MICROPALAEONTOLOGY AND LITHOSTRATIGRAPHY OF THE LOWER MIOCENE DEPOSITIONAL SYSTEMS IN THE MISTELBACH HALFGRABEN (WESTERN VIENNA BASIN)

Dissertation

zur Erlangung des Doktorgrades der Naturwissenschaften

an der Karl-Franzens-Universität Graz

Institut für Erdwissenschaften

vorgelegt von

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Graz, September 2016

"I know, for most people the world *Geology* results in the same feelings as, let's say, weaving. Boring. Dirt and rocks. But most people […] would be astonished, how exciting it is to let your feelers grope downwards through the layers of the earth, towards the centre of the planet. It's like leafing through a book written by the earth itself. Full of mysteries! Full of surprise! Full of dark wonders!"

(from "Rumo & Die Wunder im Dunkeln", by Walter Moers)

Contents

Abstract

The Mistelbach Basin, a tectonic halfgraben of c. 60 km length and a maximum width of c. 20 km, is a key area for the understanding of the stratigraphic and palaeogeographic development of the Vienna Basin. The halfgraben forms a junction between the Vienna Basin and the Alpine-Carpathian Foreland Basin and acted variously as gate for marine connections and riverine discharge throughout the Miocene.

During the pioneer phase of Paratethys stratigraphy, the hydrocarbon exploration drillings of this area were the base for still valid foraminifera eco-zonations, proposed by Rudolf Grill. The exploration geologists of the 1940-1950ies, however, were not aware of the complex tectonic setting of the area, which was strongly shaped during the Styrian tectonic phase. New high-resolution 3D seismic data of the OMV-AG revealed spectacular insights into the tectonic setting of the highly structured area, clearly contradicting existing stratigraphic schemes. Strongly tilted lower Miocene strata are separated from Middle Miocene formations by a major erosional phase and discordance, including canyon-like features. Micropalaeontological analyses on samples of 17 cores were performed for bio- and lithostratigraphic reinterpretation. Biostratigraphy is largely based on benthic and planktonic foraminifers. In addition, the partly rich macrofauna (molluscs, otoliths, bryozoans) was identified for palaeoecological analyses. In combination with 2D and 3D seismic data and well log data correlative horizons were defined and interpreted, which allowed establishing a modern lithostratigraphic scheme for all units.

One major result is the correlation of the basal Lužice Formation with the Ottnangian transgression at 18.1 Ma. This dating contradicts Eggenburgian sedimentation in the Vienna Basin and constrains tectonic considerations. The hiatus between the terminal Karpatian and the onset of Badenian sedimentation spans at least 1 Ma, providing ample time for tilting and erosion during the Styrian tectonic phase. In addition a smaller erosive event occurred during the terminal Karpatian, partly anticipating the channel formation in the Badenian.

For the first time, the marine filling of the huge canyon features in the Mistelbach Halfgraben and the Alpine-Carpathian Foreland Basin can be dated as early Badenian based on the occurrence of *Orbulina*.

Zusammenfassung

Das Mistelbach Becken, ein tektonischer Halbgraben von ca. 60 km Länge und einer maximalen Breite von ca. 20 km, ist ein Schlüsselbereich für das Verständnis der stratigraphischen und paläogeographischen Entwicklung des Wiener Beckens. Der Halbgraben bildet den Übergang zwischen dem Wiener Becken und dem Alpin-Karpatischen Vorland und agierte während des Miozäns als Tor für marine sowie fluviatile Verbindungen.

Während der Pionierphase der Paratethys-Stratigraphie, legten die Erkundungsbohrungen der Kohlenwasserstoffindustrie die Basis für die noch immer gültigen Foraminiferen-Ökozonen, die erstmal von Rudolf Grill vorgeschlagen wurden. Die Explorationsgeologen der 1940-1950er jedoch, hatten noch keine Kenntnis vom komplexen tektonischen Bau des Gebietes, der stark durch die „Styrian tectonic phase" geprägt wurde. Neue hochauflösende 3D-seismische Daten der OMV-AG zeigen spektakuläre Einblicke in den tektonischen Bau des stark gegliederten Gebietes, die den bisher vorhandenen stratigraphischen Ideen deutlich widersprechen. Stark gekippte untermiozäne Schichten werden durch eine Haupterosionsphase und deutliche Diskordanz von den darüber liegenden mittelmiozänen Formationen getrennt. Für die bio- und lithostratigraphische Neuinterpretation wurden mikropaläontologische Untersuchungen an Proben von 17 verschiedenen Bohrkernen durchgeführt. Die Biostratigraphie basiert weitgehend auf benthischen und planktonischen Foraminiferen. Darüber hinaus wurde die zum Teil reiche Makrofauna (Mollusken, Otolithen, Bryozoen) für paläoökologische Analysen identifiziert. Zusammen mit 2D- und 3D-seismischen sowie geophysikalischen Daten konnten Korrelationshorizonte definiert und interpretiert werden, die es ermöglichten ein modernes lithostratigraphisches Konzept für alle Einheiten aufzustellen.

Ein wichtiges Ergebnis ist z.B. die Korrelation der basalen Lužice Formation mit der Ottnang-Transgression vor 18,1 Millionen Jahren. Diese Datierung widerspricht einer eggenburgischen Sedimentation im Wiener Becken und schränkt tektonische Überlegungen ein. Der Hiatus zwischen dem ausgehenden Karpatium und dem Beginn der Sedimentation im Badenium erstreckt sich über mindestens eine Million Jahre und liefert dadurch genügend Zeit für die Kippung und Erosion der untermiozänen Schichten während der „Styrian tectonic phase". Außerdem kam es am Ende des Karpatiums zu einem kleineren erosiven Ereignis, welches der channel-Bildung im Badenium vorausging.

Zum ersten Mal konnte die marine Füllung des großen Canyons im Mistelbach Halbgraben und Alpin-Karpatischen Vorlandbecken aufgrund des Auftretens von *Orbulina* auf frühes Badenium datiert werden.

Acknowledgements

First I want to thank my supervisors Mathias Harzhauser and Werner Piller for giving me the opportunity to participate in the project and for the support during the last years.

I am very grateful to Philipp Strauss (OMV-AG, E&P) for developing the idea for this project and for his continuous and valuable support and scientific input. I greatly acknowledge the very open-minded politics of the OMV-AG to provide access to the core material in Gänserndorf, seismic and well log data as well as internal reports to support this thesis.

I also thank Roman Sauer, Thomas Kuffner and Johann Biskup (OMV-AG, Gänserndorf) for the preparation and handling of the numerous core boxes in the storage in Gänserndorf as well as for help and support during the sampling campaigns.

I am especially grateful to Fred Rögl for his help and support while identifying the foraminifera and for providing a stack of literature and other equipment.

Special thanks to Franz Topka for washing and preparing the huge amount of samples.

A tremendous THANKS goes to all the present and also past members of the Geological-Palaeontological Department of the Natural History Museum in Vienna (Elsa, Uschi, Oleg, Thomas I., Thomas II., Thomas III., Sonja, Franz, Herbert, Paloma, Adriana, Omri, Toni I., Toni II., Alex, Andreas, Matús, Heinz Kollmann, Susi, Hildegard Adamek, Alice) for hours of distraction, amusing conversations, culinary delights and lessons in the "Austrian language". Also special thanks to Madalina.

My gratitude goes to all the people I met at the International School on Foraminifera in Urbino/Italy in 2013 for the interesting and helpful lessons, the enormous amount of essential literature and hours of table soccer at "our" favourite pub. Special thanks to my roommate Kate for her still lasting friendship. May *Orbulina* be with you!

Thomas thanks for companionship, your patience and advice, for drying my tears.

Last but not least, I like to thank my family and friends back home in Germany for their love and moral support.

1. Introduction

1.1. Scope of work

In 2012 and 2013, a new 3D seismic campaign was carried out by the OMV-AG located on the Mistelbach Block in the western Vienna Basin. These new seismic data revealed new insights and even sedimentary features, which were unknown so far. Moreover, the survey was located in an important area since the Mistelbach Basin forms the junction between the Alpine-Carpathian Foreland Basin in the west and the Vienna Basin (Pannonian Basin System) in the east. Furthermore the basin fill comprises several hundred metres of especially Lower Miocene deposits.

The new data on the sedimentary architecture (e.g. huge canyon structures with unrecognised basin fans) call doubts on existing stratigraphic schemes and the understanding of the (esp. early Miocene) basin evolution. Consequently the established timing of geodynamic events and calculated sedimentation rates are largely inaccurate. Moreover, the understanding of biostratigraphic events in the circum-Mediterranean area during the Miocene was greatly modified by integration of palaeomagnetic and astrochronologic methods during the last few years. Therefore, existing schemes for the Vienna Basin have to be adapted and synchronised with these new time scales and with the results of this study on the Mistelbach Halfgraben.

Due to the cooperation of the OMV-AG (represented by P. Strauss), the Natural History Museum Vienna (M. Harzhauser, O. Mandic) and the Institute of Palaeontology/University Graz (W.E. Piller) the project named "*Integrated stratigraphy of the Lower Miocene depositional systems in the western Vienna Basin*" was initiated to develop an updated biostratigraphy and new interpretation of the depositional environments of the Lower Miocene successions for a better understanding of the complex geologic evolution of the Vienna Basin.

This can be done by combining the results from 1) suitable wells (regarding their position within the investigation area), 2) a critical biostratigraphic evaluation of the foraminiferal content of the samples, 3) a modern quantitative analysis of these planktonic and benthic foraminiferal assemblages in terms of palaeoecological conditions and 4) the interpretation and incorporation of data based on the 2D and 3D seismics to gain information on depositional environments.

1) Core samples have to be taken from wells, which can be unambiguously positioned in the seismic data. The following wells were chosen to obtain two roughly WNW-ESE trending transects (Poysdorf 1-Walterskirchen 1-Althöflein 1-Ginzersdorf 1+2 in the northern part of the study area and Siebenhirten 3-Mistelbach 1-Mistelbach U1-Kettlasbrunn 1+2-Maustrenk West1 in the central part). The addition of several southern wells (Pirawarth U3+U5, Hohenruppersdorf 19+24+25) allows the formation of roughly NNE-SSW trending transects.

2) The foraminiferal assemblages allow the correlation with other Paratethyan and Mediterranean successions. This is the base for dating the cores and for intrabasin cross-correlations. This cross-correlation will be critically compared with international standard biozones of the Early Miocene. This is crucial as many Vienna Basin eco-bio-zones have turned out to be diachronous and largely facies dependent (e.g. *Spirorutilus* Zone).

3) In the next step, quantitative and qualitative analyses of the planktonic and benthic foraminiferal content of the samples allow a serious evaluation and description of changing palaeoecological parameters (productivity, water depth, oxygenation, transport) through time for each investigated core. As soon as established, these data served for core-to-core intrabasin correlation and helped to identify potential sedimentary gaps or major differences in sedimentary regimes. Analyses included washing and screening for biota; all foraminifera were picked, identified and interpreted. Taphonomical features were evaluated to detect reworking and/or transport. Especially the amount and taxonomic inventory of reworked taxa shed light on the tectonic history of the western Vienna Basin during the Early Miocene when the Waschberg Unit was highly active, reshaping the basin geometry fundamentally.

4) Based on this rigid framework seismic data can be interpreted in a next step in terms of sequence stratigraphy to gather information on the development of the depositional environments of the halfgraben through time.

As a PhD candidate within the project, the parts I was mainly responsible for include the entire biostratigraphic and palaeoecological evaluation of the microfossil content of the samples as well as the description of the sedimentary core material (chapters 3 and 4). Furthermore I was partly allowed to contribute to the lithostratigraphic results (chapter 5). Therefore this thesis comprises mainly these major topics.

1.2. Foraminifera – stratigraphic markers and palaeoenvironmental proxies

Large parts of this thesis are based on the evaluation and interpretation of foraminiferal assemblages to obtain information on biostratigraphic controls and a wealth of different palaeoecological parameters.

Foraminifera (derived from Latin *foramen*, little hole and *ferre*, to carry or bear) are pseudopod-bearing protozoans, which form organic, agglutinated or secreted biomineralised (calcium carbonate) tests that enclose their amoeboid bodies. The tests are single- or multichambered and can show a variety of ornamentations on the surface. The single chambers (foramen) are internally connected via openings and allow the cytoplasm to flow (Kaminski, 2005; Loeblich and Tappan, 1987). Predominantly they are found in marine habitats in a broad range of ecological niches (abyssal to restricted lagoons; Murray, 2006). Over 50 000 fossil and living species are known.

Fossil benthic foraminifera can be used to estimate palaeoenvironmental conditions like bathymetry (water depths), bottom water oxygenation, salinity, productivity, increased sedimentation rates, flux of organic material, water energy and post-depositional transport. They also mirror the influence of e.g. changing substrates, food availability, temperature, seasonality and water clarity. This detailed description of assemblages is possible since numerous studies of modern benthic taxa deliver biological facts and data about foraminiferal ecology and provide kind of a reference data-set for actualistic reconstructions of palaeoenvironments (Leckie and Olson, 2003; Murray, 1991, 2006 and many others). In the fossil record benthic foraminifers are known since the Cambrian (Sen Gupta, 2002). Information about surface water temperature, productivity, salinity, upwelling and surface water stratification are given by planktonic foraminifera, which are known in the fossil record since the Jurassic (Sen Gupta, 2002). They serve as palaeoclimatic indicators.

1.3. OMV-Data

Besides the vast amount of samples of core material, which were gathered during four sampling campaigns at the core shed in Gänserndorf, the OMV-AG provided screenshots of numerous seismic lines (x-, i-, random-lines) as well as 3D maps from the seismic survey on the Mistelbach Block. Digitalised SP- and RES-log data from the selected wells were available as well as scans of the e-logs. Additionally, the OMV enabled access to internal well reports and descriptions from the 1950ies to late 1980ies to gain supplementary information.

Furthermore the following OMV-internal reports from other projects were kindly provided:

- Beidinger et al. (2009): Tectonic evolution of the Vienna Basin and the Waschberg Zone during the early Miocene.
- Decker et al. (2011): Tectonics of the Slovak part of the Vienna Basin and the adjacent western Carpathians during the Lower Miocene.
- Fuchs et al. (2001): Mid-Oligocene Thomasl-Formation (Waschberg Unit, Lower Austria) – Micropaleontology and stratigraphic correlation.
- Kuffner (2001): Depositional environment and reservoir properties of selected Egerian, Eggenburgian and Ottnangian cores from the Waschberg Zone.
- Sauer and Kuffner (1997): Depositional environment, petrography and reservoir properties of selected Helvetian cores.
- Schreiber (1988): Biostratigraphische Neubearbeitung des tieferen Neogen im nördlichen Wiener Becken.
- Schreiber (1989): Biostratigraphische Nachuntersuchung an Bohrungen im Raum Walterskirchen – Großkrut – Ginzersdorf.

2. Geological setting

During the late Eocene the Eurasian area was a vast archipelago, flooded by intercontinental seas with open marine connections to the Atlantic and the Indopacific Ocean (Rögl, 1999; Steininger and Wessely, 2000). Close to the Eocene/Oligocene boundary the Eurasian realm underwent fundamental tectonic and palaeogeographical changes induced by the northward movement and anticlockwise rotation of the African plate (Kováč et al., 1998a; Márton et al., 2003, 2006; Rögl, 1998b, 1999). The resulting continuous rise of the Alpine mountain chain led to the disintegration of the ancient Tethyan Ocean into the southern Mediterranean Sea and the northern Paratethys Sea (Báldi, 1980; Piller et al., 2007; Rögl, 1998b, 1999).

Laskarev (1924) recognised the different and often highly endemic character of the Paratethyan (esp. mollusc) faunas while investigating the Vienna, Styrian, Pannonian, Dacian and Euxinian basins. Therefore, he introduced the separation of the Paratethys as an independent (bio-) geographic entity from the Neogene Mediterranean bioprovince. The subdivision of the Paratethys into three palaeogeographic and geotectonic parts (western, central and eastern Paratethys) traces back to Seneš (1959). Each unit describes a different environmental history. The elongated Western Paratethys region spreads along the Alpine Foreland Basins of France, Switzerland, southern Germany and Upper Austria, whereas the Central Paratethys extended along the Eastern Alpine – Carpathian Foreland basins from Lower Austria to Moldavia, including the Pannonian and Dacian as well as the Vienna Basin. Today's area of the Black, Caspian and Aral Sea basins correspond to the Eastern Paratethys (Piller et al., 2007; Seneš, 1959, 1961).

During the Oligocene and Middle Miocene the **Central Paratethys** covered large parts of Central Europe (fig. 1). Regional tectonics, complex patterns of changing seaways and landbridges as well as global sea-level changes strongly influenced the palaeogeography and -oceanography but also the development of flora and fauna of the region during this time window (Piller et al., 2007; Rögl, 1998b, 1999). Subsequent restrictions of the marine realm led to the development of the Pannonian Lake System during the late Miocene (fig. 1D; Harzhauser and Piller, 2007). Regional stratigraphic concepts were developed to better understand the complex history of the Central Paratethys and to describe its distinct biogeography, facies and depositional patterns (mainly Báldi and Seneš, 1975; Cicha et al., 1967; Papp et al., 1973, 1974, 1978, 1985; Steininger and Seneš, 1971; Stevanović et al., 1990).

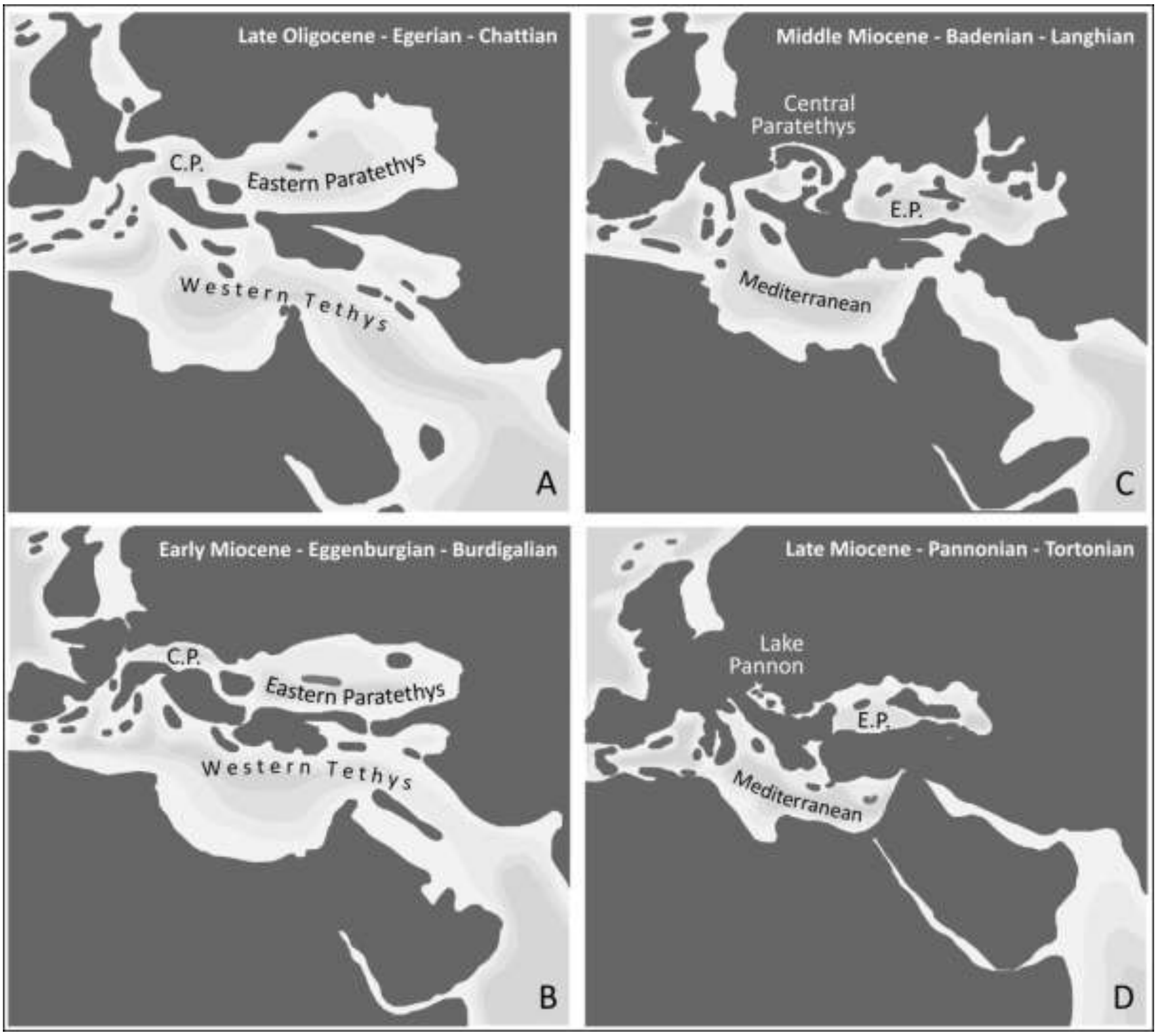


Fig. 1: Late Oligocene to Late Miocene palaeogeographic maps of the Paratethys and Mediterranean Seas according to Rögl (1998b) and Harzhauser and Piller (2007). Abbr.: C.P. = Central Paratethys, E.P. = Eastern Paratethys.

The **Vienna Basin** is located at the northwestern margin of the Pannonian Basin System within the Alpine-Carpathian mountain chain, more precisely between the Eastern Alps and the Western Carpathians (fig. 2). It covers large parts of eastern Austria (Lower Austria, Vienna and Burgenland) and extends into the Czech Republic in the N and Slovakia in the E. The Vienna Basin is a rhombic pull-apart basin, about 200 km long and 55 km wide (Decker and Peresson, 1996; Royden, 1985; Wessely, 1988) and it strikes roughly SW-NE from Gloggnitz (Lower Austria) in the SSW to Napajedla (Czech Republic) in the NNE.

Its southwestern border is formed topographically by the Eastern Alps and to the NW by the Waschberg-Ždánice Unit. To the east it is bordered by the Rosalia, Leitha and Hainburg Hills and the Male Karpaty Mountains, all four are part of the Alpine-Carpathian Central Zone. Pre-Neogene

Alpine-Carpathian nappes form the basement of the Vienna basin, whose Neogene sedimentary fill reaches a maximum thickness of about 5500 m.

Fig. 2: Geographic position of the Vienna Basin in the Alpine-Carpathian-Pannonian System. ***1*** *– European platform,* ***2*** *– Carpathian-Alpine externides,* ***3*** *– Pieniny Klippen Belt,* ***4*** *– Alpine-Carpathian-Dinaride and Pannonian internides,* ***5*** *– Neogene volcanites,* ***6*** *– Neogene basins. B = Bükk, NCA = Northern Calcareous Alps, TCR = Transdanubian Central Range (from Hyžný and Schlögl, 2011 and Harzhauser et al., 2011b, therein simplified from Kováč, 2000).*

The Spannberg Ridge – a morphological high – subdivides the basin into a northern and a southern part (Wessely, 2006). Due to the ridge marine sedimentation was restricted to the north (N of the Danube) during the Early Miocene and extended into the south only during the Middle and Late Miocene. The Vienna Basin is internally subdivided into a series of horst and graben systems developed by a complex fault system. The uplifted blocks at the margin of the basin are separated from the inner deeper areas by major faults. These systems are the Mistelbach Halfgraben with the corresponding Steinberg Fault in the northwestern basin, the Moravian central depression and Bulhary Fault in the northern basin, the Mödling Block and Leopoldsdorf Fault in the southern basin and the Láb-Malacky High and Leitha and Láb Fault Zones in the eastern part of the Vienna basin (Wessely, 2006).

Two distinct stages characterise the evolution of tectonics, subsidence and sedimentation in the Vienna Basin. During the first stage - referred to as a Lower Miocene piggy-back stage –

sedimentation occurred in a system of piggy-back basins, which developed in a compressive tectonic regime established by the collision of the orogen with the North European platform (Hölzel et al., 2010; Kovác et al., 1989, 1998b; Peresson and Decker, 1997; Seifert, 1992). The subsequent Middle to Upper Miocene stage of pull-apart basin formation along the sinistral Vienna Basin Transfer Fault was enabled due to the northeastward lithospheric displacement of the Western Carpathians (Hölzel et al., 2010; Kovác et al., 1998b; Ratschbacher et al., 1991; Royden, 1988). During a compressional phase during the late Miocene basin subsidence and sedimentation terminated (Decker and Peresson, 1996; Hölzel et al., 2010).

The first modern description of the tectonic elements forming the Mistelbach area was presented by Janoschek (1951), who named the unit "Mistelbach Hochscholle" (**Mistelbach Horst**) (figs. 3-5). Although Janoschek (1951) did not have adequate seismic data his basic subdivisions are still valid.

The Mistelbach Horst (figs. 3, 4) is an elongate rhombic, SW-NE oriented element along the northwestern margin of the Vienna Basin with a maximum length of c. 60 km and a maximum width of c. 20 km. Its southernmost tip is in the area of Manhartsbrunn and Münichsthal in Austria and the northern spur reaches to Břeclav and Lednice in the Czech Republic. In respect to its width, its westernmost point is Olgersdorf and the area between Sulz and Steinberg marks its eastern limit. Tectonically, the Schrattenberg Fault forms its northwestern boundary to the Waschberg-Ždánice Unit and the northwestern boundary to the Poysbrunn Horst. The Bisamberg Fault represents its southwestern boundary to the Rhenodanubian Flysch Unit. The huge Steinberg Fault forms its eastern boundary towards the deeper parts of the VB, such as the Aderklaa High, the Matzen High and the Zistersdorf Depression.

Internally, the Mistelbach Horst comprises the Kronberg High in the south, which lacks lower Miocene deposits. It passes towards the north into the deep Mistelbach Halfgraben (= Muldenzone Schrick-Kettlasbrunn sensu Janoschek, 1951), which is mainly defined by the steep Bisamberg Fault in the west and the adjacent Mistelbach High (= Hochzone Wilfersdorf-Paasdorf-Neubau sensu Janoschek, 1951). West of this structure follows the shallow Siebenhirten Basin (=Erdberger Muldenzone sensu Janoschek, 1951). It is limited in the west by the narrow Hörersdorf High and the associated Schrattenberg Fault and passes towards NNE into the Katzelsdorf Basin. This is defined by the Schrattenberg Fault and the adjacent Poysbrunn Horst in the NW and the Althöflein High, which forms its separation from the Mistelbach Halfgraben in the south.

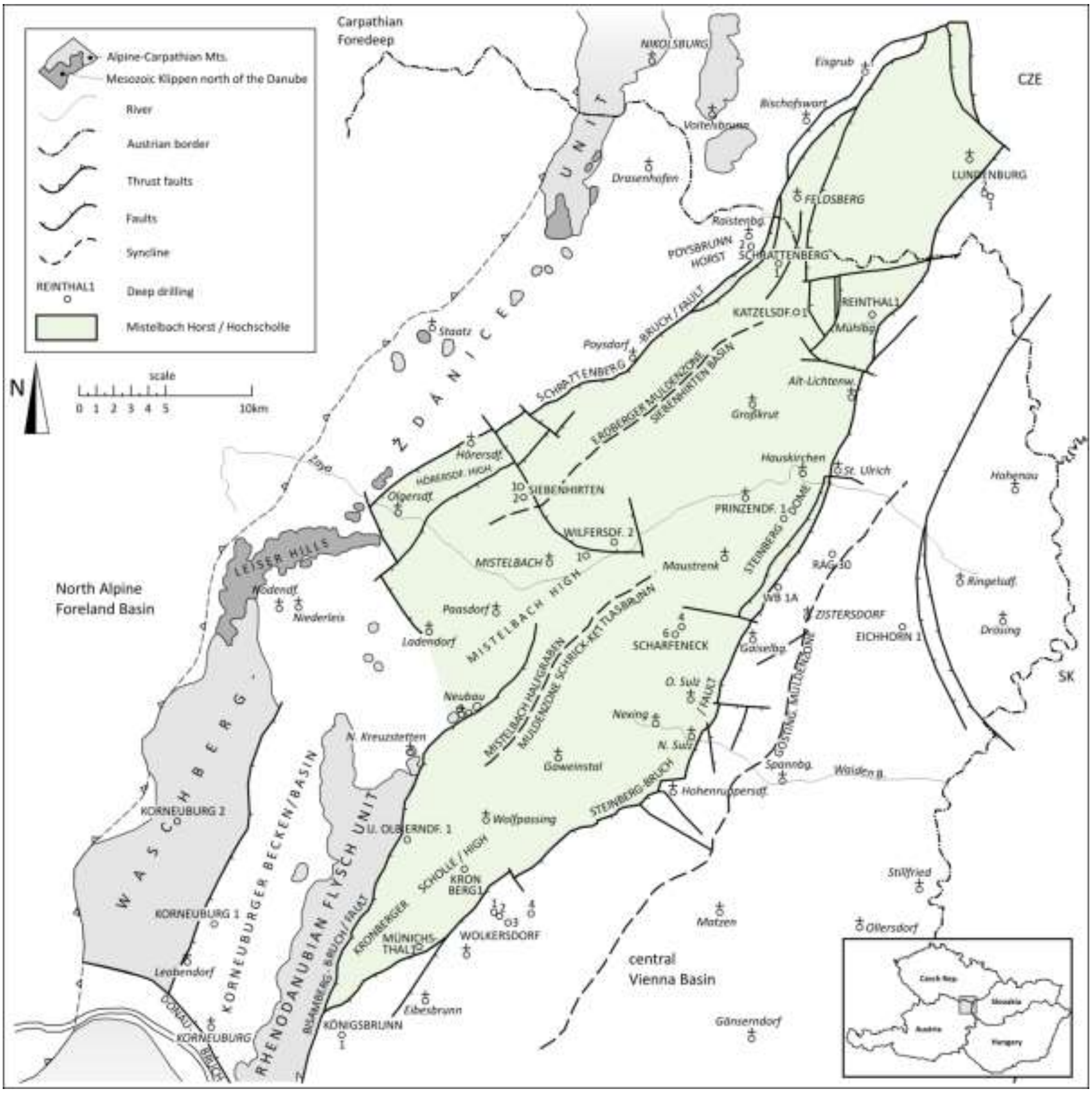


Fig. 3: Geographic position of the Mistelbach Horst (Mistelbach Hochscholle sensu Janoschek, 1951) in the northwestern area of the Vienna Basin and its tectonic elements (modified from Janoschek, 1951).

The 3D survey of the OMV took place roughly in the centre of the Mistelbach Horst (fig. 5). Mainly the Miocene deposits of the Mistelbach Halfgraben are considered within the current project. For this area, the existing lithostratigraphy, as used in the geological literature and especially in internal OMV reports is largely a hybrid of litho-, bio- and ecostratigraphic terms (fig. 6). This hybrid-situation is based on the mixture of Austrian terms developed for the adjacent North Alpine Carpathian Foredeep in the west, internal OMV terminology developed for the central Vienna Basin and established formation names from the Czech-Slovak part of the Vienna Basin in the northeast.

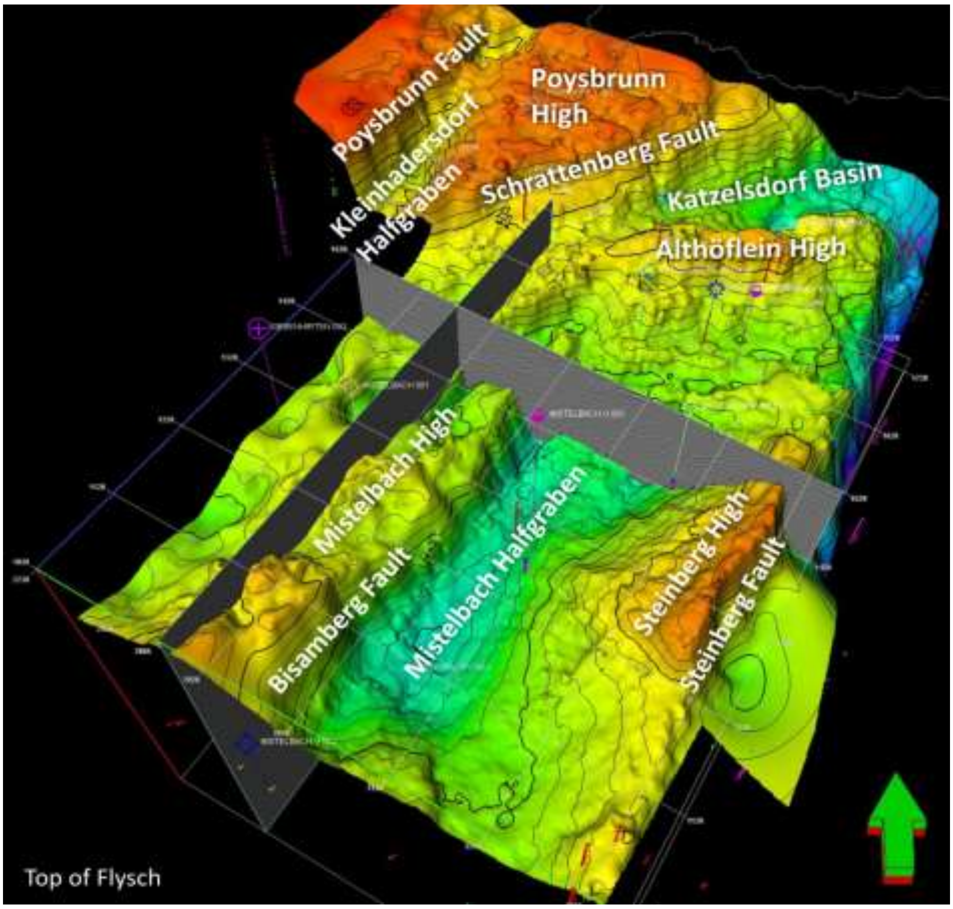


Fig. 4: 3D seismic topography of the investigated Mistelbach Half-graben based on the Flysch-top reflector with position of the structural entities sensu Janoschek, 1951 (provided by P. Strauss, OMV).

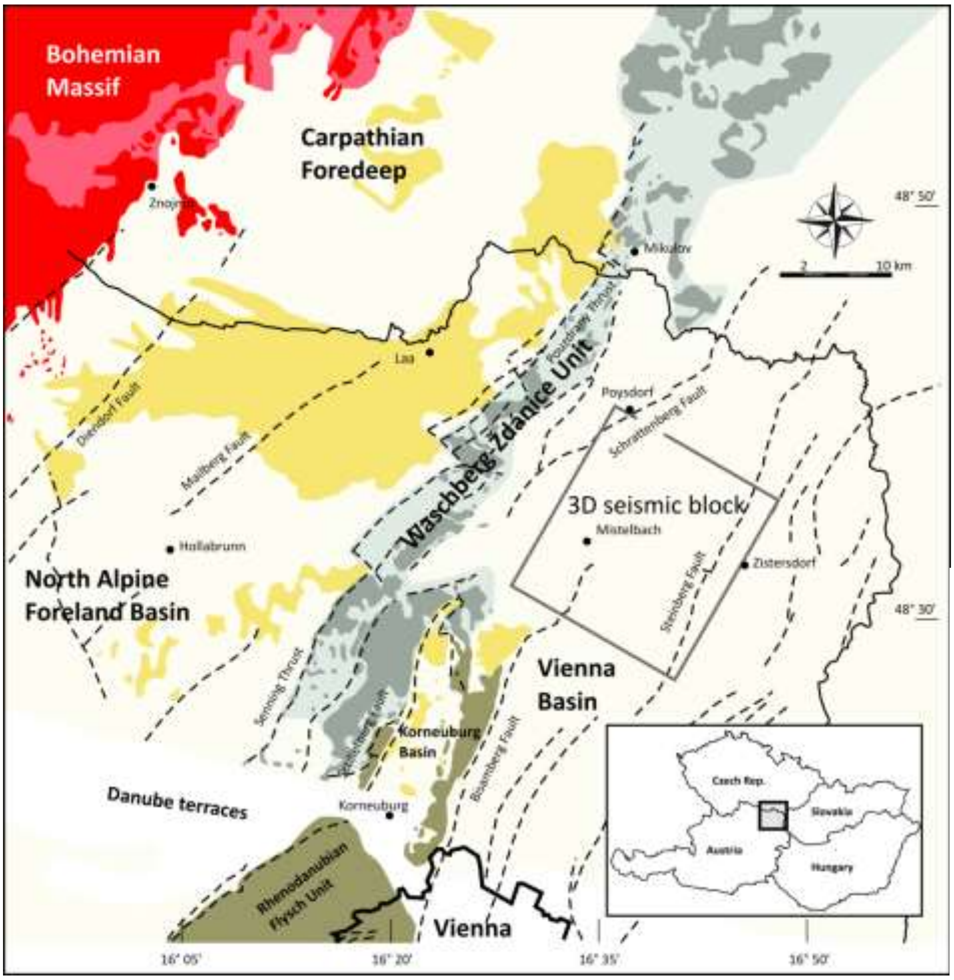


Fig. 5: Position of the investigation area plotted on the simplified geologic map of Lower Austria (modified from Dellmour and Harzhauser, 2012).

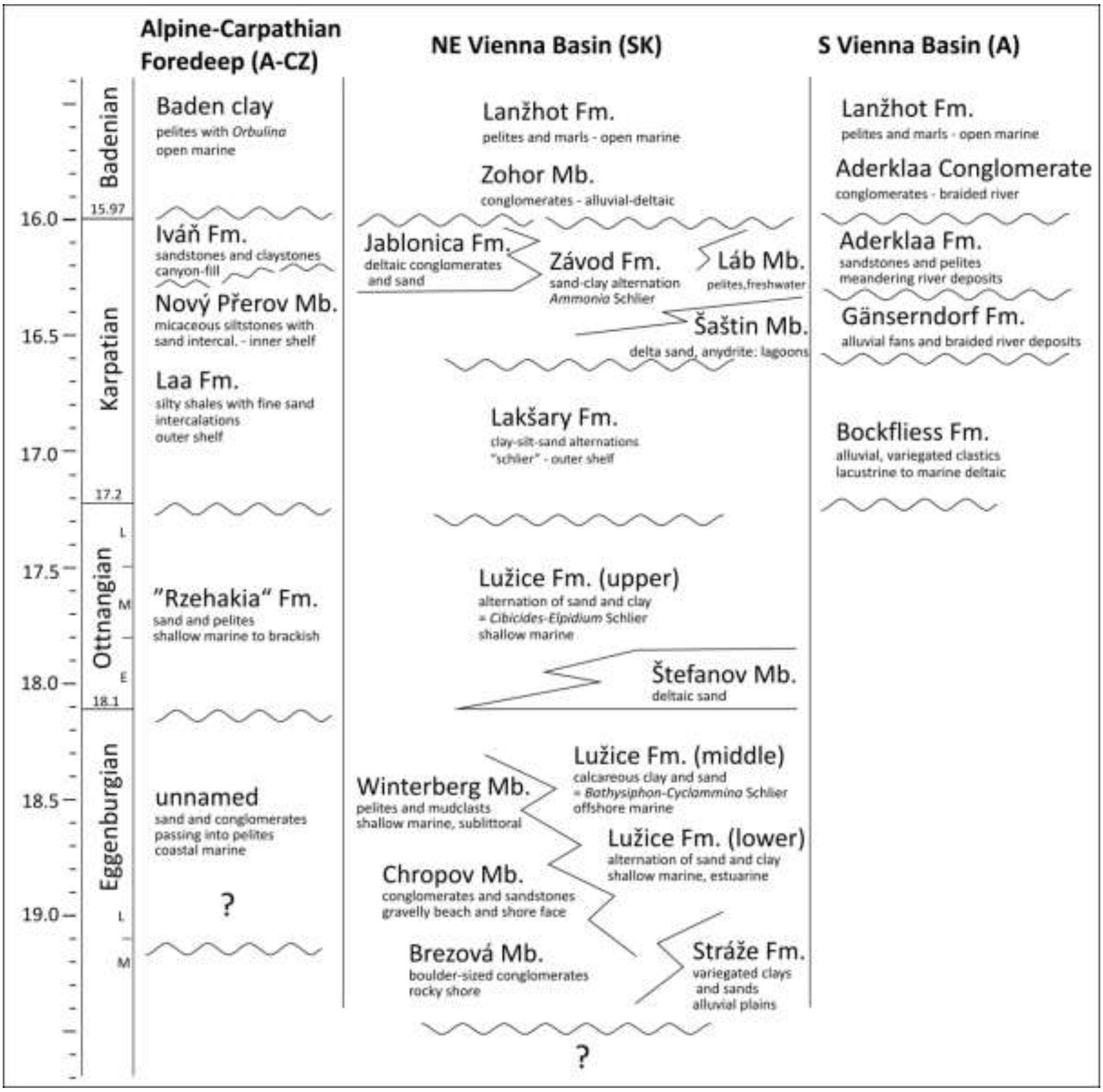


Fig. 6: Lithostratigraphic "starting situation" for the Miocene deposits of the Mistelbach Halfgraben, which is mainly a hybrid of litho-, bio- and ecostratigraphic terms based on the mixture of Austrian terms used for the North Alpine Carpathian Foredeep in the west, internal OMV terms for the southern/central Vienna Basin and formation names from the Czech and Slovak parts of the Vienna Basin in the northeast (Adámek et al., 2003; Buday, 1955; Buday and Cicha, 1956, 1965; Cicha et al., 1998; Grill, 1941, 1943; Jiříček and Seifert, 1990; Kováč et al., 2004; Roetzel and Schnabel, 2002; Špička, 1966; Špička and Zapletalová, 1943; Vass, 2002; Veit, 1943; Weissenbäck, 1995).

3. Wells, cores, samples & e-logs

3.1. Introduction

Within the joint project 17 wells were selected based on available core material and their relative position in the survey area (figs. 7, 8). The main aim was to cover several SSW-NNE and WNW-ESE transects (see fig. 86), which could be linked to the 3D seismic survey. Sampling took place during four campaigns in March and September 2013. Altogether 404 samples were taken from the wells (tab. 1). Additionally, lithological and sedimentological features of the sampled cores were briefly described, macroscopic palaeontological features were noted and pictures were taken from all cores. A detailed sedimentological analysis, however, was beyond the scope of the present study. The e-log data, if available, were kindly provided by the OMV E&P.

well	sample total
Althöflein 1	45
Ginzersdorf 1	19
Ginzersdorf 2	16
Hohenruppersdorf 19	14
Hohenruppersdorf 24	11
Hohenruppersdorf 25	15
Kettlasbrunn 1	34
Kettlasbrunn 2	50
Maustrenk West1	50
Mistelbach 1	21
Mistelbach U1	14
Pirawarth U3	5
Pirawarth U5	2
Poysdorf 1	29
Scharfeneck Ost1	26
Siebenhirten 3	27
Walterskirchen 1	26
	404

Tab. 1: Number of samples taken per well.

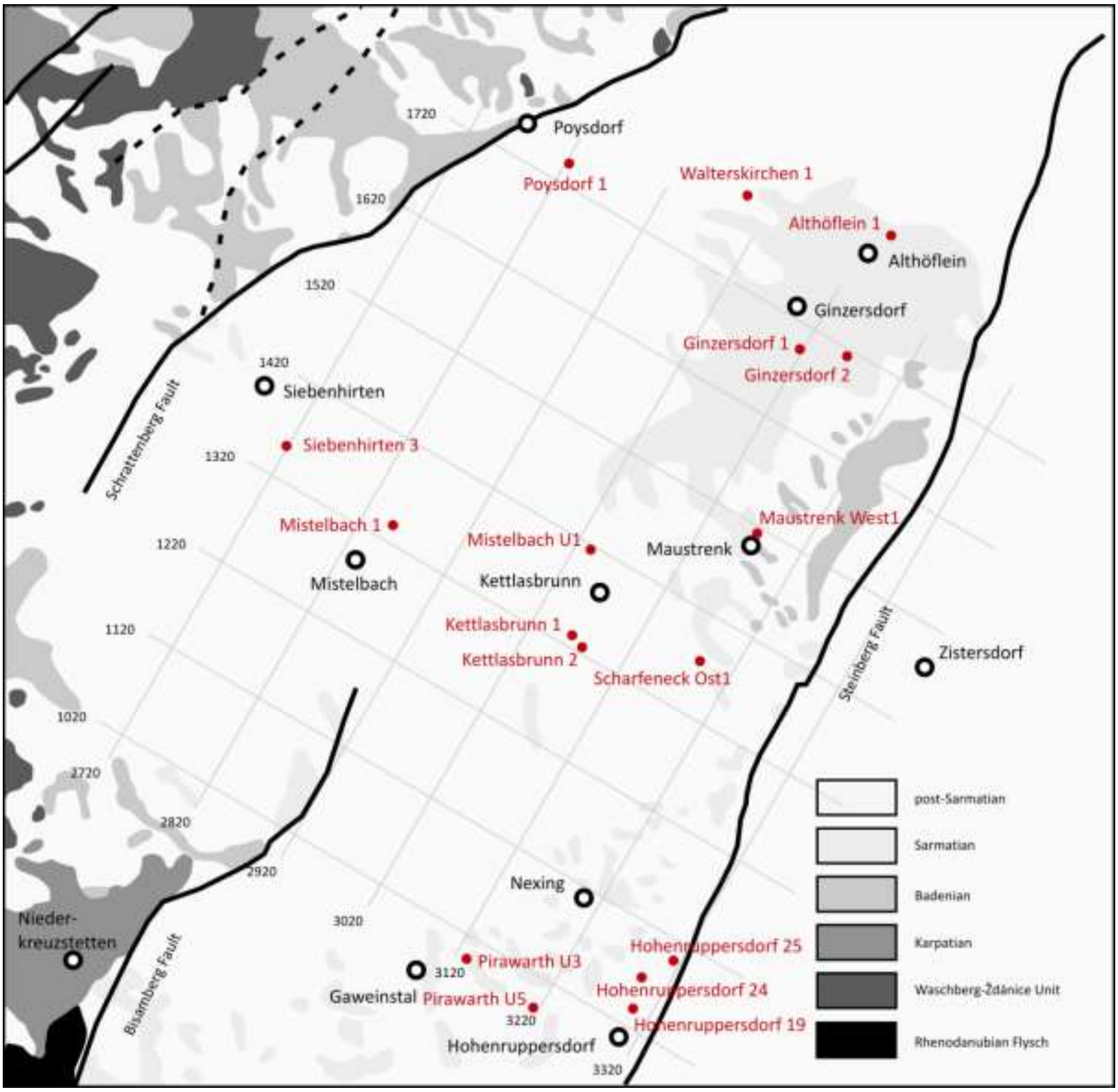


Fig. 7: Position of the 17 selected wells (red) within the survey area (grid) and overview on the surrounding surface geology (after Grill, 1968 and Schnabel et al., 2002).

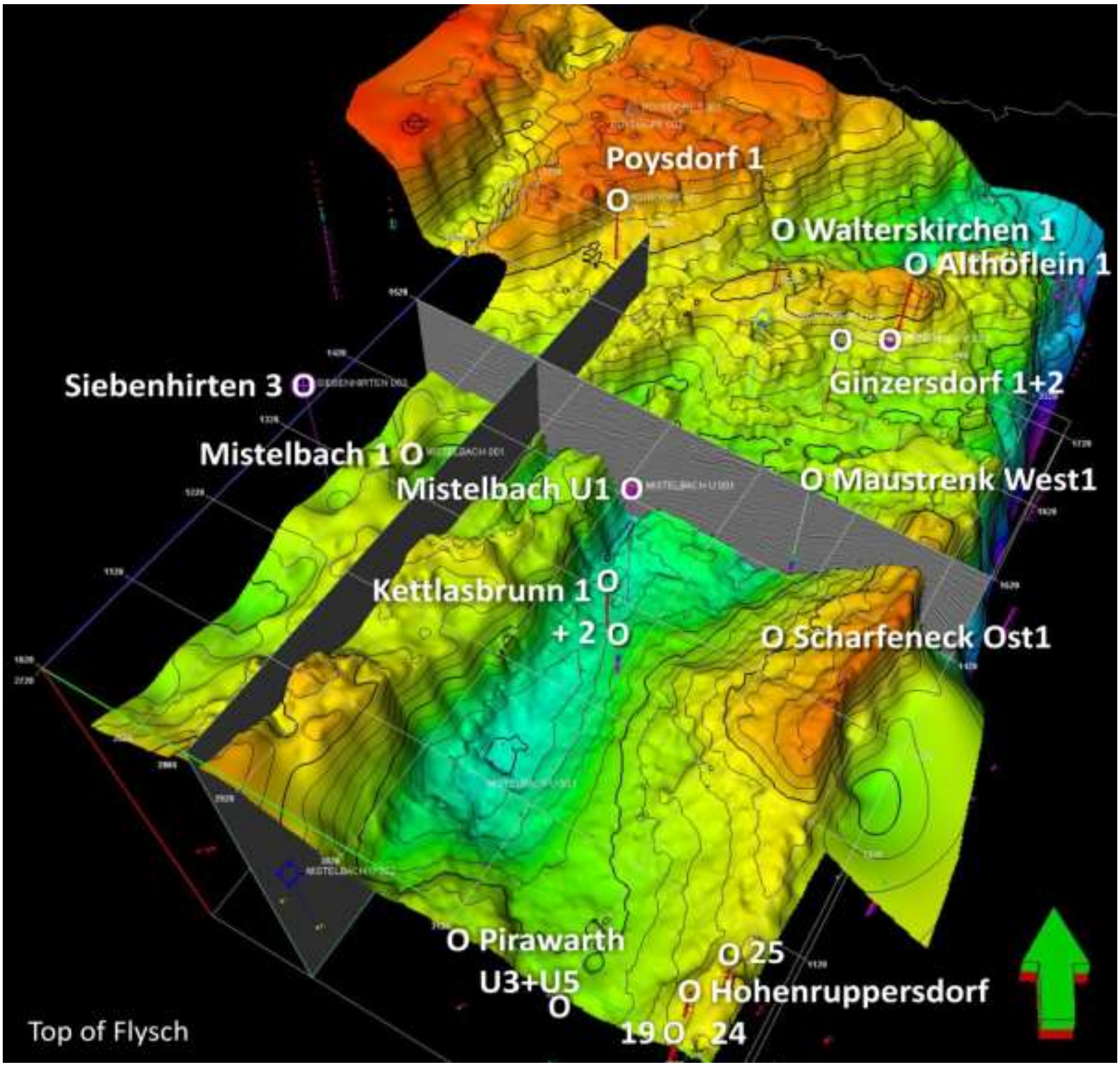


Fig. 8: 3D seismic topography of the investigated Mistelbach Halfgraben based on the Flysch-top reflector with position of the selected wells (picture provided by P. Strauss, OMV).

3.2. Althöflein 1

3.2.1. Sampling

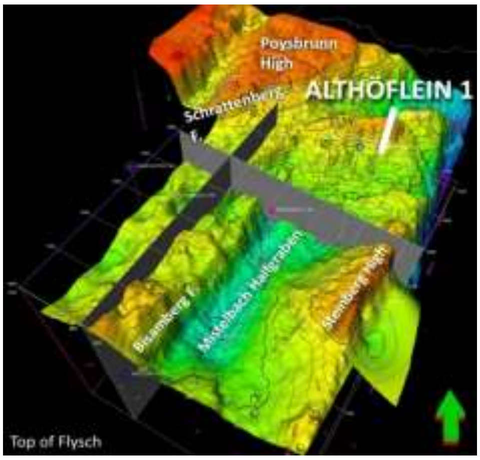


Fig. 9: Northeastern position of the Althöflein 1-well within the investigated area of the Mistelbach Block.

The Althöflein 1-core was sampled on March 12th and 25th in 2013 in Gänserndorf. The well is located in the northeastern area of the Mistelbach Block-survey on the south-facing slope of the Althöflein High (fig. 9). In total 45 samples were taken from the about 600 m long available core material, preferably in more clayey to fine sandy sediments. 18 of these samples were stored, whereas the remaining 27 samples went into technical processing and micropalaeontological studies (tab. 2).

3.2.2. Lithology – core material (fig. 10)

The sediments of the Althöflein 1-core consist mainly of greyish and micaceous, partly fine sandy marls, which sporadically show bedding or fine lamination. Often gastropods and bivalve remains as well as carbonised plant debris can be observed.

The uppermost core AH1 (11–14m) 1/1 consists of light to middle grey marl. Small pebbles as well as thin layers of carbonised plant debris can be found occasionally. Downcore (AH1 (40–45m) 2/1) the marl gets sandier and the underlying core AH1 (70–75m) 3/1 is made up of fine- to middle-grained sand and shows also signs for palaeosol formation. The five cores AH1 (70–75m) 3/2 and AH1 (100–105m) 4/1+2+3+4 are composed of middle to dark grey, micaceous and sandy marl. Partly the marl is more clayey and/or shows layers of small carbonised plant debris. Core AH1 (130–135m) 5/1 consists of greenish, micaceous and marly fine-grained sand. The topmost 20 cm are made of green marl. Micaceous, light to middle grey, fine- to middle-grained sand builds up core AH1 (130–135m) 5/2. Marly and grey fine sand follows in the underlying core AH1 (160–165m) 6/1, which merges into middle grey and micaceous marl in core AH1 (160–165m) 6/2. Core AH1 (160–165m) 6/3 comprises middle grey, fine- to middle-grained sand and sandy, dark marl. Sandy and dark grey marl is found in the cores AH1 (190–195m) 7/1 and AH1 (190–195m) 7/2. A fine-grained, marly, micaceous and light to dark grey sand builds up cores AH1 (190–195m) 7/3+4, the latter also contains small gastropods. The cores AH1 (220–225m) 8/1+2+3 comprise fine sandy, micaceous marl. In the light grey sediment bivalve remains and gastropods were found. The same sediment can be observed in the following five cores AH1 (250–255m) 9/1+2+3+4+5, which also show layers of clayey flakes, bedding structures, bivalves and carbonised plant remains. Sand-free, grey-brown and micaceous marl with gastropods makes up cores AH1 (280–285m) 10/1+2. Cores AH1 (310–315m) 11/1+2 consist of fine sandy, light grey-brown marl with a fine lamination and small pebbles. The basal part of core AH1 (340–345m) 12/1 is made up of conglomerate with sandy matrix. The remaining part comprises a light to middle grey, partly sandy and micaceous marl. Core AH1 (340–345m) 12/2 shows the same composition. Grey, fine sandy and micaceous marl can be observed in the cores AH1 (370–375m) 13/1+2+3. This marl continues in rather this composition in all following 24 cores down to the base of the well (AH1 (400–405m) 14/1, AH1 (430–435m) 15/1+2+3+4, AH1 (460–465m) 16/1, AH1 (490–495m) 17/1+2+3, AH1 (520–523m) 18/1+2+3, AH1 (550–555m) 19/1+2+3+4, AH1 (580–585m) 20/1+2, AH1 (610–615m) 21/1+2, AH1 (640–645m) 22/1+2 and AH1 (670–674m) 23/1+2). Carbonised plant remains and macrofossils were not found in these samples.

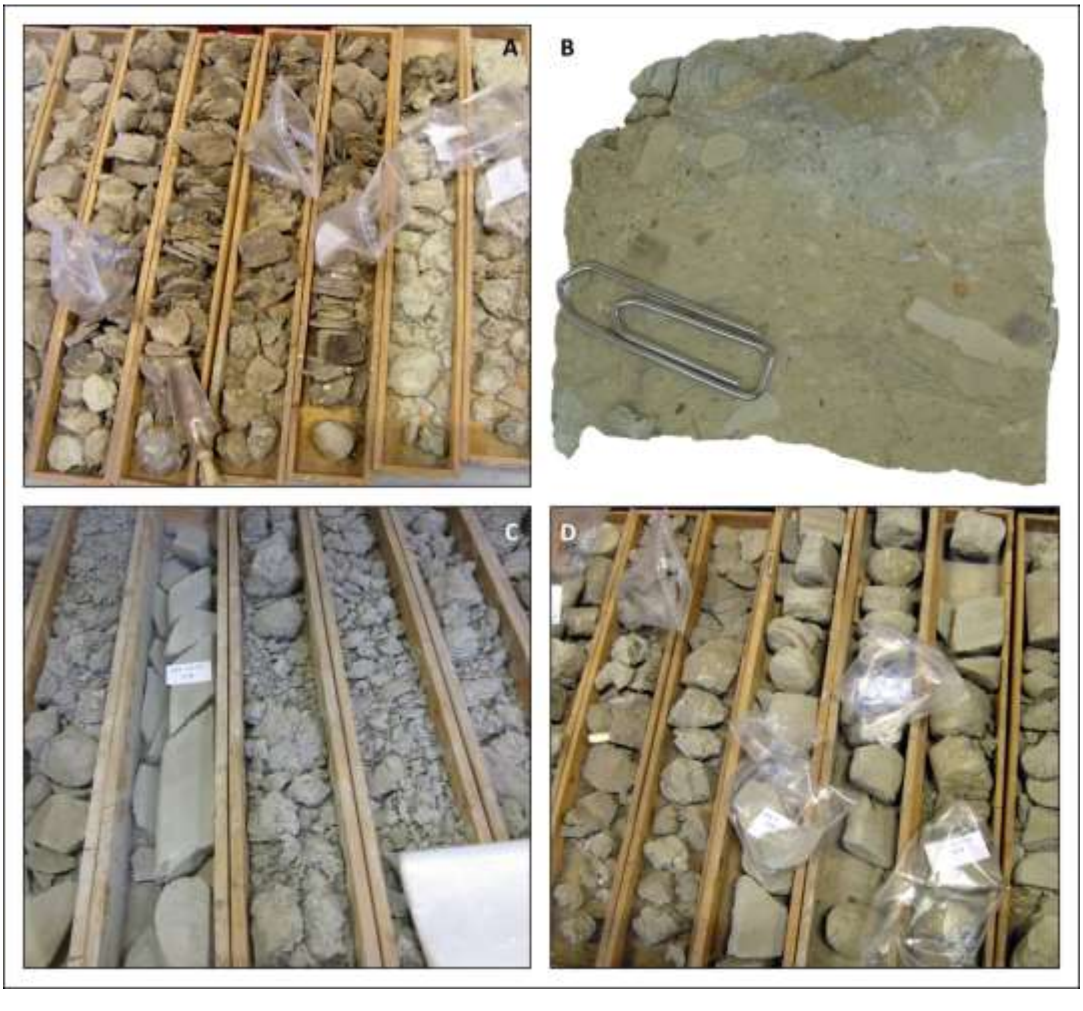


*Fig. 10: **A:** View on the various coloured sandy marls of cores AH1 (100–105m) 4 (left) to AH1 (160–165m) 6 (right). One box measures one metre in length. **B:** Detailed view on the basal part of core AH1 (340–345m) 12/1, which is composed of a light brown conglomerate with sandy matrix. **C:** Light to middle grey marls make up the lower half of the core: on the left more homogenous core AH1 (550–555m) 19/1 (small white paper) and on the right core AH1 (580–585m) 20/2+1. **D:** Brownish marl of cores AH1 (220–225m) 8/2+1 (left side) and the more homogenous cores AH1 (250–255m) 9/5-2 (right side) consisting of fine- to middle-grained sand with weak bedding.*

Tab. 2: Overview on sample status.

Althöflein 1	**date of sampling**	**sampled**	**stored**	**processed**	**with foramini-feral content**	**micro-sterile**
AH1 (100-105m) 4/4	12.03.2013	x	x			
AH1 (100-105m) 4/2	12.03.2013	x	x			
AH1 (100-105m) 4/1	12.03.2013	x		x	x	
AH1 (130-135m) 5/2	12.03.2013	x	x			
AH1 (130-135m) 5/1	12.03.2013	x		x	x	
AH1 (160-165m) 6/2	12.03.2013	x		x	x	
AH1 (160-165m) 6/1	12.03.2013	x	x			
AH1 (190-195m) 7/4	12.03.2013	x		x	x	
AH1 (190-195m) 7/2	12.03.2013	x	x			
AH1 (220-225m) 8/3	12.03.2013	x	x			
AH1 (220-225m) 8/2	12.03.2013	x		x	x	
AH1 (250-255m) 9/5	12.03.2013	x	x			
AH1 (250-255m) 9/4	12.03.2013	x		x	x	
AH1 (250-255m) 9/3	12.03.2013	x		x		x
AH1 (280-285m) 10/2	12.03.2013	x		x	x	
AH1 (280-285m) 10/1	12.03.2013	x	x			
AH1 (310-315m) 11/1	12.03.2013	x		x	x	
AH1 (340-345m) 12/2	12.03.2013	x	x			
AH1 (340-345m) 12/1	12.03.2013	x		x		x
AH1 (370-375m) 13/3	12.03.2013	x		x	x	
AH1 (370-375m) 13/1	12.03.2013	x		x		x
AH1 (430-435m) 14/1	25.03.2013	x		x		x
AH1 (430-435m) 15/4	25.03.2013	x	x			
AH1 (430-435m) 15/3	25.03.2013	x		x	x	
AH1 (430-435m) 15/2	25.03.2013	x	x			
AH1 (430-435m) 15/1	25.03.2013	x	x			
AH1 (460-465m) 16/1	25.03.2013	x		x	x	
AH1 (460-465m) 17/3	25.03.2013	x	x			
AH1 (460-465m) 17/2	25.03.2013	x		x		x
AH1 (460-465m) 17/1	25.03.2013	x	x			
AH1 (520-523m) 18/3	25.03.2013	x		x	x	
AH1 (520-523m) 18/2	25.03.2013	x	x			
AH1 (520-523m) 18/1	25.03.2013	x		x		x
AH1 (460-465m) 19/4	25.03.2013	x	x			
AH1 (460-465m) 19/3	25.03.2013	x		x		x
AH1 (460-465m) 19/2	25.03.2013	x		x		x
AH1 (460-465m) 19/1	25.03.2013	x		x		x
AH1 (460-465m) 20/2	25.03.2013	x		x		x
AH1 (460-465m) 20/1	25.03.2013	x		x		x
AH1 (610-615m) 21/2	25.03.2013	x		x	x	
AH1 (610-615m) 21/1	25.03.2013	x	x			
AH1 (610-615m) 22/2	25.03.2013	x		x		x
AH1 (610-615m) 22/1	25.03.2013	x		x		x
AH1 (610-615m) 23/2	25.03.2013	x	x			
AH1 (610-615m) 23/1	25.03.2013	x		x		x

3.2.3. SP- and RES-logs

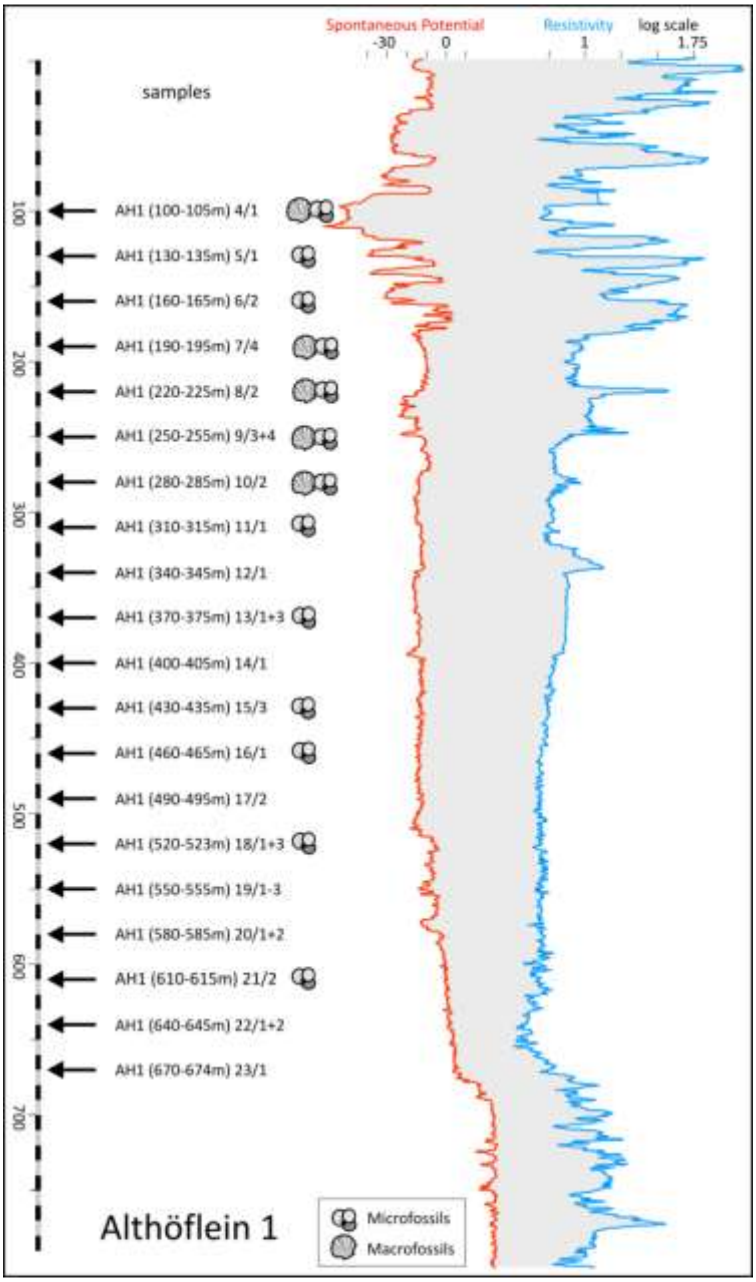


Fig. 11: Wire-logs of Althöflein 1 with position of all samples. Fossil-bearing samples are indicated.

Figure 11 shows the SP- and RES-wire-logs of the Althöflein 1-drilling. Additionally, the positions of all taken samples are shown. It is also indicated if a sample bears macro- and/or microfossils.

SP-log:

The SP-log is generally slightly serrated with lower amplitudes and a uniform pattern. No distinct segments are visible. The log shows a very slight coarsening upward trend. Between 680-800 m a line with very low amplitudes similar to a shale line is formed. A slight coarsening upward with uniform low amplitudes is observed between 180-680 m. The uppermost metres (0-180 m) show a bow-shape.

RES-log:

The RES-log shows a stronger serration than the SP-log and a slight coarsening upward trend. Between 650-800 m the log indicates a broad bow-shape within a lower amplitude range. The segment between 180-650 m has low amplitudes and shows a very slight coarsening upward. Four outliers are visible. A cylindrical shape is noticeable at 220-250 m. The uppermost metres are stronger serrated and show a coarsening upward trend.

3.3. Ginzersdorf 1

3.3.1. Sampling

Fig. 12: Position of the Ginzersdorf 1-well within the investigated Mistelbach Block.

The Ginzersdorf 1-core was sampled on March 12th in 2013 in Gänserndorf. The well is located in the northeast of the survey block in the northern part of the Mistelbach Halfgraben (fig. 12). 19 samples were taken during this first sampling campaign, of which five were stored and 14 went into the further technical treatments (tab. 3).

3.3.2. Lithology – core material (fig. 13)

Micaceous and partly fine sandy marl of greyish or darker brown colour makes up the main proportion of the core material. Fine laminae can partly be observed in the darker brown marl. Fragments of molluscs were also found.

The uppermost cores GI1 (300–305m) 2/2 and GI1 (350–355m) 3/1 are composed of sandy and micaceous marl, whereas the underlying core GI1 (400–405m) 4/1 contains marly and micaceous, fine- to medium-grained sand with molluscs. Core GI1 (450–455m) 5/1 comprises silty, fine-grained sandstone, which changes into light grey, micaceous and marly, fine- to medium-grained sand in core GI1 (550–555m) 7/2. Micaceous, fine sandy marl builds up cores GI1 (650–655m) 9/1+4. The cores GI1 (700–705m) 10/1+3 and GI1 (750–755m) 11/1 are made up of dark laminated marl, which is followed by micaceous and fine sandy marl in the underlying cores GI1 (800–805m) 12/2, GI1 (850–852.5m) 13/1 and GI1 (900–902m) 14/1. The sediment of core GI1 (950–953.5m) 15/1 consists of grey marl, which contains sandy layers. Core GI1 (950–953.5m) 15/2 is made of light to middle grey, fine sandy marl with lamination. Mainly greyish marl can be found in the cores GI1 (999–1003.7m) 16/1 and GI1 (1050–1055m) 17/1+2, whereby hard, greyish conglomeratic sandstone is intercalated in the lower part of core GI1 (999–1003.7m) 16/1. The following cores GI1 (1077–1082m) 18/1 and GI1 (1100–1105m) 19/1+2 show marl and sand.

*Fig. 13: **A:** Characteristic lithologies of different cores of the Ginzersdorf 1-well. The uppermost core GI1 (450–455m) 5/1 contains silty fine-grained sandstone, whereas the second one GI1 (750–755m) 11/1 is composed of brownish, laminated marl. The following core GI1 (800–805m) 12/2 comprises micaceous, fine sandy marl. Core GI1 (950–953.5m) 15/2 at the bottom shows greyish fine sandy marl with lamination. One box measures one metre in length. **B:** Greyish sandstone found in the lower part of core GI1 (999–1003.7m) 16/1. **C:** Detailed view on dark brownish laminated marl of core GI1 (700–705m) 10/3.*

Ginzersdorf 1	date of sampling	sampled	stored	processed	with foramini-feral content	micro-sterile	disso-luble
GI1 (300-305m) 2/2	12.03.2013	x	x				
GI1 (350-355m) 3/1	12.03.2013	x		x		x	
GI1 (400-405m) 4/1	12.03.2013	x		x		x	
GI1 (450-455m) 5/1	12.03.2013	x		x		x	
GI1 (550-555m) 7/2	12.03.2013	x		x		x	
GI1 (650-655m) 9/4	12.03.2013	x	x				
GI1 (650-655m) 9/1	12.03.2013	x		x		x	
GI1 (700-705m) 10/3	12.03.2013	x		x		x	
GI1 (700-705m) 10/1	12.03.2013	x	x				
GI1 (750-755m) 11/1	12.03.2013	x		x		x	
GI1 (800-805m) 12/2	12.03.2013	x		x		x	
GI1 (850-852.5m) 13/1	12.03.2013	x		x		x	
GI1 (900-902m) 14/1	12.03.2013	x		x		x	
GI1 (950-953.5m) 15/2	12.03.2013	x		x		x	
GI1 (950-953.5m) 15/1	12.03.2013	x	x				
GI1 (999-1003.7m) 16/1	12.03.2013	x		x			x
GI1 (1050-1055m) 17/2	12.03.2013	x	x				
GI1 (1050-1055m) 17/1	12.03.2013	x		x	x		
GI1 (1077-1082m) 18/1	12.03.2013	x		x		x	

Tab. 3: Sample status of the Ginzersdorf 1-well.

Ginzersdorf 2	date of sampling	sampled	stored	processed	with foramini-feral content	micro-sterile
GI2 (550-555m) 1/4	12.03.2013	x	x			
GI2 (550-555m) 1/1	12.03.2013	x		x		x
GI2 (700-704.5m) 2/1	12.03.2013	x		x		x
GI2 (898-903m) 3/1	12.03.2013	x		x		x
GI2 (925-930m) 4/1	12.03.2013	x		x		x
GI2 (950-952.7m) 5/2	12.03.2013	x		x		x
GI2 (950-952.7m) 5/1	12.03.2013	x	x			
GI2 (975-978m) 6/2	12.03.2013	x		x		x
GI2 (1000-1002m) 7/1	12.03.2013	x		x		x
GI2 (1025-1027,4m) 8/2	12.03.2013	x		x		x
GI2 (1050-1052m) 9/2	12.03.2013	x		x		x
GI2 (1084-1086.7m) 10/1	12.03.2013	x	x			
GI2 (1084-1086.7m) 10/2	12.03.2013	x		x	x	
GI2 (1125-1126.6m) 12/1	12.03.2013	x		x		x
GI2 (1200-1201m) 15/2	12.03.2013	x		x		x
GI2 (1200-1201m) 15/1	12.03.2013	x	x			

Tab. 4: Overview on sample status of the Ginzersdorf 2-well.

3.3.3. SP- and RES-logs

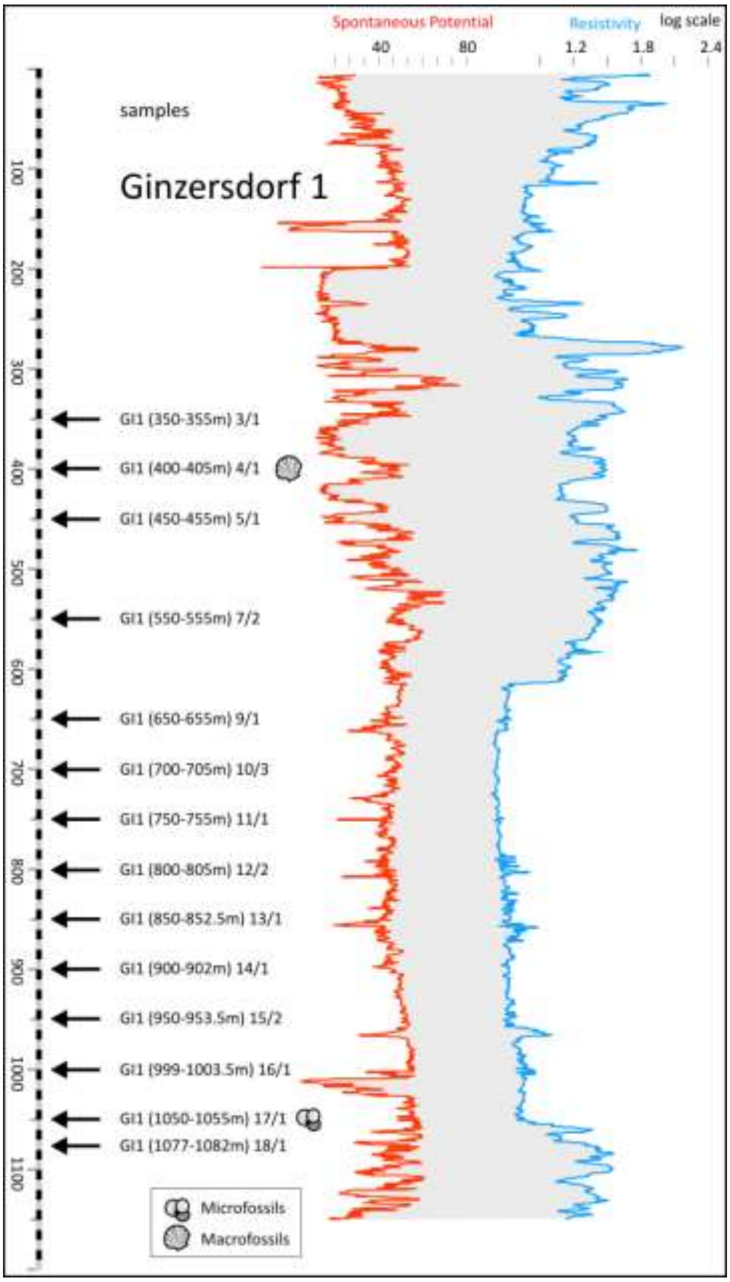


Fig. 14: Wire-logs of Ginzersdorf 1 with position of all samples. Fossil-bearing samples are indicated.

Figure 14 shows the SP- and RES-wire-logs of the drilling. Additionally, the positions of all taken samples are shown. It is also indicated if a sample bears macro- and/or microfossils.

SP-log:

A general uniform and serrated pattern without distinct segments is formed by the SP-log of the Ginzersdorf 1-well, which also shows a slight coarsening upward trend. The log is markedly box-shaped between 200-280 m. Between 0-200 m it is funnel-shaped.

RES-log:

The RES-log is generally more segmented than the corresponding SP-log with a broader range of amplitudes and a serration. A shale baseline-like segment (615-1060 m) with low amplitudes follows the underlying segment (1060-1150 m) with higher amplitudes and pronounced serration. The base of the following segment (200-615 m), which is curved and stronger serrated, is marked by a distinct change in amplitude. The uppermost 200 m show a distinct coarsening upward (funnel-shape).

3.4. Ginzersdorf 2

3.4.1. Sampling

Fig. 15: Northeastern position of the Ginzersdorf 2-well within the investigated area of the Mistelbach Block.

On March 12th 2013, 16 samples were taken from the Ginzersdorf 2-well at the OMV in Gänserndorf. Twelve of these samples went into further investigations and the remaining four are stored in the Geological Department of the NHM (tab. 4). Ginzersdorf 2 is located next to the Ginzersdorf 1-well in the northeast of the survey block within the Mistelbach Halfgraben infill (fig. 15).

3.4.2. Lithology – core material (fig. 16)

This well comprises mainly marl with variable amounts of fine sand. The samples contain generally less mica than in Ginzersdorf 1. The marls are brown-grey or greyish and even lamination can partly be observed. Also sand lenses and sandy intercalations were found throughout the core. One core (GI2 (1084–1086.7m) 10/2) also shows mollusc remains and carbonised plant debris.

The uppermost cores GI2 (550–555m) 1/1+4 and GI2 (700–704.5m) 2/1 are composed of greyish, micaceous sand. This sand merges into well bedded, brown-grey marl in the underlying cores GI2 (898–903m) 3/1, GI2 (925–930m) 4/1, GI2 (950–952.7m) 5/1+2 and GI2 (975–978m) 6/2. Occasionally sand debris or sand lenses are intercalated. Cores GI2 (1000–1002m) 7/1, GI2 (1025–1027.4m) 8/2 and GI2 (1050–1052m) 9/2 comprise grey and fine sandy marl. Sandy marl with condensed mollusc remains and carbonised plant remains, sandy debris and bedding structures can be observed in the cores GI2 (1084–1086.7m) 10/1+2. The cores GI2 (1125–1126.6m) 12/1, GI2 (1175–1178m) 14/1 and GI2 (1200–1201m) 15/1+2 consist of light greyish marl with sand debris.

Fig. 16: ***A:*** *Core GI2 (700–704.5m) 2/1 at the top comprises greyish, micaceous sand. Second core GI2 (950–952.7m) 5/1 is composed of brown-grey laminated marl, whereas the third one GI2 (1000–1002m) 7/1 shows greyish, fine sandy marl. Core GI2 (1200–1201m) 15/2 at the bottom contains light grey homogenous sandstone (left) and darker, more clayey marl (right). One box measures one metre in length.* ***B:*** *Detailed view on a piece of core GI2 (1084–1086.7m) 10/1 with changing lithology from light grey sandstone to brown-greenish, sandy marl.* ***C:*** *Carbonised plant fragment found in core GI2 (1125–1126.6m) 12/1.*

3.4.3. SP- and RES-logs

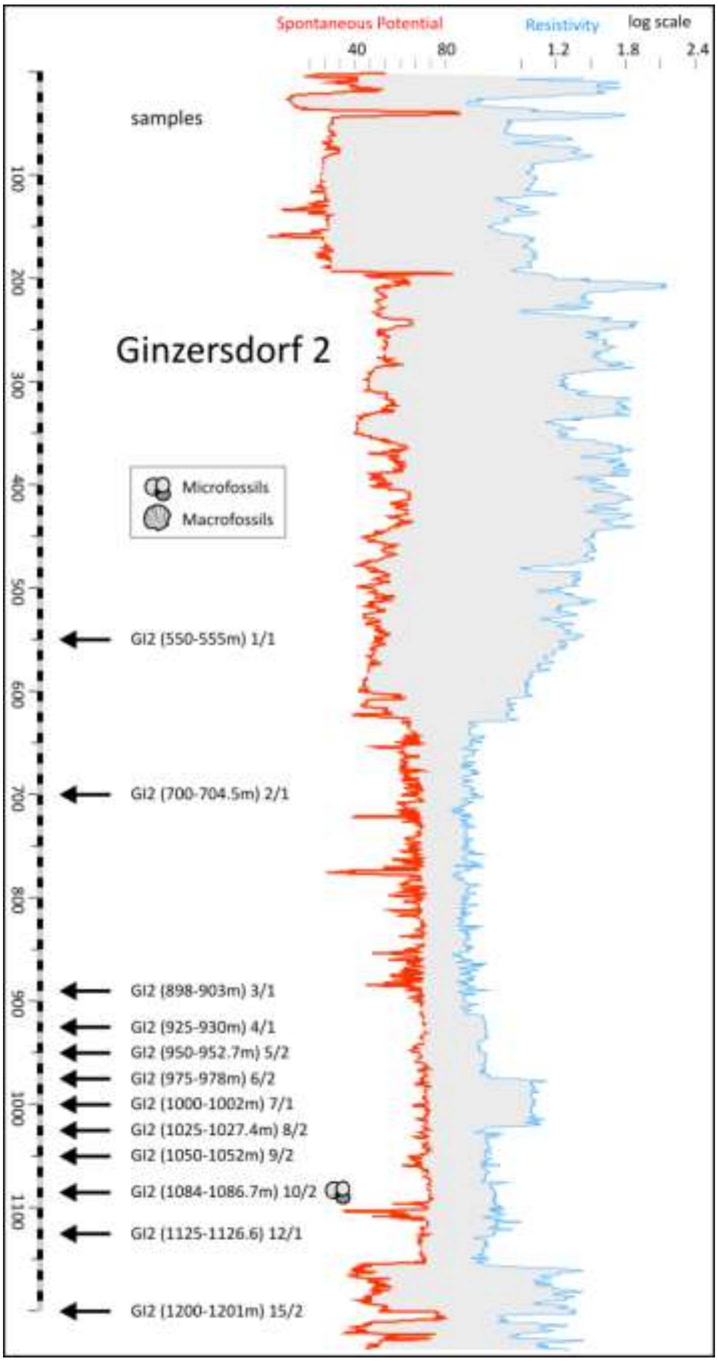


Fig. 17: Wire-logs of Ginzersdorf 2 with position of all samples. Fossil-bearing samples are indicated.

Figure 17 shows the SP- and RES-wire-logs of the drilling. Additionally, the positions of all taken samples are shown. It is also indicated if a sample bears macro- and/or microfossils.

SP-log:

A generally pronounced serration within lower amplitude ranges and a slight coarsening upward trend are visible. Except the lowermost 80 m (1160-~1240 m) the lower part (630-1160 m) of the log is more uniform with mainly low amplitude serrations. Between 200-630 m the log shows a similar pattern but with generally higher amplitudes than the underlying segment. A cylindrical shape is formed between 50-200 m.

RES-log:

This log shows a very similar pattern than the RES-log of the Ginzersdorf 1-well.

3.5. Hohenruppersdorf 19

3.5.1. Sampling

Fig. 18: Position of the Hohenruppersdorf 19-well within the investigated area of the Mistelbach Block.

The Hohenruppersdorf 19-well, which was sampled during the last sampling campaign on September 3rd in 2013, is positioned in the very southern corner of the survey (fig. 18). 14 samples were taken of which only one is stored in Vienna at the NHM (tab. 5).

3.5.2. Lithology – core material (fig. 19)

Greyish, micaceous and marly fine sand and sandstone make up the majority of the core material of the Hohenruppersdorf 19-well. Additionally, clay intercalations as well as coquinas of gastropods and other mollusc remains were found. Two samples indicate palaeosol formation (HRD19 (815–819m) 11/1 and HRD19 (970–975m) 13/1).

The uppermost cores HRD19 (400–405m) 1/1+2 contain brownish, fine sand with several thin, coarser intercalations. No macrofossils were detected. The next six cores (HRD19 (400–405m) 1/3, HRD19 (495–500m) 2/1, HRD19 (571–576m) 3/1, HRD19 (590–595m) 4/1, HRD19 (605–610m) 5/1 and HRD19 (630–635m) 6/1) are composed of grey, micaceous and very marly fine sand. HRD19 (571–576m) 3/1 also comprises gastropod shells. Core HRD19 (650–656m) 7/1 shows a very similar sedimentary composition, with higher clay content and contains gastropods. The sediment of core HRD19 (725–730m) 9/1 is the same like the one in the aforementioned cores. The same micaceous and marly fine sand is found in the cores HRD19 (803–808m) 10/1+2, but they additionally show lamination. Core HRD19 (815–819m) 11/1 is made up of mottled, fine-grained sand, indicating palaeosol formation. Marly sandstone with clay intercalations and small molluscs builds up core

HRD19 (819–820m) 12/1. Grey, partly mottled, fine sandstone with numerous clay intercalations indicates again the formation of palaeosol in core HRD19 (970–975m) 13/1. The underlying cores HRD19 (1003–1008m) 14/1+2 consist of the same sediment type but lack traces of soil formation. The lowermost core HRD19 (1060–1063m) 15/1 contains dark grey clay with sandy intercalations.

*Fig. 19: **A:** Examples of cores HRD19 (571–576m) 3/1 from the bottom of the picture to HRD19 (1003–1008m) 14/1 at the top. All cores are made up of marly fine-grained sand with changing percentage of clay. One box is one metre in length. **B:** Example of palaeosol indicated by mottled fine-grained sandstone in core HRD19 (815–819m) 11/1.*

Tab. 5: Sample status of the Hohenruppersdorf 19-well.

Hohenruppersdorf 19	date of sampling	sampled	stored	processed	with foraminiferal content	micro-sterile
HRD19 (400-405m) 1/1	03.09.2013	x	x			
HRD19 (400-405m) 1/2	03.09.2013	x		x	x	
HRD19 (495-500m) 2/1	03.09.2013	x		x	x	
HRD19 (571-576m) 3/1	03.09.2013	x		x	x	
HRD19 (590-595m) 4/1	03.09.2013	x		x	x	
HRD19 (630-635m) 6/1	03.09.2013	x		x	x	
HRD19 (650-656m) 7/1	03.09.2013	x		x	x	
HRD19 (725-730m) 9/1	03.09.2013	x		x		x
HRD19 (803-808m) 10/2	03.09.2013	x		x		x
HRD19 (815-819m) 11/1	03.09.2013	x		x		x
HRD19 (819-820m) 12/1	03.09.2013	x		x	x	
HRD19 (970-975m) 13/1	03.09.2013	x		x		x
HRD19 (1003-1008m) 14/1	03.09.2013	x		x		x
HRD19 (1060-1063m) 15/1	03.09.2013	x		x		x

3.5.3. SP- and RES-logs

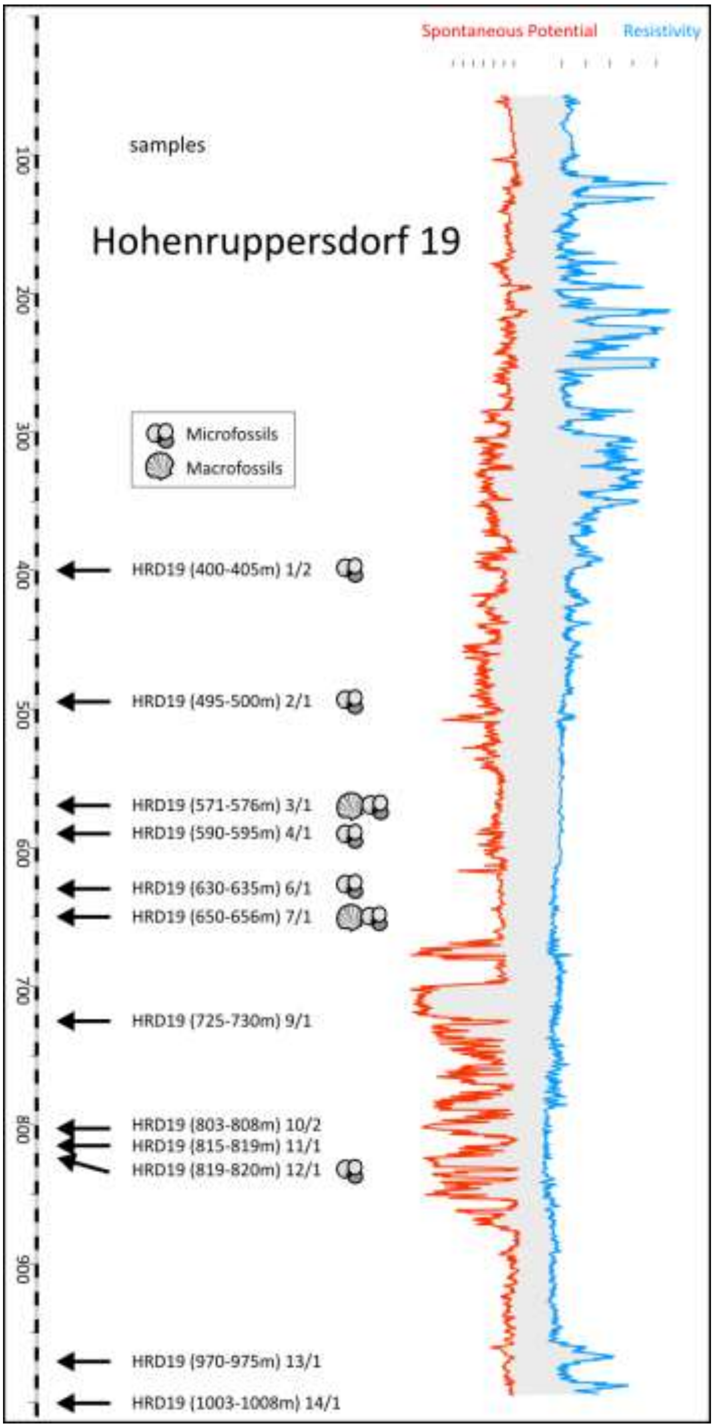


Fig. 20: Wire-logs of Hohenruppersdorf 19 with position of all samples. Fossil-bearing samples are indicated.

Figure 20 shows the SP- and RES-wire-logs of the drilling. Additionally, the positions of some samples are shown. It is also indicated if a sample bears macro- and/or microfossils.

SP-log:

This SP-log shows mainly very low amplitudes but is strongly serrated. No distinct segments are visible except for the metres 700-880, where the log is stronger serrated and funnel-shaped, indicating a slight coarsening upward.

RES-log:

In general this RES-log shows a more uniform pattern with stronger serrations. Between 460-960 m the log is shale line-like formed. The segment between 130-350 m has higher amplitudes.

3.6. Hohenruppersdorf 24

3.6.1. Sampling

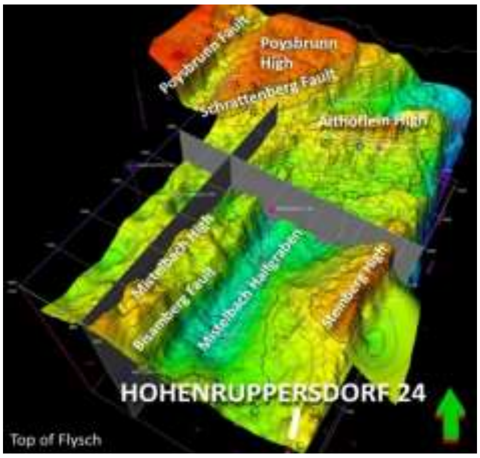


Fig. 21: Position of the Hohenruppersdorf 24-well within the investigated block.

The Hohenruppersdorf 24-core was sampled on September 3rd in 2013 in Gänserndorf. The well is located in the southernmost corner of the survey (fig. 21). In total eleven samples were taken from available core material, preferably in more clayey to fine sandy sediments. One of these samples was stored, whereas the remaining ten samples went into technical processing and further studies (tab. 6).

