

## Evolutionary study of genus *Metania* GRAY, 1867

(Porifera-Spongillidae)

### I. The new species.\*

by

Cecilia Volkmer-Ribeiro

Museu de Ciências Naturais da Fundação Zoobotânica do Rio Grande do Sul,  
Porto Alegre, RS, Brasil

The redefinition by PENNEY and RACEK (1968), of genus *Metania* GRAY, 1867, of freshwater sponges, was a first step towards the natural grouping of several species previously placed in other genera. That redefinition was however based mainly on study of type and syntype material. The authors missed collections of neotropical material and thus could not revise the status of *Tubella spinata* CARTER, 1881. They were also unaware of the description of *Tubella mello-leitaoi* (sic) MACHADO, 1947.

Study of plenty of new material collected mainly from amazonian waters evidenced the necessity of description of two new species, redescription of *Metania reticulata* (BOWERBANK 1863) and of *Metania spinata* (CARTER 1881a) and redefinition of the genus. This revisive work was first written in portuguese and approved as "Livre-Docência" thesis (VOLKMER-RIBEIRO, 1976). Enlargening of the synonymy proposed by PENNEY and RACEK (1968) was also further carried on and filogenetic and evolutionary inter and intragenetic lines were for the first time traced for this genus.

The present paper is the first of a series where that thesis will have most significant parts translated into English and published. Because translation is a hard task which might delay publication of the whole for some more years, the author choosed to fractionate the work in this series where the second part will deal with the redescribed species and the third with redefinition of the genus and discussion of evolutionary and filogenetic aspects.

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*Metania fittkai* n. sp.

Figs. 1, 3, 4

Holotype: MCN 61, Igarapé Aduja, Itú River (branch of Negro River) Amazonas State, Brazil, 12. XI. 1962, E.J. Fittkau leg.

Paratypes: MCN 59, 60, 62, 78, Igarapé Aduja, Itú River, Amazonas State, Brazil, 12. XI. 1962, E.J. Fittkau leg.; MCN 53, Branquinho River (branch of Cuieras River) Pará State, Brazil, 1961, E.J. Fittkau leg.; MCN 47, Igarapé do Cachoeira (Branquinho River), Pará State, Brazil, 20. XII. 1961, E.J. Fittkau leg.; MCN 362, Branquinho River, Pará State, Brazil, XII. 1961, E.J. Fittkau leg.

Holotype deposited at Museu Nacional da Quinta da Boa Vista, Rio de Janeiro, Brazil.

Paratypes deposited at Museu de Ciências Naturais da Fundação Zoobotânica do Rio Grande do Sul, (MCN) Porto Alegre, Brazil.

Type locality: Igarapé Aduja, Itú River (branch of Negro River) Amazonas State, Brazil.

Description: Sponge forming thin, brownish, very fragile crusts on leaves, small branches or bark of trees periodically reached by flooding waters. But it may also grow amassing thin submersed roots. In this last case the sponge forms quite massive growths which desagregate into portions like crumbs of bread. Surface, under magnification, conspicuously reticulate and slightly hispid. Oscula are seen as irregularly distributed larger meshes of the reticulum. Skeleton consisting of a dense reticulum of circular meshes and slender flattened fibers. There are no secondary fibers. Some fibers may project beyond the surface of the reticulum as acicular projections.

Megascleres of two distinct classes.

Alfa megascleres: Small, smooth, slight to strongly curved abruptly pointed anfióxea to almost anfistrongyla, with quite uniform sizes in the same individual. These megascleres predominate in the skeletal fibers. Length range 113 – 219 micrometers, width range 8 – 28 micrometers.

Beta megascleres: Spiny, stout, straight to curved, abruptly pointed anfióxea which may reach the anfistrongylos condition; displaying a characteristic covering of large, conical spines which may or may not leave free the extremities of the scleres. Beta megascleres predominate in the structure of the gemmular cages. Length range 60 – 126 micrometers, width range 10 – 16 micrometers.

Microscleres: Minute anfióxea with extremities gradually very sharp pointed, displaying a characteristic covering of spines with lanceolate extremities. The largest spines as well as the extremities of the microscleres are covered with a minute granulation. Length range 43 – 90 micrometers, width range 3 – 5 micrometers.

Gemmoscleres: Very short boletiform anfidiscs having a large expansion of the shaft under the lower rotule; from this expansion on the shaft abruptly slenders towards the upper rotule. Lower rotule large, with almost circular outline, slight to strongly umbonate and with large, bent, undulated margins which may sometimes hide half of the shaft. Upper rotule with starlike outline, flat or dome shaped, with margins regulary or irregularly cut in a number of marginal, incurved teeth. Shaft usually smooth, except for the large expansion under the lower rotule. This expansion results in fact of a particular modification of

the collar of spines typical of the genus: here only two spines in sometimes perfect opposition are present. Malformations of this special sort of collar take to irregular, lateral expansions of the shaft, or to shafts bearing a single hook or a single expansion along the whole shaft. Length range 13 – 34 micrometers, diameter of lower rotule 14 – 20 micrometers, width of shaft 3 – 5 micrometers.

