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

Family Isodictyidae Dendy, 1924

Eduardo Hajdu[1] & Gisele Lôbo-Hajdu[2]

[1] Museu Nacional, Departamento de Invertebrados, Universidade Federal do Rio de Janeiro, Quinta da Boa Vista, s/n, 20940-040, Rio de Janeiro, RJ, Brazil & Centro de Biologia Marinha, Universidade de São Paulo, São Sebastião, SP, Brazil. – (hajdu@acd.ufrj.br)
[2] Departamento de Biologia Celular e Genética (DBCG), Instituto de Biologia Roberto Alcântara Gomes (IBRAG), Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brazil. (glhajdu@uerj.br)

Isodictyidae Dendy, (Demospongiae, Poecilosclerida) contains two genera, *Coelocarteria* and *Isodictya*, allocated to suborder Mycalina. *Ichnodonax* is considered a junior synonym of *Coelocarteria*. *Cercidochela, Homoeodictya, Neoesperiopsis, Textiliforma* and *Valentis* are considered junior synonyms of *Isodictya*.
Keywords: Porifera; Demospongiae; Poecilosclerida; Mycalina; Isodictyidae; *Coelocarteria*; *Isodictya*.

DIAGNOSIS, SCOPE

Synonymy

Isodictyeae Dendy, 1924: 334.

Diagnosis

Mycalina with (mostly) diactinal megascleres arranged in a (plumo)reticulate skeletal architecture (niphatid- or phloeodictyid-like) and palmate isochelae.

Scope

The family contains eight nominal and two valid genera, *Coelocarteria* and *Isodictya*, with *Ichnodonax* included as a junior synonym of *Coelocarteria*, and *Cercidochela, Homoeodictya, Neoesperiopsis, Textiliforma* and *Valentis* included in *Isodictya*.

Taxonomic remarks

Isodictya has been the focus of some recent ping-pong assignments in the poriferan classification. Conflicting hypotheses were proposed by Hajdu *et al*. (1994a) and Samaai *et al*. (1999), postulating niphatid (Niphatidae, Haplosclerida) or mycalid (Mycalidae, Poecilosclerida) affinities, respectively. As Samaai *et al*. (1999) undertook a most rigorous formal analysis on the affinities of *Isodictya* their results are followed here. Accordingly, *Isodictya* and allied taxa are included within the Mycalina. Their suggestion of closer relationships between *Isodictya* and mycalid genera, such as *Esperiopsis* and *Mycale*, needs further investigation, and consequently *Isodictya* has not been accommodated within the Mycalidae but referred to Dendy's (1924) 'section' Isodictyeae, which is here promoted to family-level status. Refer to the remarks on *Isodictya* for further comments on the interpretation of the phylogenetic affinities of the genus.

KEY TO GENERA

(1) Reticulated choanosomal skeleton with thick tracts of oxeas, ectosomal skeleton a dense tangential reticulation of strongyles, Fistulose ..... ***Coelocarteria***
Reticulated choanosomal skeleton with variably thick tracts of oxeas (rarely styles), ectosomal skeleton with tufts of the same spicules, digitiform/flabellate forms are common ..... ***Isodictya***

COELOCARTERIA BURTON, 1934

Synonymy

Coelocarteria Burton, 1934a: 563. *Ichnodonax* de Laubenfels, 1954: 112.

Type species

Phloeodictyon singaporense Carter, 1883b: 326 (by original designation).

Diagnosis

Isodictyidae with fistules; a phloeodictyid-like architecture with a dense, but neat reticulation of plurispicular tracts of strongyles and/or oxeas.

Description of type species

Coelocarteria singaporensis (Carter, 1883b) (Fig. 1).

Synonymy. *Phloeodictyon singaporense* Carter, 1883b: 326. *Histoderma vesiculatum* Dendy, 1905: 166. *Ichnodonax kapne* de Laubenfels, 1954: 112.