3.6.2. Lithology – core material (fig. 22)

The well is mainly composed of brown, micaceous fine sand and silt. Clay intercalations are sporadically interspersed. Also gastropods and other mollusc fragments as well as carbonised plant debris are frequently found.

Mica-rich, light brown, badly sorted silt with carbonised plant debris and gastropod shells can be found in the uppermost cores HRD24 (250–255m) 1/1 and HRD24 (256–260.5m) 2/1. Gastropods and other mollusc remains were observed in the fine sandy material of core HRD24 (390–395m) 3/1, which is again followed by mica-rich, badly sorted silt with carbonised plant debris in cores HRD24 (390–395m) 3/2+3. Brown clayey silt builds up core HRD24 (491–495m) 4/1. Core HRD24 (550–555m) 5/1 is made up of grey fine sand with lots of mica and gastropod shells. Core HRD24 (620–624m) 6/1 is composed of brownish clay, which contains lots of mica and also carbonised plant remains. Intercalated silt and clay layers with gastropods were found in core HRD24 (641–645m) 7/1. Core HRD24 (668–670m) 8/1 consists of sandstone. Brown silty material is also observed in the following three cores (HRD24 (775–779.5m) 9/1 and HRD24 (791.5–796m) 10/1+2). The first one additionally contains gastropod and other numerous mollusc remains. Core HRD24 (807–811m) 11/1 changes into micaceous fine sand with clay intercalations. The lowermost core HRD24 (1000.5–1001.5m) 12/1 comprises fine sandstone.

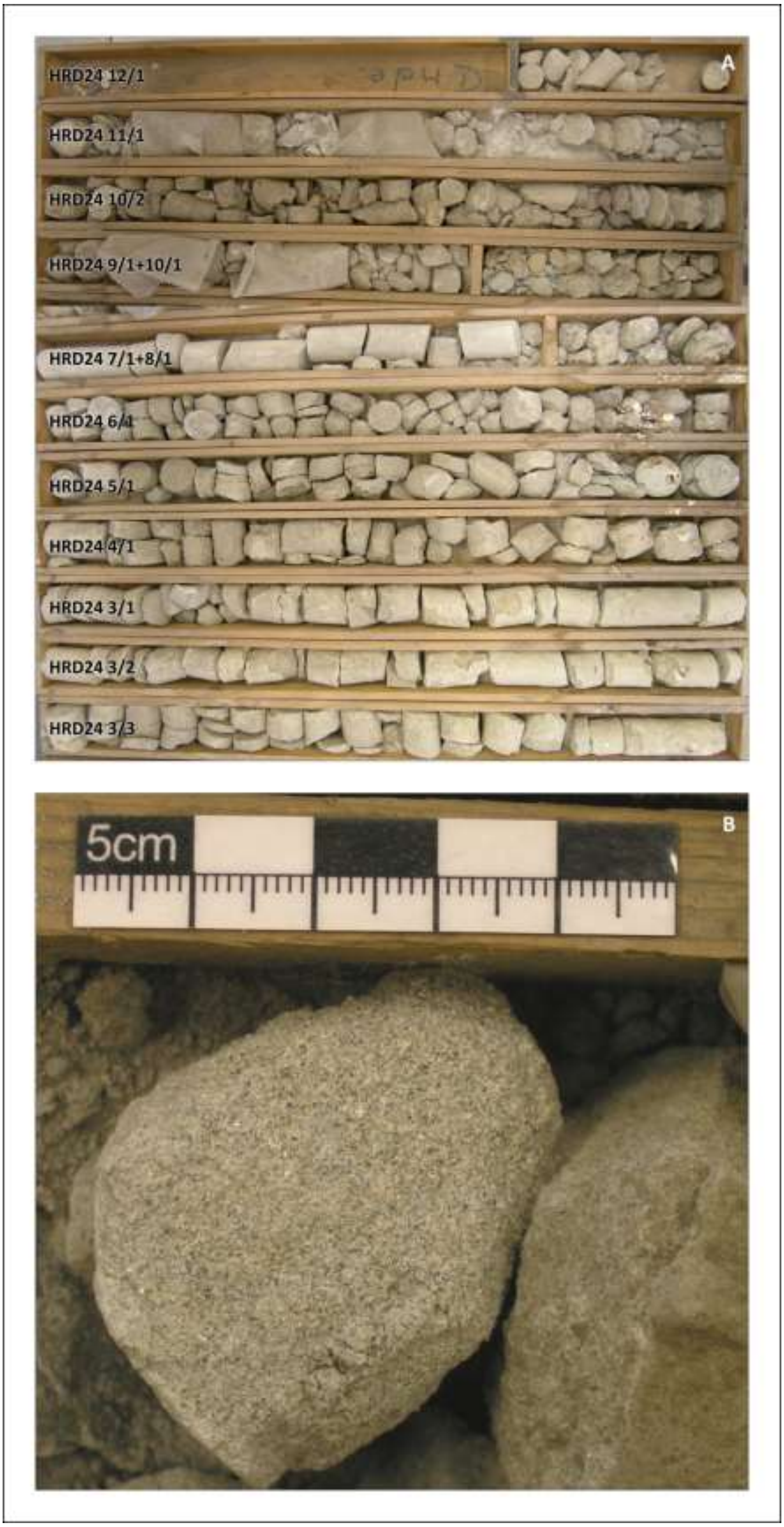


*Fig. 22: **A:** View on cores HRD24 (390–395m) 3 to HRD24 (1000.5–1001.5m) 12, made up of different coloured fine-grained sand, silt and clayey material. One box measures one metre in length. **B:** Detailed view on micaceous fine sand of core HRD24 (807–811m) 11/1.*

Tab. 6: Overview of the sample status.

Hohenruppersdorf 24	**date of sampling**	**sampled**	**stored**	**processed**	**with foramini-feral content**	**micro-sterile**
HRD24 (256-260,5m) 2/1	03.09.2013	x		x	x	
HRD24 (390-395m) 3/3	03.09.2013	x	x			
HRD24 (390-395m) 3/1	03.09.2013	x		x	x	
HRD24 (491-495m) 4/1	03.09.2013	x		x		x
HRD24 (550-555m) 5/1	03.09.2013	x		x	x	
HRD24 (620-624m) 6/1	03.09.2013	x		x	x	
HRD24 (641-645m) 7/1	03.09.2013	x		x	x	
HRD24 (775-779,5m) 9/1	03.09.2013	x		x	x	
HRD24 (791.5-796m) 10/2	03.09.2013	x		x		x
HRD24 (807-811m) 11/1	03.09.2013	x		x		x
HRD24 (1000.5-1001.5m) 12/1	03.09.2013	x		x		x

3.6.3. SP- and RES-logs

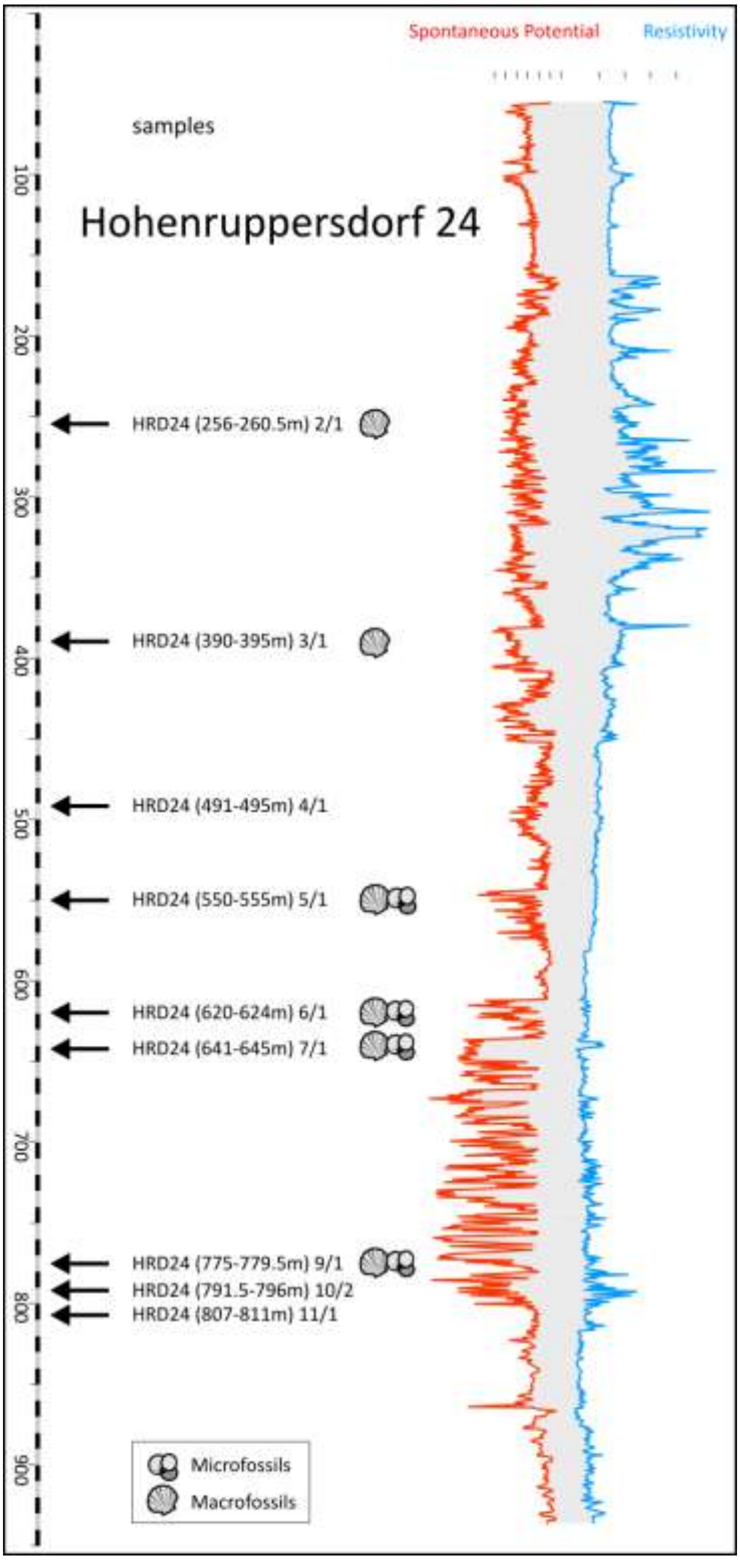


Fig. 23: Wire-logs of Hohenruppersdorf 24 with position of all samples. Fossil-bearing samples are indicated.

Figure 23 shows the SP- and RES-wire-logs of the drilling. Additionally, the positions of some taken samples are shown. It is also indicated if a sample bears macro- and/or microfossils.

SP- and RES-logs:

Both SP- and RES-log of this well show a very similar pattern than the corresponding logs of the adjacent Hohenruppersdorf 19-well. Only the stronger serrated part of the SP-log lies between 615-800 m and the shale baseline-like part of the RES-log ranges between 430-880 m depth.

3.7. Hohenruppersdorf 25

3.7.1. Sampling

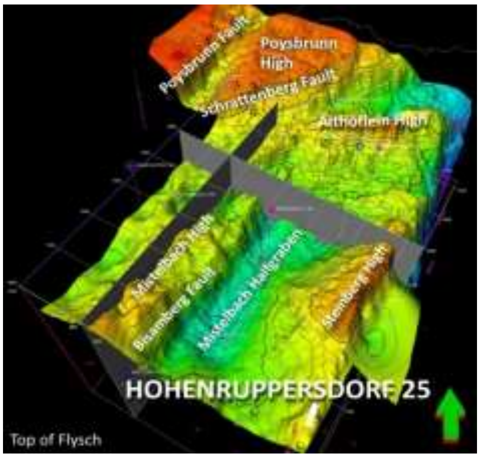


Fig. 24: Southern position of the Hohenruppersdorf 25-well within the Mistelbach Block.

The Hohenruppersdorf 25-well is positioned next to the other Hohenruppersdorf wells in the southernmost corner of the investigated block (fig. 24) and was also sampled on the 3rd September 2013. 14 of the 15 taken samples went into the technical processing (tab. 7).

Hohenruppersdorf 25	date of sampling	sampled	stored	processed	with foraminiferal content	micro-sterile
HRD25 (290-298m) 1/1	03.09.2013	x		x	x	
HRD25 (290-298m) 1/3	03.09.2013	x	x			
HRD25 (310-315m) 2/1	03.09.2013	x		x	x	
HRD25 (440-445m) 3/1	03.09.2013	x		x		x
HRD25 (490-495m) 4/1	03.09.2013	x		x	x	
HRD25 (550-557m) 5/1	03.09.2013	x		x	x	
HRD25 (600-605m) 6/1	03.09.2013	x		x		x
HRD25 (645-650m) 7/1	03.09.2013	x		x	x	
HRD25 (665-670m) 8/1	03.09.2013	x		x	x	
HRD25 (685-690m) 9/1	03.09.2013	x		x	x	
HRD25 (740-745m) 10/1	03.09.2013	x		x	x	
HRD25 (745-750m) 11/2	03.09.2013	x		x		x
HRD25 (751-756m) 12/1	03.09.2013	x		x		x
HRD25 (915-919m) 13/1	03.09.2013	x		x		x
HRD25 (979-984.5m) 14/1	03.09.2013	x		x		x

Tab. 7: Overview of the sample status.

3.7.2. Lithology – core material (fig. 25)

The sediment of the Hohenruppersdorf 25-well consists mainly of brown-grey, clayey-silty or silty-fine-grained sandy material. In some samples molluscs, especially gastropods were found.

The uppermost cores HRD25 (290–298m) 1/1+2+3 comprise brown-grey, clayey-silty sediment with changing contribution by fine- to middle-grained sand, carbonised plant debris and gastropod shells. The following eight cores (HRD25 (310–315m) 2/1, HRD25 (440–445m) 3/1, HRD25 (490–495m) 4/1+2, HRD25 (550–557m) 5/1+2 and HRD25 (600–605m) 6/1+2) are brownish with high sand content. Cores HRD25 (310–315m) 2/1, HRD25 (490–495m) 4/1 and HRD25 (550–557m) 5/1 additionally yielded gastropods. Core HRD25 (645–650m) 7/1 is composed of light grey, fine- to middle-grained sand with molluscs. Light brown, silty fine-grained sand builds up the cores HRD25 (665–670m) 8/1, HRD25 (685–690m) 9/1 and HRD25 (740–745m) 10/1, but HRD25 (685–690m) 9/1 is sandier than the other two. Core HRD25 (745–750m) 11/2 is divided into two parts. The lower one comprises light brown, silty to fine sand with mollusc shells, whereas the upper part is composed of a more dense and dark grey, clayey silt. Dense, silty to partly fine sandy marl makes up core HRD25 (751–756m) 12/1. Core HRD25 (915–919m) 13/1 consists of marly and brown-grey material without any macrofossils. Core HRD25 (979–984.5m) 14/1 contains brownish-grey, dense and uniform clayey-silty sediment.

Fig. 25: ***A:*** *Fine- to middle-grained sand in cores HRD25 (290–298m) 1 to HRD25 (979–984.5m) 14. One box measures one metre in length.* ***B:*** *Mollusc remains found in core HRD25 (645–650m) 7/1.*

3.7.3. SP- and RES-logs

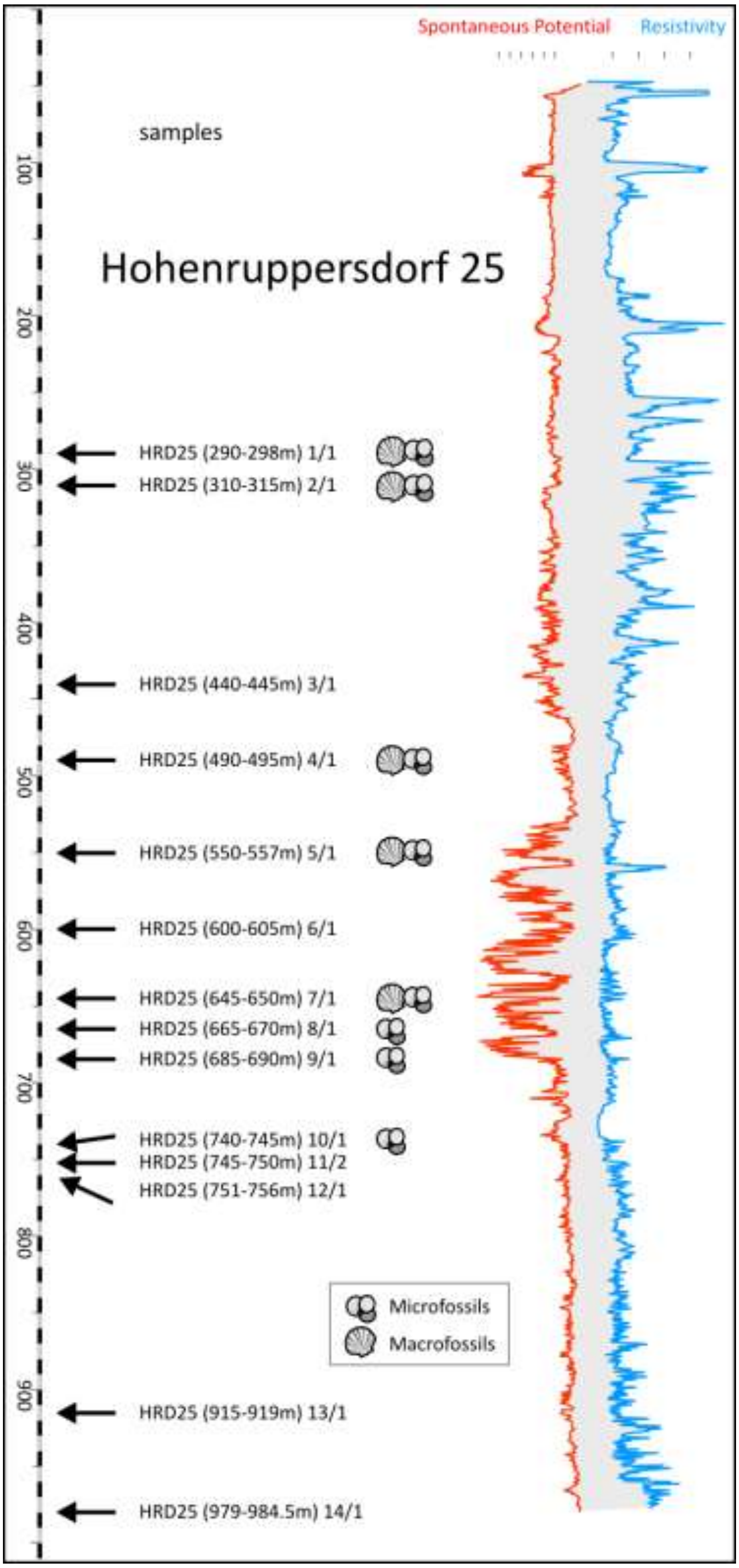


Fig. 26: Wire-logs of Hohenruppersdorf 25 with position of all samples. Fossil-bearing samples are indicated.

Figure 26 shows the SP- and RES-wire-logs of the drilling. Additionally, the positions of all taken samples are shown. It is also indicated if a sample bears macro- and/or microfossils.

SP- and RES-logs:

Both SP- and RES-log of this well show a very similar pattern than the corresponding logs of the adjacent Hohenruppersdorf 19 and 24-wells. Only the stronger serrated part of the SP-log lies between 590-690 m and the shale baseline-like part of the RES-log is not markedly visible.

3.8. Kettlasbrunn 1

3.8.1. Sampling

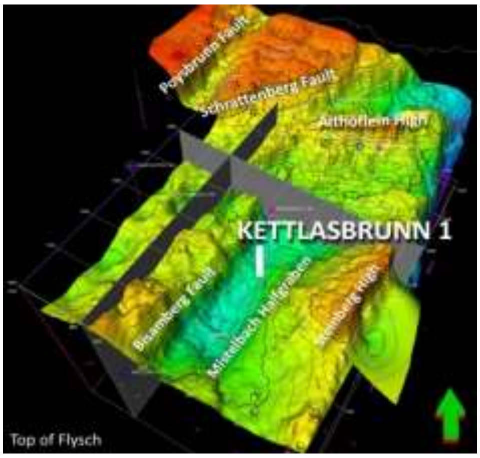


Fig. 27: Position of the Kettlasbrunn 1-well within the investigated area.

The Kettlasbrunn 1-core was sampled on March 12th in 2013. The well is located in the centre of survey block, in the middle of the Mistelbach Halfgraben (fig. 27). In total 34 samples were taken from the available core material. 16 of these samples were stored, whereas the remaining 18 samples went into further processing (tab. 8).

3.8.2. Lithology – core material (fig. 28)

The majority of the sedimentary material consists of light grey or brownish, micaceous, partly clayey-silty, fine- to middle-grained sand. Few findings of bivalves and carbonised plant debris are observed.

The uppermost three cores KA1 (200–205m) 1/1+2+3 are composed of light grey, micaceous, medium-grained sand with bivalve shells, brown clay intercalations and carbonised plant remains. The following seven cores KA1 (250–252.8m) 2/1 and KA1 (300–306m) 4/1+2+3+4+5+6 consist of poorly sorted, medium- to coarse-grained sand, partly with small pebbles. Poorly sorted fine sand builds up core KA1 (350–355m) 5/1. Cores KA1 (400–403.7m) 6/1+2 comprise micaceous fine sand. Core KA1 (400–403.7m) 6/3 is made of silty-fine sandy and badly sorted material with light clayey intercalations. Cores KA1 (450–455.5m) 7/1+2+3 show dark brown clay-silt with brownish sandy intercalations. KA1 (450–455.5m) 7/4 is made up of brown and clayey to silty fine sand with carbonised plant remains, whereas core KA1 (500–506m) 8/1 contains light brown fine sand. This brownish fine sand continues in the underlying cores KA1 (500–506m) 8/2+3+4 and KA1 (550–555m) 9/1. Core KA1 (550–555m) 9/2 consists of dark grey clay with lighter spots. Dark, clayey fine sand was found in KA1 (550–555m) 9/3+4. Brown sandy clay can be observed in the cores KA1 (600–604m)

10/1+2+3+4. Core KA1 (650–655m) 11/1 is composed of alternating sand and clay layers. Brown, sandy clay follows in core KA1 (650–655m) 11/2. The underlying cores KA1 (701–705m) 12/1+2+3+4, KA1 (750–755m) 13/1+2+3+4+5 and KA1 (795–800m) 14/1+2 are made of light grey and micaceous, silty fine sand, which partly shows clayey intercalations or nodules. This fine sand merges into a brownish, more clayey one in cores KA1 (895–900m) 15/1+2.

Fig. 28: ***A:*** *Top view of cores KA1 (400–403.7m) 6 (left) to KA1 (300–306m) 4 (right). Core 6 consists of brownish fine sand, whereas core 5 comprises greyish fine sand and core 4 is made up of pebbly medium- to coarse-grained sand.* ***B:*** *Brown and clayey to silty fine sand of core KA1 (450–455.5m) 7 and lighter brown fine sand of core KA1 (500–506m) 8.* ***C:*** *Top view of cores KA1 (600–604m) 10 to KA1 (701–705m) 12, which comprise brownish and sandy clay. Apparently, the boxes 12/4 and 12/3 differ from the others due to their lighter sandy content. One box is one metre in length.*

Kettlasbrunn 1	date of sampling	sampled	stored	processed	with foramini-feral content	micro-sterile	disso-luble
KA1 (200-205m) 1/1	12.03.2013	x		x			x
KA1 (200-205m) 1/2	12.03.2013	x		x		x	
KA1 (200-205m) 1/3	12.03.2013	x		x		x	
KA1 (250-252.8m) 2/1	12.03.2013	x		x		x	
KA1 (300-306m) 4/3	12.03.2013	x		x		x	
KA1 (350-355m) 5/1	12.03.2013	x		x		x	
KA1 (400-403.7m) 6/3	12.03.2013	x		x			x
KA1 (400-403.7m) 6/2	12.03.2013	x		x		x	
KA1 (400-403.7m) 6/1	12.03.2013	x	x				
KA1 (450-455,5m) 7/4	12.03.2013	x		x	x		
KA1 (450-455,5m) 7/1	12.03.2013	x	x				
KA1 (500-506m) 8/4	12.03.2013	x	x				
KA1 (500-506m) 8/2	12.03.2013	x	x				
KA1 (500-506m) 8/1	12.03.2013	x		x	x		
KA1 (550-555m) 9/3	12.03.2013	x	x				
KA1 (550-555m) 9/2	12.03.2013	x		x	x		
KA1 (550-555m) 9/1	12.03.2013	x	x				
KA1 (600-604m) 10/4	12.03.2013	x		x	x		
KA1 (600-604m) 10/3	12.03.2013	x	x				
KA1 (600-604m) 10/2	12.03.2013	x	x				
KA1 (600-604m) 10/1	12.03.2013	x	x				
KA1 (650-655m) 11/2	12.03.2013	x	x				
KA1 (650-655m) 11/1	12.03.2013	x		x		x	
KA1 (701-705m) 12/3	12.03.2013	x	x				
KA1 (701-705m) 12/2	12.03.2013	x		x	x		
KA1 (701-705m) 12/1	12.03.2013	x	x				
KA1 (750-755m) 13/4	12.03.2013	x	x				
KA1 (750-755m) 13/3	12.03.2013	x	x				
KA1 (750-755m) 13/2	12.03.2013	x	x				
KA1 (750-755m) 13/1	12.03.2013	x		x	x		
KA1 (795-800m) 14/2	12.03.2013	x		x	x		
KA1 (795-800m) 14/1	12.03.2013	x	x				
KA1 (895-900m) 15/2	12.03.2013	x		x	x		
KA1 (895-900m) 15/1	12.03.2013	x		x		x	

Tab. 8: Overview on sample status.

3.8.3. SP- and RES-logs

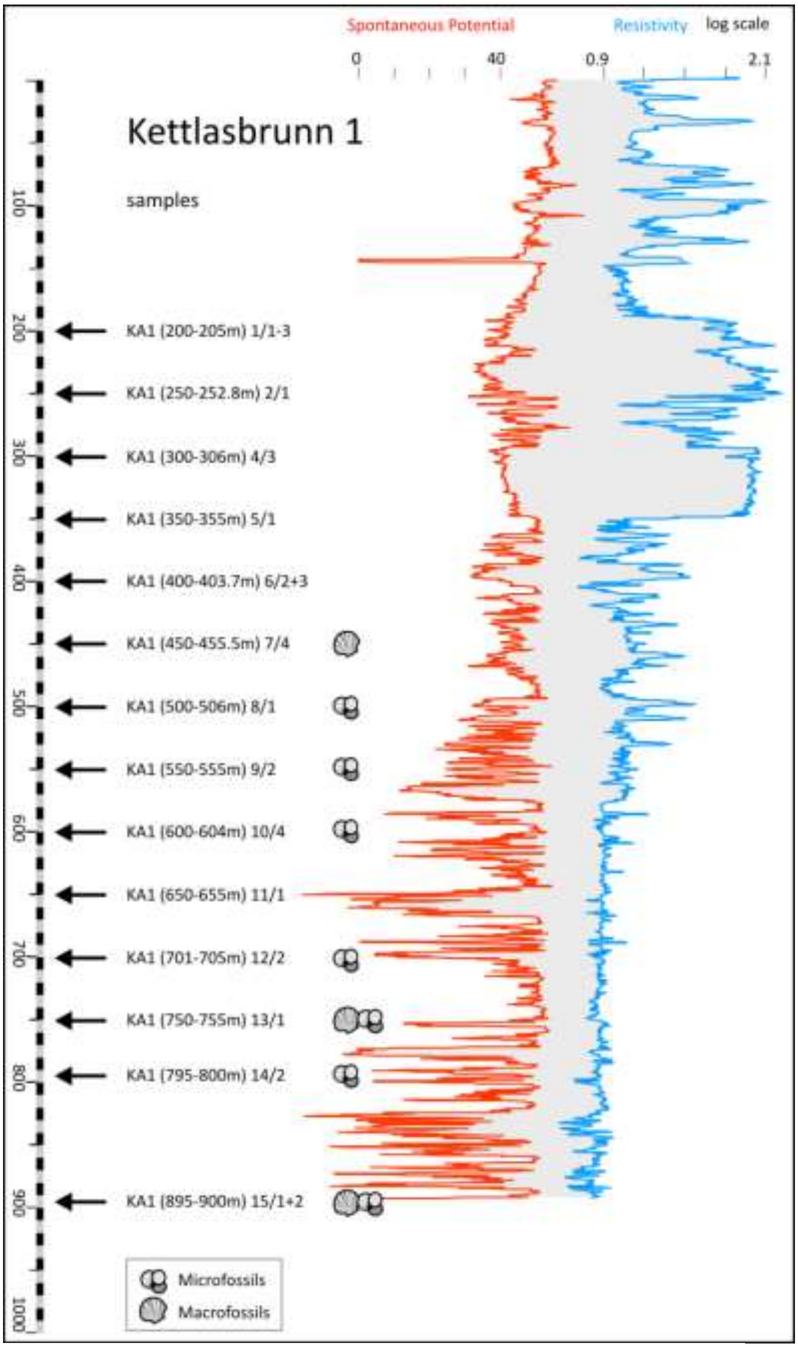


Fig. 29: Wire-logs of Kettlasbrunn 1 with position of all samples. Fossil-bearing samples are indicated.

Figure 29 shows the SP- and RES-wire-logs of the drilling. Additionally, the positions of all taken samples are shown. It is also indicated if a sample bears macro- and/or microfossils.

SP-log:

Generally the SP-log is strongly serrated with high amplitudes and a fining upward trend. Between 370-900 m this log is bell-shaped (form like a Christmas tree) with a strong pronounced serration, a fining upward trend and high amplitudes. In the overlying part the amplitudes have a lower range than below and the serration is less distinct.

RES-log:

Generally this log shows a slight coarsening upward. A strong serration with higher amplitudes is visible as well as two distinct segments. These are box-shaped and range within 190-260 m and 300-350 m depth. These two segments are much less pronounced in the SP-log.

3.9. Kettlasbrunn 2

3.9.1. Sampling

The Kettlasbrunn 2-core was sampled on March 12th in 2013. The well is located in the centre of the survey block, in the middle of the Mistelbach Halfgraben (fig. 30) next to Kettlasbrunn 1. 50 samples were taken during this first sampling campaign, of which 30 were stored and 20 went into the further technical treatments (tab. 9).

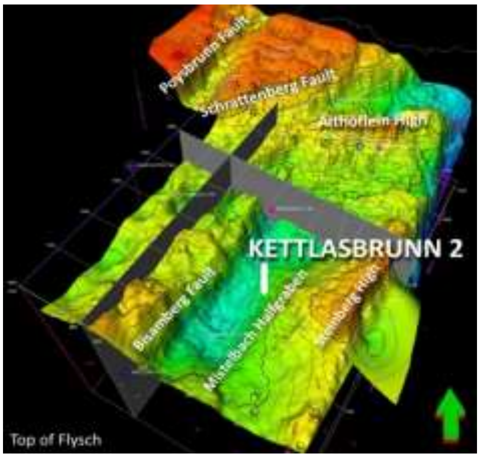


Fig. 30: Central position of the Kettlasbrunn 2-well within the investigated area of the Mistelbach Block.

3.9.2. Lithology – core material (fig. 31)

Along the Kettlasbrunn 2-core either brownish grey, micaceous, partly clayey to silty fine- to middle-grained sand or grey silt can be observed. Few samples contain carbonised plant debris.

The uppermost cores KA2 (900–905m) 1/1+2 comprise grey, clayey, fine- to medium-grained sand. Core KA2 (960–965m) 2/1 contains grey clay, fine sand and dark clay layers. The following core KA2 (960–965m) 2/2 is made up of grey, clayey fine- to medium-grained sand with interspersed carbonised plant remains. Cores KA2 (960–965m) 2/3, KA2 (1020–1025m) 3/1+2+3+4 and KA2 (1080–1085m) 4/1 are composed of grey, clayey silt and fine sand. KA2 (1020–1025m) 3/3 additionally contains bivalve remains. Brownish, micaceous fine sand without bivalve remains builds up cores KA2 (1080–1085m) 4/2+3+4+5. Cores KA2 (1140–1145m) 5/1+2+3 are made of brownish and silty fine sand. Light grey, poorly sorted, micaceous, fine- to medium-grained sand is observed in cores KA2 (1204–1210m) 6/1+2+3+4. The underlying cores KA2 (1255–1259.5m) 7/1+2+3+4+5 are made of brownish, silty fine sand. The cores KA2 (1320–1325m) 8/1+2 merge into light grey and micaceous sand, partly with carbonised layers. Cores KA2 (1320–1325m) 8/3+4+5 are composed of clayey silt to fine sand. Additionally carbonised plant remains can be found. The following cores KA2

(1380–1385m) 9/1+2 consist of marly and micaceous fine sand. Fine sandy, grey-brown marl and micaceous fine- to medium-grained sand can be found in KA2 (1380–1385m) 9/3, whereas KA2 (1440–1445m) 10/1+2+3+4 consist of marly, micaceous fine sand. Cores KA2 (1500–1505m) 11/1+2+3 and KA2 (1560–1565m) 12/1+2+3+4+5 are made of thin cross bedded, brownish, fine- to medium-grained sand. The latter five additionally show clay clasts, thin clayey layers, interspersed layers of coarse sand and carbonised plant remains. The cores KA2 (1611–1616m) 13/1+2+3+4+5 and KA2 (1680–1685m) 14/1+2+3+4 comprise light, micaceous, fine- to medium-grained sand. Marly, fine sandy silt builds up the lowermost sampled core KA2 (1707–1711m) 15/5.

*Fig. 31: **A:** View on cores KA2 (1080–1085m) 4 to KA2 (1255–1259.5m) 7, which contain micaceous, brownish or lighter grey fine sand. **B:** Cores KA2 (1204–1210m) 6 to KA2 (1320–1325m) 8 containing fine-grained sand. Additionally the clay content increases towards core 8. **C:** Cores KA2 (1500–1505m) 11 to KA2 (1611–1616m) 13, comprising brownish fine- to medium–grained sand. **D:** Brownish fine- to medium-grained sand of core KA2 (1560–1565m) 12/2 with intense bioturbation. **E:** Similar as in picture D, this piece of core KA2 (1320–1325m) 8/4 shows dark layers of carbonised plant remains. **F:** Core KA2 (1020–1025m) 3/1 with mollusc fragments.*

Tab. 9: Overview on sample status.

Kettlasbrunn 2	date of sampling	sampled	stored	processed	with foramini-feral content	micro-sterile	disso-luble
KA2 (900-905m) 1/2	12.03.2013	x		x		x	
KA2 (900-905m) 1/1	12.03.2013	x	x				
KA2 (960-965m) 2/3	12.03.2013	x	x				
KA2 (960-965m) 2/2	12.03.2013	x		x		x	
KA2 (960-965m) 2/1	12.03.2013	x		x		x	
KA2 (1020-1025m) 3/4	12.03.2013	x		x	x		
KA2 (1020-1025m) 3/3	12.03.2013	x	x				
KA2 (1020-1025m) 3/2	12.03.2013	x	x				
KA2 (1020-1025m) 3/1	12.03.2013	x		x	x		
KA2 (1080-1085m) 4/5	12.03.2013	x	x				
KA2 (1080-1085m) 4/4	12.03.2013	x	x				
KA2 (1080-1085m) 4/3	12.03.2013	x		x	x		
KA2 (1080-1085m) 4/2	12.03.2013	x	x				
KA2 (1080-1085m) 4/1	12.03.2013	x	x				
KA2 (1140-1145m) 5/2	12.03.2013	x		x	x		
KA2 (1204-1210m) 6/4	12.03.2013	x		x		x	
KA2 (1204-1210m) 6/3	12.03.2013	x	x				
KA2 (1204-1210m) 6/1	12.03.2013	x	x				
KA2 (1255-1259.5m) 7/5	12.03.2013	x	x				
KA2 (1255-1259.5m) 7/4	12.03.2013	x	x				
KA2 (1255-1259.5m) 7/3	12.03.2013	x		x		x	
KA2 (1255-1259.5m) 7/2	12.03.2013	x	x				
KA2 (1255-1259.5m) 7/1	12.03.2013	x		x		x	
KA2 (1320-1325m) 8/5	12.03.2013	x	x				
KA2 (1320-1325m) 8/4	12.03.2013	x		x		x	
KA2 (1320-1325m) 8/3	12.03.2013	x	x				
KA2 (1320-1325m) 8/2	12.03.2013	x	x				
KA2 (1380-1385m) 9/3	12.03.2013	x		x	x		
KA2 (1380-1385m) 9/2	12.03.2013	x	x				
KA2 (1380-1385m) 9/1	12.03.2013	x	x				
KA2 (1440-1445m) 10/3	12.03.2013	x		x		x	
KA2 (1440-1445m) 10/2	12.03.2013	x		x			x
KA2 (1440-1445m) 10/1	12.03.2013	x	x				
KA2 (1500-1505m) 11/3	12.03.2013	x		x		x	
KA2 (1500-1505m) 11/2	12.03.2013	x	x				
KA2 (1500-1505m) 11/1	12.03.2013	x	x				
KA2 (1560-1565m) 12/5	12.03.2013	x	x				
KA2 (1560-1565m) 12/4	12.03.2013	x	x				
KA2 (1560-1565m) 12/3	12.03.2013	x	x				
KA2 (1560-1565m) 12/2	12.03.2013	x		x		x	
KA2 (1560-1565m) 12/1	12.03.2013	x	x				
KA2 (1611-1616m) 13/5	12.03.2013	x	x				
KA2 (1611-1616m) 13/4	12.03.2013	x	x				
KA2 (1611-1616m) 13/3	12.03.2013	x		x		x	
KA2 (1611-1616m) 13/2	12.03.2013	x		x		x	
KA2 (1680-1685m) 14/4	12.03.2013	x	x				
KA2 (1680-1685m) 14/3	12.03.2013	x		x		x	
KA2 (1680-1685m) 14/2	12.03.2013	x	x				
KA2 (1680-1685m) 14/1	12.03.2013	x	x				
KA2 (1707-1711m) 15/5	12.03.2013	x		x		x	

3.9.3. SP- and RES-logs

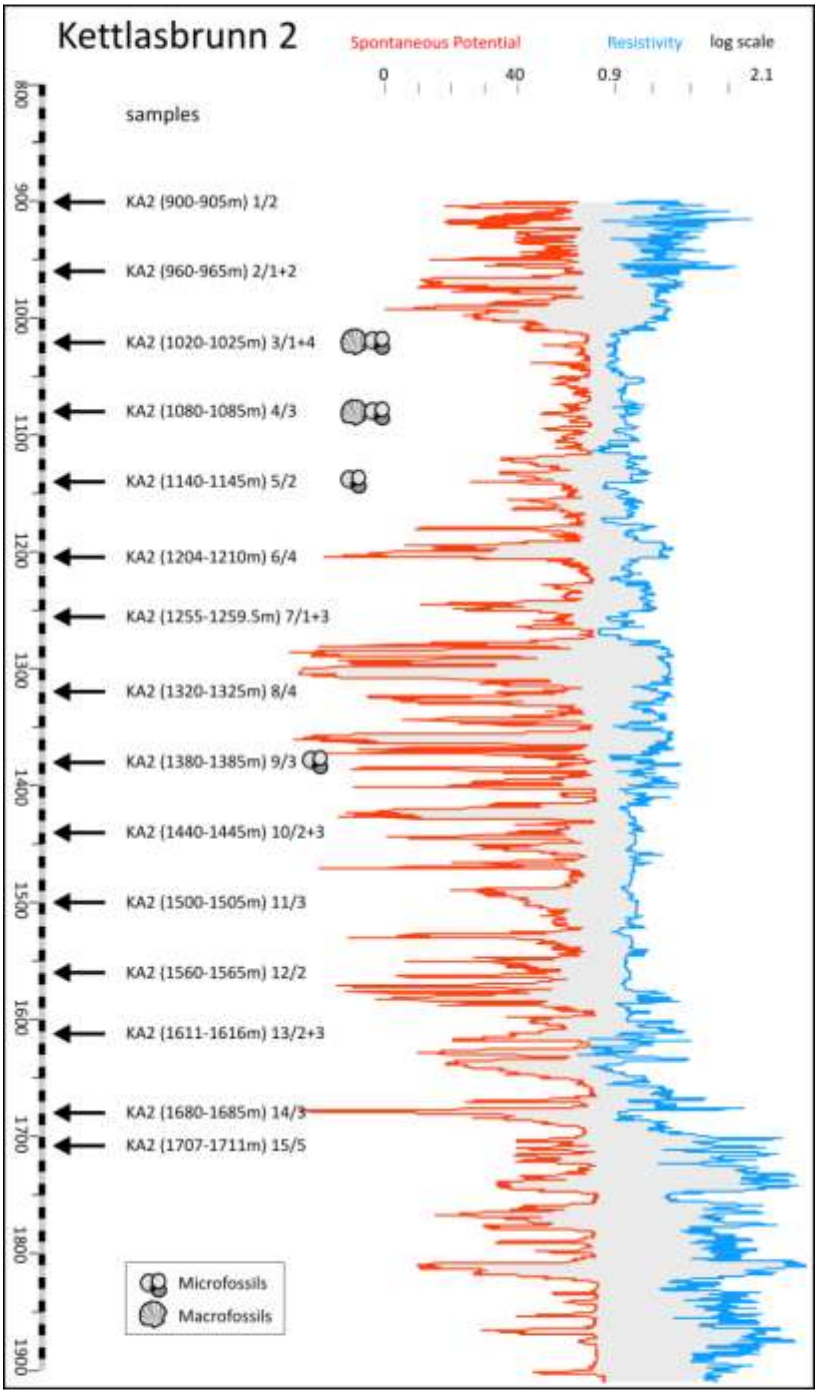


Fig. 32: Wire-logs of Kettlasbrunn 2 with position of all samples. Fossil-bearing samples are indicated.

Figure 32 shows the SP- and RES-wire-logs of the drilling. Additionally, the positions of all taken samples are shown. It is also indicated if a sample bears macro- and/or microfossils.

SP-log:

From base to top this log is very strongly serrated with high amplitudes. Only a small part between 1020-1120 m shows markedly lower amplitudes and serrations. No general trend of fining or coarsening upward is visible.

RES-log:

This log shows also no general trend of fining or coarsening, but is also strongly serrated with higher amplitudes. Between 1020-1700 m the amplitudes show a lower range than in the under- and overlying segments.

3.10. Maustrenk West1

3.10.1. Sampling

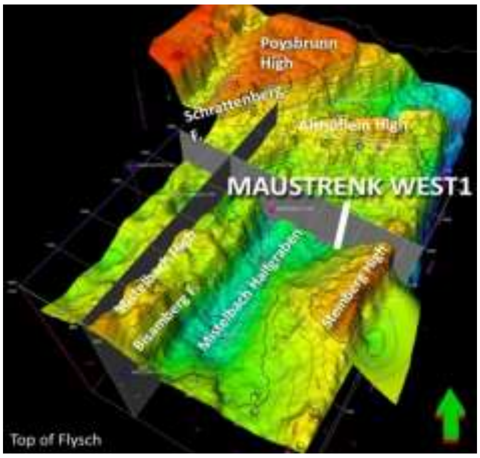


Fig. 33: Eastern position of the Maustrenk West1-well within the investigated area of the Mistelbach Block.

The Maustrenk West1-well, located in the east of the investigated block (fig. 33), was sampled on March 25th 2013 during the second sampling campaign in Gänserndorf. In total 50 samples were taken from the available core material. 26 of these samples were stored, whereas the remaining 24 samples went into technical processing (tab. 10).

3.10.2. Lithology – core material (fig. 34)

Along the Maustrenk West1-core mainly greyish or greyish-brownish marl with thin sand intercalations can be observed. Partly lamination and ripple structures are indicated.

The uppermost cores MTW1 (1000–1005m) 1/1+2+3 consist of fine sandy and micaceous marl. The following 21 cores (MTW1 (1050–1055m) 2/1+2+3+4+5, MTW1 (1100–1105m) 3/1+2+3+4+5, MTW1 (1130–1138m) 4/1+2+3+4+5+6+7 and MTW1 (1200–1205m) 5/2+3+4+5) show grey-brownish, sandy marl with small sand layers. MTW1 (1050–1055m) 2/5 also yielded bivalve remains. Greyish, less sandy and well laminated marl with small ripple structures and intercalated sandy layers builds up cores MTW1 (1247.5–1252.5m) 6/3+5, MTW1 (1300–1305m) 7/3+5, MTW1 (1350–1355m) 8/1 and MTW1 (1380–1385m) 9/1+4, MTW1 (1458–1463m) 11/3+5 and MTW1 (1480–1485m) 12/2+4+6. Between them core MTW1 (1420–1424.7m) 10/4 comprises sandy marl without lamination, but with sand intercalations. Cores MTW1 (1510–1517m) 13/2+4+7 are made of greyish, sandy marl intercalated with thick fine- to medium-grained sand layers, which contain mollusc shells. In the following ten cores (MTW1 (1540–1545m) 14/2+4, MTW1 (1568–1573m) 15/3, MTW1 (1597.6–

1602.6m) 16/1+4, MTW1 (1645.5–1650.2m) 17/2+5, MTW1 (1688–1691.7m) 18/1+4 and MTW1 (1733–1735m) 19/2) greyish, sandy marl with thin sand layers can be found.

Fig. 34: ***A:*** *View on a part of core MTW1 (1130–1138m) 4/6 containing greyish marl.* ***B:*** *Core MTW1 (1200–1205m) 5/2 with greyish-brownish marl with intercalating sand layers of 2-3 cm thickness.* ***C:*** *This figure shows an example of greyish sandy marl with flaser bedding found in core MTW1 (1420–1424.7m) 10/4.* ***D:*** *Ripple structure found in core MTW1 (1480–1485m) 12/4.*

Maustrenk West1	date of sampling	sampled	stored	processed	with foramini-feral content	micro-sterile
MTW1 (1000-1005m) 1/3	25.03.2013	x	x			
MTW1 (1000-1005m) 1/2	25.03.2013	x		x		x
MTW1 (1000-1005m) 1/1	25.03.2013	x	x			
MTW1 (1050-1055m) 2/5	25.03.2013	x	x			
MTW1 (1050-1055m) 2/4	25.03.2013	x	x			
MTW1 (1050-1055m) 2/3	25.03.2013	x		x		x
MTW1 (1050-1055m) 2/2	25.03.2013	x	x			
MTW1 (1050-1055m) 2/1	25.03.2013	x	x			
MTW1 (1100-1105m) 3/5	25.03.2013	x		x	x	
MTW1 (1100-1105m) 3/4	25.03.2013	x	x			
MTW1 (1100-1105m) 3/3	25.03.2013	x	x			
MTW1 (1100-1105m) 3/2	25.03.2013	x	x			
MTW1 (1100-1105m) 3/1	25.03.2013	x		x		x
MTW1 (1130-1138m) 4/7	25.03.2013	x		x	x	
MTW1 (1130-1138m) 4/6	25.03.2013	x	x			
MTW1 (1130-1138m) 4/5	25.03.2013	x	x			
MTW1 (1130-1138m) 4/4	25.03.2013	x	x			
MTW1 (1130-1138m) 4/3	25.03.2013	x	x			
MTW1 (1130-1138m) 4/2	25.03.2013	x		x	x	
MTW1 (1130-1138m) 4/1	25.03.2013	x	x			
MTW1 (1200-1205m) 5/5	25.03.2013	x		x		x
MTW1 (1200-1205m) 5/4	25.03.2013	x	x			
MTW1 (1200-1205m) 5/3	25.03.2013	x	x			
MTW1 (1200-1205m) 5/2	25.03.2013	x		x		x
MTW1 (1247.5-1252.5m) 6/5	25.03.2013	x		x		x
MTW1 (1247.5-1252.5m) 6/3	25.03.2013	x	x			
MTW1 (1300-1305m) 7/5	25.03.2013	x		x		x
MTW1 (1300-1305m) 7/3	25.03.2013	x	x			
MTW1 (1350-1355m) 8/1	25.03.2013	x		x		x
MTW1 (1380-1385m) 9/4	25.03.2013	x	x			
MTW1 (1380-1385m) 9/1	25.03.2013	x		x	x	
MTW1 (1420-1424.7m) 10/4	25.03.2013	x		x		x
MTW1 (1458-1463m) 11/5	25.03.2013	x	x			
MTW1 (1458-1463m) 11/3	25.03.2013	x		x		x
MTW1 (1480-1485m) 12/6	25.03.2013	x	x			
MTW1 (1480-1485m) 12/4	25.03.2013	x		x	x	
MTW1 (1480-1485m) 12/2	25.03.2013	x	x			
MTW1 (1510-1517m) 13/7	25.03.2013	x	x			
MTW1 (1510-1517m) 13/4	25.03.2013	x	x			
MTW1 (1510-1517m) 13/2	25.03.2013	x		x		x
MTW1 (1540-1545m) 14/4	25.03.2013	x		x		x
MTW1 (1540-1545m) 14/2	25.03.2013	x	x			
MTW1 (1568-1573m) 15/3	25.03.2013	x		x	Flysch	
MTW1 (1597.6-1602.6m) 16/4	25.03.2013	x	x			
MTW1 (1597.6-1602.6m) 16/1	25.03.2013	x		x	Flysch	
MTW1 (1645.5-1650.2m) 17/5	25.03.2013	x		x		x
MTW1 (1645.5-1650.2m) 17/2	25.03.2013	x		x	Flysch	
MTW1 (1688-1691.7m) 18/4	25.03.2013	x		x		x
MTW1 (1688-1691.7m) 18/1	25.03.2013	x		x		x
MTW1 (1733-1735m) 19/2	25.03.2013	x		x		x

Tab. 10: Sample status of the Maustrenk West1-well.

3.10.3. SP- and RES-logs

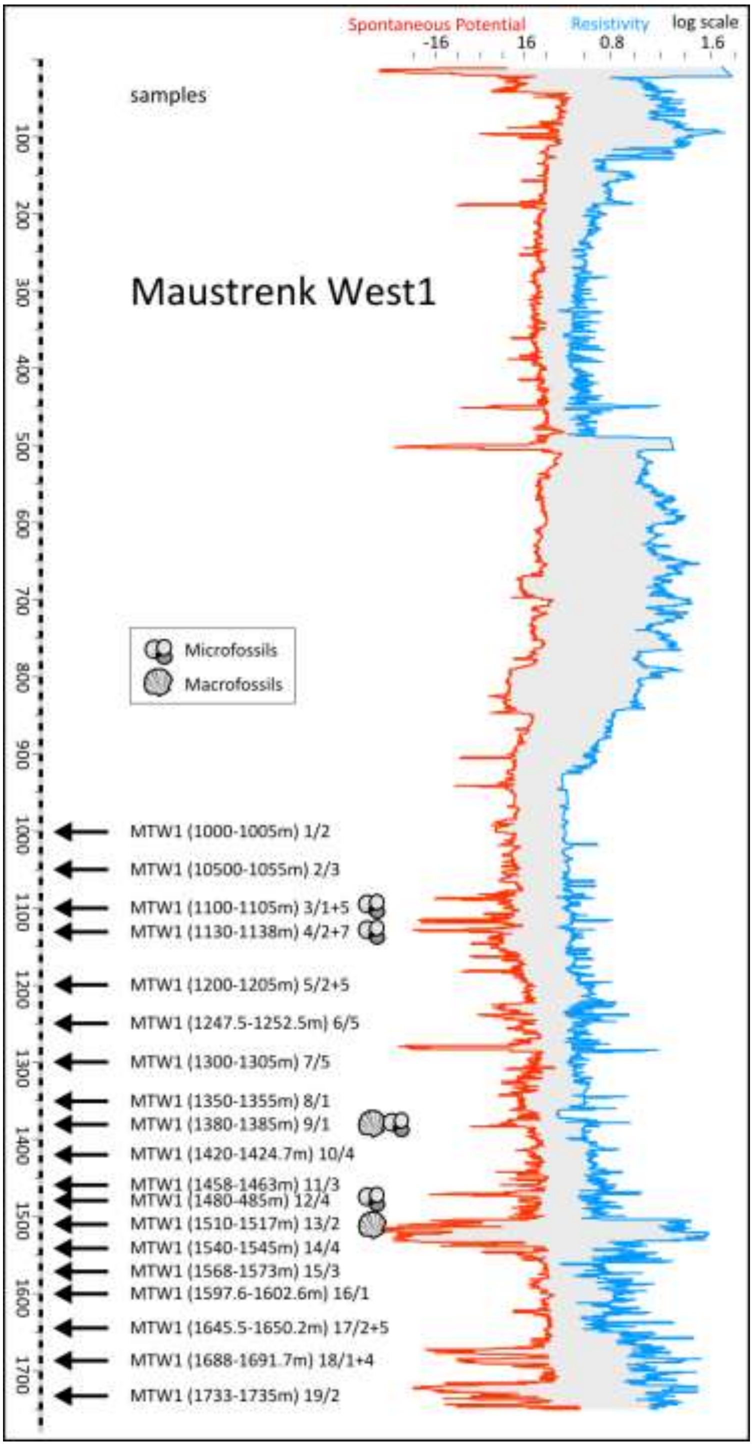


Fig. 35: Wire-logs of Maustrenk West1 with position of all samples. Fossil-bearing samples are indicated.

Figure 35 shows the SP- and RES-wire-logs of the drilling. Additionally, the positions of all taken samples are shown. It is also indicated if a sample bears macro- and/or microfossils.

SP-log:

This SP-log is serrated and shows no trend of fining or coarsening upward.

RES-log:

The RES- log differs from the SP-log. It is generally stronger serrated with high amplitudes and distinct segments. Between 930-1750 m the log shows a strongly serrated pattern with a fining upward trend and a bell-shape (Christmas tree). The segment between 500-930 m forms a rounded funnel-shape with a distinct coarsening trend. Between 130-500 m depths follows a low amplitude segment.

3.11. Mistelbach 1

3.11.1. Sampling

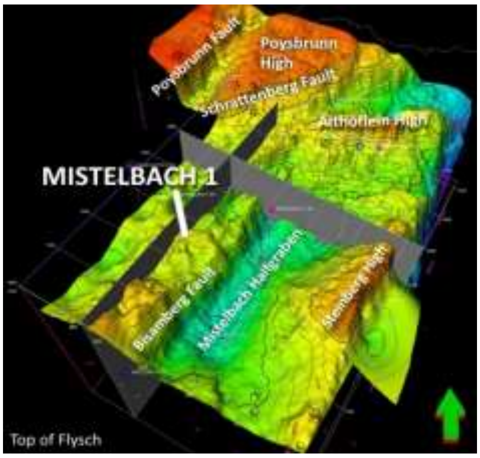


Fig. 36: Western position of the Mistelbach 1-well within the investigated area.

On March 28th 2013, the Mistelbach 1-core was sampled in Gänserndorf. The well is located in the western part of the investigated block (fig. 36). In total 21 samples were taken. Five are stored in the NHM, whereas the remaining 16 samples went into the technical processing (tab. 11).

3.11.2. Lithology – core material (fig. 37)

Marly or clayey sandstone and brownish partly sandy marl makes up the sedimentary material of the Mistelbach 1-core. Additionally in two cores lamination and mollusc remains were found.

The uppermost cores MI1 (800–805m) 1/1+2 are made of light grey sandstone, the latter additionally yields mollusc remains. Macrofossils are also found in the light grey, fine- to medium-grained sand of MI1 (800–805m) 1/3. Micaceous and laminated, fine-grained sandstone builds up core MI1 (969–972m) 2/1. The following cores (MI1 (969–972m) 2/2+3+4, MI1 (1052–1057m) 3/1+2+3+4+5 and MI1 (1140.5–1145.5m) 4/1) show brownish, micaceous marl- and sandstone. MI1 (1140.5–1145.5m) 4/2 comprises sandy and grey marl. Brownish and micaceous, clayey marl makes up the cores MI1 (1140.5–1145.5m) 4/3+4+5 and MI1 (1203–1208m) 5/1+2+3+4+5. In the cores MI1 (1289–1294m) 6/1+2+3+4+5+6 brownish, micaceous and fine sandy marl, which is partly laminated, can be observed. Sandy, partly laminated marl builds up the underlying cores MI1 (1373.5–1377m) 7/1+2+3+4 and MI1 (1440–1445m) 8/1+2+3+4+5+6+7. Sandy marlstone and brownish, micaceous, laminated fine-grained sandstone made up core MI1 (1519.5–1524.5m) 9/1. The cores MI1 (1519.5–1524.5m) 9/2+3+4+5+6 are made up of micaceous and sandy marl. Additionally clasts of brownish sandstone and conglomerate were found in the cores MI1 (1519.5–1524.5m) 9/2+3+4. Marl can be found in the cores MI1 (1593.5–1597.5m) 10/1+2. Core MI1 (1593.5–1597.5m) 10/3 is made of sandstone. In MI1 (1593.5–1597.5m) 10/4 the sediment changes into micaceous and sandy marlstone. Marl and micaceous sandstone make up core MI1 (1593.5–1597.5m) 10/5. In the underlying cores MI1 (1668–16731m) 11/1+2+3+4 follows sandstone with cross bedding. Cores MI1 (1668–1673m) 11/5 and MI1 (1753–1755m) 12/1 consist of micaceous and marly fine-grained sandstone.

*Fig. 37: **A:** Cores MI1 (1593.5–1597.5m) 10 to MI1 (1753–1755m) 12, containing greyish sandstone. **B:** View on the boxes of cores MI1 (1519.5–1524.5m) 9 and MI1 (1593.5–1597.5m) 10, made up of sandy marl and sandstone. **C:** Brownish fine sandy marl (core MI1 (1289–1294m) 6) and more greyish sandy marl at the top (core MI1 (1373.5–1377m) 7). **D:** Grey, fine- to medium-grained sandstone with mollusc coquina of up to 2 cm thickness found in core MI1 (800–805m) 1/3. **E:** Core MI1 (1203–1208m) 5/4 with distinct lamination in dense greyish marl. **F+G:** Cores MI1 (1519.5–1524.5m) 9/2+3 with conglomeratic intraclasts of dense sandy and laminated marl. **H:** Example of uniform, marly fine-grained sandstone of core MI1 (1668–1673m) 11/1.*

Mistelbach 1	date of sampling	sampled	stored	processed	with foraminiferal content	micro-sterile
MI1 (800-805m) 1/2	28.03.2013	x		x		x
MI1 (969-972m) 2/1	28.03.2013	x		x		x
MI1 (969-972m) 2/3	28.03.2013	x		x		x
MI1 (1052-1057m) 3/5	28.03.2013	x	x			
MI1 (1052-1057m) 3/2	28.03.2013	x		x	x	
MI1 (1140.5-1145.5m) 4/1	28.03.2013	x		x		x
MI1 (1140.5-1145.5m) 4/3	28.03.2013	x		x		x
MI1 (1203-1208m) 5/5	28.03.2013	x	x			
MI1 (1203-1208m) 5/2	28.03.2013	x		x		x
MI1 (1289-1294m) 6/4	28.03.2013	x	x			
MI1 (1289-1294m) 6/1	28.03.2013	x		x		x
MI1 (1373,5-1377m) 7/4	28.03.2013	x		x	x	
MI1 (1373,5-1377m) 7/1	28.03.2013	x	x			
MI1 (1440-1445m) 8/6	28.03.2013	x		x		x
MI1 (1440-1445m) 8/4	28.03.2013	x		x		x
MI1 (1440-1445m) 8/1	28.03.2013	x		x		x
MI1 (1519.5-1524.5m) 9/6	28.03.2013	x		x		x
MI1 (1593.5-1597.5m) 10/5	28.03.2013	x		x		x
MI1 (1668-1673m) 11/5	28.03.2013	x		x		x
MI1 (1668-1673m) 11/4	28.03.2013	x	x			
MI1 (1753-1755m) 12/1	28.03.2013	x		x		x

Tab. 11: Sample status of the Mistelbach 1-well.

3.11.3. SP- and RES-logs

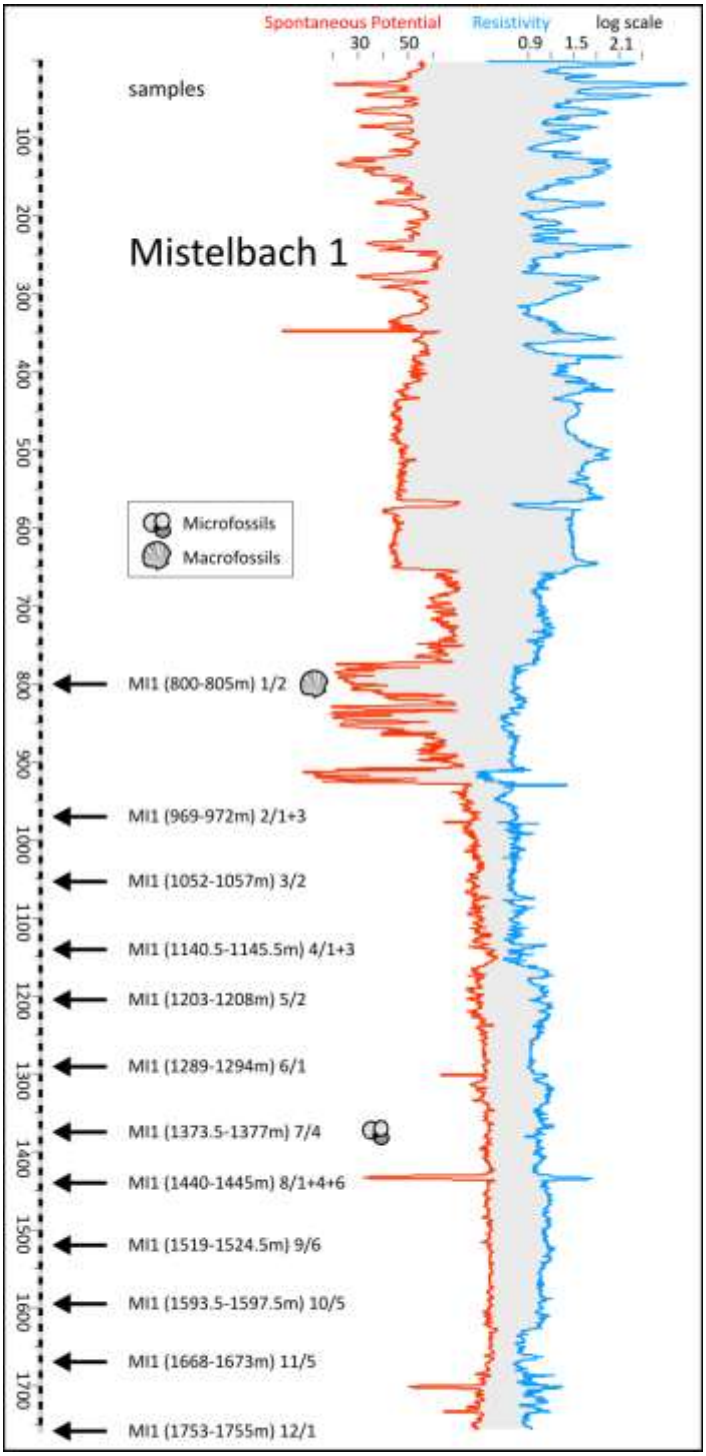


Fig. 38: Wire-logs of Mistelbach 1 with position of all samples. Fossil-bearing samples are indicated.

Figure 38 shows the SP- and RES-wire-logs of the drilling. Additionally, the positions of all taken samples are shown. It is also indicated if a sample bears macro- and/or microfossils.

SP-log:

This log ranges generally in a broader range of amplitudes and shows a slight coarsening upward trend. Between 660-1750 m it has a shale line-like form with very low amplitudes, weak serration and less outliers. Only between 770-930 m depth stronger serrations of higher amplitudes are developed. The overlying part shows generally higher amplitudes and also runaways.

RES-log:

The pattern of the RES-log is similar to the corresponding SP-log.

3.12. Mistelbach U1

3.12.1. Sampling

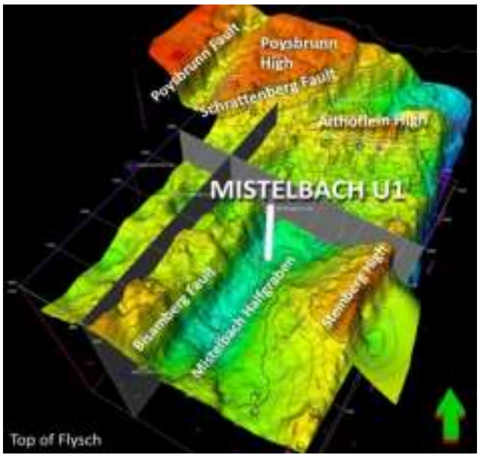


Fig. 39: Central position of the Mistelbach U1-well within the survey block.

The Mistelbach U1-core was sampled during the second sampling campaign on March 25th in 2013. The well is located in the middle of the survey, next to the Kettlasbrunn wells (fig. 39). In total 14 samples were taken from the available core material. One of these samples was stored, whereas the remaining 13 samples were processed (tab. 12).

3.12.2. Lithology – core material (fig. 40)

The sampled cores MisU1 (1298–1302m) 1/1+2, MisU1 (1624–1633m) 2/1+4, MisU1 (1885–1894m) 3/1+4+6, MisU1 (2038–2043.5m) 4/2+5, MisU1 (2097–2099m) 5/1, MisU1 (2099–2105m) 6/1+5 and MisU1 (2295–2300m) 7/1+4 are made up of less sandy, greyish marl with interspersed mollusc-rich layers.

Tab. 12: Overview of the sample status of the Mistelbach U1-well.

Mistelbach U1	date of sampling	sampled	stored	processed	with foramini-feral content	micro-sterile	disso-luble
MisU1 (1298-1302m) 1/1	25.03.2013	x		x		x	
MisU1 (1298-1302m) 1/2	25.03.2013	x		x	x		
MisU1 (1624-1633m) 2/1	25.03.2013	x		x		x	
MisU1 (1624-1633m) 2/4	25.03.2013	x		x		x	
MisU1 (1885-1894m) 3/1	25.03.2013	x		x	x		
MisU1 (1885-1894m) 3/4	25.03.2013	x		x	x		
MisU1 (1885-1894m) 3/6	25.03.2013	x	x				
MisU1 (2038-2043.5m) 4/2	25.03.2013	x		x		x	
MisU1 (2038-2043.5m) 4/5	25.03.2013	x		x		x	
MisU1 (2097-2099m) 5/1	25.03.2013	x		x			x
MisU1 (2099-2105m) 6/1	25.03.2013	x		x		x	
MisU1 (2099-2105m) 6/5	25.03.2013	x		x			x
MisU1 (2295-2300m) 7/1	25.03.2013	x		x		x	
MisU1 (2295-2300m) 7/4	25.03.2013	x		x		x	

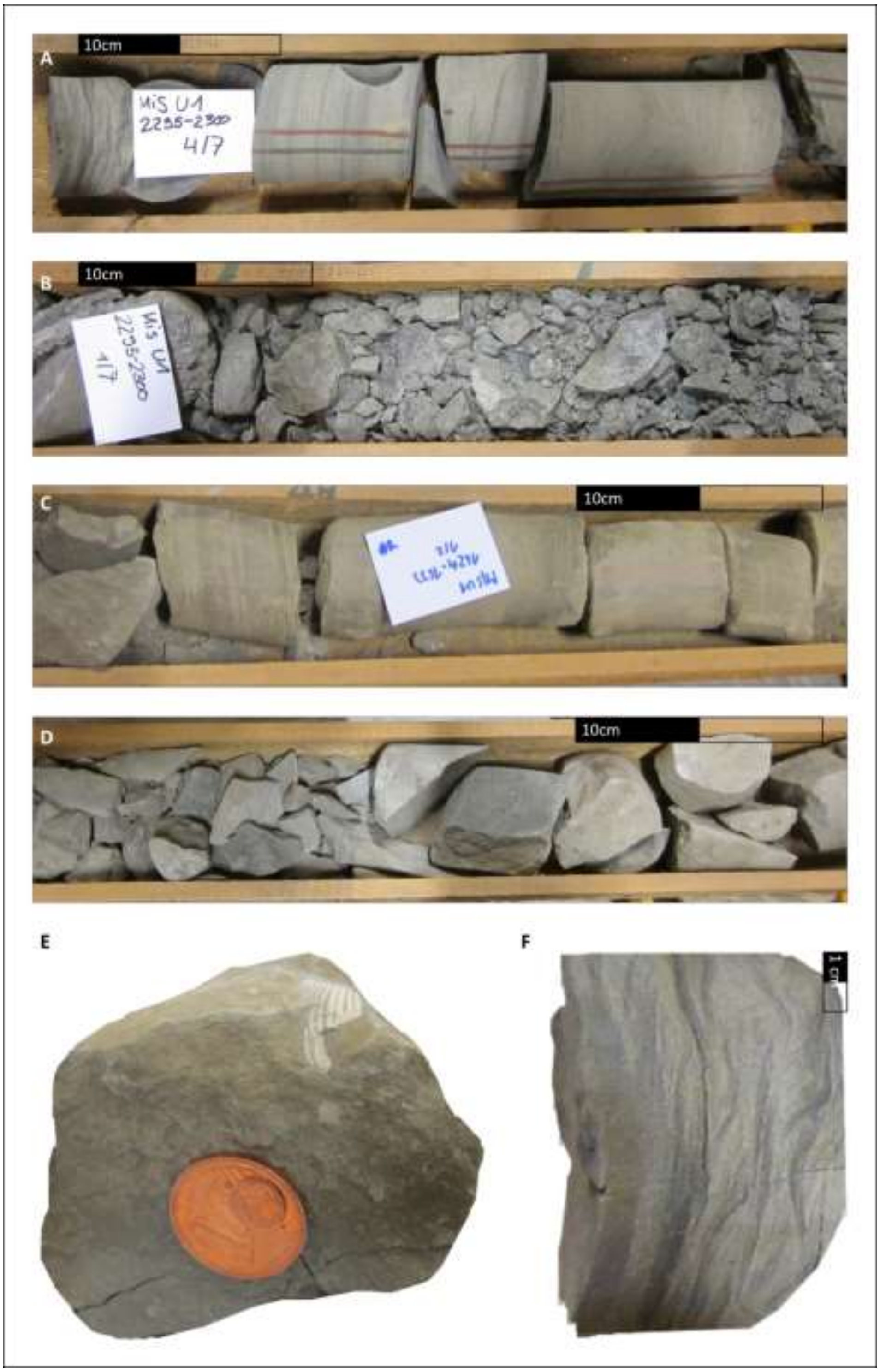


Fig. 40: ***A:*** *Box of core MisU1 (2295–2300m) 7/4 containing dense greyish marl with intercalated carbonised plant debris.* ***B:*** *Greyish and sandy marl of core MisU1 (2295–2300m) 7/1.* ***C:*** *Core MisU1 (1624–1633m) 2/1 consists of laminated brownish marl.* ***D:*** *Core MisU1 (2097–2099m) 5/1 is composed of greyish silty marl.* ***E:*** *A fragment of bivalve* Anadara*, found in core MisU1 (1885–1894m) 3/4.* ***F:*** *Greyish marl with darker intercalations of carbonised plant remains in core MisU1 (2295–2300m) 7/4 and flaser bedding.*

3.12.3. SP- and RES-logs

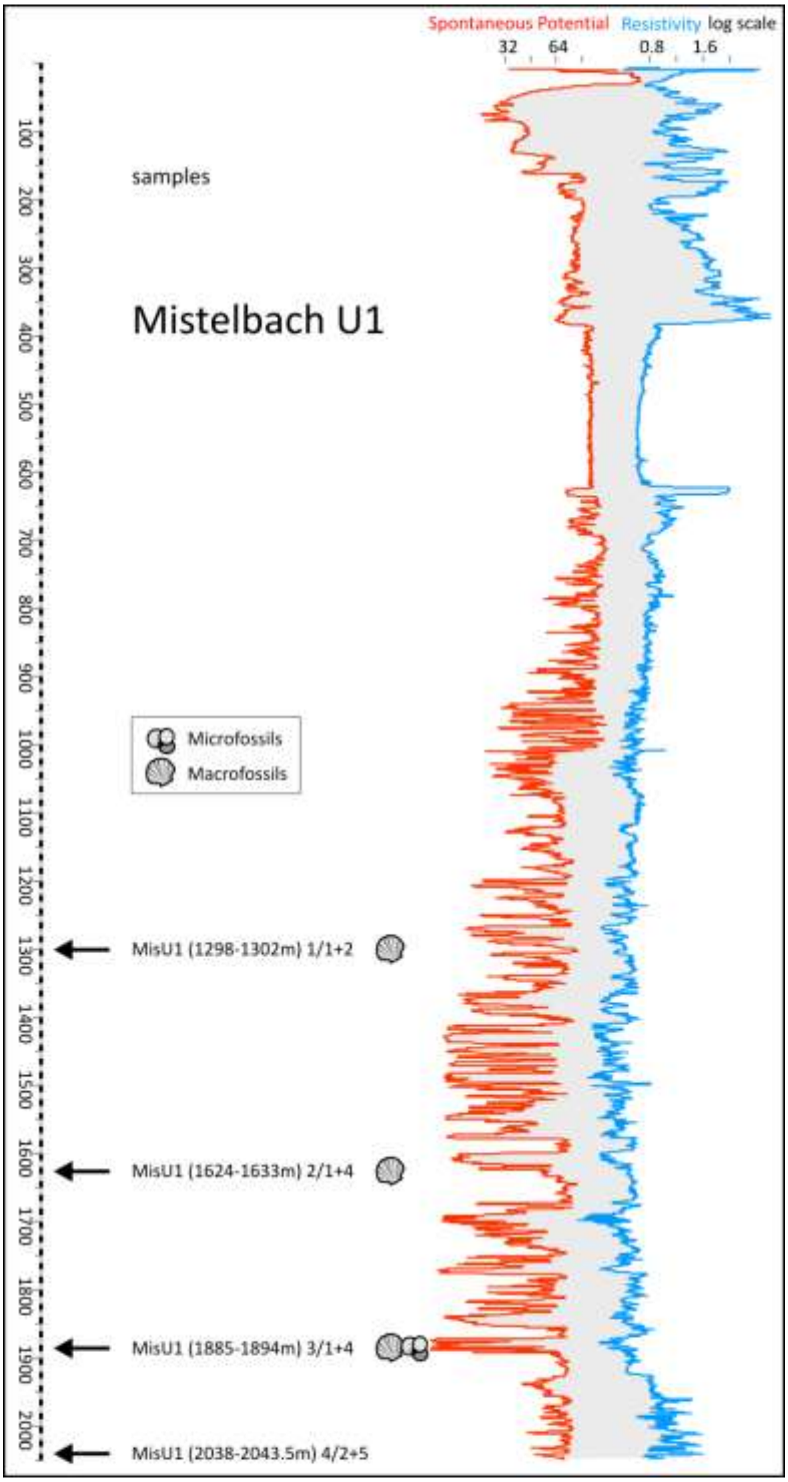


Fig. 41: Wire-logs of Mistelbach U1 with position of all samples. Fossil-bearing samples are indicated.

Figure 41 shows the SP- and RES-wire-logs of the drilling. Additionally, the positions of some samples are shown. It is also indicated if a sample bears macro- and/or microfossils.

SP-log:

The SP-log of this well is generally strongly serrated with high amplitudes and a distinct shale baseline. Between 630-1900 m depth the serration is strongly pronounced. The log indicates a fining upward and is bell-shaped (like a Christmas tree). The distinct shale line follows between 380-630 m. Between 50-380 m a slight coarsening upward is indicated.

RES-log:

This pattern of the RES-log is similar to the SP-log, but its serration is weaker. The shale line is also distinct.

3.13. Pirawarth U3

3.13.1. Sampling

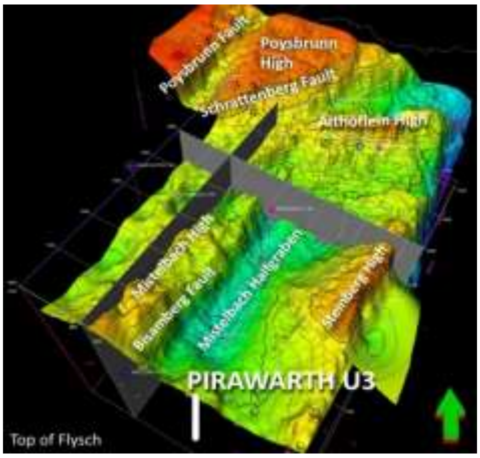


Fig. 42: Southern position of the Pirawarth U3-well on the margin of the investigated area.

On September 3rd in 2013 the Pirawarth U3-core was sampled. All samples went into processing (tab. 13). The well is located in the south of the survey at the southern margin of the Mistelbach Halfgraben (fig. 42).

3.13.2. Lithology – core material (fig. 43)

Brownish, clayey silt and sandy intercalations make up the sedimentary material of the Pirawarth U3-core. Numerous thin layers of carbonised plant debris can be found.

In the cores PWU3 (1123–1128m) 1/1+2+3 bedded, brownish, clayey-silty sandstone with thin clay intercalations and carbonised plant debris can be found. This sandstone changes into middle to dark grey, layered and clayey silt, which scarcely shows sandy intercalations, in the underlying two cores PWU3 (1438–1443m) 2/1+2.

Pirawarth U3	date of sampling	sampled	stored	processed	with foramini-feral content	micro-sterile
PWU3 (1123-1128m) 1/1	03.09.2013	x		x	x	
PWU3 (1123-1128m) 1/2	03.09.2013	x		x		x
PWU3 (1123-1128m) 1/3	03.09.2013	x		x	x	
PWU3 (1438-1443m) 2/1	03.09.2013	x		x		x
PWU3 (1438-1443m) 2/2	03.09.2013	x		x		x

Tab. 13: Overview on the sample status.

Fig. 43: ***A:*** *View on cores PWU3 (1123–1128m) 1 and PWU3 (1438–1443m) 2. Core PWU3 (1123–1128m) 1 comprises brownish, bedded sandstone, which grades downcore into clayey silt. One box measures one metre in length.* ***B-D:*** *Detailed views on examples for laminae, thin layers of carbonised plant remains as well as fine ripple structures, cross bedding and intercalations of darker clay in core PWU3 (1123–1128m) 1/3.* ***E:*** *Similar features found in core PWU3 (1123–1128m) 1/2.*

3.14. Pirawarth U5

3.14.1. Sampling

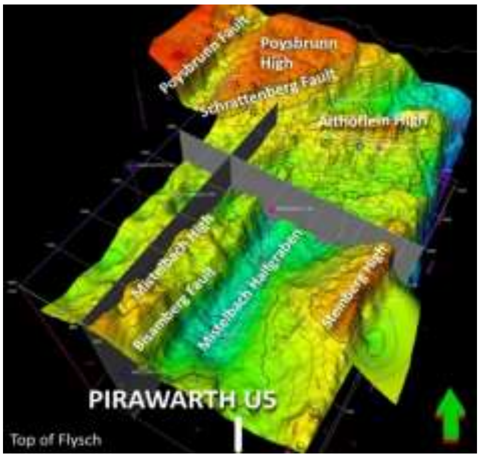


Fig. 44: Southern position of the Pirawarth U5-well on the margin of the investigated area.

On September 3rd in 2013 the Pirawarth U5-core was sampled. Only two samples were taken and both went into investigation (tab. 14). The well is located in the south of the survey at the southern margin of the Mistelbach Halfgraben (fig. 44) next to the Pirawarth U3-well.

3.14.2. Lithology – core material (fig. 45)

The cores PWU5 (795–800m) 1/1+2 are made of dense, bedded, light to middle brown-grey, fine- to middle-grained sandstone. In the underlying cores PWU5 (795–800m) 1/3+4 the sandstone is more clayey and marly and shows intercalations of clay and carbonised plant remains.

Pirawarth U5	date of sampling	sampled	stored	processed	with foramini-feral content	micro-sterile
PWU5 (795-800m) 1/3	03.09.2013	x		x	x	
PWU5 (795-800m) 1/4	03.09.2013	x		x		x

Tab. 14: Sample status of the Pirawarth U5-well.

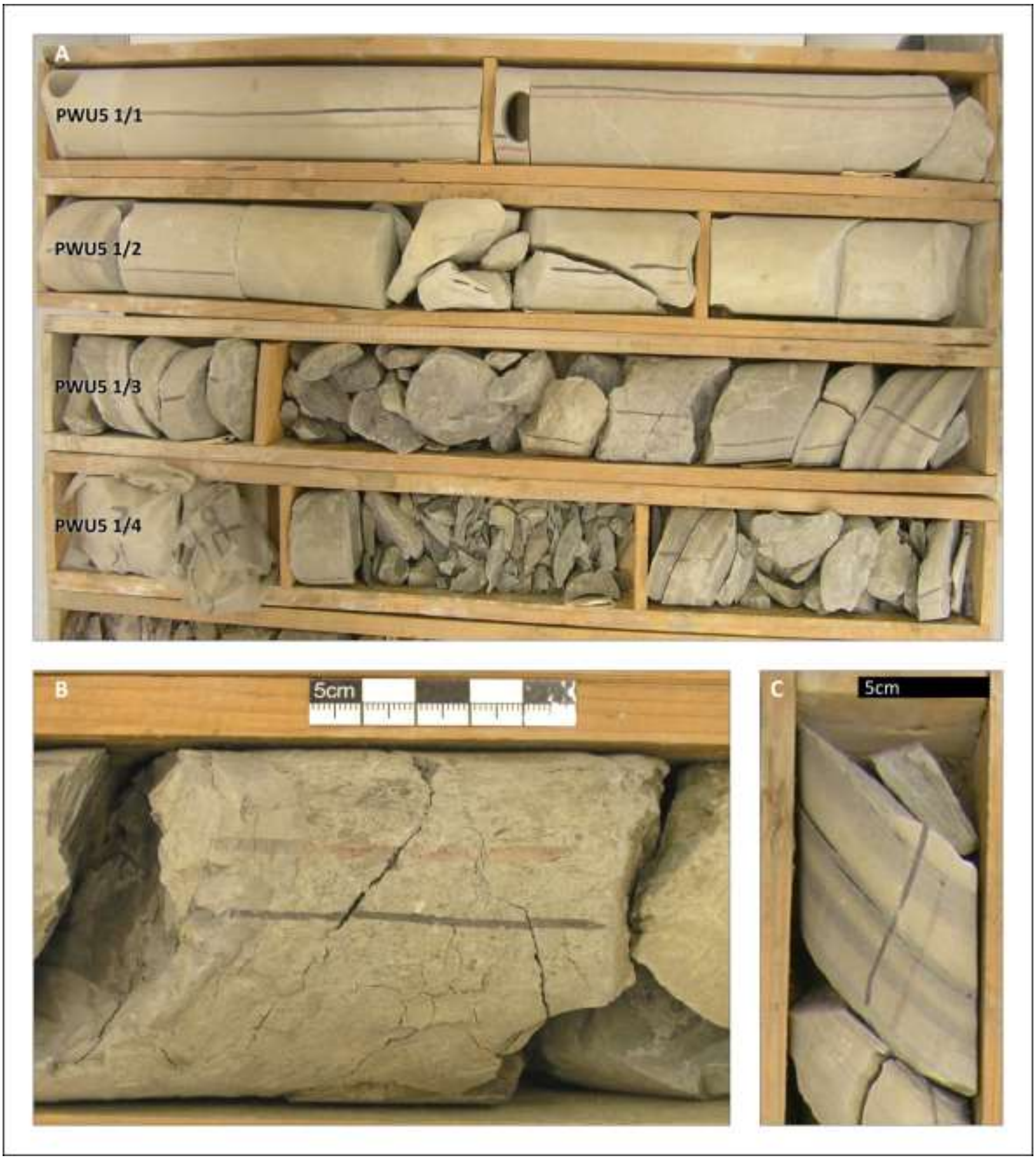


Fig. 45: ***A:*** *Top view on the boxes of core PWU5 (795–800m) 1 containing light brown sandstone as well as brown-greyish, laminated clayey marl. One box is one metre in length.* ***B+C:*** *Detailed view on clayey marl of core PWU5 (795–800m) 1/3. In C darker layers with carbonised plant remains are visible.*

3.15. Poysdorf 1

3.15.1. Sampling

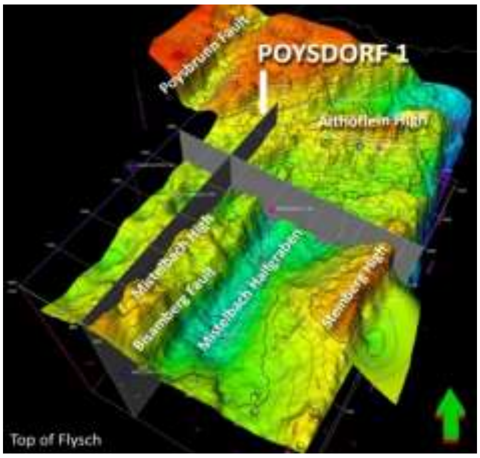


Fig. 46: Northern position of the Poysdorf 1-well within the survey area on the Mistelbach Block.

The Poysdorf 1-core was sampled on March 25th in 2013. 23 of the 29 taken samples went into further processing. The remaining six samples were stored (tab. 15). Poysdorf 1-well is located in the northern corner of the investigated block (fig. 46).

3.15.2. Lithology – core material (fig. 47)

All Poysdorf 1-cores are composed of greenish or grey-green, partly micaceous marl (e.g.: PO1 (40–45m) 1/1, PO1 (70–75m) 2/1, PO1 (99.5–105m) 3/1, PO1 (160–165m) 5/1+2+5, PO1 (190–195m) 6/1+3, PO1 (220–225m) 7/2, PO1 (250–255m) 8/2+4, PO1 (280–285m) 9/1, PO1 (310–315m) 10/2, PO1 (340–345m) 11/1, PO1 (370–375m) 12/2+3, PO1 (400–405m) 13/2, PO1 (430–435m) 14/3+5, PO1 (460–465m) 15/1+3, PO1 (490–495m) 16/1, PO1 (520–525m) 17/2+3, PO1 (550–554m) 18/3, PO1 (580–585m) 19/2 and PO1 (610–612.5m) 20/1). Only PO1 (130–135m) 4/2 and PO1 (250–255m) 8/1 consist of fine sand.

Additionally, molluscs are observed in cores PO1 (99.5–105m) 3/1, PO1 (130–135m) 4/2, PO1 (220–225m) 7/2, PO1 (280 285m) 9/1, PO1 (460–465m) 15/1, PO1 (490–495m) 16/1 and PO1 (520–525m) 17/2.

Fig. 47: ***A:*** *View on the green-greyish marl of core PO1 (580–585m) 19/2.* ***B:*** *Homogenous greyish marl in core PO1 (550–554m) 18/3* ***C:*** *Core PO1 (520–525m) 17/2 with more brownish marl.* ***D:*** *Top view on greenish marl of core PO1 (310–315m) 10/2.* ***E:*** *Greyish fine sand of core PO1 (250–255m) 8/1.*

Poysdorf 1	date of sampling	sampled	stored	processed	with foramini-feral content	micro-sterile
PO1 (40-45m) 1/1	25.03.2013	x		x	x	
PO1 (70-75m) 2/1	25.03.2013	x		x		x
PO1 (99,5-105m) 3/1	25.03.2013	x		x	x	
PO1 (130-135m) 4/2	25.03.2013	x		x	x	
PO1 (160-165m) 5/5	25.03.2013	x	x			
PO1 (160-165m) 5/2	25.03.2013	x		x	x	
PO1 (160-165m) 5/1	25.03.2013	x	x			
PO1 (190-195m) 6/3	25.03.2013	x		x		x
PO1 (190-195m) 6/1	25.03.2013	x		x		x
PO1 (220-225m) 7/2	25.03.2013	x		x		x
PO1 (250-255m) 8/4	25.03.2013	x	x			
PO1 (250-255m) 8/2	25.03.2013	x	x			
PO1 (250-255m) 8/1	25.03.2013	x		x	x	
PO1 (280-285m) 9/1	25.03.2013	x		x	x	
PO1 (310-315m) 10/2	25.03.2013	x		x		x
PO1 (340-345m) 11/1	25.03.2013	x		x		x
PO1 (370-375m) 12/3	25.03.2013	x		x		x
PO1 (370-375m) 12/2	25.03.2013	x		x		x
PO1 (400-405m) 13/2	25.03.2013	x		x		x
PO1 (430-435m) 14/5	25.03.2013	x	x			
PO1 (430-435m) 14/3	25.03.2013	x		x	x	
PO1 (460-465m) 15/3	25.03.2013	x		x		x
PO1 (460-465m) 15/1	25.03.2013	x		x	x	
PO1 (490-495m) 16/1	25.03.2013	x		x	x	
PO1 (520-525m) 17/3	25.03.2013	x	x			
PO1 (520-525m) 17/2	25.03.2013	x		x	x	
PO1 (550-554m) 18/3	25.03.2013	x		x		x
PO1 (580-585m) 19/2	25.03.2013	x		x		x
PO1 (610-612.5m) 20/1	25.03.2013	x		x		x

Tab. 15: Sample status of the Poysdorf 1-well.

3.15.3. SP- and RES-logs

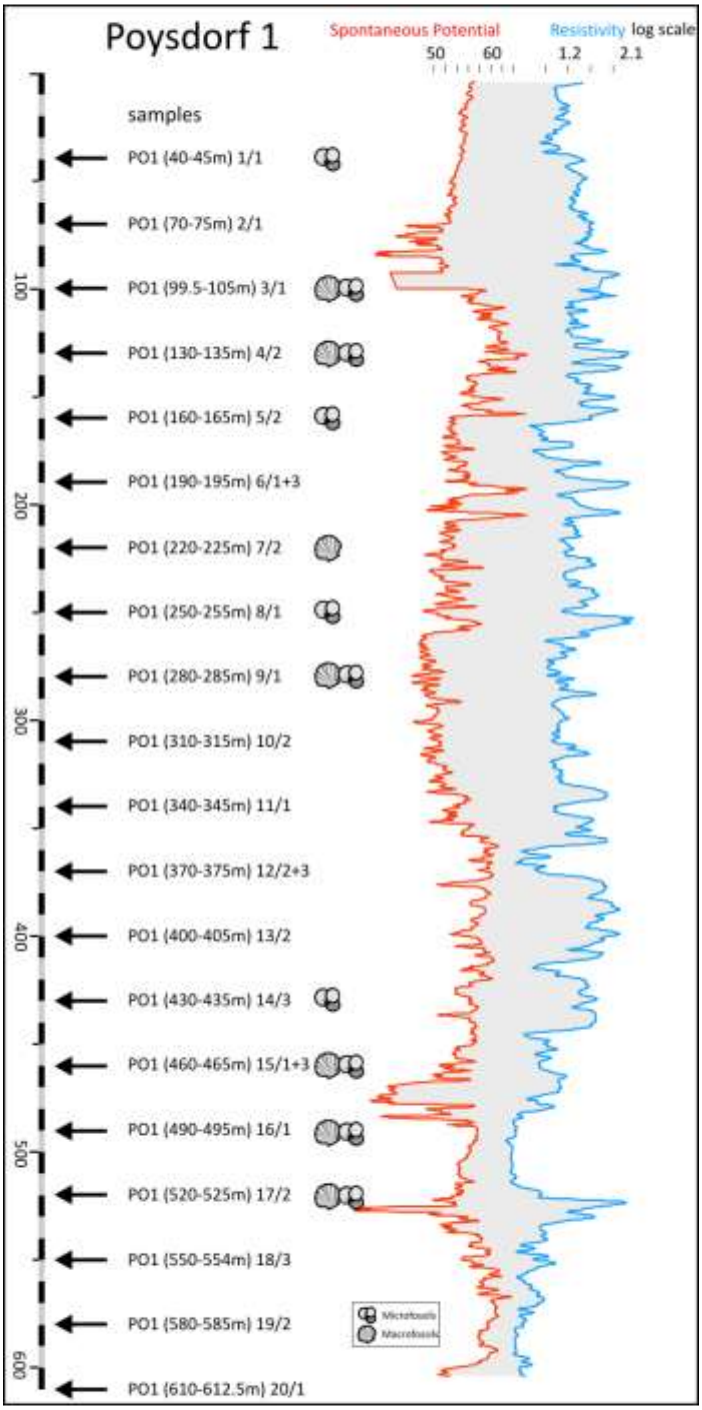


Fig. 48: Wire-logs of Poysdorf 1 with position of all samples. Fossil-bearing samples are indicated.