Gemmules: Very abundant, enclosed in cages of beta and alfa megascleres, ranging in diameter from 368 to 987 micrometers. Small, spherical to sub-spherical, pneumatic coat thin; porus tube short, conical, covered with slanting gemmoscleres and bearing a peripheral collar. Gemmoscleres radially arranged in a single layer with the lower rotules completely embedded in the inner gemmular wall and part of the shafts and the upper rotule projecting free from the pneumatic coat.

Remarks: The new species shows all characteristics of the genus such as the boletiform anfidiscs, where the shaft bears a typical modification of the collar of spines, the presence of alfa and beta megascleres, the first integrating the skeletal fibers and the second present mainly in the gemmular cages, microscleres which bear at the middle portion large spines with lanceolated extremities and a reticulated disposition of the skeletal fibers.

On the other hand, the studied specimens display features which fully justify the description of a new species. The material was also collected at sites quite distant from one another and where *M. reticulata* and *M. spinata* did also occur. It is specifically characteristic of the studied material the shape of the gemmoscleres and their extreme shortening in length, the modification presented by the collar of spines in the gemmosclere shaft, the kind of spine covering of the beta megascleres and of the slender microscleres and the reduction in number of the spines on the microscleres. Very peculiar yet of *M. fittkai* are the flattened fibers which make up a more delicate skeletal reticulum where secondary fibers are no longer present. Also particular of the new species are the shape and fragility of the specimens. *M. fittkai* is undoubtedly more closely allied to *M. reticulata* but shares also a few characteristics with *M. subtilis* n. sp.

*Metania subtilis* n. sp.

Figs. 2, 5, 6

Material: MCN 48, Branquinho River (branch of Cuieras River) Pará State, Brazil, 21. VII. 1961, E.J. Fittkau leg. (Several pieces in two minute flasks with alcohol. Pieces evidently resulting from detaching one or two thin crustlike specimens from the substratum).

Holotype: Part of the fragments with gemmules. Dried. Deposited at Museu Nacional da Quinta da Boa Vista, Rio de Janeiro, Brazil.

Paratype: The rest of the fragments, also bearing gemmules and dried. Deposited at Museu de Ciências Naturais da Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre Brazil.

Type locality: Branquinho River (branch of Cuieras River) Pará State, Brazil.

Description: Sponges forming very thin, small, yellowish crustlike patches which are slightly thicker at middle portion (3 mm) and slender towards the border line (1 mm).

Crusts collected from substratum perennially submersed and thus not subject of the annual shift of the water level of amazonian rivers. Surface smooth though hispid to the touch. Pinacoderm conspicuous under magnification and clustered with microscleres. Oscula few, small circular orifices which, under magnification, show in fact to be the outer openings of large cloacas where several channels come to. Crusts rigid but brittle. Skeleton compact with no evidence of reticular construction: stout anfiroea are radially bound in bundles, the free extremities of one bundle meeting those of the next. Spongin scarce and present only at the base and at the junctions of the radiating anfiroea.

Megascleres: Stout, smooth, straight to slightly curved, gradually sharp pointed anfiroea, with quite differing sizes. Length range 216 – 381 micrometers, width range 8 – 43 micrometers.

Microscleres: The largest seen in this genus. Spiny, slender to stout, gradually very sharp pointed to abruptly pointed, extremely abundant anfiroea with length varying in the same individual from those of the largest microscleres of other species of the genus to those of the shortest beta megascleres. The smallest of these microscleres are covered with uniform spines at their middle portion and with a granulation from there to the extremities of the scleres; the largest have their spines reduced to almost a uniform granulation extending over the whole of the sclere. The largest spines may show, under higher magnifications, lanceolated terminations. Microscleres of this species are not restricted to the pinacoderm of the sponge. Length range 79 – 143 micrometers, width range 9 – 10 micrometers.

Gemmoscleres: Large, stout, boletiform anfidiscs displaying more variations in length than in size. Shafts long, usually smooth except for one or several large expansions under the lower rotule. Lower rotule large, flat or slightly umbonate, conspicuously polygonal, with large, undulated, incurved margins. Upper rotule with starlike outline, flat and then having its margin cut in a number of regular incurved small teeth or umbonate and with a number of larger, also incurved teeth. This rotule may yet be reduced to a knob with one or a few irregular spines. The large expansions of the shaft under the lower rotule result, as in *M. fittkai* of a same particular modification of the collar of spines, when two large spines are present, or take to radial reinforcements which meet the margin of the rotule in such a way as to determine its polygonal outline. Some shafts may bear one to several large incurved spines.