Material examined. Holotype: BMNH (not seen). Other material. ZMA 790–807, 810 – 'Siboga' Exped., Indonesia, det. M. Burton. ZMA 6501, 6511, 8556, 8594, 8625, 8690, 8840, 9279 – 'Snellius II' Exped., Indonesia, det. R.W.M. Van Soest. ZMA 11417 – Madang, Papua New Guinea, det. R.W.M. Van Soest.

Description (adapted from Dendy, 1905: 166, as Histoderma vesiculatum; Bergquist, 1965: 161, compilation of literature data and own observation on p. 162). Body of varied morphology; subhemispherical, tubular, barrel-shaped, oval, cushion-like; with fistules up to 6.5 cm high (Fig. 1A). Colour alive, yellow to brown, turning to dark-brown, or purplish color in spirit. Ectosomal

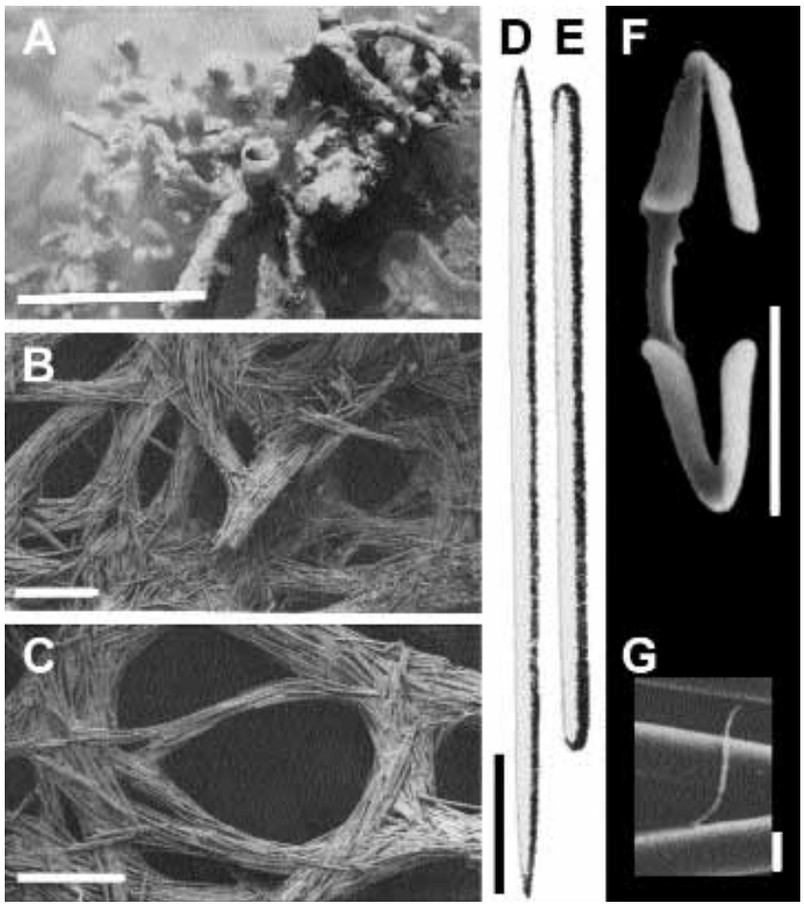

Fig. 1. A–G, *Coelocarteria singaporensis* (Carter, 1883b as *Phloeodictyon*). A, live-specimen in the intertidal at Sumba (Indonesia, 'Snellius II' Exped., photo & det. R.W.M. Van Soest, ZMA 6501) (scale 5 cm). B–C, stout reticulation of multispicular tracts of megascleres (ZMA 8840, det. R.W.M. Van Soest) (scale 500 μm). D–E, drawings of megascleres (from Ridley, 1884a, pl. XLI fig. s, as *Rhizochalina singaporensis*) (scale ca. 50 μm). F, palmate isochela (ZMA 8840, det. R.W.M. Van Soest) (scale). G, toxa (ZMA 8840, det. R.W.M. Van Soest) (scale 10 μm).

skeleton a single tangential layer of strongyles packed together with a few larger oxeas. Choanosomal skeleton mainly a dense phloeodictyid reticulation of plurispicular tracts up to ca. 300 μm thick (Fig. 1B–C). Megascleres: Oxeas, 300 μm long and 17 μm thick in the holotype, 237–312 μm long and 3.5–16 μm thick in other records (Fig. 1D). Strongyles, 40–80 μm long and 4 μm thick in the holotype, 30–120 μm long and 3.5–12 μm thick in other specimens (Fig. 1E). Microscleres: palmate isochelae, 14–17.5 μm long in specimens other than the type.

