Major events in the evolution of Triassic reef ecosystems

Stanley, G.D. Jr., Geology, Univ of Montana, 32 Campus Drive #1296, Missoula, MT 59812, fossil@selway.umt.edu

Mass extinctions and faunal turnover mark the Triassic history of reefs. Reef development occurred throughout a vast shallow Tethys seaway as well as around far-flung Panthalassan island outposts in the ancient Pacific, now preserved as displaced terranes. Following the Permian extinction, recovery on reefs did not take place until Anisian time with the appearance of new taxa. It was followed by a Ladinian-Carnian expansion. Coralline sponges, ‘Tubiphytes’, bryozoans, inozoan and sphinctozoid sponges, corals, microproblematica and calcareous algae dominated. The late Carnian to early Norian was marked by major reef extinctions. During a 13 million-year interval, 90% of older sphinctozoid and coral species were lost but diversity was maintained with reciprocal replacement by new taxa. The result was a rapid taxonomic turnover which reshaped the structure of Late Triassic reefs and allowed the emergence of corals as reefbuilders.

The succeeding Norian-Rhaetian reef ecosystem globally, was maximally extended to 30°N and 35°S. It coincided with a major rise in global sea-level, worldwide expansion of carbonate platforms and maximum reef diversity. Scleractinian corals and sphinctozoid sponges emerged in a new reef building consortium, along with a diverse group of other reef organisms. Few taxonomic differences exist between Norian and Rhaetian reefbuilders but overall diversity was lower among Rhaetian taxa. Some workers ascribe a gradual diversity decline leading to the end-Triassic, but Tethys reef ecosystems were an exception. They collapsed suddenly at the end of the Triassic with full recovery not until mid-Jurassic time. A most peculiar effect in the Tethys, is the appearance of Permian Lazarus taxa in the Norian rather than in the Anisian-Ladinian recovery interval.

The Triassic reef record for North American island-arc terranes is incomplete, mostly recording the great Norian expansion. When corrected for tectonic displacements, the data yield latitudes similar to those of the Tethys. Rare subtropical Carnian patch reefs are known from the western Canadian craton. Although well-developed reefs and thick carbonates are uncommon, diversity was high with 50% or more Tethyan species. Unlike the Tethys, Norian-Rhaetian terrane taxa occur in some lowest Norian deposits. Permian Lazarus taxa occur in the Norian and an Early Jurassic reef contains Carnian holdovers, lending support to the idea of Panthalassan volcanic islands as refuges during times of global crises when the Tethys was disproportionately affected. A more detailed stratigraphic study of American terrane faunas is needed to test this hypothesis.