

CONODONT FAUNAL TURNOVER AND DIVERSITY CHANGES THROUGH THE FRASNIAN-FAMENNIAN (F/F) MASS EXTINCTION AND RECOVERY EPISODES

MORROW, Jared R., Dept. of Geological Sciences, Univ. of Colorado, Boulder, CO 80309-0250, U.S.A.; SANDBERG, Charles A., Geologist Emeritus, U.S. Geological Survey, Box 25046, MS 940, Federal Center, Denver, CO 80225-0046, U.S.A.

Relatively rapid (<2 m.y.), stepwise mass extinction during the late Frasnian (mid-Late Devonian) resulted in a major global biomass reduction and loss of up to 82% of tropical marine species. This mass extinction episode culminated at the Frasnian-Famennian (F/F) boundary, which is defined by phylogenetically-linked species within the conodont genus *Palmatolepis*. Detailed, computer database-assisted analysis of >50 Euramerican conodont samples from the latest Frasnian *linguiformis*, and earliest Famennian Early, Middle, and Late *triangularis* Zones (or chrons of some workers) reveals several steps in the final extinction and subsequent initial recovery of faunas across the boundary.

The most marked conodont faunal changes occurred during the 0.3-m.y.-long *linguiformis* Zone. Diversity and abundance, which were greatest early in the zone, were first significantly reduced within the range of *Palmatolepis linguiformis* at the "Upper Kellwasser [deepening] Event" in the middle part of the zone. A second major step took place coincident with an abrupt shallowing event and the apparent extinction of the nominal species late in the zone, following which further steps of diversity-loss occurred. A third, and terminal, <0.02-m.y.-long event at the F/F boundary produced the greatest relative extinction. Accompanying these steps were stress-induced increases in short-ranging aberrant and mutant morphotypes within extant species.

Conodont species diversity within the *linguiformis* Zone decreased from >70 taxa prior to the Kellwasser Event to ~35 taxa in the time after the loss of the nominal species. Of the ~35 remaining species that survived late into the *linguiformis* Zone, ~20 more were lost at the terminal F/F boundary event, for an overall species loss of nearly 80% during the entire zone. Of the 15 known species that survived into the Famennian, eight are relatively long-ranging, in part opportunistic, taxa that had evolved before the *linguiformis* Zone. These existed at least into the Late *triangularis* Zone, when they gave rise to radiations within Famennian genera including *Icriodus*, *Pelekysgnathus* (including triple-rowed species), and *Polygnathus*. The remaining survivors include six progenitor taxa that originated during the *linguiformis* Zone and were ancestral to important Famennian lineages of *Palmatolepis*, *Polygnathus*, and possibly *Ancyrognathus*. In addition, one short-ranging taxon, *Ancyroides ubiquitus*, was an apparent disaster species significant only in faunas adjacent to the F/F boundary.

Biofacies analysis of conodont genera across the F/F boundary indicates that a relatively stable community structure existed throughout most of the *linguiformis* Zone, with faunas dominated by *Palmatolepis*, *Polygnathus*, *Ancyrodella*, and *Icriodus* in order of decreasing abundance. However, beginning in the late part of the *linguiformis* Zone, percentages of *Icriodus* increased to a peak of nearly 30% in the immediate post-extinction survival interval, reflecting lower eustatic sea level and the opportunistic exploitation of niche space previously occupied by *Polygnathus* and *Ancyrodella*, which both suffered heavy losses during the terminal mass extinction. Complete post-extinction recovery of Famennian conodont faunas did not occur until the Late *triangularis* Zone, indicating an episode of ~1 m.y. between the final F/F boundary extinction and full re-establishment of a highly diverse community structure.