

Bathymetry of the Silurian Nautiloid Fauna from the 'Orthoceratite Limestone', SW Sardinia

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Various factors must be considered in order to determine the depositional environment of the Silurian 'orthoceratite limestones' of SW Sardinia. The work of Gnoli et al. (1980, 1990) suggests a depositional environment for the limestone facies in a normally oxygenated epicontinental sea of limited depth rich in an exclusively pelagic fauna in the upper part but occasionally toxic towards the bottom. A study by Ferretti (1989) of the microfacies of the Upper Silurian has determined two stages of deposition for the cephalopod limestone facies. During the Late Wenlock - Ludlow a shallow high energy (near wave-base) shelf environment is suggested. A deeper tranquil environment is suggested for the Pridoli of a shallow offshore basin occasionally affected by storm sedimentation.

However, nautiloids which are abundant in the limestone provide an independent means of assessing bathymetry. The chambered cephalopods i.e. living *Nautilus* and by inference fossil nautiloids, are unique in having developed a fixed volume phragmocone, with subatmospheric internal pressure as a buoyancy tank to minimise energy expense, thus their distribution is depth-dependent (Denton 1974; Chen & Lindstrom, 1991)

The maximum hydrostatic limit for mature *Nautilus* is known to be equivalent to a depth of about 800m, below which the shell implodes (Hewitt & Westermann, 1987). The calculated implosion depths therefore can be expected to provide reliable evidence of depositional depth of the fossil bearing stratum (Chen & Lindstrom, 1991).

A bathymetric study of twenty eight species of nautiloids from the 'orthoceratite limestone' of the Upper Silurian of SW Sardinia has implied a water depth in excess of 300m based on those septa that have imploded as they exceeded their calculated hydrostatic limits. The structural limit of the weakest elements of the fauna is <100m. The habitat depths for the species indicate an environment of <350m taking the data for the weaker species as the limiting factor.

Where a stratigraphical control was placed on the fauna, within three assemblages, the environments deduced from the habitat depths of each assemblage were somewhat deeper than the environments implied by the previous studies for the periods Wenlock to late Ludlow and Pridoli. With the former having habitat depths between 100-500m and the latter between 200-700m.

The palaeoecological implications from the various morphologies of the nautiloid species that there were two distinct faunal elements, one mesopelagic and the other epipelagic inhabiting an environment of between 150-450m are supported by the calculated habitat depths for the species. The fact that specimens of all growth stages

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are found indicates that this was an in situ assemblage and not an accumulation due to postmortem drifting of the shells.