

## TRIASSIC AMMONOID RECOVERIES AND EXTINCTIONS.

E.T.Tozer, Geological Survey of Canada, 100 West Pender Street, Vancouver, British Columbia, V6B 1R8, Canada.

Triassic ammonoids provide an excellent glimpse of faunal recovery after the extinctions at the P-T boundary. No other animals, with the possible exception of those represented by conodonts, provide so nearly a continuous faunal record with more than 40 different successive faunas easily distinguished. The problems introduced by Lazarus taxa are reduced although there are still gaps that make positive elucidation of some phylogenies difficult or impossible.

The Triassic chronology used here is that of most DNAG volumes, except that Scythian, the only Triassic stage in the Lower Triassic in the Introductory volume is divided into four, as in volumes for Western and Arctic Canada. Succession of Triassic series and stages is thus: Lower Triassic - Griesbachian, Dienerian, Smithian, Spathian; Middle Triassic - Anisian, Ladinian; Upper Triassic - Carnian, Norian. Rhaetian of some authors is part or parts of this Upper Norian. How much of the Upper Norian has not been settled.

In a 1980 census Triassic Ammonoidea were assigned to 3 Orders, Prolecanitida (3 genera); Ceratitida (427); Phylloceratida (15). In the Ceratitida virtually every kind of morphological character is represented. Shells range in shape from serpenticone to globose and oxycone, or heteromorph; in sculpture from smooth to ribbed and/or tuberculate. All kinds of sutures are developed. The large number of taxa are necessary to express the variation.

The Permian-Triassic boundary was not a disaster for the ammonoids. Three groups cross the boundary, one of Prolecanitida (Episageceratidae), two of Ceratitida (Otocerataceae and Xenodiscaceae). Episageceratidae and Otocerataceae were sterile short-lived survivors. Xenodiscaceae were the only group significant for the recovery. From them stem, directly or indirectly, all remaining Triassic Ammonoidea, both Ceratitida and Phylloceratida.

Triassic ammonoid history starts with the fauna of the *Otoceras* beds, originally discovered in the Himalayas, later in the Circum-Arctic areas. The spectacular radiations above the P-T boundary were not a straight linear progression, but an anastomosing plexus, with many abrupt appearances and extinctions. The scope of the extinctions and recoveries is shown by the numbers of short-lived and new genera in each successive stage or substage as recorded in the 1980 census. Additions, since then, have not changed the overall picture. There were several crises marked by extinctions and abrupt new appearances, notably between the Smithian and Spathian, the Spathian and Anisian, Lower and Upper Carnian, and at two levels (L-M and M-U) within the Norian. At the end of the Upper Norian (= top Rhaetian) there was near total disaster with only one family (Discophyllitidae of Phylloceratida) surviving to be the seed for the Jurassic recovery.