Figure 48 shows the SP- and RES-wire-logs of the drilling. Additionally, the positions of all taken samples are shown. It is also indicated if a sample bears macro- and/or microfossils.

SP-log:

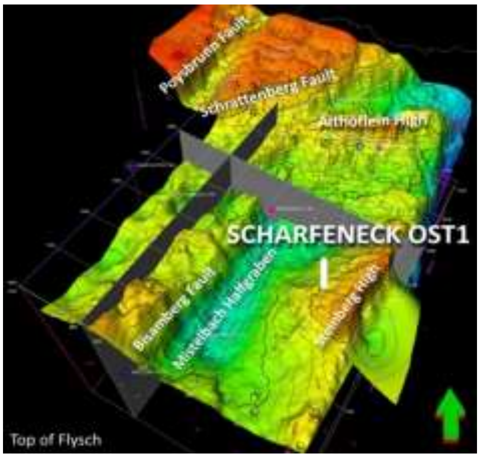
The SP-log is generally uniformly shaped throughout the pattern. The serration is pronounced with higher amplitudes. Between 260-360 m a slight coarsening upward trend (funnel-shape) is indicated. A distinct bell-shape is formed between 0-100 m signifying a strong fining upward trend.

RES-log:

Again the RES-log shows similar characteristics than the SP-log: uniform pattern with stronger serration within a broader amplitude range. Only the distinct bell-shape on the top as well as the coarsening segment in the middle are not pronounced.

3.16. Scharfeneck Ost1

3.16.1. Sampling



Cuttings of the Scharfeneck Ost1-core were sampled on September 3rd in 2013. The well is located in the east of the block on the slope of the Steinberg High (fig. 49). 26 samples were taken and all of them went into processing (tab. 16).

Fig. 49: Southeastern position of the Scharfeneck Ost1-well within the investigation area.

3.16.2. Lithology – core material

The drill cutting material consists of brownish marl, which is homogeneous in all samples.

Tab. 16: Overview on sample status.

Scharfeneck Ost1	date of sampling	sampled	stored	processed	with foramini-feral content	micro-sterile
SE O1 - 580m	03.09.2013	x		x		x
SE O1 - 590m	03.09.2013	x		x		x
SE O1 - 610m	03.09.2013	x		x		x
SE O1 - 620m	03.09.2013	x		x		x
SE O1 - 630m	03.09.2013	x		x		x
SE O1 - 640m	03.09.2013	x		x		x
SE O1 - 650m	03.09.2013	x		x		x
SE O1 - 660m	03.09.2013	x		x		x
SE O1 - 670m	03.09.2013	x		x		x
SE O1 - 680m	03.09.2013	x		x		x
SE O1 - 690m	03.09.2013	x		x		x
SE O1 - 710m	03.09.2013	x		x		x
SE O1 - 720m	03.09.2013	x		x		x
SE O1 - 730m	03.09.2013	x		x		x
SE O1 - 740m	03.09.2013	x		x		x
SE O1 - 750m	03.09.2013	x		x		x
SE O1 - 760m	03.09.2013	x		x		x
SE O1 - 770m	03.09.2013	x		x		x
SE O1 - 780m	03.09.2013	x		x		x
SE O1 - 790m	03.09.2013	x		x		x
SE O1 - 800m	03.09.2013	x		x		x
SE O1 - 810m	03.09.2013	x		x		x
SE O1 - 820m	03.09.2013	x		x		x
SE O1 - 830m	03.09.2013	x		x		x
SE O1 - 840m	03.09.2013	x		x		x
SE O1 - 860m	03.09.2013	x		x		x

3.17. Siebenhirten 3

3.17.1. Sampling

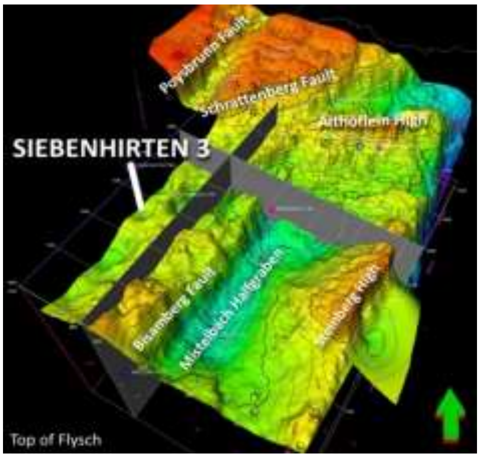


Fig. 50: Western position of the Siebenhirten 3-well within the Mistelbach Block.

The Siebenhirten 3-well is positioned at the western margin of the investigated survey (fig. 50) and was sampled during the third sampling campaign on March 28th in 2013. All 27 taken samples went into technical processing and micropalaeontological studies (tab. 17).

3.17.2. Lithology – core material (fig. 51)

The majority of the sample material of the Siebenhirten 3-core consists of brown-grey, micaceous sandy marl, which sporadically contains also sand intercalations. In several samples mollusc remains and lamination were found.

The uppermost cores SI3 (300–305m) 1/1+2, SI3 (400–405m) 2/1+2, SI3 (500–505m) 3/1, SI3 (600–604m) 4/1+2, SI3 (700–705m) 5/1+2, SI3 (800–805m) 6/1+2+3 are composed of brown-grey marl. Additionally sand layers can be found in SI3 (400–405m) 2/1, SI3 (500–505m) 3/1, SI3 (700–705m) 5/1 and SI3 (800–805m) 6/1. The latter two also yield carbonised plant debris and mollusc remains, respectively. Light brown, sandy marl makes up the following cores (SI3 (900–906m) 7/1+2+3+4 and SI3 (1000–1003m) 8/1). Grey-brown marl with thin sand intercalations follows in the cores SI3 (1000–1003m) 8/2+3. The marl merges into glauconitic sand in the cores SI3 (1100–1107m) 9/1+2+3+4, which is underlain again by grey-brown marl with thin sand intercalations and interspersed mollusc remains in SI3 (1200–1204m) 10/1 and SI3 (1250–1255m) 11/1. Cores SI3 (1335–1340m) 12/1+2 and SI3 (1385–1390m) 13/1 comprise micaceous and sandy marl. Grey-brown marl with thin sandy intercalations as well as micaceous fine- to medium-grained sand containing molluscs make up the cores SI3 (1385–1390m) 13/2, SI3 (1435–1440m) 14/1+2 and SI3 (1485–

1490m) 15/1+2. The cores SI3 (1530–1535m) 16/1+2+3 are made up of grey, marly and micaceous fine sand with mollusc shells. Micaceous medium-grained sand with clayey intercalations and implied lamination can be observed in core SI3 (1585–1590m) 17/1 and 17/2. The following cores SI3 (1635–1640m) 18/1, SI3 (1660–1664m) 19/1+2, SI3 (1679–1680.7m) 20/1+2 and SI3 (1716–1720.3m) 21/1+2+3 are composed of brown-grey and sandy marl.

*Fig. 51: **A:** View on cores SI3 (300–305m) 1 to SI3 (600–604m) 4/2 containing brown-grey, sandy marl. **B:** Cores SI3 (700–705m) 5 to SI3 (900–906m) 7 with more greyish sandy marl. **C:** View on cores SI3 (1000–1003m) 8 and SI3 (1100–1107m) 9. Lithological change from brownish sandy marl (8) to glauconitic grey sand (9). **D:** Grey micaceous fine sand of core SI3 (1530–1535m) 16 between more brownish sediment of cores SI3 (1485–1490m) 15/2 to SI3 (1635–1640m) 18/1. One box is one metre in length. **E:** Detailed view of a piece of core SI3 (1635–1640m) 18/1 showing layers of brownish marly sand. The lower part also contains small clay clasts. **F:** Example of glauconitic sand found in core SI3 (1100–1107m) 9/3. **G:** Thin laminae and layers of carbonised plant debris intercalated in brownish marly sand of core SI3 (1635–1640m) 18/1.*

Tab. 17: Overview on sample status.

Siebenhirten 3	date of sampling	sampled	stored	processed	with foramini-feral content	micro-sterile
SI3 (300-305m) 1/2	28.03.2013	x		x		x
SI3 (400-405m) 2/2	28.03.2013	x		x	x	
SI3 (500-505m) 3/1	28.03.2013	x		x	x	
SI3 (600-604m) 4/2	28.03.2013	x		x	x	
SI3 (700-705m) 5/1	28.03.2013	x		x		x
SI3 (800-805m) 6/3	28.03.2013	x		x	x	
SI3 (900-906m) 7/3	28.03.2013	x		x	x	
SI3 (1000-1003m) 8/2	28.03.2013	x		x	x	
SI3 (1100-1107m) 9/4	28.03.2013	x		x		x
SI3 (1200-1204m) 10/1	28.03.2013	x		x		x
SI3 (1250-1255m) 11/1	28.03.2013	x		x	x	
SI3 (1335-1340m) 12/1	28.03.2013	x		x	x	
SI3 (1385-1390m) 13/1	28.03.2013	x		x		x
SI3 (1435-1440m) 14/2	28.03.2013	x		x		x
SI3 (1485-1490m) 15/2	28.03.2013	x		x	x	
SI3 (1530-1535m) 16/2	28.03.2013	x		x		x
SI3 (1530-1535m) 16/1	28.03.2013	x		x		x
SI3 (1585-1590m) 17/1	28.03.2013	x		x		x
SI3 (1585-1590m) 17/2	28.03.2013	x		x		x
SI3 (1635-1640m) 18/1	28.03.2013	x		x		x
SI3 (1660-1664m) 19/2	28.03.2013	x		x		x
SI3 (1660-1664m) 19/1	28.03.2013	x		x		x
SI3 (1679-1680.7m) 20/2	28.03.2013	x		x		x
SI3 (1679-1680.7m) 20/1	28.03.2013	x		x		x
SI3 (1716-1720.3m) 21/3	28.03.2013	x		x		x
SI3 (1716-1720.3m) 21/2	28.03.2013	x		x		x
SI3 (1716-1720.3m) 21/1	28.03.2013	x		x	x	

3.17.3. SP- and RES-logs

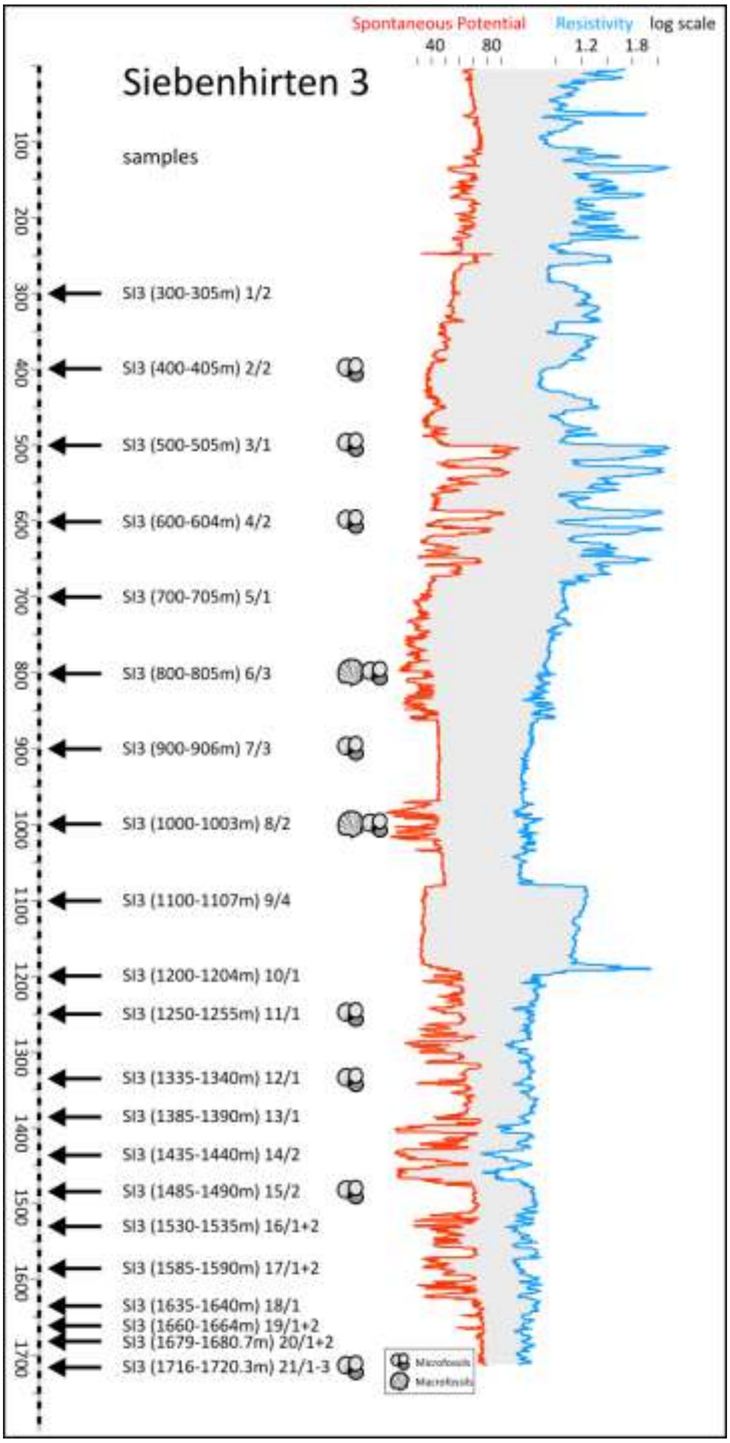


Fig. 52: Wire-logs of Siebenhirten 3 with position of all samples. Fossil-bearing samples are indicated.

Figure 52 shows the SP- and RES-wire-logs of the drilling. Additionally, the positions of all taken samples are shown. It is also indicated if a sample bears macro- and/or microfossils.

SP-log:

This SP-log is generally serrated with higher amplitudes and shows an overall trend of slight fining upward. Between 1200-1720 m the log is uniformly serrated within the same amplitude range. A cylindrical-shaped segment ranges between 1090-1210 m depth, which is followed by a shale baseline between 870-1090 m. This baseline is interrupted by a serration about 1000 m depth. Between 0-870 m the log shows a slight fining upward.

RES-log:

The corresponding RES-log is similar to the SP-log in its segmentation and it is also serrated. Between 1200-1720 m depth the pattern is uniformly serrated within a same range of low amplitudes. It follows a cylindrically shaped segment in 1090-1200 m depth. The shale baseline is also pronounced with same serrated interruption in the same depth range. Between 690-870 m a slight coarsening trend with small amplitude ranges and less serration is formed. The overlying segment is uniformly serrated with higher amplitudes but without a significant trend.

3.18. Walterskirchen 1

3.18.1. Sampling

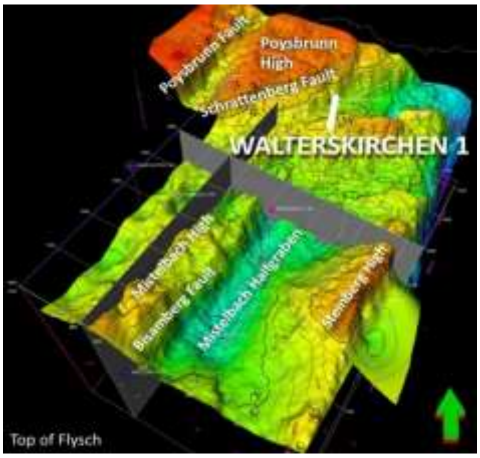


Fig. 53: Northern position of the Walterskirchen 1-well within the investigated area.

The Walterskirchen 1-well is located in the northern part of the investigated survey on top of a small swell south of the Katzelsdorf Basin (figs. 4, 53). In total 26 samples were taken from the available core material on March 28th in 2013. Eight of these samples were stored, whereas the remaining 18 samples went into technical processing (tab. 18).

3.18.2. Lithology – core material (fig. 54)

The Walterskirchen 1-cores are mainly composed of brown-greenish or greyish fine sandy marl. Additionally, partly clayey/marly fine- to medium-grained sand or sandstone can be observed. Mollusc remains, especially gastropods were found.

The uppermost four cores WA1 (200–205m) 1/1+2+3+4 are made up of greenish-brown, fine sandy marl with freshwater molluscs and implications for formation of palaeosol. In cores WA1 (250–255m) 2/1+4 greenish-grey and sandy marl can be found. Between them, light grey fine- to medium-grained sandstone builds up the cores WA1 (250–255m) 2/2+3. Light brown, sandy marl with distinct lamination and partly clasts of sandstone, carbonised plant remains and gastropods makes up cores WA1 (300–305m) 3/1+2+3 and WA1 (350–355m) 4/1+2+3+4+5. The underlying cores WA1 (400–405m) 5/1+2+3 are made of light grey and fine sandy marl, which also yields mollusc remains and carbonised plant debris. In cores WA1 (450–455m) 6/1+2+3 grey-brown, mottled and bedded fine- to medium-grained sandstone can be found. This sandstone merges into micaceous fine- to medium-grained sand, containing mollusc and carbonised plant remains in cores WA1 (500–505m) 7/1+2+3+4. Cores WA1 (550–554m) 8/1+2+3 and WA1 (580–581m) 9/1 are made up of brown, laminated and fine sandy marl. The following six cores WA1 (610–611.2m) 10/1, WA1 (640–641.5m)

11/1+2, WA1 (670–672.4m) 12/1+2 and WA1 (700–703m) 13/1 are composed of greyish, partly sandy marl. Cores WA1 (730–734.5m) 14/1+2 contain marly fine sandstone. In core WA1 (754–758m) 15/1 follows sandy marl, which changes into brown-grey and laminated fine sandstone in core WA1 (754–758m) 15/2.

*Fig. 54: **A:** View on the boxes of cores WA1 (200–205m) 1/1 to WA1 (350–355m) 4 with greenish, mottled marl indicating formation of palaeosol (core 1), lighter and sandier marl (core 2), brownish laminated sandy marl (core 3) and dark brown marl with distinct lamination (core 4). **B:** Cores WA1 (400–405m) 5 and WA1 (450–455m) 6 comprising greyish marl (5) and mottled sandstone (6). One box measures one metre in length. **C:** Example of laminated brownish marl of core WA1 (200–205m) 1/4. **D:** Piece of core WA1 (350–355m) 4/5 with distinctly laminated brownish marl. **E:** Brownish marl merging into condensed layer of mollusc remains bedded in marl found in core WA1 (400–405m) 5/2. **F:** Example of green-grey sandy marl with grey sandstone clasts in core WA1 (250–255m) 2/2. **G:** This piece of core WA1 (300–305m) 3/3 is made up of brownish, sandy laminated marl. Load structures can be recognised.*

Tab. 18: Overview on sample status.

Walterskirchen 1	date of sampling	sampled	stored	processed	with foramini-feral content	micro-sterile
WA1 (200-205m) 1/3	28.03.2013	x	x			
WA1 (200-205m) 1/1	28.03.2013	x		x	x	
WA1 (250-255m) 2/4	28.03.2013	x	x			
WA1 (250-255m) 2/1	28.03.2013	x		x		x
WA1 (300-305m) 3/3	28.03.2013	x		x		x
WA1 (300-305m) 3/1	28.03.2013	x		x	x	
WA1 (350-353m) 4/3	28.03.2013	x	x			
WA1 (350-353m) 4/2	28.03.2013	x		x	x	
WA1 (350-353m) 4/1	28.03.2013	x	x			
WA1 (400-403m) 5/3	28.03.2013	x	x			
WA1 (400-403m) 5/2	28.03.2013	x	x			
WA1 (400-403m) 5/1	28.03.2013	x		x	x	
WA1 (450-455m) 6/3	28.03.2013	x	x			
WA1 (450-455m) 6/2	28.03.2013	x		x	x	
WA1 (450-455m) 6/1	28.03.2013	x	x			
WA1 (500-505m) 7/4	28.03.2013	x		x	x	
WA1 (500-505m) 7/1	28.03.2013	x		x		x
WA1 (550-554m) 8/2	28.03.2013	x		x		Flysch
WA1 (580-581m) 9/1	28.03.2013	x		x		Flysch
WA1 (610-611.2m) 10/1	28.03.2013	x		x		Flysch
WA1 (640-641,5m) 11/2	28.03.2013	x		x		Flysch
WA1 (670-672.4m) 12/2	28.03.2013	x		x		Flysch
WA1 (670-672.4m) 12/1	28.03.2013	x		x		Flysch
WA1 (700-703m) 13/1	28.03.2013	x		x		Flysch
WA1 (730-734.5m) 14/2	28.03.2013	x		x		Flysch
WA1 (754-758m) 15/2	28.03.2013	x		x		Flysch

3.18.3. SP- and RES-logs

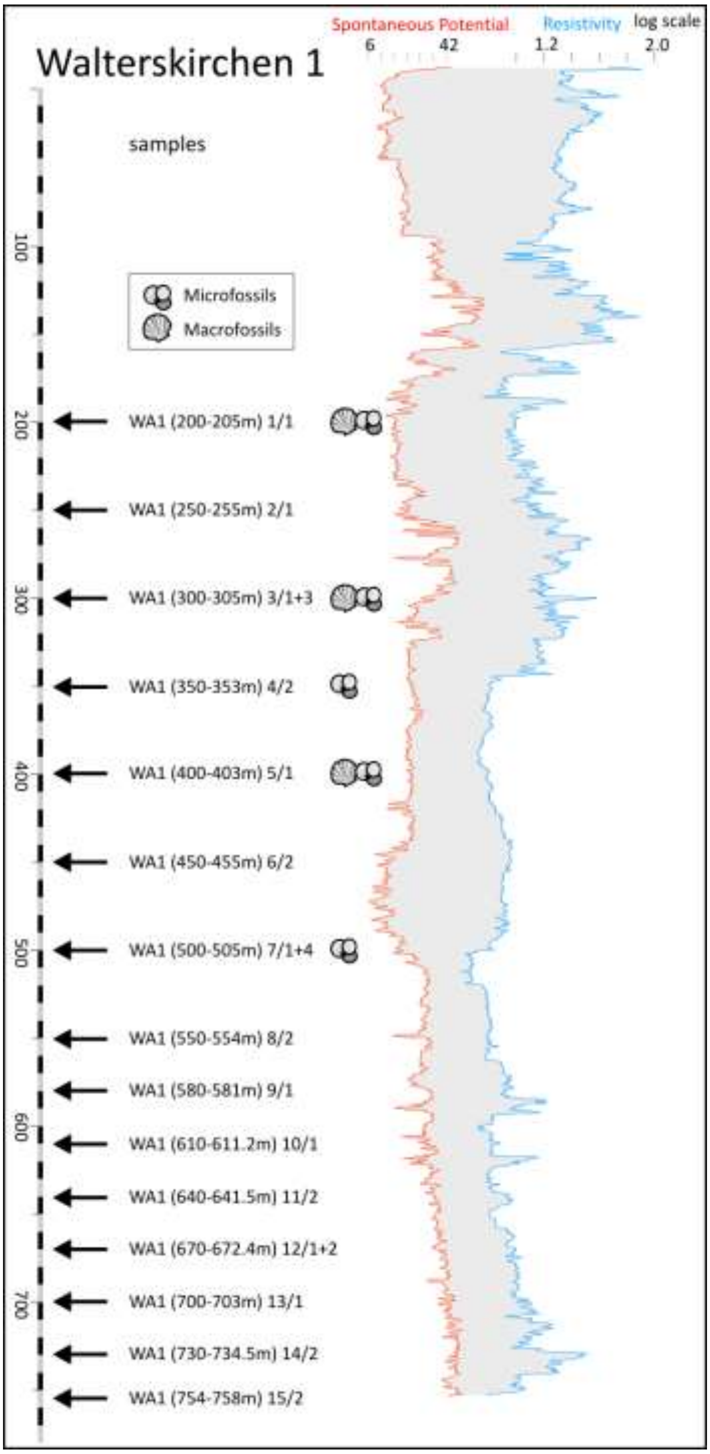


Fig. 55: Wire-logs of Walterskirchen 1 with position of all samples. Fossil-bearing samples are indicated.

Figure 55 shows the SP- and RES-wire-logs of the drilling. Additionally, the positions of all taken samples are shown. It is also indicated if a sample bears macro- and/or microfossils.

SP-log:

Generally this SP-log is serrated within a similar range of amplitudes. It shows no distinct segments like a shale line. An overall very slight coarsening upward trend can be observed. Between 440-760 m depth the SP-log indicates a slight coarsening upward and shows lower amplitudes and weaker serration. A stronger serration with higher amplitudes but no clear trend is visible in segment 150-440 m. Between 0-150 m depth the log is funnel-shaped indicating a coarsening upward.

RES-log:

This corresponding RES-log has a similar pattern than the SP-log. In general it is stronger serrated, but also shows a very slight coarsening upward trend.

4. Micropalaeontology

4.1. Material, Methods and general results

4.1.1. Technical processing and identification

After the sampling campaigns in Gänserndorf the 282 chosen samples (tab. 19) went through the identical technical process to extract the foraminiferal content. Each sample was soaked in diluted hydrogen peroxide (H_2O_2) for several hours and afterwards washed under running tab water and sieved through a set of standard sieves (mesh size > 63 µm). The oven-dried samples were then split into representative amounts using a splitter as described in Rupp (1986). The specimens were picked for size fractions 0.25-0.5 mm, 0.5-1 mm and, if available >1 mm. Even broken and poorly preserved specimens were taken. Additionally, all occurring gastropods, bivalves, serpulids, scaphopods, polychaetes, otoliths, bryozoans and coral fragments as well as fish remains were collected for supplementary palaeoecological information.

well	sample total	samples processed	samples stored	with foramini-feral content	microsterile	dissoluble
Althöflein 1	45	27	18	13	14	0
Ginzersdorf 1	19	14	5	1	12	1
Ginzersdorf 2	16	12	4	1	11	0
Hohenruppersdorf 19	14	13	1	7	6	0
Hohenruppersdorf 24	11	10	1	6	4	0
Hohenruppersdorf 25	15	14	1	8	6	0
Kettlasbrunn 1	34	18	16	8	8	2
Kettlasbrunn 2	50	20	30	5	14	1
Maustrenk West1	50	24	26	8	16	0
Mistelbach 1	21	16	5	2	14	0
Mistelbach U1	14	13	1	3	8	2
Pirawarth U3	5	5	0	2	3	0
Pirawarth U5	2	2	0	1	1	0
Poysdorf 1	29	23	6	10	13	0
Scharfeneck Ost1	26	26	0	0	26	0
Siebenhirten 3	27	27	0	10	17	0
Walterskirchen 1	26	18	8	6	3	9 Flysch
	404	282	122	91	176	6

Tab. 19: Summary of sample status, number of microsterile samples and number of samples with foraminiferal content.

The planktonic and benthic foraminifera were then identified to species level (as far as possible) and counted. The identification is based on Cicha et al. (1998, 2003), Didkovskij and Satanovskaja (1970), Gebhardt et al. (2009), Görög (1992), Haunold (1995), Jones (1994), Kennett and Srinivasan (1983), Loeblich and Tappan (1987), Łuczkowska (1974), Papp (1963), Papp and Schmid (1985), Papp and Turnovsky (1953), Popescu and Crihan (2004), Rögl (1985, 1994, 1998a), Rögl and Spezzaferri (2003), Rupp (1986), Schütz et al. (2007) and Wenger (1987).

4.1.2. Statistical Analyses

The foraminiferal composition of each sample was investigated to evaluate its biostratigraphic value. This allows correlation to international and regional standard biozones but also a core-to-core-correlation within the study area. Chapter 4.2. gives a short insight into the biostratigraphy of the different regional stages occurring in this study.

In order to gain palaeoecological information the quantitative data (based on counts) for the assemblages were used to calculate different diversity indices. The quantitative data were transformed (arc-sin transformed) into percentages to show the relative abundances of 1) common taxa, 2) agglutinated, miliolid and hyaline taxa and of 3) different environmental indicators concerning water depth, oxygenation of the bottom water, mode of life, environmental stress and organic matter flux. These statistical analyses were carried out using the software PAST (Paleontological Statistics, version 2.17, Hammer et al., 2001) and Microsoft Excel.

4.1.2.1. Diversity Indices

Four different diversity indices were applied to better describe the diversity and species distribution within the assemblages.

The number of taxa gives an idea about the diversity of a microfossil assemblage and expresses the total number of species occurring in one sample.

The Fisher Alpha Index is another value to express the diversity. This index eliminates the influence of the sample size and remains regardless of the number of individuals (Murray, 1991; Pippèrr and Reichenbacher, 2010). High index values indicate high species richness. Its mathematical expression is $S = \alpha * \ln(1+n/\alpha)$, where S is the number of taxa, n is the number of individuals and α is the Fisher's diversity index (Hammer and Harper, 2006).

Dominance D expresses the authority of a species over the total number of species within one sample. When D is 1 the assemblage is dominated by a single taxon. If all taxa are equally present D will be 0. The mathematical expression is D = $\sum(p_i^2)$, where $p_i = n_i/n$ (n_i is the number of individuals of taxon i) (Hammer and Harper, 2006).

A conceptual inverse, the Equitability index J describes the similarity between species contributions (Hammer and Harper, 2006; Murray, 1991). In other words, it evaluates how the individuals of a given community are divided between the involved species (Pippèrr and Reichenbacher, 2010). If all species are represented by the same number of specimens J = 1. Its mathematical expression is J = H/lnS, where S is the total number of species and $H = - \Sigma p_i \ln p_i$ (Shannon-Wiener index) (Hammer and Harper, 2006).

4.1.2.2. Palaeoecological and -environmental analyses based on benthic foraminifera

Numerous investigations from the last decades based on modern benthic foraminiferal communities show that different environments are characterised and can be distinguished by certain species associations (Murray 1991, 2006 and references therein; following references). Hereby several ecological factors that may influence the distribution of benthic foraminifera play a major role. Among others, these factors can be: water depth, salinity, organic flux to the seafloor, bottom-water oxygenation, water temperature, sedimentation rates, substrate type, turbulence, light and ecological preferences of the species. Therefore, modern but also fossil (due to actualistic reconstruction) benthic foraminiferal communities are a useful tool to evaluate and determine depositional environments and systems.

For the palaeoecological and -environmental analyses herein benthic foraminifera were grouped according to their bathymetric distribution, dependency of bottom water oxygenation and microhabitat preferences (see tab. 20 and references therein). Taxa, which can be used as markers for environmental stress and organic matter flux were also evaluated.

The benthic foraminiferal depth zonations (inner neritic (0-50 m), middle neritic (50-100 m), outer neritic (100-200 m) and upper bathyal (200-500 m)) are based on Culver (1988), Leckie and Olson (2003) and Murray (1991, 2006). One has to keep in mind that the foraminiferal taxa are not necessarily restricted and common in only these zones, but generally occur in low abundances in a wider range of environmental conditions. Higher abundances are expected in rather (near-) optimum conditions (Altenbach et al., 2003; Murray, 2006; Pippèrr, 2011a). Consequently, the made assumptions regarding the palaeoecology are principally based on more dominant and abundant species and genera, whereas subordinate taxa make a least significant difference and are therefore less regarded.

Referring to Kaiho (1994) the following terms describing dissolved-oxygen levels in marine waters are used: oxic (>1.5mL/L), suboxic (0.3-1.5mL/L) and dysoxic (0.1-0.3mL/L). Kaiho (1994) based his division of calcareous benthic foraminifera as level-indicators on the relationship between their preferred microhabitats, specific morphologic characteristics and oxygen levels.

Over the years numerous of papers focused on benthic foraminiferal microhabitats and the possible factors limiting the vertical depth distribution of meiobenthos in the sediment profile (e.g.: Jorissen, 1987, 1988; Kaiho, 1994; Jorissen et al., 1995; Schmiedl et al., 1997; Van der Zwaan et al., 1999; Altenbach et al. 1999; Den Dulk et al., 1998, 2000; Abu-Zied et al. 2008; numerous references therein). According to these authors, the assemblages are mainly controlled by two antagonising parameters: oxygen (bottom-water oxygenation) and food availability (organic flux). Jorissen et al. (1995) developed a conceptual model (TROX-model; fig. 56), in which they explained benthic foraminiferal microhabitats in terms of <u>TR</u>ophic (nutritional, labile organic carbon) conditions and <u>OX</u>ygen concentrations. The model is partly based on observations and conclusions of Shirayama (1984) and Corliss and Emerson (1990), such as the assumption of Shirayama (1984) that the depth in the sediment down to which organisms can live is determined by oxygen availability and, that in the presence of oxygen, the vertical distribution of organisms is controlled by food availability. According to the model, in well-oxygenated but food-limited systems foraminiferal communities are restricted to the surficial sediments due to the low amount of food available. The oxygen concentration within deeper sediment layers is high, but lacking metabolisable organic matter causes the foraminifera to stay near the surface. Hence, the communities consist of mainly epifaunal or surface dwelling taxa adapted to live in oligotrophic environments. In eutrophic environments, the penetration depth (vertical occurrence) of most taxa depends on the critical level of oxygen present within the sediment. Nutrients are not limiting as the amount of organic matter in subsurface sediment layers is high. The foraminiferal assemblage is dominated by infaunal taxa. In the intermediate mesotrophic situation, enough organic matter is available and the oxygen penetration depth is moderate. Hence, a well-developed vertical distribution of both epi- and infaunal species is supported.

Based on the contribution of specific infaunal and deep infaunal species within the assemblages environmental stress markers can be deduced (see tab. 20; Van Hinsbergen et al., 2005).

A further tool to roughly estimate palaeodepth is the P/B ratio, i. e. the percentage of planktonic foraminifera in the total foraminiferal assemblage (%P = P/(P+B)*100, where P is the total count of planktonic and B the total count of benthic individuals). With increasing water depth and distance to the shore the P/B ratios increase (Grimsdale and Van Morkhoven, 1955; Phleger, 1951; Van der

Zwaan et al., 1990; Van Hinsbergen et al., 2005). Murray (1976, 1991) suggested the following generalisations: ratios of < 20 % for inner shelf (inner neritic) environments, 10-60 % for middle shelf (middle neritic) environments, 40-70 % for outer shelf (outer neritic) and > 70 % for upper continental slope environments.

Van der Zwaan et al. (1990) observed that variation in the P/B ratio from area to area appears to have a strong dependency on the amount of included infaunal benthic foraminifera. To correct the influence of this dependency they developed a modified P/B ratio. The corrected ratios show near-identical regressions between the proportions of planktonic foraminifera (%P) and depth in several test regions. The regression is described by Depth D (m) = $e^{(3.58718+(0.03534*\%Pc))}$, where %Pc is the corrected ratio (%Pc = $((P*100)/(P+(B_t-B_i)))$ with P is the total count of planktonic, B_t the total count of benthic and B_i the total count of infaunal benthic individuals).

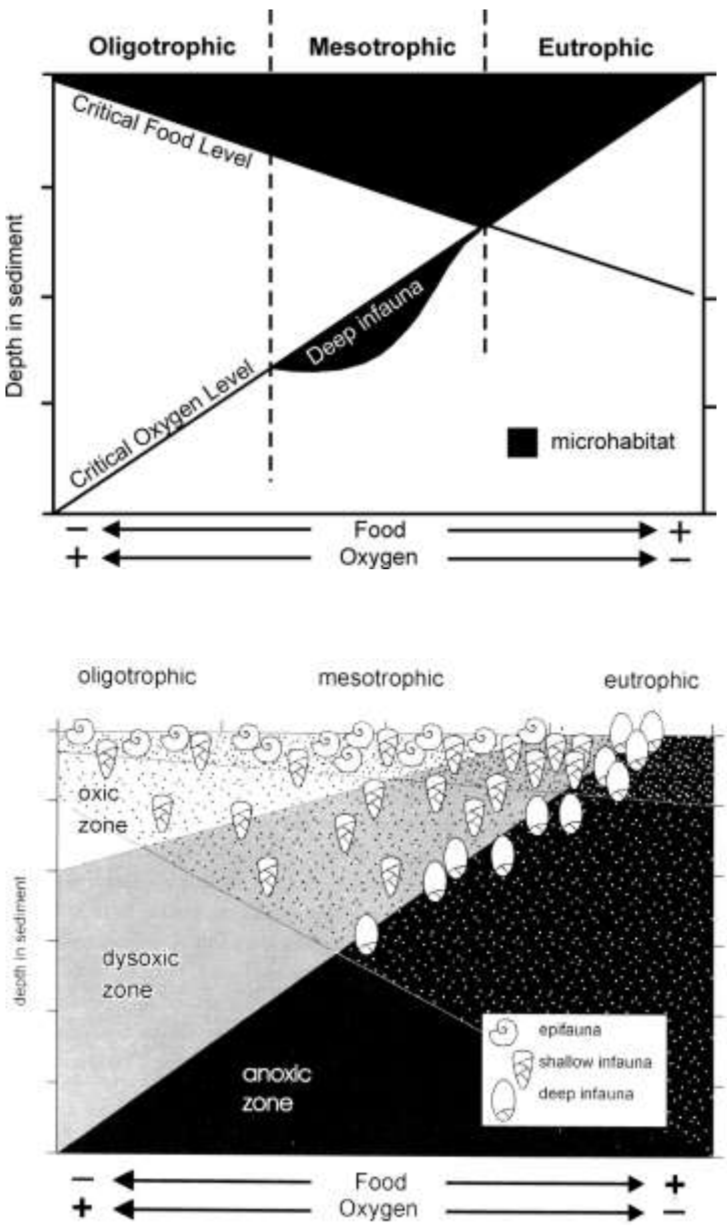


Fig. 56: ***Above:*** *Conceptual TROX-model explaining benthic foraminiferal living depth in terms of food availability and concentration of oxygen in the sediment. See text for further explanation. Figure depicted from Jorissen et al. (1995).* ***Below:*** *Second more detailed illustration of the TROX-model (from Van der Zwaan et al., 1999).*

	depth	habitat	oxygen	organic matter flux	stress marker	references
Bathysiphon spp.	B	E		H		2,8
Cribrostomoides subglobosus	IN-B	E to SI				2,3
Cyclammina spp.	ON-A	E?				2
Martinottiella communis	ON-B	E	O			2,12,13,
Reticulophragmium spp.		E to SI				5
Semivulvulina pectinata	MN-B	E	S			3,2
Spirorutilus carinatus	IN-B	E	O			3,5,21
Textularia spp.	IN-B	E	O			2,3,12,17
miliolids	IN-ON	E				
Borelis spp.	IN	E				2
Cycloforina spp.		E				
Pyrgo spp.	IN-B	E	O/S			1,2
Quinqueloculina spp.	IN-ON	E	O/S			1,2
Sigmoilinita tenuis	MN-B	E	O			3,12,13,20
Sigmoilopsis spp.	MN-B	E				3,5,13,20
Spirolina austriaca	IN	E				2
Spiroloculina spp.	IN	E	O/S			2,6
Triloculina spp.		E	O			1,2
Ammonia spp.	IN	E to SI	O/S			2,3,4,6,13
Amphicoryna spp.	MN-B	INF	S			1,3,4,5,8
Amphimorphina haueriana	MN-B	INF	S			3,21
Amphistegina radiata	IN-MN	E	O			2
Asterigerinata planorbis	IN-MN	E	O			2,3,12,17
Astrononion stelligerum	IN-B	INF	S			1,2,3,6,9,10,13
Aubignyna spp.	IN	INF?				2
Biapertorbis biaperturatus	ON-B	E				3,5,8
Bolivina spp.	IN-B	DI	D		x	1,2,3,4,9,11,12,14,21
Bulimina spp.	IN-B	INF	S/D	H (*B. elongata*)	x	1,2,3,4,5,11,14,21
Caucasina spp.	IN-B	INF	S/D			3,4,5,9,11,14
Cancris auriculus	MN-ON	E	S	H		2,9
Cassidulina laevigata	MN-B	INF	S	M to H		1,2,3,4,12
Cibicidoides spp.	MN-B	E	O			1,2,3,4,5,13,17
Dentalina spp.	IN-B	INF	S/D			1,3,4,13
Discorbinoides sp.	IN-MN					3
Elphidiella spp.	IN-ON	INF?				2
Elphidium spp. *(keeled)*	IN-ON	E	O			2,3,4,17
Elphidium spp. *(unkeeled)*	IN	INF	O			2
Eponides repandus	IN-B	E	O			2,12
Fissurina laevigata	IN-B	INF	S			1,3,12
Fursenkoina acuta	IN-B	INF	S/D		x	1,2,3,5,11,12,14,15,21
Glandulina spp.	MN-B	INF	S			7,12
Globulina gibba	IN-B		O			3,20
Grigelis pyrula		INF	S			21
Guttulina spp.	IN-B	INF	S			3,12
Hansenisca soldanii	ON-B	E	S			3,9,12,16
Heterolepa dutemplei	IN-B	E	O			2,3,15
Hoeglundina elegans	ON-B	E to SI	S	H		1,2,3,12
Laevidentalina spp.	ON-B	INF	S/D			3,4,8,12
Lagena spp.	IN-B	INF	S			1,3,4,5,8,9,12
Lenticulina spp.	MN-B	E	S			1,2,3,4,8,9,12,13,15
Lobatula lobatula	IN-MN	E	O			2,3,12,13,17,20
Marginulina hirsuta	IN-B	INF?				8,13,18
Melonis spp.	MN-B	INF	S/D	H		1,2,3,4,12,13
Myllostomella recta	MN-B	INF				18,19
Nonion spp.	MN-B	INF	S			1,2,3,4,12,13
Nonionella turgida	IN-B	INF	S			1,2,6
Pappina spp.	MN-B	INF	S			3,21
Pararotalia spp.	IN-MN	E	O			2,3,21
Plectofrondicularia spp.	MN-B	INF	S			3,5,21
Porosononion granosum	IN-MN					3,4
Praeglobobulimina spp.	MN-B	DI	D	H	x	1,2,3,4,11,12,14,17,21

Pullenia spp.	ON-B	INF	S			1,2,3,4,9,10,12,13
Reussella spinulosa	IN-ON	E	O			3,21
Siphonina reticulata	MN-B	E	O			13,21
Siphonodosaria consobrina	ON-B	INF	S			3,4,21
Sphaeroidina bulloides	MN-B	E	S			1,4,12,13
Uvigerina spp.	MN-B	INF	S	H	x	1,2,3,4,11,12,14,21
Vaginulinopsis hauerina	MN-B	INF	S			3,8,21
Valvulineria complanata	ON-B	INF	S		x	1,3,11,14,21

References:

1 Kaiho (1994)
2 Murray (2006)
3 Hohenegger (2005)
4 Rögl and Spezzaferri (2003)
5 Pippèrr and Reichenbacher (2010)
6 Bernhard and Sen Gupta (2002)
7 Jones (1994)
8 Reolid et al. (2008)
9 Kouwenhoven and Van der Zwaan (2006)
10 Den Dulk et al. (2000)
11 Van Hinsbergen et al. (2005)
12 Pezelj et al. (2007)
13 Spezzaferri and Tamburini (2007)
14 Spezzaferri et al. (2002)
15 Báldi (2006)
16 Corliss (1991)
17 Martins et al. (2007)
18 Roetzel et al. (2006)
19 Grunert et al. (2010b)
20 Wenger (1987)
21 Pezelj et al. (2013)

Tab. 20: Ecologic preferences of selected benthic foraminiferal taxa. Bathymetric distribution (IN = inner neritic, MN = middle neritic, ON = outer neritic, B = bathyal, A = abyssal), microhabitat (E = epifaunal, SI = shallow infaunal, I = infaunal, DI = deep infaunal), oxygen dependency (O = oxic, S = suboxic, D = dysoxic), dependency on organic matter flux (H = high OM flux, M = moderate OM flux) and stress marker.

4.1.2.3. Palaeoclimatic and -environmental analyses of planktonic foraminifera

Planktonic foraminifera can be used to evaluate palaeoclimatic conditions regarding surface water temperature. In order to gain these information, where available the detected planktonic foraminifera were divided into temperature-related groups (after Bicchi et al., 2003; Kennett and Srinivasan, 1983; Li et al., 1999; Rupp and Hohenegger, 2008; Spezzaferri, 2004).

Typical indicators for cool waters are *Globigerina* and *Turborotalita*, whereas *Globorotalia* and *Globoturborotalita* indicate temperate waters. Warm-temperate waters are often associated with *Globigerinella*. Warm surface waters are reflected by higher occurrences of *Globigerinoides*, *Globoquadrina* and *Orbulina*.

Similarly, planktonic foraminifers are sensible to productivity and nutrient input. Thus, *Globigerina bulloides*, *G*. *praebulloides* and the small, 5-chambered *G*. *tarchanensis* are reported to prefer environments with higher productivity and therefore indicate an increased input of nutrients (Hemleben et al., 1989; Hilbrecht, 1996; Rögl and Spezzaferri, 2003; Rupp and Hohenegger, 2008; Spezzaferri, 2004).

Globigerinella obesa is supposed to be an element of deeper water layers (Hilbrecht, 1996; Nikolaev et al., 1998) under warm-temperate conditions.

Since *Globorotalia scitula* is known to dwell in deeper water layers (Hilbrecht, 1996; Itou et al., 2001) and the species is related to *Globorotalia bykovae* after Cicha et al. (1998), the *Globorotalia* group might therefore reflect deeper water habitats.

After Nikolaev et al. (1998) *Globoturborotalita* is thought to prefer deeper water layers.

Heavy cancellated relatives of *Globoquadrina altispira* are typical warm water elements found in more tropical oceans (*Globoquadrina hexagona*; Bé and Hutson, 1977). As reported in Nikolaev et al. (1998) *Globoquadrina* is associated with intermediate water depths.

4.1.3. General results

During the examination of the samples about two-thirds (176 of the 282 processed samples) turned out to be microsterile (tab. 19, 21). Another six samples were dissoluble and nine further samples could be excluded from the beginning since they yielded pre-Neogene microfaunas. However, the remaining 91 samples yielded a great variety of foraminiferal individuals.

Microsterile samples were classified as such, when:

- they showed no foraminiferal content at all, or
- during several rounds of picking on the tray less than 15 tests were observed.

A comparison of 1) the core material, 2) the washing residue (was observed and documented during picking process) and 3) the relative stratigraphic position in seismics and wire-logs of both the determined samples as well as the microsterile samples, the latter can be assigned to various lithostratigraphic units. The sterile samples occur within all lithostratigraphic units and they are not restricted to certain horizons and/or specific biozones.

I have not further analysed the causes for the lack of microfossils in these samples but suppose that diagenetic effects and carbonate dissolution may play a major role. For samples with extremely rare but present microfaunas the absence of foraminifera may also be a primary signature, reflecting hostile environmental conditions.

Altogether 261 different foraminiferal species of 107 different genera were identified (21055 single specimens) in the 91 samples. When determination to specific or generic level was impossible, the three categories "Hyaline", "Miliolidae" and "Agglutinated" were used according to the test composition. The species split as follows:

- Agglutinated → 25 species of 16 genera
- Miliolids → 43 species of 13 genera
- Hyaline → 193 species of 78 genera (thereof 25 planktonic species in 9 planktonic genera)

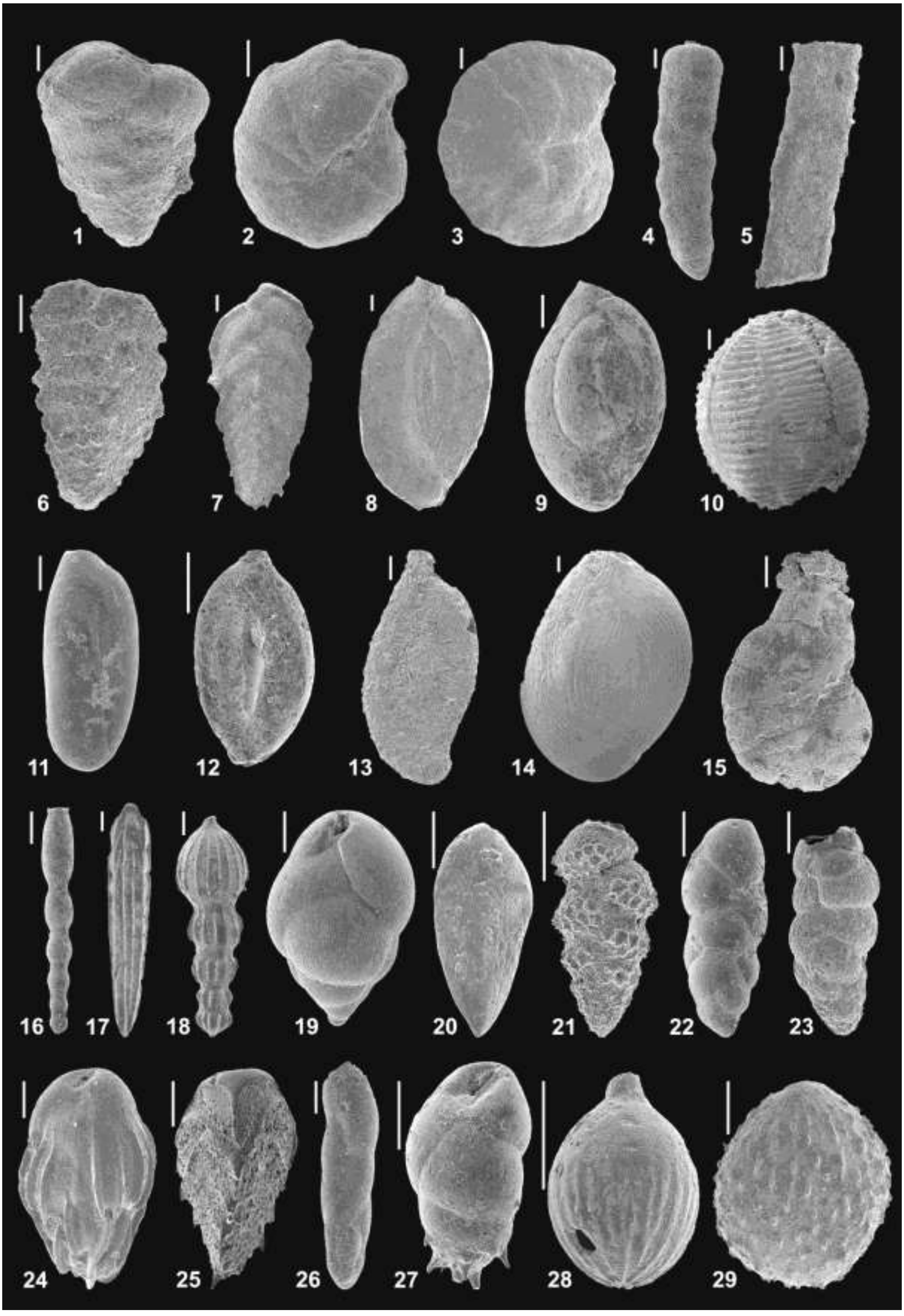
A list with the count of all species of all samples as well as the calculated diversity indices and palaeoecological parameters can be found in Appendices 1 and 2.

The following two plates show a selection of 52 ubiquitous and also marker species to give an insight in the variety and rich diversity. The pictures were made with the SEM at the NHM Vienna. Examples for agglutinated species are shown in pictures 1-7 of Plate 1, miliolid (porcellanous) foraminifera in pictures 8-15 of Plate 1. All remaining examples are hyaline taxa.

Tab. 21: List of all samples that turned out to be microsterile.

AH1 (250-255m) 9/3	HRD25 (745-750m) 11/2	MI1 (1593.5-1597.5m) 10/5
AH1 (340-345m) 12/1	HRD25 (751-756m) 12/1	MI1 (1668-1673m) 11/5
AH1 (370-375m) 13/1	HRD25 (915-919m) 13/1	MI1 (1753-1755m) 12/1
AH1 (430-435m) 14/1	HRD25 (979-984.5m) 14/1	MisU1 (1298-1302m) 1/1
AH1 (460-465m) 17/2	KA1 (200-205m) 1/2	MisU1 (1624-1633m) 2/1
AH1 (520-523m) 18/1	KA1 (200-205m) 1/3	MisU1 (1624-1633m) 2/4
AH1 (460-465m) 19/3	KA1 (250-252.8m) 2/1	MisU1 (2038-2043.5m) 4/2
AH1 (460-465m) 19/2	KA1 (300-306m) 4/3	MisU1 (2038-2043.5m) 4/5
AH1 (460-465m) 19/1	KA1 (350-355m) 5/1	MisU1 (2099-2105m) 6/1
AH1 (460-465m) 20/2	KA1 (400-403.7m) 6/2	MisU1 (2295-2300m) 7/1
AH1 (460-465m) 20/1	KA1 (650-655m) 11/1	MisU1 (2295-2300m) 7/4
AH1 (610-615m) 22/2	KA1 (895-900m) 15/1	PWU3 (1123-1128m) 1/2
AH1 (610-615m) 22/1	KA2 (900-905m) 1/2	PWU3 (1438-1443m) 2/1
AH1 (610-615m) 23/1	KA2 (960-965m) 2/2	PWU3 (1438-1443m) 2/2
GI1 (350-355m) 3/1	KA2 (960-965m) 2/1	PWU5 (795-800m) 1/4
GI1 (400-405m) 4/1	KA2 (1204-1210m) 6/4	PO1 (70-75m) 2/1
GI1 (450-455m) 5/1	KA2 (1255-1259.5m) 7/3	PO1 (190-195m) 6/3
GI1 (550-555m) 7/2	KA2 (1255-1259.5m) 7/1	PO1 (190-195m) 6/1
GI1 (650-655m) 9/1	KA2 (1320-1325m) 8/4	PO1 (220-225m) 7/2
GI1 (700-705m) 10/3	KA2 (1440-1445m) 10/3	PO1 (310-315m) 10/2
GI1 (750-755m) 11/1	KA2 (1500-1505m) 11/3	PO1 (340-345m) 11/1
GI1 (800-805m) 12/2	KA2 (1560-1565m) 12/2	PO1 (370-375m) 12/3
GI1 (850-852.5m) 13/1	KA2 (1611-1616m) 13/3	PO1 (370-375m) 12/2
GI1 (900-902m) 14/1	KA2 (1611-1616m) 13/2	PO1 (400-405m) 13/2
GI1 (950-953.5m) 15/2	KA2 (1680-1685m) 14/3	PO1 (460-465m) 15/3
GI1 (1077-1082m) 18/1	KA2 (1707-1711m) 15/5	PO1 (550-554m) 18/3
GI2 (550-555m) 1/1	MTW1 (1000-1005m) 1/2	PO1 (580-585m) 19/2
GI2 (700-704.5m) 2/1	MTW1 (1050-1055m) 2/3	PO1 (610-612.5m) 20/1
GI2 (898-903m) 3/1	MTW1 (1100-1105m) 3/1	Scharfeneck Ost1 completely
GI2 (925-930m) 4/1	MTW1 (1200-1205m) 5/5	SI3 (300-305m) 1/2
GI2 (950-952.7m) 5/2	MTW1 (1200-1205m) 5/2	SI3 (700-705m) 5/1
GI2 (975-978m) 6/2	MTW1 (1247.5-1252.5m) 6/5	SI3 (1100-1107m) 9/4
GI2 (1000-1002m) 7/1	MTW1 (1300-1305m) 7/5	SI3 (1200-1204m) 10/1
GI2 (1025-1027,4m) 8/2	MTW1 (1350-1355m) 8/1	SI3 (1385-1390m) 13/1
GI2 (1050-1052m) 9/2	MTW1 (1420-1424.7m) 10/4	SI3 (1435-1440m) 14/2
GI2 (1125-1126.6m) 12/1	MTW1 (1458-1463m) 11/3	SI3 (1530-1535m) 16/2
GI2 (1200-1201m) 15/2	MTW1 (1510-1517m) 13/2	SI3 (1530-1535m) 16/1
HRD19 (725-730m) 9/1	MTW1 (1540-1545m) 14/4	SI3 (1585-1590m) 17/1
HRD19 (803-808m) 10/2	MI1 (800-805m) 1/2	SI3 (1585-1590m) 17/2
HRD19 (815-819m) 11/1	MI1 (969-972m) 2/1	SI3 (1635-1640m) 18/1
HRD19 (970-975m) 13/1	MI1 (969-972m) 2/3	SI3 (1660-1664m) 19/2
HRD19 (1003-1008m) 14/1	MI1 (1140.5-1145.5m) 4/1	SI3 (1660-1664m) 19/1
HRD19 (1060-1063m) 15/1	MI1 (1140.5-1145.5m) 4/3	SI3 (1679-1680.7m) 20/2
HRD24 (491-495m) 4/1	MI1 (1203-1208m) 5/2	SI3 (1679-1680.7m) 20/1
HRD24 (791.5-796m) 10/2	MI1 (1289-1294m) 6/1	SI3 (1716-1720.3m) 21/3
HRD24 (807-811m) 11/1	MI1 (1440-1445m) 8/6	SI3 (1716-1720.3m) 21/2
HRD24 (1000.5-1001.5m) 12/1	MI1 (1440-1445m) 8/4	WA1 (250-255m) 2/1
HRD25 (440-445m) 3/1	MI1 (1440-1445m) 8/1	WA1 (300-305m) 3/3
HRD25 (600-605m) 6/1	MI1 (1519.5-1524.5m) 9/6	WA1 (500-505m) 7/1

Plate 1: A selection of different foraminiferal taxa found in the investigated wells of the Mistelbach Halfgraben. Species 1–7 are agglutinated, 8–15 are porcellanous/miliolid representatives and the remaining 14 taxa are different hyaline species. Scale bar = 100µm. ***1:*** Textularia gramen *d'Orbigny, KA2 (1020–1025m) 3/4;* ***2:*** Cribrostomoides subglobosus *(M. Sars), GI1 (1050–1055m) 17/1;* ***3:*** Reticulophragmium karpaticum *Cicha & Zapletalová, GI1 (1050–1055m) 17/1;* ***4:*** Martinottiella communis *(Reuss), SI3 (1000–1003m) 8/2;* ***5:*** Bathysiphon filiformis *M. Sars, MI1 (1373.5–1377m) 7/4;* ***6:*** Paravulvulina serrata *(Reuss), PO1 (520–525m) 17/2;* ***7:*** Spirorutilus carinatus *(d'Orbigny), SI3 (900–906m) 7/3;* ***8:*** Cycloforina contorta *(d'Orbigny), AH1 (190–195m) 7/4;* ***9:*** Quinqueloculina akneriana *d'Orbigny, PO1 (520–525m) 17/2;* ***10:*** Borelis melo *(Fichtel & Moll), PO1 (520–525m) 17/2;* ***11:*** Pseudotriloculina consobrina *d'Orbigny, AH1 (190–195m) 7/4;* ***12:*** Sigmoilinita tenuis *(Czjzek), HRD24 (550–555m) 5/1;* ***13:*** Sigmoilopsis foeda *(Reuss), AH1 (220–225m) 8/2;* ***14:*** Quinqueloculina boueana *d'Orbigny, PO1 (520–525m) 17/2;* ***15:*** Spirolina austriaca *d'Orbigny, AH1 (190–195m) 7/4;* ***16:*** Laevidentalina boueana *(d'Orbigny), SI3 (900–906m) 7/3;* ***17:*** Plectofrondicularia digitalis *(Neugeboren), AH1 (130–135m) 5/1;* ***18:*** Amphicoryna badenensis *(d'Orbigny), SI3 (500–505m) 3/1;* ***19:*** Praeglobobulimina pupoides *(d'Orbigny), SI3 (1000–1003m) 8/2;* ***20:*** Bolivina dilatata *Reuss, SI3 (900–906m) 7/3;* ***21:*** Bitubulogenerina reticulata *Cushman, AH1 (220–225m) 8/2;* ***22:*** Bulimina elongata *d'Orbigny, SI3 (900–906m) 7/3;* ***23:*** Pappina breviformis *(Papp & Turnovsky), AH1 (280–285m) 10/2;* ***24:*** Uvigerina macrocarinata *Papp & Turnovsky, SI3 (900–906m) 7/3;* ***25:*** Reussella spinulosa *(Reuss), AH1 (220–225m) 8/2;* ***26:*** Fursenkoina acuta *(d'Orbigny), HRD19 (630–635m) 6/1;* ***27:*** Caucasina subulata *(Cushman & Parker), SI3 (900–906m) 7/3;* ***28:*** Lagena gracilicosta *Reuss, SI3 (400–405m) 2/2;* ***29:*** Globulina punctata *d'Orbigny, PO1 (520–525m) 17/2.*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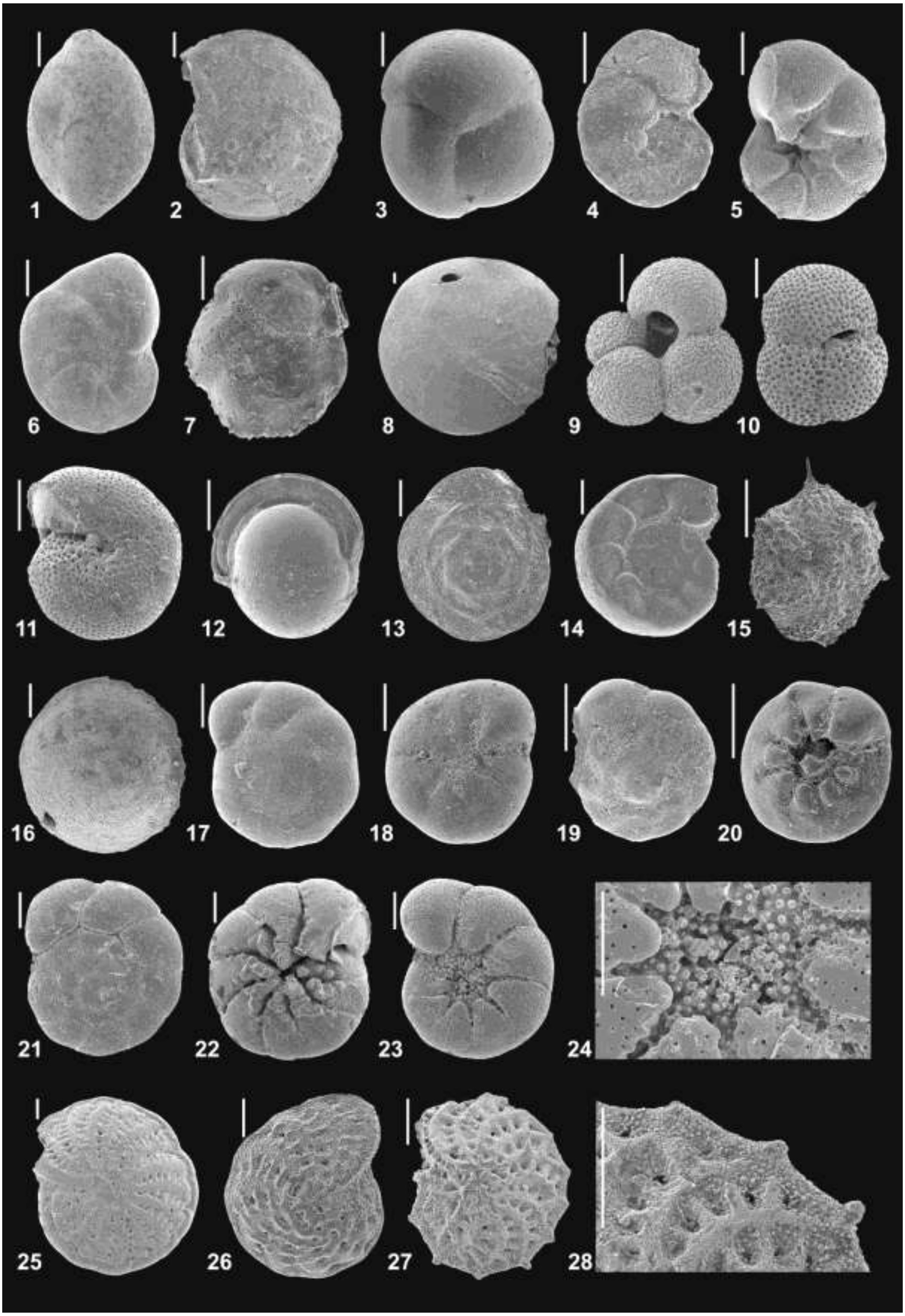
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Plate 2: A selection of different foraminiferal species found in the investigated wells of the Mistelbach Halfgraben. All illustrated foraminiferal species are hyaline taxa. Scale bar = 100µm. ***1:*** Guttulina communis *(d'Orbigny), PO1 (520–525m) 17/2;* ***2:*** Lenticulina inornata *(d'Orbigny), HRD19 (650–656m) 7/1;* ***3:*** Sphaeroidina bulloides *d'Orbigny, SI3 (1000–1003m) 8/2;* ***4:*** Lobatula lobatula *(Walker & Jacob), AH1 (130–135m) 5/1;* ***5:*** Valvulineria complanata *(d'Orbigny), SI3 (900–906m) 7/3;* ***6:*** Nonion commune *(d'Orbigny), SI3 (500–505m) 3/1;* ***7:*** Siphonina reticulata *(Czjzek), AH1 (310–315m) 11/1;* ***8:*** Amphistegina radiata *(Fichtel & Moll), PO1 (520–525m) 17/2;* ***9:*** Globigerina bulloides *d'Orbigny, PO1 (130–135m) 4/2;* ***10:*** Globigerinoides trilobus *(Reuss), AH1 (130–135m) 5/1;* ***11:*** Melonis pompilioides *(Fichtel & Moll), SI3 (900–906m) 7/3;* ***12:*** Pullenia bulloides *(d'Orbigny), SI3 (900–906m) 7/3;* ***13:*** Heterolepa dutemplei *(d'Orbigny), SI3 (1000–1003m) 8/2;* ***14:*** Hansenisca soldanii *(d'Orbigny), SI3 (1000–1003m) 8/2;* ***15:*** Schackoinella imperatoria *(d'Orbigny), PO1 (520–525m) 17/2;* ***16:*** Asterigerinata planorbis *(d'Orbigny), PO1 (520–525m) 17/2;* ***17:*** Aubignyna *sp. 1 – spiral side, WA1 (300–305m) 3/1;* ***18:*** Aubignyna *sp. 1 – umbilical side, WA1 (300–305m) 3/1;* ***19:*** Ammonia pseudobeccarii *(Putrya) – spiral side, WA1 (200–205m) 1/1;* ***20:*** Ammonia pseudobeccarii *(Putrya) – umbilical side, WA1 (200–205m) 1/1;* ***21:*** Ammonia viennensis *(d'Orbigny) – spiral side, AH1 (160–165m) 6/2;* ***22:*** Ammonia viennensis *(d'Orbigny) – umbilical side, AH1 (160–165m) 6/2;* ***23:*** Porosononion granosum *(d'Orbigny), AH1 (160–165m) 6/2;* ***24:*** Porosononion granosum *(d'Orbigny) – umbilical area, AH1 (160–165m) 6/2;* ***25:*** Elphidium flexuosum *(d'Orbigny), AH1 (190–195m) 7/4;* ***26:*** Elphidium grilli *Papp, WA1 (200–205m) 1/1;* ***27:*** Elphidium aculeatum *(d'Orbigny), AH1 (130–135m) 5/1;* ***28:*** Elphidium aculeatum *(d'Orbigny), keel with short spines, AH1 (130–135m) 5/1.*

4.2. Biostratigraphy

The marine biostratigraphy of the Miocene of the Paratethys Sea is based on foraminifera and nannoplankton. Due to the poor preservation and the huge amount of reworked specimens, nannoplankton turned out to be of little value in all test samples that were analysed within the current project. Therefore I focused on foraminifera, which were used to establish biostratigraphic zonations within the Paratethys since the early 20th century (see Cicha et al., 1998; Piller et al., 2007 and Harzhauser and Piller, 2007 for references). For the Eggenburgian, Ottnangian and Karpatian no regional zonations are proposed so far, and the existing correlations either try to adopt international biostratigraphic schemes and/or to use FADs (first appearance datum) and LADs (last appearance datum) of certain – often endemic – taxa (e.g.: Wenger, 1987; Cicha et al., 1998; Pippèrr, 2011b; Grunert et al., 2013, 2014). For the Badenian and Sarmatian, a regional biostratigraphic (or better ecostratigraphic) zonation is well-established and used herein.

In the following, assemblages and marker species typical for the regional Paratethys stages and especially for the successions of the Vienna Basin are briefly described. Since many samples contained less and/or only ubiquitous species it was ambiguous to determine their age. In these cases the assumptions were counter-checked with the associated mollusc assemblages, their relative stratigraphic position and correlation with the seismic data to gain more reliable stratigraphic data. For the correlation with lithostratigraphic units see chapter 5.

4.2.1. Upper Eggenburgian-Ottnangian

The biostratigraphy of the Ottnangian is primarily based on endemic benthic foraminiferal and mollusc species (Cicha and Rögl, 1973; Steininger et al., 1973). Due to the high rate of endemism a correlation to the international biostratigraphic zonation schemes proved to be difficult (Harzhauser and Piller, 2007; Piller et al., 2007). Traditionally, a three-fold subdivision of the Ottnangian deposits exists in the North Alpine Foreland Basin and in the Vienna Basin, reflecting the differing foraminiferal content. Although Cicha and Rögl (1973) and Rögl (1985) suggest a possible correlation to the Burdigalian *Globigerinoides trilobus* Zone of the Mediterranean (sensu Iaccarino, 1985) planktonic foraminiferal assemblages of the Ottnangian generally do not reveal taxa useful for biostratigraphy (Rögl, 1985). Only the FAD of the endemic species *Cassigerinella spinata* is documented for the base of the Ottnangian in Bavaria and Upper Austria (Cicha et al., 1998). As a correlation with the global planktic zonation fails, regional foraminiferal biostratigraphy relies on the evolution of endemic benthic species. *Amphicoryna ottnangensis* is the only well-established marker for the early Ottnangian in Bavaria and Upper Austria (Cicha and Rögl, 1973; Wenger, 1987; Cicha et al., 1998; Rupp and Haunold-Jenke, 2003). It has its FAD at the Eggenburgian/Ottnangian boundary and lasts until the earliest middle Ottnangian. Another species often used in Ottnangian biostratigraphy is *Sigmoilopsis ottnangensis*. While its FAD in Bavaria has been recorded during the late Eggenburgian and its LAD at the end of the early Ottnangian, its records from the Austrian North Alpine Foreland Basin and Vienna Basin seem to be restricted to the early Ottnangian (Cicha and Rögl, 1973; Wenger, 1987; Cicha et al., 1998). The FAD of *Pappina breviformis* has been suggested as a marker for the base of the middle Ottnangian (Wenger, 1987; Cicha et al., 1998).

Unfortunately, when introducing the three-fold subdivision of the oldest part of the Vienna Basin fill, which is now considered to represent the Ottnangian, Grill (1941, 1943, 1968) and other authors mixed lithostratigraphy and biostratigraphy.

This is expressed for example in terms such as "*Bathysiphon-Cyclammina* Schlier" for the late Eggenburgian/early Ottnangian (lithostratigraphic unit herein: lower Lužice Formation, see chapter 5.2.2.). It is characterised by offshore faunas with *Bathysiphon taurinensis*, *Cyclammina* *praecancellata* and *Haplophragmoides vasiceki* as typical species, along with *Uvigerina posthantkeni*, *Globigerinoides trilobus* and *Globigerina praebulloides* (Cicha and Rögl, 1973; Cicha et al., 1998). *Ammonia*-dominated assemblages are reported from deltaic and estuarine, nearshore environments (Kováč et al., 2004).

The separation of the following upper part of the Lužice Formation from the lower one is originally based on a marked shift in assemblage composition towards shallow-water faunas of the so-called "*Cibicides-Elphidium* Schlier" (Grill, 1941, 1943, 1968; lithostratigraphic unit herein: upper Lužice Formation, Ottnangian). *Cibicidoides budayi*, *Lenticulina inornata*, *Lobatula lobatula*, *Amphicoryna ottnangensis*, *Pappina breviformis*, *Bolivina fastigia* and *Bolivina tumida* along with various elphidiids are also typical in this zone (Cicha and Rögl, 1973; Cicha et al., 1998).

The microfauna of the uppermost part of the Ottnangian of the northern Vienna Basin is strongly impoverished, small and dominated by *Ammonia* and in the literature referred to as "impoverished Schlier" or "Fish-Schlier" due to frequent occurrences of fish scales and bones (Cicha et al., 1998; Kováč et al., 2004; lithostratigraphic unit herein: uppermost Lužice Formation, Ottnangian).

Obviously this shift in assemblage composition reflects mainly a change in regional palaeoenvironment and its biostratigraphic significance on a larger Paratethyan scale is doubtful.

Additionally, following abundant species can be and were found (partly) within all three parts of the Lužice Formation: *Sigmoilopsis ottnangensis*, *Lenticulina melvilli*, partly *Semivulvulina pectinata*, *Spirorutilus carinatus*, *Textularia gramen*, *Quinqueloculina buchiana*, *Sigmoilinita tenuis*, *Triloculina* sp., *Ammonia viennensis*, *Amphimorphina haueriana*, *Bolivina hebes*, *Bolivina dilatata*, *Bolivina scitula*, *Bulimina elongata*, *Caucasina schischkinskayae*, *Elphidium angulatum*, *Elphidium macellum*, *Elphidium subtypicum*, *Elphidium ungeri*, *Fontbotia wuellerstorfi*, *Globulina gibba*, *Guttulina communis*, *Heterolepa dutemplei*, *Laevidentalina communis*, *Lagena striata*, *Melonis affinis*, *Melonis pompilioides*, *Porosononion granosum*, *Reussella spinulosa*, *Sphaeroidina bulloides* (Cicha and Rögl, 1973; Cicha et al., 1971; Cicha et al., 1998; Grunert et al., 2012, 2013) and planktonic foraminifera like *Globigerina ottnangensis* (Cicha and Rögl, 1973).

<u>Samples of late Eggenburgian/early Ottnangian age:</u>

Schlierbasis-Schutt: MTW1 (1510–1517m) 13/7

Lower Lužice Fm.: GI1 (1050–1055m) 17/1, GI2 (1084–1086.7m) 10/2, MI1 (1373.5–1377m) 7/4, MTW1 (1380–1385m) 9/1, MTW1 (1480–1485m) 12/4

Samples of Ottnangian age:

Upper Lužice Fm.: AH1 (370–375m) 13/3, AH1 (430–435m) 15/3, AH1 (460–465m) 16/1, AH1 (520–523m) 18/3, AH1 (610–615m) 21/2, KA2 (1140–1145m) 5/2, KA2 (1380–1385m) 9/3, MisU1 (1298–1302m) 1/2, MisU1 (1624–1633m) 2/1, MisU1 (1885–1894m) 3/1, MisU1 (1885–1894m) 3/4, MTW1 (1100–1105m) 3/5, MTW1 (1130–1138m) 4/2, MTW1 (1130–1138m) 4/7, SI3 (1335–1340m) 12/1, SI3 (1485–1490m) 15/2, SI3 (1716–1720.3m) 21/1

Uppermost Lužice Fm.: KA2 (1020–1025m) 3/1, KA2 (1020–1025m) 3/4, KA2 (1080–1085m) 4/3

4.2.2. Karpatian

The assemblages of the Karpatian exhibit a transitional composition between the Ottnangian and early Badenian ones (Cicha et al., 2003). Since many typical Ottnangian species persist into the Karpatian (e.g. *Reticulophragmium karpaticum*, S*emivulvulina pectinata*, *Elphidium subtypicum*, *Fontbotia wuellerstorfi*; Wenger, 1987), it is difficult to differentiate between the two stages. Anyway, according to Cicha and Zapletalová (1967) a differentiation is possible due to a generally higher number and increased diversity of especially benthic foraminiferal species. Distinguishing the Karpatian assemblages from the early Badenian ones can also be difficult. On the one hand, there is the first appearance of the planktonic genus *Praeorbulina* at the base of the Badenian (Cicha et al., 2003). On the other hand, higher percentages of planktonic species in general and an extreme increase in diversity hint at early Badenian assemblages (Cicha and Zapletalová, 1967; Cicha et al., 2003). Additionally, benthic forms also appear with an increased size (Cicha et al., 2003).

Assemblages containing *Bulimina elongata*, *Caucasina schischkinskayae, Globigerina ottnangensis*, *Globorotalia scitula*, *Uvigerina acuminata*, *U*. *graciliformis*, *Pappina breviformis* and *P*. *primiformis* along with elphidiids and agglutinated species are characteristic for the neritic early Karpatian (lithostratigraphic unit herein: Lakšary Member, Laa Fm., lower Karpatian). Nevertheless only *Uvigerina graciliformis* is considered to be a marker for the base of the Karpatian (Cicha and Zapletalová, 1967; Cicha et al., 2003; Kováč et al., 2004; Petrová, 2004; Rögl et al., 2003; Spezzaferri et al., 2002).

The appearance of *Globigerinoides bisphericus* can be used as a valuable marker for the upper Karpatian (Seneš in collab., 1971; Spezzaferri et al., 2002; Rögl et al., 2003; lithostratigraphic unit herein: Závod Member, Laa Fm., upper Karpatian). Upper Karpatian shallow-water faunas as e.g. reported from the Korneuburg Basin by Rögl (1998a) contain *Ammonia*, *Porosononion* and *Elphidiella* in more hypersaline, inner neritic assemblages and *Ammonia*, *Elphidium*, *Nonion*, *Reussella*, *Caucasina*, *Hanzawaia* as well as small globigerinids in full marine, inner neritic environments.

Full overviews of significant species and typical assemblages are given in Cicha and Zapletalová (1967), Rögl (1998a) and Cicha et al. (2003). In this study significant species for the Karpatian are

Reticulophragmium karpaticum, *Pappina primiformis*, *Pappina breviformis*, *Uvigerina graciliformis*, *Elphidium macellum*, *Elphidium fichtelianum*. These co-occur with the following ubiquitous species: *Bathysiphon taurinensis*, *Cyclammina carpatica*, *Semivulvulina pectinata*, *Textularia gramen*, *Ammonia viennensis*, *Asterigerinata planorbis*, *Bolivina dilatata*, *Bolivina hebes*, *Bulimina buchiana*, *Bulimina elongata*, *Caucasina schischkinskayae*, *Cibicidoides lopjanicus*, *Cibicidoides ungerianus ungerianus*, *Globulina gibba*, *Globigerinoides bisphericus*, *Globigerina praebulloides*, *Globigerina tarchanensis*, *Globigerinoides trilobus*, *Hansenisca soldanii*, *Heterolepa dutemplei*, *Laevidentalina elegans*, *Lenticulina inornata*, *Lenticulina melvilli*, *Lenticulina orbicularis*, *Marginulina hirsuta*, *Pullenia bulloides*, *Siphonina reticulata*, *Siphonodosaria consobrina*, *Uvigerina acuminata*, *Uvigerina semiornata* and *Valvulineria complanata*.

<u>Samples of Karpatian age:</u>

Laa Fm., Lakšary Mb.: GI1 (400–405m) 4/1, KA1 (750–755m) 13/1, KA1 (795–800m) 14/2, KA1 (895–900m) 15/2, MI1 (800–805m)1/2

Laa Fm., Závod Mb.: KA1 (450–455,5m) 7/4, KA1 (500–506m) 8/1, KA1 (550–555m) 9/2, KA1 (600–604m) 10/4, KA1 (701–705m) 12/2, SI3 (1250–1255m) 11/1, WA1 (500–505m) 7/4

Laa Fm., Ginzersdorf Mb.: AH1 (250–255m) 9/4, AH1 (280–285m) 10/2, AH1 (310–315m) 11/1

Laa Fm.?: HRD19 (819–820m) 12/1, HRD24 (775–779.5m) 9/1, HRD25 (740–745m) 10/1

<u>Samples of Karpatian or Badenian age:</u>

HRD25 (665–670m) 8/1, HRD25 (685–690m) 9/1

4.2.3. Badenian

For the Badenian of the Vienna Basin a threefold ecostratigraphic subdivision was developed by Grill (1941, 1943), which was refined later by numerous authors (see Cicha et al., 1998, 2003). The three biozones are: the Lagenidae Zone, the *Spirorutilus* Zone (= *Spiroplectammina* or Sandschaler Zone in older literature) and the *Bulimina-Bolivina* Zone.

In general, the Badenian assemblages differ from the underlying Karpatian ones in their higher diversity and the higher percentages of planktonic species. From Sarmatian assemblages they are clearly separated by their diversity and fully marine character and the lack of the Sarmatian endemisms. Strong reworking of Badenian strata during the Sarmatian, however, makes a clear recognition difficult in some cases and caused misinterpretations in former internal OMV reports on the herein studied wells. The ecostratigraphic subdivision coincides roughly with the lithostratigraphic subdivision. The massive deposits of the Baden Tegel (an informal lithostratigraphic term) of the northern Vienna Basin are divided into the Lanžhot, Jakubov and Studienka formations (Kováč et al., 2004).

The fauna of the Lower Lagenidae Zone is related to the Karpatian fauna but more diverse. Typical representatives are members of the superfamilies Nodosariacea (such as the genera *Amphicoryna*, *Amphimorphina*, *Dentalina*, *Glandulina*, *Globulina*, *Laevidentalina*, *Lagena*, *Lenticulina*, *Marginulina*, *Neugeborina*, *Nodosaria*, *Plectofrondicularia* and many others) and Buliminacea (i. a. the genera: *Bulimina*, *Pappina*, *Praeglobobulimina*, *Reussella* and *Uvigerina*) together with different bolivinids, *Elphidium flexuosum* and often planktonic foraminifera like *Praeorbulina glomerosa circularis*, *Globigerina praebulloides*, *Globigerinella obesa* and small globorotaliids (Papp et al., 1978; Cicha et al., 1998; Rögl and Spezzaferri 2003). Additionally, species of *Textularia*, *Cibicidoides* and different miliolids occur. Occurrences of *Uvigerina macrocarinata* and *Praeorbulina glomerosa circularis* are good markers for the Lower Lagenidae Zone (Papp, 1963; Papp et al., 1978). A representative example of a typical Lower Lagenidae-assemblage is shown in Rögl and Spezzaferri (2003).

The Upper Lagenidae Zone is characterised by an ideal development of the foraminiferal fauna. The tests are bigger and more numerous. Along with all the aforementioned taxa, typical members of the assemblages are *Martinottiella communis*, *Semivulvulina pectinata*, *Spirorutilus carinatus*, *Textularia gramen*, *Textularia laevigata*, *Ammonia* spp., *Amphistegina* spp., *Elphidium* spp., *Heterolepa dutemplei*, *Heterostegina* spp. as well as a rich planktonic community with *Orbulina suturalis*, *Globigerina bulloides*, *Globigerina diplostoma*, *Globigerina concinna*, *Globigerinella regularis* and many others (Papp et al., 1978; Cicha et al., 1998; Báldi and Hohenegger, 2008; Rupp and Hohenegger, 2008). In more marginal deposits the Miliolacea are also frequent (e.g. Q*uinqueloculina haidingeri*, *Qu*. *buchiana*, *Qu*. *laevigata*, *Pyrgo simplex*, *Triloculina* spp., *Spiroloculina* spp., *Peneroplis* spp., *Borelis melo*). Especially the occurrence of *Orbulina* is an important marker because its FAD is dated at 15.1 Ma (Wade et al., 2011).

A good overview of assemblages of the Middle Badenian *Spirorutilus* Zone is shown in Rupp (1986). It is characterised by several species of the genera *Amphistegina*, *Heterostegina*, *Elphidium*, *Cibicidoides*, *Cibicides*, *Bulimina*, *Bolivina*, *Uvigerina* (esp. *U*. *venusta*), *Spirorutilus carinatus*, *Textularia*, *Martinottiella*, *Cyclammina* and *Haplophragmoides*. The planktonic foraminifera are represented by the known species from the Lagenidae Zone together with *Globigerinoides quadrilobatus* (Papp et al., 1978; Cicha et al., 1998). The distribution of this ecozone seems to be slightly diachronous and it might reflect the progradation of marginal-deltaic facies during the middle Badenian in the Vienna Basin (own observations; Kováč pers. comm, 2014).

The *Bulimina-Bolivina* Zone shows a comparatively impoverished, less diverse fauna in opposite to the underlying ones. This Upper Badenian Zone is characterised by representatives of the name-giving genera together with smaller individuals of *Cibicidoides*, *Cibicides*, *Quinqueloculina*, *Elphidium*, *Uvigerina*, *Pavonitina* and *Globigerina*. Nodosariacea are rare. Often only assemblages with *Ammonia* and *Elphidium*, sometimes together with *Porosononion granosum*, *Cibicidoides*, *Cibicides* and *Quinqueloculina* occur (Papp et al., 1978; Cicha et al., 1998). The switch in composition of the foraminiferal assemblages from middle to upper Badenian coincides with the onset of the global cooling of the Miocene Climate Transition at the Langhian/Serravallian boundary (Holbourn et al., 2005). A direct driving force, related to the overall climate change, is the switch from anti-estuarine to estuarine circulation patterns in the Badenian Paratethys Sea and the development of widespread dysoxia on the sea bottom (Báldi, 2006).

<u>Samples of Badenian age:</u>

Baden Gr.: WA1 (450–455m) 6/2

Baden Group, Lower Badenian?: HRD19 (630–635m) 6/1, HRD19 (650–656m) 7/1

Baden Gr., Lanžhot Fm. (Lagenidae Z.): HRD19 (495–500m) 2/1, HRD19 (571–576m) 3/1, HRD19 (590–595m) 4/1, HRD24 (550–555m) 5/1, HRD24 (620–624m) 6/1, HRD24 (641–645m) 7/1 HRD25 (490–495m) 4/1, HRD25 (550–557m) 5/1, HRD25 (645–650m) 7/1, PWU3 (1123–1128m) 1/1, PWU3 (1123–1128m) 1/3, SI3 (800–805m) 6/3

Baden Gr., Jakubov Fm. (*Spirorutilus* Zone): AH1 (190–195m) 7/4, AH1 (220–225m) 8/2, HRD19 (400–405m) 1/2, HRD24 (390–395m) 3/1, HRD25 (290–298m) 1/1, HRD25 (310–315m) 2/1, PO1 (490–495m) 16/1, PO1 (520–525m) 17/2, WA1 (400–403m) 5/1

Baden Gr., Studienka Fm. (*Bulimina-Bolivina* Zone): PO1 (430–435m) 14/3, PO1 (460–465m) 15/1, WA1 (350–353m) 4/2

Iváň Fm.: SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2

<u>Samples of Karpatian or Badenian age:</u>

HRD25 (665–670m) 8/1, HRD25 (685–690m) 9/1

4.2.4. Sarmatian

The Sarmatian assemblages show significant changes in their foraminiferal faunas due to major tectonic changes in the Paratethyan realm. Since the Paratethys became largely restricted from the proto-Mediterranean Sea, oceanic connections were no longer available. These changes influenced water depth and salinity. Therefore the majority of foraminiferal species became extinct and only a small part survived into the Sarmatian (Brestenská, 1974; Cicha et al., 1998; Harzhauser and Piller, 2007; Schütz et al., 2007). Aside from the geodynamic impact, a major change in water chemistry with nutrient-rich surface waters and dysoxic bottom conditions caused the faunistic breakdown at the Badenian/Sarmatian boundary (Harzhauser and Piller, 2007). The subsequent climatic amelioration and the shift towards hypersaline and alkaline waters supported the development of new lineages and radiations rooted in the survivors of the crisis. The rapid change of palaeoecological conditions and the quick succession of newly evolving faunas resulted in a biostratigraphic zonation, which is valid in the entire Paratethys Sea.

Species persisting into the Sarmatian belong mainly to ubiquitous species, such as *Quinqueloculina akneriana*, *Qu*. *badenensis*, *Triloculina inflata*, *Tr*. *inornata*, *Bulimina elongata*, *Ammonia beccarii*, *A*. *viennensis*, *Elphidium fichtelianum*, *E*. *macellum*, *Elphidiella minuta*, *Lobatula lobatula* and *Fursenkoina schreibersiana*. New sculptured elphidiids developed, like *Elphidium reginum*, *E*. *aculeatum*, *E*. *josephinum*, *E*. *grilli*, *E*. *subumbilicatum*, *E*. *fichtelianum* and *E*. *koberi*. In general the Sarmatian assemblages are composed of elphidiid and miliolid representatives as well as *Ammonia* spp. Species like *Schackoinella imperatoria*, *Nonion bogdanowiczi* and *Aubignyna* sp. occur as well. Often, the Sarmatian assemblages also contain reworked Badenian material (Brestenská, 1974; this study). The early Sarmatian spans the *Elphidium reginum* and *E. hauerinum* Zones and the late Sarmatian the *Porosononion granosum* Zone of the foraminifera zonation (Grill 1941; Harzhauser and Piller, 2004a, b). Typical assemblages for this stage are shown in Görög (1992), Schütz et al. (2007) and Gebhardt et al. (2009).

Samples of Sarmatian age:

Elphidium Z.: AH1 (100–105m) 4/1, AH1 (130–135m) 5/1, AH1 (160–165m) 6/2, HRD24 (256–260.5m) 2/1, PO1 (40–45m) 1/1, PO1 (99.5–105m) 3/1, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2, PO1 (220–225m) 7/2, PO1 (250–255m) 8/1, PO1 (280–285m) 9/1, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (600–604m) 4/2, WA1 (200–205m) 1/1, WA1 (300–305m) 3/1

4.3. Biostratigraphy and palaeoecology of the sampled wells

4.3.1. Althöflein 1

4.3.1.1. Composition and diversity - results

Moderately to well-preserved tests of 141 benthic and planktonic foraminiferal taxa and about 3580 individuals have been identified in 13 of 27 processed samples from the Althöflein 1-well. The remaining 14 samples were sterile. Sample AH1 (460–465m) 16/1 was not taken into account in the following diversity and abundance measurements due to the very low number of specimens. The uppermost three samples (AH1 (100–105m) 4/1, AH1 (130–135m) 5/1 and AH1 (160–165m) 6/2) are composed of Sarmatian as well as reworked Badenian material. Therefore, the following calculations and interpretations of these three samples take only the autochthonous Sarmatian species in considerations. Benthic foraminifera are the dominating group (91 % benthic vs. 9 % of planktonic species).