Remarks. The specimen ZMA 8840 studied under SEM by Hajdu *et al*. (1994b) had palmate isochelae with a few spines on the inner side of their shafts (Fig. 1F), as well as rare toxas, about 50 μm long (Fig. 1G). *Coelocarteria* has been assigned to the Coelosphaeridae by recent authors (e.g., Bergquist, 1965; Van Soest, 1984) on the basis of its fistular habit. Hajdu *et al*. (1994a,b) argued against a synapomorphic value for the fistulae in sponge phylogeny, suggesting an emphasis on anatomical features when higher taxa are circumscribed within the Poecilosclerida and Haplosclerida. Accordingly, a new interpretation of the Coelosphaeridae was advanced, where the diagnosis was based on the combined possession of smooth ectosomal tylotes and arcuate chelae (Hajdu *et al*., 1994a). Van Soest (this volume), shifted the diagnosis to a reticulate choanosomal architecture in addition to arcuate chelae, in view of the occurrence of smooth ectosomal tylotes in the type species of *Hymedesmia* Bowerbank, 1864, viz., *H. zetlandica* Bowerbank, 1864. Consequently, *Coelocarteria* had to be transferred from this redefined taxon. Its possession of palmate chelae, as well as absence of acanthostyles or any accessory megascleres, suggested inclusion within the Mycalina, more precisely, within one of three available ill-defined families, viz., Desmacellidae Ridley & Dendy, 1886, Isodictyidae or Mycalidae Lundbeck, 1905. The reticulated choanosomal archi-tecture of diactinal megascleres and possession of palmate isochelae suggest a closer affinity with *Isodictya* than to any of these other taxa.

ISODICTYA BOWERBANK, 1864

Synonymy

Isodictya Bowerbank, 1864: 197. *Homoeodictya* Ehlers, 1870: 32. *Textiliforma* Carter, 1885d: 288. *Cercidochela* Kirkpatrick, 1907: 284. *Valentis* de Laubenfels, 1936: 96. *Neoesperiopsis* de Laubenfels, 1949a: 15.

