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Paleoecological control of ostracode distribution in a Pennsylvanian Auernig cyclothem of the Carnic Alps, Austria

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Abstract

Pennsylvanian (Kasimovian) ostracodes from the lower part of the Auernig Group, Carnic Alps, Austria, inhabited a shallow-marine and open-marine environment. Paleontological investigations of two ostracode faunas brought significant differences between the ostracode assemblage of the *Anthracoporella* (dasycladalean algae) mound environment and the one from the overlying nodular limestone. Additionally paleoecological data are obtained from the overall microfacies of mound and mound-cover rocks and from their respective fossil associations. These data are used to interpret ostracode environments.

Mound ostracode assemblages show a smaller number of dominant species, contain remarkably tiny forms (for example the bolliid *Solleikope parva* Fohrer, 1991), and are dominated by smooth-shelled to less ornamented carapaces. This is probably because large size and sculpture elements such as spines and thorns would have been restricting for a life in an *Anthracoporella* "jungle". Some species, for example *Carnizzia auricula* Fohrer, 1997b, are adapted to the mound environment because of their morphological features, and are very rare to absent outside of the *Anthracoporella* mounds.

Ostracode faunas collected from the overlying nodular limestone are completely different. They are characterized by a higher number of dominant species and show a broad variety of morphological features. These faunas are dominated by the highly ornamented members of the families Amphissitidae, Scrobiculidae, Kirkbyidae, Kellettinidae, and Paraparchitidae.

Representatives of the family Bairdiidae, e.g., *Bairdia*, are the most abundant species in *Anthracoporella* mounds and in the mound-cover rocks. This group of ostracodes requires open-marine and shallow-marine conditions, but within these parameters there is a high paleoecological tolerance. With regard to these paleoecological limits *Bairdia* is an opportunistic species.

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Anthracoporella mound ostracodes of other Pennsylvanian shelf regions have so far not been reported. As to the mound-cover ostracodes there are close relationships of the Carnic Alps ostracodes to those of the Cantabrian Mountains, Spain.

Keywords: *Anthracoporella* mounds; Austria; Carnic Alps; Cyclothems; Ostracodes; Paleoecology; Pennsylvanian; Upper Carboniferous

1. Introduction

Cyclic sedimentation patterns caused by glacio-eustatic sea-level changes are a common phenomenon in Upper Paleozoic strata nearly worldwide. The Pennsylvanian strata of the Carnic Alps (Auernig Group and Lower Pseudoschwagerina Limestone, each consisting of several formations) are characterized by such cyclothems (Figs. 1, 2).

A common type of cyclothem in the Auernig Group begins with siliciclastics at the base. Bedded limestone containing phylloid algae follows upward, merging into algal mounds constructed largely by *Anthracoporella* and *Archaeolithophyllum*. The mounds are overlain by nodular limestone containing selectively silicified organisms. Siliciclastics follow above, before the next cyclothem begins.

Ostracodes are prominent components in Late Carboniferous and Early Permian carbonates of the Carnic Alps and were the subject of several papers (Ruggieri, 1966; Ruggieri and Siveter, 1975; Becker and Fohrer, 1990; Fohrer, 1991, 1997a,b; Sánchez de Posada and Fohrer, 2001). The present paper focuses on the oldest known ostracode faunas and their paleoecological implications of the entire Auernig Group and Rattendorf Group.

Research on ostracodes in Pennsylvanian Auernig Group limestones is governed by the occurrence of selectively silicified organisms including ostracodes (e.g., Fohrer, 1991, 1997a). Otherwise it is very difficult, if not impossible, to extract the ostracodes from the limestones. In general this kind of silicification occurs in the nodular limestones that overlie algal mounds. The massive mounds, which contain algae, are commonly not affected by silicification except for one cyclothem in the Pizzul Formation, where parts of massive algal mound rocks are silicified. The latter has been studied in order to compare ostracodes adapted to *Anthracoporella* mound environments with ostracode faunas obtained from the overlying (mound-cover) nodular limestones.

Ostracode data from *Anthracoporella* mounds of other Pennsylvanian shelf regions have so far not been reported. However, ostracodes of the nodular limestone that overlies mounds bear a striking resemblance to ostracode faunas from the Cuera Limestones (Moscovian) in the Cantabrian Mountains, Spain (Sánchez de Posada and Fohrer, 2001; Sánchez de Posada and Bless, 1999). Thus, comparison of mound versus mound-cover ostracodes in the present paper may give clues to the paleoecological control of ostracode distribution in Pennsylvanian rocks.

2. Location, geological context, and stratigraphic scheme

Basins formed by Variscan orogenic movements (late Namurian to middle Westphalian) in the Carnic Alps, on the present Austrian–Italian border (Fig. 1), were filled with mid-Carboniferous to Early Permian age sediments. These sediments form the Pennsylvanian to Early Permian age Auernig, Rattendorf, and Trogkofel Groups (Figs. 1, 2). The Auernig Group is subdivided, from base to top, into the Meledis, Pizzul, Corona, Auernig, and Carnizza Formations. The measured section (Fig. 3) is from the Pizzul Formation. Sediments of the Auernig Group are cyclic deposits (Auernig Rythmus sensu Kahler, 1955) with quartz-rich conglomerates, sandstone (usually cross-bedded at the base), bioturbated siltstone (with trace fossils), and limestone (Fig. 3). The environments range from deltaic and shoreface to shallow-marine (Venturini, 1990, p. 13). The Rattendorf Group is subdivided into the Lower Pseudoschwagerina Limestone, the Grenzland Formation, and the Upper Pseudoschwagerina Limestone. The overlying Trogkofel Group (Fig. 1, not on Fig. 2) includes the Trogkofel Lime-