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The Prosanto Formation, a marine Middle Triassic Fossil-Lagerstätte near Davos (Canton Graubünden, Eastern Swiss Alps)

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Key words: Taphonomy, Fossil-Lagerstätte, Middle Triassic, Prosanto Formation, Graubünden, Eastern Swiss Alps, Austroalpine Silvretta Nappe

Introduction

During the last 15 years, more than 1000 small but well-preserved actinopterygian fishes, a few sauropterygian reptiles and some crustaceans, bivalves, gastropods, dasycladacean algae and terrestrial plants have been collected from the Ladinian (Middle Triassic) Prosanto Formation in the Ducan and Landwasser region near Davos (Canton Graubünden, Eastern Swiss Alps). The sequence of dark limestone, shale and dolomite of the Prosanto Formation occurs as a 100 to 200 m thick and more than 20 km wide lenticular intercalation in shallow water dolomites (Vallatscha and Altein Formations) of the strongly deformed sediments of the Austroalpine Silvretta Nappe. A joint paper on the geology, stratigraphy, paleoecology and the fossils was published by Bürgin et al. (1991). As most of these fossils were collected in the scree, small excavations have been organized in 1992 and 1993 in an alpine locality at 2600 m altitude near Davos to obtain more information about the taphonomy of the fossils and their distribution within the layers. Fossiliferous beds of 2.5 m thickness were studied in detail on a surface of 20 square meters, yielding about 500 complete or fragmentary fossils.

Taphonomy, paleoecology and paleogeography

Articulated skeletons of actinopterygian fishes, aquatic reptiles, crustaceans and twigs of conifers have been preserved only in finely laminated limestone and shale beds without any bioturbation. There are no signs of current activity in these background sediments, such as orientation of skeletons or unidirectional drifting of finer skeletal elements. Some fragmentary fish skeletons and many isolated skulls, jaws, teeth and scales suggest a slow settling of the carcasses through the water column. Slumps, breccias and frequent calcareous turbidites, often rich in siliceous sponge spicules, ostracods and benthic foraminifers, document the instability of the basin margins. A few beds with trace fossils (*Thalassinoides* and *Rhizocorallium*) document short events of bottom population by deposit

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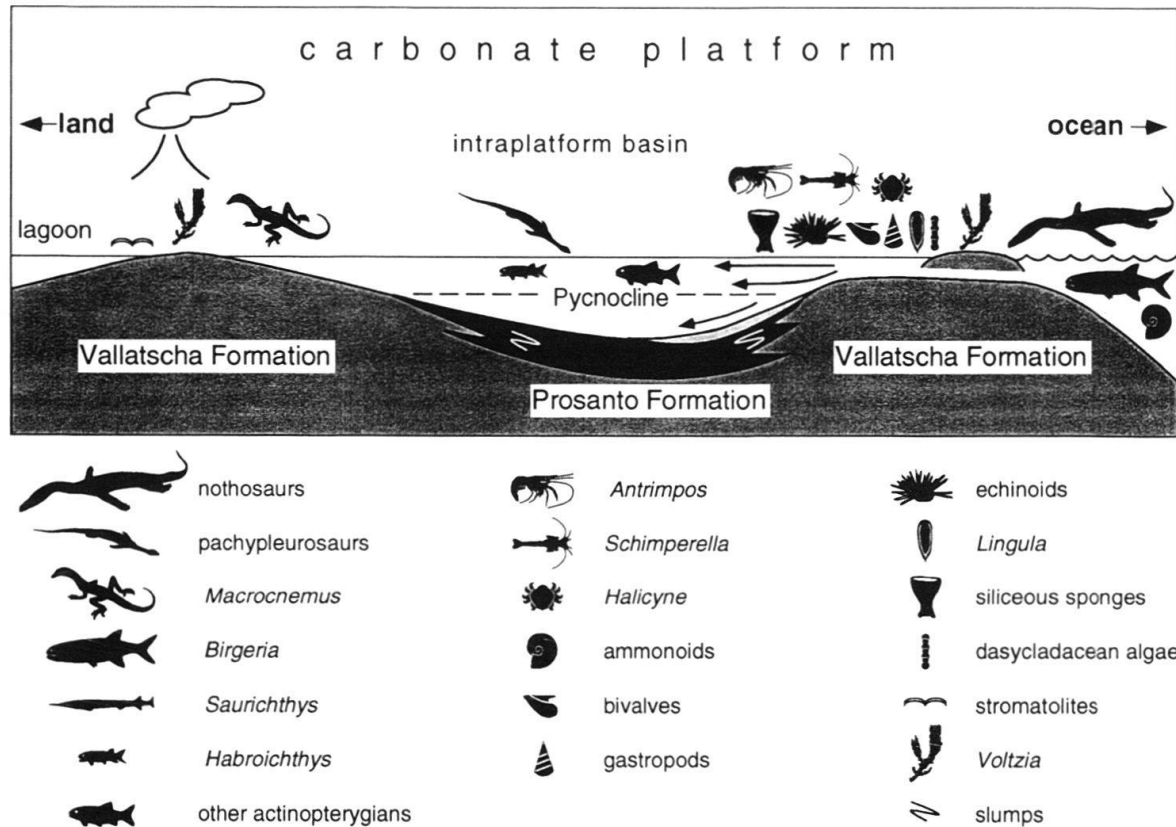