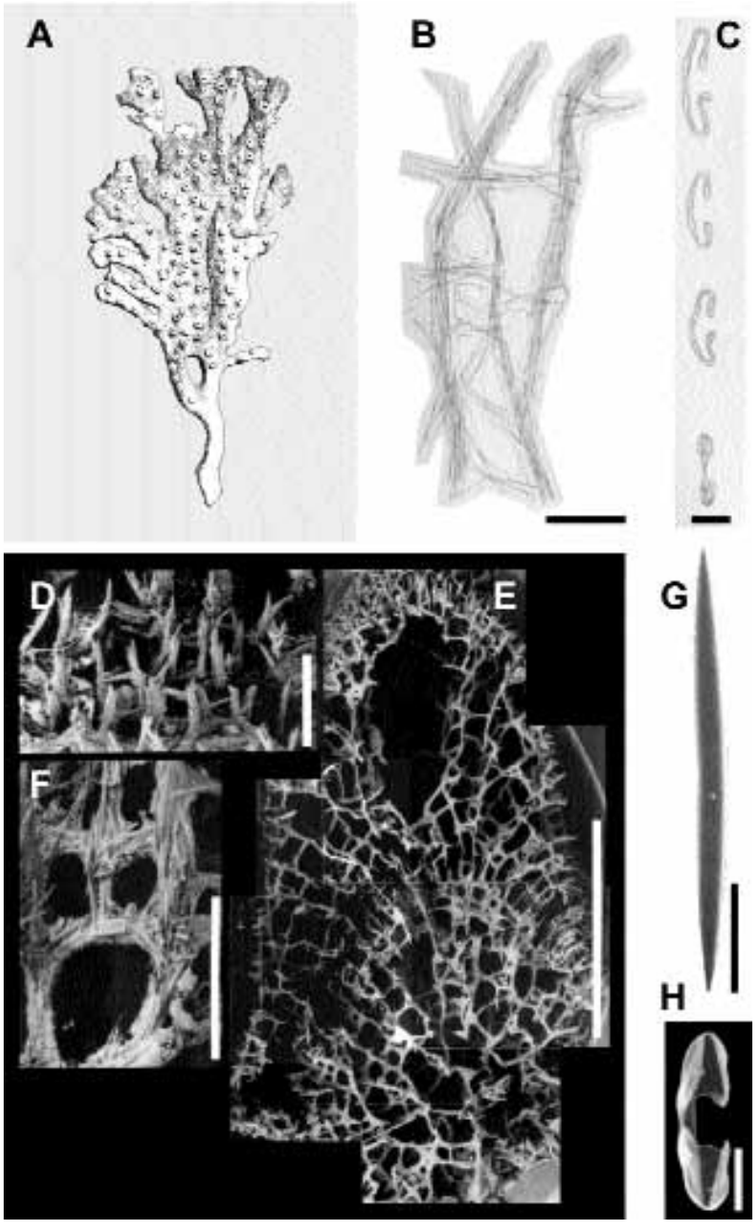

Fig. 2. A–H, *Isodictya palmata* (Ellis & Solander, 1786 as *Spongia*). A, Ellis & Solander's (1786) specimen (from Ellis & Solander, 1786, pl. 58 fig. 6). B–C, BMNH 1930.7.3.381 (Orkney Isles, from Bowerbank, 1874, pl. LII fig. 2). B, drawing of choanosomal architecture (scale 200 μm). C, drawing of palmate isochelae on side (upper three) and face views (scale 10 μm). D–H, ZMA 3280, off Iceland (det. R.W.M. Van Soest). D, tangential view of the surface of the specimen showing the projecting terminations of the choanosomal fibres (scale 500 μm). E, transverse section through a branch showing the plumo-reticulated organization of the skeleton with large subectosomal spaces (scale 5 mm). F, detail of the isodictyal reticulation showing primary and secondary connecting tracts of megascleres cemented by spongin (scale 500 μm). G, fusiform oxea (scale 50 μm). H, palmate isochela on side view (scale 10 μm).

Type species

Spongia palmata Ellis & Solander, 1786 (by subsequent designation; Dendy, 1924).

Diagnosis

Isodictyidae of flabellate/digitate growth forms; choanosomal skeleton reticulate or plumoreticulate (niphatid-like); megascleres are mostly diactinal, usually oxeas; microscleres, palmate isochelae, frequently with plate-like inner extensions of the falxes.

Description of type species

Spongia palmata Ellis & Solander, 1786 (Fig. 2).

Synonymy. *Spongia palmata* Ellis & Solander, 1786: 189. *Spongia digitata* Esper, 1797: 190. *Halichondria palmata* Johnston, 1842: 92. *Isodictya palmata* Bowerbank, 1866: 311. *Pachychalina compressa* Schmidt, 1870: 37.

Material examined. 'Holotype' of *Halichondria palmata* Johnston, 1842: BMNH 1847.9.7.1 – Berwickshire coast. Other material. BMNH 1910.1.1.2197 – NE Atlantic, Norman Collection. ZMA 3280 – off Iceland, 64°48′N, 12°45′W, det. R.W.M. Van Soest.

Description (adapted from Lundbeck, 1905: 121). Erect, digitate with variably compressed branches which may coalesce into plate-shaped areas (Fig. 2A). Surface is finely and densely shaggy from the projecting ends of the skeletal fibres (Fig. 2D), connected by thin organic ectosome draped over the fibre ends. Oscula up to 5 mm in diameter (in spirit), mostly along the edges of the compressed branches, but also scattered on the plates formed by the fusion of some branches (Fig. 2A). Reticulated skeleton composed of primary ascending tracts connected by thinner secondary tracts (Fig. 2B, E–F). Skeletal meshes larger, the closer to the surface, in a pattern resembling that of niphatids (Fig. 2E). Megascleres are cigar-shaped oxeas (116–277 μm long and 4.5–16.8 μm thick; 199–(206.5)–216 μm long and 10–11 μm thick in the holotype, Fig. 2G), occasionally styles or strongyles. Microscleres are palmate isochelae (23–35 μm in length, 23.8 μm in the holotype, Fig. 2C, H).