Gemmules: Free, not as numerous as in the other species of the genus, forming overlying strata in the lower part of the sponge, and ranging in diameter from 413 to 776 micrometers. Spherical, subspherical or cordiform in shape. Inner gemmular wall thick, pneumatic coat conspicuous. Porus tube short, conical, slightly curved, covered with slanting gemmoscleres and devoid of the peripheral collar. Gemmoscleres radially arranged in a single layer with the lower rotule completely embedded in the inner gemmular wall and half of the shaft in the pneumatic coat, while other half of the shaft and the upper rotule project free. This arrangement gives the gemmules a hispid surface and renders it easy to distinguish the disparities in size of the gemmoscleres.

Remarks: *M. subtilis* can be easily separated from other congeners by its drastic reduction of some generic characteristics such as the beta megascleres, the gemmular cages and the reticulated skeleton. On the other hand, the identity of its gemmoscleres with those of the other species of the genus do not allow inclosure of this material in any other

presently defined genus or recommend description of a new genus. The microscleres of *M. subtilis* with their quite aberrant sizes and particular covering of spines stand in fact for scleres which are in an intermediate position between the microscleres and the beta megascleres of other *Metania* species. *M. subtilis* has some characteristics in common with *M. fittkai* and other with *M. spinata*. With this last species it shares the long, smooth anfiioxa of the skeleton, the lack of gemmular cages, the long gemmoscleres with lateral expansions of the shaft under the lower rotule, the polygonal outline of that rotule and the sometimes umbonate upper rotule with large incurved spines. The microscleres of *M. subtilis* show some similarities with the beta megascleres of *M. spinata* in what respects the quite uniform covering of spines in their middle portion. *M. subtilis* and *M. fittkai* have in common characteristics such as the smooth skeletal anfiioxa, the particular modification of the collar of spines under the lower rotule, the large undulated incurved margins of this rotule and the starlike outline of some of the upper rotules.

### Summary

In the first paper of a series, the author describes two new species of genus *Metania* GRAY, 1867, starting translation into English and publication of most significant parts of her "Livre-Docência" thesis. In that thesis genus *Metania* was redefined and had its evolutionary inter and intrageneric lines traced upon study particularly of large collections of amazonian specimens.

### Resumo

No primeiro artigo de uma série de três o autor descreve duas novas espécies do gênero *Metania* GRAY, 1867, dando início assim à versão para o inglês e publicação dos trechos mais significativos de sua tese de Livre-Docência. Nesta tese o gênero *Metania*, de esponjas de água doce, foi redefinido e teve sua filogenia inter e intragenérica proposta, com base em estudo de amplas coleções de espécimes provenientes, principalmente, da amazônia brasileira.

### Acknowledgements

*Metania fittkai* n. sp. has its name dedicated to Dr. Ernst-Josef Fittkau in scientific recognition for a most careful and extensive collection of amazonian spongillids. The author is indebt to Dr. Fittkau for having entrusted her with study of that collection. She acknowledges granting of fellowship no. 11116134/76 of Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Brazil.

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Author's address:

Dr. Cecilia Volkmer-Ribeiro  
Museu de Ciências Naturais  
da Fundação Zoobotânica do Rio Grande do Sul  
Caixa postal 1188  
Porto Alegre - RS  
Brasil

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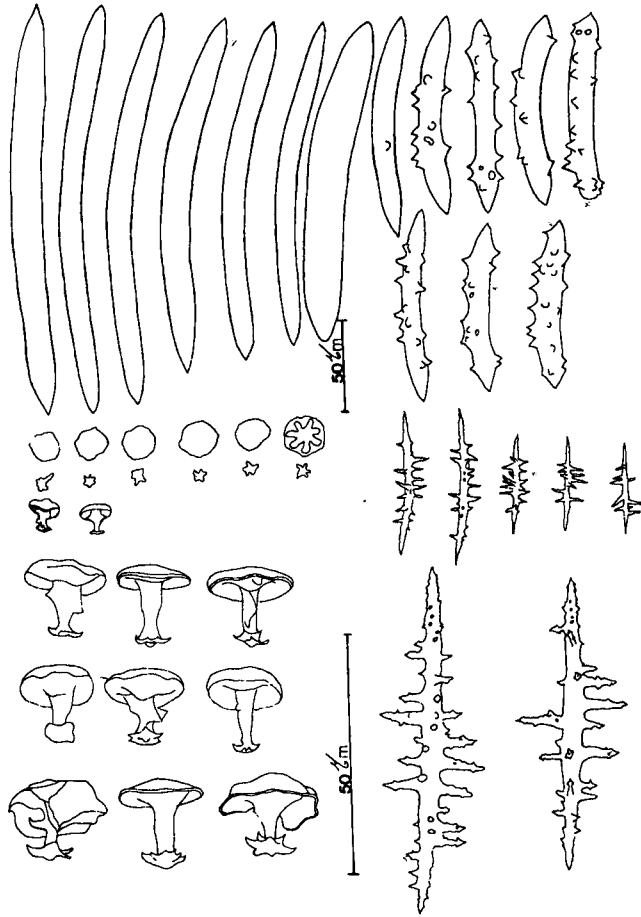