Hyaline taxa make up the main proportion of the entire foraminiferal content (85 %), followed by miliolid (porcellanous, 8 %) and agglutinated taxa (7 %). The number of taxa ranges between 5 in sample AH1 (160–165m) 6/2 and 48 in sample AH1 (280–285m) 10/2. The uppermost three samples show the lowest diversity. Fisher Alpha Diversity shows values between 0.8 and 16.7. Equitability is generally higher with values between 0.53 and 0.86. Sample AH1 (100–105m) 4/1 shows the lowest value. Conversely, dominance is generally low with values ranging between 0.07 and 0.42 (fig. 57).

Foraminiferal species representing an inner neritic setting show higher abundances with values between 25 and 94 % in the uppermost three samples (fig. 57). From sample AH1 (190–195m) 7/4 downwards the values are generally lower and vary between 5 and 38 %. Taxa characteristic for an inner to middle neritic setting vary between 1 and 51 % and taxa for an inner to outer neritic setting between 1 and 38 %. The middle to outer neritic setting is only represented in sample AH1 (250–255m) 8/2 with 2 %. The inner neritic-bathyal setting is represented with values up to 24 %, the middle neritic-bathyal with values up to 52 % and the outer neritic-bathyal setting shows numbers between only 1 and 3 %. Bathyal taxa occur in samples AH1 (310–315m) 11/1 and AH1 (520–523m) 18/3 with 1 and 17 % respectively.

Indicative taxa for elevated flux of organic matter as well as environmental stress both peak in sample AH1 (310–315m) 11/1 with each 11 % (fig. 57). The values result from an increased contribution of the infaunal species *Uvigerina* spp.

Epifaunal species dominate almost all the assemblages of the Althöflein 1-core (fig. 57). Higher percentages of infaunal species occur in samples AH1 (220–225m) 8/2 to AH1 (310–315m) 11/1. Deep infaunal species are barely represented. The high values of epifaunal taxa result mainly from high abundances of *Elphidium* spp. (keeled), different miliolids and *Asterigerinata planorbis*.

Samples AH1 (130–135m) 5/1, AH1 (280–285m) 10/2 and AH1 (370–375m) 13/3 down to AH1 (610–615m) 21/2 are dominated by species preferring oxic bottom water conditions (fig. 57), like *Elphidium* spp., *Asterigerinata planorbis* and *Lobatula lobatula*. AH1 (100–105m) 4/1 and AH1 (160–165m) 6/2 to AH1 (220–225m) 8/2 occur with higher contributions of oxic to suboxic indicators, whereas samples AH1 (250–255m) 9/4 and AH1 (310–315m) 11/1 represent suboxic bottom waters. Foraminiferal taxa preferring dysoxic bottom water conditions show slightly enlarged values up to 5 %.

In samples AH1 (280–285m) 10/2 and AH1 (310–315m) 11/1 planktonic foraminifera indicating cool surface water conditions (herein *Globigerina bulloides*, *G*. *diplostoma*, *G*. *falconensis*, *G*. *ottnangensis*, *G*. *praebulloides*, *G*. *tarchanensis*) reach percentages of 97 % and 84 %, respectively. The contribution of temperate (*Globorotalia bykovae*, *G*. *peripheroronda*, *Globoturborotalita woodi*), warm-temperate (*Globigerinella regularis*) and warm indicator species (*Globigerinoides bisphericus*, *G*. *quadrilobatus*, *G*. *trilobus*, *Orbulina suturalis*) is much lower ranging between 1 and 16 % in the two samples. The planktonic foraminiferal content of the remaining samples is negligible. The indicative taxa for increased productivity (*Globigerina bulloides*, *G*. *praebulloides* and *G*. *tarchanensis*) show increased values in this samples.

In most samples, the majority of species is represented only by a handful of individuals. In contrast around eleven species (fig. 58) are quite abundant or are even forming entire assemblages.

4.3.1.2. Biostratigraphy and palaeoecological interpretation

The uppermost three samples AH1 (100–105m) 4/1, AH1 (130–135m) 5/1 and AH1 (160–165m) 6/2 are of early Sarmatian age and correspond to the *Elphidium* Zone (Holic Fm.). Even though the samples contain a lot of reworked Badenian material, typical Sarmatian species with increased occurrences were found. These are *Elphidium grilli*, *E. aculeatum*, *E. hauerinum*, *Aubignyna* sp. as well as *Ammonia viennensis* and *Porosononion granosum* hinting at the environmental changes with the beginning of the Sarmatian.

The following samples AH1 (190–195m) 7/4 and AH1 (220–225m) 8/2 are Badenian in age corresponding to the *Spirorutilus* Zone (Jakubov Fm.). They comprise species like *Quinqueloculina* spp., *Cycloforina contorta*, *Elphidium* spp., *Ammonia* spp., *Borelis melo* and *Spirolina austriaca* and show in general a similar composition as the middle Badenian communities presented in Rupp (1986) from the central Vienna Basin.

Uvigerina graciliformis as a marker species for the Karpatian places the two samples AH1 (280–285m) 10/2 and AH1 (310–315m) 11/1 into the Karpatian. Additionally, species like *Globigerinoides bisphericus, Pappina breviformis*, *Pappina primiformis* and *Cibicidoides lopjanicus* support this stratigraphic position. The sample AH1 (250–255m) 9/4 overlying the two aforementioned is also placed in the Karpatian due to its relative stratigraphic position and the absence of Badenien markers. Unfortunately it lacks typical Karpatian species and contains only few individuals.

All underlying samples (AH1 (370–375m) 13/3, AH1 (430–435m) 15/3, AH1 (460–465m) 16/1, AH1 (520–523m) 18/3 and AH1 (610–615m) 21/2) are placed in the Ottnangian (Upper Lužice Fm.). They comprise typical early Miocene species and differ from the overlying Karpatian assemblages in composition.

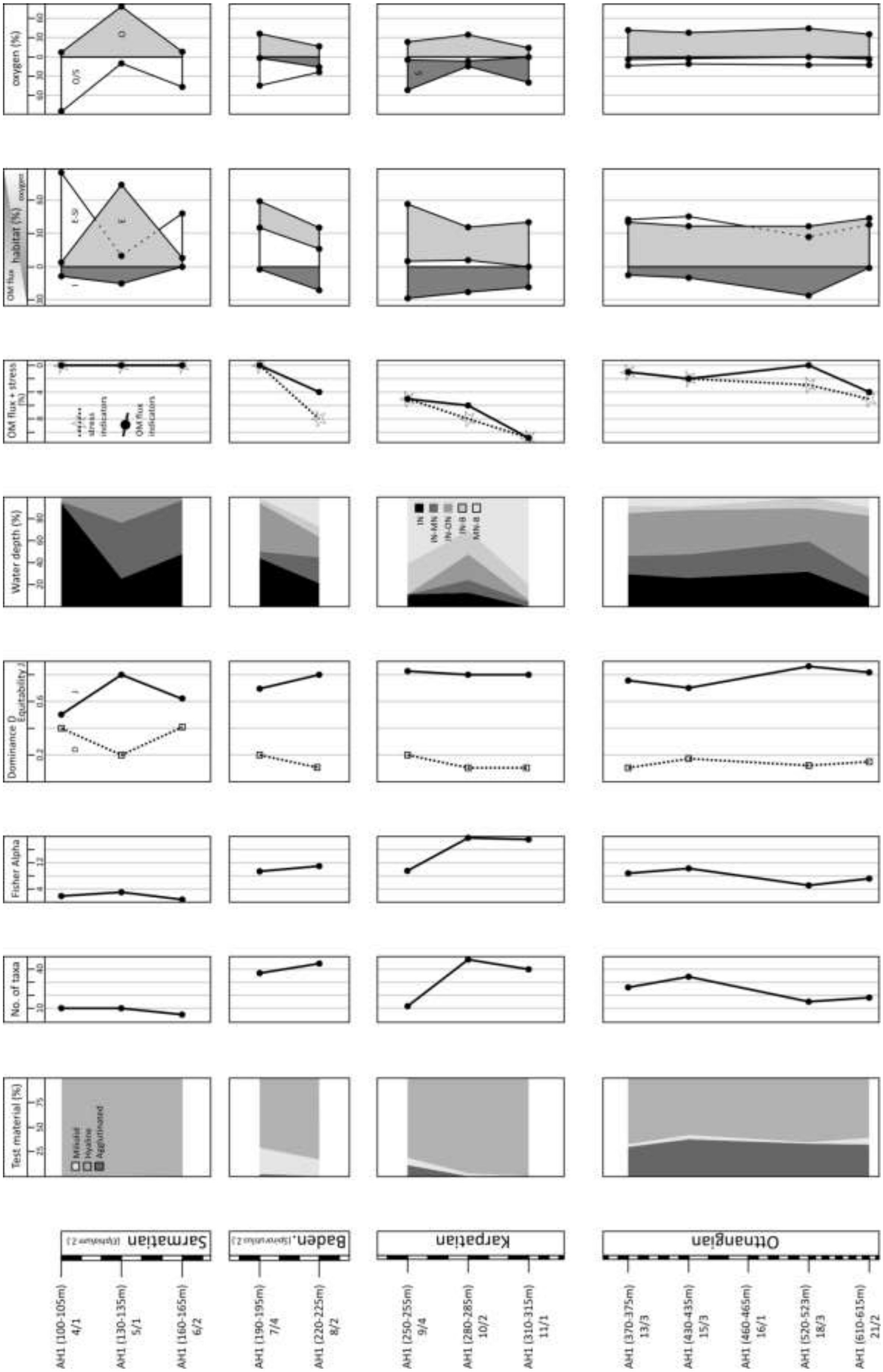

Test material (%)
Miliolid
Hyaline
Agglutinated
No. of taxa
Fisher Alpha
Dominance D
Equitability J
Water depth (%)
IN
IN-MN
IN-ON
OM flux + stress (%)
stress indicators
OM flux indicators
OM flux
habitat (%)
oxygen
oxygen (%)
Sarmatian
Baden.
Karpatian
Ottnangian
AH1 (100-105m) 4/1
AH1 (130-135m) 5/1
AH1 (160-165m) 6/2
AH1 (190-195m) 7/4
AH1 (220-225m) 8/2
AH1 (250-255m) 9/4
AH1 (280-285m) 10/2
AH1 (310-315m) 11/1
AH1 (370-375m) 13/3
AH1 (430-435m) 15/3
AH1 (460-465m) 16/1
AH1 (520-523m) 18/3
AH1 (610-615m) 21/2

Fig. 57: *Trends in benthic foraminiferal assemblages of the Althöflein 1-well. Nomenclature for oxic, suboxic and dysoxic indicators follows Kaiho (1994). Trends in epifaunal, infaunal and deep infaunal taxa reflect the antagonistic relationship of organic matter flux and bottom water oxygenation.*
IN = inner neritic species, IN-MN = inner to middle neritic species, IN-ON = inner to outer neritic species, IN/MN-B = inner/middle neritic-bathyal species, I = infaunal, E = epifaunal, E-SI = epifaunal to shallow infaunal, O = oxic indicators, S = suboxic indicators, O/S = oxic/suboxic indicators, OM = organic matter.

AH1 (100–105m) 4/1

Age: Sarmatian (*Elphidium* Zone), based on occurrence of *Elphidium grilli*, *Elphidium aculeatum*, *Aubignyna* sp.

Composition: AH1 (100–105m) 4/1 is composed of reworked Badenian foraminifera, such as *Quinqueloculina buchiana*, *Fursenkoina acuta* and *Globorotalia bykovae*. Besides these, mainly well-preserved specimens of autochthonous Sarmatian taxa (*Elphidium grilli*, *Elphidium antoninum*, *Elphidium crispum*, *Elphidium aculeatum*, *Aubignyna* sp., *Ammonia* spp., *Porosononion granosum*, *Nonion bogdanowiczi* and *Asterigerinata planorbis*) make up the assemblage. These are mainly epifaunal to slightly infaunal taxa with oxic to suboxic preferences (*Ammonia* spp.) as well as epifaunal taxa representing oxygenated bottom waters (elphidiids). Few infaunal species were found (*Aubignyna* sp., *Nonion bogdanowiczi*). Environmental stress and an increased organic matter flux are not documented.

Environment: mainly epifaunal to slightly infaunal; muddy sand, vegetated; marine to slightly brackish; meso- to oligotrophic; low-oxygenated; 0-50 m; lagoonal, inner shelf, shallow subtidal

AH1 (130–135m) 5/1

Age: Sarmatian (*Elphidium* Zone), based on occurrence of Sarmatian taxa *Elphidium hauerinum*, *Elphidium aculeatum*, *Aubignyna* sp.

Composition: Sample AH1 (130–135m) 5/1 also contains numerous reworked Badenian foraminifera together with Sarmatian nearshore fauna. The well-preserved Sarmatian taxa are *Aubignyna* sp., *Elphidium aculeatum*, *Elphidium antoninum*, *Elphidium crispum*, *Elphidium hauerinum*, *Lobatula lobatula*, *Asterigerinata planorbis*, *Ammonia* spp. and *Porosononion granosum*. Diversity value 2.7 and the found assemblage range well within the ones reported in Murray (1991, 2006) for inner shelf assemblages. Increased organic matter flux to the sea floor and environmental stress are not observed. The majority of species has an epifaunal mode of life under oxygenated bottom water conditions (*Asterigerinata planorbis*, elphidiids except *E. antoninum*, *Lobatula lobatula*).

Environment: mainly epifaunal; muddy sand, vegetated, hard substrates; marine; mesotrophic; oxic; 0-50 m; inner shelf, shallow subtidal

SEM pictures: Pl. 1: 17 *Plectofrondicularia digitalis*; Pl. 2: 4 *Lobatula lobatula*, 10 *Globigerinoides trilobus*, 27+28 *Elphidium aculeatum*

AH1 (160–165m) 6/2

Age: Sarmatian (*Elphidium* Zone), based on numerous occurrences of *Ammonia viennensis*, *Porosononion granosum* as well as *Elphidium aculeatum*

Composition: The assemblage again contains several reworked Badenian foraminifera from the middle/outer shelf. *Ammonia viennensis*, *Porosononion granosum*, *Elphidium aculeatum*, *Elphidium crispum*, *Lobatula lobatula* represent autochthonous Sarmatian foraminifers, which are moderately preserved showing signs of corrosion and abrasion. They indicate an inner shelf, shallow subtidal environment of 0-50 m water depth. The assemblage comprises mainly the epi- to infaunal taxon *Ammonia viennensis*, pointing to slightly suboxic conditions. Epifaunal species with oxic preferences are underrepresented (elphidiids) and infaunal species are not found. Environmental stress and an increased organic matter flux are not documented.

Environment: mainly epi- to shallow infaunal; muddy sand, vegetated, hard substrates; marine to brackish; meso- to oligotrophic; slightly oxygen-depleted; 0-50 m; nearshore, inner shelf, shallow subtidal

SEM pictures: Pl. 2: 21+22 *Ammonia viennensis*, 23+24 *Porosononion granosum*

AH1 (190–195m) 7/4

Age: Badenian (*Spirorutilus* Zone), based on co-occurrence of *Quinqueloculina* spp. *Cycloforina contorta*, *Elphidium* spp., *Ammonia* spp., *Borelis melo*, *Spirolina austriaca* (similar community as in Rupp, 1986)

Composition: The diverse foraminiferal assemblage (*Ammonia* spp., keeled elphidiids, *Quinqueloculina* spp., *Pseudotriloculina consobrina*, *Cycloforina* spp., *Triloculina* spp., *Borelis melo*, *Textularia gramen*, *Asterigerinata planorbis*, *Spirolina austriaca* and other less abundant species) of sample AH1 (190–195m) 7/4 represents a shallow marine, inner shelf environment. This diversity and its Fisher Alpha value of 9.2 agree with the data reported in Murray (1991, 2006) for an inner shelf setting. A vegetated sea floor (e.g. seagrass) is indicated by the number of species showing a clinging or epiphytic mode of life, such as *Quinqueloculina* spp., *Spirolina austriaca*, *Borelis melo*, *Textularia gramen*, *Cibicidoides* spp. and *Lobatula lobatula*. Fluxes of organic matter to the sea floor as well as environmental stress are not documented in the benthic foraminifers, which are moderately preserved (slight corrosion and abrasion). Infaunal species are rare.

Environment: mainly epifaunal; muddy sand, vegetated (seagrass), algal-coated hard substrates; marine to slightly hypersaline; oligotrophic; oxic to slightly suboxic; 0-50 m; shallow subtidal, inner shelf

SEM pictures: Pl. 1: 8 *Cycloforina contorta*, 11 *Pseudotriloculina consobrina*, 15 *Spirolina austriaca*; Pl. 2: 25 *Elphidium flexuosum*

AH1 (220–225m) 8/2

Age: Badenian (*Spirorutilus* Zone), based on co-occurrence of *Quinqueloculina* spp. *Cycloforina contorta*, *Elphidium* spp., *Ammonia* spp., *Bitubulogenerina reticulata*, *Sigmoilopsis foeda* (similar community as in Rupp, 1986)

Composition: A slightly deeper environment as represented by sample AH1 (190–195m) 7/4 is indicated by the moderately preserved, slightly abraded benthic community of this sample (*Ammonia* spp., *Porosononion granosum*, *Nonion commune*, *Quinqueloculina* spp., *Bolivina dilatata*, *Cycloforina contorta*, *Lobatula lobatula*, keeled elphidiids, *Sigmoilopsis* spp., *Cibicidoides* spp., *Fursenkoina acuta* and other species) with a Diversity value of 11.1, which fits to the values of an inner shelf setting reported in Murray (1991, 2006). The assemblage suggests a shallow marine, inner shelf system of up to 100 m water depth. Again, vegetated sea floor is indicated but the number of indicator species is lower than in the overlying sample AH1 (190–195m) 7/4 (*Quinqueloculina* spp., *Borelis melo*, *Textularia gramen*, *Cibicidoides* spp. and *Lobatula lobatula*). Increased organic matter flux and environmental stress are documented due to slightly higher abundances of indicator species like *Bolivina dilatata*, *Fursenkoina acuta*, *Melonis pompilioides*, *Valvulineria complanata*, *Praeglobobulimina pyrula*, *Cancris auriculus* and *Bulimina elongata*. These are also infaunal to deep infaunal species.

Environment: epifaunal to deep infaunal; muddy-silty sand, vegetated (seagrass), hard substrate; marine; mesotrophic; suboxic; 0-100 m; shallow subtidal, inner to middle shelf

SEM pictures: Pl. 1: 13 *Sigmoilopsis foeda*, 21 *Bitubulogenerina reticulata*, 25 *Reussella spinulosa*

AH1 (250–255m) 9/4

Age: Karpatian, based on absence of Badenian markers and relative stratigraphic position

Composition: The low diverse, moderately preserved foraminiferal assemblage (e.g. *Lenticulina inornata*, *Textularia gramen*, *Vaginulinopsis hauerina*, *Ammonia viennensis*) of sample AH1 (250–255m) 9/4 represents an inner/outer shelf environment with a water depth about 100 m. The detected species and the Fisher Alpha value 10.1 agree with the data reported in Murray (1991, 2006) for inner and outer shelf assemblages. It is largely composed of epifaunal species adapted to oxic to slightly low-oxygenated bottom water conditions. The infaunal species are mainly adapted to suboxic environments.

<u>*Environment*:</u> mainly epifaunal; mud to fine sand; marine; mesotrophic; suboxic; about 100 m; inner/outer shelf

AH1 (280–285m) 10/2

<u>*Age*:</u> Karpatian, based on co-occurrences of *Uvigerina graciliformis*, *Pappina breviformis*, *Pappina primiformis*, *Cibicidoides lopjanicus*

<u>*Composition*:</u> The foraminiferal assemblage is characteristic for an inner to outer shelf setting of about 100 m water depth (e.g.: keeled elphidiids, *Ammonia* spp., *Heterolepa dutemplei*, *Pappina* spp., *Asterigerinata planorbis*, *Bulimina* spp., *Lenticulina* spp., *Nonion commune*, *Cibicidoides* spp., unkeeled elphidiids, *Porosononion granosum*, *Melonis pompilioides* and many others). The specimens are moderately to well-preserved. The Diversity value of 16.7 ranges well within those reported for benthic foraminifers from inner to outer shelf assemblages (Murray, 1991, 2006). Epifaunal taxa with mainly oxic preferences make up two-thirds of the assemblage. Slightly increased flux of organic matter and environmental stress are documented in the infauna by species, such as *Bulimina* spp., *Uvigerina* spp., *Bolivina dilatata*, *Fursenkoina acuta*, *Melonis pompilioides* and *Praeglobobulimina pyrula*, which are adapted to suboxic and dysoxic environments.

The proportion of planktonic foraminifera preferring cool temperature conditions (97 %) hint at cool surface waters. The increased contribution of planktonic taxa preferring productive environments (*Globigerina bulloides*, *G*. *tarchanensis*; 60 % of planktonic content) indicate an increased input of nutrients.

<u>*Environment*:</u> mainly epifaunal; muddy sand, hard substrates; marine; mesotrophic; oxic to rather suboxic; about 100 m; inner/outer shelf

<u>*SEM pictures:*</u> Pl. 1: 23 *Pappina breviformis*

AH1 (310–315m) 11/1

<u>*Age*:</u> Karpatian, based on co-occurrences of *Uvigerina graciliformis*, *Uvigerina semiornata*, *Uvigerina pygmoides*, *Pappina primiformis*, *Cibicidoides lopjanicus*, *Lenticulina melvilli*, *Globigerinoides bisphericus*

<u>*Composition*:</u> An inner/outer shelf community of 100-200 m water depth was found in this assemblage (e.g.: *Lenticulina* spp., *Uvigerina* spp., *Cibicidoides* spp., *Heterolepa dutemplei*, *Nonion commune*, *Melonis pompilioides*, *Asterigerinata planorbis*, *Bolivina dilatata*, *Siphonina reticulata*, *Siphonodosaria consobrina* and keeled elphidiids). Based on the foraminiferal content with indicators, such as *Uvigerina* spp., *Melonis pompilioides*, *Bolivina dilatata*, *Pappina primiformis* and

Valvulineria complanata, organic matter flux and environmental stress remained high. Mainly epifaunal and infaunal taxa with suboxic preferences were found. The preservation is moderately to well, especially the tests of the genus *Lenticulina* are more abraded and fragmented.

Cool surface water conditions are indicated by the high abundance of planktonic taxa preferring cool temperatures (84 %). *Globigerina bulloides* and *G*. *praebulloides* additionally hint at increased productivity (79 % of planktonic content).

Environment: epifaunal and infaunal; mud to silt, hard substrate; marine; mesotrophic; suboxic; 100-200 m; inner/outer shelf

SEM picture: Pl. 2: 7 *Siphonina reticulata*

AH1 (370–375m) 13/3

Age: Ottnangian, based on occurrence of *Reticulophragmium karpaticum*, *Elphidium karpaticum* and *Globigerina praebulloides* together with ubiquitous species

Composition: The inner shelf environment is indicated by several taxa, such as *Reticulophragmium karpaticum*, different keeled elphidiids, *Ammonia* spp., *Asterigerinata planorbis*, *Heterolepa dutemplei*, *Quinqueloculina* spp., *Lenticulina* spp., *Lobatula lobatula*. Tests are moderately to well-preserved. Primarily the specimens of the genera *Elphidium* and *Ammonia* show signs of abrasion. The assemblage is largely composed of epifaunal taxa preferring oxic to slightly suboxic bottom waters. Infaunal species occur rarely. They are adapted to more suboxic conditions. Organic matter flux and environmental stress are not documented.

Environment: mainly epifaunal; muddy sand, hard substrate; marine; oligotrophic; oxic to slightly suboxic; 0-100 m; shallow subtidal, inner shelf

AH1 (430–435m) 15/3

Age: Ottnangian, based on occurrence of *Reticulophragmium karpaticum*, *Elphidium* spp. and *Globigerina praebulloides* together with ubiquitous species

Composition: The same environment as in sample AH1 (370–375m) 13/3 is indicated by the well to moderately preserved assemblage of this sample. Especially the found miliolids are only moderately preserved due to abrasion and breakage. *Reticulophragmium karpaticum*, different keeled elphidiids, *Asterigerinata planorbis*, *Ammonia* spp., unkeeled elphidiids, *Porosononion granosum*, *Quinqueloculina* spp., *Cibicidoides* spp., *Heterolepa dutemplei*, *Lenticulina* spp., *Lobatula lobatula* and other taxa characterise the environment located within the inner shelf.

Environment: mainly epifaunal; (muddy) sand; marine; oligotrophic; oxic to slightly suboxic; 0-100 m; shallow subtidal, inner shelf

AH1 (460–465m) 16/1

<u>*Age*:</u> Ottnangian, based on relative stratigraphic position

<u>*Composition and environment*:</u> no data

AH1 (520–523m) 18/3

<u>*Age*:</u> Ottnangian, based on small foraminiferal content and relative stratigraphic position

<u>*Composition*:</u> The foraminiferal assemblage points to a shallow subtidal, inner shelf environment down to 50 m water depth (e.g.: different keeled elphidiids, *Asterigerinata planorbis*, unkeeled elphidiids, *Ammonia* spp., *Porosononion granosum*, *Heterolepa dutemplei*, *Quinqueloculina* spp. and *Reticulophragmium karpaticum*). The community is largely composed of epifaunal taxa preferring oxygenated bottom waters. Infaunal species occur in a smaller amount. They are adapted to oxic conditions. Vegetation and hard substrates might have been available due to the abundance of taxa with a clinging mode of life or dwelling in vegetated habitats like keeled elphidiids or *Quinqueloculina*. The tests are moderately preserved showing signs of abrasion, corrosion and fragmentation. Miliolid specimens are only poorly preserved.

<u>*Environment*:</u> mainly epifaunal; muddy sand, hard substrates, vegetation; marine to slightly hypersaline; mesotrophic; oxygenated; 0-50 m; lagoonal, shallow subtidal, inner shelf

AH1 (610–615m) 21/2

<u>*Age*:</u> Ottnangian, based on occurrence of *Reticulophragmium karpaticum* and *Globigerina praebulloides* together with ubiquitous species

<u>*Composition*:</u> The assemblage (e.g. with *Reticulophragmium karpaticum*, keeled elphidiids, *Quinqueloculina* spp., *Ammonia* spp., *Asterigerinata planorbis*, *Praeglobobulimina pupoides*, *Heterolepa dutemplei*, *Lobatula lobatula*) is suggesting an inner shelf setting of 0-50 m water depth, similar to that found in sample AH1 (520–523m) 18/3. Again, vegetation and hard substrates might have been available. The Diversity value of 8.2 ranges within those reported in Murray (1991, 2006) for an inner shelf setting. The sample is mainly composed of epifaunal species adapted to an oxic to slightly suboxic sea floor. Infaunal species are rarely found, preferring suboxic to dysoxic conditions. *Praeglobobulimina pupoides* and *Bolivina dilatata* hint at slightly increased flux of organic material and environmental stress. The foraminiferal remains are again moderately preserved due to abrasion, corrosion and fragmentation. Miliolid specimens are only poorly preserved.

<u>*Environment*:</u> mainly epifaunal; muddy sand, hard substrates, vegetation; marine to slightly hypersaline; mesotrophic; oxic to slightly suboxic; 0-50 m; lagoonal, shallow subtidal, inner shelf

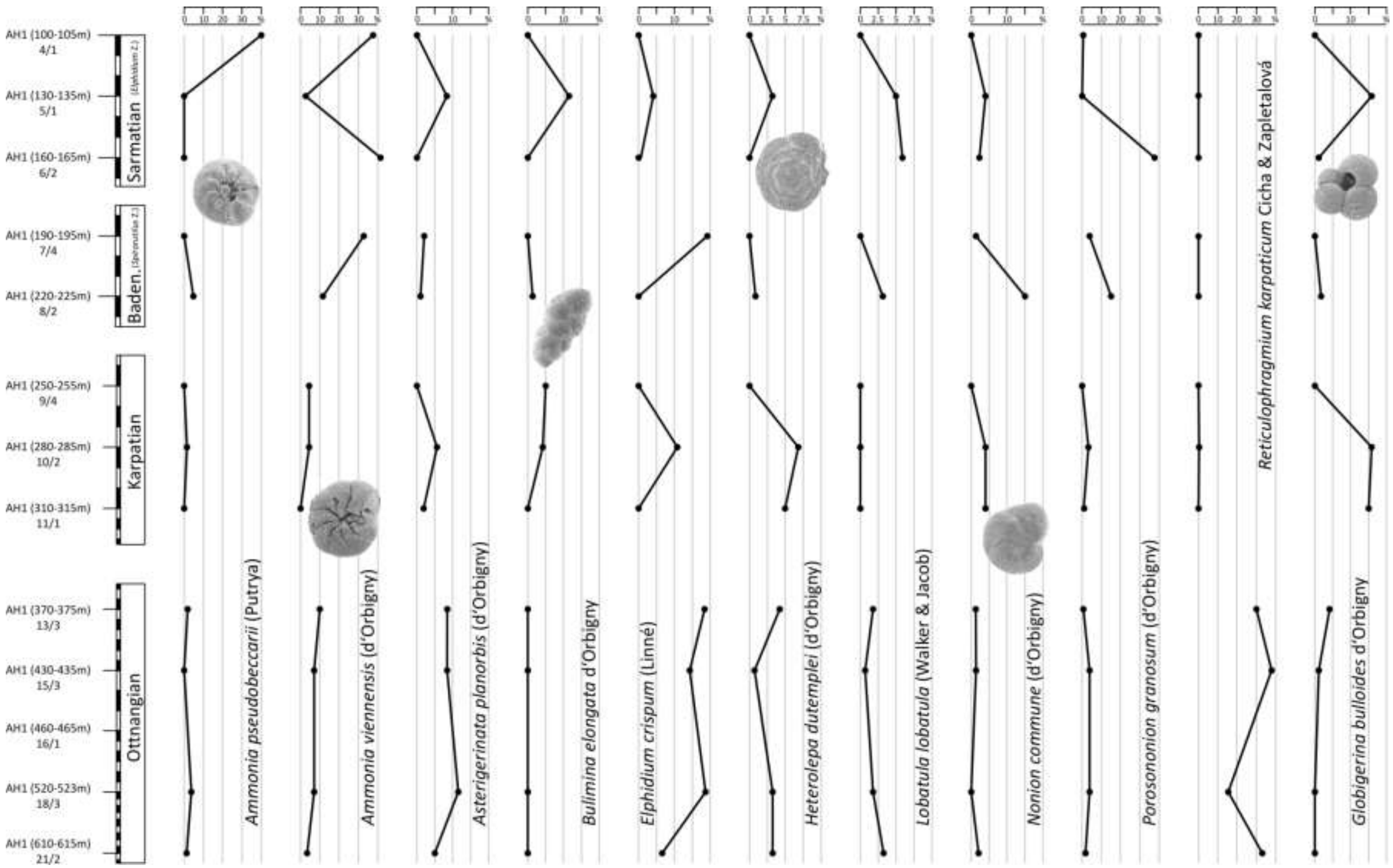


Fig. 58: Distribution of the most abundant species that make up the majority of the sample.

4.3.2. Ginzersdorf 1

4.3.2.1. Composition and diversity - results

266 well-preserved tests of only six benthic and planktonic foraminiferal taxa have been found and identified in one single sample (GI1 (1050–1055m) 17/1). The other thirteen of the 14 investigated samples of the well were barren. No planktonic foraminifera were found.

Taxa with hyaline and miliolid tests are clearly underrepresented (1 % each). So the agglutinated group is dominating with 98 %. Fisher Alpha Diversity is 1.1, equitability J is 0.66 and dominance D is expressed with a value of 0.36 (fig. 59).

The dominating species with 45 % are typical for an inner neritic-bathyal setting (*Cribrostomoides subglobosus* and *Reticulophragmium karpaticum*). The middle neritic-bathyal and outer neritic-bathyal settings are represented only with 1 % each (MN-B by *Sigmoilinita tenuis* and ON-B by *Laevidentalina boueana*). *Bathysiphon* characterising bathyal settings shows an abundance of 3 % (fig. 59).

Index taxa for an epifaunal to shallow infaunal mode of life (herein *Cribrostomoides subglobosus* and *Reticulophragmium karpaticum*) occur with high abundance of 83 %. Conversely, the infaunal species are underrepresented with 4 %. Herein, infaunal taxon is mainly *Laevidentalina boueana*. Deep infaunal species are missing (fig. 59).

Within the investigated sample GI1 (1050–1055m) 17/1 *Cribrostomoides subglobosus* and *Reticulophragmium karpaticum* are the most abundant species; the other four species are less important (fig. 59).

4.3.2.2. Biostratigraphy and palaeoecological interpretation

Sample GI1 (400–405m) 4/1 is of Karpatian age due to its identified molluscan content. Sample GI1 (1050–1055m) 17/1 is placed into the late Eggenburgian/early Ottnangian Lower Lužice Fm. because of the presence of *Bathysiphon taurinensis* and the relative stratigraphic position of the sample.

GI1 (400–405m) 4/1

Age: Karpatian, based on mollusc assemblage

Composition and environment: no data

GI1 (1050–1055m) 17/1

Age: late Eggenburgian/early Ottnangian, based on *Bathysiphon taurinensis* and relative stratigraphic position

Composition: This well-preserved sample with only few fragmented specimens contains mainly agglutinated species (*Cribrostomoides subglobosus*, *Reticulophragmium karpaticum*, *Ammodiscus miocenicus* and *Bathysiphon taurinensis*). Accessory taxa are *Laevidentalina boueana* and *Sigmoilinita tenuis*. Most of the species are epifaunal to shallow infaunal. The infaunal species *Bathysiphon* hints at an increase of organic matter flux.

Environment: epifaunal to infaunal; sand, coarse; marine; mesotrophic; oxic to suboxic; outer shelf to upper bathyal

SEM pictures: Pl. 1: 2 *Cribrostomoides subglobosus*, 3 *Reticulophragmium karpaticum*

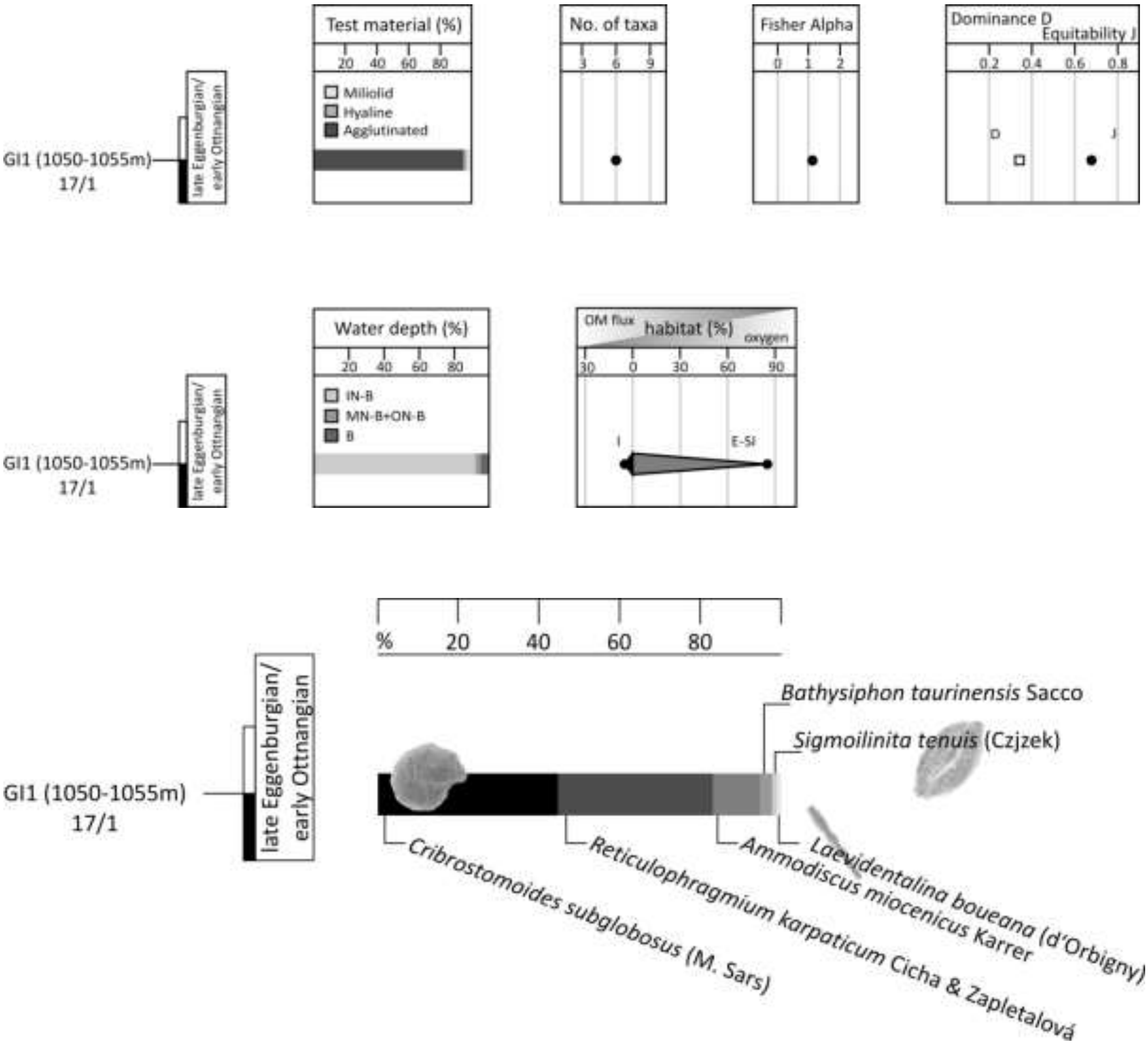


Fig. 59: Values of diversity indices (Fisher Alpha, Equitability E and Dominance D), distribution of palaeoecological preferences and contribution of the most abundant species that make up the majority of the sample GI1 (1050-1055m) 17/1.

IN/MN/ON-B = inner/middle/outer neritic-bathyal species, B = bathyal species, E-SI = epifaunal to shallow infaunal, IN = infaunal, OM = organic matter.

4.3.3. Ginzersdorf 2

4.3.3.1. Composition and diversity - results

Moderately preserved tests of only seven benthic and planktonic foraminiferal taxa (fig. 60) and only 39 individuals were found and identified in one sample from the Ginzersdorf 2-well (GI2 (1084–1086.7m) 10/2). The remaining eleven investigated samples were barren. Planktonic foraminifera were not found.

Taxa with hyaline tests show abundances of 54 %. The agglutinated group appears with 46 %. Miliolid species are missing. Fisher Alpha Diversity is 2.5, equitability J is 0.72 and dominance D shows a value of 0.31 (fig. 60).

The dominating species with 38 % are characteristic for an inner neritic-bathyal setting (*Heterolepa dutemplei*, *Reticulophragmium karpaticum* and *Spirorutilus carinatus*, fig. 60). The middle neritic-bathyal setting is represented with 13 % by *Lenticulina inornata* and *Semivulvulina pectinata*. *Elphidium crispum* characterising the inner to outer neritic setting shows an abundance of 5 %.

Indicative taxa for elevated flux of organic matter and environmental stress were not found.

All identified species are characteristic for an epifaunal or epifaunal to shallow infaunal mode of life (56 and 41 %). Deep infaunal species are absent (fig. 60).

44 % of the identified species (*Heterolepa dutemplei*, *Elphidium crispum* and *Spirorutilus carinatus*) prefer oxic environments, whereas 13 % are indicators for suboxic conditions (*Lenticulina inornata* and *Semivulvulina pectinata*) (fig. 60).

Within the investigated sample GI2 (1084–1086.7m) 10/2 *Heterolepa dutemplei* and *Reticulophragmium karpaticum* are the most abundant species; the other five species occur with lower values (fig. 60).

4.3.3.2. Biostratigraphy and palaeoecological interpretation

The investigated sample GI2 (1084–1086.7m) 10/2 is of late Eggenburgian/early Ottnangian age (Lower Lužice Fm.), based on the general composition and its relative stratigraphic position.

GI2 (1084–1086.7m) 10/2

<u>*Age*</u>: late Eggenburgian/early Ottnangian, based on general composition and relative stratigraphic position

<u>*Composition*</u>: The taxa found in this sample (*Reticulophragmium karpaticum*, *Heterolepa dutemplei*, *Lenticulina inornata*, *Elphidium crispum*, *Semivulvulina pectinata*, *Spirorutilus carinatus*) are epifaunal to shallow infaunal elements, preferring oxic to suboxic bottom water conditions. Infaunal species

are missing. The poorly to moderately preserved assemblage suggests an outer shelf to upper bathyal setting under mesotrophic conditions on the sea floor.

Environment: epifaunal to shallow infaunal; mud, hard substrate; marine; mesotrophic; oxic to slightly suboxic; outer shelf to upper bathyal

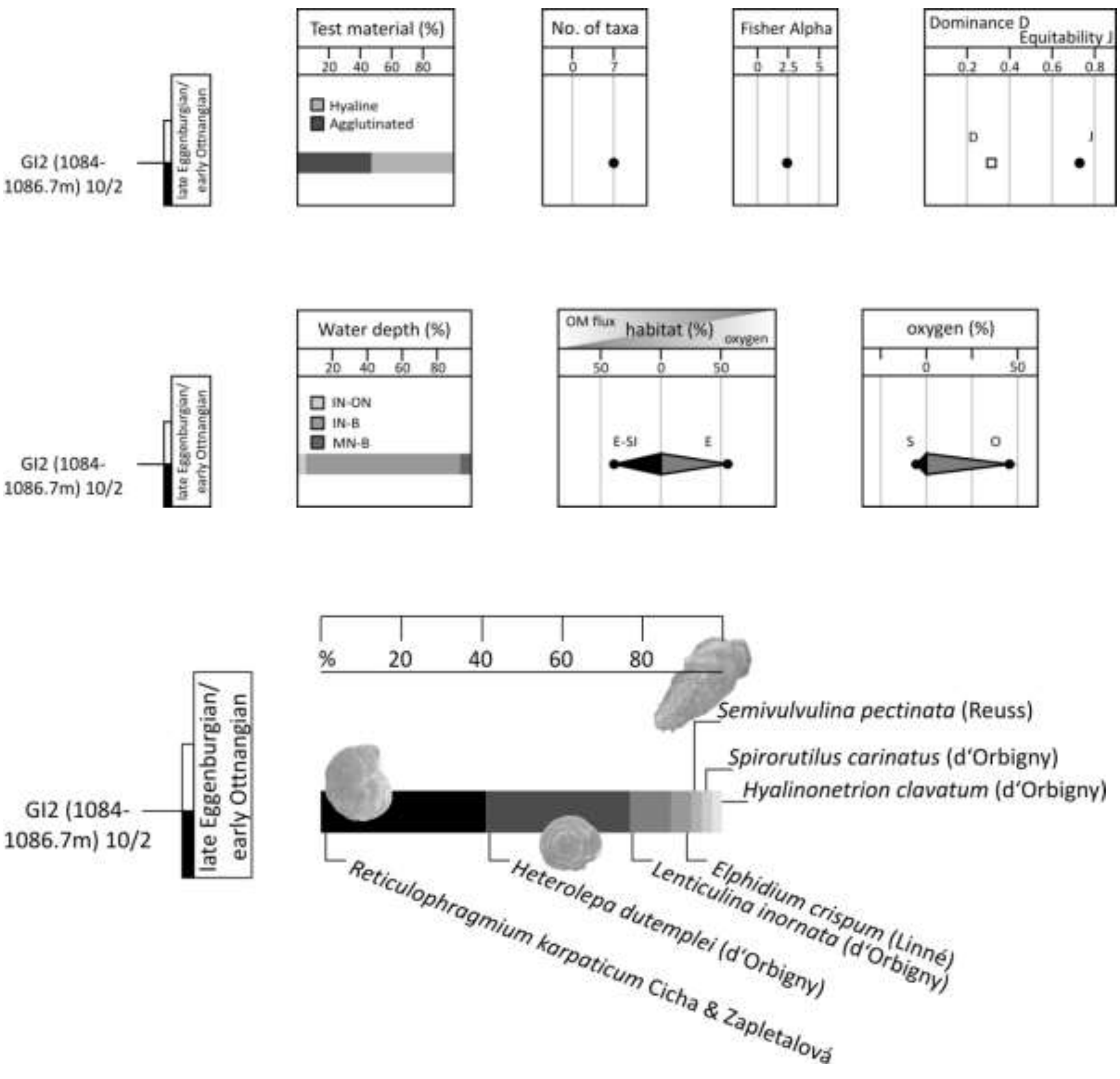


Fig. 60: Values of diversity indices (Fisher Alpha, Equitability E and Dominance D), distribution of palaeoecological preferences and contribution of the most abundant species of the sample GI2 (1084-1086.7m) 10/2.
IN-ON = inner to outer neritic, IN/MN-B = inner/middle neritic-bathyal species, E = epifaunal species, E-SI = epifaunal to shallow infaunal species, O = oxic, S = suboxic indicators, OM = organic matter.

4.3.4. Hohenruppersdorf 19

4.3.4.1. Composition and diversity - results

Moderately preserved tests of 50 benthic and planktonic taxa as well as more than 1200 individuals have been identified in seven samples from the Hohenruppersdorf 19-well. Six samples were sterile. Due to their small number of individuals samples HRD19 (400–405m) 1/2 and HRD19 (571–576m) 3/1 were not taken into account in the following analyses. Benthic foraminifera make up the main proportion of collected specimens (99 % benthic vs. 1 % of planktonic species).

The hyaline taxa are dominating all foraminiferal assemblages (93 %), followed by porcellanous (5 %) and very rare agglutinated taxa (2 %). The number of taxa ranges between 8 and 22. Samples HRD19 (590–595m) 4/1 and HRD19 (630–635m) 6/1 show the highest values. Fisher Alpha Diversity values range between 2.2 and 5.4 with the highest number in sample HRD19 (590–595m) 4/1. Equitability varies between 0.37 and 0.74. Dominance has its highest value 0.62 in sample HRD19 (495–500m) 2/1. The underlying samples are ranging between 0.25 and 0.36 (fig. 62).

The inner neritic setting, mainly represented by *Ammonia* spp., shows a higher abundance (75 %) only in the lowermost sample HRD19 (819–820m) 12/1 (fig. 62). Between samples HRD19 (495–500m) 2/1 and HRD19 (650–656m) 7/1 the values range between 2 and 5 %. Taxa characteristic for the inner to middle neritic, inner to outer neritic and middle to outer neritic settings (e.g. *Quinqueloculina* spp., keeled elphidiids, *Porosononion granosum* in this well) vary only between 1 and 8 %. Taxa representing an inner neritic-bathyal setting (herein *Fursenkoina acuta*, *Bulimina elongata*, *Bolivina dilatata* and *Textularia gramen*) make up the main proportion in sample HRD19 (495–500m) 2/1 with 82 %. Their contribution declines in samples HRD19 (590–595m) 4/1 and HRD19 (630–635m) 6/1 with values 22 and 47 %, respectively and vanishes in the lowermost two samples. The middle neritic-bathyal setting represented by *Nonion commune*, *Lenticulina* spp., *Semivulvulina pectinata* and *Cibicidoides* spp. occurs in all investigated samples with percentages between 11 and 81 %.

Index taxa for environmental stress (herein *Fursenkoina acuta*, *Bulimina elongata* and *Bolivina dilatata*) show values between 21 and 78 %. The indicator species (*Bulimina elongata*) for elevated flux of organic matter peaks in the uppermost sample HRD19 (495–500m) 2/1, appears in sample HRD19 (590–595m) 4/1 and vanishes in the lowermost two samples (fig. 62).

Epifaunal species are only dominating in sample HRD19 (650–656m) 7/1 with 62 % (fig. 62). The over- and underlying samples vary between 9 and 35 %. Taxa with an infaunal mode of life show opposing numbers along the Hohenruppersdorf 19-core: higher in the upper three and low in the other two samples. Deep infaunal species are barely represented. The values of epifaunal taxa result mainly from abundances of *Lenticulina* spp., *Cibicidoides* spp. and the involved miliolids. *Nonion* *commune*, *Fursenkoina acuta*, *Bulimina elongata* and *Bolivina dilatata* mainly contribute to the high percentages of infaunal species.

The index taxa for suboxic bottom waters are clearly dominating the assemblages with percentages between 10 and 78 % (fig. 62). The responsible taxa for these numbers are *Nonion commune*, *Fursenkoina acuta*, *Bulimina elongata* and *Lenticulina* spp. Lower values up to 7 % in all samples are shown by the different species representing oxic bottom waters. The indicators for such conditions are different miliolids and *Cibicidoides* spp. Foraminiferal taxa preferring dysoxic conditions appear only in sample HRD19 (630–635m) 6/1 with 11 % due to a higher abundance of *Bolivina dilatata*.

The faunas of the Hohenruppersdorf 19-well consist of different 50 taxa, most of them are scarcely represented. However, six species, e.g. *Ammonia viennensis*, *Bulimina elongata* and *Bolivina dilatata* were found more often and their distribution along the core is shown in fig. 61.

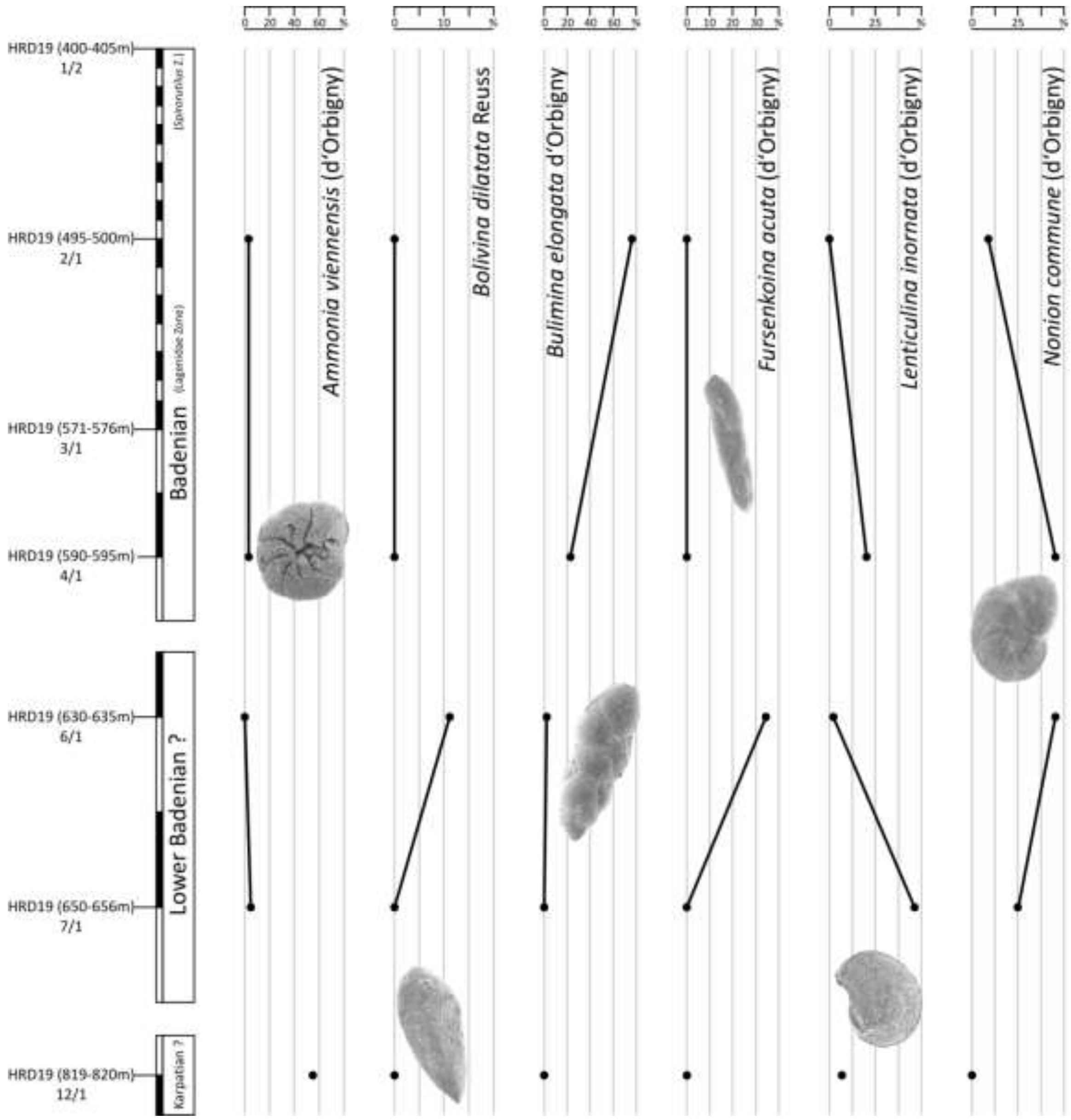


Fig. 61: Downcore distribution of the most abundant species in the assemblages of the Hohenruppersdorf 19-well.

4.3.4.2. Biostratigraphy and palaeoecological interpretation

The uppermost sample HRD19 (400–405m) 1/2 is of middle Badenian age (*Spirorutilus* Zone/ Jakubov Fm.). The underlying three samples (HRD19 (495–500m) 2/1, HRD19 (571–576m) 3/1 and HRD19 (590–595m) 4/1) are of Badenian age (Lanžhot Fm.) and yield Lagenidae Zone assemblages with numerous lagenids, *Quinqueloculina haidingeri*, *Qu. triangularis* and *Sigmoilinita tschokrakensis*. Additionally, their general composition is reminiscent of the communities described in Papp et al. (1978).

Due to the presence of ubiquitous taxa and the lack of any marker species the underlying samples HRD19 (630–635m) 6/1 and HRD19 (650–656m) 7/1 cannot be dated accurately but may be of early Badenian age. The lowermost sample (HRD19 (819–820m) 12/1) contains also few significant species (representatives of the genera *Ammonia*, *Lenticulina*, *Porosononion*, *Quinqueloculina*, *Cibicidoides* and keeled *Elphidium*). Due to its relative stratigraphic position it is tentatively placed within the Karpatian.

HRD19 (400–405m) 1/2

Age: Badenian (*Spirorutilus* Zone), based on mollusc fauna

Composition and environment: no data

HRD19 (495–500m) 2/1

Age: Badenian (Lagenidae Zone), based on *Bulimina elongata* and general composition (as reported in Papp et al., 1978)

Composition: The moderately to well-preserved foraminiferal assemblage (*Bulimina elongata*, *Nonion commune*, *Textularia gramen*, *Ammonia* spp., *Cibicidoides* spp., *Quinqueloculina* spp. and others) of sample HRD19 (495–500m) 2/1 represents a setting on the outer part of the inner shelf. The Fisher Alpha value of 4.1 agrees with the data reported in Murray (1991, 2006) for inner shelf assemblages. Increased organic matter flux to the sea floor is clearly documented by benthic foraminifera, which are largely composed of infaunal species adapted to suboxic environments. Epifaunal species are much less represented. The abundance of infaunal species and epifaunal indicators for oxic conditions suggest a mesotrophic, suboxic environment for this assemblage.

Environment: mainly infaunal; mud to fine sand, hard substrate; marine; mesotrophic; suboxic; about 50 m; outer part of inner shelf

HRD19 (571–576m) 3/1

Age: Badenian (Lagenidae Zone), based on relative stratigraphic position and found *Quinqueloculina haidingeri*

Composition and environment: no data

HRD19 (590–595m) 4/1

Age: Badenian (Lagenidae Zone), based on number of lagenids, occurrence of *Quinqueloculina triangularis* and *Sigmoilinita tschokrakensis* and general composition (as reported in Papp et al., 1978)

Composition: The diverse foraminiferal assemblage of sample HRD19 (590–595m) 4/1 represents a setting on the outer part of the inner shelf (e.g.: *Nonion commune*, *Bulimina elongata*, *Lenticulina* sp., *Quinqueloculina* spp., *Semivulvulina pectinata*, *Ammonia* spp., *Cycloforina contorta*, *Heterolepa dutemplei* and different other species). The found species and the Fisher Alpha value of 5.4 agree with the data reported in Murray (1991, 2006) for inner shelf assemblages. The assemblage is mainly composed of infaunal species adapted to suboxic bottom water conditions. The involved epifaunal species indicate low-oxygenated conditions. Almost all tests are abraded and corroded.

Environment: mainly infaunal; mud to silt; marine; mesotrophic; suboxic; about 50 m; outer part of inner shelf

HRD19 (630–635m) 6/1

Age: Lower Badenian?

Composition: This sample contains mainly species, such as *Nonion commune*, *Fursenkoina acuta*, *Bolivina dilatata*, *Lenticulina* spp., *Sigmoilopsis schlumbergeri*, *Bulimina elongata*, *Cibicidoides* spp., *Laevidentalina* spp., *Textularia gramen*, *Valvulineria complanata*, *Reussella spinulosa* and others. Most of these are infaunal or deep infaunal adapted to sub- or even dysoxic bottom water conditions (e.g.: *Nonion commune*, *Fursenkoina acuta* and *Bolivina dilatata*). The epifaunal species, much less represented, hint at oxic to suboxic conditions. Based on the abundances of infaunal *Fursenkoina acuta* and *Bolivina dilatata* environmental stress is indicated. Preservation is moderate, partly even poor due to strong abrasion and corrosion of the tests.

Environment: mainly infaunal; mud to silt, hard substrate; marine; meso- to even eutrophic; suboxic; about 50 m; outer part of inner shelf

SEM pictures: Pl. 1: 26 *Fursenkoina acuta*

HRD19 (650–656m) 7/1

<u>*Age*</u>: Lower Badenian?

<u>*Composition*</u>: The less diverse and poorly preserved foraminiferal assemblage (*Lenticulina* spp., *Nonion commune*, *Ammonia viennensis*, *Semivulvulina pectinata*, *Quinqueloculina buchiana*, *Pararotalia aculeata*) of this sample represents an environment on the outer part of the inner shelf. The Fisher Alpha value of 4.5 agrees with the data reported in Murray (1991, 2006) for an inner shelf environment. Organic matter flux to the sea floor as well as environmental stress is not documented. Only one infaunal species (*Nonion commune*) was found pointing to suboxic conditions. These conditions are also well documented in the greater number of epifaunal species.

<u>*Environment*</u>: mainly epifaunal; mud to sand; marine; mesotrophic; suboxic; about 50 m; outer part of inner shelf

<u>*SEM pictures:*</u> Pl. 2: 2 *Lenticulina inornata*

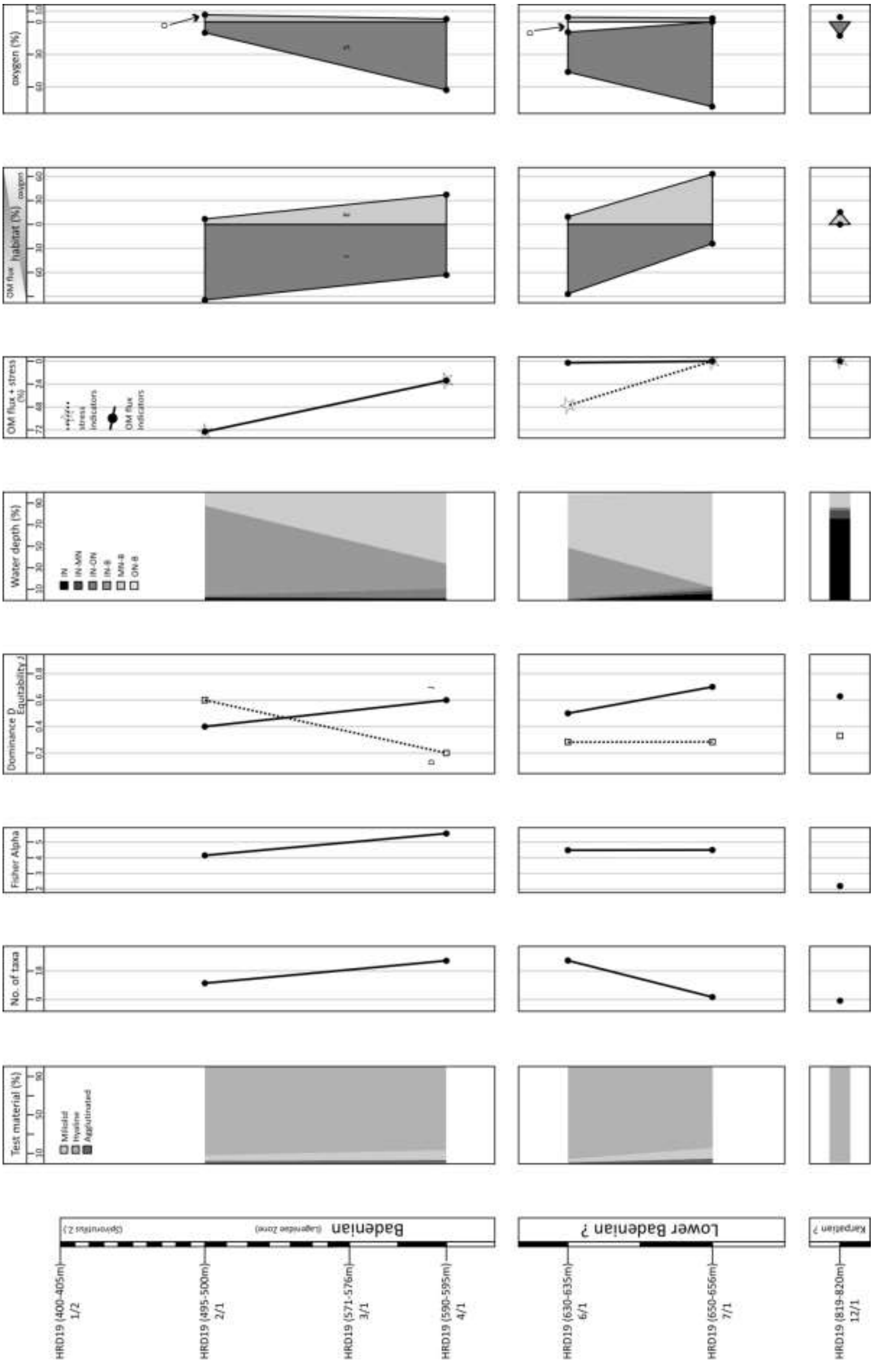
HRD19 (819–820m) 12/1

<u>*Age*</u>: Karpatian?, based on relative stratigraphic position, foraminiferal content meaningless

<u>*Composition*</u>: The sediments from this sample were deposited in a water depth ranging between 0-50 m on the inner shelf indicated by moderately preserved species like *Ammonia* spp., *Lenticulina inornata*, *Porosononion granosum*, *Quinqueloculina* sp., *Cibicidoides* sp., keeled *Elphidium* sp. Organic matter flux to the sea floor as well as environmental stress are not documented. Infaunal species are absent. The assemblage is composed of epifaunal species adapted to oxic to slightly suboxic bottom water conditions.

<u>*Environment*</u>: epifaunal; mud to sand; marine; mesotrophic; oxic to slightly suboxic; 0-50 m; inner shelf

Fig. 62: Diversity indices and palaeoenvironmental trends in the benthic foraminiferal assemblages of the Hohenruppersdorf 19-well. Nomenclature for oxic, suboxic and dysoxic indicators follows Kaiho (1994). Trends in epifaunal, infaunal and deep infaunal taxa reflect the antagonistic relationship of organic matter flux and bottom water oxygenation. IN = inner neritic species, IN-MN = inner to middle neritic species, IN-ON = inner to outer neritic species, IN/MN/ON-B = inner/middle/outer neritic-bathyal species, I = infaunal, E = epifaunal, O = oxic indicators, S = suboxic indicators, D = dysoxic indicators, OM = organic matter.


oxygen (%)
OM flux
habitat (%)
oxygen
OM flux + stress (%)
stress indicators
OM flux indicators
Water depth (%)
IN
IN-MN
IN-ON
IN-B
MN-B
ON-B
Dominance D
Equitability J
Fisher Alpha
No. of taxa
Test material (%)
Miliolid
Hyaline
Agglutinated
Badenian
(Lagenidae Zone)
(Spirorutilus Z.)
Lower Badenian ?
Karpatian ?
HRD19 (400-405m) 1/2
HRD19 (495-500m) 2/1
HRD19 (571-576m) 3/1
HRD19 (590-595m) 4/1
HRD19 (630-635m) 6/1
HRD19 (650-656m) 7/1
HRD19 (819-820m) 12/1

4.3.5. Hohenruppersdorf 24

4.3.5.1. Composition and diversity - results

Moderately preserved tests of 47 benthic and planktonic foraminiferal taxa and almost 780 counted individuals have been found and identified in six of ten investigated samples. The remaining four samples from the Hohenruppersdorf 24-well were microsterile. Samples HRD24 (256–260.5m) 2/1 and HRD24 (390–395m) 3/1 were not taken into account in the following analyses because of the very low number of found individuals. Benthic foraminifera are clearly dominating (96 % benthic vs. 4 % of planktonic species).

Taxa with hyaline tests are the most frequent group with 77 %. The miliolid and agglutinated taxa contribute with 19 and 4 %, respectively. Number of taxa shows values between 10 and 22 (fig. 63). The upper two samples are more diverse than the lower two. The Fisher Alpha Diversity ranges between 2.1 and 6.5 with the highest number in sample HRD24 (620–624m) 6/1. Varying with values between 0.74 and 0.83 in the upper three samples, equitability shows the lowest number 0.44 at the lowermost sample HRD24 (775–779.5m) 9/1. Dominance starts with lowest value 0.16 at sample HRD24 (550–555m) 5/1 and shows higher numbers downwards.

Taxa characteristic for an inner neritic setting like *Ammonia* spp. vary between 16 and 61 % downcore (fig. 63). Indicators for inner to middle neritic, inner to outer neritic and middle to outer neritic settings like e.g. *Cycloforina gracilis*, *Quinqueloculina* spp. and *Elphidium crispum* show abundances up to 39 % spread over the entire core. The inner neritic-bathyal setting represented by higher abundances of mainly *Fursenkoina acuta*, *Bulimina elongata* and *Heterolepa dutemplei* occurs in all investigated samples with percentages between 1 and 20 %. The lowest values occur at samples HRD24 (641–645m) 7/1 and HRD24 (775–779.5m) 9/1. Taxa representing the middle neritic-bathyal setting show a similar distribution along the core with percentages ranging between 3 and 61 %. Indicators are mainly *Nonion commune*, *Lenticulina* spp., *Semivulvulina pectinata* and *Sigmoilinita tenuis*. The outer neritic-bathyal setting is represented in the uppermost sample with 16 % by *Valvulineria complanata*. Bathyal representatives were not found.

The indicative taxa for elevated flux of organic matter *Bulimina elongata* and *Uvigerina pygmoides* peak in sample HRD24 (620–624m) 6/1 with 8 %. In the remaining samples these taxa are less abundant with values up to 3 %. A decrease is visible in the abundances of the stress marker species *Fursenkoina acuta*, *Valvulineria complanata*, *Bulimina elongata* as well as *Bolivina dilatata* and *Uvigerina pygmoides*. They peak with 22 % in the uppermost sample HRD24 (550–555m) 5/1 and have reduced values between 1 and 17 % in the underlying samples (fig. 63).

Index taxa for an epifaunal mode of life (herein mainly different miliolids, *Lenticulina* spp. and *Heterolepa dutemplei*) show values between 21 and 70 % (fig. 63). Conversely, the infaunal species range with higher values (57 and 58 %) in the upper two samples and decrease downcore to values between only 3 and 4 %. Infaunal species are herein mainly represented by *Nonion commune*, *Valvulineria complanata*, *Fursenkoina acuta* and *Bulimina elongata*. Deep infaunal species were barely found.

Lower values between 3 and 5 % shown by the different species representing suboxic bottom waters were found in the lower two samples whereas the upper two samples HRD24 (550–555m) 5/1 and HRD24 (620–624m) 6/1 show high abundances of 54 and 56 %. The indicators for this are *Nonion commune*, *Lenticulina* spp., *Fursenkoina acuta*, *Valvulineria complanata* and *Bulimina elongata*. The abundances of index taxa for oxic bottom waters are clearly dominating sample HRD24 (641–645m) 7/1 with 52 %. The responsible taxa for this numbers are mainly different miliolids and *Heterolepa dutemplei*. Foraminiferal taxa preferring dysoxic conditions are clearly underrepresented.

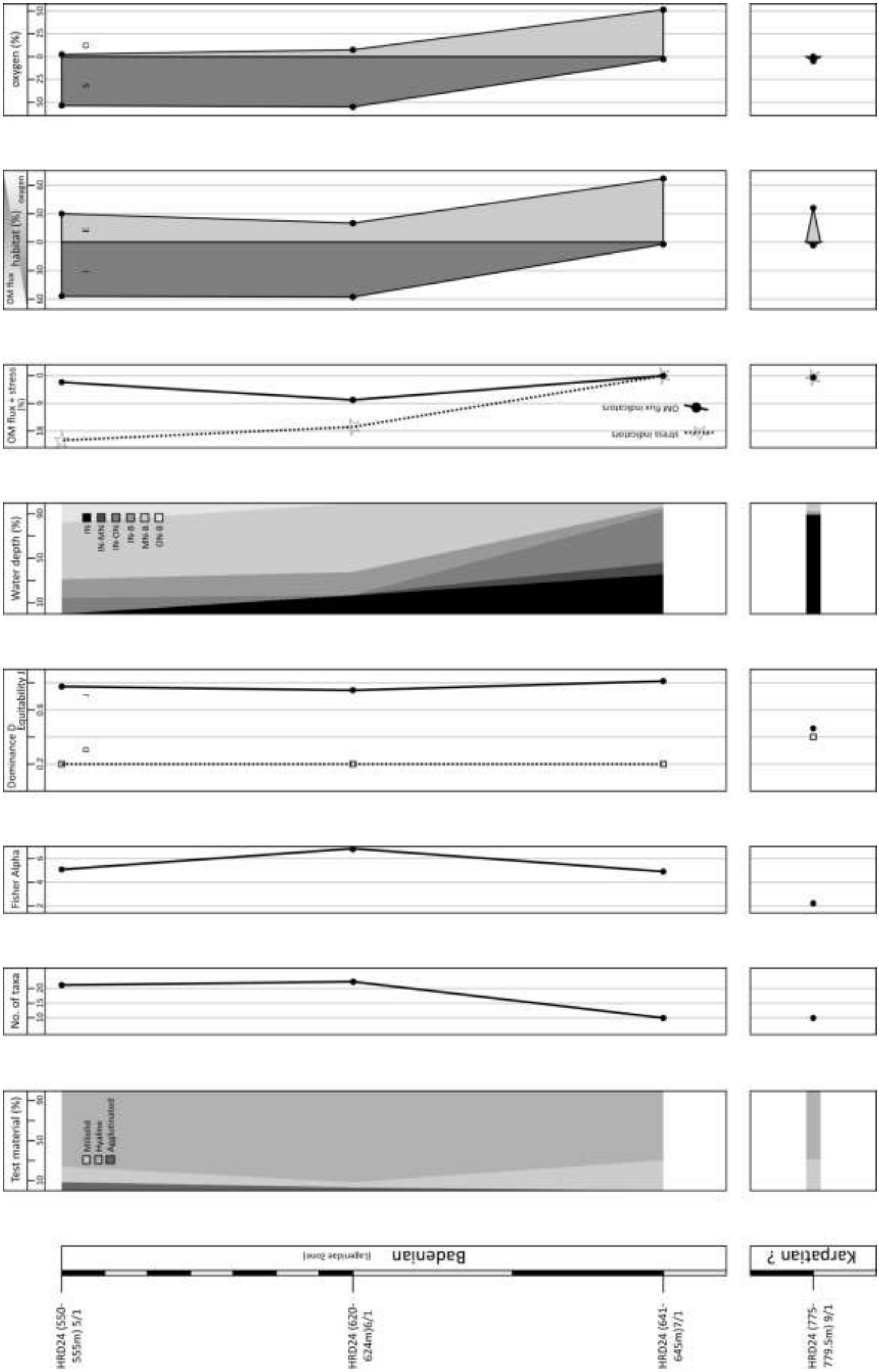
The samples contain 47 taxa, of which the majority is represented only by a handful of individuals; only four species are frequent (fig. 64).

4.3.5.2. Biostratigraphy and palaeoecological interpretation

The uppermost sample HRD24 (256–260.5m) 2/1 is of Sarmatian age. It contains only two foraminifera, but the mollusc fauna is indicative and the correlation is supported by the position within the seismics. The following sample HRD24 (390–395m) 3/1 can be placed into the middle Badenian *Spirorutilus* Zone (Jakubov Fm.) based on its mollusc content. It yielded only four foraminifers.

The underlying samples HRD24 (550–555m) 5/1, HRD24 (620–624m) 6/1 and HRD24 (641–645m) 7/1 are correlated with the Badenian Lagenidae Zone, based on the large number of lagenids and the presence of *Borelis melo*, *Quinqueloculina haidingeri* and *Lagena haidingeri*. Additionally their compositions are similar to those reported by Papp et al. (1978) for typical Lagenidae Zone assemblages. The lowermost sample HRD24 (775–779.5m) 9/1 is tentatively placed into the Karpatian (Laa Fm.) based on its differing composition and absence of Badenian markers as found in the overlying samples.

Fig. 63: Diversity indices and palaeoenvironmental trends in the benthic foraminiferal assemblages of the Hohenruppersdorf 24-well. Nomenclature for oxic, suboxic and dysoxic indicators follows Kaiho (1994). Trends in epifaunal, infaunal and deep infaunal taxa reflect the antagonistic relationship of organic matter flux and bottom water oxygenation. IN = inner neritic species, IN-MN = inner to middle neritic species, IN-ON = inner to outer neritic species, IN/MN/ON-B = inner/middle/outer neritic-bathyal species, I = infaunal, E = epifaunal, O = oxic indicators, S = suboxic indicators, OM = organic matter.



oxygen (%)
habitat (%)
OM flux
oxygen
OM flux + stress (%)
OM flux indications
stress indications
Water depth (%)
IN
IN-MN
IN-ON
IN-B
MN-B
ON-B
Dominance D
Equitability J
Fisher Alpha
No. of taxa
Test material (%)
Miliolid
Hyaline
Agglutinated
Badenian
(Lagenidae Zone)
Karpatian ?
HRD24 (550-555m) 5/1
HRD24 (620-624m)6/1
HRD24 (641-645m)7/1
HRD24 (775-779.5m) 9/1

HRD24 (256–260.5m) 2/1

Age: Sarmatian, based on mollusc fauna and seismic correlation

Composition and *environment*: no foraminiferal data

HRD24 (390–395m) 3/1

Age: Badenian (*Spirorutilus* Zone), based on mollusc fauna

Composition and environment: no foraminiferal data

HRD24 (550–555m) 5/1

Age: Badenian (Lagenidae Zone), based on number of lagenids, *Quinqueloculina haidingeri*, *Lagena haidingeri* and supplementary species

Composition: The foraminiferal assemblage (e.g. with *Nonion commune*, *Valvulineria complanata*, *Quinqueloculina* spp., *Fursenkoina acuta*, *Lenticulina* spp., *Cyclammina* sp., *Bulimina elongata*, *Heterolepa dutemplei*, *Semivulvulina pectinata*, *Sigmoilinita tenuis*) points to an outer shelf environment between 100-200 m water depth. The community is largely composed of infaunal taxa preferring suboxic bottom waters. Epifaunal species occur in a smaller amount. They are adapted to more oxic conditions. Environmental stress is indicated by *Valvulineria complanata*, *Fursenkoina acuta* and *Bulimina elongata*. The foraminifera are poorly to moderately preserved. Especially the miliolids show a poor preservation due to strong corrosion and abrasion.

Environment: mainly infaunal; mud to silt; marine; mesotrophic; suboxic; 100-200 m; outer shelf

SEM pictures: Pl. 1: 12 *Sigmoilinita tenuis*

HRD24 (620–624m) 6/1

Age: Badenian (Lagenidae Zone), based on number of lagenids and general composition (as reported in Papp et al., 1978)

Composition: The assemblage is suggesting a slightly shallower setting on the outer part of the inner shelf about 100 m (e.g.: *Nonion commune*, *Ammonia* spp., *Lenticulina* spp., *Fursenkoina acuta*, *Bulimina elongata*, *Pappina primiformis*, *Semivulvulina pectinata*, *Sigmoilinita tenuis*, *Heterolepa dutemplei* and other taxa). The sample is mainly composed of infaunal species adapted to a suboxic sea floor. The found epifaunal species prefer oxic to suboxic conditions. *Fursenkoina acuta*, *Bulimina elongata* and *Uvigerina pygmoides* hint at slightly increased flux of organic material and environmental stress. Besides the poorly preserved miliolids and specimens of *Ammonia*, the remaining taxa are moderately preserved showing signs of corrosion and abrasion.

Environment: mainly infaunal; mud to silt; marine; mesotrophic; suboxic; about 100 m; outer part of inner shelf

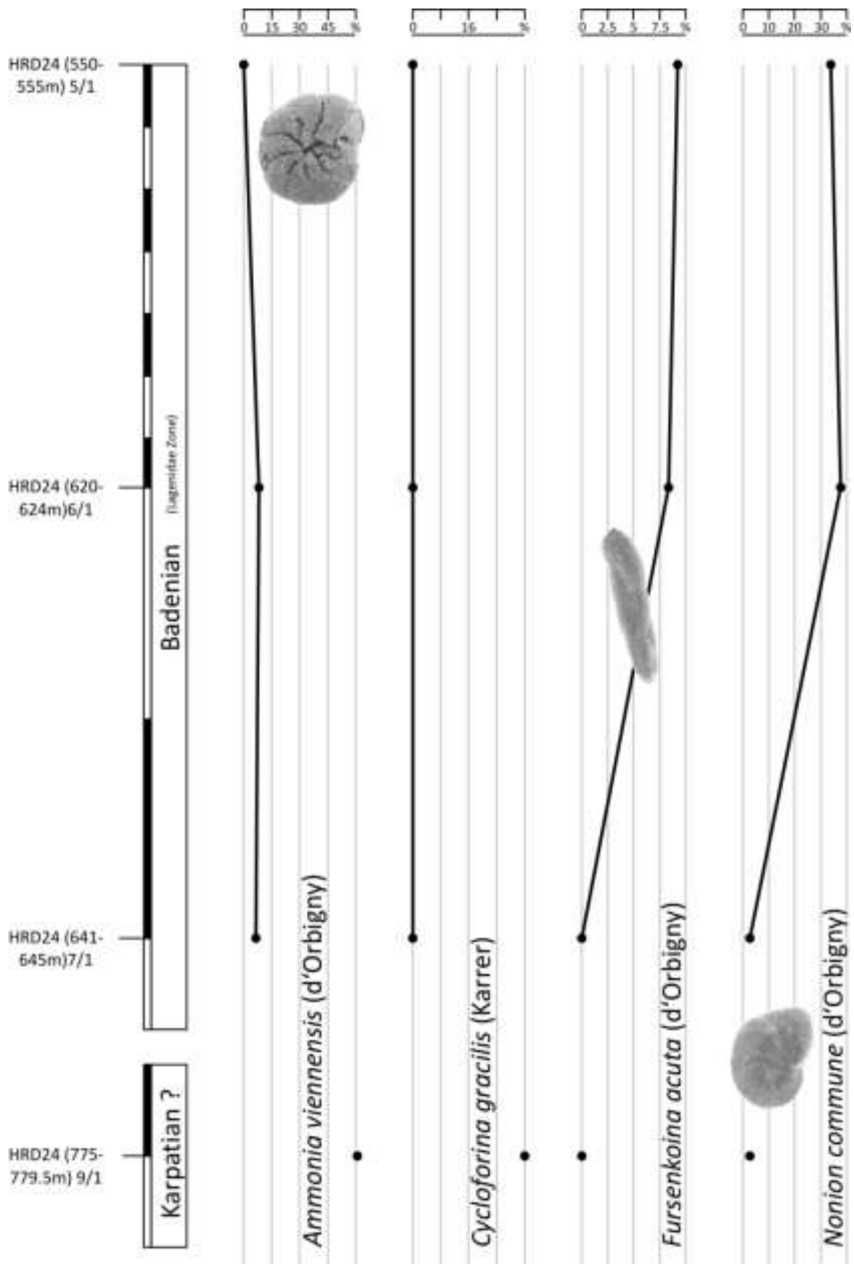


Fig. 64: Most abundant foraminiferal taxa found in the examined samples of the Hohenruppersdorf 24-well.

HRD24 (641–645m) 7/1

Age: Badenian (Lagenidae Zone), based on *Borelis melo* and composition

Composition: This sample contains hyaline and porcellanous species (*Elphidium crispum*, *Borelis melo*, *Ammonia* spp., *Triloculina inflata*, *Porosononion granosum*, *Heterolepa dutemplei*, *Nonion commune*). Almost all taxa are epifaunal and adapted to oxic conditions on the sea floor. Only one infaunal species (*Nonion commune*) was found. Organic matter flux to the sea floor as well as environmental stress is not documented. The moderately preserved community suggests a lagoonal nearshore environment. Additionally *Elphidium crispum*, *Borelis melo* and *Triloculina inflata* point to vegetation (e.g. seagrass) due to epiphytic or clinging mode of life.

Environment: mainly epifaunal; muddy sand, vegetation, algal-coated hard substrate; marine to hypersaline; oligotrophic; oxic; 0-50 m; nearshore, inner shelf

HRD24 (775–779.5m) 9/1

Age: Karpatian?, based on different composition and absence of Badenian markers as in the overlying samples

Composition: The taxa found in this sample (*Ammonia viennensis*, *Cycloforina gracilis*, *Nonion commune*, *Lenticulina inornata*, *Quinqueloculina hauerina*, *Bulimina elongata*) are mainly epifaunal to shallow infaunal preferring oxic to suboxic bottom water conditions. Infaunal species are rare (*Nonion commune*). Organic matter flux to the sea floor as well as environmental stress is not documented. The moderately to well-preserved assemblage suggests a marine to hypersaline lagoonal setting. Especially the tests of *Ammonia* show moderate preservation.

Environment: mainly epifaunal to shallow infaunal; muddy sand; marine to hypersaline; oligotrophic; oxic to suboxic; 0-50 m; lagoon, inner shelf

4.3.6. Hohenruppersdorf 25

4.3.6.1. Composition and diversity - results

Moderately to well-preserved tests of 78 benthic and planktonic foraminiferal taxa and 2331 individuals have been identified in eight samples from the Hohenruppersdorf 25-well. Six samples turned out to be microsterile. Sample HRD25 (685–690m) 9/1 was not taken into account in the following diversity and abundance analyses due to the very low number of specimens. Benthic foraminifera are the dominating group (96 % benthic vs. 4 % of planktonic species).

The hyaline taxa make up the main proportion of the entire foraminiferal content (83 %), followed by porcellanous (9 %) and agglutinated taxa (8 %). The number of taxa ranges between 3 in sample HRD25 (740–745m) 10/1 and 47 in sample HRD25 (290–298m) 1/1 (fig. 66). The same distribution is visible in Fisher Alpha Diversity with values up to 10.0. Equitability varies between values 0.49 and 0.88. Sample HRD25 (310–315m) 2/1 shows the highest number. Conversely, dominance shows higher values downcore ranging between 0.09 and 0.66.

Species representing an inner neritic setting (herein *Ammonia* spp.) display abundances with values up to 14 % in the upper four samples (fig. 66). Sample HRD25 (665–670m) 8/1 peaks at 87 % to fall to 0 % in the basal sample HRD25 (740–745m) 10/1. The taxa characteristic for inner to middle neritic, inner to outer neritic and middle to outer neritic settings (*Porosononion granosum*, different miliolids, keeled elphidiids, *Cycloforina* spp. and *Cancris auriculus*) vary between 1 and 25 %. The lowermost sample is always 0 %. The upper three samples have the highest numbers. The inner neritic-bathyal setting is represented with relatively low values ranging between 1 and 14 %. The first two samples occur with the highest numbers. Responsible species are *Textularia* spp., *Heterolepa dutemplei*, *Bulimina* spp. and *Fursenkoina acuta*. Taxa representing the middle neritic-bathyal setting (*Lenticulina* spp., *Nonion commune*, *Sigmoilopsis* spp., *Semivulvulina pectinata* and *Praeglobobulimina* spp.) show very high abundances all over the core, ranging between 16 and 80 %. Sample HRD25 (665–670m) 8/1 shows the lowest value of only 1 %. Sample HRD25 (290–298m) 1/1 presents the highest amount of outer neritic-bathyal setting indicators (herein *Valvulineria complanata* and *Hansenisca soldanii*). Sample HRD25 (310–315m) 2/1 displays a lower contribution of these taxa (12 %).

Indicative taxa for elevated flux of organic matter as well as environmental stress occur only in the uppermost two samples HRD25 (290–298m) 1/1 (6/27 %) and HRD25 (310–315m) 2/1 (24/34 %) (fig. 66). The values result from an increased contribution of the species *Praeglobobulimina* spp., *Cancris auriculus*, *Bulimina elongata* and *Melonis* spp. for the increased flux and of *Valvulineria complanata*, *Praeglobobulimina* spp., *Bulimina elongata* and *Fursenkoina acuta* for the increased environmental stress conditions.

Epifaunal species dominate the assemblages of the Hohenruppersdorf 25-core with increased values between 13 and 90 % and is opposed by reduced percentages of infaunal species. The infaunal taxa show higher values only in the upper two samples with 36 and 19 %. Deep infaunal species occur only at the topmost two samples with 2 and 20 %. The high values of epifaunal plus epifaunal to shallow infaunal taxa result mainly from high abundances of *Ammonia* spp., *Lenticulina* spp., *Textularia* spp., different miliolids, *Sigmoilopsis* spp., *Semivulvulina pectinata* and some other species. The infaunal mode of life is represented by taxa like *Valvulineria complanata*, *Nonion commune*, *Bulimina* spp., *Melonis* spp. and *Fursenkoina acuta*, whereas *Praeglobobulimina* spp. hints at a deep infaunal setting (fig. 66).

Suboxic bottom waters are represented in the sampled core by *Lenticulina* spp., *Valvulineria complanata*, *Nonion commune* and other species with abundances up to 80 % (fig. 66). The lowest contribution can be found in sample HRD25 (665–670m) 8/1, the highest in the lowermost one. The index taxa for oxic bottom waters show contrary values. These range between 2 and 22 % abundance, mainly contributed by species *Textularia* spp., *Sigmoilopsis* spp., *Semivulvulina pectinata* and keeled elphidiids. Foraminiferal taxa preferring dysoxic bottom water conditions occur only in samples HRD25 (290–298m) 1/1 and HRD25 (310–315m) 2/1 with 2 and 20 % caused by increased abundance of *Praeglobobulimina* spp.

The samples from this well do not contain planktonic foraminifera or their number is negligible, except for sample HRD25 (290–298m) 1/1. Therein taxa preferring warm surface water conditions (herein *Globigerinoides trilobatus* and *G. quadrilobatus*) show the highest proportion of all planktonic foraminifera (50 %) followed by cool temperature indicators (29 %; *Globigerina bulloides*, *G. falconensis* and *G. praebulloides*). Warm-temperate indicators are represented with 13 % (*Globigerinella obesa*). The indicative taxa for increased productivity (*Globigerina bulloides* and *G. praebulloides*) make up 29 %.

Most of the 78 taxa are represented only sporadically. The contributions by the five most abundant species are shown in fig. 65.

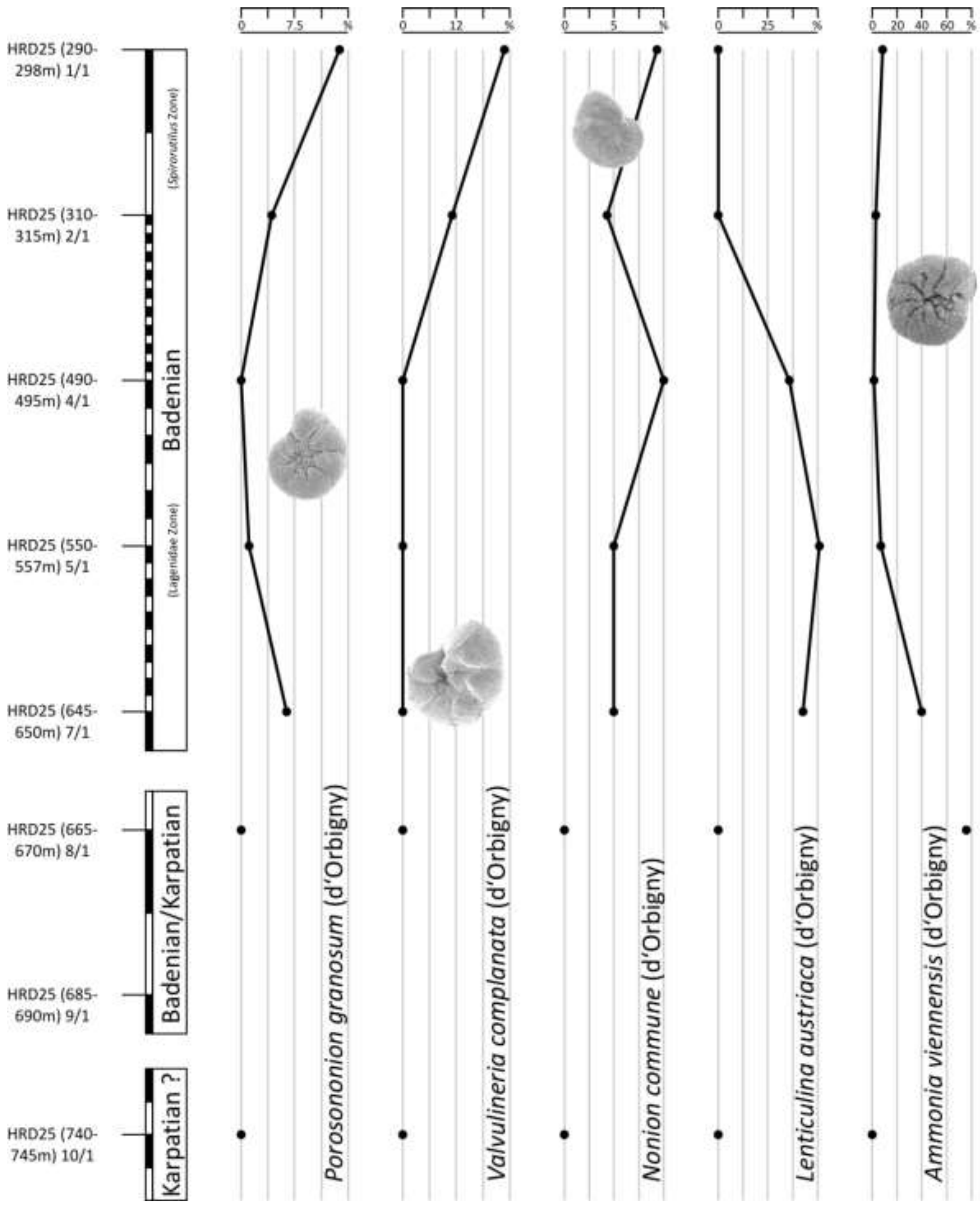


Fig. 65: Most abundant species in the assemblages of the Hohenruppersdorf 25-well.

