Ber. Inst. Geol. Paläont. K.-F.-Univ. Graz	ISSN 1608-8166	Volume 7	Graz 2003

RESPONSE OF CORAL FAUNAS TO ENVIRONMENTAL CHANGE IN THE LATE ORDOVICIAN OF LAURENTIA

Robert J. ELIAS* & Graham A. YOUNG**

* Dept. of Geological Sciences, University of Manitoba, Winnipeg, MB R3T 2N2, Canada.
** Manitoba Museum, 190 Rupert Avenue, Winnipeg, MB R3B 0N2, Canada.

Four biogeographic divisions of corals arose in the Late Ordovician (Cincinnatian) of Laurentia (North America). These include the cratonic Red River–Stony Mountain, Richmond and Edgewood provinces, and a „continental margin" assemblage. The development of this provincialism resulted from introductions of corals to environmentally distinct regions, as overall environments changed through Late Ordovician time.

Prior to the Cincinnatian, during Mohawkian time, sand was deposited widely over western Laurentia in environments that were unfavourable for corals. In the east, corals were widespread within the carbonate facies. Beginning in the late Mohawkian, this eastern fauna was displaced westward in response to the development of a foreland basin, with turbid, cool-water, nutrient-rich conditions, related to the Taconic Orogeny along the continental margin. This set the stage for the appearance of Cincinnatian coral faunas.

A major early Cincinnatian transgression brought an epicontinental sea and predominantly carbonate deposition to western and northern Laurentia. Water temperature and salinity were typically elevated compared with the sea in the east and with the open ocean. The Red River–Stony Mountain Province originated during this event, as corals arrived from the eastern sea and the continental margin, and endemic forms appeared. The ecologic structure in this province was complex, with specialized species and distinct species-associations. Fluctuations in the dominance of taxa, and bioevents involving evolution and dispersion, were related to environmental changes during two major transgressive-regressive cycles. Late in the Cincinnatian (late Richmondian–Gamachian), sea level and temperature dropped in association with glaciation in Gondwana. Red River–Stony Mountain species became extinct and corals resembling „continental margin" forms were introduced to the continental interior.

The Richmond Province was established during Richmondian time, on a mixed carbonate-siliciclastic platform along the margin of the epicontinental sea in eastern Laurentia. Corals were introduced from the continental interior and new endemic forms appeared during transgressive events as favourable environments, such as more tropical marine conditions, returned to this region. In general, water salinity was probably somewhat lower and nutrient content somewhat higher than in the Red River–Stony Mountain Province. There were distinct species-associations and differences in species dominance in various environments, but two highly variable solitary rugosans spanned the range of conditions inhabited by corals. This province was eliminated during the major end-Richmondian regression.

The Edgewood Province originated during Gamachian time, with the arrival of immigrants and the appearance of endemic corals. This occurred during minor transgressions into the continental interior from the open ocean to the south, as sea level oscillated during the glacial maximum. Carbonate sedimentation was dominant in this small epicontinental sea. Fluctuating, elevated levels of nutrients and runoff likely contributed to overall environmental instability. There was just a single species-association, dominated by one extraordinarily variable solitary rugosan. This fauna persisted into the earliest Silurian as sea level rose during deglaciation, but it was succeeded by a new assemblage in late Rhuddanian time.