Fig. 1:  
 "Camera lucida" drawings of the spicular components of *Metania fittkai* n. sp. At top alfa and beta megascleres.  
 At middle left lower and upper rotules of anfidiscs in profile.  
 At middle right microscleres as seen at low magnification.  
 At bottom anfidiscs and microscleres at high magnification.

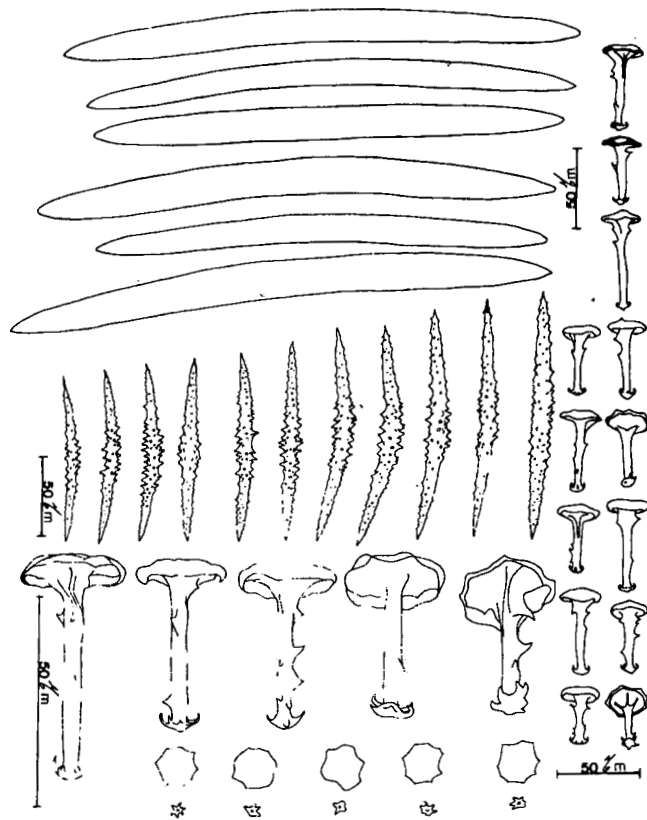


Fig. 2:  
 "Camera lucida" drawings of the spicular components of  
*Metania subtilis* n. sp. Megascleres at top, microscleres at  
 middle and gemmoscleres at bottom (high magnification)  
 and right (low magnification).





Fig. 3:  
Holotype of *Metania fittkai* n. sp. (MCN 61). Upper. Sponge amassing thin roots.

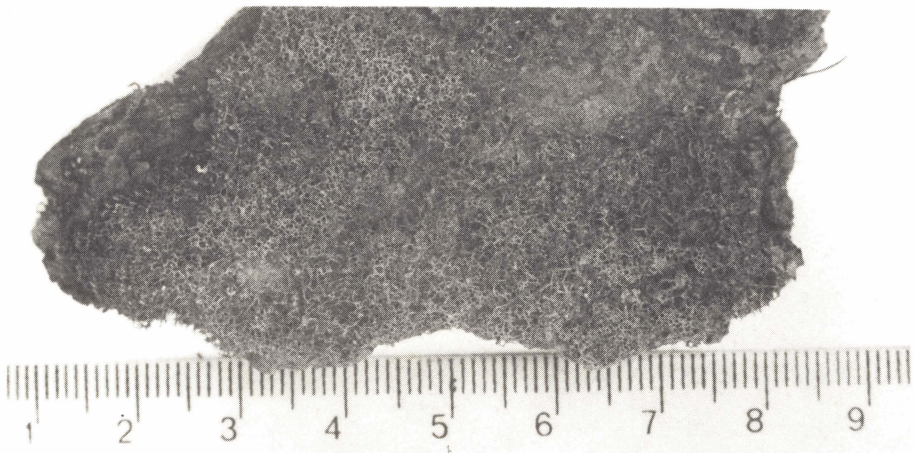


Fig. 4:  
Paratype of *Metania fittkai* n. sp. (MCN 59). Sponge on bark of tree.



Fig. 5:  
Part of the fragments which constitute the holotype of *Metania subtilis* n. sp. (MCN 48).





Fig. 6:  
One of the fragments of the type of *Metania subtilis* seen at high magnification (upper side).