4.3.6.2. Biostratigraphy and palaeoecological interpretation

Since *Sigmoilopsis foeda*, *Bitubulogenerina reticulata*, *Cibicidoides austriacus*, *Globigerina falconensis* and *Globigerinoides quadrilobatus* were found the uppermost two samples HRD25 (290–298m) 1/1 and HRD25 (310–315m) 2/1 are interpreted as middle Badenian in age (*Spirorutilus* Zone; Jakubov Fm.). Additionally, their compositions are similar to those reported in Papp et al. (1978) and Rupp (1986) for the respective biozone.

The following three samples HRD25 (490–495m) 4/1, HRD25 (550–557m) 5/1 and HRD25 (645–650m) 7/1 are placed into the lower Badenian Lagenidae Zone (Lanžhot Fm.) based on the occurrences of *Amphistegina radiata*, *Quinqueloculina haidingeri Qu. hauerina*, *Cycloforina badenensis*, *Adelosina longirostra, Cibicidoides austriacus* and additional species.

Based on the absence of significant markers and their relative position the two following samples (HRD25 (665–670m) 8/1 and HRD25 (685–690m) 9/1) can only be identified as Badenian/Karpatian in age. The lowermost sample contains only few foraminifera and is therefore only tentatively placed into the Karpatian (Laa Fm.).

HRD25 (290–298m) 1/1

Age: Badenian (*Spirorutilus* Zone), based on the occurrences of *Sigmoilopsis foeda*, *Bitubulogenerina reticulata*, *Cibicidoides austriacus*, *Globigerina falconensis*, *Globigerinoides quadrilobatus* and general composition (as reported in Papp et al., 1978 and similar to Rupp, 1986)

Composition: The diverse foraminiferal assemblage (*Valvulineria complanata*, *Ammonia* spp., *Porosononion granosum*, *Textularia* spp., *Nonion commune*, *Cycloforina contorta*, *Sigmoilopsis* spp., *Bulimina* spp., *Praeglobobulimina* spp., *Cancris auriculus*, *Heterolepa dutemplei*, *Quinqueloculina* spp., *Pseudogaudryina mayeriana*, *Cibicidoides* spp. and many others) of sample HRD25 (290–298m) 1/1 represents a setting on the outer part of the inner shelf. The species composition and the Fisher Alpha value of 10.0 agree with the data reported in Murray (1991, 2006) for an inner shelf assemblage. The assemblage is composed approximately fifty-fifty of epifaunal and infaunal/deep infaunal species. Most of the epifaunal species depend on oxic bottom waters, whereas the infaunal taxa are solely adapted to suboxic or even dysoxic bottom water conditions. The latter comprise several species pointing to increased organic matter flux to the sea floor and environmental stress, such as *Valvulineria complanata*, *Bulimina elongata*, *Praeglobobulimina* spp., *Fursenkoina acuta*, *Melonis* spp., *Cancris auriculus*, *Cassidulina laevigata and Hoeglundina elegans*. Even though some specimens are strongly corroded and partly pyritisised general preservation is moderately to well. Only the miliolid tests are poorly preserved.

The increased contribution of planktonic foraminifera preferring warm temperature conditions hints at warmer surface waters. *Globigerinella obesa*, known as a deeper water element, indicates deeper warm-temperate layers. The proportion of planktonic taxa preferring productive environments (*Globigerina bulloides*, *G. praebulloides*; 29 % of planktonic content) may indicate a slightly increased input of nutrients.

Environment: epi- and infaunal; muddy-silty sand, hard substrate; marine; mesotrophic; oxic bottom, sub- to dysoxic layer within sediment; 50-150 m; deltaic?, outer part of inner shelf

HRD25 (310–315m) 2/1

Age: Badenian (*Spirorutilus* Zone), based on the occurrences of *Sigmoilopsis foeda*, *Globigerinoides quadrilobatus*

Composition: The foraminiferal assemblage (*Praeglobobulimina pupoides*, *Triloculina inflata*, *Valvulineria complanata*, *Quinqueloculina* spp., *Karreriella chilostoma*, *Heterolepa dutemplei*, *Ammonia* spp., keeled elphidiids, *Bulimina elongata*, *Porosononion granosum*, *Nonion commune*, *Neugeborina longiscata*, *Pyrgo simplex*) of sample HRD25 (310–315 m) 2/1 characterises a setting on the inner shelf between 0-100 m water depths. The data reported in Murray (1991, 2006) for inner shelf environments agree with that assumption. Again, the assemblage is composed roughly fifty-fifty of epifaunal and infaunal/deep infaunal species. Oxic bottom waters are preferred by the involved epifaunal species, whereas the infaunal and deep infaunal taxa are solely adapted to suboxic and dysoxic bottom water conditions. Increased organic matter flux to the sea floor and environmental stress is indicated by the latter (*Praeglobobulimina pupoides*, *Valvulineria complanata*, *Bulimina elongata*). The tests are moderately to well-preserved, some are strongly corroded and pyritisised.

Environment: epifaunal and infaunal; mud to fine sand, hard substrate; marine; mesotrophic; oxic bottom, sub- to dysoxic within sediment; 0-100 m; inner shelf

HRD25 (490–495m) 4/1

Age: Badenian (Lagenidae Zone), based on occurrence of *Amphistegina radiata*, *Quinqueloculina haidingeri* and *Cibicidoides austriacus* and additional species

Composition: The foraminiferal assemblage with a main contribution of *Lenticulina* spp., *Quinqueloculina* spp., *Nonion commune*, keeled elphidiids, *Semivulvulina pectinata*, *Sigmoilopsis schlumbergeri*, *Asterigerinata planorbis* and *Cibicidoides austriaca* indicates a marine environment on the outer inner shelf. The Diversity value of 5.5 ranges well within those reported for benthic foraminifera from inner shelf assemblages (Murray 1991, 2006). Environmental stress and organic matter flux to the sea floor are not documented. Benthic foraminifers are largely composed of epifaunal species adapted to oxic to suboxic conditions. The infaunal species *Nonion commune* points to suboxic dependency. Due to abrasion, corrosion and breakage specimens of the taxa *Ammonia*, *Lenticulina* and different miliolids show poor preservation, whereas the remaining species are moderately preserved.

Environment: mainly epifaunal; mud to silt, vegetated, hard substrate; marine; mesotrophic; suboxic; about 100 m; inner shelf

HRD25 (550–557m) 5/1

Age: Badenian (Lagenidae Zone), based on occurrence of *Amphistegina radiata*, *Quinqueloculina hauerina* and additional species

Composition: The moderately diverse foraminiferal assemblage of sample HRD25 (550–557m) 5/1 is similar to that of sample HRD25 (490–495m) 4/1 and represents the inner part of the outer shelf (e.g. *Lenticulina austriaca*, *Semivulvulina pectinata*, *Quinqueloculina* spp., *Sigmoilopsis schlumbergeri*, *Ammonia* spp., *Heterolepa dutemplei*, *Nonion commune*, keeled elphidiids, *Sigmoilinita tenuis*, *Amphistegina radiata*). Organic matter flux to the sea floor as well as environmental stress are not documented. Only few infaunal species (*Nonion commune*, *Siphonodosaria consobrina* and *Vaginulinopsis hauerina*) were found pointing to suboxic conditions. These conditions are also well documented in the greater number of epifaunal species. Again, specimens of the taxa *Ammonia*, *Lenticulina* and different miliolids show poor preservation, whereas the remaining species are moderately preserved.

Environment: mainly epifaunal; mud to silt, vegetated, hard substrate; marine; mesotrophic; suboxic; 100-150 m; inner part of outer shelf

HRD25 (645–650m) 7/1

Age: Badenian (Lagenidae Zone), based on occurrence of *Amphistegina radiata*, *Cycloforina badenensis* and *Adelosina longirostra*

Composition: The assemblage is suggesting a setting on the outer part of the inner shelf in 50-100 m depth (e.g. *Ammonia* spp., *Lenticulina austriaca*, *Porosononion granosum*, *Nonion commune*, *Sigmoilopsis schlumbergeri*, *Asterigerinata planorbis* and keeled elphidiids). The sample is mainly composed of epifaunal species adapted to an oxic to suboxic sea floor. The infaunal species prefer suboxic conditions. Organic matter flux to the sea floor as well as environmental stress is not documented. Due to abrasion, specimens of the taxa *Ammonia* and *Lenticulina* are poorly preserved, whereas the remaining species are moderately preserved.

Environment: mainly epifaunal; muddy-silty sand; marine; mesotrophic; suboxic; 50-100 m; outer part of inner shelf

HRD25 (665–670m) 8/1

Age: Badenian/Karpatian, based on absence of significant markers

Composition: This assemblage is composed of *Ammonia* spp., *Cycloforina gracilis*, keeled elphidiids and *Quinqueloculina seminulum*. These epifaunal to shallow infaunal taxa prefer oxic to slightly suboxic bottom water conditions and dwell in an inner shelf setting. The tests are poorly to moderately preserved and show signs of corrosion, abrasion and breakage.

Environment: epifaunal to shallow infaunal; muddy sand, vegetated; marine to hypersaline; oligotrophic; oxic to slightly suboxic; 0-50 m; lagoonal, inner shelf

HRD25 (685–690m) 9/1

Age: Badenian/Karpatian

Composition and e*nvironment*: no data

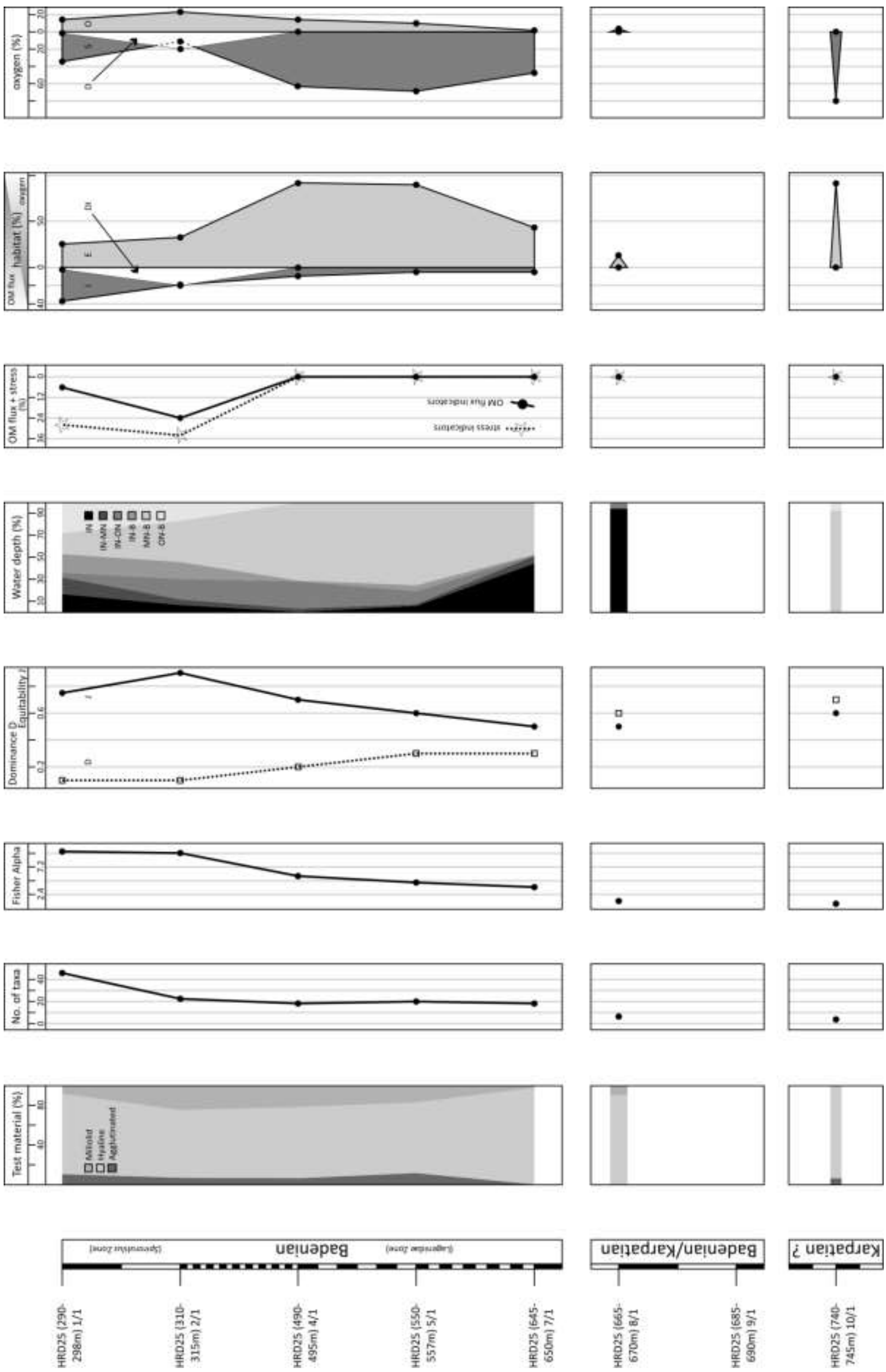
HRD25 (740–745m) 10/1

Age: Karpatian?, based on rare occurrence of *Cyclammina karpatica*

Composition: This sample is composed of the moderately preserved species *Lenticulina inornata* and *Cyclammina karpatica*. The genus *Lenticulina* is epifaunal adapted to suboxic conditions on the sea floor. Infaunal species, organic matter flux to the sea floor as well as environmental stress are not documented. The community displays a marine, suboxic and mesotrophic environment on the outer shelf to upper bathyal.

Environment: epifaunal; mud; marine; mesotrophic, suboxic; outer shelf to upper bathyal

Fig. 66: Palaeoecological trends in the benthic foraminiferal assemblages of the Hohenruppersdorf 25-well. Nomenclature for oxic, suboxic and dysoxic indicators follows Kaiho (1994). Trends in epifaunal, infaunal and deep infaunal taxa reflect the antagonistic relationship of organic matter flux and bottom water oxygenation. IN = inner neritic species, IN-MN = inner to middle neritic species, IN-ON = inner to outer neritic species, IN/MN/ON-B = inner/middle/outer neritic-bathyal species, I = infaunal, DI = deep infaunal, E = epifaunal, O = oxic indicators, S = suboxic indicators, D = dysoxic indicators, OM = organic matter.


oxygen (%)
OM flux
habitat (%)
oxygen
OM flux + stress (%)
OM flux indicators
stress indicators
Water depth (%)
IN
IN-MN
IN-ON
IN-B
MN-B
ON-B
Dominance D
Equitability J
Fisher Alpha
No. of taxa
Test material (%)
Miliolid
Hyaline
Agglutinated
Badenian
Badenian/Karpatian
Karpatian ?
HRD25 (290-298m) 1/1
HRD25 (310-315m) 2/1
HRD25 (490-495m) 4/1
HRD25 (550-557m) 5/1
HRD25 (645-650m) 7/1
HRD25 (665-670m) 8/1
HRD25 (685-690m) 9/1
HRD25 (740-745m) 10/1

4.3.7. Kettlasbrunn 1

4.3.7.1. Composition and diversity - results

986 benthic and planktonic well to moderately preserved tests of 20 different taxa have been identified in eight samples from the Kettlasbrunn 1-well. Eight samples were sterile. Due to their small number of individuals samples KA1 (450–455.5m) 7/4 and KA1 (600–604m) 10/4 were not taken into account in the following analyses. Benthic foraminifera make up the main proportion of collected specimens (99 % benthic vs. 1 % of planktonic species).

The hyaline taxa are dominating the foraminiferal assemblages (99 %), followed by porcellanous (1 %) taxa. Agglutinated species are missing. The number of taxa ranges between 2 and 7. Sample KA1 (795–800m) 14/2 shows the lowest value (fig. 67). Fisher Alpha Diversity shows values between 0.3 and 1.7 with the highest number in the lowermost sample KA1 (895–900m) 15/2. Equitability varies between 0.11 and 0.42 with the lowest number at sample KA1 (750–755m) 13/1. Dominance has its highest value 0.94 in sample KA1 (750–755m) 13/1. The other samples range between 0.62 and 0.89.

Species representing the inner neritic setting (*Ammonia* spp.) are clearly dominating all investigated samples with abundances between 89 and even 100 % (fig. 67). The few remaining percentages are contributed by species characteristic for inner to middle neritic and inner to outer neritic (*Quinqueloculina* spp., *Asterigerinata planorbis*, keeled elphidiids and *Porosononion granosum*) as well as inner/middle/outer neritic to bathyal settings (*Bolivina hebes*, *Bulimina elongata*, *Cibicidoides* spp., *Heterolepa dutemplei* and *Nonion commune*) with proportions up to 5 %.

Index taxa for environmental stress and an elevated flux of organic matter are missing in the samples (fig. 67).

The epifaunal and infaunal species are underrepresented in all samples since the epifaunal to shallow infaunal species *Ammonia* spp. makes up all assemblages, exclusively (fig. 67). Only the lowermost sample KA1 (895–900m) 15/2 shows infaunal species with 2 %, contributed by *Nonion commune*.

A very similar distribution is shown for the indicators of oxic and oxic/suboxic bottom water conditions (fig. 67). The latter make up all the assemblages. Suboxic species were barely found.

The species *Ammonia viennensis*, *A. pseudobeccarii* and *Porosononion granosum* make up the vast majority in all eight investigated samples of the Kettlasbrunn 1-well (fig. 68). The remaining 17 species are represented only by one or two individuals each.

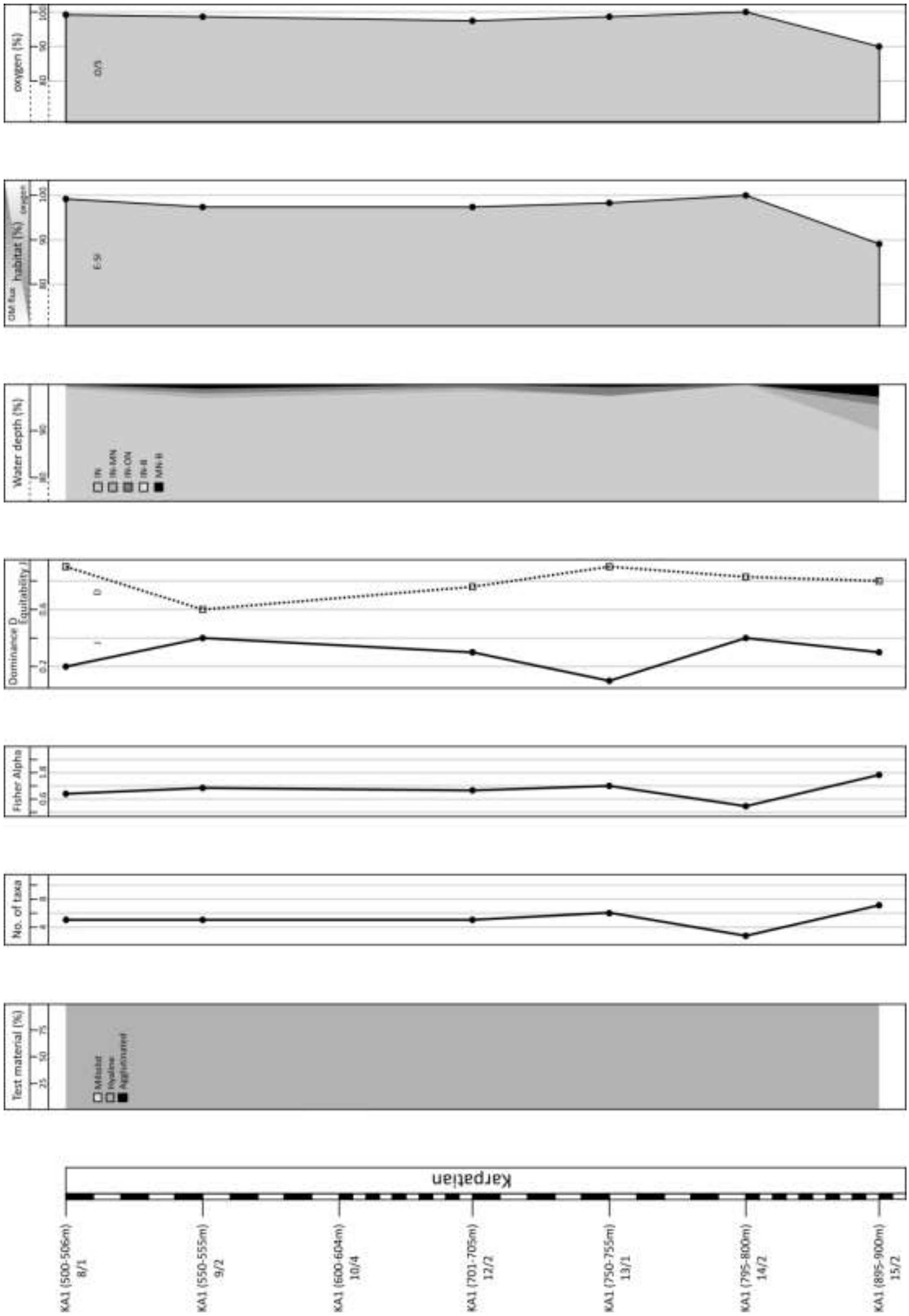


Fig. 67: Trends in the benthic foraminiferal assemblages of the Kettlasbrunn 1-well. Nomenclature for oxic and suboxic indicators follows Kaiho (1994). Trends in epifaunal and infaunal taxa reflect the antagonistic relationship of organic matter flux and bottom water oxygenation. IN = inner neritic species, IN-MN = inner to middle neritic species, IN-ON = inner to outer neritic species, IN/MN-B = inner/middle neritic-bathyal species, E-SI = epi- to shallow infaunal, O/S = oxic/suboxic indicators, OM = organic matter.

4.3.7.2. Biostratigraphy and palaeoecological interpretation

All samples are placed within the Karpatian stage due to the foraminiferal content, their relative stratigraphic position and/or more distinct molluscan content (Závod Mb./Laa Fm.: KA1 (450–455.5m) 7/4, KA1 (500–506m) 8/1, KA1 (550–555m) 9/2, KA1 (600–604m) 10/4 and KA1 (701–705m) 12/2; Lakšary Mb./Laa Fm.: KA1 (750–755m) 13/1, KA1 (795–800m) 14/2 and KA1 (895–900m) 15/2). Typical *Elphidium ortenburgense* and *Cibicidoides lopjanicus* were found.

KA1 (450–455.5m) 7/4

Age: Karpatian, based on mollusc assemblage

Composition and environment: no data

KA1 (500–506m) 8/1

Age: Karpatian, based on relative stratigraphic position and absence of markers

Composition: This foraminiferal assemblage consists almost entirely of *Ammonia* spp. and represents an intertidal to shallow subtidal, lagoonal setting. The specimens are moderately to well-preserved.

Environment: epifaunal to shallow infaunal; muddy sand, patches of vegetation; brackish to hypersaline; oligotrophic; oxic to suboxic; lagoonal, intertidal to shallow subtidal

KA1 (550–555m) 9/2

Age: Karpatian, based on relative stratigraphic position

Composition: Sample KA1 (550–555m) 9/2 shows the same foraminiferal composition as sample KA1 (500–506m) 8/1 with *Ammonia* spp. as the dominant taxa. Therefore, the environment remains constant. So is the preservation.

Environment: epifaunal to shallow infaunal; muddy sand, patches of vegetation; brackish to hypersaline; oligotrophic; oxic to suboxic; lagoonal, intertidal to shallow subtidal

KA1 (600–604m) 10/4

Age: Karpatian, based on occurrence of *Elphidium ortenburgense* and relative stratigraphic position

Composition and environment: no data

KA1 (701–705m) 12/2, KA1 (750–755m) 13/1, KA1 (795–800m) 14/2

Age: Karpatian, based on occurrence of *Elphidium ortenburgense* (samples 12/2 and 13/1) and relative stratigraphic position

Composition: These three samples are more or less identical with the samples KA1 (500–506m) 8/1 and KA1 (550–555m) 9/2. The genus *Ammonia* is still the dominating one, accompanied by the supplementary taxa *Cibicidoides*, keeled elphidiids, *Quinqueloculina*, *Porosononion* with changing contribution. The specimens of sample KA1 (701–705m) 12/2 are moderately to well-preserved, the ones of KA1 (750–755m) 13/1 poorly to moderately with strong abrasion and KA1 (795–800m) 14/2 shows a moderate to good preservation.

Environment: epifaunal to shallow infaunal; muddy sand, patches of vegetation; brackish to hypersaline; oligotrophic; oxic to suboxic; lagoonal, intertidal to shallow subtidal

KA1 (895–900m) 15/2

Age: Karpatian, based on occurrence of *Elphidium ortenburgense* and *Cibicidoides lopjanicus* and relative stratigraphic position

Composition: Compared to the previous samples, the low diverse foraminiferal assemblage (*Ammonia viennensis*, *Porosononion granosum*, *Nonion commune*, *Heterolepa dutemplei*, *Elphidium ortenburgense* and *Cibicidoides lopjanicus*) of sample KA1 (895–900m) 15/2 suggests a slightly deeper shallow subtidal, inner shelf setting. Preservation is poor to moderate.

Environment: epifaunal to shallow infaunal; muddy sand, hard substrate, vegetation; marine; oligotrophic; oxic to suboxic; 0-50 m; inner shelf, shallow subtidal

4.3.8. Kettlasbrunn 2

4.3.8.1. Composition and diversity - results

Moderately preserved tests of 18 different foraminiferal taxa and 319 specimens have been identified in five samples from the Kettlasbrunn 2-well. 14 samples were sterile. Samples KA2 (1020–1025m) 3/1 and KA2 (1140–

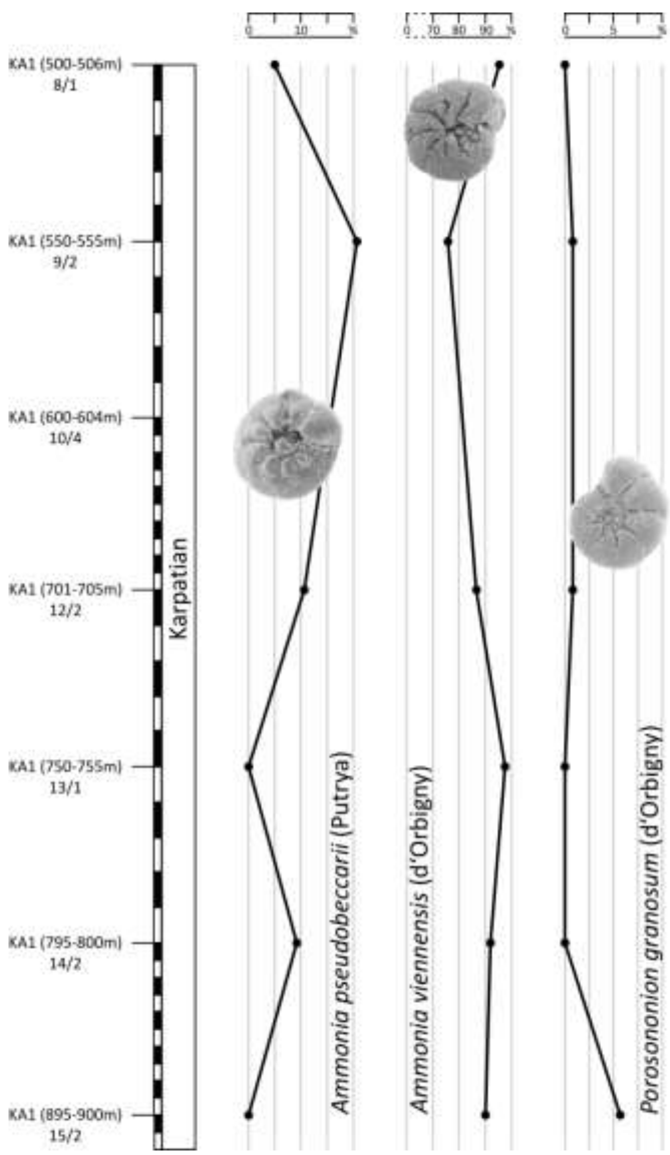


Fig. 68: Most abundant benthic foraminiferal taxa found in the examined samples of the Kettlasbrunn 1-well.

1145m) 5/2 were not taken into account in the following analyses due to their small number of found individuals. Planktonic foraminifera were not found.

The hyaline taxa are dominating the foraminiferal assemblages (83 %), followed by agglutinated (13 %) and miliolid taxa (4 %). The number of taxa ranges between 1 and 10. Sample KA2 (1380–1385m) 9/3 shows the lowest value (fig. 69). Fisher Alpha Diversity shows values between 0.2 and 2.7 with the highest number in the upper sample KA2 (1020–1025m) 3/4. Equitability varies between 0.77 and 0.00 with the lowest number at sample KA2 (1380–1385m) 9/3. Dominance has its highest value 1.00 in sample KA2 (1380–1385m) 9/3. The other samples range between 0.24 and 0.97.

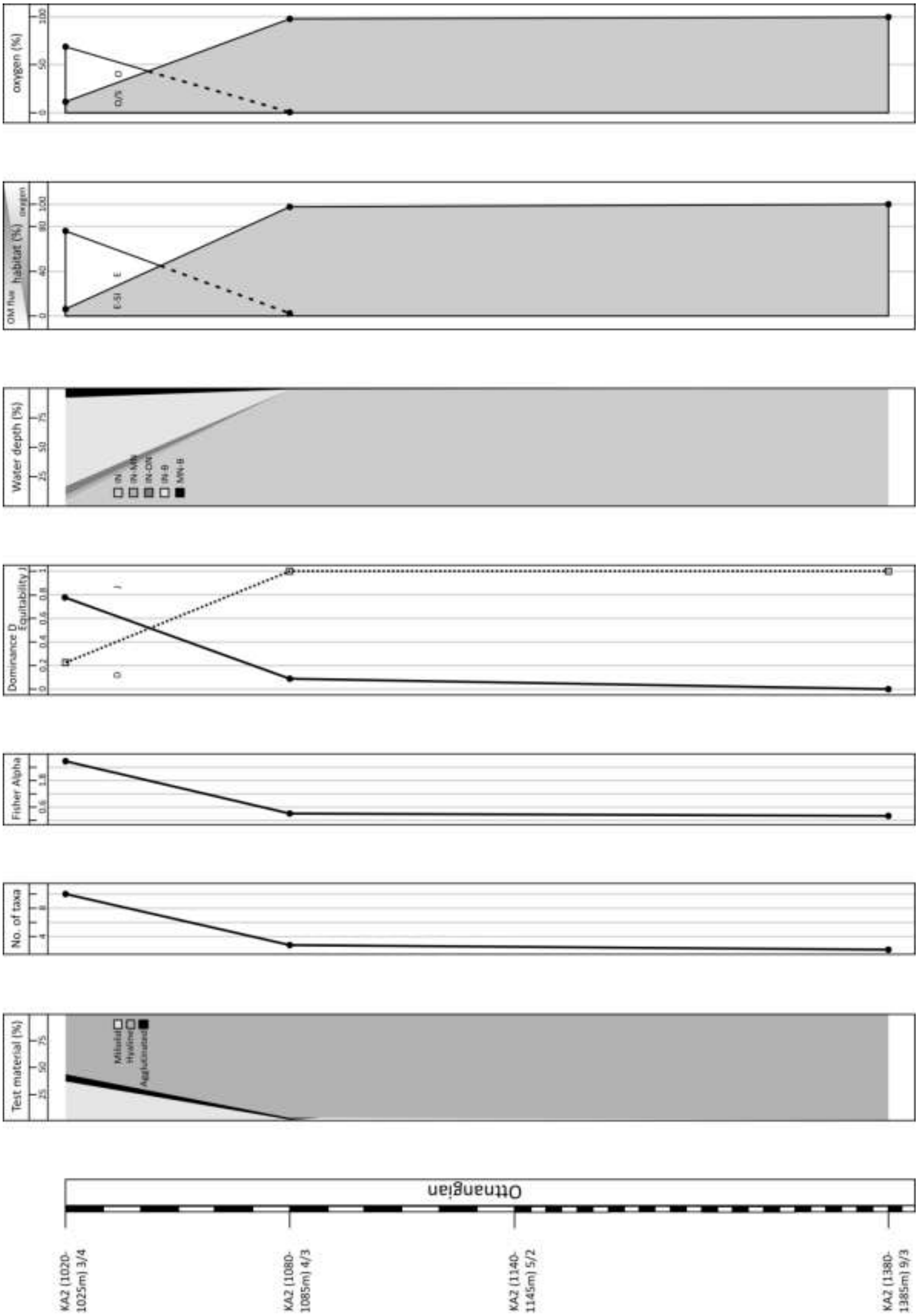
Species representing an inner neritic setting (*Ammonia* spp.) are clearly dominating the assemblages, except for sample KA2 (1020–1025m) 3/4. There specimens characteristic for an inner and middle neritic to bathyal setting (*Textularia* spp., *Semivulvulina pectinata*, *Bulimina elongata*, *Globulina gibba* and *Heterolepa dutemplei*) make up the main proportion. Other neritic indicators (*Porosononion granosum* and *Quinqueloculina* spp. etc.) are underrepresented and vary with numbers up to 7 % (fig. 69).

Index taxa for environmental stress and an elevated flux of organic matter are clearly underrepresented (fig. 69).

The epifaunal and epifaunal to shallow infaunal species as well as indicators for oxic and oxic/suboxic bottom water conditions show the same distribution like in the Kettlasbrunn 1-well (fig. 69). They are clearly dominating all the assemblages. Both indicators for suboxic bottom waters and taxa characteristic for an infaunal mode of life are very rare or missing.

The samples of the Kettlasbrunn 2-well contain 18 taxa, most of them only scarcely represented. Only *Ammonia viennensis*, *Heterolepa dutemplei* and *Textularia gramen* are frequently represented (fig. 70).

Fig. 69: Palaeoecological trends in the benthic foraminiferal assemblages of the Kettlasbrunn 2-well. Nomenclature for oxic, suboxic and dysoxic indicators follows Kaiho (1994). Trends in epifaunal, infaunal and deep infaunal taxa reflect the antagonistic relationship of organic matter flux and bottom water oxygenation. IN = inner neritic species, IN-MN = inner to middle neritic species, IN-ON = inner to outer neritic species, IN/MN-B = inner/middle neritic-bathyal species, E-SI = epifaunal to shallow infaunal, E = epifaunal, O = oxic indicators, O/S = oxic/suboxic indicators, OM = organic matter.


oxygen (%)
D/S
D
OM flux
habitat (%)
oxygen
E-SI
E
Water depth (%)
IN
IN-MN
IN-OW
IN-B
MN-B
Dominance D
Equitability J
D
J
Fisher Alpha
No. of taxa
Test material (%)
Miliolid
Hyaline
Agglutinated
Ottnangian
KA2 (1020-1025m) 3/4
KA2 (1080-1085m) 4/3
KA2 (1140-1145m) 5/2
KA2 (1380-1385m) 9/3

4.3.8.2. Biostratigraphy and palaeoecological interpretation

All samples are of Ottnangian age. KA2 (1020–1025m) 3/1, KA2 (1020–1025m) 3/4 and KA2 (1080–1085m) 4/3 contain low diverse, impoverished and small foraminiferal faunas pointing to typical uppermost Ottnangian assemblages in older literature referred to as “impoverished Schlier” or “Fish-Schlier” (herein uppermost Lužice Fm.).

The underlying samples KA2 (1140–1145m) 5/2 and KA2 (1380–1385m) 9/3 were placed in the upper Lužice Fm. due to their low diverse faunas and relative stratigraphic position.

KA2 (1020–1025m) 3/1

Age: Ottnangian, see KA2 (1020–1025m) 3/4

Composition and environment: no data

KA2 (1020–1025m) 3/4

Age: Ottnangian, based on impoverished and small fauna

Composition: A shelf environment is indicated by the foraminiferal assemblage of *Heterolepa dutemplei*, *Textularia gramen*, *Semivulvulina pectinata*, *Quinqueloculina buchiana*, *Globulina gibba*, *Ammonia viennensis* and *Porosononion granosum*. These epifaunal species are adapted to oxygenated bottom waters. The specimens are quite small and poorly to moderately preserved.

Environment: epifaunal; muddy sand, hard substrate; marine; mesotrophic; oxic; shelf

SEM pictures: Pl. 1: 1 *Textularia gramen*

KA2 (1080–1085m) 4/3

Age: Ottnangian, based on impoverished and small fauna

Composition: This assemblage is mainly composed of *Ammonia viennensis*. This epifaunal to shallow infaunal taxa prefers oxic to slightly suboxic bottom water conditions and dwells in an intertidal to shallow subtidal (lagoonal) setting. The specimens are quite small and poorly to moderately preserved.

Environment: epifaunal to shallow infaunal; muddy sand; marine to hypersaline; oligotrophic; oxic to slightly suboxic; lagoonal, intertidal to shallow subtidal

KA2 (1140–1145m) 5/2

Age: Ottnangian, based on relative stratigraphic position

Composition and environment: no data

KA2 (1380–1385m) 9/3

Age: Ottnangian, based on relative stratigraphic position and impoverished and small fauna

Composition: Only *Ammonia viennensis* was found in this sample pointing to a shallow inner shelf setting (lagoonal) with oxic to slightly suboxic bottom water conditions. The specimens are quite small and poorly to moderately preserved.

Environment: epifaunal to shallow infaunal; muddy sand; brackish to hypersaline; oligotrophic; oxic to slightly suboxic; lagoonal, intertidal to shallow subtidal

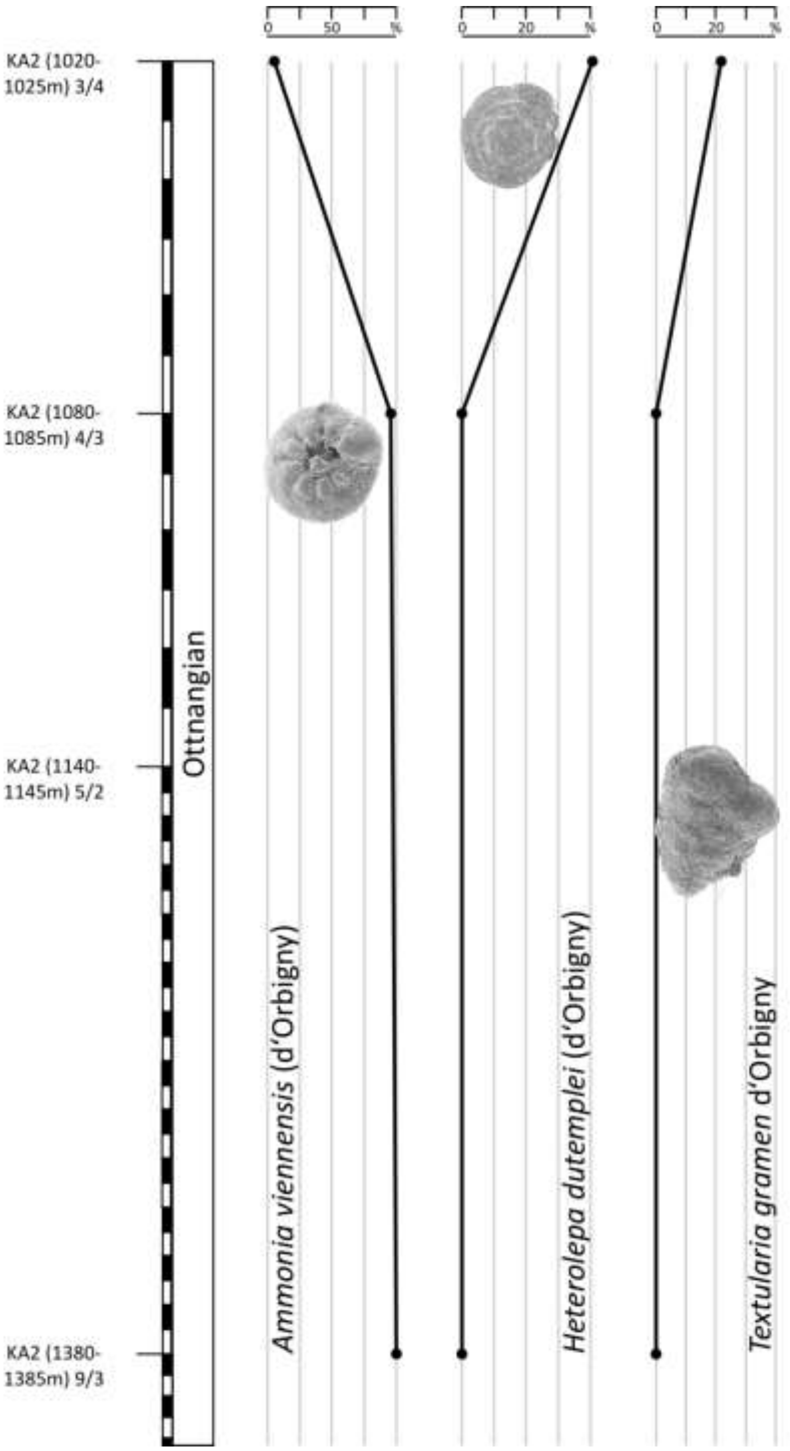


Fig. 70: Most abundant benthic foraminiferal taxa found in the examined samples of the Kettlasbrunn 2-well.

4.3.9. Maustrenk West1

4.3.9.1. Composition and diversity - results

Moderately preserved tests of 43 benthic and planktonic foraminiferal taxa and 327 individuals have been identified in five samples from the Maustrenk West1-well. 19 samples turned out to be microsterile or are containing reworked Palaeogene assemblages, which are not taken into account. Samples MTW1 (1100–1105m) 3/5 and MTW1 (1130–1138m) 4/2 were not considered in the following diversity and abundance analyses due to the very low number of specimens. Benthic foraminifera are the dominating group (99 % benthic vs. 1 % of planktonic species).

The hyaline taxa make up the main proportion of the entire foraminiferal content (86 %), followed by agglutinated (11 %) and porcellanous taxa (3 %). The number of taxa ranges between 15 in sample MTW1 (1480–1485m) 12/4 and 26 in sample MTW1 (1380–1385m) 9/1 (fig. 72). The same distribution is visible in Fisher Alpha Diversity with values between 5.1 and 10.1. Equitability varies between values 0.72 and 0.77. Sample MTW1 (1480–1485m) 12/4 shows the highest number. Conversely, dominance shows values ranging between 0.18 and 0.21.

The species representing an inner neritic setting (herein *Ammonia* spp.) display abundances between 9 and 25 % and vanish in the basal sample MTW1 (1480–1485m) 12/4. The taxa characteristic for inner to middle neritic and inner to outer neritic settings (keeled elphidiids, *Lobatula lobatula*) vary between 2 and 27 %. The inner neritic-bathyal setting is represented with values ranging between 7 and 53 %. The first two samples occur with the lowest numbers. Responsible species are mainly *Heterolepa dutemplei*, *Spirorutilus carinatus* and *Textularia* spp. Taxa representing the middle neritic-bathyal setting (mainly *Cibicidoides* spp., *Semivulvulina deperdita*, *Lenticulina* spp., *Nonion commune*) vary with values between 13 and 48 %. Sample MTW1 (1480–1485m) 12/4 presents the highest amount of outer neritic-bathyal setting indicators (herein *Cyclammina bradyi*, *Pullenia bulloides* and *Martinottiella communis*), with only 4 %, whereas the samples MTW1 (1130–1138m) 4/7 and MTW1 (1380–1385m) 9/1 show each 1 % abundance (fig. 72). Markers for a pure bathyal setting were not found.

Indicative taxa for elevated flux of organic matter as well as environmental stress do not occur significantly and are not taken into further account (fig. 72).

Epifaunal species dominate the assemblages (fig. 72). The infaunal taxa show very low abundances throughout the core and range between 3 and 7 %. Deep infaunal species are missing. The high values of epifaunal taxa result mainly from high abundances of *Cibicidoides* spp., keeled elphidiids, *Heterolepa dutemplei*, *Ammonia* spp. and several other taxa. The infaunal mode of life is represented by taxa like *Amphicoryna ottnangensis*, *Nonion commune*, *Grigelis pyrula* and *Pullenia bulloides*.

Suboxic bottom waters are represented in the sampled core by *Semivulvulina deperdita*, *Lenticulina* spp., *Amphicoryna ottnangensis*, *Nonion commune* and some other species with abundances between 3 up to 9 %. The lowest contribution can be found in the lowermost sample, the highest in MTW1 (1380–1385m) 9/1. The index taxa for oxic bottom waters show opposing values. These indicators range between 58 and 78 % abundance, mainly contributed by species *Cibicidoides* spp., keeled elphidiids, *Heterolepa dutemplei*, *Ammonia* spp., *Spirorutilus carinatus*, *Textularia* spp. and several others. Foraminiferal taxa preferring dysoxic bottom water conditions are missing (fig. 72).

The majority of the 43 species is represented only by a handful of individuals. Only five species (fig. 71) show higher abundances and partly make up about half the assemblages.

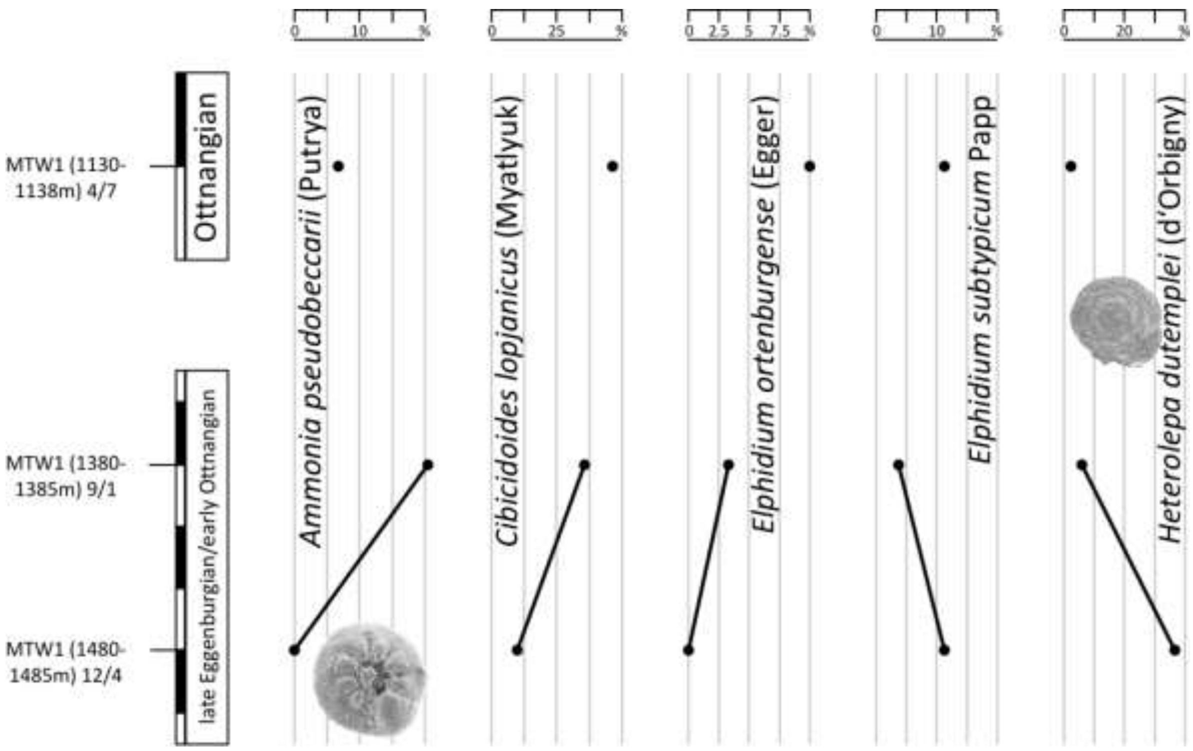


Fig. 71: Distribution of the most abundant species that make up the majority of the sample.

4.3.9.2. Biostratigraphy and palaeoecological interpretation

The upper three samples MTW1 (1100–1105m) 3/5, MTW1 (1130–1138m) 4/2 and MTW1 (1130–1138m) 4/7 are of Ottnangian age and derive from the Upper Lužice Fm. (*Cibicides*-*Elphidium* Schlier; Grill, 1943). Typical early Miocene species of the genera *Cibicidoides* and *Elphidium* occur in these samples (e.g.: *Cibicidoides lopjanicus*, *Elphidium ortenburgense* and *E. subtypicum*). The relative stratigraphic position as well as numerous fish remains found within the assemblages also hint at a position within the impoverished Upper Ottnangian. The underlying samples MTW1 (1380–1385m) 9/1 and MTW1 (1480–1485m) 12/4 belong to the lower Lužice Fm. (late Eggenburgian/early Ottnangian; *Bathysiphon-Cyclammina* Schlier transitioning into *Cibicides-Elphidium* Schlier). *Cyclammina bradyi* was found in the latter sample. Sample MTW1 (1510–1517m) 13/7 based on its molluscan content represents the upper Eggenburgian/lower Ottnangian Schlierbasis-Schutt (basal Schlier-debris). All following samples (MTW1 (1568–1573m) 15/3, MTW1 (1597.6–1602.6m) 16/1 and MTW1 (1645.5–1650.2m) 17/2) were not taken into consideration since they contain Flysch-type assemblages.

MTW1 (1100–1105m) 3/5, MTW1 (1130–1138m) 4/2

Age: Ottnangian, based on relative stratigraphic position, for MTW1 (1130–1138m) 4/2 see at MTW1 (1130–1138m) 4/7, fish remains hint also at impoverished Upper Ottnangian

Composition and environment: no data

MTW1 (1130–1138m) 4/7

Age: Ottnangian, based on co-occurrence of *Cibicidoides* spp. and *Elphidium* spp.

Composition: An inner shelf setting with water depths down to 100 m is indicated by the benthic foraminifera of this assemblage (*Cibicidoides* spp., keeled elphidiids, *Ammonia* spp., *Lenticulina* spp., *Heterolepa dutemplei*, *Textularia gramen*, *Pullenia bulloides*, *Sigmoilinita tenuis*, *Triloculina gibba* and *Asterigerinata planorbis*). Organic matter flux and environmental stress are not documented. Infaunal to deep infaunal species are rare. The high abundances of epifaunal taxa suggest oxic to slightly suboxic bottom-water conditions. The foraminifera are moderately preserved, miliolids show a poor preservation.

Environment: mainly epifaunal; muddy sand, hard substrate, vegetated; marine; mesotrophic; oxic to slightly suboxic; 0-100 m; inner shelf

MTW1 (1380–1385m) 9/1

Age: late Eggenburgian/early Ottnangian, based on co-occurrence of *Cibicidoides* spp. and *Elphidium* spp. and relative stratigraphic position

Composition: This sample is composed of the following poorly preserved species: *Cibicidoides* spp., *Ammonia* spp., keeled elphidiids, *Heterolepa dutemplei*, *Asterigerinata planorbis*, *Lenticulina inornata*, *Textularia gramen*, *Sigmoilinita tenuis*, *Nonion commune*, *Lobatula lobatula*. Most taxa are epifaunal adapted to oxic conditions on the sea floor. Infaunal species, such as *Nonion commune*, prefer suboxic conditions. Organic matter flux to the sea floor as well as environmental stress are not documented. The community displays a marine, inner shelf environment.

Environment: mainly epifaunal; muddy-silty sand, hard substrate, vegetated; marine; mesotrophic; oxic to slightly suboxic; inner shelf

MTW1 (1480–1485m) 12/4

Age: late Eggenburgian/early Ottnangian, based on co-occurrence of *Cibicidoides* spp. and *Elphidium* spp., *Cyclammina bradyi* and relative stratigraphic position

Composition: The taxa found in this sample are mainly epifaunal preferring oxic bottom water conditions (e.g.: *Heterolepa dutemplei*, *Spirorutilus carinatus*, keeled elphidiids, *Cibicidoides* spp., *Semivulvulina deperdita*, *Cyclammina bradyi*, *Asterigerinata planorbis*, *Fursenkoina acuta*, *Sphaeroidina bulloides*, *Textularia gramen*, *Amphicoryna ottnangensis*, *Martinottiella communis*). Infaunal species are rare and are adapted to suboxic conditions (*Fursenkoina acuta* and *Amphicoryna ottnangensis*). The assemblage suggests an outer shelf to upper bathyal

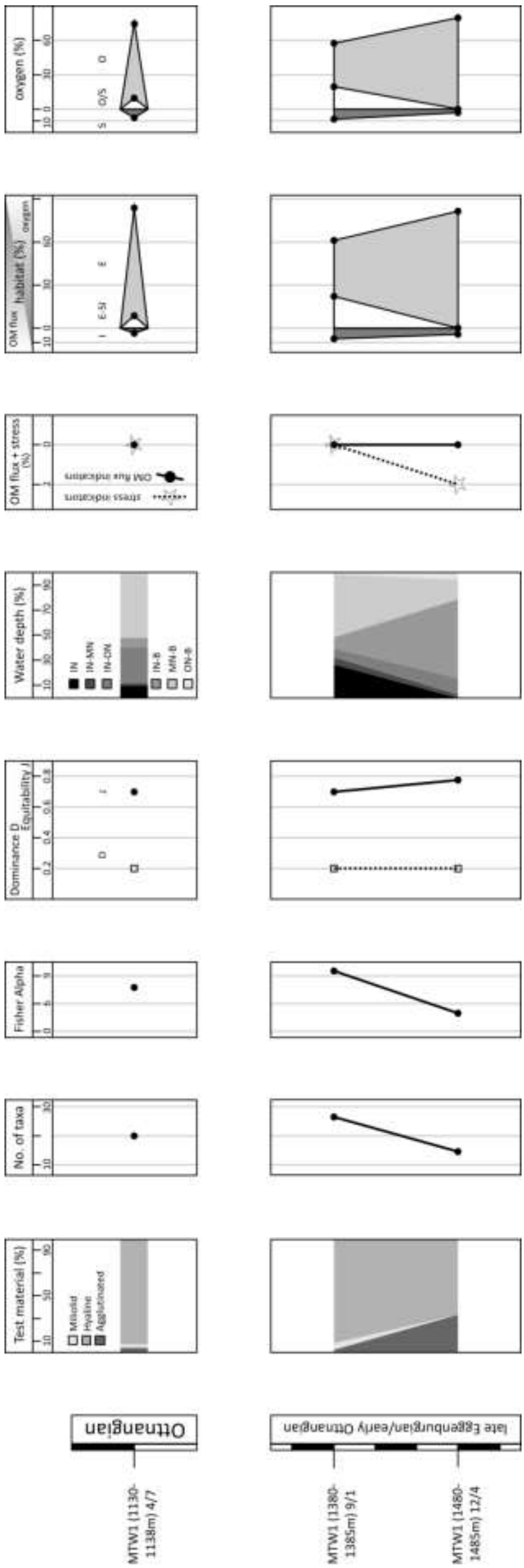


Fig. 72: Trends in the benthic foraminiferal assemblages of the Maustrenk West1-well. Nomenclature for oxic and suboxic indicators follows Kaiho (1994). Trends in epifaunal and infaunal taxa reflect the antagonistic relationship of organic matter flux and bottom water oxygenation. IN = inner neritic species, IN-MN = inner to middle neritic species, IN-ON = inner to outer neritic species, IN/MN/ON-B = inner/middle/outer neritic-bathyal species, I = infaunal, E = epifaunal, E-SI = epifaunal to shallow infaunal, O = oxic, S = suboxic, O/S = oxic/suboxic indicators, OM = organic matter.

setting. Due to strong abrasion, corrosion and fragmentation the tests are poorly preserved.

Environment: mainly epifaunal; muddy sand, hard substrate; marine; mesotrophic; oxic; outer shelf to upper bathyal

MTW1 (1510–1517m) 13/7

Age: late Eggenburgian/early Ottnangian, based on mollusc fauna

Composition and environment: no foraminiferal data

MTW1 (1568–1573m) 15/3, MTW1 (1597.6–1602.6m) 16/1, MTW1 (1645.5–1650.2m) 17/2

Age:

Composition and environment: Flysch-type assemblages, not taken into consideration

4.3.10. Mistelbach 1

4.3.10.1. Composition and diversity - results

111 moderately preserved tests of three benthic foraminiferal taxa have been found and identified in two samples. The other 14 of the 16 investigated samples of the Mistelbach 1-well were barren. Sample MI1 (1052-1057m) 3/2 was not considered.

Taxa with hyaline and miliolid tests are not represented. So the agglutinated group makes up the assemblage. Fisher Alpha Diversity is 0.6, equitability J is 0.24 and dominance D is expressed with 0.88 (fig. 73).

Bathysiphon filiformis is the most important and prominent species in sample MI1 (1373.5–1377m) 7/4 (fig. 73). It indicates an upper bathyal setting. This species has an epifaunal mode of life and can be indicative for an elevated flux of organic matter (fig. 73).

4.3.10.2. Biostratigraphy and palaeoecological interpretation

The upper sample MI1 (800–805m) 1/2 is placed into the Lakšary Member of the Karpatian Laa Fm. due to its molluscan content. Sample MI1 (1373.5–1377m) 7/4 is late Eggenburgian/early Ottnangian in age, based on the occurrence of *Bathysiphon filiformis* and the regional context.

MI1 (800–805m) 1/2

<u>Age</u>: Karpatian, based on mollusc assemblage

<u>Composition and environment</u>: no foraminiferal data

MI1 (1373.5–1377m) 7/4

<u>Age</u>: late Eggenburgian/early Ottnangian, based on occurrence of *Bathysiphon filiformis*

<u>Composition</u>: Moderately preserved and epifaunal *Bathysiphon filiformis* suggests an upper bathyal, marine setting.

<u>Environment</u>: sediment; marine; upper bathyal

<u>SEM pictures:</u> Pl. 1: 5 *Bathysiphon filiformis*

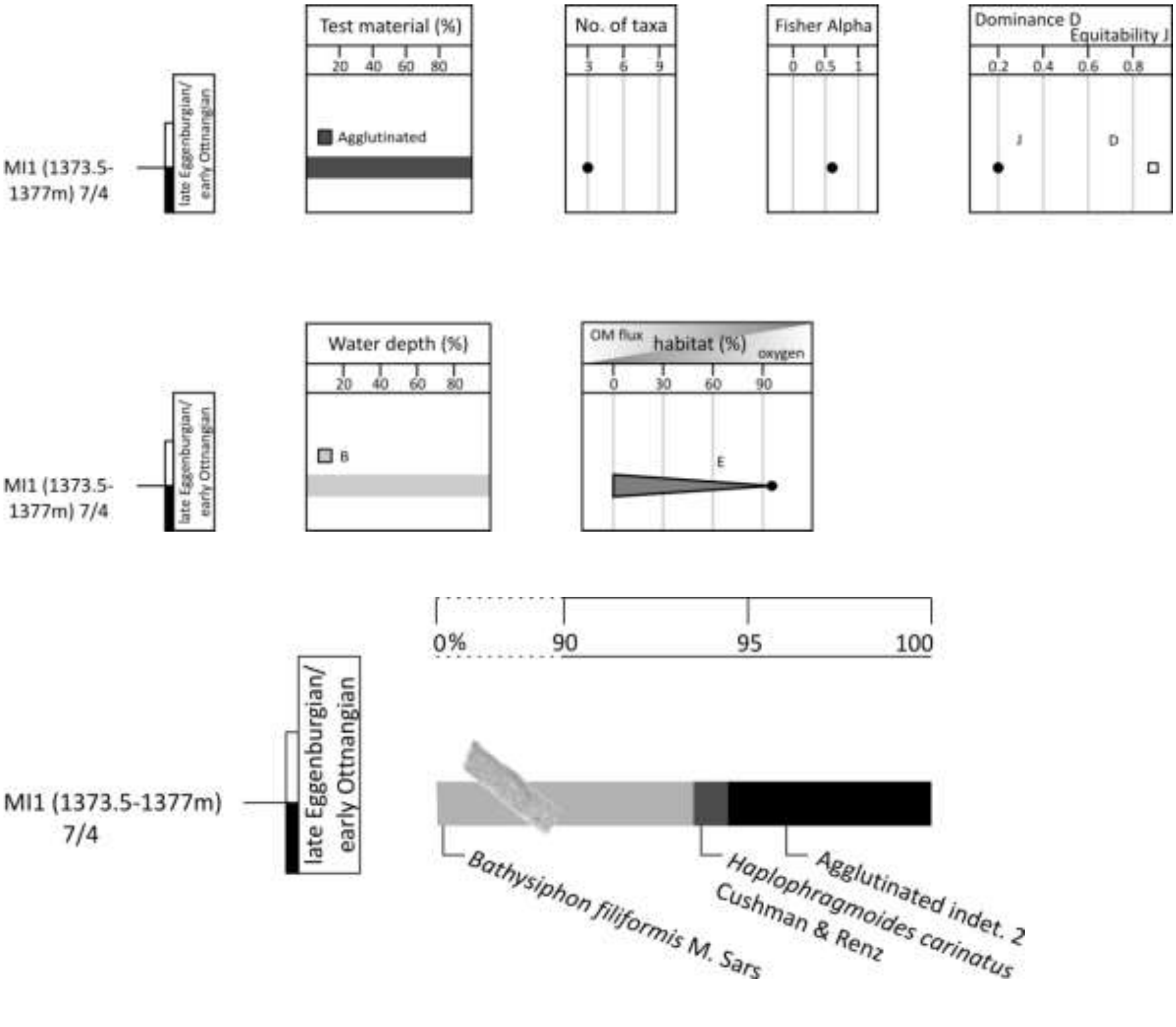


Fig. 73: Values of diversity indices (Fisher Alpha, Equitability E and Dominance D), distribution of palaeoecological preferences and contribution of the most abundant taxa that make up the majority of the sample MI1 (1373.5-1377m) 7/4.
B = bathyal species, E = epifaunal, OM = organic matter

4.3.11. Mistelbach U1

4.3.11.1. Composition and diversity - results

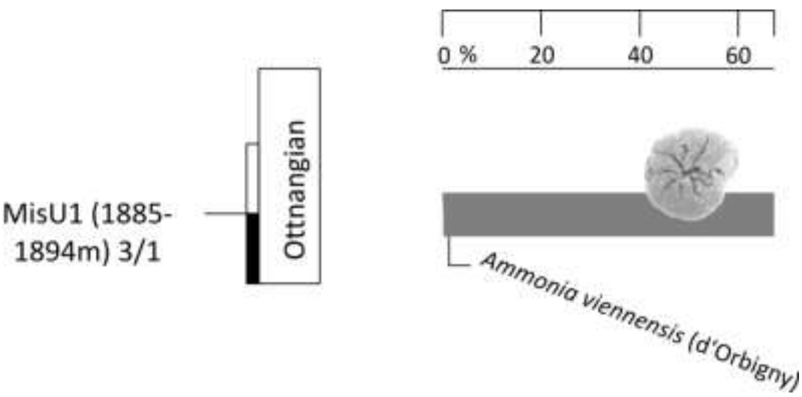
Moderately preserved tests of only eleven benthic foraminiferal taxa and only 79 individuals were found and identified in three samples of the Mistelbach U1-well. The remaining eight investigated samples were microsterile. Due to the very low number of specimens the samples MisU1 (1298–1302m) 1/2 and MisU1 (1885–1894m) 3/4 were not taken into account in the following diversity and abundance analyses.

Taxa with hyaline tests show abundance of 96 %. The agglutinated group appears with 4 %. Miliolid species as well as planktonic foraminifera are missing. Fisher Alpha Diversity is 1.3, equitability J is 0.62 and dominance D is expressed with a value of 0.47 (fig. 75).

Taxa characteristic for an inner neritic setting are represented by *Ammonia viennensis* with 65 %.

Indicative taxa for elevated flux of organic matter and environmental stress were not found.

Ammonia viennensis is characteristic for an epifaunal to shallow infaunal mode of life and tend to life in an oxic/suboxic environment (fig. 75).



Only *Ammonia viennensis* was found to be more abundant in sample MisU1 (1885–1894m) 3/1 (fig. 74) making up about two-thirds of the assemblage.

Fig. 74: Ammonia viennensis *is the most abundant species in this sample from MisU1.*

4.3.11.2. Biostratigraphy and palaeoecological interpretation

The four investigated samples of the Mistelbach U1-well with foraminiferal content (MisU1 (1298–1302m) 1/2, MisU1 (1624–1633m) 2/1, MisU1 (1885–1894m) 3/1 and MisU1 (1885–1894m) 3/4) are placed within the Ottnangian Upper Lužice Fm. either due to their relative stratigraphic position or because of their more distinct mollusc content.

MisU1 (1298–1302m) 1/2, MisU1 (1624–1633m) 2/1

<u>*Age*</u>: Ottnangian, based on mollusc assemblage and relative stratigraphic position

<u>*Composition and environment*</u>: no foraminiferal data

MisU1 (1885–1894m) 3/1, MisU1 (1885–1894m) 3/4

Age: Ottnangian, based on impoverished fauna and also on relative stratigraphic position and mollusc assemblage

Composition: An inner shelf setting is indicated by the benthic foraminifera of this assemblage (*Ammonia* spp., elphidiids, *Porosononion granosum*). Organic matter flux, environmental stress and infaunal species are not documented. Both samples contain poorly preserved specimens.

Environment: epifaunal to shallow infaunal; muddy sand; mesotrophic; oxic to slightly suboxic, shelf

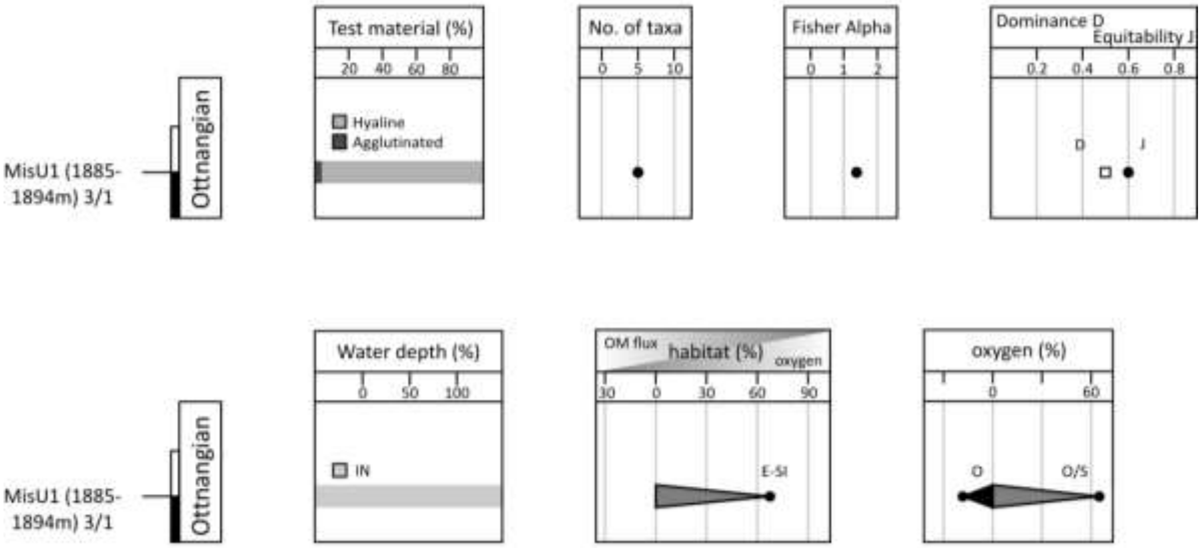


Fig. 75: Contribution of the different foraminiferal test types, different diversity indices (Fisher Alpha, Dominance and Equitability) and distribution of palaeoecological preferences within the assemblage. Nomenclature for oxic, suboxic and dysoxic indicators follows Kaiho (1994). Trends in epifaunal and infaunal taxa reflect the antagonistic relationship of organic matter flux and bottom water oxygenation. IN = inner neritic species, E-SI = epifaunal to shallow infaunal, O = oxic, O/S = oxic/suboxic indicators.

4.3.12. Pirawarth U3

4.3.12.1. Composition and diversity - results

391 moderately preserved tests of twelve benthic foraminiferal taxa have been found and identified in two samples. The other three of the five investigated samples of the Pirawarth U3-well were barren. Due to the low number of specimens the sample PWU3 (1123–1128m) 1/1 was not taken into account in the following diversity and abundance analyses. Planktonic species occur only with one individual.

Taxa with agglutinated and miliolid tests are underrepresented (1 % and 21 %). The hyaline group makes up 78 %. Fisher Alpha Diversity is 2.3, equitability J is 0.5 and dominance D is expressed with 0.43 (fig. 76).

Species representing an inner neritic setting (*Ammonia* spp.) show an abundance of 63 %. The middle neritic-bathyal setting is represented with a low value of 4 % by *Cibicidoides pachyderma*, *Lenticulina inornata* and *Nonion commune*.

Taxa indicative for elevated flux of organic matter and environmental stress are absent (fig. 76).

Species with an epifaunal to shallow infaunal mode of life dominate the assemblage (fig. 76). Responsible taxa are different miliolids and *Ammonia* spp. Epifaunal taxa like *Cibicidoides pachyderma* and *Lenticulina inornata* are represented with 36 %. Infaunal indicators do not occur.

Suboxic bottom waters are represented in the sampled core by *Lenticulina* spp. and *Nonion commune* with 2 % (fig. 76). So are oxic conditions. In contrast, index taxa for oxic/suboxic bottom waters predominate. These indicators occur with 63 % abundance, mainly contributed by different miliolids and *Ammonia* spp.

The samples PWU3 (1123–1128m) 1/1 and PWU3 (1123–1128m) 1/3 of the Pirawarth U3-well contain about eleven taxa, of which the majority is represented only by one or two individuals. The latter sample contains five more abundant species (see fig. 76) like *Ammonia viennensis* or *Adelosina longirostra*.

4.3.12.2. Biostratigraphy and palaeoecological interpretation

The following investigated samples PWU3 (1123–1128m) 1/1 and PWU3 (1123–1128m) 1/3 are identified as early Badenian in age ranging in the Lagenidae ecozone (Lanžhot Fm.) due to occurrences of the species *Adelosina longirostra* and *Adelosina schreibersi*.

PWU3 (1123–1128m) 1/1

Age: Badenian (Lagenidae Zone), based on position of sample PWU3 (1123–1128m) 1/3

Composition: Only *Ammonia viennensis* and *Reticulophragmium* sp. were found in this sample pointing to shallow inner shelf conditions. The tests are poorly preserved.

Environment: muddy sand; brackish to hypersaline; oxic to slightly suboxic; 0-50 m; lagoonal, inner shelf

PWU3 (1123–1128m) 1/3

Age: Badenian (Lagenidae Zone), based on occurrence of *Adelosina longirostra* and *Adelosina schreibersi*

<u>Composition</u>: This assemblage is largely composed of *Ammonia* spp., *Cycloforina gracilis*, *Adelosina* spp., *Cibicidoides pachyderma* and *Lenticulina inornata*. These epifaunal to shallow infaunal taxa prefer oxic to slightly suboxic bottom water conditions. In comparison to sample PWU3 (1123–1128m) 1/1, this assemblage suggests a more marine inner shelf setting and the foraminifera are moderately preserved.

<u>Environment</u>: epifaunal to shallow infaunal; muddy sand, hard substrate; more marine; oligotrophic; oxic to slightly suboxic; 0-50 m; inner shelf

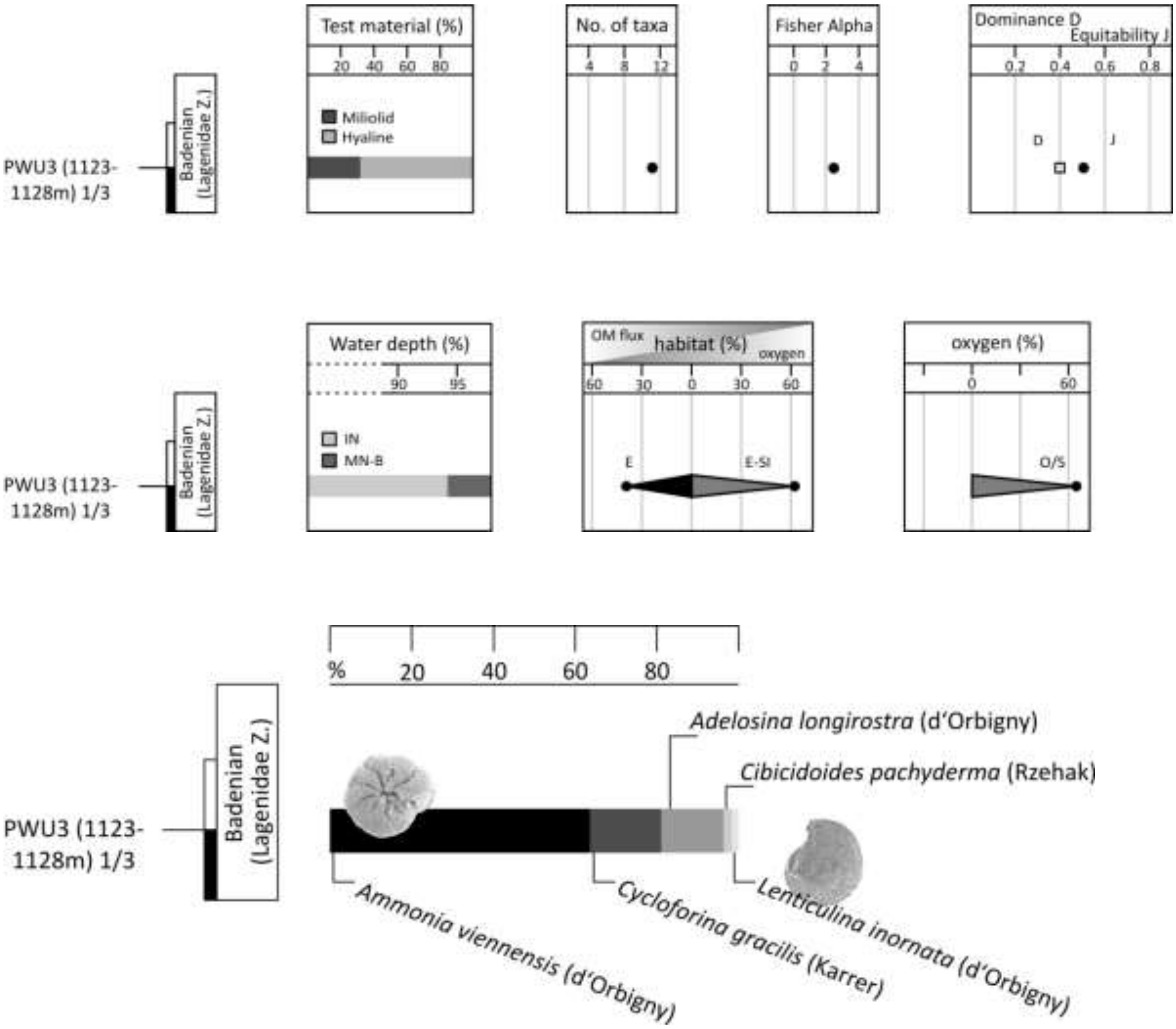


Fig. 76: Values of diversity indices (Fisher Alpha, Equitability E and Dominance D), distribution of palaeoecological preferences and contribution of the most abundant taxa that make up the majority of the sample PWU3 (1123-1128m) 1/3.

IN = inner neritic species, MN-B = middle neritic-bathyal species, E = epifaunal, E-SI = epifaunal to shallow infaunal species, O/S = oxic/suboxic indicators, OM = organic matter

4.3.13. Pirawarth U5

4.3.13.1. Composition and diversity results

Sample PWU5 (795–800m) 1/3 contained only five specimens and is not interpreted. The other investigated sample was sterile.

4.3.14. Poysdorf 1

4.3.14.1. Composition and diversity - results

Moderately to well-preserved tests of 126 benthic and planktonic foraminiferal taxa and 4087 counted individuals have been found and identified in ten of the 23 investigated samples. The remaining 13 samples from the Poysdorf 1-well were barren. Samples PO1 (280–285m) 9/1 and PO1 (430–435 m) 14/3 were not taken into account in the following measurements because of the very low number of individuals. The uppermost five samples (PO1 (40–45m) 1/1, PO1 (99.5–105m) 3/1, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2 and PO1 (250–255m) 8/1) are composed of Sarmatian as well as reworked Badenian material. Therefore the following calculations and interpretations of these five samples refer only to the Sarmatian content. Benthic foraminifera are clearly dominating (91 % benthic vs. 9 % of planktonic species).

Taxa with hyaline tests are the most frequent group with 84 %. The miliolid and agglutinated taxa contribute with 13 and 3 %, respectively. The number of taxa shows values between 9 and 71. Fisher Alpha Diversity ranges between 2.1 and 16.4 with the highest number in the lowermost sample PO1 (520–525m) 17/2. Equitability shows numbers between 0.26 and 0.81. Dominance is expressed with values between 0.05 and 0.75, which is the highest value (fig. 77).

The taxa characteristic for an inner neritic setting like *Ammonia* spp., unkeeled elphidiids, *Spirolina austriaca* and *Borelis* spp. are spread over the entire core with numbers between 15 and 91 % (fig. 77). Indicators for an inner to middle neritic setting like *Porosononion granosum*, *Asterigerinata planorbis* and *Lobatula lobatula* are represented with up to 63 %. The inner to outer neritic setting is shown with abundances between 3 and 25 % by keeled elphidiids, *Quinqueloculina* spp. and others. The inner and middle neritic-bathyal settings represented by higher abundances of several foraminiferal species such as *Nonion commune*, *Bulimina* spp., *Heterolepa dutemplei*, *Melonis pompilioides* and *Cibicidoides* spp. occur in all investigated samples with percentages up to 39 %.

The indicative taxa for elevated flux of organic matter, such as *Bulimina elongata*, *Melonis pompilioides*, *Cassidulina laevigata* and *Uvigerina* spp. peak in sample PO1 (250–255m) 8/1 with 8 %. In the remaining samples these flux-indicators are less frequent with abundances up to 3 %. The abundances of stress marker species like *Bulimina* spp., *Bolivina* spp., *Valvulineria complanata* and *Uvigerina* spp. show a similar distribution like the flux indicators. The values range between 1 and even 39 % (fig. 77).

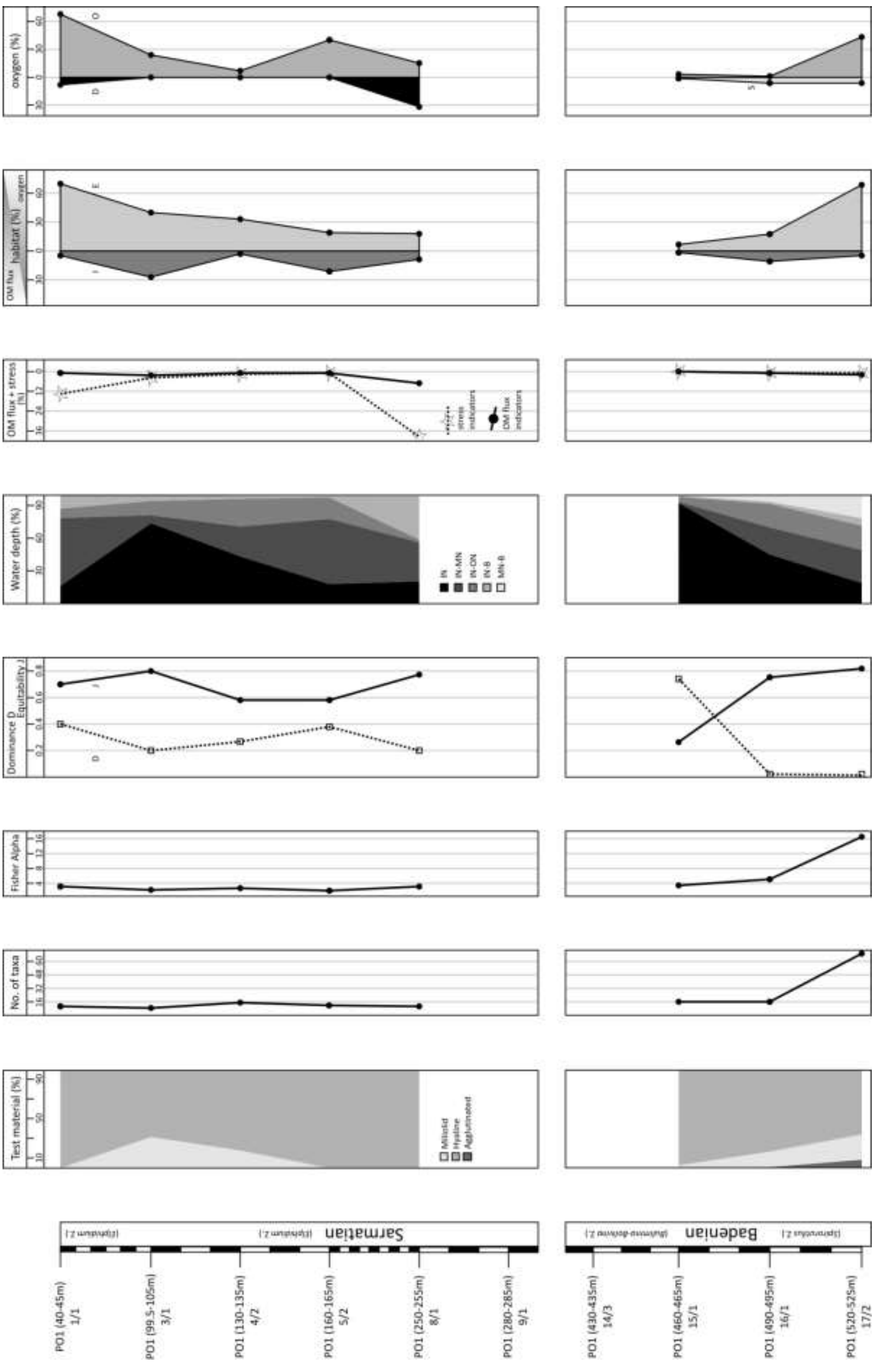
Index taxa for an epifaunal mode of life (herein different miliolids, keeled elphidiids, *Asterigerinata planorbis* and *Lobatula lobatula*) occur in all samples with high abundances, ranging between 6 and 71 % (fig. 77). Conversely, the infaunal species range with generally lower values (2 to 27 %). Infaunal species are herein mainly represented by unkeeled elphidiids, *Nonion commune*, *Melonis pompilioide*s and *Bulimina* spp. Deep infaunal species occur with 8 and 32 % in samples PO1 (40–45m) 1/1 and PO1 (250–255m) 8/1, respectively.

Higher values up to 71 % are visible for the different species representing oxic bottom waters. The indicators are mainly different elphidiids, different miliolids and several others (fig. 77). The abundances of index taxa for suboxic bottom waters are relatively low in all samples, ranging between 1 and 5 % (fig. 77). Contributors for these conditions are *Nonion commune*, *Lenticulina* spp., *Fursenkoina acuta*, *Valvulineria complanata* and *Bulimina elongata*. Foraminiferal taxa preferring dysoxic conditions (herein *Bolivina* spp. and *Praeglobobulimina pyrula*) are clearly underrepresented and occur only in higher abundance in the samples PO1 (40–45m) 1/1 and PO1 (250–255m) 8/1 with 8 and 32 %.

Samples PO1 (40–45m) 1/1, PO1 (130–135m) 4/2, PO1 (160–165 m) 5/2 and PO1 (250–255m) 8/1 of the Poysdorf 1-well contain a certain amount of planktonic foraminifera. Since these globigerinids belong to the reworked Badenian content of the assemblages their palaeoclimatic information cannot be taken into account.

126 taxa were found in the assemblages of the Poysdorf 1-well. Despite the seven most abundant species with more than 160 individuals, e.g. *Ammonia viennensis*, *Porosononion granosum* or the planktonic species *Globorotalia transsylvanica* (see fig. 78), the remaining ones are only scarcely represented.

Fig. 77: Palaeoecological trends in the benthic foraminiferal assemblages of the Poysdorf 1-core. Nomenclature for oxic, suboxic and dysoxic indicators follows Kaiho (1994). Trends in epifaunal and infaunal taxa reflect the antagonistic relationship of organic matter flux and bottom water oxygenation. IN = inner neritic species, IN-MN = inner to middle neritic species, IN-ON = inner to outer neritic species, IN/MN-B = inner/middle neritic-bathyal species, I = infaunal, E = epifaunal, O = oxic indicators, S = suboxic indicators, D = dysoxic indicators, OM = organic matter.


oxygen (%)
habitat (%)
OM flux
OM flux + stress (%)
stress indicators
OM flux indicators
Water depth (%)
IN
IN-MN
IN-ON
IN-B
MN-B
Dominance D
Equitability J
Fisher Alpha
No. of taxa
Test material (%)
Miliolid
Hyaline
Agglutinated
Sarmatian
Badenian
PO1 (40-45m) 1/1
PO1 (99.5-105m) 3/1
PO1 (130-135m) 4/2
PO1 (160-165m) 5/2
PO1 (250-255m) 8/1
PO1 (280-285m) 9/1
PO1 (430-435m) 14/3
PO1 (460-465m) 15/1
PO1 (490-495m) 16/1
PO1 (520-525m) 17/2

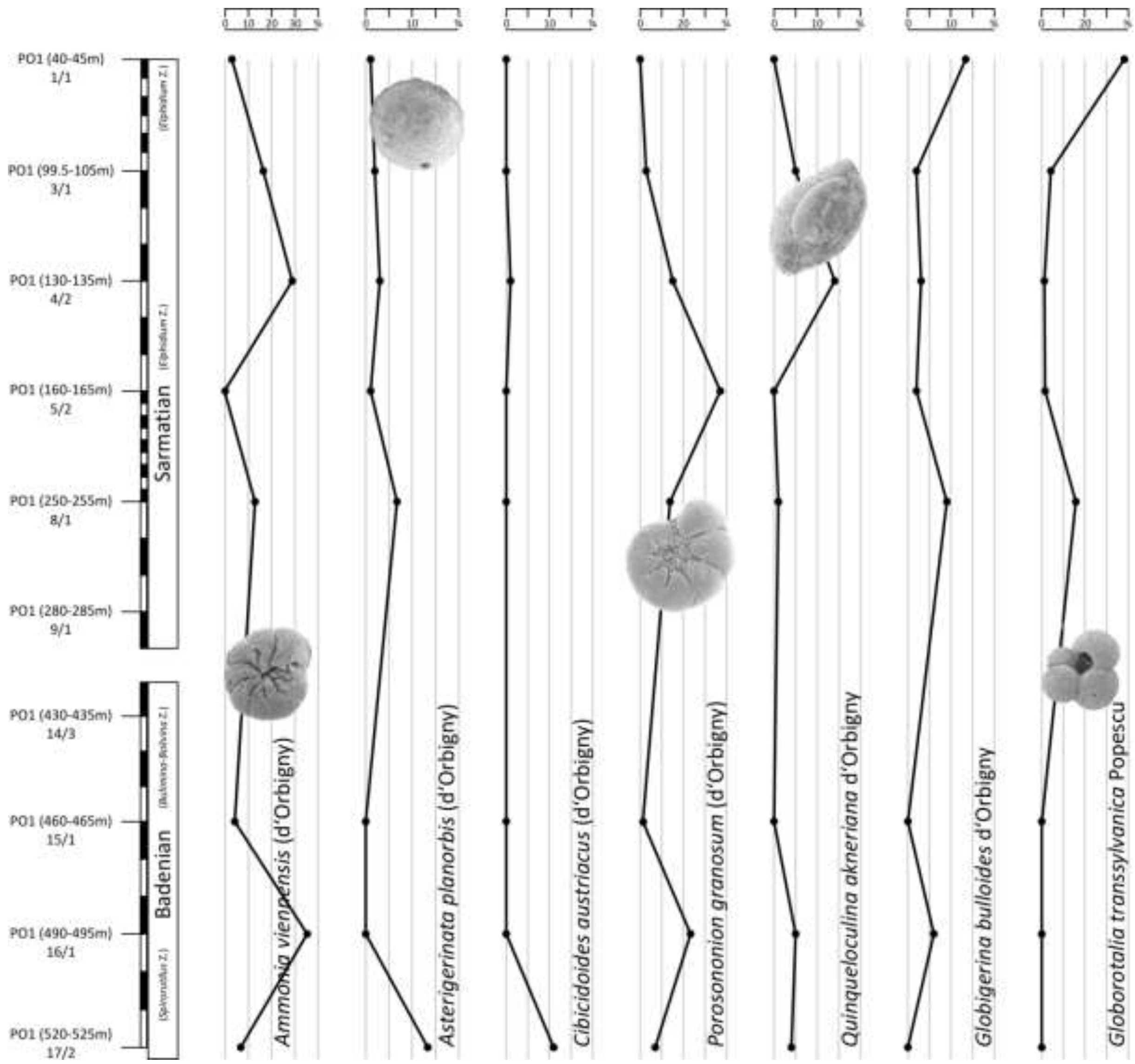


Fig. 78: Distribution of the most abundant species that make up the majority of the samples.

4.3.14.2. Biostratigraphy and palaeoecological interpretation

The uppermost seven samples (PO1 (40–45m) 1/1 to PO1 (280–285m) 9/1) are of Sarmatian age and belong to the *Elphidium* Zone. Even though the samples contain reworked Badenian material, typical Sarmatian species like *Elphidium* spp. (esp. *E*. *aculeatum*, *E. grilli* and *E*. *hauerinum*), *Ammonia* spp., *Lobatula lobatula* and *Porosononion granosum* were found.

Based on the impoverished assemblage composition with mainly *Ammonia pseudobeccarii*, the molluscan assemblage and the relative stratigraphic position samples PO1 (430–435m) 14/3 and PO1 (460–465m) 15/1 are identified as late Badenian in age (*Bulimina-Bolivina* Zone, Studienka Fm.). The underlying highly diverse samples PO1 (490–495m) 16/1 and PO1 (520–525m) 17/2 are placed in the middle Badenian *Spirorutilus* ecozone (Jakubov Fm.), based on the co-occurrence of *Cibicidoides* *austriacus*, *Cornuspira plicata*, *Sigmoilopsis foeda*, *Adelosina longirostra*, *Pyrgoella ventruosa*, *Paravulvulina serrata*, *Cycloforina lucida*, *C. badenensis*, *Quinqueloculina haidingeri*, *Spirolina austriaca*, *Borelis melo* and their general composition (similar to coeval assemblages described by Rupp, 1986).

PO1 (40–45m) 1/1

Age: Sarmatian (*Elphidium* Zone), based on co-occurrence of *Elphidium* spp., (esp. *E. aculeatum*), *Ammonia* spp., *Lobatula lobatula* and relative stratigraphic position

Composition: The autochthonous foraminiferal content with *Ammonia* spp., *Asterigerinata planorbis*, *Bolivina* spp., *Bulimina* spp., *Elphidium aculeatum*, *E. crispum*, *E. fichtelianum* and *Lobatula lobatula* hints at an inner shelf environment with slightly increased flux and stress conditions. These epifaunal and infaunal species prefer oxic and suboxic bottom water conditions, respectively. Additionally, reworked Badenian material indicated by planktonic taxa like *Globorotalia* group, *Orbulina suturalis*, *Globigerinoides quadrilobatus* and benthic foraminifera like *Melonis pompilioide*s, *Valvulineria complanata*, *Praeglobobulimina pyrula*, *Lenticulina austriaca* is observed. All specimens are well-preserved.

