

Cephalopods

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In *Fragmenta Silurica* nine species of cephalopods were described from Gotland (Angelin in Angelin & Lindström 1880), but by 1885 Lindström estimated the total number of Gotland species to be at least 100. However, it is more likely that the actual number exceeds 200. To date, the only major groups which have been described monographically are ascoceratids (17 species) and ophioceratids (2 species; both by Lindström 1890), and phragmoceratids (32 species; Hedström 1917). Occasional species of actinoceratids and orthoceratids have been described or revised by Teichert (1934) and Mutvei (1957, 1964a). Thus, only a small fraction of the Gotland material has been adequately described, forming a serious obstacle to the identification of specimens from Vattenfallet.

The total number of cephalopod specimens in the Vattenfallet material is 64, comprising at least 16 genera. Of these, six taxa have been identified at the generic level. The remainder were grouped according to the shape of their shells: gomphoceroids, cyrtconic brevicones, cyrtconic longicones and orthocones. The preservation is variable with the shell wall partially or wholly dissolved in several specimens. Many shells have been crushed during the compaction of the sediment. The shell chambers are frequently filled by a coarse calcitic spar, and the structure of the wall of the siphonal tube is poorly preserved. Under these circumstances, identification of the majority of the cephalopods has not been possible.

For distribution see Fig. 30.

Faunal list

Orthoceratidae: *Leurocycloceras* sp., *Kionoceras* sp.

Dawsonoceratidae: *Dawsonoceras* sp.

Phragmoceratidae: *Phragmoceras* sp. indet.

Ophioceratidae: *Ophioceras* sp. indet.

Huroniidae: *Huroniella?* sp. indet.

A very rough estimate of the possible number of different cephalopod species

in the material from each lithostratigraphical unit of the section gives the following data: Upper Visby Marl 4 species, Högklint *b* 11 species, and Högklint *c* 7 species. No cephalopod has been found in Högklint *a* and Högklint *d*.

Ecological remarks

The only survivor of the ectocochleate cephalopods, *Nautilus*, has a specialized mode of life, in being a mobile benthic scavenger. It lives in deep waters (300–500 m), but migrates seasonally to the shore, probably when spawning (Hamada & Mikami 1977). The recent coleoids are active carnivores, having a vagile benthic, or nektic to pseudoplanktic mode of life. The oceanic squids belonging to the last category are particularly numerous. Many of them float with the aid of ammonium chloride in their tissues, thus maintaining buoyancy without possessing chambered shells (Denton 1974). The mantle musculature and swimming ability are often more or less reduced. The majority of living coleoids catch live prey with their long tentacles.

The orthocones, cyrtoconic brevicones and cyrtoconic longicones from Vattenfallet certainly had poor swimming ability. This conclusion is supported by the fact that, to judge from their attachment to the shell, the retractor muscles were small and their relationship to the main mantle cavity was different from that in *Nautilus* (Mutvei 1964b). The structure of the siphonal tube clearly indicates that it was used in regulation of the volume of cameral liquid and thus these nautiloids were not benthic but pseudoplanktic, and undertook vertical migration.

The gomphoceroid nautiloids, together with *Phragmoceras*, were not efficient swimmers, as indicated by their poorly streamlined shells. Adult gomphoceroids are especially common in reef mounds and their mode of life may have been adapted to that general environment. Only mature specimens with constricted apertures have been found. The young animals probably lived in a different biotope. The constricted apertures allowed only microphagous feeding. It is interesting to note that the retractor muscles were numerous and arranged uniformly around the body (Mutvei 1964b). Their unique arrangement may have been somehow connected to a microphagous feeding habit. It is not possible to determine whether the gomphoceroids were benthic or pseudoplanktic.

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