Remarks. Comparative material examined: *Isodictya deichmannae* (de Laubenfels, 1949a) – ZMA 6186, east Cape Cod (NW Atlantic, det. R.W.M. Van Soest). Samaai *et al*. (1999) conducted a formal phylogenetic analysis in order to test the controversial allocation of *Isodictya* (and its synonym *Cercidochela*) to the haplosclerids proposed by Hajdu *et al*. (1994b), as well as that of *Coelocarteria*, as discussed above. Their results were taken here as the state of the art of our knowledge regarding the affinities of *Isodictya*, but it is of special concern that neither haplosclerids with strict isodictyal skeletons (=*Isodictya palmata*-like), nor poecilosclerids devoid of chelae were considered in their analysis. Additionally, too much synapomorphic value was attached to details of skeletal anatomy (7 out of 12 characters), which may either be interpreted differently by other authors working on the same species (there are no strict definitions of skeletal architecture terminology – terms are mainly broad descriptors), or vary widely when additional species are added to the analysis. The only chemical character considered by Samaai *et al*. (1999), viz., manzamines, coded synapomorphic for the haplosclerids, is known to occur in poecilosclerids too (Harper, *in litteris*; in Van Soest & Braekman, 1999).

Two other genera are also included here in synonymy with *Isodictya*, based on recent re-examination of their respective type material (courtesy of Rob Van Soest). *Textiliforma* Carter, 1885d was erected for type species *Textiliforma foliata* Carter, 1885d: 288 from Cape of Good Hope, South Africa (by monotypy). The type series (not examined) contains thinly flabelliform sponges, with groups of oscules scattered over the surface. The skeleton is a ladder-like reticulation of spicule tracts embedded in spongin. Spicules are oxeas of 120 × 10 μm and isochelae of 25 μm. From Carter's characterization of the latter ('navicular, with obtuse ends') these are presumed to be the palmate type peculiar to *Isodictya*. Several *Isodictya* species have been described from South Africa by Lévi (1963), but none exactly match the description of Carter. Nevertheless, the synonymy of *Textiliforma* with *Isodictya* is clear. *Valentis* de Laubenfels, 1936 was erected for type species *Desmacidon lentus* Vosmaer, 1880: 131 from the 'coast of France' (by original designation). The dry holotype (RMNH 261), was re-examined. The label reads '*Desmacidon lentus* Vosm. type, coll. Persoon, ? Kust van Frankrijk', which indicates that it is not certainly from the coast of France. In view of its characters, it appears unlikely to be from Western Europe. It is a thinly flabelliform sponge with a distinct oscular and poral surface, size 21 × 11 × 0.8 cm. The skeleton is a reticulation of spongin-cemented thick spicule tracts forming elongate meshes, primary tracts up to 250 μm in diameter, interconnecting tracts 50–150 μm, meshes 200–800 × 200–450 μm. No special ectosomal skeleton, the tracts ending at the surface in spreading brushes of megascleres. Spicules consist of thick, strongly curved oxeas, 250–300 × 24–30 μm, and palmate isochelae 20–25 μm. Vosmaer (1880) mentioned several other spicule types, but these were not observed; presumably they were foreign. This is undoubtedly a species of the genus *Isodictya*, but it differs from the European *Isodictya palmata* in several distinct traits: thinly flabelliform, smaller oscules, thicker spicules. Since the origin of the specimen is unknown, it is here provisionally named *Isodictya lenta* (Vosmaer, 1880). On the basis of Vosmaer's partly faulty description, de Laubenfels (1936) made a genus definition which does not cover the properties of *Desmacidon lentus*. The genus *Valentis* is here assigned to the synonymy of *Isodictya* based on the characters of the type specimen.

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