Contributions to the lithostratotype of "Hofergrabenmergel" (Hochmoos Formation, Lower Gosau Subgroup; Coniacian/Santonian; Upper Austria)

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The "Hofergrabenmergel" on their classical locality in Sattelgraben (currently used topographic name for „Hofergraben") and outcrops in Finstergraben and Schattau in Gosau region, Northern Calcareous Alps, Upper Austria, represent the upper section of the Hochmoos Formation, which is part of the Lower Gosau Subgroup.
The Hofergabenmergel (name coined by Kollmann, in Plöchinger 1982) are represented by soft grey marls in part rich in corals, gastropods and bivalves.

Finstergrabenwandl

Following the heavy rainfalls in early August 2002 a shallow ditch along the Zwieselalm forest road temporarily exposed the topmost grey marls of Hochmoos Formation (sample point K&S 11 A) below the Kalksandsteinbank of Finstergrabenwandl outcrop. The rich macrofauna of the Kalksandsteinbank of Finstergrabenwandl was described by Dhondt (1987): bivalves), Kollmann (1980: gastropods), Summesberger (1979, 1980, 1992: ammonites) and Tröger & Summesberger (1994: inoceramids). Our sample K&S 11 A from the soft grey marls on the immediate basis of the Kalksandsteinbank yielded poorly preserved assemblages of foraminifers, calcareous nannofossils and palynomorphs, which show an Upper Santonian age.

Finstergraben

We consider the Hofergrabenmergel basically as sediments of a shallow marine muddy water environment. In the upper part of the coral marls sequence light-yellowish limestone beds, rich in corals, gastropods and bivalves are intercalated and also dark grey bituminous calcareous layers up to a few dm thickness occur. The occasional presence of non-marine algae in part of the marls points to freshwater influence from river-estuaries.

According to the present knowledge this predominantly shallow-marine macrofossil-rich marly sequence in the Hofergraben is up to several tens of meters thick and comprises nannozones UC11 and UC12 correlated with the Upper Coniacian-Middle Santonian. Nannofossil assemblages consist of scarce *Micula staurophora*, and consistent *Lucianorhabdus quadrifidus* with long distal stems. The foraminiferal assemblages are dominated by benthonic taxa and confirm a stratigraphical range from the Dicarinella concavata to Dicarinella asymetrica Zones.

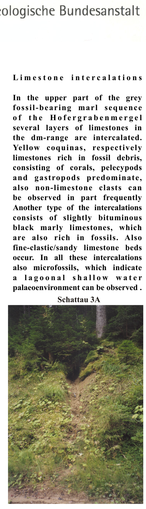
Hofergraben

The ostracod fauna from the Hofergraben is very poor. Main faunal elements are *Bairdia* and *Cytherella*. The palynomorph assemblage corresponds to Oculopollis-Complexiopollis Dominance Zone (Coniacian-Santonian). Dinocyst assemblages suggest prevailingly shallow marine conditions (*Dinogymnium, Odontochitina, Xenascus*), occasionally mixed with chorate dinocysts of litoral or neritic environment (*Spiniferites, Florentinia*).

Limestone intercalations

In the upper part of the grey fossil-bearing marl sequence of the Hofergrabenmergel several layers of limestones in the dm-range are intercalated. Yellow coquinas, respectively limestones rich in fossil debris, consisting of corals, pelecypods and gastropods predominate, also non-limestone clasts can be observed in part frequently Another type of the intercalations consists of slightly bituminous black marly limestones, which are also rich in fossils. Also fine-clastic/sandy limestone beds occur. In all these intercalations also microfossils, which indicate a lagonal shallow water palaeoenvironment can be observed .

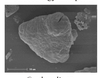
Schattau 3A



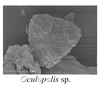
PALYNOMORPHA

Stratigraphically important and characteristic species

Redeposition - bisaceate gymnosperm



Oculopollis sp.



Oculopollis sp.

Palynomorp OCULOPOLLIS-COMPLEXIOPOLLIS	Coniacian - Early Santonian				
Samples	HG1	HG2A	HG2B	HG3A	HG3B
Dinoflagellate cysts					
Achomosphaera ramulifera (Deflandre) Evitt	+	+	+	++	++
Apteodinium cf. *spp.*			+		
Cribroperidinium sp.	+++	++	++	+++	++
Florentinia cooksoniae Cookson & Eisenack			+		
Florentinia mantellii (Davey & Williams)			+		
Florentinia sp.			+		
Fromeodinium cf. *microgranulosum* Clark & Verdier			+		
Fromeodinium sp.			+		
Glaphyrocysta longitra (Davey & Verdier) Dusbury		+			
Florentinia sp.			+		
Heterosphaeridium sp.	+		+		
Odontochitina operculata (Wetzel) Deflandre	+		+		
Odontochitina sp.	+		+		
Palaeohystrichophora infusorioides Deflandre	A	++	++	++	++
Spiniferites sp.	A		++		
Xenascus ceratioides (Deflandre) Lentin & Loeblich	A	++	++	A	
Acritarchs/prasinophytes					
Micrhystridium sp.	+	A	++		+
Leiosphaeridia cf. *similis* Cookson & Eisenack	+				+
Leiosphaeridia sp. indetectum Deunff	+			A	+
Veryhachium sp.	+			A	
Non-marine algae					
Botrococcus braunii Kützing					+
Sporomorphs (pteridophyte spores, Gymnosperm pollen, Angiosperm pollen)					
Pteridophyte spores					
Cyathidites sp.	+	+			
Cyathidites minor sensu Couper	+			+	
Cyathidites minor-ripatus sp.				+	
Cyathidites australis Couper				+	
Cyathidites sp.				+	+
Ephedripites sp.					+
Ephedripites-Gnetaceae (Tricolpate) Groot & Groot	++	+			
Gleichenidites senonicus Ross	++				
Matonisporites cf. *photoni* Couper	+				
Osmunda sp.	+				
Pilosisporites trichopapillatus (Thiergart) Delcourt & Sprumont	+				
Polypodiisporites cf. *polypodiensis* (Groot & Groot) Groot & Penny	+				
Polypodiisporites sp.	++	+	++	++	
Rouseisporites reticulatus Pocock	+				
Stereisporites sp.	++				
Trilobosporites sp.	+				
Gymnosperm pollen					
Araucariacites australis Cookson	+				
Classopollis sensu Pocock	++	++	++	++	++
Classopollis torosus (Reissinger) Couper	+				
Classopollis torosus-fragilis Singh	+				
Ephedripites sp.	+				
Microcachryidites antarcticus Wetzel & Gottfried	+				
Monosulcites sp.	+				
Monosulcites minimus sensu Couper	+				
Monosulcites minimus (Cookson) emend. Dettmann	+				
Monosulcites sp.	+				
Monosulcites sp.	+				
Monosulcites sp.