Environment: epifaunal and infaunal; muddy-silty sand, hard substrate; marine; mesotrophic; oxic; 0-50 m; inner shelf

PO1 (99.5–105m) 3/1

Age: Sarmatian (*Elphidium* Zone), based on co-occurrence of *Elphidium* spp. and *Ammonia* spp. and relative stratigraphic position

Composition: A shallow marine, vegetated nearshore setting with slightly increased values for organic matter flux to the sea floor and environmental stress is indicated in this sample. The Sarmatian fauna (*Pseudotriloculina consobrina*, *Quinqueloculina akneriana*, *Elphidium antoninum*, *Ammonia* spp. and *Porosononion granosum*, *Bulimina* spp. and *Asterigerinata planorbis*) is largely composed of epifaunal and oxic to slightly suboxic taxa. Reworked Badenian material comprises *Globorotalia* spp., *Globigerinoides quadrilobatus*, *Globigerina bulloides*, *Lenticulina orbicularis* and *Laevidentalina elegans*. The autochthonous as well as the reworked content is moderately preserved, but the latter shows stronger signs of abrasion and pyritisation and is partly coated black.

Environment: mainly epifaunal; muddy sand, vegetated; marine to hypersaline; meso- to oligotrophic; oxic to suboxic; nearshore, intertidal

PO1 (130–135m) 4/2

Age: Sarmatian (*Elphidium* Zone), based on co-occurrence of *Elphidium* spp. and *Ammonia* spp., *Porosononion granosum* and relative stratigraphic position

Composition: Sample PO1 (130–135m) 4/2 comprises Sarmatian as well as reworked Badenian foraminifera (e.g. *Semivulvulina deperdita*, *Adelosina longirostra*, *Quinqueloculina haidingeri*, *Ammonia tepida*, *Bulimina elongata longa*, *Cibicidoides austriacus*, *Laevidentalina spp*. and *Orthomorphina columella*).

The Sarmatian fauna is composed of several miliolids, *Asterigerinata planorbis*, *Ammonia viennensis*, *Bulimina* spp., *Caucasina subulata*, *Elphidium fichtelianum*, *E. crispum*, *Lobatula lobatula*, *Nonion commune*, *Porosononion granosum* and others. These mainly epifaunal species point to oxic to slightly suboxic conditions. *Nonion*, *Bulimina* and *Caucasina* as infaunal indicators prefer suboxic conditions. All tests are moderately preserved.

Environment: mainly epifaunal; muddy-silty sand, vegetated, hard substrate; marine to hypersaline; mesotrophic to oligotrophic; oxic to suboxic; 0-50 m; lagoonal, inner shelf

SEM picture: Pl. 2: 9 *Globigerina bulloides*

PO1 (160–165m) 5/2

Age: Sarmatian (*Elphidium* Zone), based on occurrence of several elphidiids, especially Sarmatian species *Elphidium grilli* and *E. hauerinum*

Composition: A great number of keeled and unkeeled elphidiids (*E. fichtelianum*, *E. grilli*, *E. hauerinum*, *E. obtusum*, *E. reussi*, *E.* sp. (see Cicha et al., 1998.)) as well as species like *Ammonia* spp., *Asterigerinata planorbis*, *Bulimina elongata*, *Nonion commune* and *Porosononion granosum* make up the Sarmatian fauna. Reworked Badenian deposits are indicated by Badenian species, such as *Cibicidoides austriacus*, different elphidiids, *Lenticulina austriaca*, *Laevidentalina boueana*, *Globigerinoides quadrilobatus*, *Orbulina suturalis* and *Globorotalia transsylvanica*. The Sarmatian assemblage indicates a vegetated inner shelf setting of 0-50 m water depth. Since the fauna is largely composed of epifaunal, oxic taxa, it suggests a more oligotrophic and oxic environment. The preservation is moderate to good; especially the Badenian tests are more fragmented and abraded.

Environment: mainly epifaunal; sand, vegetated; marine to hypersaline; more oligotrophic; oxic; 0-50 m; lagoonal, inner shelf

PO1 (220–225m) 7/2

Age: Sarmatian (*Elphidium* Zone), based on mollusc assemblage

Composition and environment: no data

PO1 (250–255m) 8/1

Age: Sarmatian (*Elphidium* Zone), based on co-occurrence of *Elphidium* spp. and *Ammonia* spp., *Porosononion granosum* and relative stratigraphic position

Composition: The Sarmatian fauna indicates an inner shelf setting down to 50 m water depth as represented by species like *Quinqueloculina akneriana*, *Ammonia* spp., *Asterigerinata planorbis*, *Bulimina elongata*, *Bolivina dilatata*, *Elphidium crispum*, *E*. *fichtelianum*, *Lobatula lobatula* and *Porosononion granosum*. The infaunal and deep infaunal, suboxic to dysoxic genera *Bulimina* and *Bolivina* point at increased stress and matter flux conditions. The remaining epifaunal taxa prefer oxic to slightly suboxic bottom water conditions. Reworked Badenian species (*Bulimina elongata longa* and *Globorotalia group*, etc.) are less common than in the overlying samples. The foraminiferal content is moderately preserved.

Environment: epifaunal and infaunal; muddy sand, hard substrate, vegetated; marine to slightly hypersaline; mesotrophic; suboxic; 0-50 m; inner shelf

PO1 (280–285m) 9/1

Age: Sarmatian (*Elphidium* Zone), based on correlation with seismic data and relative stratigraphic position

Composition and environment: no data

PO1 (430–435m) 14/3

Age: Badenian (*Bulimina-Bolivina* Zone), based relative stratigraphic position

Composition and environment: no data

PO1 (460–465m) 15/1

Age: Badenian (*Bulimina-Bolivina* Zone), based on assemblage composition (as reported in Papp et al., 1978) and also on mollusc assemblage

Composition: Sample PO1 (460–465m) 15/1 contains a low diverse foraminiferal assemblage with mainly *Ammonia* spp., *Quinqueloculina triangularis*, keeled elphidiids, *Aubignyna* sp., *Heterolepa dutemplei*, *Siphonina reticulata* and a few others. The fauna is largely composed of epifaunal to shallow infaunal species depending on oxic to slightly suboxic bottom water conditions. Organic matter flux to the sea floor and environmental stress are not documented. The tests are moderately to well-preserved.

Environment: mainly epifaunal to shallow infaunal; muddy sand; marine to hypersaline; more oligotrophic; oxic to slightly suboxic; lagoonal, intertidal

PO1 (490–495m) 16/1

Age: Badenian (*Spirorutilus* Zone), based on *Sigmoilopsis foeda* and general composition (similar to coeval assemblages described by Rupp, 1986)

Composition: A lagoonal, inner shelf setting with a water depth down to 50 m is indicated by the moderately preserved fauna found in sample PO1 (490–495m) 16/1 (*Ammonia viennensis*, *Porosononion granosum*, *Quinqueloculina* spp., *Nonion commune*, *Aubignyna* sp., *Bulimina elongata*, *Textularia gramen*, *Cycloforina contorta*, *Sigmoilopsis foeda*). Most of the taxa are epifaunal to shallow infaunal and prefer oxic to slightly suboxic environments. *Nonion commune*, *Aubignyna* sp. and *Bulimina elongata* are infaunal species preferring suboxic conditions.

Environment: mainly epifaunal to shallow infaunal; muddy-silty sand; marine; mesotrophic; suboxic; 0-50 m; lagoonal, inner shelf, sublittoral

PO1 (520–525m) 17/2

Age: Badenian (*Spirorutilus* Zone), based on co-occurrence of *Cibicidoides austriacus*, *Cornuspira plicata*, *Sigmoilopsis foeda*, *Adelosina longirostra*, *Pyrgoella ventruosa*, *Paravulvulina serrata*, *Cycloforina lucida*, *C. badenensis*, *Quinqueloculina haidingeri*, *Spirolina austriaca*, *Borelis melo* and the general highly diverse, ideal development of the assemblages fauna

Composition: This highly diverse assemblage contains 71 different taxa representing an intertidal, nearshore setting down to 40 m water depth (e.g. *Cibicidoides* spp., *Asterigerinata planorbis*, *Ammonia* spp., *Quinqueloculina* spp., *Porosononion granosum*, keeled elphidiids, *Cycloforina* spp., *Paravulvulina serrata*, *Semivulvulina* spp., *Borelis* spp., *Heterolepa dutemplei*, *Spirolina austriaca*, *Lobatula lobatula*, *Amphistegina radiata*). Almost all species are epifaunal taxa adapted to oxygenated or low-oxygenated bottom water conditions. Genera, such as *Borelis*, *Spirolina*, *Quinqueloculina*, *Lobatula* and *Elphidium* indicate vegetation (e.g. seagrass) and hard substrates due to their clinging and epiphytic mode of life. The included miliolid tests are poorly preserved due to corrosion. The found agglutinated and hyaline species are moderately to well-preserved.

Environment: epifaunal; sand, vegetated, hard substrate, algal-coated; marine to slightly hypersaline; mesotrophic; oxic to slightly suboxic; 0-40 m; lagoonal, nearshore, intertidal

SEM pictures: Pl. 1: 6 *Paravulvulina serrata*, 9 *Quinqueloculina akneriana*, 10 *Borelis melo*, 14 *Quinqueloculina boueana*, 29 *Globulina punctata*; Pl. 2: 1 *Guttulina communis*, 8 *Amphistegina radiata*, 15 *Schackoinella imperatoria*, 16 *Asterigerinata planorbis*

4.3.15. Scharfeneck Ost1

4.3.15.1. Composition and diversity - results

The samples SE O1 580 m, SE O1 630m, SE O1 670m, SE O1 730m, SE O1 740m and SE O1 860m contained only very few foraminiferal specimens each (one to two individuals). Therefore, these and the remaining 20 samples were considered microsterile and are not discussed further.

4.3.16. Siebenhirten 3

4.3.16.1. Composition and diversity - results

Well to moderately preserved tests of 141 different benthic and planktonic foraminiferal taxa as well as more than 4500 individuals have been identified in ten samples from the Siebenhirten 3-well. 17 samples were sterile. Due to their small number of individuals the lowermost three samples SI3 (1335–1340m) 12/1, SI3 (1485–1490m) 15/2 and SI3 (1716–1720.3m) 21/1 were not taken into account in the following analyses. The uppermost three samples (SI3 (400–405m) 2/2, SI3 (500–505m) 3/1 and SI3 (600–604m) 4/2) are composed of Sarmatian as well as reworked Badenian material. Therefore the following calculations and interpretations of these three samples refer only to the Sarmatian content. Benthic foraminifera make up the main proportion of collected specimens (70 % benthic vs. 30 % of planktonic species).

The hyaline taxa are dominating all foraminiferal assemblages (94 %), followed by porcellanous (3 %) and agglutinated taxa (3 %). The number of taxa ranges between 7 and 70. Samples SI3 (900–906m) 7/3 and SI3 (1000–1003m) 8/2 show the highest values (fig. 79). Fisher Alpha Diversity shows values between 1.5 and 15.3 with the highest number in sample SI3 (900–906m) 7/3. Equitability varies between 0.13 and 0.86 with the lowest number at the lowermost sample. Dominance has its highest value 0.89 in sample SI3 (1250–1255m) 11/1. The overlying samples are ranging between 0.05 and 0.70.

An inner neritic setting mainly represented by *Ammonia* spp., unkeeled elphidiids and *Borelis melo* shows abundances between 3 and 94 % (fig. 79). The highest value was found in the lowermost sample. Taxa characteristic for inner to middle neritic and inner to outer neritic settings (*Quinqueloculina* spp., keeled elphidiids, *Porosononion granosum*, *Lobatula lobatula* and others in this well) vary with up to 27 %. Taxa representing the inner neritic-bathyal setting (herein *Bulimina elongata*, *Heterolepa dutemplei*, *Caucasina* spp., *Bolivina* spp., *Spirolina austriaca*, *Textularia* spp. and several others) make up the main proportion in many samples with values up to 83 %. Only in samples SI3 (800–805m) 6/3 and SI3 (1250–1255m) 11/1 their contribution is declined to 1 %. The middle neritic-bathyal setting represented mainly by *Nonion commune*, *Uvigerina* spp., *Cassidulina laevigata*, *Melonis pompilioides*, *Semivulvulina pectinata* and *Myllostomella recta* occurs in some investigated samples with percentages between 1 and 31 %. Species responsible for the low contribution of indicators for the outer neritic-bathyal setting with up to 19 % are *Valvulineria complanata*, *Pullenia bulloides*, *Hansenisca soldanii*, *Laevidentalina* spp., *Hoeglundina elegans* and *Martinottiella communis*.

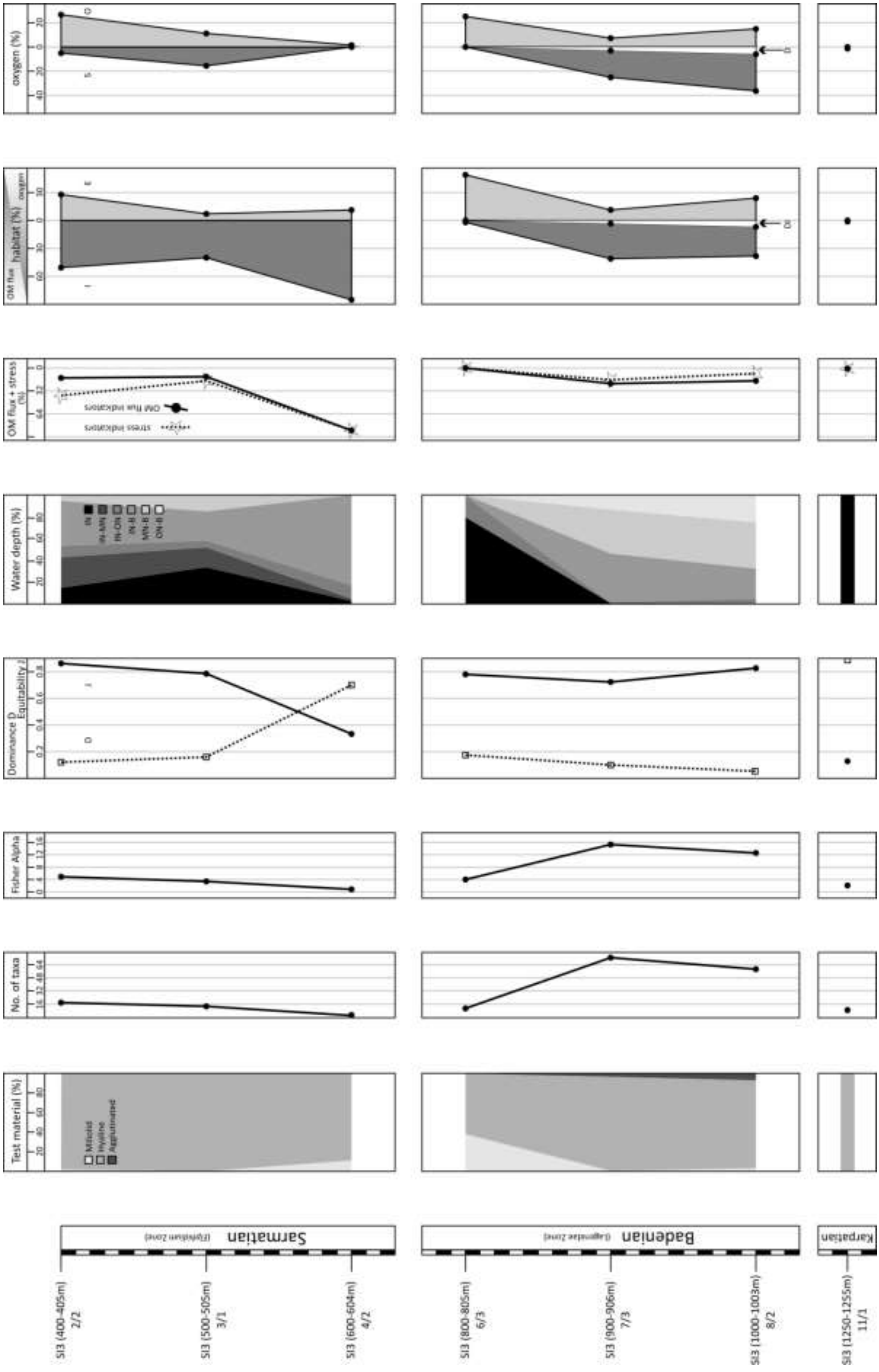
Indicative taxa for environmental stress (*Bulimina elongata*, *Bolivina dilatata*, *Praeglobobulimina* spp., *Uvigerina* spp. and *Valvulineria complanata*) show values between 1 and 83 %. The indicator species (*Bulimina elongata*, *Cassidulina laevigata*, *Hoeglundina elegans*, *Melonis pompilioides*, *Praeglobobulimina* spp. and *Uvigerina* spp.) for an elevated flux of organic matter peaks in sample SI3 (600–604m) 4/2 with 83 % and appears in the other samples with values between 1 and 25 % (fig. 79).

The epifaunal species are frequent in almost all samples with values between 10 and 48 % (fig. 79). Taxa with an infaunal mode of life show opposing numbers along the core, with the highest abundance of 83 % in sample SI3 (600–604m) 4/2. Deep infaunal species are barely represented and occur for example in sample SI3 (900–906m) 7/3 with 3 and in SI3 (1000–1003m) 8/2 with 6 %. The values of epifaunal taxa result mainly from abundances of *Heterolepa dutemplei*, *Lobatula lobatula*, *Cassidulina laevigata*, keeled elphidiids and the involved agglutinated foraminifera. *Nonion commune*, *Bulimina elongata*, *Bolivina dilatata*, *Melonis pompilioides*, *Caucasina* spp., *Uvigerina* spp. and several other species mainly contribute to the high percentages of infaunal species.

The index taxa for suboxic bottom waters vary in the assemblages with percentages up to 37 % (fig. 79). The contributing taxa are *Nonion commune*, *Bulimina elongata*, *Melonis pompilioides*, *Caucasina* spp., *Uvigerina* spp. and several others. Values between 1 and 26 % in all samples are shown by the different species representing oxic bottom waters. The lowermost sample shows 0 %. The indicators for this bottom water conditions are different miliolids, *Heterolepa dutemplei*, *Lobatula lobatula* and other taxa. Foraminiferal taxa preferring dysoxic conditions appear only with values up to 6 % due to a higher abundance of *Bolivina dilatata* and *Praeglobobulimina* spp.

SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (900–906m) 7/3 and SI3 (1000–1003m) 8/2 contain also numerous planktonic species. The former two samples cannot be taken into account for palaeoclimatic information since their globigerinids belong to the reworked Badenian content of these Sarmatian assemblages. The latter two samples can be used. Therein, the proportions of cool water elements (*Globigerina bulloides*, *G*. *concinna*, *G*. *diplostoma*, *G*. *falconensis*, *G*. *praebulloides*, *G*. *tarchanensis* and *Turborotalita quinqueloba*) vary between 19 and 51 %. Temperate elements like *Globorotalia bykovae*, *G*. *peripheroronda*, *G*. *transsylvanica* and *Globoturborotalita woodi* range within 41 and 72 %. The warm-temperate indicators (*Globigerinella regularis* and *Paragloborotalia* *mayeri*) are rare and reach percentages only up to 7 %. Warm indicators are represented with values between 2 and 8 %. These are *Globigerinoides bisphericus*, *G*. *trilobatus*, *G*. *quadrilobatus* and *Orbulina suturalis*. Indicators for high productivity occur with abundances between 17 and 18 %.

Fig. 79: Trends in benthic foraminiferal assemblages of the Siebenhirten 3-well. Nomenclature for oxic, suboxic and dysoxic indicators follows Kaiho (1994). Trends in epifaunal, infaunal and deep infaunal taxa reflect the antagonistic relationship of organic matter flux and bottom water oxygenation. IN = inner neritic species, IN-MN = inner to middle neritic species, IN-ON = inner to outer neritic species, IN/MN/ON-B = inner/middle/outer neritic-bathyal species, I = infaunal, E = epifaunal, DI = deep infaunal, O = oxic indicators, S = suboxic indicators, D = dysoxic indicators, OM = organic matter.



Test material (%)
Miliolid
Hyaline
Agglutinated
No. of taxa
Fisher Alpha
Dominance D
Equitability J
Water depth (%)
IN
IN-MN
IN-ON
IN-B
MN-B
ON-B
OM flux + stress (%)
OM flux indicators
stress indicators
OM flux
habitat (%)
oxygen
oxygen (%)
Sarmatian
Badenian
Karpatian
SI3 (400-405m) 2/2
SI3 (500-505m) 3/1
SI3 (600-604m) 4/2
SI3 (800-805m) 6/3
SI3 (900-906m) 7/3
SI3 (1000-1003m) 8/2
SI3 (1250-1255m) 11/1

The samples of the Siebenhirten 3-well contain about 141 taxa, of which 130 are represented only by counts under 100 individuals. In contrast the remaining eleven species (fig. 80), e.g. *Ammonia viennensis*, *Bulimina elongata* and *Heterolepa dutemplei* as well as the planktonic species *Globorotalia bykovae* and *Globigerina bulloides* show increased abundances or make up almost the entire assemblage.

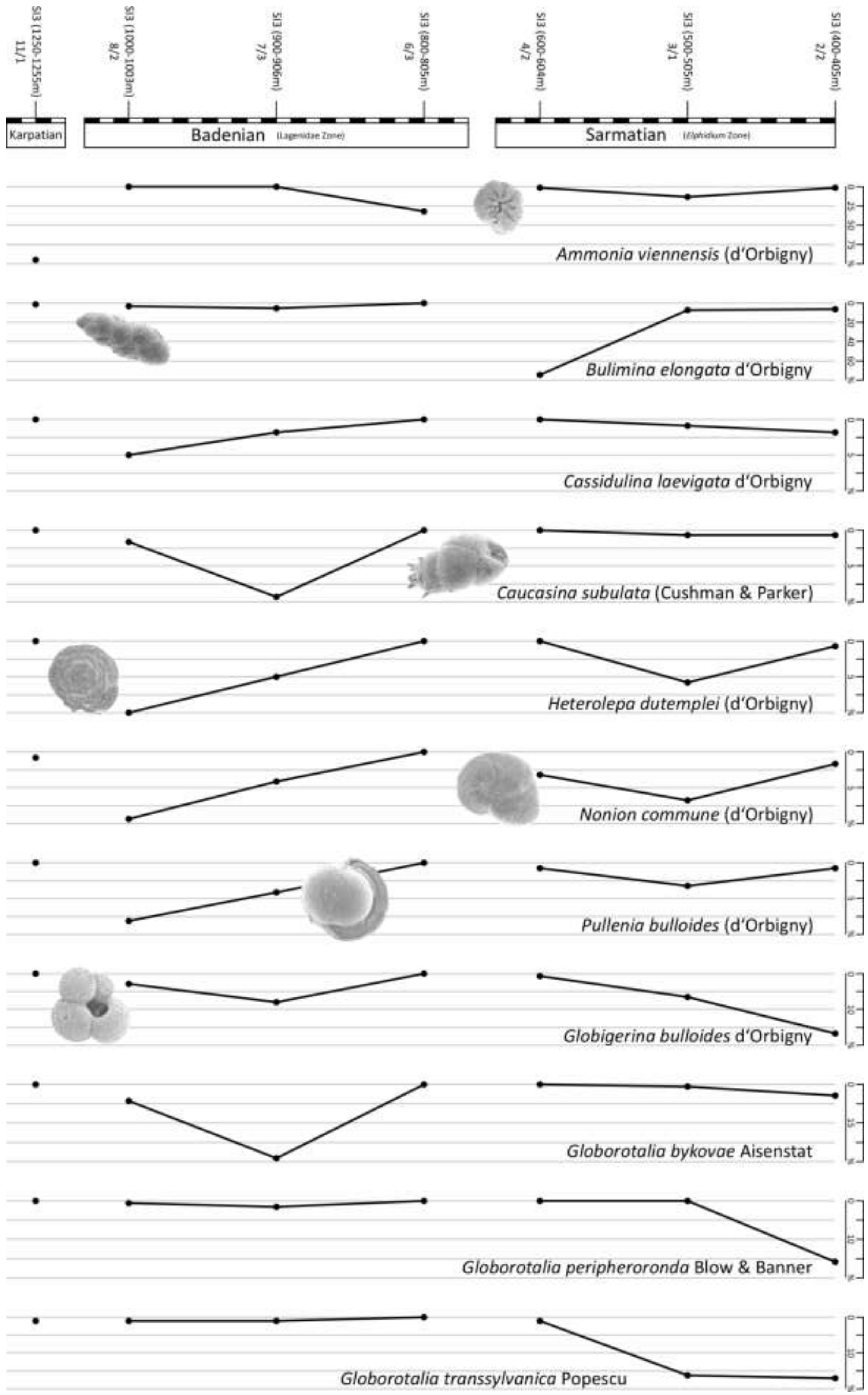
4.3.16.2. Biostratigraphy and palaeoecological interpretation

The uppermost three samples SI3 (400–405m) 2/2, SI3 (500–505m) 3/1 and SI3 (600–604 m) 4/2 are of lower Sarmatian age and belong to the *Elphidium* Zone (Holic Fm.). Even though the samples contain reworked Badenian material, typical Sarmatian species with increased occurrences were found. These are *Elphidium grilli*, *E. antoninum*, *E. hauerinum*, *E aculeatum* and *E. josephinum*. Sample SI3 (800–805m) 6/3 is placed into the Badenian Lagenidae ecozone (Lanžhot Fm.), based on the occurrence of *Borelis melo*, *Quinqueloculina triangularis*, *Cycloforina badenensis* and *Triloculina scapha*.

The following samples SI3 (900–906m) 7/3 and SI3 (1000–1003m) 8/2, located within the distinct channel-like feature in the seismics, hint at a Badenian age (Iváň Fm.) since they yield rich Lagenidae assemblages reminiscent of the Lower Lagenidae Zone. Found species are e.g. *Uvigerina venusta*, *U. macrocarinata, Pappina parkeri* and the planktonic foraminifer *Orbulina suturalis* as well as other numerous globigerinids.

Due to the occurrences of *Cibicidoides lopjanicus*, *Globigerina praebulloides*, *G*. *ottnangensis* and a high amount of *Ammonia viennensis* sample SI3 (1250–1255m) 11/1 is placed into the Karpatian (Závod Mb./Laa Fm.). The remaining samples SI3 (1335–1340m) 12/1, SI3 (1485–1490m) 15/2 and SI3 (1716–1720.3m) 21/1 are of Ottnangian age (Upper Lužice Fm.). They are low diverse, containing mainly small tests of *Ammonia viennensis*.

Fig. 80: Most abundant species found in the Siebenhirten 3 assemblages.



Karpatian
Badenian (Lagenidae Zone)
Sarmatian (Elphidium Zone)
SI3 (1250-1255m) 11/1
SI3 (1000-1003m) 8/2
SI3 (900-906m) 7/3
SI3 (800-805m) 6/3
SI3 (600-604m) 4/2
SI3 (500-505m) 3/1
SI3 (400-405m) 2/2
Ammonia viennensis (d'Orbigny)
Bulimina elongata d'Orbigny
Cassidulina laevigata d'Orbigny
Caucasina subulata (Cushman & Parker)
Heterolepa dutemplei (d'Orbigny)
Nonion commune (d'Orbigny)
Pullenia bulloides (d'Orbigny)
Globigerina bulloides d'Orbigny
Globorotalia bykovae Aisenstat
Globorotalia peripheroronda Blow & Banner
Globorotalia transsylvanica Popescu

SI3 (400–405m) 2/2

<u>*Age*</u>: Sarmatian (*Elphidium* Zone), based on occurrence of Sarmatian elphidiids, such as *Elphidium grilli*, *E*. *antoninum*

<u>*Composition*</u>: SI3 (400–405m) 2/2 is composed of many reworked Badenian foraminifera dwelling in deeper habitats on the middle and/or outer shelf, such as *Valvulineria complanata*, *Uvigerina* spp., *Pullenia bulloides*, *Praeglobobulimina pyrula*, *Myllostomella recta*, *Hoeglundina elegans*, *Hansenisca soldanii*, *Cassidulina laevigata*, *Amphicoryna* spp. and several planktonic taxa like *Globigerina falconensis*, *Globigerinella regularis* and the *Globorotalia* group. Besides these taxa, a typical Sarmatian vegetated, nearshore environment is indicated. The autochthonous taxa are keeled and unkeeled elphidiids (e.g. *Elphidium grilli*, *E*. *antoninum*), *Ammonia* spp., *Bolivina* spp., *Bulimina* spp., *Lobatula lobatula*, *Caucasina subulata*, *Asterigerinata planorbis*, *Nonion commune*, *Fissurina marginata* and *Quinqueloculina* spp. These are epi- and infaunal/deep infaunal species with oxic and sub-/dysoxic preferences, respectively. The latter also indicate environmental stress and a slight increase in organic matter flux. The Sarmatian content is well-preserved with less signs of abrasion, whereas the Badenian foraminifera are moderately preserved.

<u>*Environment*</u>: epi- and infaunal; muddy sand; brackish to hypersaline; mesotrophic; low-oxygenated; lagoonal, nearshore

<u>*SEM pictures:*</u> Pl. 1: 28 *Lagena gracilicosta*

SI3 (500–505m) 3/1

<u>*Age*</u>: Sarmatian (*Elphidium* Zone), based on occurrence of Sarmatian elphidiids, such as *Elphidium aculeatum*, *E*. *hauerinum*, *E*. *josephinum*

<u>*Composition*</u>: SI3 (500–505 m) 3/1 shows a similar composition like the overlying one. It also contains numerous reworked Badenian foraminifera together with Sarmatian nearshore fauna. Typical Sarmatian taxa are *Elphidium hauerinum*, *E*. *aculeatum* and *E*. *josephinum*. Besides these, *Ammonia* spp., other keeled elphidiids, *Bulimina* spp. and *Bolivina dilatata* occur. The assemblage suggests a nearshore and vegetated environment with slightly increased flux and environmental stress under low-oxygenated bottom water conditions. The tests are well-preserved.

<u>*Environment*</u>: epi- and infaunal; muddy sand, hard substrate; brackish to hypersaline; mesotrophic; suboxic; lagoonal, nearshore

<u>*SEM pictures:*</u> Pl. 1: 18 *Amphicoryna badenensis*

SI3 (600–604 m) 4/2

<u>*Age*</u>: Sarmatian (*Elphidium* Zone), based on occurrence of Sarmatian elphidiids, such as *Elphidium aculeatum*

Composition: The assemblage again contains several reworked Badenian foraminifera from the middle/outer shelf (see SI3 (400–405 m) 2/2). *Elphidium aculeatum* is an epifaunal Sarmatian foraminifer. High abundance of infaunal *Bulimina elongata* hints at stress conditions and increased organic matter flux. *Quinqueloculina akneriana* and *Ammonia* spp. were also observed, representing epifaunal oxic conditions. The assemblage suggests a nearshore environment. The foraminifera are moderately preserved and partly pyritisised.

Environment: mainly infaunal; mud to fine sand; marine to hypersaline; mesotrophic; suboxic; lagoonal, nearshore

SI3 (800–805m) 6/3

Age: Badenian (Lagenidae Zone), based on occurrence of *Borelis melo*, *Quinqueloculina triangularis*, *Cycloforina badenensis*, *Triloculina scapha*

Composition: A nearshore, lagoonal environment is indicated by the benthic foraminifera of this assemblage (*Ammonia* spp., keeled elphidiids, *Borelis melo*, *Cycloforina badenensis*, *Quinqueloculina triangularis*, *Pyrgo simplex*, *Triloculina* spp., unkeeled elphidiids) with Diversity value 4.0, which fits to the reported values in Murray (1991, 2006) for more hypersaline inner shelf settings. Vegetated sea floor (e.g. seagrass) is indicated by most of the found taxa except for *Ammonia* and *Cycloforina badenensis*. Increased organic matter flux and environmental stress are not documented. All included genera are epifaunal and adapted to oxic to suboxic bottom water conditions. In general, the preservation is poor.

Environment: epifaunal; muddy sand, vegetated, algal-coated hard substrate; marine to hypersaline; mesotrophic; oxic to suboxic; 0-50 m; lagoonal, nearshore

SI3 (900–906m) 7/3

Age: Badenian (Lower Lagenidae Zone), based on occurrence of *Uvigerina venusta*, *U*. *grilli U*. *macrocarinata*, *Orbulina suturalis*, *Lenticulina americana*, *Pappina parkeri*, numerous globigerinids

Composition: A deeper environment is indicated by the diverse and well-preserved benthic foraminifera of this assemblage (*Caucasina subulata*, *Uvigerina* spp., *Bulimina* spp., *Heterolepa dutemplei*, *Pullenia bulloides*, *Nonion commune*, *Melonis pompilioides*, *Bolivina* spp., *Cassidulina laevigata*, *Spirorutilus carinatus*, *Lenticulina* spp., *Ceratocancris haueri*, *Valvulineria complanata*, *Amphicoryna badenensis*, *Hoeglundina elegans*, *Plectofrondicularia* spp., *Textularia gramen*, *Myllostomella recta*, *Stilostomella adolphina* and many others) with a Diversity value of 15.2. Comparable values were reported by Murray (1991, 2006) for outer shelf to upper bathyal assemblages. The foraminifera display a marine, outer shelf to upper bathyal system. Increased organic matter flux and environmental stress are documented by the high abundances of infaunal and deep infaunal indicators (like *Uvigerina* spp., *Bulimina* spp., *Melonis pompilioides*, *Bolivina* spp., *Cassidulina laevigata*, *Hoeglundina elegans* and others) adapted to suboxic to dysoxic conditions. Also high abundances of epifaunal foraminifers point to oxygenated to low-oxygenated bottom waters.

Temperate water layers are indicated by the great amount of the *Globorotalia* group together with *Globoturborotalita woodi*. Cooler surface water is represented by the abundance of *Globigerina* spp. *Globigerina bulloides* and *G*. *praebulloides* point to an increased input of nutrients.

Environment: epi- and infaunal; mud to fine sand, hard substrate; marine; mesotrophic; oxic to suboxic; deltaic?, outer shelf to upper bathyal

SEM pictures: Pl. 1: 7 *Spirorutilus carinatus*, 16 *Laevidentalina boueana*, 20 *Bolivina dilatata*, 22 *Bulimina elongata*, 24 *Uvigerina macrocarinata*, 27 *Caucasina subulata*; Pl. 2: 5 *Valvulineria complanata*, 6 *Nonion commune*, 11 *Melonis pompilioides*, 12 *Pullenia bulloides*

SI3 (1000–1003m) 8/2

Age: Badenian (Lower Lagenidae Zone), based on occurrence of *Uvigerina macrocarinata*, *Lenticulina spinosa*, numerous globigerinids, very similar to overlying sample SI3 (900–906m) 7/3

Composition: A similar composition and environment as in sample SI3 (900–906m) 7/3 is observed herein. Species like *Heterolepa dutemplei*, *Nonion commune*, *Pullenia bulloides*, *Ceratocancris haueri*, *Cassidulina laevigata*, *Hoeglundina elegans*, *Praeglobobulimina* spp., *Bulimina* spp., *Semivulvulina pectinata*, *Quinqueloculina* spp., *Melonis pompilioides*, *Hansenisca soldanii*, *Caucasina subulata*, *Spirorutilus carinatus*, *Bolivina* spp., *Valvulineria complanata* and many others were found. Epifaunal taxa with preferences for oxygenated and low-oxygenated bottom waters as well as infaunal and deep infaunal taxa with sub- to dysoxic adaptions in high abundances make up this assemblage. The latter ones also indicate environmental stress and an increased flux of organic material. Generally the tests are moderately to well-preserved. The porcellanous tests are only poorly preserved, tests of *Lenticulina* moderately and lagenid remains are noticeably well-preserved.

Cool indicator species (*Globigerina bulloides*, *G*. *praebulloides and G*. *tarchanensis*) dominate the planktonic content and hint at cool surface water conditions as well as an increased nutrient input. Temperate deeper water layers are represented by the amount of the *Globorotalia* group.

Environment: epi- and infaunal; mud, hard substrate; marine; mesotrophic; oxic to suboxic; deltaic?, outer shelf to upper bathyal

SEM pictures: Pl. 1: 4 *Martinottiella communis*, 19 *Praeglobobulimina pupoides*; Pl. 2: 3 *Sphaeroidina bulloides*, 13 *Heterolepa dutemplei*, 14 *Hansenisca soldanii*

SI3 (1250–1255m) 11/1

<u>*Age*:</u> Karpatian, based on occurrence of *Cibicidoides lopjanicus*, *Globigerina praebulloides*, *G. ottnangensis* and high amount of *Ammonia viennensis*

<u>*Composition*:</u> The well-preserved taxa found in this sample (*Ammonia viennensis*, *Nonion commune*, *Cibicidoides lopjanicus*, *Bulimina elongata*, *Cassidulina laevigata*, *Bolivina dilatata*) are epifaunal to shallow infaunal preferring oxic to suboxic bottom water conditions. Infaunal species are rare.

Organic matter flux to the sea floor as well as environmental stress is barely documented. The assemblage suggests a lagoonal setting.

<u>*Environment*:</u> epifaunal to shallow infaunal; muddy sand; brackish to hypersaline; oligotrophic; oxic to slightly suboxic; 0-50 m; lagoonal

SI3 (1335–1340m) 12/1

<u>*Age*:</u> Ottnangian, based on relative stratigraphic position

<u>*Composition and environment*:</u> no data

SI3 (1485–1490m) 15/2, SI3 (1716–1720.3m) 21/1

<u>*Age*:</u> Ottnangian, based on relative stratigraphic position

<u>*Composition and environment*:</u> no data

4.3.17. Walterskirchen 1

4.3.17.1. Composition and diversity - results

Moderately to well-preserved tests of 77 benthic and planktonic taxa and 1979 individuals have been identified in seven samples from the Walterskirchen 1-well. Eleven samples turned out to be microsterile. Samples WA1 (350–355m) 4/2, WA1 (450–455m) 6/2 and WA1 (640–641.5m) 11/2 were not taken into account in the following diversity and abundance analyses due to the very low number of specimens. Benthic foraminifera are the dominating group (99 % benthic vs. 1 % of planktonic species).

The hyaline taxa make up the main proportion of the entire foraminiferal content (88 %), followed by porcellanous (7 %) and agglutinated taxa (5 %). The number of taxa ranges between 10 in sample WA1 (200–205m) 1/1 and 42 in sample WA1 (400–405m) 5/1. The same distribution is visible in the Fisher Alpha Diversity with values between 1.8 and 10.0. Equitability values vary between 0.43 and 0.71. Sample WA1 (400–405m) 5/1 shows the highest number. Conversely, dominance shows downcore values ranging between 0.11 and 0.43 (fig. 82).

The species representing an inner neritic setting (*Ammonia* spp. and *Aubignyna* sp.) are more prominent in the uppermost two samples (32 and 62 %) and become less important in the underlying samples (fig. 82). The taxa characteristic for inner to middle neritic and inner to outer neritic settings (*Porosononion granosum*, different miliolids and keeled elphidiids) vary between 7 and 35 %. The uppermost sample shows the highest values. The inner neritic-bathyal setting is represented with lower values ranging between 1 and 30 %. The first two samples occur with the lowest numbers. Responsible species are *Textularia* spp., *Heterolepa dutemplei*, *Bulimina elongata*, *Bolivina dilatata* and *Fursenkoina acuta*. Taxa representing the middle neritic-bathyal setting (*Lenticulina* spp., *Nonion commune*, *Cibicidoides* spp., *Sigmoilopsis foeda*, *Semivulvulina* spp. and *Praeglobobulimina pupoides*) become more important in the lower samples, ranging with up to 57 %. Sample WA1 (200–205m) 1/1 shows the lowest value. Sample WA1 (400–405m) 5/1 presents indicators for an outer neritic-bathyal setting (mainly *Valvulineria complanata*), whereas all the other samples lack these.

Indicative taxa for elevated flux of organic matter as well as environmental stress occur only in sample WA1 (400–405m) 5/1 with 18 and 39 %, respectively (fig. 82). The values result from an increased contribution of the species *Valvulineria complanata*, *Praeglobobulimina pupoides*, *Bulimina elongata* and *Melonis pompilioides*.

Epifaunal species are important in all assemblages with abundances between 19 and 89 %. The infaunal taxa show higher values only in sample WA1 (300–305m) 3/1 with 62 %. Deep infaunal species occur only in sample WA1 (400–405m) 5/1 with 3 %. The high values of epifaunal taxa result mainly from high abundances of *Lenticulina* spp., *Textularia* spp., *Heterolepa dutemplei*, different miliolids and several other species. The infaunal mode of life is represented by taxa like *Valvulineria complanata*, *Aubignyna* sp., *Nonion commune*, *Bulimina elongata* and *Melonis pompilioides*, whereas *Praeglobobulimina pupoides* hints at a deep infaunal setting (fig. 82).

Suboxic bottom waters are dominating the lower two samples with abundances of 29 and 54 % in the sampled core (fig. 82). Indicators are *Lenticulina* spp., *Valvulineria complanata*, *Nonion commune*, *Bulimina elongata* and other species. Conversely, the upper two samples are dominated by index taxa for oxic bottom waters. These indicators range between 7 and 36 % abundance, mainly contributed by species *Textularia* spp., different miliolids, *Heterolepa dutemplei* and keeled elphidiids. Foraminiferal taxa preferring dysoxic bottom water conditions occur only in sample WA1 (400–405m) 5/1 with 3 % caused by increased abundance of *Praeglobobulimina pupoides* and *Bolivina dilatata*.

77 taxa make up the assemblages of the Walterskirchen 1-well. Most of them are scarcely represented. The seven most abundant species in all samples are shown in fig. 81.

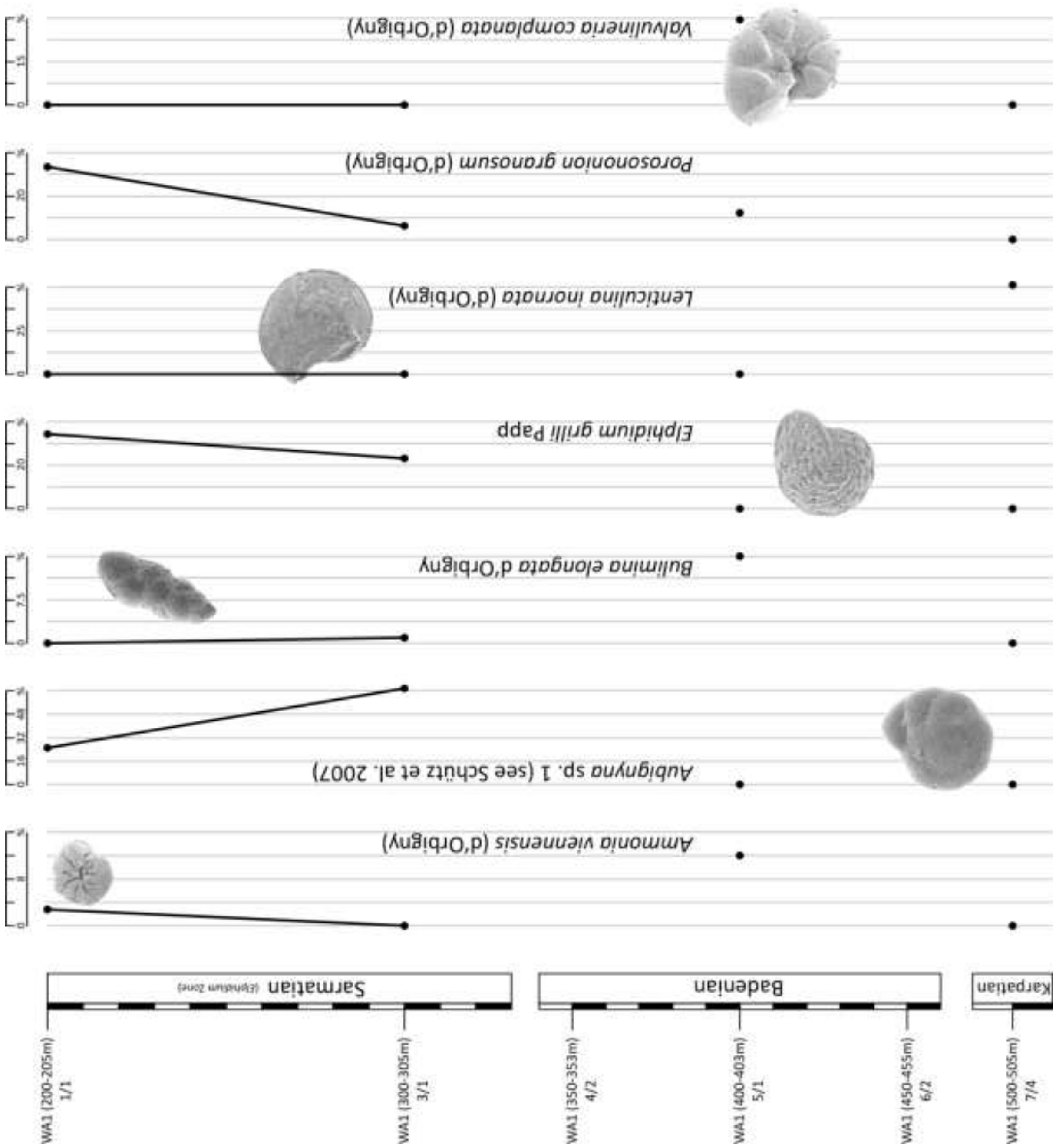


Fig. 81: Distribution of the most abundant species that make up the majority of the samples of the Walterskirchen 1-well.

4.3.17.2. Biostratigraphy and palaeoecological interpretation

The uppermost two samples (WA1 (200–205m) 1/1 and WA1 (300–305m) 3/1) are placed in the Sarmatian *Elphidium* Zone (Holic Fm.), since they yield typical Sarmatian assemblages. These contain e.g. *Aubignyna* sp., *Elphidium grilli*, *E. aculeatum*, *E. koberi* and *Schackoinella imperatoria*. Additionally, this age is strongly supported by the found mollusc faunas. The underlying sample WA1

(350–353m) 4/2 is late Badenian in age (*Bulimina-Bolivina* Zone; Studienka Fm.) indicated by its strongly impoverished fauna.

Sample WA1 (400–403m) 5/1 comprises species like *Adelosina longirostra*, *Quinqueloculina triangularis*, *Quinqueloculina haidingeri*, *Cycloforina badenensis*, *Textularia mariae* and *Sigmoilopsis foeda*. Its general composition is highly reminiscent of the middle Badenian (*Spirorutilus* Zone) faunas presented in Rupp (1986). No markers or clear hints can be found in the following sample WA1 (450–455m) 6/2. It is placed into the Badenian Group due to its relative stratigraphic position. The last sample WA1 (500–505m) 7/4 is placed in the Karpatian (Závod Mb./Laa Fm.). It contains species like *Cibicidoides lopjanicus* and shows a general composition with less planktonic content (Cicha and Zapletalová, 1967).

WA1 (200–205m) 1/1

Age: Sarmatian (*Elphidium* Zone), based on *Aubignyna* sp., *Elphidium grilli*, *Schackoinella imperatoria* and also on mollusc assemblage

Composition: A vegetated, shallow subtidal, inner shelf environment of 0-50 m is indicated by the well-preserved foraminiferal assemblage of keeled elphidiids, *Porosononion granosum*, *Aubignyna* sp., *Ammonia* spp., *Amphicoryna hispida*, *Schackoinella imperatoria*. Almost all benthic foraminifera are epifaunal adapted to oxic bottom water conditions. Organic matter flux to the sea floor and environmental stress are not documented in benthic foraminifers.

Environment: mainly epifaunal; sand, vegetated; brackish to hypersaline; mesotrophic; oxic; 0-50 m; lagoonal, inner shelf, shallow sublittoral

SEM pictures: Pl. 2: 19+20 *Ammonia pseudobeccarii*, 26 *Elphidium grilli*

WA1 (300–305m) 3/1

Age: Sarmatian (*Elphidium* Zone), based on *Aubignyna* sp., *Elphidium grilli*, *Elphidium aculeatum*, *Elphidium koberi*, and also on mollusc assemblage

Composition: The less diverse foraminiferal assemblage of sample WA1 (300–305m) 3/1 is similar to sample WA1 (200–205m) 1/1 and represents a shallow sublittoral, inner shelf environment with a water depth down to 50 m (e.g. *Aubignyna* sp., keeled elphidiids, *Porosononion granosum*, *Ammonia pseudobeccarii*, *Bulimina elongata*, *Asterigerinata planorbis* and *Fissurina laevigata*). The Diversity value of 3.0 agrees with the data reported in Murray (1991, 2006) for shallow inner shelf environments. Organic matter flux and environmental stress are not documented in benthic foraminifers. The community is largely composed of epifaunal species adapted to oxic bottom waters. Infaunal species are rare and point to suboxic conditions. The assemblage shows a good preservation.

Environment: mainly epifaunal; muddy sand; vegetated; slightly brackish to marine; mesotrophic; oxic; 0-50 m; lagoonal, inner shelf, shallow sublittoral

SEM pictures: Pl. 2: 17+18 *Aubignyna* sp

WA1 (350–353m) 4/2

Age: Badenian (*Bulimina-Bolivina* Zone), based on strongly impoverished fauna and correlation with seismic data

Composition and environment: no data

WA1 (400–403m) 5/1

Age: Badenian (*Spirorutilus* Zone), based on co-occurrence of *Adelosina longirostra*, *Quinqueloculina triangularis*, *Quinqueloculina haidingeri*, *Cycloforina badenensis*, *Textularia mariae*, *Sigmoilopsis foeda* and general optimal composition of the fauna (similar to Rupp, 1986)

Composition: A deeper marine environment is indicated by the diverse benthic foraminifera of this assemblage (*Valvulineria complanata*, *Bulimina elongata*, *Ammonia* spp., *Porosononion granosum*, *Quinqueloculina* spp., *Nonion commune*, *Cibicidoides* sp., *Cycloforina* spp., *Praeglobobulimina pupoides*, *Heterolepa dutemplei*, *Melonis pompilioides*, *Textularia* spp. and several others) with a Diversity value of 10.0, which fits to the reported values in Murray (1991, 2006) for outer shelf settings. They display an outer shelf system up to 200 m water depth. Increased organic matter flux and environmental stress are documented by the high abundances of infaunal and deep infaunal indicators like *Valvulineria complanata*, *Bulimina elongata*, *Praeglobobulimina pupoides*, *Melonis pompilioides* and *Bolivina dilatata* preferring suboxic to dysoxic conditions. Epifaunal foraminifers point to oxygenated bottom waters. All agglutinated and hyaline tests are well-preserved, whereas the porcellanous taxa show only a moderate preservation.

Environment: epifaunal and infaunal; mud to fine sand, hard substrates; marine; mesotrophic; oxic sea floor, sub- to dysoxic within sediment; down to 200 m; deltaic?, outer shelf

WA1 (450–455m) 6/2

Age: Badenian, based on comparison of sedimentary material and relative stratigraphic position

Composition and environment: no data

WA1 (500–505m) 7/4

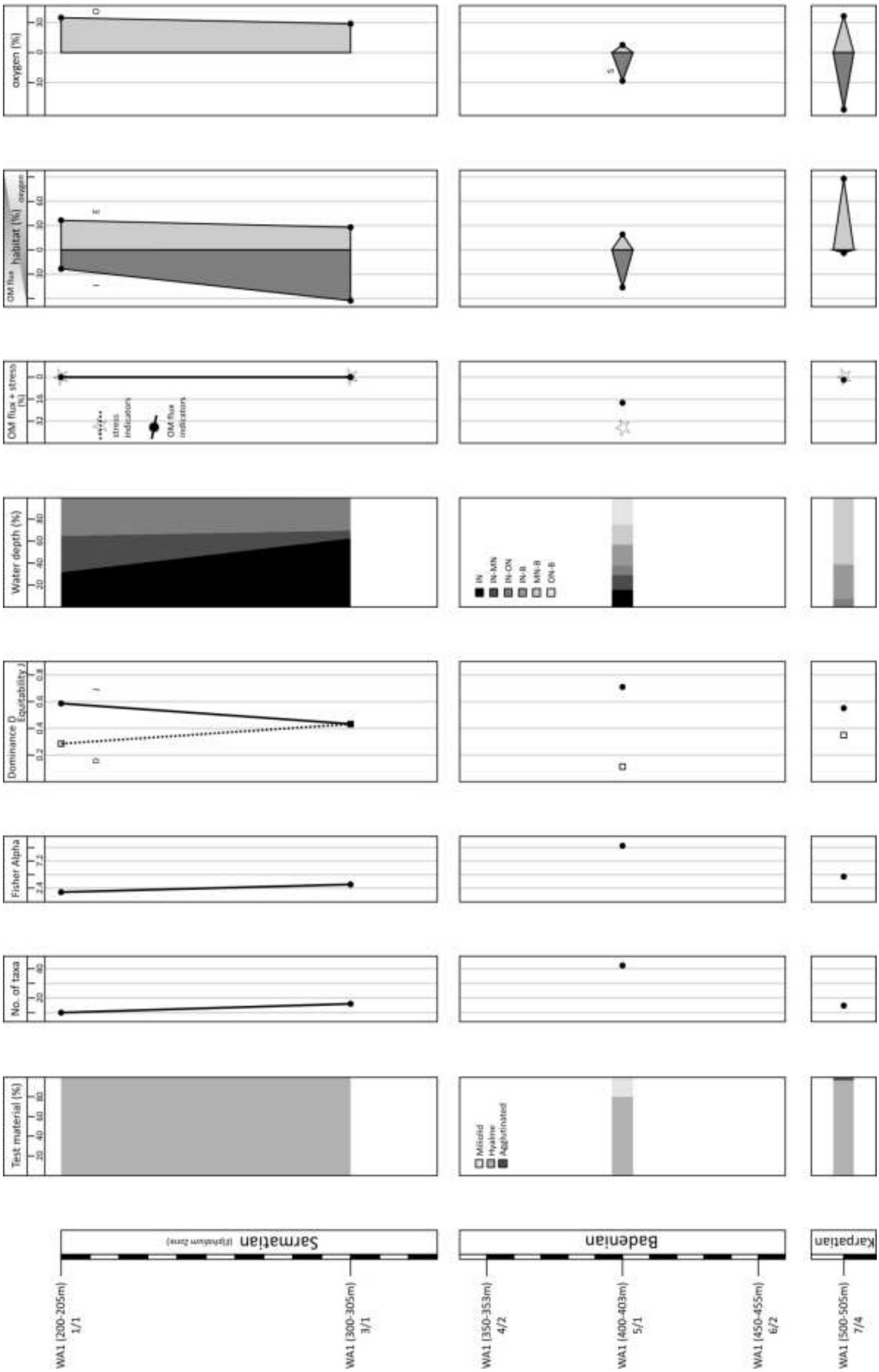
Age: Karpatian, based on *Cibicidoides lopjanicus* and general composition with less planktonic content (Cicha and Zapletalová, 1967)

Composition: The less diverse foraminiferal assemblage of sample WA1 (500–505m) 7/4 represents a marine environment on the outer shelf to upper bathyal (e.g. *Lenticulina inornata*, *Heterolepa dutemplei*, *Elphidium fichtelianum*, *Ceratocancris haueri*, *Semivulvulina pectinata*, *Melonis pompilioides*, *Globulina gibba*). Diversity value 4.2 agrees with the data reported in Murray (1991, 2006) for upper bathyal environments. The assemblage is largely composed of epifaunal species adapted to both oxic and low-oxygenated bottom water conditions. The documented infaunal species are suboxic. Organic matter flux to the sea floor as well as environmental stress are not documented. The foraminifera are poorly to moderately preserved and show partly signs of strong corrosion and abrasion.

Environment: mainly epifaunal; mud, silt, hard substrate; marine; mesotrophic; suboxic; outer shelf to upper bathyal

Fig. 82: Trends in the benthic foraminiferal assemblages of the Walterskirchen 1-well. Nomenclature for oxic and suboxic indicators follows Kaiho (1994). Trends in epifaunal and infaunal taxa reflect the antagonistic relationship of organic matter flux and bottom water oxygenation.

IN = inner neritic species, IN-MN = inner to middle neritic species, IN-ON = inner to outer neritic species, IN/MN/ON-B = inner/middle/outer neritic-bathyal species, I = infaunal, E = epifaunal, O = oxic indicators, S = suboxic indicators, OM = organic matter.



Test material (%)
Miliolid
Hyaline
Agglutinated
No. of taxa
Fisher Alpha
Dominance D
Equitability J
Water depth (%)
IN
IN-MN
IN-ON
IN-B
MN-B
ON-B
OM flux + stress (%)
stress indicators
OM-flux indicators
OM flux
habitat (%)
oxygen
oxygen (%)
Sarmatian
Badenian
Karpatian
WA1 (200-205m) 1/1
WA1 (300-305m) 3/1
WA1 (350-353m) 4/2
WA1 (400-403m) 5/1
WA1 (450-455m) 6/2
WA1 (500-505m) 7/4

4.4. Diversity Indices

While dealing with the statistical analyses of the foraminifera it became obvious that, compared to other analyses (like Cluster Analysis), plotting the diversity indices reveals significant patterns that allow a rough differentiation between the different lithostratigraphic units.

4.4.1. Dominance vs. Equitability (fig. 83)

We plotted Dominance D against Equitability J, both indices dealing with the distribution of species within an assemblage (fig. 83). Dominance shows higher values (max.: 1), when the sample is dominated by a single or only few species, whereas Equitability J evaluates the evenness with which the involved individuals are distributed in the assemblage (the bigger J the bigger is evenness).

Samples of the Ottnangian upper Lužice Fm. comprise more diverse communities whose individuals are more evenly distributed to the involved taxa within the different assemblages (D between 0.1-0.7; J between 0.6-1.0). The samples of the lower Karpatian Lakšary Mb. (Laa Fm.) however, show a different pattern. They contain low diverse and unbalanced communities of more stressed environments with values of D between 0.65-1 and of J between 0.1-0.6. With time the environmental conditions ameliorated, visible in the shift back to more diverse and balanced communities of the Karpatian Závod Mb. (D between 0.3-0.9; J between 0.1-0.7). The Badenian as well as the Sarmatian samples display also different conditions in more restricted, lagoonal (higher D, smaller J) and shelf (lower D, higher J) environments. Both, the two samples of the Badenian Iváň Fm. and the three samples of the Karpatian Ginzersdorf Mb. contain diverse and balanced shelf assemblages.

In this plot the Badenian samples were treated as an entire group. But as seen in chapter 4.2.3., the Badenian is known to show a marked change in its microfaunas from diverse and well-developed faunas of the lower and middle Badenian towards the impoverished , unbalanced and less diverse upper Badenian ones. These faunal characteristics are also visible in the position of the corresponding samples in the plot. The upper Badenian samples (PO1 (430–435m) 14/3 and PO1 (460–465m) 15/1) separate from the lower and middle Badenian ones and range in the left upper corner of the plot with higher values for dominance (1 and 0.75, respectively) and lower values for equitability (0.00 and 0.26, resp.). The assemblages are less diverse and mainly dominated by the genus *Ammonia*.

Samples HDR19 (495-500m) 2/1, HRD25 (665-670m) 8/1 and PWU3 (1123-1128m) 1/1 show similar features. They indeed belong to the lower Badenian Lagenidae Zone but as the palaeoecological analysis has shown represent more marginal and stressed, partly lagoonal environments and contain low diverse faunas which are mainly dominated by few taxa. They are also positioned in the upper left corner of the plot (HRD19 2/1: D=0.62, J=0.37; HRD25 8/1: D=0.59, J=0.49; PWU3 1/1: D=0.97, J=0.11).

All other Badenian samples contain more balanced and diverse communities and belong to the Lagenidae or *Spirorutilus* Zone and therefore are positioned in the corresponding area of the plot.

4.4.2. Fisher Alpha vs. Equitability (fig. 84)

The Fisher Alpha Diversity Index eliminates the influence of the sample size. It remains regardless of the number of individuals. High values indicate high species richness.

The Ottnangian samples (upper Lužice Fm.) contain balanced assemblages with low to moderate species richness (α between 0-10; J between 0.6-0.9). The Karpatian samples of both the Lakšary Mb. and the Závod Mb. display similar values of more stressed environmental conditions with low diverse and rather unbalanced communities (Lakšary: α between 0-2, J between 0.1-0.5; Závod: α between 0-4.8, J between 0.1-0.7). Nevertheless, a slight trend of amelioration can be observed towards the assemblages of the Závod Mb. The three samples of the uppermost Karpatian Ginzersdorf Mb. (AH1 (250–255m) 9/4, AH1 (280–285m) 10/2 and AH1 (310–315m) 11/1) are positioned significantly and separated from the other Karpatian samples with values of higher species richness. The Baden Group contains more balanced samples from shelf environments with moderate to higher species richness (α between 0-11.2, J between 0.25-1.0). Samples SI3 (900–906m) 7/3 and SI3 (1000–1003m) 8/2, representing the Badenian Mistelbach Canyon infill (Iváň Fm.) are also significant with higher species richness and balanced communities. The Sarmatian samples from the Holic Fm. are again similar to the Badenian ones. They comprise more balanced assemblages with moderate to higher species richness (α between 1.6->17.6, J between 0.4-0.9). Few samples show high values of Fisher Alpha.

Again, the Badenian samples were treated as an entire group in this plot. As seen in chapter 4.2.3., the Badenian shows a marked change in its microfaunas from diverse and well-developed faunas of the lower and middle Badenian towards the impoverished upper Badenian ones. These faunal characteristics are again visible in the position of the corresponding samples. The upper Badenian samples (PO1 (430–435m) 14/3 and PO1 (460–465m) 15/1) separate from the remaining Badenian ones and range in the left lower corner of the plot with very low values for Fisher Alpha (0.8 and 3.7, respectively) and higher values for equitability (0.00 and 0.26, resp.). The assemblages are less diverse and mainly dominated by the genus *Ammonia*.

Again, the samples HDR19 (495-500m) 2/1, HRD25 (665-670m) 8/1 and PWU3 (1123-1128m) 1/1 show similar features. They belong to the diverse lower Badenian Lagenidae Zone but represent more marginal and stressed environments and contain low diverse faunas which are mainly dominated by few taxa. They are also positioned in the lower left corner of the plot (HRD19 2/1: α=4.1, J=0.37; HRD25 8/1: α=1.4, J=0.49; PWU3 1/1: α=0.3, J=0.11).

All other Badenian samples contain more balanced and diverse communities and belong to the Lagenidae or *Spirorutilus* Zone and therefore are positioned in the corresponding area of the plot.

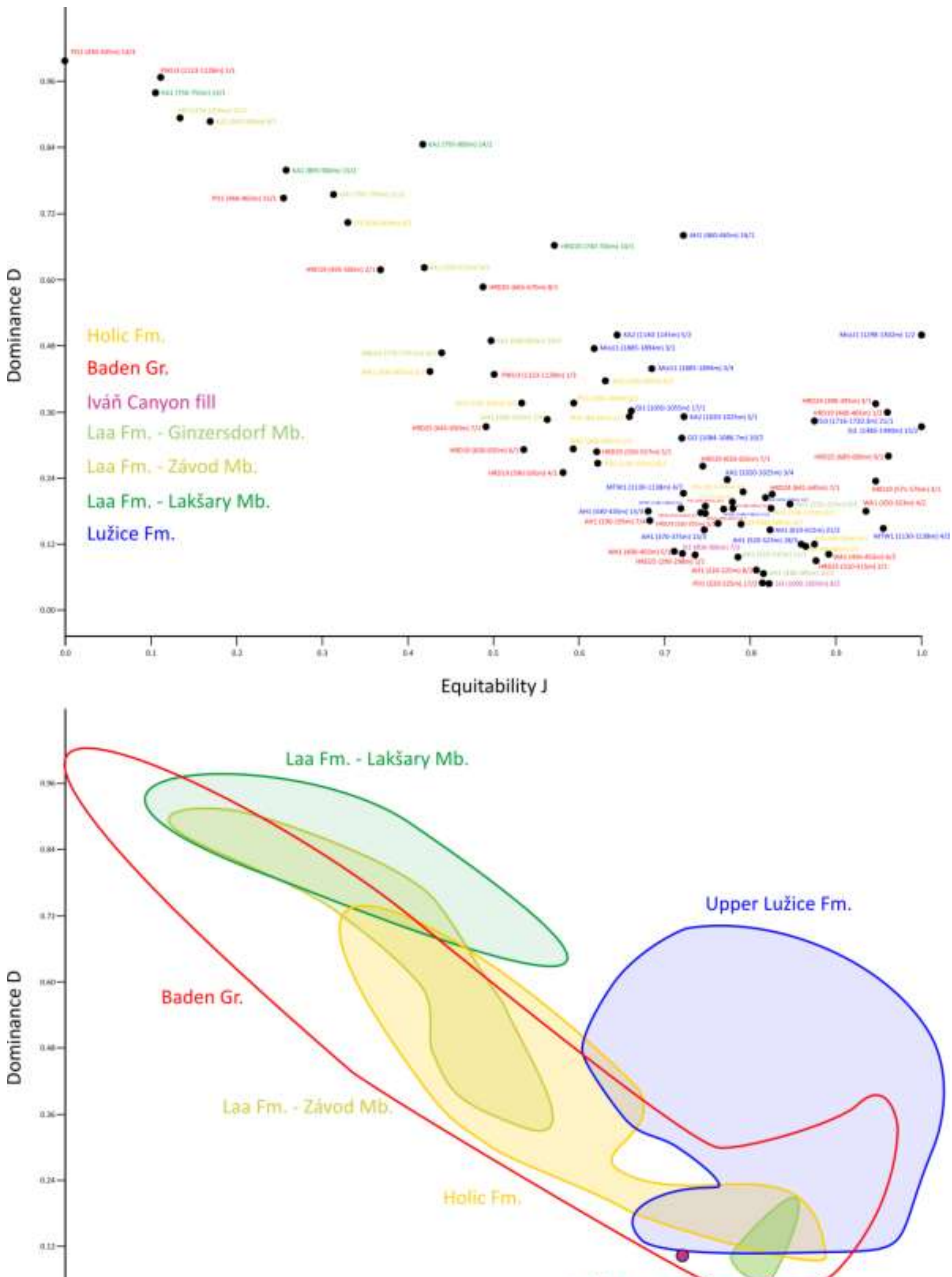


Fig. 83: The cross-plot of diversity indices (Dominance and Equitability) reveals distinct groups.

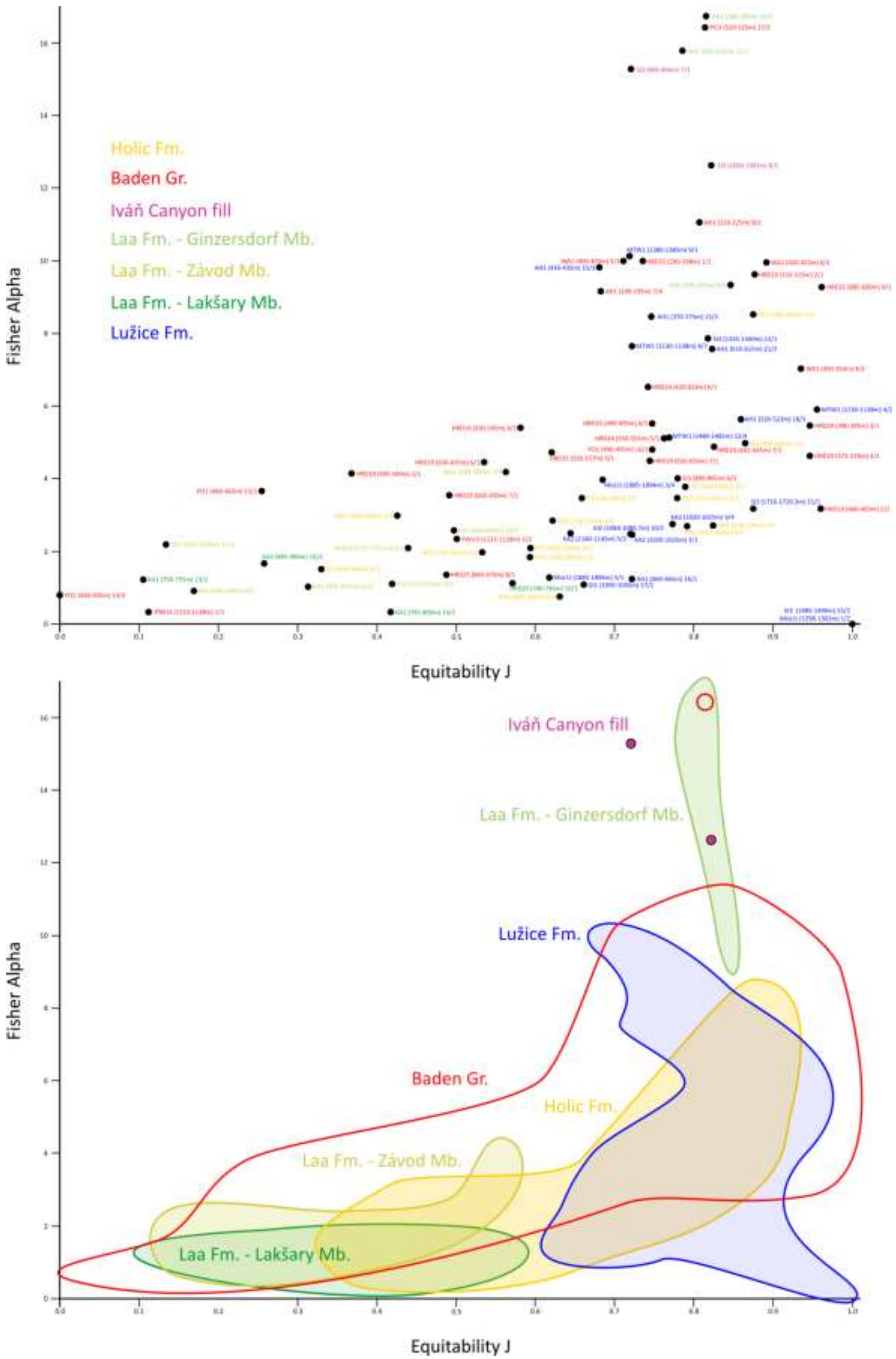


Fig. 84: The cross-plot of diversity indices (Fisher Alpha and Equitability) reveals distinct groups.

4.5. Taxonomical Index

This index lists all 261 found species of the study. The taxonomy follows Loeblich and Tappan (1987).

Order Foraminiferida Eichwald, 1830
Suborder Textulariina Delage & Hérouard, 1896
Superfamily Astrorhizacea Brady, 1881
Family Bathysiphonidae Avnimelech, 1952
Genus *Bathysiphon* G.O. & M. Sars, 1872

Bathysiphon filiformis G.O. & M. Sars, 1872 (Pl. 1, fig. 5)
1872 *Bathysiphon filiformis* G.O. & M. Sars in G.O. Sars: p. 251.
1998 *Bathysiphon filiformis* Cicha et al.: p. 82, pl. 1, figs. 3-5.
Samples: MI1 (1052–1057m) 3/2, MI1 (1373.5–1377m) 7/4

Bathysiphon taurinensis Sacco, 1893
1893 *Bathysiphon taurinensis* Sacco: p. 168, fig. 2.
1998 *Bathysiphon taurinensis* Cicha et al.: p. 82, pl. 1, figs. 1-2.
Samples: AH1 (310–315m) 11/1, AH1 (520–523m) 18/3, GI1 (1050–1055m) 17/1, HRD24 (550–555m) 5/1, SI3 (1716–1720.3m) 21/1, WA1 (640–641.5m) 11/2

Superfamily Ammodiscacea Reuss, 1862
Family Ammodiscidae Reuss, 1862
Subfamily Ammodiscinae Reuss, 1862
Genus *Ammodiscus* Reuss, 1862

Ammodiscus miocenicus Karrer, 1877
1877 *Ammodiscus miocenicus* Karrer: p. 372, pl. 16a, fig. 2.
1998 *Ammodiscus miocenicus* Cicha et al.: p. 79, pl. 2, fig. 2.
Sample: GI1 (1050–1055m) 17/1

Ammodiscus sp. 1
Sample: WA1 (500–505m) 7/4

Subfamily Ammovertellininae Saidova, 1981
Genus *Glomospira* Rzehak, 1885

Glomospira saturniformis Grzybowski, 1898
1898 *Ammodiscus charoides* Grzybowski: p. 284, pl. 10, fig. 26.
1943 *Glomospira saturniformis* Majzon: p. 155, pl. 2, fig. 9.
Sample: WA1 (640–641.5m) 11/2

Superfamily Lituolacea de Blainville, 1827
Family Haplophragmoididae Maync, 1952

Genus *Cribrostomoides* Cushman, 1910

Cribrostomoides subglobosus (M. Sars, 1869) (Pl. 1, fig. 2)

1869 *Lituola subglobosa* M. Sars: 250.

1910 *Haplophragmoides subglobosum* Cushman: p. 105, figs. 162-164.

1998 *Cribrostomoides subglobosus* Cicha et al.: p. 92, pl. 2, figs. 12-13.

Sample: GI1 (1050–1055m) 17/1

Genus *Haplophragmoides* Cushman, 1910

Haplophragmoides carinatus Cushman & Renz, 1941

1941 *Haplophragmoides carinatum* Cushman & Renz: p. 17, pl. 1, fig. 1.

1998 *Haplophragmoides carinatus* Cicha et al.: p. 106, pl. 3, figs. 1-2.

Samples: KA2 (1020–1025m) 3/4, MI1 (1373.5–1377m) 7/4

Family Lituotubidae Loeblich & Tappan, 1984
Genus *Trochamminoides* Cushman, 1910

Trochamminoides contortus Mallory, 1959

1959 *Trochamminoides contortus* Mallory: p. 110, pl. 2, fig. 1.

2012 *Trochamminoides contortus* Fregatova & Ben'yamovskiy: p. 29, pl. 1, fig. 12.

Sample: WA1 (640–641.5m) 11/2

Superfamily Loftusiacea Brady, 1884
Family Cyclamminidae Marie, 1941
Subfamily Alveolophragmiinae Saidova, 1981
Genus *Reticulophragmium* Maync, 1955

Reticulophragmium karpaticum Cicha & Zapletalová, 1963a (Pl. 1, fig. 3)

1963a *Reticulophragmium karpaticum* Cicha & Zapletalová: p. 97, textfig. 11.

1998 *Reticulophragmium karpaticum* Cicha et al.: p. 123, pl. 4, figs. 5, 61.

Samples: AH1 (370–375m) 13/3, AH1 (430–435m) 15/3, AH1 (460–465m) 16/1, AH1 (520–523m) 18/3, AH1 (610–615m) 21/2, GI1 (1050–1055m) 17/1, GI2 1084–1086.7m) 10/2

Reticulophragmium sp. 1

Sample: PWU3 (1123–1128m) 1/1

Subfamily Cyclammininae Marie, 1941
Genus *Cyclammina* Brady, 1879

Cyclammina bradyi Cushman, 1911

1911 *Cyclammina bradyi* Cushman: p. 113, textfig. 174.

1998 *Cyclammina bradyi* Cicha et al.: p. 92, pl. 4, fig. 10.

Sample: MTW1 (1480–1485m) 12/4

Cyclammina karpatica Cicha & Zapletalová, 1963a

1963a *Cyclammina karpatica* Cicha & Zapletalová: p. 108, textfig. 17.

1998 *Cyclammina karpatica* Cicha et al.: p. 92, pl. 5, figs. 6-7, 58.

Samples: HRD19 (571–576m) 3/1, HRD24 (550–555m) 5/1, HRD25 (740–745m) 10/1

Superfamily Textulariacea Ehrenberg, 1838

Family Eggerellidae Cushman, 1937

Subfamily Eggerellinae Cushman, 1937

Genus *Karreriella* Cushman, 1933

Karreriella chilostoma (Reuss, 1852)

1852 *Textularia chilostoma* Reuss: p. 18, textfigs. a-b.

1998 *Karreriella chilostoma* Cicha et al.: p. 108, pl. 9, figs. 1-3.

Samples: AH1 (190–195m) 7/4, AH1 (220–225m) 8/2, HRD25 (310–315m) 2/1

Genus *Martinottiella* Cushman, 1933

Martinottiella communis (d'Orbigny, 1826) (Pl. 1, fig. 4)

1826 *Clavulina communis* d'Orbigny: p. 102, no. 4.

1846 *Clavulina communis* d'Orbigny: p. 196, pl. 12, figs. 1-2.

1985 *Martinottiella communis* Papp & Schmid: p. 74, pl. 66, figs. 1-8.

1998 *Martinottiella communis* Cicha et al.: p. 111, pl. 9, figs. 6-7.

Samples: MTW1 (1480–1485m) 12/4, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2

Family Textulariidae Ehrenberg, 1838

Subfamily Textulariinae Ehrenberg, 1838

Genus *Paravulvulina* Cicha & Zapletalová, 1965

Paravulvulina serrata (Reuss, 1867) (Pl. 1, fig. 6)

1867 *Plecanium serratum* Reuss: p. 66, pl. 1, fig. 4.

1998 *Paravulvulina serrata* Cicha et al.: p. 116, pl. 9, fig. 9.

Sample: PO1 (520–525m) 17/2

Genus *Semivulvulina* Finlay, 1939a

Semivulvulina deperdita (d'Orbigny, 1846)

1846 *Textularia deperdita* d'Orbigny: p. 244, pl. 14, figs. 23-25.

1998 *Semivulvulina deperdita* Cicha et al.: p. 126, pl. 5, fig. 11.

Samples: MTW1 (1380–1385m) 9/1), MTW1 (1480–1485m) 12/4, PO1 (130–135m) 4/2, PO1 (520–525m) 17/2, WA1 (400–403m) 5/1

Semivulvulina pectinata (Reuss, 1850)

1850 *Textularia pectinata* Reuss: p. 381, pl. 49, figs. 2-3.

1998 *Semivulvulina pectinata* Cicha et al.: p. 126, pl. 9, figs. 10-12.

Samples: GI2 (1084–1086.7m) 10/2, HRD19 (590–595m) 4/1, HRD19 (630–635m) 6/1, HRD19 (650–656m) 7/1, HRD24 (550–555m) 5/1, HRD24 (620–624m) 6/1, HRD25 (490–495m) 4/1, HRD25 (550–557m) 5/1, KA2 (1020–1025m) 3/4, PO1 (520–525m) 17/2, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2, WA1 (500–505m) 7/4

Genus *Spirorutilus* Hofker, 1976a

Spirorutilus carinatus (d'Orbigny, 1846) (Pl. 1, fig. 7)

1846 *Textularia carinata* d'Orbigny: p. 247, pl. 14, figs. 32-34.

1965 *Spiroplectammina carinata* Cicha & Zapletalová: p. 102, pl. 1, fig. 6 ; textfigs. 1a-e.

1976a *Spirorutilus carinatus* Hofker: fig. 69.

1990 *Spirorutilus carinatus* Hottinger et al.: p. 67, pl. 1, figs. 1-7.

1998 *Spirorutilus carinatus* Cicha et al.: p. 128, pl. 5, fig. 10.

Samples: AH1 (430–435m) 15/3, GI2 (1084–1086.7m) 10/2, HRD25 (645–650m) 7/1, MisU1 (1298–1302m) 1/2, MTW1 (1480–1485m) 12/4, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2

Genus *Textularia* Defrance, 1824

Textularia gramen d'Orbigny, 1846 (Pl. 1, fig. 1)

1846 *Textularia gramen* d'Orbigny: p. 248, pl. 15, figs. 4-6.

1985 *Textularia gramen* Papp & Schmid: p. 87, pl. 81, figs. 1-3.

1998 *Textularia gramen gramen* Cicha et al.: p. 131, pl. 10, fig. 2.

Samples: AH1 (130–135m) 5/1, AH1 (160–165m) 6/2, AH1 (190–195m) 7/4, AH1 (220–225m) 8/2, AH1 (250–55m) 9/4, AH1 (280–285m) 10/2, AH1 (310–315m) 11/1, HRD19 (495–500m) 2/1, HRD19 (630–635m) 6/1, HRD25 (290–298m) 1/1, HRD25 (550–557m) 5/1, KA2 (1020–1025m) 3/4, KA2 (1140–1145m) 5/2, MTW1 (1130–1138m) 4/7, MTW1 (1380–1385m) 9/1, MTW1 (1480–1485m) 12/4, PO1 (490–495m) 16/1, PO1 (520–525m) 17/2, SI3 (400–406m) 2/2, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2, SI3 (1335–1340m)12/1, WA1 (400–403m) 5/1

Textularia gramen maxima Cicha & Zapletalová, 1965

1965 *Textularia gramen maxima* Cicha & Zapletalová: p. 115, textfigs. 10 a-d.

1998 *Textularia gramen maxima* Cicha et al.: p. 132, pl. 9, figs. 14-15.

Sample: HRD25 (645–650m) 7/1

Textularia laevigata d'Orbigny, 1826

1826 *Textularia laevigata* d'Orbigny: p. 96, no. 2.

1846 *Textularia laevigata* d'Orbigny: p. 234, pl. 14, figs. 14-16.

1998 *Textularia laevigata* Cicha et al.: p. 132, pl. 10, fig. 113.

Samples: HRD25 (290–298m) 1/1, KA2 (1020–1025m) 3/1

Textularia mariae d'Orbigny, 1846

1846 *Textularia Mariae* d'Orbigny: p. 246, pl. 14, figs. 29-31.

1998 *Textularia mariae* Cicha et al.: p. 132, pl. 9, fig. 13.

Sample: WA1 (400–403m) 5/1

Textularia pala Czjzek, 1848

1848 *Textularia pala* Czjzek: p. 148, pl. 13, figs. 25-27.

1998 *Textularia pala* Cicha et al.: p. 132, pl. 9, figs. 16-17.

Sample: PO1 (520–525m) 17/2

Subfamily Siphotextulariinae Loeblich & Tappan, 1985

Genus *Siphotextularia* Finlay, 1939a

Siphotextularia concava (Karrer, 1868)

1868 *Plecanium concavum* Karrer: p. 9, pl. 1, fig. 3.

1998 *Siphotextularia concava* Cicha et al.: p. 127, pl. 10, figs. 3-4.

Samples: MTW1 (1480–1485m) 12/4, SI3 (900–906m) 7/3

Family Pseudogaudryinidae Loeblich & Tappan, 1985
Subfamily Pseudogaudryininae Loeblich & Tappan, 1985
Genus *Pseudogaudryina* Cushman, 1936a

Pseudogaudryina mayeriana (d'Orbigny, 1846)

1846 *Textularia Mayeriana* d'Orbigny: p. 245, pl. 14, figs. 26-28.

1985 *Gaudryina mayeriana* Papp & Schmid: p. 86, pl. 79, figs. 1-4.

1998 *Pseudogaudryina mayeriana* Cicha et al.: p. 120, pl. 10, fig. 6.

Samples: HRD25 (290–298m) 1/1, KA2 (1020–1025m) 3/4

Agglutinated indet.:

Agglutinated indet. 1 HRD19 (650–656m) 7/1
Agglutinated indet. 2 MI1 (1373.5–1377m) 7/4
Agglutinated indet. 3 MisU1 (1885–1894m) 3/1
Agglutinated indet. 4 MisU1 (1885–1894m) 3/4
Agglutinated indet. 5 MTW1 (1130–1138m) 4/7
Agglutinated indet. 6 WA1 (640–641.5m) 11/2
Agglutinated indet. 7 SI3 (1716–1720.3m) 21/1
Agglutinated indet. 8 SI3 (1716–1720.3m) 21/1
Agglutinated indet. 9 HRD24 (550–555m) 5/1

Suborder Miliolina Delage & Hérouard, 1896
Superfamily Cornuspiracea Schultze, 1854
Family Cornuspiridae Schultze, 1854
Subfamily Cornuspirinae Schultze, 1854
Genus *Cornuspira* Schultze, 1854

Cornuspira plicata (Czjzek, 1848)

1848 *Operculina plicata* Czjzek: p. 146, pl. 13, figs. 12-13.

1998 *Cornuspira plicata* Cicha et al.: p. 91, pl. 11, fig. 1.

Sample: PO1 (520–525m) 17/2

Superfamily Miliolacea Ehrenberg, 1839
Family Spiroloculinidae Wiesner, 1920
Genus *Adelosina* d'Orbigny, 1826

Adelosina longirostra (d'Orbigny, 1846)

1846 *Quinqueloculina longirostra* d'Orbigny: p. 291, pl. 18, figs. 25-27.

1985 *Adelosina longirostra* Papp & Schmid: p. 100, pl. 95, figs. 9-12.

1998 *Adelosina longirostra* Cicha et al.: p. 78, pl. 12, figs. 7-8.

Samples: HRD24 (390–395m) 3/1, HRD25 (645–650m) 7/1, PO1 (130–135m) 4/2, PO1 (520–525m) 17/2, PWU3 (1123–1128m) 1/3, WA1 (400–403m) 5/1

Adelosina schreibersi (d'Orbigny, 1846)

1846 *Quinqueloculina Schreibersii* d'Orbigny: p. 296, pl. 19, figs. 22-24.

1985 *Adelosina schreibersi* Papp & Schmid: p. 103, pl. 98, figs. 6-8; pl. 99, figs. 1-5, textfig. 13.

1998 *Adelosina schreibersi* Cicha et al.: p. 78, pl. 12, figs. 9-11.

Sample: PWU3 (1123–1128m) 1/3

Genus *Spiroloculina* d'Orbigny, 1826

Spiroloculina canaliculata d'Orbigny, 1846

1846 *Spiroloculina canaliculata* d'Orbigny: p. 269, pl. 16, figs. 10-12.

1998 *Spiroloculina canaliculata* Cicha et al.: p. 127, pl. 12, figs. 12-13.

Sample: WA1 (400–403m) 5/1

Spiroloculina excavata d'Orbigny, 1846

1846 *Spiroloculina excavata* d'Orbigny: p. 271, pl. 16, figs. 19-21 (not 22-27).

1998 *Spiroloculina excavata* Cicha et al.: p. 127, pl. 12, figs. 16-17.

Samples: AH1 (130–135m) 5/1, PO1 (520–525m) 17/2, SI3 (1000–1003m) 8/2

Family Hauerinidae Schwager, 1876
Subfamily Haueininae Schwager, 1876
Genus *Cycloforina* Łuczkowska, 1972

Cycloforina badenensis (d'Orbigny, 1846)

1846 *Quinqueloculina badenensis* d'Orbigny: p. 299, pl. 20, figs. 10-12.

1952 *Miliolina badenensis*: p. 107-108.

1974 *Cycloforina badenensis* Łuczkowska: p. 73, pl. 11, fig. 5, textfig. 25.

1998 *Cycloforina badenensis* Cicha et al.: p. 92, pl. 13, figs. 10-11.

Samples: AH1 (190–195m) 7/4, HRD25 (645–650m) 7/1, PO1 (130–135m) 4/2, PO1 (520–525m) 17/2, SI3 (800–805m) 6/3, WA1 (400–403m) 5/1

Cycloforina contorta (d'Orbigny, 1846) (Pl. 1, fig. 8)

1846 *Quinqueloculina contorta* d'Orbigny: p. 298, pl. 20, figs. 4-6.

1974 *Cycloforina contorta* Łuczkowska: p. 74, pl. 11, figs. 2-3; pl. 12, fig. 3, textfig. 26.

1998a *Cycloforina contorta* Rögl: p. 141, pl. 3, figs. 3-4.

1998 *Cycloforina contorta* Cicha et al.: p. 93, pl. 14, figs. 1-3.

Samples: AH1 (190–195m) 7/4, AH1 (220–225m) 8/2, AH1 (280–285m) 10/2, AH1 (370–375m) 13/3, HRD19 (590–595m) 4/1, HRD25 (290–298m) 1/1, PO1 (130–135m) 4/2, PO1 (490–495m) 16/1, PO1 (520–525m) 17/2, WA1 (350–353m) 4/2, WA1 (400–403m) 5/1, WA1 (450–455m) 6/2

Cycloforina gracilis (Karrer, 1867)

1867 *Quinqueloculina gracilis* Karrer: p. 361, pl. 3, fig. 2.

1952 *Miliolina gracilis* Bogdanovich: p. 130, pl. 15, figs. 4a-c.

1974 *Cycloforina gracilis* Łuczkowska: p. 77, pl. 12, fig. 3, textfig. 28/1.

1998a *Cycloforina gracilis* Rögl: p. 142, pl. 3, figs. 5-6.

Samples: AH1 (190–195m) 7/4, HRD24 (775–779.5m) 9/1, HRD25 (310–315m) 2/1, HRD25 (665–670m) 8/1, KA2 (1080–1085m) 4/3, MTW1 (1380–1385m) 9/1, PO1 (520–525m) 17/2, PWU3 (1123–1128m) 1/3, WA1 (400–403m) 5/1

Cycloforina lucida (Karrer, 1868)

1868 *Quinqueloculina lucida* Karrer: p. 147, pl. 2, fig. 7.

1974 *Cycloforina lucida* Łuczkowska: p. 82, pl. 12, fig. 4, textfig. 28/2.

Sample: PO1 (520–525m) 17/2

Cycloforina nussdorfensis (d'Orbigny, 1846)

1846 *Quinqueloculina nussdorfensis* d'Orbigny: p. 295, pl. 19, figs. 13-15.

1985 *Cycloforina nussdorfensis* Papp & Schmid: p. 102, pl. 97, figs. 3-7.

Sample: PO1 (520–525m) 17/2

Cycloforina sp. 1

Sample: PO1 (130–135m) 4/2

Genus *Quinqueloculina* d'Orbigny, 1826

Quinqueloculina agglutinans d'Orbigny, 1839b

1839b *Quinqueloculina agglutinans* d'Orbigny: p. 195, pl. 2, figs. 11-13.

1977 *Quinqueloculina agglutinans* Le Calvez: p. 54, pl. 7, figs. 1-4.

1991 *Siphonaperta agglutinans* Cimerman & Langer: p. 31, pl. 25, figs. 1-3.

Samples: HRD19 (495–500m) 2/1, HRD19 (590–595m) 4/1, HRD25 (310–315m) 2/1, MTW1 (1130–1138m) 4/7, SI3 (900–906m) 7/3

Quinqueloculina akneriana d'Orbigny, 1846 (Pl. 1, fig. 9)

1846 *Quinqueloculina akneriana* d'Orbigny: p. 290, pl. 18, figs. 16-21.

1950 *Miliolina akneriana* Bogdanovich: p. 145, pl. 1, fig. 10.

1956 *Quinqueloculina akneriana* Sulimski: p. 82, pl. 4, figs. 4-8.

1998 *Quinqueloculina akneriana* Cicha et al.: p. 122, pl. 15, figs. 9-10.

Samples: AH1 (190–195m) 7/4, AH1 (220–225m) 8/2, AH1 (280–285m) 10/2, HRD25 (290–298m) 1/1, HRD25 (310–315m) 2/1, HRD25 (490–495m) 4/1, HRD25 (550–557m) 5/1, HRD25 (645–650m) 7/1, KA1 (750–755m) 13/1, PO1 (99.5–105m) 3/1, PO1 (130–135m) 4/2, PO1 (250–255m) 8/1, PO1 (490–495m) 16/1, PO1 (520–525m) 17/2, SI3 (600–604m) 4/2, SI3 (1000–1003m) 8/2, SI3 (1335–1340m) 12/1, WA1 (400–403m) 5/1

Quinqueloculina boueana d'Orbigny, 1846 (Pl. 1, fig. 14)

1846 *Quinqueloculina Boueana* d'Orbigny: p. 293, pl. 19, figs. 7-9.