Fig. 1. Paleoecological and depositional model of the Middle Triassic Prosanto Formation. The fishes and aquatic reptiles lived in the surface water of a restricted intraplateform basin. The benthic invertebrates dwelled on the adjoining shallow carbonate platforms and were washed into the basin by storms and currents. Articulated skeletons were preserved in the finely laminated sediments, deposited in stagnant abiotic bottom waters.

feeders, probably linked to gravity flows, transporting burrowing organisms and oxygen into the normally anoxic environment.

The vertebrate fauna is dominated by *Habroichthys*, a small fish with edentulous jaws, presumably feeding in large schools on planktonic organisms. A number of other actinopterygian fishes preyed on small hard-shelled organisms, partly attached to hard substrates. Small and large predatory fishes (*Saurichthys* and *Birgeria*) were in competition with the small pachypleurosaurus and the larger nothosaurs.

The Prosanto Formation is a typical conservation deposit, controlled by stagnation, obrution and bacterial sealing. The characteristic finely laminated limestone and shale must have formed in a small basin below wave base (Fig. 1). The extraordinary fossil preservation and lack of bioturbation can be explained by inhospitable bottom water, which excluded any living macrobenthos. The rare fossil macrobenthos, such as crustaceans (*Antrimpos*, *Schimperella*, *Halicyne*, *Atropicaris*), echinoids, brachiopods (*Lingula*), bivalves, gastropods and dasycladacean algae, probably were washed into the basin by storms and superficial currents. These organisms lived in the shallow water of the adjoining carbonate platforms, documented by the dolomitic Vallatscha Formation. The presence of terrestrial areas is indicated by twigs of the conifer *Voltzia*, silicified wood

(*Araucarioxylon*) and the terrestrial protorosaur *Macrocnemus*. The rarity of stenohaline organisms, such as cephalopods and echinoderms, indicate a restricted environment. The only connection to the open sea probably existed over areas of the shallow carbonate platform. Intense evaporation possibly led to increased salinity and formation of a pycnocline by concentration of the dense brine in the deeper parts of the restricted basin. Stagnant hypersaline bottom water and depletion of oxygen by decaying organic matter could explain the abiotic environment.

The Prosanto Formation of Graubünden can be compared to the Lower Meride Limestone of the Monte San Giorgio area in Canton Ticino (Southern Switzerland, Furrer 1995, this volume) and the Perledo-Varenna Formation (Northern Italy, Gaetani et al. 1992), both time equivalent restricted basinal facies in the Southern Alps. These formations were deposited in similar intraplateau basins separated by shallow carbonate platforms from the open ocean of the Triassic Tethys.

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