

distinguishable; the spines tips usually points upward giving the head a crown aspect. At the central section, the spines are almost equally long as the spicule body diameter; the spine tips are perpendicular to the spicule axis. The end section is frequently ornamented by distally decreasing tiny spine buds. In contrast, in recent species the spines are thinner and the spicule head section mass is readily distinguished, the spine tips are curved upward; in the middle section the spines are conspicuously subordinate features, the spine tips normally are perpendicular to the spicule axis; the end section is completely flat and smooth with no spines.

A hypothetical ancestry-descendant relationship between *Ropalospongia* and at least part of recent *Agelas*, has supporting evidence in the spicules of all fossil species and in most of the recent ones. They share a straight shape and a similar spine height pattern along the spicule length which results in an inverted pinus-like aspect. Additionally, the inferred fossil species paleo-environment matches the recent species environment. However, against this hypothesis it is possible to argue several issues. The uncertainty about the spicules biological source, as they were found in detritus deposition formations associated with reefs, not in a close association with indisputable poriferan fossils. The spine number, size and proportion are quantitatively higher for fossil species while are smaller for the recent ones. Finally, the geographical distribution is restricted to the oldest proto-Caribbean area in fossil species and expanded to almost all present tropical areas in extant species. The head aspect suggests that *Ropalospongia* could be an antecessor of part of the recent of *Agelas* (e.g., *A. conifera*); however, the untested hypothesis of *Fluegelispongites* as the antecessor of some of them (see below), advices to wait for additional independent evidence before making a taxonomic decision.

Genus *Fluegelispongites* Mostler, 1994 ‡

Type species *Fluegelispongites trettoensis* Mostler, 1994

The Middle and Upper Triassic (204 ma) genus *Fluegelispongites* (two species; Mostler, 1994; see Fig 1C Chapter 2) from Western Paleotethys (Buchsteiner strata, Southern Alps, Italy; Pötschenkalke, Northern Alps, Austria) belongs to the Agelasidae family. Sponge with slender C- to S-shaped curved acanthostrongyles whose thorns are helicoidally (spirally) arranged.

F. trettoensis 237 x 17 µm (n=3), 15-16 (normally 16) helicoidally arranged segments, 8 spines.
F. ventriosus 213 x 26 µm (n=9), 12-16 (normally 12) helicoidally arranged segments, 6 spines.

Remarks

Compared with recent species, *Fluegelispongites* spicules are coarser and wider, while recent ones are smoother and thinner; the SH/SW ratio is also larger in fossil species. Due to its own nature, it is prudent to take as separate both spicule features, viz. the spicule curved nature (C- S-shape) and the helicoidally arranged spined segments. Although they could be totally related characters, it is impossible to preclude yet the existence of mixed spicule types, as for example straight shapes with helicoidally arranged spined segments or C- or S-shapes with verticillated spines. Distinguish between the head and the end sections proved to be difficult as the differences in spicule width of both extremes are almost untenable to the naked eye. The head section has sharp long spines (longer than wider), with acute points and perpendicular to their bases. The central section has smooth short spines (same height and width), blunt ended and perpendicular to the spicule axis. Sometimes the end section looks exactly as the head section, but when some differences are visible the end includes shorter, less defined spines.

Taking into consideration a hypothetical ancestry-descendant relationship between *Fluegelispongites* and *Agelas*, evidence in favor may lie in the closeness of fossil spicule length with the recent ones. The head structure is also similar to recent species with few spines around and a spine in terminal position (e.g., *A. clathrodes*, see Chapter 2). In some recent species the spicule slightly curved nature is also present (e.g., *A. schmidti*, see Chapter 2). Finally, the genus fossil record is geographically, although not temporally, closer to the oldest acanthostyle spicule evidence (Lower Carboniferous of Ireland, Reitner, 1992), and also closer to the oldest sister family fossils (Astrosclerida, Triassic of Turkey and Italy, Wörheide, 1998). On the other hand, it must be noted and stressed that the fossil helicoidally arranged spines are a continuous feature; instead, most of recent *Agelas* exhibit spines in a discrete verticillated stepped fashion.

DISCUSSION

The comparison between fossils and recent spicules aspect suggests some features that could be present in the spicule of ancestral Agelasids such as presence of verticills, spicule spine and spicule body could be at least equally important spicule features; along the spicule, the spines height and shape could be similar; likely the head and end section could have a similar width.

A 'discorhabd' having some of these features have been found from the Lower Ordovician of USA (Kozur et al, 1996: 207, 219, pl 4, fig 10; 360 x 33 μm , n=1, 5 thorn rows, 4-6 spines, straight; 490-472 ma; see Fig 1A Chapter 2); however, an expected longer spicule size fails to be found. The identification as discorhabd also seems erroneous checking with the Thesaurus of Sponge Morphology (Boury-Esnault & Rützler, 1997: 44, 45, fig 247).

APPENDIX B. Additional publications

1- Speculation with Spiculation? - Three Independent Gene Fragments and Biochemical Characters versus Morphology in Demosponge Higher Classification. Erpenbeck, D. Breeuwer, J. A. J., Parra-Velandia, F. J., van Soest, R.W.M.. 2006. *Molecular Phylogenetics and Evolution* 38 (2), 293-305.

2- New records of the genus *Agelas* Duchassaing & Michelotti, 1864 (Porifera, Agelasida) off the Amazon River mouth, Brazil, Southwestern Atlantic. Mothes, B.; Campos, M.; Lerner, C.; Carraro, J.L. Parra-Velandia, F.J. 2007, *Biota Neotrop.* 7 (3).

3- A new *Agelas* (Demospongiae: Agelasida: Agelasidae) from the Thousands Islands, West-Java, Indonesia De Voogd, N.J., Parra-Velandia, F.J. & Soest, R.W.M. Van. 2008. *Zool. Med. Leiden* 82 (22), 235-243.