1985 *Quinqueloculina boueana* Papp & Schmid: p. 101, pl. 96, figs. 8-9.

1998 *Quinqueloculina boueana* Cicha et al.: p. 122, pl. 15, fig. 13.

Samples: AH1 (220–225m) 8/2, HRD25 (290–298m) 1/1, PO1 (490–495m) 16/1, PO1 (520–525m) 17/2, SI3 (1000–1003m) 8/2

Quinqueloculina buchiana d'Orbigny, 1846

1846 *Quinqueloculina buchiana* d'Orbigny: p. 289, pl. 18, figs. 10-12.

1974 *Quinqueloculina buchiana* Łuczkowska: p. 45, pl. 4, figs. 1-4, textfig. 11, textfigs. 12-14.

1998 *Quinqueloculina buchiana* Cicha et al.: p. 122, pl. 15, figs. 11-12.

Samples: AH1 (100–105m) 4/1, AH1 (190–195m) 7/4, AH1 (220–225m) 8/2, HRD19 (650–656m) 7/1, HRD24 (256–260.5m) 2/1, KA2 (1020–1025m) 3/4, PO1 (490–495m) 16/1, PO1 (520–525m) 17/2, SI3 (1000–1003m) 8/2, WA1 (400–403m) 5/1

Quinqueloculina haidingeri d'Orbigny, 1846

1846 *Quinqueloculina Haidingerii* d'Orbigny: p. 289, pl. 18, figs. 13-15.

1952 *Sigmoilina haidingeri* Bogdanovich: p. 162, pl. 24, fig. 1.

1968 *Quinqueloculina haidingeri* Margerel: p. 41, pl. 4, figs. 9-11.

1998 *Quinqueloculina haidingeri* Cicha et al.: p. 122, pl. 16, figs. 3-4.

Samples: AH1 (190–195m) 7/4, HRD19 (571–576m) 3/1, HRD24 (550–555m) 5/1, HRD25 (490–495m) 4/1, PO1 (130–135m) 4/2, PO1 (520–525m) 17/2, WA1 (400–403m) 5/1

Quinqueloculina hauerina d'Orbigny, 1846

1846 *Quinqueloculina Hauerina* d'Orbigny: p. 286, pl. 17, figs. 25-27.

1974 *Cycloforina hauerina* Łuczkowska: p. 79, pl. 12, fig. 1, textfig. 28/5.

1998 *Quinqueloculina hauerina* Cicha et al.: p. 122, pl. 13, figs. 15-16.

Samples: AH1 (190–195m) 7/4, HRD24 (775–779.5m) 9/1, HRD25 (310–315m) 2/1, HRD25 (490–495m) 4/1, HRD25 (550–557m) 5/1, PO1 (130–135m) 4/2, PO1 (490–495m) 16/1, PO1 (520–525m) 17/2, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1

Quinqueloculina seminulum Linné, 1758

1758 *Serpula seminulum* Linné: p. 786, pl. 2, figs. 1a-c.

1826 *Quinqueloculina seminulum* d'Orbigny: p. 301, pl. x, figs. x.

1858 *Miliolina seminulum* Williamson: p. 85, pl. 7, figs. 183-185.

1991 *Quinqueloculina seminula* Cimerman & Langer: p. 38, pl. 34, figs. 9-12.

Samples: AH1 (370–375m) 13/3, AH1 (430–435m) 15/3, AH1 (520–523m) 18/3, AH1 (610–615m) 21/2, HRD19 (819–820m) 12/1, HRD25 (665–670m) 8/1, KA1 (550–555m) 9/2, KA2 (1020–1025m) 3/1, WA1 (400–403m) 5/1

Quinqueloculina triangularis d'Orbigny, 1846

1846 *Quinqueloculina triangularis* d'Orbigny: p. 288, pl. 18, figs. 7-9.

1959 Miliolina podolica Didkovskij: p. 306, textfigs. 1-3.

1968 *Quinqueloculina triangularis* Margerel: p. 16, pl. 5, figs. 21-22.

1974 *Quinqueloculina triangularis* Łuczkowska: p. 63, pl. 8, figs. 4-5, pl. 9, fig. 1, textfigs. 23-24.

Samples: AH1 (220–225m) 8/2, AH1 (280–285m) 10/2, AH1 (370–375m) 13/3, AH1 (430–435m) 15/3, HRD19 (495–500m) 2/1, HRD19 (590–595m) 4/1, KA1 (895–900m) 15/2, PO1 (460–465m) 15/1, PO1 (520–525m) 17/2, SI3 (800–805m) 6/3, WA1 (200–205m) 1/1, WA1 (400–403m) 5/1, WA1 (450–455m) 6/2

Quinqueloculina sp. 1

Sample: HRD19 (590–595m) 4/1

Quinqueloculina sp. 2

Sample: HRD19 (630–635m) 6/1

Quinqueloculina sp. 3

Sample: HRD24 (550–555m) 5/1

Quinqueloculina sp. 4

Sample: WA1 (500–505m) 7/4

Quinqueloculina sp. 5
Sample: SI3 (1000–1003m) 8/2

Quinqueloculina sp. 6
Sample: SI3 (1000–1003m) 8/2

Quinqueloculina sp. 7
Sample: PO1 (160–165m) 5/2

Subfamily Miliolinellinae Vella, 1957
Genus *Pseudotriloculina* Cherif, 1970

Pseudotriloculina consobrina (d'Orbigny, 1846) (Pl. 1, fig. 11)
1846 *Triloculina consobrina* d'Orbigny: p. 277, pl. 17, figs. 10-12.
1985 *Sinuloculina consobrina* Papp & Schmid: p. 95, pl. 88, figs. 5-10, textfig. 14/2.
1998 *Pseudotriloculina consobrina* Cicha et al.: p. 121, pl. 16, figs. 21-23.
Samples: AH1 (130–135m) 5/1, AH1 (190–195m) 7/4, HRD24 (641–645m) 7/1, HRD25 (290–298m) 1/1, PO1 (99.5–105m) 3/1, PO1 (520–525m) 17/2, SI3 (400–405m) 2/2, SI3 (900–906m) 7/3

Genus *Pyrgo* Defrance, 1824

Pyrgo simplex (d'Orbigny, 1846)
1846 *Biloculina simplex* d'Orbigny: p. 264, pl. 15, figs. 25-27.
1985 *Pyrgo simplex* Papp & Schmid: p. 89, pl. 83, figs. 1-3.
1998 *Pyrgo simplex* Cicha et al.: p. 121, pl. 17, figs. 3-4.
Samples: HRD25 (310–315m) 2/1, PO1 (520–525m) 17/2, SI3 (800–805m) 6/3

Genus *Pyrgoella* Cushman & E.M. White, 1936

Pyrgoella ventruosa (Reuss, 1867)
1867 *Biloculina ventruosa* Reuss: p. 69, pl. 1, fig. 9.
1877 *Biloculina grinzingensis* Karrer: p. 375, pl. 16a, fig. 8.
1974 *Pyrgoella ventruosa* Łuczkowska: p. 122, pl. 21, figs. 1-3, textfig. 39/3.
Sample: PO1 (520–525m) 17/2

Genus *Triloculina* d'Orbigny, 1826

Triloculina eggeri (Bogdanovich, 1952)
1952 *Miliolina austriaca* (d'Orbigny) var. *eggeri* Bogdanovich: p. 98, pl. 5, fig. 8.
1974 *Triloculina eggeri* Łuczkowska: p. 133, pl. 24, figs. 1-2, textfig. 45.
1998a *Triloculina eggeri* Rögl: p. 150, pl. 3, figs. 1-2.
Sample: PO1 (520–525m) 17/2

Triloculina gibba d'Orbigny, 1826
1826 *Triloculina gibba* d'Orbigny: p. 133, no. 3.
1974 *Triloculina gibba* Łuczkowska: p. 134, pl. 23, fig. 2.
1998 *Triloculina gibba* Cicha et al.: p. 132, pl. 17, figs. 6-8.

Samples: AH1 (190–195m) 7/4, AH1 (220–225m) 8/2, AH1 (280–285m) 10/2, HRD25 (290–298m) 1/1, MTW1 (1130–1138m) 4/7, PO1 (99.5–105m) 3/1, PO1 (520–525m) 17/2, SI3 (800–805m) 6/3, WA1 (450–455m) 6/2

Triloculina inflata d'Orbigny, 1846

1846 *Triloculina inflata* d'Orbigny: p. 278, pl. 17, figs. 13-15.

1985 *Triloculina inflata* Papp & Schmid: p. 95, pl. 89, figs. 1-3.

1998 *Triloculina inflata* Cicha et al.: p. 132, pl. 17, figs. 9-10.

Samples: AH1 (130–135m) 5/1, AH1 (190–195m) 7/4, AH1 (250–255m) 9/4, HRD19 (495–500m) 2/1, HRD24 (641–645m) 7/1, HRD25 (290–298m) 1/1, HRD25 (310–315m) 2/1, HRD25 (550–557m) 5/1, WA1 (350–353m) 4/2, WA1 (400–403m) 5/1

Triloculina scapha d'Orbigny, 1846

1846 *Triloculina scapha* d'Orbigny: p. 276, pl. 17, figs. 4-6.

1985 *Triloculina scapha* Papp & Schmid: p. 94, pl. 87, figs. 1-7.

Sample: SI3 (800–805m) 6/3

Subfamily Sigmoilinitinae Łuczkowska, 1974

Genus *Sigmoilinita* Seiglie, 1965

Sigmoilinita tenuis (Czjzek, 1848) (Pl. 1, fig. 12)

1848 *Quinqueloculina tenuis* Czjzek: p. 149, pl. 13, figs. 31-34.

1951 *Sigmoilina tenuis* Marks: p. 39, pl. 5, fig. 7.

1965 *Sigmoilinita tenuis* Seiglie: p. 72.

1998 *Sigmoilinita tenuis* Cicha et al.: p. 126, pl. 17, figs. 15-16.

Samples: AH1 (220–225m) 8/2, AH1 (430–435m) 15/3, GI1 (1050–1055m) 17/1, HRD24 (550–555m) 5/1, HRD25 (490–495m) 4/1, HRD25 (550–557m) 5/1, HRD24 (620–624m) 6/1, MTW1 (1130–1138m) 4/7, MTW1 (1380–1385m) 9/1, SI3 (900–906m) 7/3, WA1 (400–403m) 5/1

Sigmoilinita tschokrakensis Gerke, 1938

1938 *Sigmoilina tschokrakensis* Gerke: p. 308, pl. 3, figs. 1-18.

1952 *Sigmoilina tschokrakensis* Bogdanovich: p. 161, pl. 23, figs. 6-7.

1974 *Sigmoilinita tschokrakensis* Łuczkowska: p. 150, pl. 16, figs. 8-9.

Samples: HRD19 (590–595m) 4/1, HRD19 (630–635m) 6/1, HRD19 (650–656m) 7/1

Subfamily Sigmoilopsinae Vella, 1957

Genus *Sigmoilopsis* Finlay, 1947

Sigmoilopsis celata (Costa, 1855)

1855 *Spiroloculina celata* Costa: p. 126, pl. 1, fig. 14.

1959 *Sigmoilina celata* Dieci: p. 24, pl. 1, fig. 19.

1969b *Sigmoilopsis celata* Rögl: p. 72, pl. 1, fig. 9.

Sample: HRD24 (620–624m) 6/1

Sigmoilopsis foeda (Reuss, 1850) (Pl. 1, fig. 13)

1850 *Quinqueloculina foeda* Reuss: p. 384, pl. 50, figs. 5-6.

1974 *Sigmoilopsis foeda* Łuczkowska: p. 99, pl. 15, figs. 1-4, textfig. 34/5-9.

1986 *Sigmoilopsis foeda* Rupp: p. 67, pl. 36, fig. 1.

Samples: AH1 (220–225m) 8/2, HRD24 (550–555m) 5/1, HRD25 (290–298m) 1/1, HRD25 (310–315m) 2/1, PO1 (490–495m) 16/1, PO1 (520–525m) 17/2, WA1 (400–403m) 5/1

Sigmoilopsis schlumbergeri (Silvestri, 1904)

1904 *Sigmoilina schlumbergeri* Silvestri: p. 276, pl. 17, figs. 4-6.

1951 *Sigmoilina schlumbergeri* Phleger & Parker: p. 8, pl. 4, fig. 6.

1991 *Sigmoilopsis schlumbergeri* Cimerman & Langer: p. 48, pl. 46, figs. 10-14.

2013 *Sigmoilopsis schlumbergeri* Holbourn et al.: p. 506, figs. 1-2.

Samples: AH1 (220–225m) 8/2, HRD19 (630–635m) 6/1, HRD25 (290–298m) 1/1, HRD25 (490–495m) 4/1, HRD25 (550–557m) 5/1, HRD25 (645–650m) 7/1

Sigmoilopsis sp. 1

Sample: PWU3 (1123–1128m) 1/3

Superfamily Alveolinacea Ehrenberg, 1839
Family Alveolinidae Ehrenberg, 1839
Genus *Borelis* de Montfort, 1808

Borelis melo (Fichtel & Moll, 1798) (Pl. 1, fig. 10)

1798 *Nautilus melo* var. α Fichtel & Moll: p. 118, pl. 24, figs. a-f.

1846 *Alveolina melo* d'Orbigny: p. 147, pl. 7, figs. 15-16.

1984 *Borelis melo* Rögl & Hansen: p. 71, pl. 29, figs. 5-6; pl. 30, figs. 1-4.

1998 *Borelis melo melo* Cicha et al.: p. 86, pl. 19, figs. 10, 13, 15 ; pl. 20, figs. 1-2.

Samples: AH1 (190–195m) 7/4, AH1 (220–225m) 8/2, HRD19 (400–405m) 1/2, HRD19 (571–576m) 3/1, HRD24 (390–395m) 3/1, HRD24 (641–645m) 7/1, PO1 (520–525m) 17/2, SI3 (800–805m) 6/3

Borelis melo haueri (d'Orbigny, 1846)

1846 *Alveolina Haueri* d'Orbigny: p. 148, pl. 7, figs. 17-18.

1998 *Borelis melo haueri* Cicha et al.: p. 86, pl. 19, figs. 11-12.

Sample: PO1 (520–525m) 17/2

Superfamily Soritacea Ehrenberg, 1839
Family Peneroplidae Schultze, 1854
Genus *Spirolina* Lamarck, 1804a

Spirolina austriaca d'Orbigny, 1846 (Pl. 1, fig. 15)

1846 *Spirolina austriaca* d'Orbigny: p. 137, pl. 7, figs. 7-9.

1985 *Spirolina austriaca* Papp & Schmid: p. 54, pl. 45, figs. 1-5.

1998 *Spirolina austriaca* Cicha et al.: p. 127, pl. 20, figs. 5-7.

Samples: AH1 (190–195m) 7/4, AH1 (430–435m) 15/3, PO1 (99.5–105m) 3/1, PO1 (280–285m) 9/1, PO1 (520–525m) 17/2

Spirolina sp. 1

Sample: HRD24 (641–645m) 7/1

Miliolidae indet.:

Miliolidae indet. 1	HRD19 (650–656m) 7/1
Miliolidae indet. 2	MTW1 (1380–1385m) 9/1
Miliolidae indet. 3	MTW1 (1380–1385m) 9/1
Miliolidae indet. 4	KA2 (1140–1145m) 5/2
Miliolidae indet. 5	WA1 (400–403m) 5/1
Miliolidae indet. 6	SI3 (800–805m) 6/3
Miliolidae indet. 7	SI3 (1485–1490m) 15/2
Miliolidae indet. 8	AH1 (100–105m) 4/1
Miliolidae indet. 9	PO1 (520–525m) 17/2

Suborder Lagenina Delage & Hérouard, 1896
Superfamily Nodosariacea Ehrenberg, 1838
Family Nodosariidae Ehrenberg, 1838
Subfamily Nodosariinae Ehrenberg, 1838
Genus *Dentalina* Risso, 1826

Dentalina acuta d'Orbigny, 1846

1846 *Dentalina acuta* d'Orbigny: p. 56, pl. 2, figs. 40-43.

1998 *Dentalina acuta* Cicha et al.: p. 93, pl. 21, fig. 2.

Sample: AH1 (190–195m) 7/4

Dentalina sp. 1

Sample: SI3 (1000–1003m) 8/2

Genus *Grigelis* Mikhalevich, 1981

Grigelis pyrula (d'Orbigny, 1826)

1826 *Nodosaria pyrula* d'Orbigny: p. 253, no. 13.

1846 *Nodosaria semirugosa* d'Orbigny: p. 34, pl. 1, figs. 20-23.

1998 *Grigelis pyrula* Cicha et al.: p. 105, pl. 21, fig. 9.

Samples: AH1 (130–135m) 5/1, MTW1 (1380–1385m) 9/1, PO1 (130–135m) 4/2

Genus *Laevidentalina* Loeblich & Tappan, 1986

Laevidentalina boueana (d'Orbigny, 1846) (Pl. 1, fig. 16)

1846 *Dentalina Boueana* d'Orbigny: p. 47, pl. 2, figs. 4-6.

1998 *Laevidentalina boueana* Cicha et al.: p. 109, pl. 21, fig. 8.

Samples: AH1 (280–285m) 10/2, AH1 (430–435m) 15/3, GI1 (1050–1055m) 17/1, HRD25 (290–298m) 1/1, HRD25 (310–315m) 2/1, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2

Laevidentalina communis (d'Orbigny, 1826)

1826 *Dentalina communis* d'Orbigny: p. 254, no. 35.

1998 *Laevidentalina communis* Cicha et al.: p. 109, pl. 21, fig. 3.

Samples: AH1 (130–135m) 5/1, SI3 (500–505m) 3/1

Laevidentalina elegans (d'Orbigny, 1846)

1846 *Dentalina elegans* d'Orbigny: p. 45, pl. 1, figs. 52-56.

1998 *Laevidentalina elegans* Cicha et al.: p. 109, pl. 21, figs. 6-7.

Samples: AH1 (220–225m) 8/2, AH1 (310–315m) 11/1, PO1 (40–45m) 1/1, PO1 (99.5–105m) 3/1, PO1 (130–135m) 4/2, PO1 (520–525m) 17/2, SI3 (500–505m) 3/1

Laevidentalina inornata (d'Orbigny, 1846)

1846 *Dentalina inornata* d'Orbigny: p. 44, pl. 1, figs. 50-51.

1985 *Dentalina inornata* Papp & Schmid: p. 28, pl. 9, figs. 5-8.

1998a *Laevidentalina inornata* Rögl: p. 147, pl. 3, fig. 7.

Sample: HRD19 (630–635m) 6/1

Laevidentalina scripta (d'Orbigny, 1846)

1846 *Dentalina scripta* d'Orbigny: p. 51, pl. 2, figs. 21-23.

1985 *Dentalina scripta* Papp & Schmid: p. 31, pl. 15, figs. 1-4.

1998a *Laevidentalina scripta* Rögl: p. 147, pl. 3, fig. 9.

Samples: AH1 (160–165m) 6/2, HRD19 (590–595m) 4/1, HRD25 (290–298m) 1/1, HRD19 (630–635m) 6/1, SI3 (1716–1720.3m) 21/1, WA1 (400–403m) 5/1

Laevidentalina sp. 1

Sample: HRD24 (550–555m) 5/1

Genus *Nodosaria* Lamarck, 1812

Nodosaria sp. 1

Sample: MTW1 (1380–1385m) 9/1

Nodosaria sp. 2

Sample: SI3 (500–505m) 3/1

Nodosaria sp. 3

Sample: AH1 (280–285m) 10/2

Genus *Neugeborina* Popescu, 1998

Neugeborina irregularis (d'Orbigny, 1846)

1846 *Nodosaria irregularis* d'Orbigny: p. 32, pl. 1, figs. 13-14.

1985 *Nodosaria irregularis* Papp & Schmid: p. 23, pl. 3, figs. 6-9; pl. 4, fig. 1.

2003 *Neugeborina irregularis* Rögl & Spezzaferri: p. 48, pl. 6, figs. 5-6.

Samples: AH1 (310–315m) 11/1, PO1 (40–45m) 1/1, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2, PO1 (250–255m) 8/1, PO1 (520–525m) 17/2, SI3 (1000–1003m) 8/2

Neugeborina longiscata (d'Orbigny, 1846)

1846 *Nodosaria longiscata* d'Orbigny: p. 32, pl. 1, figs. 10-12.

1985 *Nodosaria longiscata* Papp & Schmid: p. 23, pl. 3, figs. 1-5.

1998 *Neugeborina longiscata* Cicha et al.: p. 113, pl. 21, fig. 12.

2003 *Neugeborina longiscata* Rögl & Spezzaferri: p. 49, pl. 6, fig. 4.

Samples: AH1 (130–135m) 5/1, HRD25 (310–315m) 2/1, PO1 (40–45m) 1/1, SI3 (400–405m) 2/2

Genus *Pseudonodosaria* Boomgaart, 1949

Pseudonodosaria brevis (d'Orbigny, 1846)

1846 *Dentalina brevis* d'Orbigny: p. 48, pl. 2, figs. 9-10.

1985 *Dentalina brevis* Papp & Schmid: p. 30, pl. 12, figs. 8-11.

1998 *Pseudonodosaria brevis* Cicha et al.: p. 121, pl. 21, figs. 15-16.

Samples: AH1 (250–255m) 9/4, SI3 (1000–1003m) 8/2

Subfamily Plectofrondiculariinae Cushman, 1927

Genus *Plectofrondicularia* Liebus, 1902

Plectofrondicularia digitalis (Neugeboren, 1850) (Pl. 1, fig. 17)

1850 *Frondicularia digitalis* Neugeboren: p. 121, pl. 3, fig. 4.

1987 *Plectofrondicularis digitalis* Wenger: p. 261, pl. 5, figs. 13-14.

1998 *Plectofrondicularis digitalis* Cicha et al.: p. 118, pl. 22, figs. 11-12.

Samples: AH1 (130–135m) 5/1, SI3 (900–906m) 7/3

Plectofrondicularia raricosta (Karrer, 1877)

1877 *Frondicularia raricosta* Karrer: p. 381, pl. 16b, fig. 28.

1939/1940 *Plectofrondicularis raricosta* Liebus: p. 24, textfig. 1.

1969b *Plectofrondicularis raricosta* Rögl: p. 77, pl. 2, figs. 11-12.

Samples: AH1 (130–135m) 5/1, SI3 (900–906m) 7/3

Plectofrondicularia striata (Hantken, 1875)

1875 *Flabellina striata* Hantken: p. 36, pl. 13, fig. 13.

1998 *Plectofrondicularis striata* Cicha et al.: p. 118, pl. 22, fig. 9.

Sample: SI3 (900–906m) 7/3

Genus *Amphimorphina* Neugeboren, 1850

Amphimorphina haueriana Neugeboren, 1850

1850 *Amphimorphina haueriana* Neugeboren: p. 127, pl. 4, figs. 13-14.

1998 *Amphimorphina haueriana* Cicha et al.: p. 80, pl. 22, figs. 6-8.

Samples: AH1 (130–135m) 5/1, AH1 (160–165m) 6/2, AH1 (250–255m) 9/4, PO1 (40–45m) 1/1, PO1 (130–135m) 4/2, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2

Family Vaginulinidae Reuss, 1860

Subfamily Lenticulininae Chapman, Parr & Collins, 1934

Genus *Lenticulina* Lamarck, 1804b

Lenticulina americana (Cushman, 1918)

1918 *Cristellaria americana* Cushman: p. 50, pl. 10, figs. 5-6.

1978 *Lenticulina americana* Molčíková: p. 129, pl. 1, fig. 1, textfig. 2.

2003 *Lenticulina americana* Rögl & Spezzaferri: p. 47, pl. 3, fig. 1.

Sample: SI3 (900–906m) 7/3

Lenticulina austriaca (d'Orbigny, 1846)

1846 *Robulina austriaca* d'Orbigny: p. 103, pl. 5, figs. 1-2.

1985 *Lenticulina inornata* Papp & Schmid: p. 44, pl. 32, figs. 5-8.

2003 *Lenticulina austriaca* Rögl & Spezzaferri: p. 47, pl. 3, figs. 2,4.

Samples: HRD24 (550–555m) 5/1, HRD24 (620–624m) 6/1, HRD25 (490–495m) 4/1, HRD25 (550–557m) 5/1, HRD25 (645–650m) 7/1, PO1 (40–45m) 1/1, PO1 (160–165m) 5/2, PO1 (520–525m) 17/2, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2, WA1 (450–455m) 6/2

Lenticulina cultrata (de Montfort, 1808)

1808 *Robulus cultratus* de Montfort: p. 214 (fide Ellis & Messina).

1846 *Robulina cultrata* d'Orbigny: p. 96, pl. 4, figs. 10-13.

1985 *Lenticulina cultrata* Papp & Schmid: p. 41, pl. 28, figs. 4-7.

Samples: SI3 (1000–1003m) 8/2, WA1 (400–403m) 5/1

Lenticulina inornata (d'Orbigny, 1846) (Pl. 2, fig. 2)

1846 *Robulina inornata* d'Orbigny: p. 102, pl. 4, figs. 25-26.

1985 *Lenticulina inornata* Papp & Schmid: p. 43, pl. 31, figs. 6-8.

1998 *Lenticulina inornata* Cicha et al.: p. 110, pl. 23, fig. 1.

Samples: AH1 (250–255m) 9/4, AH1 (280–285m) 10/2, AH1 (370–375m) 13/3, GI2 (1084–1086.7m) 10/2, HRD19 (571–576m) 3/1, HRD19 (590–595m) 4/1, HRD19 (630–635m) 6/1, HRD19 (650–656m) 7/1, HRD19 (819–820m) 12/1, HRD24 (550–555m) 5/1, HRD24 (620–624m) 6/1, HRD24 (775–779.5m) 9/1, HRD25 (665–670m) 8/1, HRD25 (740–745m) 10/1, MTW1 (1380–1385m) 9/1, PO1 (520–525m) 17/2, PWU3 (1123–1128m) 1/3, SI3 (900–906m) 7/3, WA1 (450–455m) 6/2, WA1 (500–505m) 7/4

Lenticulina melvilli (Cushman & Renz, 1941)

1941 *Robulus melvilli* Cushman & Renz: p. 12, pl. 2, fig. 12.

1998 *Lenticulina melvilli* Cicha et al.: p. 110, pl. 23, figs. 10-11.

Samples: AH1 (310–315m) 11/1, HRD19 (495–500m) 2/1, HRD19 (571–576m) 3/1, HRD19 (630–635m) 6/1, HRD19 (650–656m) 7/1, HRD25 (490–495m) 4/1

Lenticulina orbicularis (d'Orbigny, 1826)

1826 *Robulina orbicularis* d'Orbigny: p. 277, pl. 15, figs. 8-9.

1991 *Lenticulina orbicularis* Cimerman & Langer: p. 51, pl. 53, fig. 12.

1994 *Lenticulina orbicularis* Jones: p. 81, pl. 69, fig. 17.

Samples: AH1 (280–285m) 10/2, AH1 (310–315m) 11/1, AH1 (370–375m) 13/3, AH1 (430–435m) 15/3, PO1 (99.5–105m) 3/1, PO1 (130–135m) 4/2, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2

Lenticulina spinosa (Cushman, 1918)

1918 *Cristellaria americana* var. *spinosa* Cushman: p. 51, pl. 10, fig. 7.

1978 *Lenticulina americana spinosa* Molčíková: p. 129, pl. 1, fig. 2, textfig. 3.

2003 *Lenticulina spinosa* Rögl & Spezzaferri: p. 48, pl. 3, fig. 34.

Samples: SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2

Lenticulina vortex (Fichtel & Moll, 1798)

1798 *Nautilus vortex* Fichtel & Moll: p. 33, pl. 2, figs. d-i.

1846 *Robulina imperatoria* d'Orbigny: p. 104, pl. 5, figs. 5-6.

1984 *Lenticulina vortex* Rögl & Hansen: p. 30, pl. 2, figs. 3-4, textfig. 8.

1998 *Lenticulina vortex* Cicha et al.: p. 110, pl. 23, fig. 2.

Sample: SI3 (1000–1003m) 8/2

Lenticulina sp. 1

Sample: MTW1 (1130–1138m) 4/7

Lenticulina sp. 2

Sample: SI3 (900–906m) 7/3

Lenticulina sp. 3

Sample: SI3 (1000–1003m) 8/2

Subfamily Marginulininae Wedekind, 1937

Genus *Amphicoryna* Schlumberger, 1881

Amphicoryna badenensis (d'Orbigny, 1846) (Pl. 1, fig. 18)

1846 *Nodosaria badenensis* d'Orbigny: p. 38, pl. 1, figs. 34-35.

1998a *Amphicoryna badenensis* Rögl: p. 136, pl. 3, fig. 8.

2003 *Amphicoryna badenensis* Rögl & Spezzaferri: p. 44, pl. 4, figs. 1-6; pl. 9, fig. 2.

Samples: PO1 (40–45m) 1/1, PO1 (130–135m) 4/2, PO1 (460–465m) 15/1, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2, WA1 (450–455m) 6/2

Amphicoryna hispida (d'Orbigny, 1846)

1846 *Nodosaria hispida* d'Orbigny: p. 35, pl. 1, figs. 24-25.

1846 *Dentalina floscula* d'Orbigny: p. 50, pl. 2, figs. 16-17.

1985 *Nodosaria hispida* Papp & Schmid: p. 25, pl. 5, figs. 1-8.

2003 *Amphicoryna hispida* Rögl & Spezzaferri: p. 44, pl. 4, figs. 7-11; pl. 9, fig. 3.

Samples: AH1 (130–135m) 5/1, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (1335–1340m) 12/1, WA1 (200–205m) 1/1

Amphicoryna ottnangensis (Toula, 1914)

1914 *Nodosaria ottnangensis* Toula: p. 105, fig. 1.

1998 *Amphicoryna ottnangensis* Cicha et al.: p. 80, pl. 25, figs. 5-6.

Samples: MTW1 (1380–1385m) 9/1, MTW1 (1480–1485m) 12/4

Genus *Marginulina* d'Orbigny, 1826

Marginulina hirsuta d'Orbigny, 1826

1826 *Marginulina hirsuta* d'Orbigny: p. 259, no. 5.

1846 *Marginulina hirsuta* d'Orbigny: p. 69, pl. 3, figs. 17-18.

1998 *Marginulina hirsuta* Cicha et al.: p. 111, pl. 25, figs. 13-14.

Samples: AH1 (280–285m) 10/2, AH1 (310–315m) 11/1

Genus *Vaginulinopsis* Silvestri, 1904

Vaginulinopsis hauerina (d'Orbigny, 1846)

1846 *Cristellaria Hauerina* d'Orbigny: p. 84, pl. 3, figs. 24-25.

1985 *Vaginulinopsis hauerina* Papp & Schmid: p. 38, pl. 23, figs. 1-5.

1998 *Vaginulinopsis hauerina* Cicha et al.: p. 135, pl. 25, fig. 15.

Samples: AH1 (250–255m) 9/4, HRD25 (550–557m) 5/1, WA1 (500–505m) 7/4

Subfamily Vaginulininae Reuss, 1860
Genus *Planularia* Defrance, 1826

Planularia kubinyi (Hantken, 1875)

1875 *Robulina Kubinyi* Hantken: p. 56, pl. 6, fig. 7.

1998 *Planularia kubinyi* Cicha et al.: p. 118, pl. 26, figs. 8-9.

Sample: AH1 (310–315m) 11/1

Family Lagenidae Reuss, 1862
Genus *Hyalinonetrion* Patterson & Richardson, 1988

Hyalinonetrion clavatum (d'Orbigny, 1846)

1846 *Oolina clavata* d'Orbigny: p. 24, pl. 1, figs. 2-3.

1985 *Lagena clavata* Papp & Schmid: p. 21, pl. 1, figs. 6-9.

1998 *Hyalinonetrion clavatum* Cicha et al.: p. 108, pl. 27, fig. 6.

Samples: AH1 (130–135m) 5/1, AH1 (160–165m) 6/2, GI2 (1084–1086.7m) 10/2, SI3 (400–405m) 2/2, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2

Genus *Lagena* Walker & Jacob, 1798

Lagena gracilicosta Reuss, 1863 (Pl. 1, fig. 28)

1863 *Lagena gracilicosta* Reuss: p. 327, pl. 3, figs. 42-43.

1998 *Lagena gracilicosta* Cicha et al.: p. 109, pl. 27, figs. 3-4.

Samples: MTW1 (1130–1138m) 4/7, PO1 (40–45m) 1/1, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1

Lagena haidingeri (Czjzek, 1848)

1848 *Oolina haidingeri* Czjzek: p. 138, pl. 12, figs. 1-2.

1969a *Lagena haidingeri* Rögl: p. 216, pl. 1, fig. 1.

2004 *Lagena haidingeri* Popescu & Crihan: p. 405, pl. 1, fig. 11

Samples: HRD19 (495–500m) 2/1, HRD24 (550–555m) 5/1

Lagena striata (d'Orbigny, 1839a)

1839a *Oolina striata* d'Orbigny: p. 21, pl. 5, figs. 77,79.

1983 *Lagena striata* Popescu: p. 265, pl. 2, figs. 7-9; pl. 7, fig. 5.

1998a *Lagena striata* Rögl: p. 147, pl. 3, fig. 13.

Samples: HRD24 (550–555m) 5/1, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (900–906m) 7/3, WA1 (300–305m) 3/1

Lagena sp. 1
Sample: SI3 (400–405m) 2/2

Lagena sp. 2
Sample: AH1 (280–285m) 10/2

Genus *Pygmaeoseistron* Patterson & Richardson, 1988

Pygmaeoseistron hispidum (Reuss, 1862)
1862 *Lagena hispida* Reuss: p. 335, pl. 6, figs. 77, 79.
1998 *Pygmaeoseistron hispidum* Cicha et al.: p. 121, pl. 27, figs. 1-2.
Samples: HRD19 (590–595m) 4/1, PO1 (99.5–105m) 3/1, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (1000–1003m) 8/2

Family Polymorphinidae d'Orbigny, 1839b
Subfamily Polymorphininae d'Orbigny, 1839b
Genus *Globulina* d'Orbigny, 1839b

Globulina gibba d'Orbigny, 1846
1846 *Globulina gibba* d'Orbigny: p. 227, pl. 13, figs. 13-14.
1985 *Globulina gibba* Papp & Schmid: p. 79, pl. 71, figs. 9-12.
1998a *Globulina gibba* Rögl: p. 146, pl. 3, figs. 17-18.
Samples: AH1 (190–195m) 7/4, HRD24 (620–624m) 6/1, HRD24 (775–779.5m) 9/1, KA2 (1020–1025m) 3/4, MTW1 (1130–1138m) 4/2, MTW1 (1380–1385m) 9/1, PO1 (40–45m) 1/1, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2, PO1 (520–525m) 17/2, SI3 (500–505m) 3/1, SI3 (1335–1340m) 12/1, WA1 (500–505m) 7/4

Globulina punctata d'Orbigny, 1846 (Pl. 1, fig. 29)
1846 *Globulina punctata* d'Orbigny: p. 229, pl. 13, figs. 17-18.
1985 *Globulina punctata* Papp & Schmid: p. 80, pl. 72, figs. 4-5.
Samples: AH1 (160–165m) 6/2, KA2 (1140–1145m) 5/2, MTW1 (1130–1138m) 4/2, MisU1 (1885–1894m) 3/4, PO1 (520–525m) 17/2, SI3 (1250–1255m) 11/1, SI3 (1335–1340m) 12/1

Globulina striata (Egger, 1857)
1857 *Polymorphina* (*Globulina*) *striata* Egger: p. 291, pl. 14, figs. 3-4.
1987 *Globulina striata* Wenger: p. 263, pl. 5, figs. 23-24.
1998a *Globulina striata* Rögl: p. 146, pl. 3, fig. 91.
Samples: AH1 (190–195m) 7/4, HRD24 (620–624m) 6/1, MTW1 (1130–1138m) 4/7, MTW1 (1480–1485m) 12/4

Globulina sp. 1
Sample: MTW1 (1380–1385m) 9/1

Genus *Guttulina* d'Orbigny, 1839b

Guttulina austriaca d'Orbigny, 1846
1846 *Guttulina austriaca* d'Orbigny: p. 223, pl. 12, figs. 23-25.

1985 *Guttulina austriaca* Papp & Schmid: p. 78, pl. 69, figs. 10-13; pl. 70, fig. 1.

Sample: PO1 (520–525m) 17/2

Guttulina communis (d'Orbigny, 1826) (Pl. 2, fig. 1)

1826 *Polymorphina* (Les Guttulines) *striata* d'Orbigny: p. 265, no. 15.

1846 *Guttulina communis* d'Orbigny: p. 224, pl. 13, figs. 6-8.

1998 *Guttulina communis* Cicha et al.: p. 105, pl. 28, figs. 2-3.

Samples: AH1 (130–135m) 5/1, HRD24 (620–624m) 6/1, PO1 (520–525m) 17/2

Family Ellipsolagenidae A. Silvestri, 1923

Subfamily Oolininae Loeblich & Tappan, 1961

Genus *Favulina* Patterson & Richardson, 1988

Favulina geometrica (Reuss, 1863)

1863 *Lagena geometrica* Reuss: p. 334, pl. 5, fig. 74.

1983 *Oolina* cf. *geometrica* Popescu: p. 267, pl. 8, figs. 1-3.

1998a *Favulina geometrica* Rögl: p. 144, pl. 3, fig. 12.

Sample: KA1 (500–506m) 8/1

Favulina hexagona (Williamson, 1848)

1848 *Entosolenia squamosa* (Montagu) var. *hexagona* Williamson: p. 20, pl. 2, fig. 23.

1998 *Favulina hexagona* Cicha et al.: p. 96, pl. 28, fig. 11.

Samples: AH1 (160–165m) 6/2, MTW1 (1380–1385m) 9/1, SI3 (400–405m) 2/2

Subfamily Ellipsolageninae A. Silvestri, 1923

Genus *Fissurina* Reuss, 1850

Fissurina laevigata Reuss, 1850

1850 *Fissurina laevigata* Reuss: p. 366, pl. 46, fig. 1.

1987 *Fissurina laevigata* Wenger: p. 284, pl. 10, figs. 9-10.

1994 *Fissurina laevigata* Jones: p. 113, pl. 114, fig. 8.

Samples: SI3 (500–505m) 3/1, WA1 (300–305m) 3/1, WA1 (400–403m) 5/1

Fissurina marginata (Montagu, 1803)

1803 *Vermiculum marginatum* Montagu: p. 2, pl. 1, fig. 7.

1953 *Fissurina* cf. *marginata* Loeblich & Tappan: p. 77, pl. 14, figs. 6-9; pl. 7, fig. 5.

2002 *Fissurina marginata* Hanagata: p. 167, pl. 10, fig. 9.

Sample: SI3 (400–405m) 2/2

Subfamily Parafissurininae J.W. Jones, 1984

Genus *Parafissurina* Parr, 1947

Parafissurina carinata (Buchner, 1940)

1940 *Lagena lateralis* Cushman forma *carinata* Buchner: p. 521, pl. 23, figs. 499-500.

1983 *Parafissurina carinata* Popescu: p. 274, pl. 10, figs. 14-16.

2003 *Pseudosolenia lateralis carinata* Buchner – Rögl & Spezzaferri: p. 58, pl. 4, figs. 25-26.

Samples: HRD24 (620–624m) 6/1, SI3 (1250–1255m) 11/1

Family Glandulinidae Reuss, 1860
Subfamily Glandulininae Reuss, 1860
Genus *Glandulina* d'Orbigny, 1839b

Glandulina ovula d'Orbigny, 1846

1846 *Glandulina ovula* d'Orbigny: p. 29, pl. 1, figs. 6-7.

1998 *Glandulina ovula* Cicha et al.: p. 98, pl. 29, fig. 6.

Samples: AH1 (160–165m) 6/2, AH1 (280–285m) 10/2, HRD25 (290–298m) 1/1, PO1 (520–525m) 17/2, WA1 (400–403m) 5/1

Suborder Robertinina Loeblich & Tappan, 1984
Superfamily Ceratobuliminacea Cushman, 1927
Family Ceratobuliminidae Cushman, 1927
Subfamily Ceratobuliminae Cushman, 1927
Genus *Ceratocancris* Finlay, 1939b

Ceratocancris haueri (d'Orbigny, 1846)

1846 *Rotalina Hauerii* d'Orbigny: p. 151, pl. 7, figs. 22-24.

1985 *Ceratocancris haueri* Papp & Schmid: p. 58, pl. 48, figs. 1-6.

1998 *Ceratocancris haueri* Cicha et al.: p. 89, pl. 29, figs. 14-16.

Samples: AH1 (160–165m) 6/2, AH1 (280–285m) 10/2, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2, WA1 (500–505m) 7/4

Family Epistominidae Wedekind, 1937
Subfamily Epistomininae Wedekind, 1937
Genus *Hoeglundina* Brotzen, 1948

Hoeglundina elegans (d'Orbigny, 1826)

1826 *Rotalia* (Turbinuline) *elegans* d'Orbigny: p. 176, no. 54.

1846 *Rotalina Partschiana* d'Orbigny: p. 153, pl. 7, figs. 28-30.

1985 *Hoeglundina elegans* Papp & Schmid: p. 59, pl. 49, figs. 1-6.

1998 *Hoeglundina elegans* Cicha et al.: p. 108, pl. 29, figs. 19-21.

Samples: HRD25 (290–298m) 1/1, KA1 (750–755m) 13/1, KA2 (1020–1025m) 3/1, PO1 (40–45m) 1/1, SI3 (400–405m) 2/2, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2, WA1 (400–403m) 5/1

Suborder Globigerinina Delage & Hérouard, 1896
Superfamily Globorotaliacea Cushman, 1927
Family Globorotaliidae Cushman, 1927
Genus *Globorotalia* Cushman, 1927

Globorotalia bykovae Aisenstat, 1960

1960 *Turborotalia bykovae* Aisenstat in Subbotina et al.: p. 69, pl. 13, fig. 7a-c.

1998 *Globorotalia* (*Obandyella*) *bykovae* Cicha et al.: p. 104, pl. 39, figs. 33-35.

Samples: AH1 (100–105m) 4/1, AH1 (130–135m) 5/1, AH1 (160–165m) 6/2, AH1 (280–285m) 10/2, AH1 (370–375m) 13/3, PO1 (40–45m) 1/1, PO1 (99.5–105m) 3/1, PO1 (130–135m) 4/2, PO1 (250–255m) 8/1, PO1 (280–285m) 9/1, PO1 (490–495m) 16/1, PO1 (520–525m) 17/2, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2

Globorotalia peripheroronda Blow & Banner, 1966

1966 *Globorotalia* (*Turborotalia*) *peripheroronda* Blow & Banner: p. 294, pl. 1, fig. 1.

1998 *Globorotalia* (*Fohsella*) *peripheroronda* Cicha et al.: p. 103, pl. 39, figs. 27-29.

Samples: AH1 (130–135m) 5/1, AH1 (160–165m) 6/2, AH1 (220–225m) 8/2, AH1 (370–375m) 13/3, PO1 (280–285m) 9/1, SI3 (400–405m) 2/2, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2

Globorotalia transsylvanica Popescu, 1970

1970 *Globorotalia* (*Turborotalia*) *transsylvanica* Popescu: p. 200, pl. 7, figs. 28-30.

1998 *Globorotalia* (*Obandyella*) *transsylvanica* Cicha et al.: p. 104, pl. 39, figs. 30-32.

Samples: PO1 (40–45m) 1/1, PO1 (99.5–105m) 3/1, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2, PO1 (250–255m) 8/1, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (600–604m) 4/2, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2, SI3 (1250–1255m) 11/1

Genus *Paragloborotalia* Cifelli, 1982

Paragloborotalia ? mayeri (Cushman & Ellisor, 1939)

1939 *Globorotalia mayeri* Cushman & Ellisor: p. 11, pl. 2, fig. 4.

1998 *Paragloborotalia* ? *mayeri* Cicha et al.: p. 115, pl. 39, figs. 24-26.

Samples: PO1 (460–465m) 15/1, PO1 (490–495m) 16/1, SI3 (500–505m) 3/1, SI3 (900–906m) 7/3

Family Catapsydracidae Bolli, Loeblich & Tappan, 1957
Genus *Globoquadrina* Finlay, 1947

Globoquadrina cf. *altispira* (Cushman & Jarvis, 1936)

1936 *Globigerina altispira* Cushman & Jarvis: p. 5, pl. 1, figs. 13-14.

1998 *Globoquadrina altispira* Cicha et al.: p. 103, pl. 41, figs. 3-5.

Sample: PO1 (130–135m) 4/2

Superfamily Globigerinacea Carpenter, Parker & Jones, 1862
Family Globigerinidae Carpenter, Parker & Jones, 1862
Subfamily Globigerininae Carpenter, Parker & Jones, 1862
Genus *Globigerina* d'Orbigny, 1826

Globigerina bulloides d'Orbigny, 1826 (Pl. 2, fig. 9)

1826 *Globigerina bulloides* d'Orbigny: p. 277, no. 1.

1846 *Globigerina bulloides* d'Orbigny: p. 163, pl. 9, figs. 4-6, no. 116.

1998 *Globigerina bulloides* Cicha et al.: p. 99, pl. 34, figs. 24-26.

Samples: AH1 (130–135m) 5/1, AH1 (160–165m) 6/2, AH1 (190–195m) 7/4, AH1 (220–225m) 8/2, AH1 (280–285m) 10/2, AH1 (310–315m) 11/1, AH1 (370–375m) 13/3, AH1 (430–435m) 15/3, HRD25 (290–298m) 1/1, PO1 (40–45m) 1/1, PO1 (99.5–105m) 3/1, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2, PO1 (250–255m) 8/1, PO1 (280–285m) 9/1, PO1 (490–495m) 16/1, PO1 (520–525m) 17/2, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (600–604m) 4/2, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2, WA1 (200–205m) 1/1, WA1 (300–305m) 3/1, WA1 (450–455m) 6/2

Globigerina concinna Reuss, 1850

1850 *Globigerina concinna* Reuss: p. 373, pl. 47, fig. 8a-b.

1978 *Globigerina concinna* Papp et al.: p. 270, pl. 1, figs. 12-14.

1994	*Globigerina concinna* Rögl: p. 139, pl. 1, figs. 23-26; pl. 2, figs. 1-6.

1998	*Globigerina concinna* Cicha et al.: p. 99, pl. 32, figs. 15-17.

Samples: SI3 (500–505m) 3/1, SI3 (900–906m) 7/3, WA1 (300–305m) 3/1

Globigerina diplostoma Reuss, 1850

1850	*Globigerina diplostoma* Reuss: p. 373, pl. 47, fig. 9a-b; pl. 48, f. 1.

1998	*Globigerina diplostoma* Cicha et al.: p. 99, pl. 35, figs. 1-3.

Samples: AH1 (130–135m) 5/1, AH1 (220–225m) 8/2, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2, PO1 (520–525m) 17/2, SI3 (500–505m) 3/1, SI3 (900–906m) 7/3

Globigerina falconensis Blow, 1959

1959	*Globigerina falconensis* Blow: p. 177, pl. 9, fig. 40.

1998	*Globigerina falconensis* Cicha et al.: p. 100, pl. 35, figs. 4-8.

Samples: AH1 (130–135m) 5/1, AH1 (190–195m) 7/4, HRD25 (290–298m) 1/1, PO1 (40–45m) 1/1, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (900–906m) 7/3, SI3 (1250–1255m) 11/1

Globigerina ottnangensis Rögl, 1969a

1969a	*Globigerina ciperoensis ottnangensis* Rögl: p. 221, pl. 2, figs. 7-10; pl. 4, figs. 1-7.

1985	*Globigerina ciperoensis ottnangensis* Rögl: p. 321, pl.- fig. 5, fig. 5.

1994	*Globigerina ottnangensis* Rögl: p. 137, pl. 1, figs. 11-16; pl. 4, fig. 2.

1998	*Globigerina ottnangensis* Cicha et al.: p. 100, pl. 32, figs. 9-14.

Samples: AH1 (280–285m) 10/2, AH1 (310–315m) 11/1, KA1 (701–705m) 12/2, MTW1 (1130–1138m) 4/7, SI3 (1250–1255m) 11/1

Globigerina praebulloides Blow, 1959

1959	*Globigerina praebulloides* Blow: p. 180, pl. 8, fig. 47; pl. 9, fig. 48.

1998	*Globigerina praebulloides* Cicha et al.: p. 100, pl. 34, figs. 13-16.

Samples: AH1 (130–135m) 5/1, AH1 (310–315m) 11/1, AH1 (370–375m) 13/3, AH1 (430–435m) 15/3, AH1 (520–523m) 18/3, AH1 (610–615m) 21/2, HRD19 (495–500m) 2/1, HRD24 (775–779.5m) 9/1, HRD25 (290–298m) 1/1, HRD25 (740–745m) 10/1, KA1 (600–604m) 10/4, SI3 (500–505m) 3/1, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2, SI3 (1250–1255m) 11/1, WA1 (300–305m) 3/1, WA1 (500–505m) 7/4

Globigerina tarchanensis Subbotina & Chutzieva, 1950

1950	*Globigerina tarchanensis* Subbotina & Chutzieva in Bogdanowicz: p. 173, pl. 10, fig. 5a-c.

1998	*Globigerina tarchanensis* Cicha et al.: p. 101, pl. 32, figs. 18-22.

Samples: AH1 (130–135m) 5/1, AH1 (280–285m) 10/2, PO1 (160–165m) 5/2, PO1 (460–465m) 15/1, SI3 (400–405m) 2/2, SI3 (1000–1003m) 8/2, WA1 (300–305m) 3/1, WA1 (400–403m) 5/1

Globigerina sp. 1

Sample: HRD19 (630–635m) 6/1

Globigerina sp. 2

Sample: HRD24 (550–555m) 5/1

Globigerina sp. 3

Sample: HRD24 (550–555m) 5/1

Globigerina sp. 4
Sample: PWU3 (1123–1128m) 1/3

Globigerina sp. 5
Sample: SI3 (500–505m) 3/1

Genus *Globigerinella* Cushman, 1927

Globigerinella obesa (Bolli, 1957)
1957 *Globorotalia obesa* Bolli: p. 119, pl. 29, fig. 2.
1998 *Globigerinella obesa* Cicha et al.: p. 101, pl. 38, figs. 1-3.
Sample: HRD25 (290–298m) 1/1

Globigerinella regularis (d'Orbigny, 1846)
1846 *Globigerina regularis* d'Orbigny: p. 162, pl. 9, figs. 1-3.
1998 *Globigerinella regularis* Cicha et al.: p. 101, pl. 38, figs. 4-6.
Samples: AH1 (130–135m) 5/1, AH1 (280–285m) 10/2, PO1 (490–495m) 16/1, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (900–906m) 7/3

Genus *Globigerinoides* Cushman, 1927

Globigerinoides bipshericus Todd, 1954
1954 *Globigerinoides bispherica* Todd: p. 681, pl. 1, fig. 1.
1998 *Globigerinoides bisphericus* Cicha et al.: p. 102, pl. 36, figs. 4-7.
Samples: AH1 (310–315m) 11/1, SI3 (900–906m) 7/3

Globigerinoides quadrilobatus (d'Orbigny, 1846)
1846 *Globigerina quadrilobata* d'Orbigny: p. 164, pl. 91, figs. 7-10.
1998 *Globigerinoides quadrilobatus* Cicha et al.: p. 102, pl. 36, figs. 8-10.
Samples: AH1 (130–135m) 5/1, AH1 (220–225m) 8/2, HRD25 (290–298m) 1/1, HRD25 (310–315m) 2/1, PO1 (40–45m) 1/1, PO1 (99.5–105m) 3/1, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2, SI3 (500–505m) 3/1, SI3 (1000–1003m) 8/2

Globigerinoides trilobus (Reuss, 1850) (Pl. 2, fig. 10)
1850 *Globigerina triloba* Reuss: p. 374, pl. 47, fig. 11.
1978 *Globigerinoides trilobus* Papp et al.: p. 273, pl. 4, figs. 9-11.
1998 *Globigerinoides trilobus* Cicha et al.: p. 102, pl. 36, figs. 1-3.
Samples: AH1 (130–135m) 5/1, AH1 (220–225m) 8/2, AH1 (310–315m) 11/1, HRD25 (290–298m) 1/1, PO1 (520–525m) 17/2, SI3 (400–405m) 2/2, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2, SI3 (1335–1340m) 12/1

Genus *Globoturborotalita* Hofker, 1976b

Globoturborotalita woodi (Jenkins, 1960)
1960 *Globigerina woodi* Jenkins: p. 352, pl. 2, fig. 2.
1987 *Globigerina woodi* Wenger: p. 317, pl. 19, figs. 10-12.
1998 *Globoturborotalia woodi* Cicha et al.: p. 104, pl. 35, figs. 14-16.

Samples: AH1 (130–135m) 5/1, AH1 (430–435m) 15/3, HRD25 (290–298m) 1/1, SI3 (500–505m) 3/1, SI3 (900–906m) 7/3

Genus *Turborotalita* Blow & Banner, 1962

Turborotalita quinqueloba (Natland, 1938)

1938 *Globigerina quinqueloba* Natland: p. 149, pl. 6, fig. 7.

1998 *Turborotalita quinqueloba* Cicha et al.: p. 132, pl. 31, figs. 7-10.

Sample: SI3 (1000–1003m) 8/2

Subfamily Orbulininae Schultze, 1854

Genus *Orbulina* d'Orbigny, 1839b

Orbulina suturalis Brönnimann, 1951

1951 Orbulina suturalis Brönnimann: p. 135, textfigs. 2-4.

1956 Orbulina suturalis Blow: p. 66, pl. 2, figs. 5-7.

1998 Orbulina suturalis Cicha et al.: p. 114, pl. 37, figs. 3-4.

Samples: AH1 (130–135m) 5/1, PO1 (40–45m) 1/1, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2, SI3 (500–505m) 3/1, SI3 (900–906m) 7/3, WA1 (400–403m) 5/1

Suborder Rotaliina Delage & Hérouard, 1896

Superfamily Bolivinacea Glaessner, 1937

Family Bolivinidae Glaessner, 1937

Genus *Bolivina* d'Orbigny, 1839a

Bolivina dilatata Reuss, 1850 (Pl. 1, fig. 20)

1850 *Bolivina dilatata* Reuss: p. 381, pl. 48, fig. 15.

1963b *Bolivina dilatata dilatata* Cicha & Zapletalová: p. 131, fig. 11.

1998a *Bolivina dilatata* Rögl: p. 139, pl. 4, fig. 2.

Samples: AH1 (130–135m) 5/1, AH1 (220–225m) 8/2, AH1 (280–285m) 10/2, AH1 (310–315m) 11/1, AH1 (370–375m) 13/3, AH1 (520–523m) 18/3, AH1 (610–615m) 21/2, HRD19 (590–595m) 4/1, HRD19 (630–635m) 6/1, HRD24 (550–555m) 5/1, HRD24 (620–624m) 6/1, PO1 (40–45m) 1/1, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2, PO1 (250–255m) 8/1, PO1 (520–525m) 17/2, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2, SI3 (1250–1255m) 11/1, WA1 (400–403m) 5/1

Bolivina hebes Macfadyen, 1930

1930 *Bolivina hebes* Macfadyen: p. 59, pl. 2, fig. 5.

1963b *Bolivina hebes* Cicha & Zapletalová: p. 157, fig. 30.

1998a *Bolivina hebes* Rögl: p. 140, pl. 4, fig. 3.

Samples: AH1 (160–165m) 6/2, KA1 (600–604m) 10/4, PO1 (40–45m) 1/1, PO1 (160–165m) 5/2, SI3 (400–405m) 2/2, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2

Bolivina sp. 1

Sample: PO1 (130–135m) 4/2

Superfamily Cassidulinacea d'Orbigny, 1839b
Family Cassidulinidae d'Orbigny, 1839b
Subfamily Cassidulininae d'Orbigny, 1839b
Genus *Cassidulina* d'Orbigny, 1826

Cassidulina laevigata d'Orbigny, 1826

1826 *Cassidulina laevigata* d'Orbigny: p. 282, pl. 15, figs. 4-5.

1998 *Cassidulina laevigata* Cicha et al.: p. 88, pl. 45, figs. 2-4.

2003 *Cassidulina laevigata* Rögl & Spezzaferri: p. 44, pl. 5, fig. 7.

Samples: AH1 (130–135m) 5/1, AH1 (220–225m) 8/2, HRD25 (290–298m) 1/1, PO1 (160–165m) 5/2, PO1 (250–255m) 8/1, PO1 (520–525m) 17/2, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2, SI3 (1250–1255m) 11/1

Superfamily Turilinacea Cushman, 1927
Family Stainforthiidae Reiss, 1963
Genus *Virgulopsis* Finlay, 1939c

Virgulopsis tuberculatus (Egger, 1857)

1857 *Bulimina tuberculata* Egger: p. 284, pl. 12, figs. 4-7.

1998 *Virgulopsis tuberculatus* Cicha et al.: p. 136, pl. 46, figs. 1-2.

Sample: AH1 (220–225m) 8/2

Superfamily Buliminacea Jones, 1875
Family Siphogenerinoididae Saidova, 1981
Subfamily Tubulogenerininae Saidova, 1981
Genus *Bitubulogenerina* Howe, 1934

Bitubulogenerina reticulata Cushman, 1936a (Pl. 1, fig. 21)

1936a *Bitubulogenerina reticulata* Cushman: p. 62, pl. 8, fig. 21.

1998 *Bitubulogenerina reticulata* Cicha et al.: p. 83, pl. 46, figs. 7-10.

Samples: AH1 (220–225m) 8/2, HRD25 (290–298m) 1/1, PO1 (520–525m) 17/2, WA1 (400–403m) 5/1

Family Buliminidae Jones, 1875
Genus *Bulimina* d'Orbigny, 1826

Bulimina buchiana d'Orbigny, 1846

1846 *Bulimina Buchiana* d'Orbigny: p. 186, pl. 11, figs. 15-18.

1985 *Bulimina costata* Papp & Schmid: p. 72, pl. 63, figs. 1-4.

1998a *Bulimina buchiana* Rögl: p. 140, pl. 4, fig. 7.

Samples: AH1 (130–135m) 5/1, AH1 (280–285m) 10/2

Bulimina elongata d'Orbigny, 1846 (Pl. 1, fig. 22)

1846 *Bulimina elongata* d'Orbigny: p. 187, pl. 11, figs. 19-20.

1985 *Bulimina elongata* Papp & Schmid: p. 73, pl. 63, figs. 5-9.

1998a *Bulimina elongata* Rögl: p. 140.

Samples: AH1 (130–135m) 5/1, AH1 (160–165m) 6/2, AH1 (190–195m) 7/4, AH1 (220–225m) 8/2, AH1 (250–255m) 9/4, AH1 (280–285m) 10/2, AH1 (430–435m) 15/3, HRD19 (495–500m) 2/1, HRD19

(590–595m) 4/1, HRD19 (630–635m) 6/1, HRD24 (550–555m) 5/1, HRD24 (620–624m) 6/1, HRD24 (775–779.5m) 9/1, HRD25 (290–298m) 1/1, HRD25 (310–315m) 2/1, KA1 (600–604m) 10/4, KA2 (1020–1025m) 3/4, PO1 (40–45m) 1/1, PO1 (99.5–105m) 3/1, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2, PO1 (250–255m) 8/1, PO1 (460–465m) 15/1, PO1 (490–495m) 16/1, PO1 (520–525m) 17/2, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (600–604m) 4/2, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2, SI3 (1250–1255m) 11/1, WA1 (300–305m) 3/1, WA1 (400–403m) 5/1

Bulimina elongata longa (Venglinskyi, 1958)

1958 *Neobulimina longa* Venglinskyi: p. 134, pl. 28, fig. 4.

1998 *Bulimina elongata longa* Cicha et al.: p. 87, pl. 47, figs. 6-7.

Samples: AH1 (130–135m) 5/1, AH1 (280–285m) 10/2, HRD25 (290–298m) 1/1, PO1 (130–135m) 4/2, PO1 (250–255m) 8/1, SI3 (400–405m) 2/2

Bulimina striata d'Orbigny, 1837

1837 *Bulimina striata* d'Orbigny in Cuvier: p. 18, pl. 3, fig. 16.

1937 *Bulimina striata* Cushman & Parker: p. 119, pl. 28, figs. 1-3.

1987 *Bulimina striata* Wenger: p. 268, pl. 7, figs. 1-2.

Samples: AH1 (100–105m) 4/1, AH1 (130–135m) 5/1, AH1 (310–315m) 11/1, AH1 (520–523m) 18/3, PO1 (40–45m) 1/1, PO1 (99.5–105m) 3/1, PO1 (130–135m) 4/2, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2

Genus *Praeglobobulimina* Hofker, 1951

Praeglobobulimina pupoides (d'Orbigny, 1846) (Pl. 1, fig. 19)

1846 *Bulimina pupoides* d'Orbigny: p. 185, pl. 11, figs. 11-12.

1988 *Praeglobobulimina pupoides* Cicha & Čtyroká: p. 503, pl. 2, figs. 12-15.

1998 *Praeglobobulimina pupoides* Cicha et al.: p. 119, pl. 48, figs. 14-17.

2003 G*lobobulimina pupoides* Rögl & Spezzaferri: p. 45, pl. 5, fig. 20.

Samples: AH1 (130–135m) 5/1, AH1 (610–615m) 21/2, HRD25 (290–298m) 1/1, HRD25 (310–315m) 2/1, SI3 (500–505m) 3/1, SI3 (1000–1003m) 8/2, WA1 (400–403m) 5/1

Praeglobobulimina pyrula (d'Orbigny, 1846)

1846 *Bulimina pyrula* d'Orbigny: p. 184, pl. 11, figs. 9-10.

1988 *Praeglobobulimina pyrula* Cicha & Čtyroká: p. 503, pl. 2, figs. 9-10.

1998 *Praeglobobulimina pyrula* Cicha et al.: p. 119, pl. 48, figs. 11-13.

2003 G*lobobulimina pyrula* Rögl & Spezzaferri: p. 46, pl. 5, fig. 210.

Samples: AH1 (130–135m) 5/1, AH1 (160–165m) 6/2, AH1 (220–225m) 8/2, AH1 (280–285m) 10/2, AH1 (430–435m) 15/3, HRD25 (290–298m) 1/1, PO1 (40–45m) 1/1, PO1 (99.5–105m) 3/1, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2, SI3 (1335–1340m) 12/1

Family Pappinidae Haunold, 1990

Genus *Pappina* Haunold, 1990

Pappina breviformis (Papp & Turnovsky, 1953) (Pl. 1, fig. 23)

1953 *Uvigerina parkeri breviformis* Papp & Turnovsky: p. 122, pl. 5/A, figs. 3-4.

1995 *Pappina primiformis* Haunold: p. 79, pl. 2, figs. 12-13.

1998a *Pappina breviformis* Rögl: p. 148, pl. 4, fig. 10.

1998 *Pappina breviformis* Cicha et al.: p. 114, pl. 49, figs. 5-6.

Samples: AH1 (280–285m) 10/2, AH1 (370–375m) 13/3

Pappina parkeri (Karrer, 1877)

1877 *Uvigerina Parkeri* Karrer: p. 385-386, pl. 16b, fig. 50.

1925 *Uvigerina compressa* Cushman: p. 10, pl. 4, fig. 2.

1990 *Pappina parkeri* Haunold: p. 90-91, pl. 1, figs. 3-4; pl. 3, figs. 15-18.

1998 *Pappina parkeri* Cicha et al.: p. 115, pl. 49, figs. 1-2, 8-9.

Samples: AH1 (280–285m) 10/2, PO1 (130–135m) 4/2, SI3 (900–906m) 7/3

Pappina primiformis (Papp & Turnovsky, 1953)

1953 *Uvigerina bononiensis primiformis* Papp & Turnovsky: p. 121, pl. 5/A, figs. 1-2.

1990 *Pappina primiformis* Haunold: p. 87-89, pl. 3, figs. 11-14.

1998 *Pappina primiformis* Cicha et al.: p. 115, pl. 49, figs. 3-4.

Samples: AH1 (280–285m) 10/2, AH1 (310–315m) 11/1, HRD24 (620–624m) 6/1, MTW1 (1480–1485m) 12/4, PO1 (520–525m) 17/2

Family Uvigerinidae Haeckel, 1894
Subfamily Uvigerininae Haeckel, 1894
Genus *Uvigerina* d'Orbigny, 1826

Uvigerina aculeata d'Orbigny, 1846

1846 *Uvigerina aculeata* d'Orbigny: p. 191, pl. 11, figs. 27-28.

1998 *Uvigerina aculeata* Cicha et al.: p. 133, pl. 50, figs. 3-4.

Sample: PO1 (130–135m) 4/2

Uvigerina acuminata Hosius, 1895

1893 *Uvigerina aculeata* Hosius: p. 49, pl. 2, fig. 9 (non d'Orbigny, 1846).

1895 *Uvigerina acuminata* nom. nov. Hosius: p. 167 (footnote).

1998 *Uvigerina acuminata* Cicha et al.: p. 133, pl. 51, fig. 1.

Samples: AH1 (130–135m) 5/1, AH1 (280–285m) 10/2, AH1 (310–315m) 11/1, AH1 (430–435m) 15/3, HRD19 (590–595m) 4/1, PO1 (160–165m) 5/2, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (900–906m) 7/3

Uvigerina graciliformis Papp & Turnovsky, 1953

1953 *Uvigerina graciliformis* Papp & Turnovsky: p. 122, pl. 5/A, figs. 5-7.

1998 *Uvigerina graciliformis* Cicha et al.: p. 133, pl. 50, figs. 8-9.

2003 *Uvigerina graciliformis* Rögl & Spezzaferri: p. 51, pl. 5, fig. 24.

Samples: AH1 (280–285m) 10/2, AH1 (310–315m) 11/1, SI3 (900–906m) 7/3

Uvigerina gracilis Reuss, 1851

1851 *Uvigerina gracilis* Reuss: p. 77, pl. 5, fig. 39.

1998 *Uvigerina gracilis* Cicha et al.: p. 133, pl. 49, fig. 11.

Sample: SI3 (900–906m) 7/3

Uvigerina grilli Schmid, 1971

1971 *Uvigerina grilli* Schmid: p. 46, pl. 1, figs. 1-2.

1998 *Uvigerina grilli* Cicha et al.: p. 133, pl. 51, fig. 2.

Sample: SI3 (900–906m) 7/3

Uvigerina macrocarinata Papp & Turnovsky, 1953 (Pl. 1, fig. 24)

1953 *Uvigerina macrocarinata* Papp & Turnovsky: p. 123-124, pl. 5/B, figs. 1-3.

1978 *Uvigerina macrocarinata* Papp & Schmid: p. 280, pl. 9, figs. 1-4; pl. 11, figs. 2-4.

1995 *Uvigerina macrocarinata* Haunold: p. 76, pl. 1, figs. 11-12.

1998 *Uvigerina macrocarinata* Cicha et al.: p. 134, pl. 51, figs. 3-4.

Samples: AH1 (280–285m) 10/2, AH1 (310–315m) 11/1, PO1 (99.5–105m) 3/1, PO1 (130–135m) 4/2, SI3 (500–505m) 3/1, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2

Uvigerina mantaensis Cushman & Edwards, 1938

1938 *Uvigerina mantaensis* Cushman & Edwards: p. 84, pl. 14, fig. 8.

1998 *Uvigerina mantaensis* Cicha et al.: p. 134, pl. 49, figs. 15-16.

Sample: AH1 (310–315m) 11/1

Uvigerina pygmoides Papp & Turnovsky, 1953

1953 *Uvigerina pygmoides* Papp & Turnovsky: p. 131-132, pl. 5/C, fig. 4.

1995 *Uvigerina pygmoides* Haunold: p. 76, pl. 1, figs. 13-14.

1998 *Uvigerina pygmoides* Cicha et al.: p. 134, pl. 53, figs. 10-12.

Samples: AH1 (310–315m) 11/1, HRD24 (620–624m) 6/1, SI3 (900–906m) 7/3

Uvigerina semiornata d'Orbigny, 1846

1846 *Uvigerina semiornata* d'Orbigny: p. 189, pl. 11, figs. 23-24.

1998 *Uvigerina semiornata* Cicha et al.: p. 135, pl. 53, figs. 1-3.

Samples: AH1 (130–135m) 5/1, AH1 (310–315m) 11/1, PO1 (40–45m) 1/1, SI3 (400–405m) 2/2, SI3 (900–906m) 7/3

Uvigerina venusta Franzenau, 1894

1894 *Uvigerina venusta* Franzenau: p. 36, pl. 3, figs. 60.

1978 *Uvigerina* cf. *pygmea* Papp & Schmid: p. 281, pl. 9, fig. 13.

1995 *Uvigerina venusta* Haunold: p. 76, pl. 2, figs. 1-4.

1998 *Uvigerina venusta* Cicha et al.: p. 135, pl. 52, figs. 7-9.

Sample: SI3 (900–906m) 7/3

Uvigerina sp. 1

Sample: HRD24 (775–779.5m) 9/1

Uvigerina sp. 2

Sample: PO1 (130–135m) 4/2

Family Reussellidae Cushman, 1928

Genus *Reussella* Galloway, 1933

Reussella spinulosa (Reuss, 1850) (Pl. 1, fig. 25)

1850 *Verneuilina spinulosa* Reuss: p. 374, pl. 47, fig. 12.

1987 *Reussella spinulosa* Wenger: p. 271, pl. 7, figs. 15-16.

1998 *Reussella spinulosa* Cicha et al.: p. 124, pl. 54, figs. 16-17.

Samples: AH1 (220–225m) 8/2, HRD19 (630–635m) 6/1, HRD25 (290–298m) 1/1, PO1 (520–525m) 17/2, WA1 (400–403m) 5/1

Superfamily Fursenkoinacea Loeblich & Tappan, 1961
Family Fursenkoinidae Loeblich & Tappan, 1961
Genus *Fursenkoina* Loeblich & Tappan, 1961

Fursenkoina acuta (d'Orbigny, 1846) (Pl. 1, fig. 26)

1846 *Polymorphina acuta* d'Orbigny: p. 234, pl. 13, figs. 4-5; pl. 14, figs. 5-7.

1985 *Fursenkoina acuta* Papp & Schmid: p. 82, pl. 75, figs. 1-6.

1998 *Fursenkoina acuta* Cicha et al.: p. 97, pl. 55, fig. 1.

Samples: AH1 (100–105m) 4/1, AH1 (130–135m) 5/1, AH1 (220–225m) 8/2, AH1 (280–285m) 10/2, HRD19 (630–635m) 6/1, HRD24 (550–555m) 5/1, HRD24 (620–624m) 6/1, HRD25 (290–298m) 1/1, HRD25 (645–650m) 7/1, MTW1 (1480–1485m) 12/4, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2, SI3 (500–505m) 3/1, WA1 (350–353m) 4/2, WA1 (400–403m) 5/1

Superfamily Delosinacea Parr, 1950
Family Caucasinidae Bykova, 1959
Subfamily Caucasininae Bykova, 1959
Genus *Caucasina* Khalilov, 1951

Caucasina schischkinskayae (Samoylova, 1947)

1947 *Bulimina schischkinskayae* Samoylova: p. 82, pl. 10.

1951 *Caucasina schischkinskayae* Khalilov: p. 4.

1998 *Bulimina schischkinskayae* Cicha et al.: p. 87, pl. 47, figs. 2-4.

2003 *Caucasina schischkinskayae* Rögl & Spezzaferri: p. 60, pl. 5, fig. 17.

Samples: AH1 (130–135m) 5/1, AH1 (160–165m) 6/2, AH1 (280–285m) 10/2, WA1 (450–455m) 6/2, WA1 (500–505m) 7/4

Caucasina subulata (Cushman & Parker, 1937) (Pl. 1, fig. 27)

1937 *Bulimina elongata* d'Orbigny var. α *subulata* Cushman & Parker: p. 51, pl. 7, figs. 6-7.

1998a *Caucasina subulata* Rögl: p. 141, pl. 4, fig. 15.

2003 *Caucasina subulata* Rögl & Spezzaferri: p. 60, pl. 5, fig. 16.

Samples: AH1 (130–135m) 5/1, AH1 (160–165m) 6/2, AH1 (250–255m) 9/4, HRD24 (620–624m) 6/1, HRD25 (290–298m) 1/1, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2, PO1 (520–525m) 17/2, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2

Superfamily Stilostomellacea Finlay, 1947
Family Stilostomellidae Finlay, 1947
Genus *Orthomorphina* Stainforth, 1952

Orthomorphina columella (Karrer, 1877)

1877 *Nodosaria columella* Karrer: p. 379, pl. 16b, fig. 21.

1998 *Orthomorphina columella* Cicha et al.: p. 114, pl. 55, figs. 16-18.

Sample: PO1 (130–135m) 4/2

Genus *Siphonodosaria* A. Silvestri, 1924

Siphonodosaria consobrina (d'Orbigny, 1846)

1846 *Dentalina consobrina* d'Orbigny: p. 46, pl. 2, figs. 1-3.

1985 *Stilostomella consobrina* Papp & Schmid: p. 29, pl. 11, figs. 1-5.

1998 *Siphonodosaria* ? *consobrina* Cicha et al.: p. 127, pl. 56, fig. 7.

Samples: AH1 (130–135m) 5/1, AH1 (310–315m) 11/1, HRD25 (550–557m) 5/1, SI3 (900–906m) 7/3

Genus *Stilostomella* Guppy, 1894

Stilostomella adolphina (d'Orbigny, 1846)

1846 *Dentalina Adolphina* d'Orbigny: p. 50, pl. 2, figs. 18-20.

1998 *Stilostomella adolphina* Cicha et al.: p. 128, pl. 56, fig. 6.

Samples: AH1 (130–135m) 5/1, PO1 (130–135m) 4/2, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2

Genus *Myllostomella* Hayward, 2002

Myllostomella recta (Palmer & Bermúdez, 1936)

1936 *Ellipsonodosaria recta* Palmer & Bermúdez: p. 297, pl. 18, figs. 6-7.

1945 *Ellipsonodosaria recta* Cushman & Stainforth: p. 57, pl. 10, figs. 4-5.

1994 *Siphonodosaria recta* Bolli, Beckmann & Saunders: p. 359, pl. 18, fig. 63.21.

2003 *Myllostomella recta* Rögl & Spezzaferri: p. 48, pl. 6, figs. 18-19; pl. 9, fig. 6.

Samples: PO1 (130–135m) 4/2, PO1 (250–255m) 8/1, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2

Superfamily Discorbacea Ehrenberg, 1838

Family Bagginidae Cushman, 1927

Subfamily Bagginidae Cushman, 1927

Genus *Cancris* de Montfort, 1808

Cancris auriculus (Fichtel & Moll, 1798)

1798 *Nautilus auriculus* var. α Fichtel & Moll: p. 108, pl. 20, figs. a-c.

1998 *Cancris auriculus* Cicha et al.: p. 87, pl. 57, figs. 9-10.

Samples: AH1 (220–225m) 8/2, HRD25 (290–298m) 1/1, PO1 (130–135m) 4/2, SI3 (400–405m) 2/2

Genus *Valvulineria* Cushman, 1926a

Valvulineria complanata (d'Orbigny, 1846) (Pl. 2, fig. 5)

1846 *Rosalina complanata* d'Orbigny: p. 175, pl. 10, figs. 13-15.

1985 *Valvulineria complanata* Papp & Schmid: p. 66, pl. 59, figs. 7-11.

1998 *Valvulineria complanata* Cicha et al.: p. 136, pl. 57, figs. 11-13.

Samples: AH1 (220–225m) 8/2, AH1 (310–315m) 11/1, HRD19 (630–635m) 6/1, HRD24 (550–555m) 5/1, HRD25 (290–298m) 1/1, HRD25 (310–315m) 2/1, PO1 (40–45m) 1/1, PO1 (130–135m) 4/2, PO1

(520–525m) 17/2, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2, WA1 (400–403m) 5/1

Family Eponididae Hofker, 1951
Subfamily Eponidinae Hofker, 1951
Genus *Eponides* de Montfort, 1808

Eponides repandus (Fichtel & Moll, 1798)

1798 *Nautilus repandus* Fichtel & Moll: p. 35, pl. 3, figs. a-d.

1998 *Eponides repandus* Cicha et al.: p. 96, pl. 58, figs. 1-3.

Sample: AH1 (310–315m) 11/1

Family Discorbidae Ehrenberg, 1838
Genus *Neoeponides* Reiss, 1960

Neoeponides schreibersi (d'Orbigny, 1846)

1846 *Rotalina Schreibersi* d'Orbigny: p. 154, pl. 8, figs. 4-6.

1998 *Neoeponides schreibersi* Cicha et al.: p. 112, pl. 59, figs. 4-6.

Samples: PO1 (40–45m) 1/1, WA1 (400–403m) 5/1

Family Sphaeroidinidae Cushman, 1927
Genus *Sphaeroidina* d'Orbigny, 1826

Sphaeroidina bulloides d'Orbigny, 1826 (Pl. 2, fig. 3)

1826 *Sphaeroidina bulloides* d'Orbigny: p. 267, no. 65.

1985 *Sphaeroidina bulloides* Papp & Schmid: p. 96, pl. 90, figs. 7-12.

1998 *Sphaeroidina bulloides* Cicha et al.: p. 127, pl. 60, fig. 4.

Samples: AH1 (130–135m) 5/1, HRD25 (490–495m) 4/1, MTW1 (1480–1485m) 12/4, PO1 (160–165m) 5/2, SI3 (500–505m) 3/1, SI3 (1000–1003m) 8/2

Superfamily Glabratellacea Loeblich & Tappan, 1964
Family Glabratellidae Loeblich & Tappan, 1964
Genus *Discorbinoides* Saidova, 1975

Discorbinoides sp. 1

Sample: PO1 (520–525m) 17/2

Genus *Glabratella* Dorreen, 1948

Glabratella sp. 1

Sample: PO1 (99.5–105m) 3/1

Genus *Schackoinella* Weinhandl, 1958

Schackoinella imperatoria (d'Orbigny, 1846) (Pl. 2, fig. 15)

1846 *Rosalina imperatoria* d'Orbigny: p. 176, pl. 10, figs. 16-18.

1998 *Schackoinella imperatoria* Cicha et al.: p. 125, pl. 60, figs. 7-9.

Samples: PO1 (520–525m) 17/2, WA1 (200–205m) 1/1

Superfamily Siphoninacea Cushman, 1927
Family Siphoninidae Cushman, 1927
Subfamily Siphonininae Cushman, 1927
Genus *Siphonina* Reuss, 1850

Siphonina reticulata (Czjzek, 1848) (Pl. 2, fig. 7)

1848 *Rotalina reticulata* Czjzek: p. 145, pl. 13, figs. 7-9.

1998 *Siphonina reticulata* Cicha et al.: p. 127, pl. 60, figs. 13-14.

Samples: AH1 (310–315m) 11/1, AH1 (370–375m) 13/3, PO1 (460–465m) 15/1

Superfamily Discorbinellacea Sigal, 1952
Family Parrelloididae Hofker, 1956
Genus *Cibicidoides* Thalmann, 1939

Cibicidoides austriacus (d'Orbigny, 1846)

1846 *Anomalina austriaca* d'Orbigny: p. 172, pl. 10, figs. 4-9.

1951 *Cibicides austriacus* Marks: p. 72

1998 *Cibicidoides austriacus* Cicha et al.: p. 90, pl. 61, figs. 1-3.

Samples: HRD25 (290–298m) 1/1, HRD25 (490–495m) 4/1, HRD25 (685–690m) 9/1, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2, PO1 (520–525m) 17/2

Cibicidoides budayi (Cicha & Zapletalová, 1960)

1960 *Cibicides budayi* Cicha & Zapletalová: p. 47, pl. 4, figs. 7-9.

1998 *Cibicidoides budayi* Cicha et al.: p. 90, pl. 62, figs. 10-12.

Samples: KA1 (550–555m) 9/2, MTW1 (1380–1385m) 9/1

Cibicidoides lopjanicus (Myatlyuk, 1950)

1950 *Cibicides lopjanicus* Myatlyuk: p. 284, pl. 4, fig. 8.

1998a *Cibicidoides lopjanicus* Rögl: p. 141, pl. 5, figs. 14-16.

1998 *Cibicidoides lopjanicus* Cicha et al.: p. 90, pl. 61, figs. 4-6.

Samples: AH1 (280–285m) 10/2, AH1 (310–315m) 11/1, AH1 (430–435m) 15/3, HRD19 (495–500m) 2/1, HRD19 (590–595m) 4/1, HRD19 (630–635m) 6/1, HRD24 (620–624m) 6/1, KA1 (600–604m) 10/4, KA1 (750–755m) 13/1, KA1 (895–900m) 15/2, MTW1 (1130–1138m) 4/2, MTW1 (1130–1138m) 4/7, MTW1 (1380–1385m) 9/1, MTW1 (1480–1485m) 12/4, SI3 (1250–1255m) 11/1, WA1 (450–455m) 6/2, WA1 (500–505m) 7/4

Cibicidoides pachyderma (Rzehak, 1886)

1886 *Truncatulina pachyderma* Rzehak: p. 87, pl. 1, fig. 5.

1998 *Cibicidoides pachyderma* Cicha et al.: p. 90, pl. 62, figs. 7-9.

Samples: AH1 (160–165m) 6/2, AH1 (190–195m) 7/4, AH1 (220–225m) 8/2, AH1 (430–435m) 15/3, HRD25 (290–298m) 1/1, PO1 (130–135m) 4/2, PWU3 (1123–1128m) 1/3

Cibicidoides ungerianus ungerianus (d'Orbigny, 1846)

1846 *Rotalina Ungeriana* d'Orbigny: p. 157, pl. 8, figs. 16-18.

1998 *Cibicidoides ungerianus ungerianus* Cicha et al.: p. 91, pl. 61, figs. 15-17.

Samples: AH1 (190–195m) 7/4, AH1 (220–225m) 8/2, AH1 (280–285m) 10/2, AH1 (310–315m) 11/1, HRD19 (630–635m) 6/1, HRD25 (290–298m) 1/1, KA1 (600–604m) 10/4, MTW1 (1380–1385m) 9/1, PO1 (40–45m) 1/1, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2, PO1 (520–525m) 17/2, SI3 (400–405m) 2/2, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2, WA1 (450–455m) 6/2

Cibicidoides sp. 1
Sample: HRD19 (495–500m) 2/1

Cibicidoides sp. 2
Sample: HRD19 (819–820m) 12/1

Cibicidoides sp. 3
Sample: WA1 (400–403m) 5/1

Family Discorbinellidae Sigal, 1952
Subfamily Discorbinellinae Sigal, 1952
Genus *Biapertorbis* Pokorný, 1956

Biapertorbis biaperturatus Pokorný, 1956

1956 *Biapertorbis biaperturata* Pokorný: p. 265, figs. 4-6.
1998 *Biapertorbis biaperturatus* Cicha et al.: p. 82, pl. 63, figs. 7-8.

Sample: AH1 (310–315m) 11/1

Superfamily Planorbulinacea Schwager, 1877
Family Cibicididae Cushman, 1927
Subfamily Cibicidinae Cushman, 1927
Genus *Fontbotia* Gonzales-Donoso & Linares, 1970

Fontbotia wuellerstorfi (Schwager, 1866)

1866 *Anomalina wüllerstorfi* Schwager: p. 258, pl. 7, figs. 105, 107.
1986 *Planulina wuellerstorfi* van Morkhoven et al.: p. 48, pl. 14, figs. 1-2.
1998 *Fontbotia wuellerstorfi* Cicha et al.: p. 97, pl. 63, figs. 4-6.

Samples: AH1 (190–195m) 7/4, AH1 (430–435m) 15/3

Genus *Lobatula* Fleming, 1828

Lobatula lobatula (Walker & Jacob, 1798) (Pl. 2, fig. 4)

1798 *Nautilus lobatulus* Walker & Jacob: p. 642, pl. 14, fig. 36.
1986 *Cibicides lobatulus* Rupp: p. 59, pl. 11, figs. 8-10.
1991 *Lobatula lobatula* Cimerman & Langer: p. 71, pl. 75, figs. 1-4.
1998 *Lobatula lobatula* Cicha et al.: p. 111, pl. 63, figs. 23-25.

Samples: AH1 (130–135m) 5/1, AH1 (160–165m) 6/2, AH1 (190–195m) 7/4, AH1 (220–225m) 8/2, AH1 (370–375m) 13/3, AH1 (430–435m) 15/3, AH1 (520–523m) 18/3, AH1 (610–615m) 21/2, HRD25 (645–650m) 7/1, MTW1 (1130–1138m) 4/7, MTW1 (1380–1385m) 9/1, PO1 (40–45m) 1/1, PO1 (130–135m) 4/2, PO1 (250–255m) 8/1, PO1 (280–285m) 9/1, PO1 (460–465m) 15/1, PO1 (520–525m) 17/2, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (600–604m) 4/2, SI3 (900–906m) 7/3

Superfamily Asterigerinacea d'Orbigny, 1839b
Family Asterigerinatidae Reiss, 1963
Genus *Asterigerinata* Bermúdez, 1949

Asterigerinata planorbis (d'Orbigny, 1846) (Pl. 2, fig. 16)

1846 *Asterigerina planorbis* d'Orbigny: p. 205, pl. 11, figs. 1-3.

1986 *Asterigerinata planorbis* Rupp: p. 56, pl. 3, figs. 4-6.

1998a *Asterigerinata planorbis* Rögl: p. 137.

1998 *Asterigerinata planorbis* Cicha et al.: p. 81, pl. 64, figs. 8-10.

Samples: *Althöflein 1-well*: all samples, except AH1 (160–165m) 6/2, AH1 (460–465m) 16/1; *Hohenruppersdorf 25-well*: HRD25 (490–495m) 4/1, HRD25 (550–557m) 5/1, HRD25 (645–650m) 7/1; *Kettlasbrunn 1-well*: KA1 (450–455.5m) 7/4, KA1 (500–506m) 8/1; *Maustrenk West1-well*: MTW1 (1130–1138m) 4/7, MTW1 (1380–1385m) 9/1, MTW1 (1480–1485m) 12/4; *Poysdorf 1-well*: all samples, except PO1 (430–435m) 14/3, PO1 (460–465m) 15/1, PO1 (490–495m) 16/1; *Siebenhirten 3-well*: SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (900–906m) 7/3; *Walterskirchen 1-well*: WA1 (300–305m) 3/1

Family Amphisteginidae Cushman, 1927
Genus *Amphistegina* d'Orbigny, 1826

Amphistegina radiata (Fichtel & Moll, 1798) (Pl. 2, fig. 8)

1798 *Nautilus radiatus* Fichtel & Moll: p. 58, pl. 8, figs. a-d.

1984 *Amphistegina radiata* Rögl & Hansen: p. 44, pl. 10, figs. 4-5; textfigs. 15-16.

Samples: HRD24 (390–395m) 3/1, HRD25 (490–495m) 4/1, HRD25 (550–557m) 5/1, HRD25 (645–650m) 7/1, HRD25 (685–690m) 9/1, PO1 (520–525m) 17/2

Superfamily Nonionacea Schultze, 1854
Family Nonionidae Schultze, 1854
Subfamily Nonioninae Schultze, 1854
Genus *Nonion* de Montfort, 1808

Nonion bogdanowiczi Voloshinova, 1952

1952 *Nonion bogdanowiczi* Voloshinova: p. 19, pl. 1, figs. 7-8.

1998 *Nonion bogdanowiczi* Cicha et al.: p. 113, pl. 66, fig. 6.

Sample: AH1 (100–105m) 4/1

Nonion commune (d'Orbigny, 1826) (Pl. 2, fig. 6)

1826 *Nonionina communis* d'Orbigny: p. 128, no. 20.

1846 *Nonionina communis* d'Orbigny: p. 106, pl. 5, figs. 7-8.

1985 *Nonion commune* Papp & Schmid: p. 45, pl. 34, figs. 1-5.

1998 *Nonion commune* Cicha et al.: p. 113, pl. 66, figs. 1-2.

Samples: *Althöflein 1-well*: all samples, except AH1 (100–105m) 4/1, AH1 (250–255m) 9/4, AH1 (460–465m) 16/1, AH1 (520–523m) 18/3; HRD19 (495–500m) 2/1, HRD19 (590–595m) 4/1, HRD19 (630–635m) 6/1, HRD19 (650–656m) 7/1 ; *Hohenruppersdorf 24-well*: all samples, except HRD24 (256–260.5m) 2/1, HRD24 (390–395m) 3/1; *Hohenruppersdorf 25-well*: all samples, except HRD25 (665–670m) 8/1, HRD25 (740–745m) 10/1; KA1 (600–604m) 10/4, KA1 (895–900m) 15/2, MTW1 (1130–1138m) 4/7, MTW1 (1380–1385m) 9/1, *Poysdorf 1-well*: all samples, except PO1 (430–435m) 14/3;

PWU3 (1123–1128m) 1/3, *Siebenhirten 3-well*: all samples, except SI3 (800–805m) 6/3, SI3 (1335–1340m) 12/1, SI3 (1485–1490m) 15/2, SI3 (1716–1720.3m) 21/1; WA1 (350–353m) 4/2, WA1 (400–403m) 5/1, WA1 (450–455m) 6/2

Nonion tumidulus Pishvanova, 1960

1960 *Nonion tumidulus* Pishvanova in Subbotina et al.: p. 45, pl. 3, figs. 9-10.

1998 *Nonion tumidulus* Cicha et al.: p. 113, pl. 66, fig. 5.

Samples: HRD19 (400–405m) 1/2, SI3 (600–604m) 4/2

Genus *Nonionella* Cushman, 1926a

Nonionella turgida (Williamson, 1858)

1858 *Rotalina turgida* Williamson: p. 50, pl. 4, figs. 95-97.

1991 *Nonionella turgida* Cimerman & Langer: p. 74, pl. 84, figs. 6-8.

1994 *Nonionella turgida* Jones: p. 108, pl. 109, figs. 17-19.

Sample: SI3 (600–604m) 4/2

Genus *Nonionoides* Saidova, 1975

Nonionoides karaganicus (Krasheninnikov, 1959)

1959 *Nonionella karaganica* Krasheninnikov in Zhizhchenko: p. 41, pl. 7, fig. 4.

2003 *Nonionoides karaganicus* Rögl & Spezzaferri: p. 49, pl. 7, figs. 1-4.

Sample: HRD25 (290–298m) 1/1

Subfamily Astrononioninae Saidova, 1981

Genus *Astrononion* Cushman & Edwards, 1937

Astrononion stelligerum (d'Orbigny, 1839c)

cf. 1839c *Nonionina stelligera* d'Orbigny: p. 128, pl. 3; fig. 12.

