
New foraminiferal markers for the late Eocene (Sallow Benthic Zones 19–20) from the Helvetic Alps. Implications in biostratigraphical correlation and paleobiogeography

Carles Ferràndez-Cañadell^{*1}, Claudia Baumgartner-Mora^{†2}, and Peter O. Baumgartner^{‡2}

¹Departament Dinàmica de la Terra i de l'Oceà, Facultat de Ciències de la Terra, Universitat de Barcelona – Spain

²Institut des Sciences de la Terre, Géopolis, CH-1015 Lausanne – Switzerland

Abstract

We describe new foraminiferal taxa, which are new biostratigraphical markers for the late Eocene SBZ 19 and 20 (Priabonian). They include two new genera and new species and subspecies. They are useful biostratigraphical markers easy to identify in random sections and allow discriminating between SBZ 19 and 20.

The larger foraminifera were studied in three sections of the Priabonian Sanetsch Formation in the Helvetic Nappes of the Western Swiss Alps: The Sex Rouge (SE) and the Sanetsch Buvette (SA) sections in the Wildhorn Nappe Complex, and the Col des Essets (ETS) section in the more external Morcles Nappe. In the SE and SA sections, the Tsanfleuron Member and most of the Pierredar Limestone Member of the Sanetsch Formation are assigned to SBZ 19 (early Priabonian), while the uppermost part of the Pierredar Limestone Member is assigned to SBZ 20 (late Priabonian). In the external ETS section the entire Sanetsch Formation contains assemblages characteristic of SBZ 19, suggesting an earlier, middle-late Priabonian onset of the hemipelagic Stad Formation ("Globigerina Marls").

The three sections studied are characterized by different facies. *Nummulites-Asterigerina* facies dominate in ETS section, located in the NW, more continent-ward realm of the Morcles Nappe. Mixed orthophragminid/nummulitid facies dominate in the SE section, and orthophragminid facies in the SA section, both located in the realm of the more SE, internal Wildhorn Nappe Complex. These differences in facies, specifically the *Nummulites* facies derived from shallower depth, dominant in the ETS section are unlikely to have caused the absence characteristic taxa of SBZ 20 in the section. The lack of SBZ 20 is likely related to an earlier, middle-late Priabonian drowning in the NE, Morcles realm, contradicting general models (e.g., Menkveld-Gfeller, 2016) of successive drowning towards the NW.

The new taxa have been recognized in the literature from different Priabonian basins of the western Tethys, including southern Switzerland, northern Italy, the Ebro Basin and the Prebetic range in Spain, southern Greece, and the Thrace Basin in north-western Turkey.

*Speaker

†Corresponding author: claudia.baumgartner@unil.ch

‡Corresponding author: peter.baumgartner@unil.ch

They are, thus, not endemic to the Alpine Helvetic realm, but have a wide geographic distribution in the western Tethys and will help to characterize the Shallow Benthic Zones 19-20 in this areas and to correlate the different basins.

The new genera provide further examples of polyphyletism and parallel evolution in foraminifera. On the one hand, a new species of the rotalid *Rotorbinella* illustrates the polyphyletic recurrent origin of a simple architectural test model (with the simplest canal system) through geological time within the same bioprovince. On the other hand, the evolution of the orthophragminid *Asterocyclina* in the Caribbean and western Tethys conspicuously illustrates the diachronic parallel evolution of the same qualitative characters in geographically separated populations. Parallel evolution also produces similar gradual changes of quantitative characters (size and configuration of the bilocular megalospheric embryo; nepionic reduction), which are used to define species or subspecies biometrically. In consequence, morphologically similar or identical species can independently and diachronically originate in distant bioprovinces. The use of the same specific name for morphologically and biometrically similar species from different bioprovinces, and especially their use for chronostratigraphic correlation should therefore be avoided or applied with extreme caution.

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