distribution may be widespread but is certain only from the Mediterranean, Azores, British Isles, Sri Lanka, Western Indian Ocean, and West Coast Canada.