

## ENVIRONMENTAL PATTERNS IN THE ORIGIN AND DIVERSIFICATION OF DEEP-WATER SCLERACTINIAN AND RUGOSE CORALS

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Scleractinian and rugose corals demonstrate a broad environmental distribution and have been documented in strata reflecting deposition from high-energy, nearshore reefal to low-energy basinal settings. Both clades have a relatively high diversity of representatives which live(d) at great depths. While deep-water scleractinian coral banks are well-documented, commonly the deep-water representatives of both clades are the small, solitary, and often delicate forms. In order to determine the nature of diversification of these deep-water forms the paleoenvironments of the earliest Rugosa and representatives of extant deep-water scleractinian families were determined. Environmental patterns of the subsequent diversification of the Rugosa and scleractinian sub-order Caryophylliina were also documented. Environmental information was determined from independent sedimentological data.

The earliest reported Rugosa is Lambeophyllum from the Chazyan Crown Point Limestone (VT, U.S.A.), which was deposited in a nearshore/inner shelf setting. Subsequent to this occurrence, rugosans appear nearly simultaneously in North America, Australia, Europe and China. However, common Lambeophyllum, within the Blackriverian Orwell Limestone (NY, U.S.A), appears to be the earliest of these occurrences. The Orwell is, likewise interpreted to be shallow water in origin. After their initial appearance in an onshore environment, the Rugosa rapidly expand offshore. While Middle Ordovician Rugosa are of low diversity (1 genus at a given locality), by the end of the Blackriverian they are found in middle and outer shelf settings.

Nearly all representatives of families of extant scleractinians now living in deep-water (>200') also first occur in an onshore environment - primarily the inner shelf. The caryophylliids, the most speciose deep-water coral clade, first appear in Toarcian age inner shelf strata and soon after occur in outer shelf deposits. However, occurrences of high diversities of caryophylliids (generic diversity greater than 4 at a given locality) are confined to inner shelf settings until the Cretaceous when generic diversities of 2 or more are common in the outer shelf. In the Tertiary, high diversities of caryophylliids are generally restricted to slope and deep basin settings, a pattern which characterises their modern distribution.

Both rugose and scleractinian corals expand offshore at low diversities within 5 million years of their first appearance and thus, demonstrate environmental diversification before taxonomic diversification.