

Sponges

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Two kinds of calcitic spicules referable to sponges have been found at Vattenfallet. They belong to the genera *Astraeospongium* Roemer, 1854, and *Atractosella* Hinde, 1888 (for the range in the section, see Fig. 65).

The *Astraeospongium* spicules are essentially octactines, but the axial rays are usually missing. The observed range of diameter of the spicules is 0.5–2.3 mm, but fragments of larger specimens are present. *Astraeospongium* was previously regarded by most authors as a siliceous sponge; de Laubenfels (1955) referred it to the Order Heteractinida of the Class Hyalospongia (= Hexactinellida). However, Rietschel (1968) argued that *Astraeospongium* was most probably calcareous, and this is supported by its preservation at Vattenfallet: the spicules in the Upper Visby Marl are composed of holocrystalline calcite (thin sections of specimens from a corresponding level at the nearby locality Ygne 3 show that each spicule extinguishes as a unit between crossed nicols), which agrees with the mineralogical structure of modern calcareous sponge spicules (Jones 1970). In the Högklint Beds, the spicules are mostly silicified, and the frequent replacement and overgrowth by quartz crystals indicates that the silicification is secondary; the silicified holothurian(?) sclerites co-occurring with *Astraeospongium* in Högklint *d* also support this interpretation.

The *Atractosella* spicules are strongyles (fusiform monaxons), the rare examples of branching and angularly bent forms being due to fusion between adjoining spicules. The surface is usually granulated, more rarely smooth. They are very common in the Upper Visby Marl, with scattered finds also in Högklint *a* and *b* (Fig. 65). Smooth spicules of this kind from Vattenfallet were described by Regnéll (1955:168, Pls. 3:3, 4:2) as echinoid spines. However, the conchoidal appearance of the fracture surfaces, as well as observations of thin sections under the polarizing microscope, indicate that they are composed of discrete microcrystallites oriented with their *c* axes subparallel to the axis of the spicule, whereas echinoid spines are typically composed of the normal echinoderm stereom, i.e. each spine consists of a continuous calcite lattice with a *c* axis direction parallel to the axis of the spine. The Vattenfallet spicules compare well with the spicules from the British Wenlock described by Hinde (1888) as *Atractosella siluriensis*, although the commonly granulated surface of the Gotland specimens suggests that they probably represent a new species, here referred to as *A. n. sp. a.*

Atractosella has not previously been recognized as a calcareous sponge; de Laubenfels (1955) referred it to the Order Epipolasida of the Class De-

mospongea. The Gotland material shows convincingly that the original composition of the spicules was calcitic. A description of the available material from the Lower and Upper Visby Marls and Högklint Beds, including two natural associations of spicules, is in progress.

Spicules of siliceous sponges have been found only at the level 19.24–19.29 m, from where two hexactine spicules were isolated in an etching residue. They can be referred to as *Hexactinellida* gen. et sp. indet.

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