1937 *Astrononion stelligerum* Cushman & Edwards: p. 31, pl. 3, fig. 7a.

1998a *Astrononion stelligerum* Rögl: p. 137, pl. 5, fig. 8.

Sample: HRD25 (290–298m) 1/1

Subfamily Pulleniinae Schwager, 1877

Genus *Melonis* de Montfort, 1808

Melonis affinis (Reuss, 1851)

1851 *Nonionina affinis* Reuss: p. 72, pl. 5, fig. 32.

1991 *Melonis affinis* van Marle: p. 186-187, pl. 20, figs. 1-3.

1994 *Melonis affinis* Jones: p. 107, pl. 109, figs. 8-9.

Sample: HRD25 (290–298m) 1/1

Melonis pompilioides (Fichtel & Moll, 1798) (Pl. 2, fig. 11)

1798 *Nautilus pompilioides* Fichtel & Moll: p. 31, pl. 2, figs. a-c.

1959 *Nonion pompilioides* Nørvang: p. 145, figs. 1-6.

1984 *Melonis pompilioides* Rögl & Hansen: p. 30, pl. 2, figs. 1-2, pl. 3, fig. 1.

1998 *Melonis pompilioides* Cicha et al.: p. 111, pl. 66, figs. 14-15.

Samples: AH1 (130–135m) 5/1, AH1 (220–225m) 8/2, AH1 (280–285m) 10/2, AH1 (310–315m) 11/1, AH1 (370–375m) 13/3, AH1 (430–435m) 15/3, HRD25 (290–298m) 1/1, PO1 (40–45m) 1/1, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2, PO1 (520–525m) 17/2, SI3 (500–505m) 3/1, SI3 (600–604m) 4/2, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2, WA1 (400–403m) 5/1, WA1 (500–505m) 7/4

Genus *Pullenia* Parker & Jones, 1862

Pullenia bulloides (d'Orbigny, 1826) (Pl. 2, fig. 12)

1826 *Nonionina bulloides* d'Orbigny: p. 127, no. 2.

1985 *Pullenia bulloides* Papp & Schmid: p. 45, pl. 34, figs. 6-9.

1998 *Pullenia bulloides* Cicha et al.: p. 121, pl. 66, figs. 12-13.

Samples: AH1 (130–135m) 5/1, AH1 (280–285m) 10/2, MTW1 (1130–1138m) 4/7, MTW1 (1380–1385m) 9/1, PO1 (130–135m) 4/2, PO1 (460–465m) 15/1, PO1 (520–525m) 17/2, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (600–604m) 4/2, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2, WA1 (300–305m) 3/1

Pullenia quinqueloba (Reuss, 1851)

1851 *Nonionina quinqueloba* Reuss: p. 71, pl. 5, fig. 31.

1998 *Pullenia quinqueloba* Cicha et al.: p. 121, pl. 66, figs. 10-11.

Sample: PO1 (520–525m) 17/2

Superfamily Chilostomellacea Brady, 1881
Family Heterolepidae Gonzales-Donoso, 1969
Genus *Heterolepa* Franzenau, 1884

Heterolepa dutemplei (d'Orbigny, 1846) (Pl. 2, fig. 13)

1846 *Rotalina Dutemplei* d'Orbigny: p. 157, pl. 8, figs. 19-21.

1985 *Heterolepa dutemplei* Papp & Schmid: p. 61, pl. 52, figs. 1-6.

1998a *Heterolepa dutemplei* Rögl: p. 146, pl. 6, figs. 1-3.

1998 *Heterolepa dutemplei* Cicha et al.: p. 107, pl. 71, figs. 1-3.

Samples: *Althöflein 1-well*: all samples, except AH1 (100–105m) 4/1, AH1 (250–255m) 9/4, AH1 (460–465m) 16/1; GI2 (1084–1086.7m) 10/2, HRD19 (495–500m) 2/1, HRD19 (590–595m) 4/1, HRD19 (630–635m) 6/1, HRD24 (550–555m) 5/1, HRD24 (620–624m) 6/1, HRD24 (641–645m) 7/1, HRD25 (290–298m) 1/1, HRD25 (310–315m) 2/1, HRD25 (490–495m) 4/1, HRD25 (550–557m) 5/1, KA1 (895–900m) 15/2, KA2 (1020–1025m) 3/1, KA2 (1020–1025m) 3/4, MTW1 (1130–1138m) 4/2, MTW1 (1130–1138m) 4/7, MTW1 (1380–1385m) 9/1, MTW1 (1480–1485m) 12/4, PO1 (40–45m) 1/1, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2, PO1 (250–255m) 8/1, PO1 (460–465m) 15/1, PO1 (520–525m) 17/2, SI3 (400–405m) 2/2, SI3 (500–505m) 3/, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2, WA1 (400–403m) 5/1, WA1 (450–455m) 6/2, WA1 (500–505m) 7/4

Family Gavelinellidae Hofker, 1956
Subfamily Gyroidinoidinae Saidova, 1981
Genus *Escornebovina* Butt, 1966

Escornebovina ? *trochiformis* (Andreae, 1884)

1884 *Pulvinulina trochiformis* n. sp. Andreae: p. 216, pl. 8, fig. 14.

1998 *Escornebovina ? trochiformis* Cicha et al.: p. 96, pl. 71, figs. 14-16.

Sample: HRD25 (645–650m) 7/1

Subfamily Gavelinellinae Hofker, 1956
Genus *Hansenisca* Loeblich & Tappan, 1987

Hansenisca soldanii (d'Orbigny, 1826) (Pl. 2, fig. 14)

1826 *Rotalina Soldanii* d'Orbigny: p. 112, no. 5.
1986 *Gyroidinoides soldanii* Rupp: p. 63, pl. 22, figs. 3-5.
1998a *Hansenisca soldanii* Rögl: p. 146, pl. 6, figs. 4-5.
1998 *Hansenisca soldanii* Cicha et al.: p. 105, pl. 72, figs. 6-8.

Samples: AH1 (190–195m) 7/4, AH1 (220–225m) 8/2, AH1 (310–315m) 11/1, AH1 (430–435m) 15/3, AH1 (610–615m) 21/2, HRD25 (290–298m) 1/1, PO1 (130–135m) 4/2, PO1 (520–525m) 17/2, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (600–604m) 4/2, SI3 (900–906m) 7/3, SI3 (1000–1003m) 8/2, SI3 (1335–1340m) 12/1, WA1 (400–403m) 5/1

Family Trichohyalidae Saidova, 1981
Genus *Aubignyna* Margerel, 1970

Aubignyna sp. 1 (see Schütz et al. 2007) (Pl. 2, figs. 17-18)
Samples: AH1 (100–105m) 4/1, AH1 (130–135m) 5/1, AH1 (430–435m) 15/3, PO1 (460–465m) 15/1, PO1 (490–495m) 16/1, WA1 (200–205m) 1/1, WA1 (300–305m) 3/1
Remarks: The found individuals are very similar to the ones described as *Aubignyna* sp. in Schütz et al. (2007). The have a low trochospire, a finely perforated test, a rounded periphery and deep sutures in the umbilical area.

Superfamily Rotaliacea Ehrenberg, 1839
Family Rotaliidae Ehrenberg, 1839
Subfamily Pararotaliinae Reiss, 1963
Genus *Pararotalia* Y. Le Calvez, 1949

Pararotalia aculeata (d'Orbigny, 1846)

1846 *Rotalina aculeata* d'Orbigny: p. 159, pl. 8, figs. 25-27.
1998 *Pararotalia aculeata* Cicha et al.: p. 116, pl. 73, figs. 4-6, 10.

Sample: HRD19 (650–656m) 7/1

Pararotalia rimosa? (Reuss, 1869)

1869 *Rotalia rimosa* Reuss: p. 464, pl. 2, fig. 5.
1955 *Rotalia rimosa* Kaasschieter: p. 86, pl. 9, fig. 2.
1987 *Pararotalia rimosa* Wenger: p. 305, pl. 15, figs. 4-5, 9.

Sample: HRD19 (590–595m) 4/1

Subfamily Ammoniinae Saidova, 1981
Genus *Ammonia* Brünnich, 1772

Ammonia pseudobeccarii (Putrya, 1964) (Pl. 2, figs. 19-20)

1964 *Streblus pseudobeccarii* Putrya: p. 129, pl. 15, figs. 3-4.

1975 *Ammonia pseudobeccarii* Venglinskyi: p. 190, pl. 29, fig. 3.

1998a *Ammonia pseudobeccarii* Rögl: p. 135, pl. 2, figs. 1-6.

Samples: *Althöflein 1-well*: AH1 (100–105m) 4/1, AH1 (130–135m) 5/1, AH1 (190–195m) 7/4, AH1 (220–225m) 8/2, AH1 (280–285m) 10/2, AH1 (370–375m) 13/3, AH1 (430–435m) 15/3, AH1 (520–523m) 18/3, AH1 (610–615m) 21/2; *Hohenruppersdorf 19-well*: HRD19 (495–500m) 2/1, HRD19 (590–595m) 4/1, HRD19 (819–820m) 12/1; *Hohenruppersdorf 24-well*: HRD24 (620–624m) 6/1, HRD24 (641–645m) 7/1; *Hohenruppersdorf 25-well*: all samples, except HRD25 (490–495m) 4/1, HRD25 (685–690m) 9/1, HRD25 (740–745m) 10/1; *Kettlasbrunn 1-well*: all samples, except KA1 (750–755m) 13/1, KA1 (895–900m) 15/2; *Kettlasbrunn 2-well*: KA2 (1020–1025m) 3/1; *Maustrenk West1-well*: all samples, except MTW1 (1100–1105m) 3/5, MTW1 (1480–1485m) 12/4; *Mistelbach U1-well*: MisU1 (1885–1894m) 3/4; *Poysdorf 11-well*: PO1 (40–45m) 1/1, PO1 (99.5–105m) 3/1, PO1 (160–165m) 5/2, PO1 (250–255m) 8/1, PO1 (460–465m) 15/1, PO1 (520–525m) 17/2; *Pirawarth U3-well*: PWU3 (1123–1128m) 1/3; *Siebenhirten 3-well*: all samples, except SI3 (1250–1255m) 11/1, SI3 (1485–1490m) 15/2, SI3 (1716–1720.3m) 21/1; *Walterskirchen 1-well*: WA1 (200–205m) 1/1, WA1 (300–305m) 3/1, WA1 (350–353m) 4/2, WA1 (400–403m) 5/1

Ammonia tepida (Cushman, 1926b)

1926b *Rotalia beccarii* (Linné) var. *tepida* Cushman: p. 61, pl. 13, fig. 3.

1988 *Ammonia parkinsoniana* forma *tepida* Jorissen: pl. 7, figs. 1-4.

1998a *Ammonia tepida* Rögl: p. 136, pl. 2, figs. 7-9.

Samples: HRD19 (630–635m) 6/1, PO1 (130–135m) 4/2, PWU3 (1123–1128m) 1/3

Ammonia viennensis (d'Orbigny, 1846) (Pl. 2, figs. 21-22)

non 1758 *Nautilus Beccarii* Linné: p. 710, no. 237.

1846 *Rosalina viennensis* d'Orbigny: p. 177, pl. 10, figs. 22-24 (no. 129).

1985 *Ammonia beccarii* Papp & Schmid: p. 67, pl. 61, figs. 1-5.

1998a *Ammonia viennensis* Rögl: p. 79, pl. 74, figs. 1-3.

Samples: *Althöflein 1-well*: all samples, except AH1 (310–315m) 11/1, AH1 (460–465m) 16/1; *Hohenruppersdorf 19-well*: all samples, except HRD19 (571–576m) 3/1, HRD19 (630–635m) 6/1; *Hohenruppersdorf 24-well*: HRD24 (620–624m) 6/1, HRD24 (641–645m) 7/1, HRD24 (775–779.5m) 9/1; *Hohenruppersdorf 25-well*: all samples, except HRD25 (685–690m) 9/1, HRD25 (740–745m) 10/1; *Kettlasbrunn 1-well*: all samples, except KA1 (450–455.5m) 7/4; *Kettlasbrunn 2-well*: all samples; *Maustrenk West1-well*: all samples, except MTW1 (1480–1485m) 12/4; *Mistelbach U1-well*: all samples; *Poysdorf 11-well*: all samples, except PO1 (430–435m) 14/3; *Pirawarth U3-well*: all samples; *Siebenhirten 3-well*: all samples, except SI3 (1716–1720.3m) 21/1; *Walterskirchen 1-well*: WA1 (200–205m) 1/1, WA1 (400–403m) 5/1, WA1 (450–455m) 6/2

Family Elphidiidae Galloway, 1933

Subfamily Elphidiinae Galloway, 1933

Genus *Porosononion* Putrya, 1958 (Cribroelphidium)

Porosononion granosum (d'Orbigny, 1826) (Pl. 2, figs. 23-24)

1826 *Nonionina granosa* d'Orbigny: p. 128, no. 17.

1985 *Elphidium* (*Porosononion*) *granosum* Papp & Schmid: p. 47, pl. 37, figs. 1, 6.

1987 *Porosononion granosum* Wenger: p. 297, pl. 13, figs. 11-12.

1998 *Porosononion granosum* Cicha et al.: p. 119, pl. 74, figs. 4-5.

Samples: *Althöflein 1-well*: all samples, except AH1 (250–255m) 9/4, AH1 (460–465m) 16/1; HRD19 (590–595m) 4/1, HRD19 (819–820m) 12/1, HRD24 (620–624m) 6/1, HRD24 (641–645m) 7/1, HRD25 (290–298m) 1/1, HRD25 (310–315m) 2/1, HRD25 (550–557m) 5/1, HRD25 (645–650m) 7/1, KA1 (550–555m) 9/2, KA1 (701–705m) 12/2, KA1 (895–900m) 15/2, KA2 (1020–1025m) 3/1, KA2 (1020–1025m) 3/4, MTW1 (1130–1138m) 4/2, MisU1 (1885–1894m) 3/4, *Poysdorf 1-well*: all samples, except PO1 (430–435m) 14/3; SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (600–604m) 4/2, SI3 (1000–1003m) 8/2, *Walterskirchen 1-well*: all samples, except WA1 (500–505m) 7/4, WA1 (640–641.5m) 11/2

Genus *Elphidiella* Cushman, 1936b

Elphidiella minuta (Reuss, 1865)

1865 *Polystomella minuta* Reuss: p. 44, pl. 4, fig. 6.

1987 *Elphidiella minuta* Wenger: p. 295, pl. 13, figs. 1, 6.

1998a *Elphidiella minuta* Rögl: p. 142, pl. 8, figs. 6-7.

Samples: AH1 (100–105m) 4/1, PO1 (99.5–105m) 3/1, PO1 (130–135m) 4/2

Genus *Elphidium* de Montfort, 1808

Elphidium aculeatum (d'Orbigny, 1846) (Pl. 2, figs. 27-28)

1846 *Polystomella aculeata* d'Orbigny: p. 131, pl. 6, figs. 27-28.

1951 *Elphidium aculeatum* Marks: p. 50, pl. 6, fig. 11.

1963 *Elphidium aculeatum aculeatum* Papp: p. 274, pl. 11, fig. 7.

1998 *Elphidium aculeatum* Cicha et al.: p. 95, pl. 75, figs. 14-15.

Samples: AH1 (100–105m) 4/1, AH1 (130–135m) 5/1, AH1 (160–165m) 6/2, AH1 (190–195m) 7/4, HRD25 (310–315m) 2/1, PO1 (40–45m) 1/1, PO1 (460–465m) 15/1, SI3 (500–505m) 3/1, SI3 (600–604m) 4/2, WA1 (300–305m) 3/1

Elphidium advenum (Cushman, 1922)

1922 *Polystomella advena* Cushman: p. 56, pl. 9, figs. 11-12.

Samples: AH1 (130–135m) 5/1, AH1 (190–195m) 7/4, AH1 (220–225m) 8/2, HRD25 (290–298m) 1/1, HRD25 (310–315m) 2/1, PO1 (99.5–105m) 3/1, PO1 (130–135m) 4/2, PO1 (460–465m) 15/1, PO1 (520–525m) 17/2, SI3 (500–505m) 3/1, SI3 (600–604m) 4/2, WA1 (450–455m) 6/2

Elphidium angulatum (Egger, 1857)

1857 *Polystomella angulata* Egger: p. 302, pl. 15, figs. 5-6.

1960 *Elphidium angulatum* Krasheninnikov: p. 49, pl. 7, fig. 2.

1970 *Elphidium angulatum* Didkovskij & Satanovskaja: p. 115, pl. 70, fig. 3.

Sample: SI3 (500–505m) 3/1

Elphidium antoninum (d'Orbigny, 1846)

1846 *Polystomella antonina* d'Orbigny: p. 128, pl. 6, figs. 17-18.

1939 *Elphidium antoninum* Cushman: p. 43, pl. 11, fig. 14.

Samples: AH1 (100–105m) 4/1, AH1 (130–135m) 5/1, AH1 (370–375m) 13/3, AH1 (430–435m) 15/3, AH1 (520–523m) 18/3, PO1 (99.5–105m) 3/1, PO1 (280–285m) 9/1 SI3 (400–405m) 2/2, SI3 (900–906m) 7/3

Elphidium crispum (Linné, 1758)

1758 *Nautilus crispus* Linné: Syst. Nat. 10. Ed., p. 709, no. 236.

1798 *Nautilus crispus* Fichtel & Moll: p. 40, pl. 4, figs. a-f.

1822 *Polystomella crispa* Lamarck: p. 625.

1927 *Elphidium crispum* Cushman & Grant: p. 73, pl. 7, figs. 3a-b.

1998 *Elphidium crispum* Cicha et al.: p. 95, pl. 75, figs. 16-17.

Samples: AH1 (100–105m) 4/1, AH1 (130–135m) 5/1, AH1 (160–165m) 6/2, AH1 (190–195m) 7/4, AH1 (220–225m) 8/2, AH1 (280–285m) 10/2, AH1 (370–375m) 13/3, AH1 (430–435m) 15/3, AH1 (520–523m) 18/3, AH1 (610–615m) 21/2, GI2 (1084–1086.7m) 10/2, HRD24 (256–260.5m) 2/1, HRD24 (641–645m) 7/1, HRD25 (490–495m) 4/1, HRD25 (550–557m) 5/1, HRD25 (645–650m) 7/1, HRD25 (685–690m) 9/1, PO1 (40–45m) 1/1, PO1 (130–135m) 4/2, PO1 (250–255m) 8/1, PO1 (280–285m) 9/1, PO1 (430–435m) 14/3, PO1 (520–525m) 17/2, SI3 (400–405m) 2/2, SI3 (800–805m) 6/3

Elphidium fichtelianum (d'Orbigny, 1846)

1846 *Polystomella Fichtelliana* d'Orbigny: p. 125, pl. 6, figs. 7-8.

1939 *Elphidium fichtelianum* Cushman: p. 42, pl. 11, fig. 12.

1963 *Elphidium fichtelianum fichtelianum* Papp: p. 268, pl. 11, figs. 1-2.

1998 *Elphidium fichtelianum* Cicha et al.: p. 95, pl. 76, figs. 1-3.

Samples: AH1 (130–135m) 5/1, AH1 (190–195m) 7/4, AH1 (220–225m) 8/2, AH1 (310–315m) 11/1, AH1 (370–375m) 13/3, AH1 (430–435m) 15/3, HRD19 (590–595m) 4/1, HRD25 (490–495m) 4/1, HRD25 (550–557m) 5/1, MTW1 (1380–1385m) 9/1, PO1 (40–45m) 1/1, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2, PO1 (250–255m) 8/1, PO1 (520–525m) 17/2, SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (1335–1340m) 12/1, WA1 (500–505m) 7/4

Elphidium flexuosum (d'Orbigny, 1846) (Pl. 2, fig. 25)

1846 *Polystomella flexuosa* d'Orbigny: p. 127, pl. 6, figs. 15-16.

1951 *Elphidium flexuosum* Marks: p. 52.

1998 *Elphidium flexuosum* Cicha et al.: p. 95, pl. 76, figs. 14-15.

Samples: AH1 (190–195m) 7/4, AH1 (430–435m) 15/3, AH1 (610–615m) 21/2, HRD25 (490–495m) 4/1, SI3 (400–405m) 2/2

Elphidium grilli Papp, 1963 (Pl. 2, fig. 26)

1963 *Elphidium flexuosum grilli* Papp: p. 272, pl. 12, figs. 7-8.

1998 *Elphidium grilli* Cicha et al.: p. 95, pl. 76, fig. 8.

Samples: AH1 (100–105m) 4/1, PO1 (160–165m) 5/2, PO1 (280–285m) 9/1, SI3 (400–405m) 2/2, WA1 (200–205m) 1/1, WA1 (300–305m) 3/1

Elphidium hauerinum (d'Orbigny, 1846)

1846 *Polystomella hauerina* d'Orbigny: p. 122, pl. 6, figs. 1-2.

1951 *Elphidium hauerinum* Marks: p. 52.

1985 *Elphidium hauerinum* Papp & Schmid: pl. 49, pl. 38, figs. 5-10.

1998 *Elphidium hauerinum* Cicha et al.: p. 95, pl. 76, figs. 6-7.

Samples: AH1 (130–135m) 5/1, AH1 (280–285m) 10/2, PO1 (160–165m) 5/2, PO1 (520–525m) 17/2, SI3 (500–505m) 3/1

Elphidium josephinum (d'Orbigny, 1846)

1846 *Polystomella Josephina* d'Orbigny: p. 130, pl. 6, figs. 25-26.

1963 *Elphidium josephinum* Papp: p. 274, pl. 11, fig. 6.

1998 *Elphidium josephinum* Cicha et al.: p. 95, pl. 75, figs. 11-13.

Sample: SI3 (500–505m) 3/1

Elphidium karpaticum Myatlyuk, 1950

1950 *Elphidium karpaticum* Myatlyuk: p. 270, pl. 2, figs. 1-2.

1998 *Elphidium karpaticum* Cicha et al.: p. 95, pl. 76, figs. 9-10.

Samples: AH1 (280–285m) 10/2, AH1 (370–375m) 13/3, AH1 (610–615m) 21/2, MTW1 (1130–1138m) 4/7

Elphidium koberi Tollmann, 1955

1955 *Elphidium koberi* Tollmann: p. 199, textfig. 1.

1998 *Elphidium koberi* Cicha et al.: p. 95, pl. 77, fig. 4.

2007 *Elphidium koberi* Schütz et al.: p. 459, pl. 8. Fig. 1.

Sample: WA1 (300–305m) 3/1

Elphidium listeri (d'Orbigny, 1846)

1846 *Polystomella listeri* d'Orbigny: p. 128, pl. 6, figs. 19-22.

1963 *Elphidium listeri* Papp: p. 273, pl. 12, fig. 9.

Samples: AH1 (100–105m) 4/1, AH1 (130–135m) 5/1, KA2 (1140–1145m) 5/2, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2

Elphidium macellum (Fichtel & Moll, 1798)

1798 *Nautilus macellus* var. β Fichtel & Moll: p. 66, pl. 10, figs. h-k.

1808 *Elphidium macellum* (Fichtel & Moll) – de Montfort: p. 15.

1986 *Elphidium macellum* Rupp: p. 61, pl. 16, figs. 7-8.

Samples: AH1 (130–135m) 5/1, AH1 (160–165m) 6/2, PO1 (160–165m) 5/2

Elphidium obtusum (d'Orbigny, 1846)

1846 *Polystomella obtusa* d'Orbigny: p. 124, pl. 6, figs. 5-6.

1957 *Elphidium obtusum* Tollmann: p. 186, pl. 2, fig. 2.

Samples: AH1 (100–105m) 4/1, AH1 (160–165m) 6/2, AH1 (190–195m) 7/4, AH1 (220–225m) 8/2, AH1 (250–255m) 9/4, AH1 (280–285m) 10/2, PO1 (160–165m) 5/2, PO1 (280–285m) 9/1, SI3 (800–805m) 6/3

Elphidium ortenburgense (Egger, 1857)

1857 *Polystomella Ortenburgensis* Egger: p. 302, pl. 15, figs. 7-9.

1987 *Elphidium ortenburgense* Wenger: p. 292, pl. 12, figs. 6-7.

1998 *Elphidium ortenburgense* Cicha et al.: p. 96, pl. 76, figs. 4-5.

Samples: AH1 (280–285m) 10/2, AH1 (430–435m) 15/3, AH1 (460–465m) 16/1, AH1 (520–523m) 18/3, AH1 (610–615m) 21/2, HRD19 (495–500m) 2/1, KA1 (450–455.5m) 7/4, KA1 (600–604m) 10/4, KA1 (701–705m) 12/2, KA1 (750–755m) 13/1, KA1 (895–900m) 15/2, MTW1 (1130–1138m) 4/2, MTW1 (1130–1138m) 4/7, MTW1 (1380–1385m) 9/1, WA1 (450–455m) 6/2

Elphidium reussi Marks, 1951

1951 *Elphidium flexuosum* (d'Orbigny) var. *reussi* Marks: p. 52, pl. 6, fig. 7.

1986 *Elphidium reussi* Rupp: p. 61, pl. 17, figs. 2-3.

1987 *Elphidium reussi* Wenger: p. 291, pl. 12, figs. 1-2.

1998a *Elphidium reussi* Rögl: p. 143, pl. 7, figs. 4-6.

Samples: AH1 (160–165m) 6/2, AH1 (430–435m) 15/3, HRD19 (590–595m) 4/1, HRD19 (630–635m) 6/1, HRD19 (819–820m) 12/1, HRD25 (550–557m) 5/1, HRD25 (645–650m) 7/1 , HRD25 (665–670m) 8/1, PO1 (40–45m) 1/1, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2, PO1 (520–525m) 17/2, WA1 (300–305m) 3/1, WA1 (400–403m) 5/1, WA1 (450–455m) 6/2

Elphidium rugosum (d'Orbigny, 1846)

1846 *Polystomella rugosa* d'Orbigny: p. 123, pl. 6, figs. 3-4.

1985 *Elphidium rugosum* Papp & Schmid: p. 49, pl. 39, figs. 1-4.

1998a *Elphidium rugosum* Rögl: p. 143, pl. 7, fig. 3.

1998 *Elphidium rugosum* Cicha et al.: p. 96, pl. 76, figs. 16-17.

Samples: AH1 (280–285m) 10/2, AH1 (370–375m) 13/3, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2, SI3 (400–405m) 2/2, SI3 (800–805m) 6/3, WA1 (200–205m) 1/1

Elphidium subtypicum Papp, 1963

1963 *Elphidium flexuosum subtypicum* Papp: p. 269, pl. 11, fig. 3; pl. 12, figs. 1-3.

1987 *Elphidium flexuosum subtypicum* Wenger: p. 290, pl. 11, figs. 16-17.

1998a *Elphidium subtypicum* Rögl: p. 144, pl. 7, figs. 9-10.

1998 *Elphidium subtypicum* Cicha et al.: p. 96, pl. 76, fig. 13.

Samples: AH1 (310–315m) 11/1, AH1 (430–435m) 15/3, KA1 (500–506m) 8/1, KA1 (750–755m) 13/1, MTW1 (1130–1138m) 4/7, MTW1 (1380–1385m) 9/1, MTW1 (1480–1485m) 12/4

Elphidium ungeri (Reuss, 1850)

1850 *Polystomella ungeri* Reuss: p. 369, pl. 48, fig. 2.

1939 *Elphidium ungeri* Cushman: p. 44, pl. 11, fig. 20.

1963 *Elphidium ungeri* Papp: p. 265, pl. 13, figs. 1-2.

1998a *Elphidium ungeri* Rögl: p. 144, pl. 7, figs. 1-2.

Sample: AH1 (100–105m) 4/1

Elphidium sp. (see Cicha et al., 1998)
Sample: PO1 (160–165m) 5/2

Elphidium sp. 1
Sample: HRD19 (590–595m) 4/1

Elphidium sp. 2
Sample: HRD19 (630–635m) 6/1

Elphidium sp. 3
Sample: HRD19 (819–820m) 12/1

Elphidium sp. 4
Sample: MisU1 (1885–1894m) 3/1

Elphidium sp. 5
Sample: MisU1 (1885–1894m) 3/1

Elphidium sp. 6
Sample: WA1 (400–403m) 5/1

Elphidium sp. 7
Sample: SI3 (800–805m) 6/3

Elphidium sp. 8
Sample: SI3 (400–405m) 2/2

Elphidium sp. 9
Sample: PO1 (280–285m) 9/1

Elphidium sp. 10
Sample: PO1 (280–285m) 9/1

Elphidium sp. 11
Sample: AH1 (280–285m) 10/2

Elphidium sp. 12
Sample: AH1 (310–315m) 11/1

Hyaline indet.:

Hyaline indet. 1	MisU1 (1885–1894m) 3/4
Hyaline indet. 2	WA1 (350–353m) 4/2
Hyaline indet. 3	WA1 (500–505m) 7/4
Hyaline indet. 4	SI3 (1485–1490m) 15/2
Hyaline indet. 5	SI3 (400–405m) 2/2
Hyaline indet. 6	AH1 (220–225m) 8/2
Hyaline indet. 7	AH1 (250–255m) 9/4
Hyaline indet. 8	AH1 (310–315m) 11/1
Hyaline indet. 9	AH1 (310–315m) 11/1
Hyaline indet. 10	AH1 (610–615m) 21/2
Hyaline indet. 11	HRD24 (620–624m) 6/1
Hyaline indet. 12	HRD24 (775–779.5m) 9/1
Hyaline indet. 13	HRD25 (310–315m) 2/1
Hyaline indet. 14	MisU1 (1885–1894m) 3/1
Hyaline indet. 15	PO1 (40–45m) 1/1
Hyaline indet. 16	SI3 (400–405m) 2/2
Hyaline indet. 17	SI3 (500–505m) 3/1
Hyaline indet. 18	SI3 (900–906m) 7/3
Hyaline indet. 19	SI3 (1000–1003m) 8/2

5. Lithostratigraphy

5.1. Introduction

Only the Miocene deposits of the Mistelbach Halfgraben are considered within the current project. The existing lithostratigraphic framework of the Mistelbach Block and the entire Vienna Basin as used in the geological literature and especially in internal OMV reports is mainly a hybrid of litho-, bio- and ecostratigraphic terms. This situation is based on the mixture of Austrian terms developed for the adjacent North Alpine-Carpathian Foredeep in the west, internal OMV terminology developed for the central Vienna Basin and established formation names from the Czech-Slovak part of the Vienna Basin in the northeast. Figure 85 proposes an updated lithostratigraphic scheme for the Mistelbach Halfgraben.

The next five chapters contain detailed descriptions of the different lithostratigraphic formations and members, their age, depositional environment and distribution in the studied area. The main focus was on the Mistelbach Halfgraben with its up to 2000 m thick Neogene fill, which is presented by twelve selected seismic lines (figs. 87-98) discussed in the following text. Figure 86 shows the positions of these SSW-NNE and WNW-ENE trending seismic lines.

Additionally, figures 99-110 give a summary of the studied samples, the results of the palaeoecological analyses and the resulting lithostratigraphic units and ages together with wire-log-data (SP+RES), seismic data and a comparison to the age model in older OMV reports (if available) for each of the investigated wells.

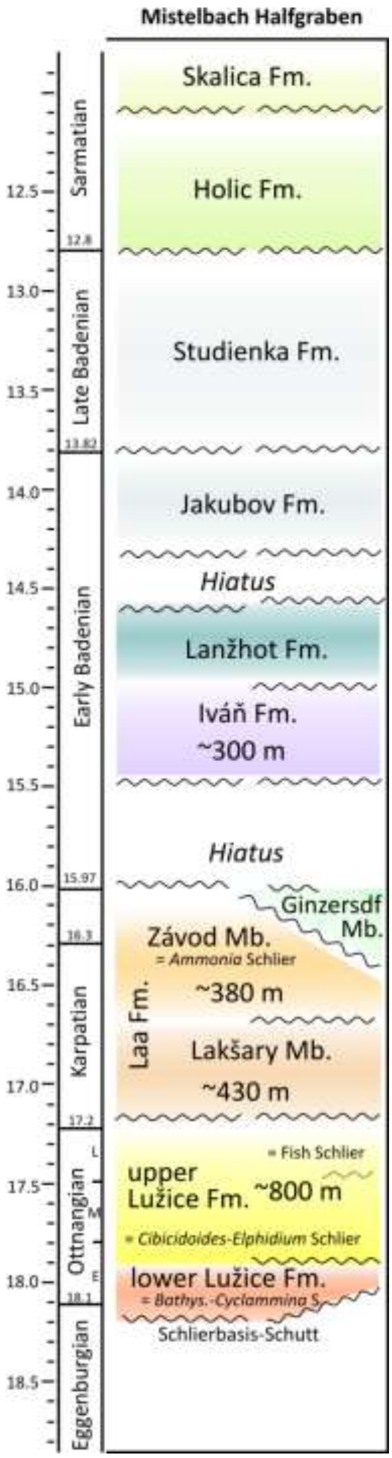
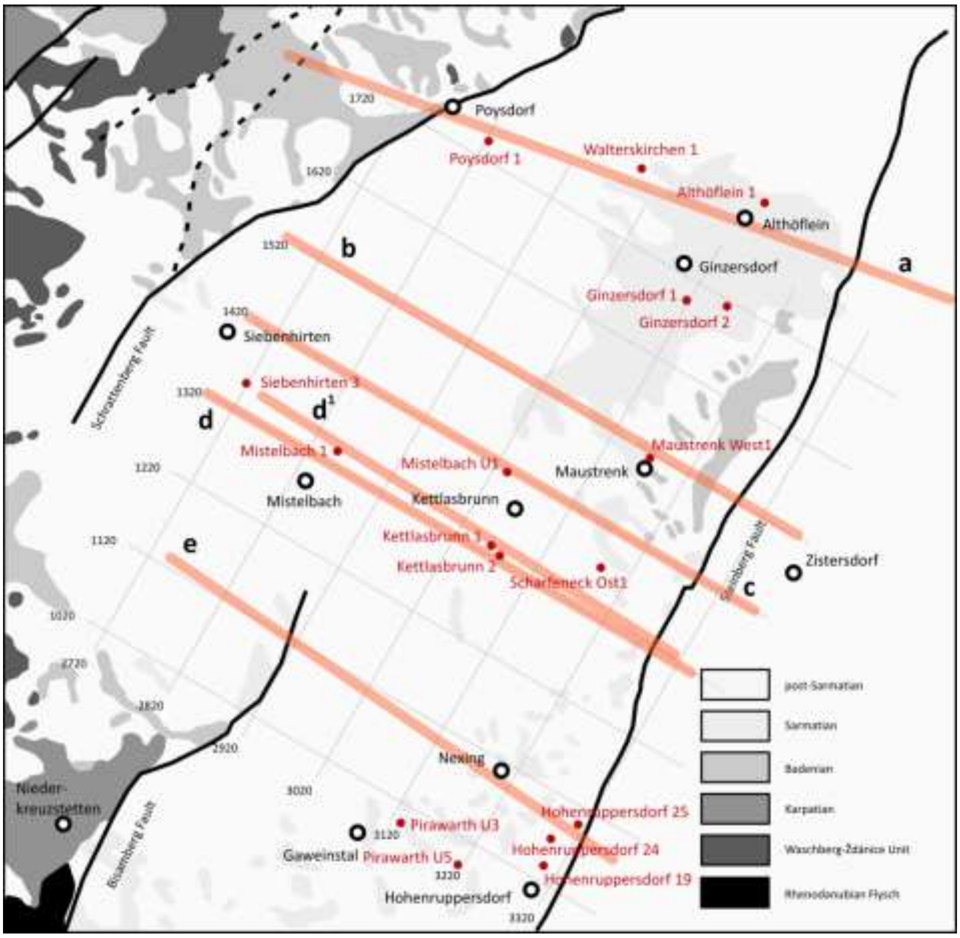


Fig. 85: Lithostratigraphic scheme for the Mistelbach Halfgraben.



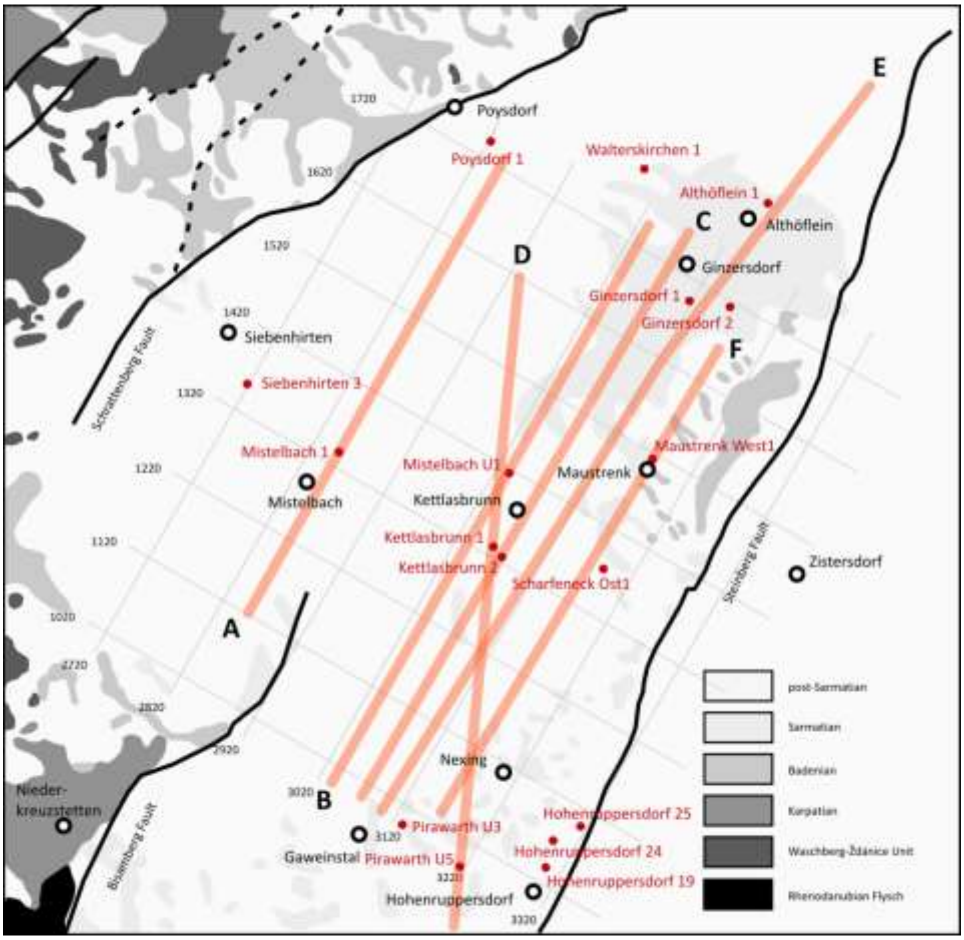


*Fig. 86: Surface geology in the investigated area (after Grill, 1968 and Schnabel, 2002). Red lines indicate WNW-ENE (**above**) and SSW-NNE (**below**) trending seismic lines discussed in the text and illustrated as figs. 87-98.*

5.2. Lužice Formation

The oldest marine sediments deposited on the pre-Neogene relief of the modern Vienna Basin are represented by the Lužice Formation (Buday and Cicha, 1956; Vass, 2002), which is restricted to the northern Vienna Basin (Austria, Moravia, Slovakia, Czech Republic). This lithostratigraphic unit is named after the village Lužice in the Czech Republic but lacks formalisation as no type section was defined so far. It was originally described from wells in the area between Studienka, Lakšárska Nová Ves and Šaštin in the northeastern part of the Vienna Basin in Slovakia but is widespread in the entire northern Vienna Basin. Lithologically it is characterised by laminated grey calcareous clays, silt and siltstones with intercalations of sands ("Schlier").

In the Czech and Slovak depocentres its deposition commenced during the latest Eggenburgian, reflected by the formation of coastal conglomerates and breccias formalised as Chropov, Brezová, Winterberg and Dobra Voda Members (Buday, 1955; Buday and Cicha, 1965; Cicha et al., 1998; Kováč et al., 2004). The mollusc fauna of these units is identical with that of the Eggenburg area in Lower Austria and the presence of taxa such as *Pecten hornensis* and *Gigantopecten holgeri* documents a late Eggenburgian or even early Ottnangian age (Mandic and Steininger, 2003). An earlier age, as suggested by the alleged occurrence of the typical Early Eggenburgian *Oopecten gigas* (Čtyroký, 1959, 1960; Kováč et al., 2004) in the basal conglomerates is based on misidentifications (results Harzhauser). This proofs these basal members of the Lužice Formation as equivalents of the Zogelsdorf and Retz Formations in the North Alpine Foreland Basin, which formed around the Eggenburgian/Ottnangian boundary (Piller et al., 2007).

Within the Mistelbach Halfgraben the Lužice Formation is divided into the following four members.

5.2.1. Schlierbasis-Schutt (basal Schlier-debris)

The Schlierbasis-Schutt (Veit, 1943; Janoschek, 1951) is a facies-equivalent of the coastal conglomerates and breccias of the Chropov, Brezová and Winterberg Members. This unit comprises gravel and pebbles of Flysch sandstone along with synsedimentary pelite and sand and formed during transgressive pulses on the pre-Neogene relief. The Schlierbasis-Schutt was intensively studied in the Maustrenk drillings, which yielded rich mollusc assemblages (Sieber, 1953; Papp and Cicha, 1973). They lack early Eggenburgian pectinids and the oldest parts of the Schlierbasis-Schutt formed like the Czech and Slovak parts of the basal Lužice Fm. around the Eggenburgian/Ottnangian boundary. Most probably they correspond to the early Ottnangian transgression, which is reflected by a quick shift from coastal bryozoan-mollusc-sands towards pelitic sediments along the southeastern margin of the Bohemian Massif (Grunert et al., 2010a).

Lithofacies: conglomerate, breccia, gravel, sandstone, coarse clastics

Age: Early Ottnangian in the Mistelbach Halfgraben. The formation of this unit is probably diachronic, tracing the advancing transgression onto the relief.

Depositional environment: An archipelago-type landscape with various nearshore settings ranging from rocky shores to gravelly beaches and sandy shores (Kováč et al., 2004) passing into well-oxygenated agitated shallow sublittoral conditions as represented by the fauna of the Winterberg Member and the Maustrenk drillings. The mollusc fauna is clearly fully marine and warm-temperate to tropical. No foraminiferal assemblage was found. The initial gravelly beaches are soon replaced by shallow sublittoral settings with abundant fossils of the pen-shell *Atrina brocchii* (d'Orbigny, 1852) and the fig-snail *Ficus condita* (Brongniart, 1923). Due to the lack of seismic data, many geologists assumed a very strong relief of the pre-Neogene basement at the onset of the marine transgression forming the Schlierbasis-Schutt (e.g. Janoschek, 1951). This interpretation was deduced from the very variable position of the Flysch-top in the drillings. The partly considerable thickness of the Schlierbasis-Schutt was interpreted as an additional hint to a high relief (Sieber, 1953; Papp and Cicha, 1973). These authors were not aware of the strong post-sedimentary tectonic movements and halfgraben formation.

Distribution in investigation area: The Schlierbasis-Schutt is documented only from the eastern area of the Mistelbach Halfgraben (e.g. fig. 88; fig. 95) and largely coinciding with the extent of the lower Lužice Formation.

Drillings and Samples: Maustrenk West1 (MTW1 (1510–1517m) 13/7) (figs. 88, 98, 105)

5.2.2. lower Lužice Formation (= Neusiedel Fm.)

The flooding of the northern Vienna Basin led to the formation of the mainly pelitic lower Lužice Formation. In the Mistelbach Halfgraben area, the pelites of the lower Lužice Fm. were termed "Neusiedel Schlier" by Kapounek et al. (1965). Based on the dominant foraminifers this unit is traditionally referred to as "*Bathysiphon-Cyclammina* Schlier" in the literature. Characteristic taxa are the name-giving *Bathysiphon taurinensis* and *Cyclammina praecancellata* along with *Haplophragmoides vasiceki* and *Globigerinoides trilobus* (Cicha et al., 1998). Despite the open marine development, a number of small deltas and estuaries are documented from the Slovak part of the basin during that phase (e.g. Závod delta) reflected by siliciclastic input and the occurrence of *Ammonia*-dominated foraminiferal assemblages associated with oligohaline molluscs (Kováč et al., 2004). A full equivalent of this formation in the adjacent Alpine-Carpathian Foredeep was described by Cicha (1997) from the drilling Laa Thermal Süd 1 (1760–1890m). The Hall Formation in the Upper Austrian part of the North Alpine Foreland Basin comprises associations with *Bathysiphon, Cyclammina* and *Haplophragmoides* and might be roughly coeval (Grunert et al., 2013).

Lithofacies: laminated grey calcareous clays, silt and siltstones with intercalations of sands

Age: The deposition of the lower Lužice Fm. seems to have commenced already during the late Eggenburgian, based on the nannoplankton flora mentioned by Kováč et al. (2004) from the Slovak territory. The listed assemblage with *Discoaster druggii, Sphenolithus disbelemnos* and *Helicosphaera ampliaperta* would indicate Zone NN2. The nannoplankton assemblages in the Mistelbach Halfgraben did not allow any dating. Based on the mollusc fauna of the basal Schlierbasis-Schutt in the Mistelbach Halfgraben, however, the lower Lužice Fm. in the investigation area is not older than early Ottnangian.

Depositional environment: Open marine pelagic, outer shelf to partly even bathyal environments. The foraminiferal communities suggest a muddy to sandy, marine, mesotrophic setting under oxic to slightly suboxic bottom water conditions. Especially the *Bathysiphon*-dominated faunas were interpreted as indicators for deeper neritic to bathyal environments with high nutrient flux and high sedimentation rates (Grunert et al., 2013).

Distribution in investigation area: The lower Lužice Fm. has a very limited distribution. As a continuous sedimentary unit it is confined to the eastern Mistelbach Halfgraben along the west-facing slope of the Steinberg High (figs. 88, 89, 94-98). In western direction it pinches out in the area of Mistelbach U1 and vanishes in northern direction roughly along the line between Walterskirchen 1/Althöflein 1 to Mistelbach U1. The maximum thickness of about 400 m is documented in the area between Ginzersdorf and Maustrenk. The unit is always strongly tectonised and tilted to the west; it overlays discordantly the pre-Neogene basement. The seismic sections C, D and F (figs. 95, 96, 98) reveal distinct downlaps in SSW direction, which seem to represent former onlaps of the initial transgression. This fits well to the presence of mollusc-bearing "Schlierbasis-Schutt" on the base of these downlaps in Maustrenk West1. The lower Lužice Fm. is characterised by more or less continuous high amplitude but low frequency reflectors, separated by thicker units of low amplitude reflectors. Towards the Steinberg High, the subparallel reflectors become increasingly deformed.

Marked unconformities within this unit, as seen in seismic section b (fig. 88) might point to synsedimentary tectonics. The overlying unit is separated by a distinct unconformity and erosive features are frequent. The continuation of the lower Lužice Fm. on the Mistelbach High is unclear. The characteristic microfauna appears in Mistelbach 1 in 1373-1377m depth. In seismic profiles, this part, however, is strongly tectonised and forms already the basement for the following Miocene deposits. In terms of tectonics, these parts may thus be rather equivalents to the "Schiefrige Tonmergel Formation" of the adjacent Waschberg-Ždánice Unit (see also Grill, 1968, p. 65).

Drillings and Samples: Ginzersdorf 1 (GI1 (1050–1055m) 17/1), Ginzersdorf 2 (GI2 (1084–1086.7m) 10/2), Maustrenk West1 (MTW1 (1380–1385m) 9/1, MTW1 (1480–1485m) 12/4), Mistelbach 1 (MI1 (1373.5–1377m) 7/4) (figs. 88, 89, 94-98, 100, 105, 106)

5.2.3. upper Lužice Formation

The separation of a lower and upper part of the Lužice Fm. was originally based on the marked shift in foraminiferal assemblages from the offshore faunas of the "*Bathysiphon-Cyclammina* Schlier" to that of the shallower water faunas of the "*Cibicides-Elphidium* Schlier" (Grill, 1943). Characteristic species are *Cibicidoides budayi, Lobatula lobatula, Lenticulina inornata, Amphicoryna ottnangensis* along with *Bolivina tumida* and *B. fastigia* (Cicha et al., 1998). Later, it became clear that the change was initiated by a drop of the relative sea-level, which allowed the progradation of the deltaic sediments of the Štefanov Mb. in the basal part of the upper Lužice Fm. (Buday, 1955). The delta sand of the Hodonin Mb. is an equivalent of the Štefanov Mb. in the Czech part of the Vienna Basin (Jiříček and Seifert, 1990). The foraminiferal assemblages of the Štefanov Mb. are very similar to that of the lower Ottnangian Zellerndorf Fm. in the North Alpine Foredeep (Cicha et al., 1998). Consequently, the up to 150 m-thick sandy body was interpreted as a Lowstand Systems Tract of the initial Ottnangian cycle (Kováč et al., 2004). The expression of this sea-level drop is distinct in nearshore areas but in deeper marine parts the upper Lužice Fm. lies concordantly on the lower Lužice Fm. During the subsequent Ottnangian transgression "Schlier" became deposited again containing microfauna, which was adapted to low oxygen bottom conditions (Cicha et al., 1998). Transport from the coastal areas into the shelf is documented by the occurrence of shallow-water bryozoans and balanids within offshore pelites (Zágoršek and Hudáčková, 2000). A direct continuation of the upper Lužice Fm. in the adjacent North Alpine Carpathian Foredeep is the Zellerndorf Fm., which was described by Cicha (1997) from the well Laa Thermal Süd (1230–1740m).

Lithofacies: laminated grey calcareous clays, silt and siltstones with intercalations of sands

Age: Ottnangian; Kováč et al. (2004) list *Sphenolithus belemnos, S. disbelemnos, S. dissimilis, Orthorhabdus serratus, Helicosphaera ampliaperta, H. scissura, H. intermedia, H. mediterranea, Coccolithus pelagicus* as typical nannoplankton taxa, indicating Zone NN3/4

Depositional environment: Open marine pelagic in basinal areas with widespread dysoxic bottom conditions. Seagrass meadows and bryozoan thickets flourished in coastal areas. A distinct shallowing trend is indicated by the development of *Lenticulina*-, *Cibicides*- and *Elphidium*-dominated assemblages in the upper part of the unit. These communities hint at muddy to sandy, marine to slightly hypersaline, mesotrophic conditions with oxic to slightly suboxic bottom waters, available vegetation and hard substrates in lagoonal, shallow subtidal settings on the inner shelf (0-50m).

Distribution in investigation area: This formation is distributed as continuous unit nearly throughout the area (figs. 87-98) except for the northern part, where it is missing on the Althöflein and Poysbrunn Highs, in the Katzelsdorf Basin and on the northern part of the Mistelbach High. It quickly seals the relief and forms a strongly WNW-tilted unit with continuous, subparallel, high amplitude and high frequency reflectors. Within the Mistelbach Halfgraben it attains a maximum thickness of c. 200-250 m.

A very strong reflector divides the upper Lužice Formation (blue line in seismic interpretations, figs. 89, 90, 94-96). The lower part displays still rather deformed beds in the Steinberg High area and partly forms downlaps (section E, fig. 97) being thus reminiscent in style of the lower Lužice Fm. South and west of Mistelbach U1 it represents the oldest cover of the pre-Neogene relief. The much stronger post-sedimentary deformation of the beds along the Bisamberg Fault (e.g. seismic line d, fig. 90) compared to the overlying units of the uppermost Lužice Fm. is a further hint of a tectonic event or a change in tectonic regime separating both units. In wire-logs of little deformed parts, this unit is characterised by a strongly serrated succession with strong peaks in the SP-logs with a slight upsection decrease in variance and amplitude (e.g. Mistelbach U1, Kettlasbrunn 1+2, figs. 104, 107). This pattern is less distinct in tectonised parts as represented in Maustrenk West1.

Drillings and Samples: Kettlasbrunn 2 (KA2 (1140–1145m) 5/2, KA2 (1380–1385m) 9/3), Maustrenk West1 (MTW1 (1100–1105m) 3/5, MTW1 (1130–1138m) 4/2, MTW1 (1130–1138m) 4/7), Mistelbach U1 (MisU1 (1298–1302m) 1/2, MisU1 (1624–1633m) 2/1, MisU1 (1885–1894m) 3/1, MisU1 (1885–1894m) 3/4), Siebenhirten 3 (SI3 (1335–1340m) 12/1, SI3 (1485–1490m) 15/2, SI3 (1716–1720.3m) 21/1). The samples AH1 (370–375m) 13/3, AH1 (430–435m) 15/3, AH1 (460–465m)

16/1, AH1 (520–523m) 18/3 and AH1 (610–615m) 21/2 derive from a tectonically strongly deformed unit but seem to represent also the upper Lužice Fm. (figs. 99, 104, 105, 107, 109).

5.2.4. uppermost Lužice Formation

The upper part of the upper Lužice Fm. bears low diverse microfauna and was referred to as "impoverished Schlier" or "Fish-Schlier" due to the frequent occurrence of fish scales and bones. Along with a dominance of *Ammonia*, the occurrence of the Amoebina genus *Silicoplacentina* is characteristic for the uppermost Lužice Fm. (Cicha et al., 1998; Kováč et al., 2004). This part is generally considered as time equivalent of the "*Rzehakia* (or *Oncophora*) Beds" of the Alpine-Carpathian Foredeep. The use of the term "*Oncophora* Beds" – coined for brackish shallow-water deposits with endemic mollusc fauna – in the area of the Mistelbach Halfgraben is clearly misguiding. The presence of the characteristic mollusc fauna of the *Rzehakia* Beds in any area of the Vienna Basin is highly doubtful. Older records revealed as misidentifications or are too poorly preserved for any conclusions (e.g. from the Bockfliess Fm. wells Spannberg 14 and Bockfließ 78; Schultz in Fuchs, 1990). The absence of *Rzehakia* Beds in the close by Laa area, documented by Cicha (1997) in the well Laa Thermal Süd 1 supports this view. Sedimentological analyses of these deposits by Kuffner (2001) documented a deep marine, turbiditic depositional environment with incomplete Bouma-cycles. Consequently, the deep marine parts of the Zellerndorf and Lužice Formations in the junction from Alpine to Carpathian Foredeep, cannot be termed "*Oncophora* or *Rzehakia* Beds" as still done in internal OMV reports (see also Hamilton, 1997; Kuffner, 2001; Dellmour and Harzhauser, 2012).

Lithofacies: laminated grey calcareous clays, silt and siltstones with intercalations of sands

Age: Late Ottnangian (NN4; Kováč et al., 2004)

Depositional environment: Shallow sea with widespread dysoxic bottom conditions; the frequent *Silicoplacentina* indicates a shallow marine, low-salinity environment with reducing conditions (Paruch-Kulczycka, 1999). The foraminiferal communities suggest a rather suboxic, marine, mesotrophic environment on the inner shelf (shallow subtidal).

Distribution in investigation area: The uppermost part of the Lužice Fm. forms a c. 100-150 m-thick and widespread unit, which is separated from the upper Lužice Fm. by a very prominent reflector (green line in seismic interpretations, figs. 88-90, 92, 94-96, 98). It coincides with minor erosive features (e.g. seismic line B, fig. 94). The subparallel reflectors are continuous and distinct but slightly less prominent and with somewhat higher spacing than those of the lower and upper Lužice

Fms. Wire-logs differ from the underlying unit in the much more stable SP-log and general higher values suggesting a decrease in sandy layers. Samples of this unit from Kettlasbrunn 2 indicate shallow marine, lagoonal environments with partly unstable and dysoxic bottom conditions. This clearly excludes any relation to the *Rzehakia* Beds of the eastern North Alpine Foreland Basin, which are lithostratigraphically defined as Traisen Fm. of the Pixendorf Group by Gebhardt et al. (2013).

Drillings and Samples: Kettlasbrunn 2 (KA2 (1020–1025m) 3/1, KA2 (1020–1025m) 3/4, KA2 (1080–1085m) 4/3) (fig. 104)

5.3. Laa Formation

This formation was originally introduced as Schlier of Laa (Suess, 1866) referring to the outcrops at Laa in Lower Austria. Later the Laa outcrops were designated as "stratotype" for the Laa Series by Kapounek et al. (1960) and the pelites of the lower Karpatian in the North Alpine Foreland Basin were united in the Laa Formation by Roetzel and Schnabel (2002). In the North Alpine Foreland Basin, the Laa Fm. comprises up to 1000 m (Goldbrunner and Kolb, 1997). The laminated greenish- to brownish-grey micaceous, silty shales display an overall coarsening upward trend (Nehyba and Petrová, 2000). Within the North Alpine and Carpathian Foreland Basin, the deposits are limited in the south and the east by Cretaceous sediments of the Waschberg-Ždánice Unit. Towards the west, single surface outcrops occur until the Diendorf Fault at the margin of the Bohemian Massif in the area of Gaindorf (Schnabel et al., 2002). Adámek et al. (2003) proposed a separation of the Laa Fm. into the about 470 m-thick Mušov Member and the 550 m-thick Nový Přerov Member. The Mušov Mb. comprises laminated greenish-grey to brownish, finely micaceous clays with silty to fine sandy laminae – as characteristic for the Schlier facies. The Nový Přerov Mb. differs from the underlying parts of the Laa Fm. in its higher proportion of silt and thick sand intercalation within grey to whitish grey micaceous siltstones.

For the NE Vienna Basin, Slovak and Czech geologists proposed an identical separation into two lithostratigraphic units: the lower Karpatian Lakšary Formation and the upper Karpatian Závod Formation, which are treated herein as members of the widespread Laa Fm.

5.3.1. Lakšary Member

This unit was introduced by Špička and Zapletalová (1964) and Špička (1966), named after the village Lakšárska Nová Ves in the Slovak Republic, based on drillings in the area between Tynec, Lanžhot and Senica. It comprises typical Schlier facies of laminated clay and silt with rare intercalations of sand. It developed during the early Karpatian transgression following the sea-level lowstand at the Ottnangian/Karpatian boundary. The associated erosional features are limited to marginal areas, whereas deeper basinal parts lack a marked discordance between the Lužice Fm. and Lakšary Mb. of the Laa Fm. (Kováč et al., 2004). Characteristic foraminifera of the neritic parts of the Lakšary Mb. are *Bulimina elongata, Caucasina schischkinskayae, Globigerina ottnangiensis, Globorotalia scitula* and *Globigerinoides bisphericus* (Kováč et al., 2004). Especially the first appearance of *Uvigerina graciliformis* allows a clear correlation with the coeval Mušov Mb. in the adjacent North Alpine and Carpathian Foreland Basin.

Lithofacies: laminated grey to brownish calcareous clays, silt and siltstones with intercalations of sands

Age: Early Karpatian (NN4); the type locality of the Laa Fm. is dated as Foraminifera Zone M4a and as nannoplankton Zone NN4 (Ćorić et al., 2004).

Depositional environment: The lower part of the Laa Fm. formed on the outer shelf to upper bathyal of the North Alpine and Carpathian Foreland Basin. Cool, nutrient-rich, upwelling-influenced surface waters were typical (Spezzaferri and Ćorić, 2001; Ćorić and Rögl, 2002). These caused dysoxic bottom conditions with reducing environments, supporting the formation of pyritised levels (Spezzaferri et al., 2002). The foraminiferal fauna consists of calcareous benthic and planktonic taxa with *Uvigerina graciliformis*, *Pappina primiformis* and *Globigerinoides bisphericus* as typical taxa (Spezzaferri et al., 2002; Petrová, 2004). Similarly for its equivalents in the Vienna Basin, open marine pelagic to turbiditic conditions and widespread dysoxic bottom conditions are discussed by Kováč et al. (2004). The herein studied fauna suggests rather shallow marine, intertidal to shallow subtidal, oligotrophic and brackish to hypersaline conditions with oxic to rather suboxic bottom waters and vegetated patches since the samples range in the upper part of this unit already hinting at the subsequent shallowing trend.

Distribution in investigation area: A very distinct and continuous unit of c. 150-200 m thickness throughout the Mistelbach Halfgraben but very thin and partly completely missing on the Mistelbach High, the Siebenhirten Basin and the Althöflein High (figs. 87-98). It does not differ considerably from the underlying Lužice Fm. in seismic features aside from slightly weaker reflectors. The base of the unit is indicated by a strong reflector with erosive features in the northeastern sector (e.g. sections E, F, figs. 97, 98) but usually has a concordant contact to the underlying Lužice Fm. in most of its distribution area. The SP-logs (e.g. Mistelbach U1, Kettlasbrunn 1+2) are reminiscent of those of the Lužice Fm. but display a characteristic fining upward trend with an overall decrease in amplitudes. The RES-log is clearly more uniform than that of the Lužice Fm. Seismic sections B-F (figs. 94-98) show that the Lakšary Mb. became considerably eroded by the canyon structure of the Iváň Fm. in the northern part of the Mistelbach Halfgraben. In addition, the reflectors are sharply truncated and discordantly overlain by Karpatian deposits of the Ginzersdorf Mb. containing *Uvigerina graciliformis* (e.g. AH1 (280–285m) 10/2) along the Althöflein High (figs. 94-98).

Drillings and Samples: Kettlasbrunn 1 (KA1 (750–755m) 13/1, KA1 (795–800m) 14/2, KA1 (895–900m) 15/2), Ginzersdorf 1 (GI1 (400–405m) 4/1; might also belong to Závod Mb.) (figs. 100, 104)

5.3.2. Závod Member

This upper member of the Laa Fm. is named after the village Závod in Slovakia. Špička and Zapletalová (1964) and Špička (1966) described this unit based on drillings in the area between Závod, Senica and Břeclav (SVK). In marginal areas the base of the Závod Mb. is characterised by submarine delta sands prograding from the central Vienna Basin towards northeast (e.g. Šaštín Mb., Vass, 2002; Gänserndorf Fm., Weissenbäck, 1995).

These prograding delta complexes are interpreted to result from a relative sea-level drop at the early/late Karpatian boundary (Kováč et al., 2004). During the subsequent transgression and highstand offshore pelites and Schlier-facies became established again. An overall shallowing trend is documented by a shift of the microfauna towards shallow-water assemblages but also by increasing oxidation of the sediments indicated by light colours, which is also typical in the coeval Nový Přerov Mb.

Among the investigated wells, Kettlasbrunn 1 drilled the Závod Mb. Samples, such as KA1 (450–455.5m) 7/4, represent the late shallowing phase, indicated by intertidal estuarine mollusc faunas, which are identical with that of the Korneuburg Basin. Interestingly, the 800 m-thick Korneuburg Fm. was tilted in the same way during the formation of a halfgraben (Zuschin et al., 2014). Therefore, we assume that the Korneuburg Fm. is a tectonically isolated continuation of the Závod Mb.

Lithofacies: Grey clay with intercalations of sand and thin light grey limestones

Age: Late Karpatian (NN4)

Depositional environment: Initially open marine, later a shallowing trend is indicated by the presence of *Ammonia*-assemblages. Gypsum and anhydrite in the central Vienna Basin suggest even hypersaline conditions in adjacent basins. The mollusc fauna of the coeval Korneuburg Fm. is indicative for subtropical tidal flats, mangrove coasts and shallow marine settings and the vegetation points to high mean annual temperatures of c. 15.7-20.8°C (Harzhauser et al., 2002; Kern et al., 2010). The foraminiferal faunas hint at muddy to sandy, rather shallow marine, lagoonal, intertidal to shallow subtidal, oligotrophic and brackish to hypersaline environments with oxic to suboxic bottom water conditions and available vegetation.

Distribution in investigation area: The thicker part of the Laa Fm. is represented by the Závod Mb. In the Mistelbach Halfgraben it has a similar distribution as the Lakšary Mb. (figs. 88, 90-92, 94-98) but reaches also up to the Siebenhirten Basin (Mistelbach 1) and on the Mistelbach and Althöflein Highs, where it seems to represent the only Karpatian sediments. Large parts of the unit were eroded by the overlying Iváň Fm. in the northern sector of the Mistelbach Halfgraben. A very prominent reflector (purple line in seismic interpretations, figs. 88, 90-92, 94-98) separates the Závod Mb. from the Lakšary Mb. Generally, the reflectors of the Závod Mb. are more uniform, slightly weaker, often showing erosive features and are partly discontinuous compared with the Lakšary Mb. Wire-logs differ from the Lakšary Mb. especially in the much higher resistivity values (e.g. Ginzersdorf 1+2, Kettlasbrunn 1+2, figs. 100, 104). The strongly serrated SP-logs display a trend towards higher values with decreasing variance. In the very top, funnel-shaped signatures typical for channel fills become dominant.

Drillings and Samples: Kettlasbrunn 1 (KA1 (450–455.5m) 7/4, KA1 (500–506m) 8/1, KA1 (550–555m) 9/2, KA1 (600–604m) 10/4, KA1 (701–705m) 12/2), Mistelbach 1 (MI1 (800–805m) 1/2), Siebenhirten 3 (SI3 (1250–1255m) 11/1), Walterskirchen 1 (WA1 (500–505m) 7/4), (Ginzersdorf 1 (GI1 (400–405m) 4/1; might also belong to Lakšary Mb.) (figs. 100, 104, 106, 109, 110)

5.3.3. Ginzersdorf Member

This 100 m-thick unit has a very limited distribution in the NNE sector of the Mistelbach Horst in the area of Ginzersdorf 1+2, Althöflein 1 and Walterskirchen 1 (sections figs. 94-98). It sharply truncates and overlies the reflector panel of the Laa Fm. (usually Lakšary Mb.), marked by a set of very prominent high amplitude reflectors. Upsection follow continuous, subparallel and dense but low amplitude reflectors. The entire package is distinctly tilted in northeastern direction and pinches out along the Althöflein High. ESE of Althöflein 1 it escaped from erosion as cap of a fault block, mainly comprising steeply tilted deposits of the Lužice Fm. (section a, fig. 87). Towards the south (close to line 1622) it is completely eroded by the canyon structure of the Iváň Fm. The palaeontological data suggest a deep marine depositional environment and contains assemblages, which are identical with those of the Lakšary Mb. in the Mistelbach Halfgraben. Therefore, this unit might rather represent a lateral equivalent of the Lakšary Mb. than of the Závod Mb. with its shallower fauna.

Lithofacies: Grey clay with intercalations of sand and thin light grey limestones

Age: Karpatian based on the presence of *Uvigerina graciliformis*

Depositional environment: The mollusc assemblage and the microfauna indicate deep marine conditions on the outer shelf or even upper bathyal.

Tectonics: The discordant position of this unit on supposedly coeval deposits and its truncated toplaps suggest a major tectonic event. No thrusts have been described so far from the Mistelbach Horst, comparable structures, however, are well documented from the adjacent Poysbrunn Horst (Beidinger et al., 2009). NW-directed thrust folds within the Laa Fm. were also detected in surface outcrops of the North Alpine and Carpathian Foreland Basin by Beidinger et al. (2009). A comparable relation to the tectonic regime of the Waschberg-Ždánice Unit was already discussed by Grill (1968) for parts of the Lužice Fm. in the Poysdorf 2-drilling.

Drillings and Samples: Althöflein 1 (AH1 (250–255m) 9/4, AH1 (280–285m) 10/2, AH1 (310–315m) 11/1), Ginzersdorf 1 (GI1 (259–255m)) (fig. 99, 100)

5.4. Iváň Formation in the Mistelbach Canyon

The strongly tilted Lužice and Laa Formations are discordantly overlain and eroded by a unit that was not recognised in the literature so far due to the lack of seismic data. This structural element is a NW-SE trending, up to 600 m deep incised channel (figs. 88-91, 93-98), which was drilled by the wells Maustrenk West1 and Mistelbach U1. Its marginal part was also drilled by the wells Kettlasbrunn 1+2. The seismic facies (fig. 89, 91, 93-98) is chaotic and relatively isotropic without noticeable internal reflectors, thus being strongly separated from the planar high amplitude reflectors of the Laa Fm. Erosive features and a weaker reflector below the most prominent one suggest a multi-phased development of the structure. In wire-logs, the unit is characterised by a very low variability in SP and resistivity values resulting in a typical chimney-like shale-line profile.

Structure, depth and stratigraphic position are fully identical with the features of the Iváň Canyon, which is incised in the Karpatian and Ottnangian formations at the junction from North Alpine Foredeep to the Carpathian Foredeep (Dellmour and Harzhauser, 2012). There it is restricted to the northeasternmost part of the North Alpine Foreland Basin and a small area of the southwestern part of the Carpathian Foredeep (well log facies K in Šikula and Nehyba, 2004) and pinches out quickly in all directions. It overlies the Nový Přerov Mb. with a marked angular unconformity throughout its distribution area and is filled by the Iváň Formation (Adámek et al., 2003). In the Iváň Canyon it comprises fine-grained calcareous sandstones in the base and up to 200 m of grey calcareous claystones. In outcrops, sand-silt interbeddings with channel structures and a rich intertidal mollusc fauna are typical.

The striking similarities between both structures – even in e-logs – suggest that they are genetically related and were both part of a submarine drainage system into the Carpathian Foredeep. As pendant to the Iváň Canyon, Mistelbach Canyon as name for the structure on the Mistelbach Horst is proposed. It seems reasonable to widen the original definition of the Iváň Fm. by also including the sedimentary fill of the Mistelbach Canyon.

Lithofacies: Brown-grey marly clay with intercalations of sand

Age: Early Badenian (?). Dellmour and Harzhauser (2012) were not able to provide clear evidence if the Iváň Canyon was filled during the latest Karpatian or the early Badenian. The nannoplankton assemblage was only indicative for zone NN4. In the North Alpine and Carpathian Foreland Basin, the Iváň Canyon is overlain by *Orbulina*-marls of Badenian (Langhian) age (Adámek et al., 2003). Therefore, the possible time-window for the formation of the Iváň Fm. is rather wide and is limited in the top only by the FAD of *Orbulina* at 15.1 Ma (Wade et al., 2011). In the central and southern Vienna Basin the first units overlying the tilted lower Miocene deposits are conglomerates such as the Aderklaa Fm. No biostratigraphic data are available for this formation and depending on concept, they are interpreted as lowermost Badenian (Strauss et al., 2006) or as latest Karpatian (Kováč et al., 2004). Recently, Hohenegger et al. (2014) proposed an earliest Badenian age for the Iváň Canyon fill – again based only on conceptual arguments. Within the study area, samples SI3 (900–906m) 7/3 and SI3 (1000–1003m) 8/2 from well Siebenhirten 3 yield very rich Lagenidae assemblages, which are highly reminiscent of the Lower Lagenidae Zone of Grill (1941). This dating, however, does not necessarily define the initial formation of the canyon, but only parts of its fill.

Depositional environment: The diverse assemblages of the two samples SI3 (900–906m) 7/3 and SI3 (1000–1003m) 8/2 indicate a marine environment on the outer shelf or even upper bathyal. They comprise numerous epi- and infaunal taxa pointing to oxygenated to low-oxygenated bottom waters and rather suboxic conditions within the sediment. Higher abundances of e.g. *Uvigerina, Bulimina* and *Bolivina* even document an increased flux of organic matter and environmental stress.

Drillings and Samples: Only few samples are available from the canyon fill. Well Siebenhirten 3 drilled this unit and samples SI3 (900–906m) 7/3 and SI3 (1000–1003m) 8/2 seem to represent this interval based on relative position and the characteristic "chimney-shaped" wire-logs (unfortunately it is not possible to integrate the well reliably in the seismic data; fig. 109).

5.5. Badenian deposits

Within this study, the internal structure and geographic extent of the Badenian units of the Mistelbach Horst will not be discussed in detail. On the one hand, the available seismic is not adequate to map these units reliably. On the other hand our Badenian samples concentrate on two separate areas: the northern sector (wells Althöflein 1, Poysdorf 1, Walterskirchen 1) and the southern margin of the Mistelbach Horst around Hohenruppersdorf (wells Hohenruppersdorf 19, 24, 25, Pirawarth U3). Both areas are difficult to interpret. In the northern promontory the Badenian deposits reflect a strongly reduced sedimentation due to the elevated topographic position of the Althöflein High already during Badenian times. In the south, the deposits are already strongly deformed and tectonised along several very narrow fault blocks associated with the Steinberg Fault.

The marine Langhian and lower Serravallian (= Badenian) deposits of the Vienna Basin are united in the Baden Group in the stratigraphic table of Austria (Piller et al., 2004). This group comprises a broad range of lithologies and numerous informal formations, which were discussed briefly by Kováč et al. (2004). Aside from numerous local deltaic and nearshore bodies, the most important and widespread units in the northern Vienna Basin are the Lanžhot, Jakubov and Studienka Formations. The correlation of these formations with the Badenian units on the Mistelbach Horst is only tentative and several smaller sedimentary entities in the seismic panels cannot be attributed to any of the three major units. Provisionally, the lithostratigraphic terminology developed for the central (north of the Spannberg ridge) and northwestern Vienna Basin was applied also for the Mistelbach Horst, as it formed in the same palaeogeographic region.

5.5.1 Lanžhot Formation

The lower Badenian formation is named after the village Lanžhot in the Slovak part of the Vienna Basin (Špička, 1966). This formation is partly a synonym of the Baden Tegel/Series (Papp et al., 1978) in Austrian literature and comprises mainly grey-blue, bioturbated clayey to sandy calcareous silts (so called Tegel) with subordinate lenses of silt and sand with rich biogenic material. Beside corallinacean algal debris, most common are foraminifera and molluscs, which are often transported from coastal areas (Rögl et al., 2008). It formed in marine, mesotrophic, rather suboxic inner to outer shelf environments up to 200 m water depth in a relatively warm, well-stratified water column. The time window available for its deposition ranges from c. 15.9 to 14.2 Ma. The stratotype section Baden-Sooss was correlated with astronomic target curves and seems to span an interval of about 14.1–14.2 Ma (Hohenegger et al., 2009). In terms of biostratigraphy it is defined by the uppermost part of the Lower Lagenidae Zone and Upper Lagenidae Zone of Grill (1941) and corresponds to the nannoplankton zone NN5 and the planktonic foraminiferal Zone M6 (Rögl et al., 2008). No surface outcrops of this phase exist on the Mistelbach Horst. The historical locality Frättingsdorf with its famous microfauna of the lower Lagenidae Zone lies already on the adjacent Poysbrunn Horst (Grill, 1968). Equivalents on the Mistelbach Horst were documented from drillings in the Maustrenk area by Grill (1941, 1943, 1968; Maustrenk 1 102–104 m, Maustrenk 3 60–66.3m).

Drillings and Samples: figs. 87-90, 94-98, 101, 102, 103, 109; Hohenruppersdorf 19 (HRD19 (495–500m) 2/1, HRD19 (571–576m) 3/1, HRD19 (590–595m) 4/1), Hohenruppersdorf 24 (HRD24 (550–555m) 5/1, HRD24 (620–624m) 6/1, HRD24 (641–645m) 7/1), Hohenruppersdorf 25 (HRD25 (490–495m) 4/1, HRD25 (550–557m) 5/1, HRD25 (645–650m) 7/1, HRD25 (665–670m) 8/1, HRD25 (685–690m) 9/1), Pirawarth U3 (PWU3 (1123–1128m) 1/1, PWU3 (1123–1128m) 1/3), Siebenhirten 3 (SI3 (800–805m) 6/3)

5.5.2. Jakubov Formation

The Jakubov Formation was named by Špička (1966) after the village Jakubov in the Slovak part of the central Vienna Basin. This open marine formation is also a part of the Baden Tegel/Series of Papp et al. (1978). The predominant lithologies are grey to greenish-grey clays and calcareous clays with subordinate sand layers. A characteristic feature is the frequent occurrence of the agglutinated foraminifera *Spirorutilus carinatus*. This species, formerly assigned to *Spiroplectammina*, was name-giving for the middle Badenian ecozone in the Vienna Basin (Grill, 1941, 1943). The Jakubov Fm. is part of the middle Badenian of most authors and formed between c. 14.2–13.6 Ma. Based on seismic data and sequence stratigraphic interpretations, it comprises upper parts of the Upper Lagenidae

Zone and the entire *Spirorutilus* Zone (Weissenbäck, 1996) and belongs to the nannoplankton zone NN5 (Kováč et al., 2004).

Along the northwestern margin of the Vienna Basin, the corallinacean platform of the Steinberg High formed largely during the middle Badenian (Grill, 1968) and the middle Badenian Steinebrunn mollusc faunas from the adjacent Poysbrunn Horst are among the most diverse assemblages of the Vienna Basin (Meznerics, 1933). Similarly, the drillings yield very rich and diverse mollusc as well as foraminiferal faunas of shallow marine, mesotrophic, oxic to suboxic settings partly indicating seagrass meadows (e.g. Althöflein 1) in water depths up to 100 m. In the seismic sections, this formation is characterised by an about 200-250 m thick unit of prograding clinoforms (e.g. seismic section A, fig. 87), which are also known from the Slovak part of the Vienna Basin (Kováč et al. 2004).

Drillings and Samples: figs. 88, 89, 91, 93, 99, 101-103, 108, 110; Althöflein 1 (AH1 (190–195m) 7/4, AH1 (220–225m) 8/2), Hohenruppersdorf 19 (HRD19 (400–405m) 1/2), Hohenruppersdorf 24 (HRD24 (390–395m) 3/1), Hohenruppersdorf 25 (HRD25 (290–298m) 1/1, HRD25 (310–315m) 2/1), Poysdorf 1 (PO1 (490–495m) 16/1, PO1 (520–525m) 17/2), Walterskirchen 1 (WA1 (400–403m) 5/1)

5.5.3. Studienka Formation

This upper Badenian formation is named after the village Studienka in the eastern part of the central Vienna Basin (Špička, 1966). The dark grey calcareous clays and sands formed in marine offshore environments with stratified water column and frequent oxygen-depleted bottom conditions (Kováčova and Hudáčková, 2009). Characteristic foraminifers are the planktonic *Velapertina indigena* and the benthic *Bolivina dilatata maxima* and *Pappina neudorfensis*. The Vienna Basin *Bulimina-Bolivina* Zone was based by Grill (1943) on the frequent occurrence of these benthic taxa. The nannoplankton is indicative for nannoplankton Zone NN6 (Kováč et al., 2004). This defines a time window for the deposition of the Studienka Formation from c. 13.6 Ma, marking the extinction of *Sphenolithus heteromorphus*, to 12.7 Ma, which is the onset of the Sarmatian (Harzhauser and Piller, 2004a, b).

Only few samples cover this interval. Nevertheless, Poysdorf 1 (PO1 (460–465m) 15/1) documents the occurrence of the marker species *Agapilia tuberculata* (usually referred to as *Nerita picta* in older literature). This gastropod is very abundant in upper Badenian strata and seems to be also restricted to this time slice. Consequently, Grill (1941) proposed the "Zone with *Rotalia beccarii* and *Nerita picta*" for the upper Badenian of the Vienna Basin. As documented by Švagrovský (1964, 1982) this zone is not restricted to the Vienna Basin but can also be traced in the Pannonian Basin complex. The foraminiferal assemblages suggest muddy to sandy, marine to hypersaline, more oligotrophic and lagoonal, intertidal, shallow environments with oxic to oxygen-depleted bottom water conditions.

Drillings and Samples: figs. 91, 93, 108, 110; Poysdorf 1 (PO1 (430–435m) 14/3, PO1 (460–465m) 15/1), Walterskirchen 1 (WA1 (350–353m) 4/2)

5.6. Sarmatian Holic and Skalica Formations

The upper Middle Miocene Sarmatian deposits are not the main scope of this study and the available seismic data do not resolve the internal structure. Therefore, herein both formations that are represented on the Mistelbach Horst in the seismic sections are united. The Sarmatian depositional environments and a detailed stratigraphy of the Vienna Basin including the Mistelbach Horst were intensively discussed by Harzhauser and Piller (2004a, b). Additional contributions focusing on the investigation area were published by Harzhauser and Piller (2010), Harzhauser et al. (2011a) and Lukeneder et al. (2011). According to these authors, the Lower Sarmatian corresponds to the mainly siliciclastic Holic Formation (Vass, 2002) and spans the *Mohrensternia* Zone and the lower part of the *Ervilia* Zone of the mollusc zonation along with the *Anomalinoides dividens* Zone, *Elphidium reginum* Zone and *Elphidium hauerinum* Zone of the foraminifera zonation (Grill, 1941). The Upper Sarmatian is represented by the mixed siliciclastic-carbonatic Skalica Formation (Vass, 2002) and comprises the upper part of the *Ervilia* Zone and the *Sarmatimactra vitaliana* Zone of the mollusc zonation along with the entire *Porosononion granosum* Zone of the foram zonation.

On the Mistelbach Horst the Sarmatian displays a very wide distribution and largely defines its surface geology, only along the Steinberg High Sarmatian deposits are missing (Grill, 1968). The famous outcrops Nexing, Hauskirchen and Kettlasbrunn expose oolitic sediments and thick coquinas of the Skalica Fm. Surface outcrops of the mainly pelitic-sandy Holic Fm. are much rarer (e.g. Siebenhirten, Maustrenk).

Within the frame of this study, Sarmatian samples are mostly represented by the Lower Sarmatian Holic Fm. The characteristic mollusc fauna, with the marker-genus *Mohrensternia*, differs considerably from the Badenian faunas and similarly, the autochthonous foraminiferal assemblages are easily separated from older ones. Due to the strong reworking of Badenian microfauna, however, the base of the Sarmatian was frequently overlooked in older OMV reports, which neglected the autochthonous mollusc fauna. The base of the Sarmatian is usually recognisable as set of high amplitude reflectors forming an erosive relief on underlying strata (fig. 87). Erosive features and channels are also frequent within the Sarmatian seismic panel. The rather regularly serrated wire-logs, in which SP-logs usually mirror the RES-logs are also very characteristic for the Sarmatian deposits throughout the Vienna Basin (Harzhauser and Piller, 2004a, b).

Age: The Sarmatian corresponds to the late Serravallian. The early Sarmatian spans an interval from 12.7-12.0 Ma and the late Sarmatian starts at 12.0 Ma and ends in the Central Paratethys with the establishment of Lake Pannon at 11.6 Ma (Harzhauser and Piller, 2004a, b).

Depositional environment: Both formations formed in very shallow marine, often nearshore and coastal settings under slightly brackish to marine, meso- to oligotrophic, oxic to slightly suboxic conditions. The assemblages of the Holic Fm. are characteristic for muddy shores and foreshores with algae or seagrass. In cases, bryozoan-serpulid build-ups formed in stagnant lagoons (Maustrenk). In contrast, the rock forming mollusc faunas of the Skalica Fm. dwelled in agitated shoals with ooid dunes (Harzhauser and Piller, 2010).

Drillings and Samples: Holic Formation: Althöflein 1 (AH1 (100–105m) 4/1, AH1 (130–135m) 5/1, AH1 (160–165m) 6/2), Hohenruppersdorf 24 (HRD24 (256-260.5m) 2/1), Poysdorf 1 (PO1 (99.5–105m) 3/1, PO1 (130–135m) 4/2, PO1 (160–165m) 5/2, PO1 (220–225m) 7/2, PO1 (250–255m) 8/1, PO1 (280–285m) 9/1), Siebenhirten 3 (SI3 (400–405m) 2/2, SI3 (500–505m) 3/1, SI3 (600–604m) 4/2), Walterskirchen 1 (WA1 (200–205m) 1/1, WA1 (300–305m) 3/1). Skalica Formation: Poysdorf 1 (PO1 (40–45m) 1/1) (figs. 99, 108-110)

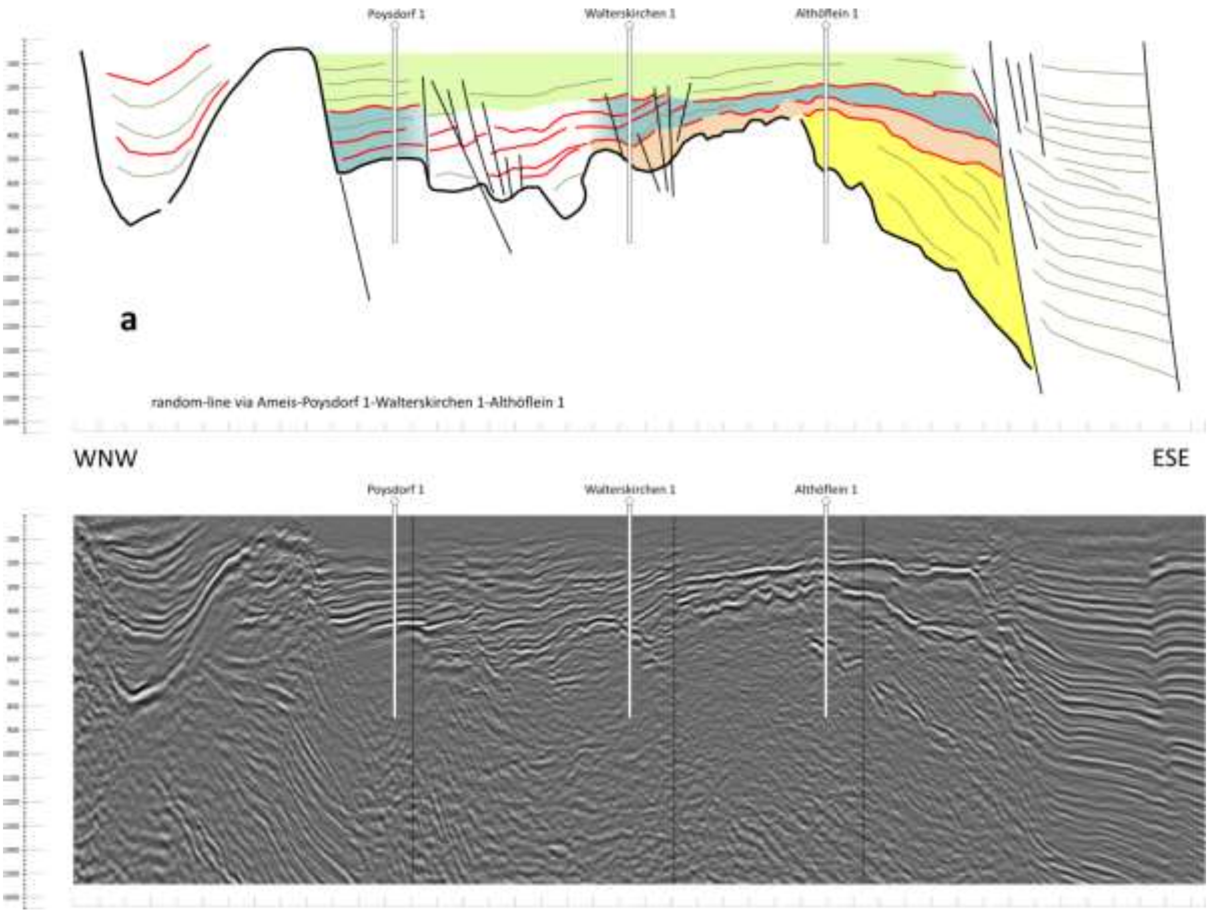


Fig. 87: WNW-ESE trending seismic line a (yellow: Lužice Fm., pinkish-brown: Karpatian, blue-green: Badenian, light green: Sarmatian). The steep fault in the right that limits the four different coloured units is the Steinberg Fault.

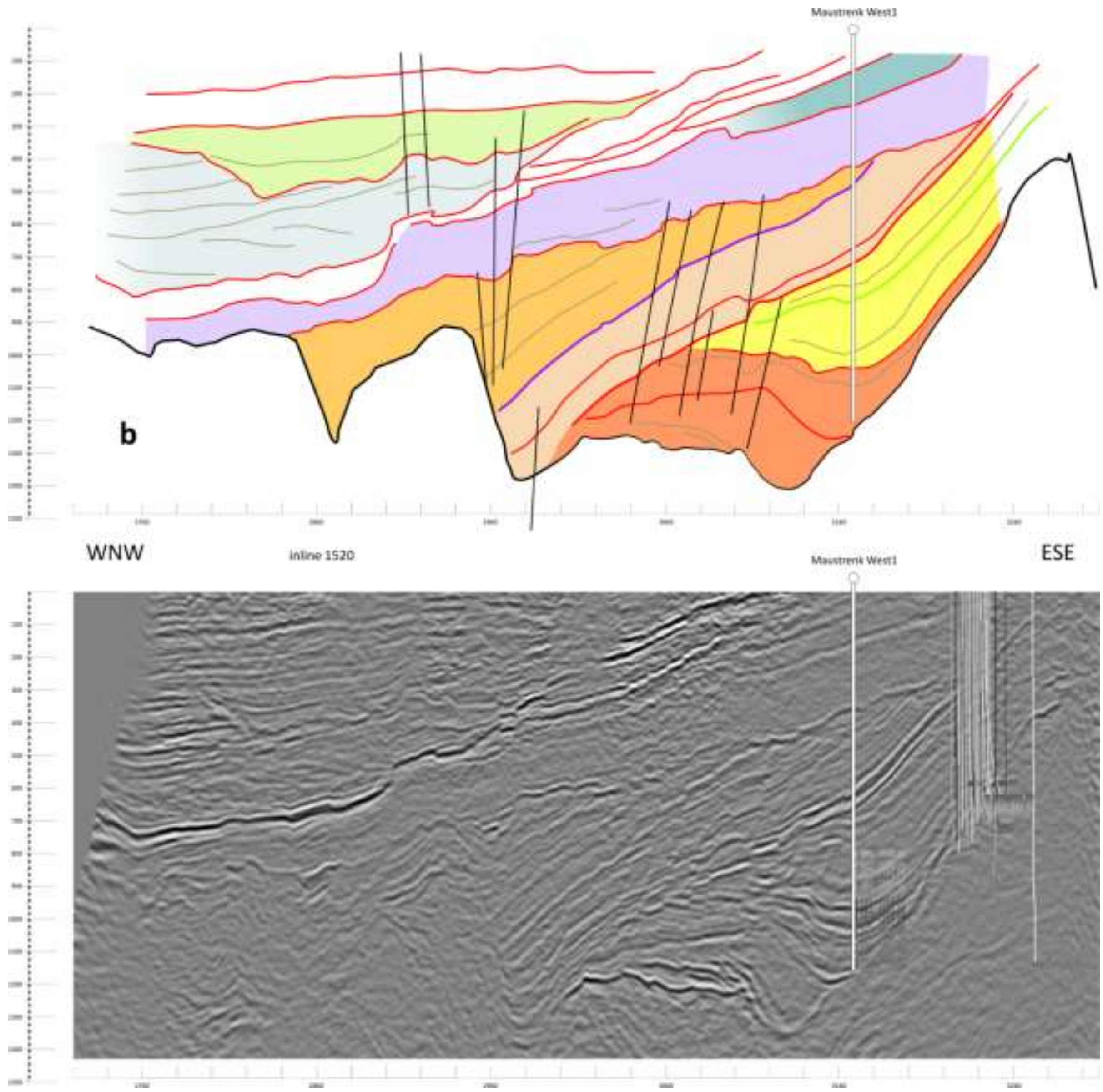


Fig. 88: WNW-ESE trending seismic line b (orange: lower Lužice Fm., yellow: upper Lužice Fm., pinkish-brown: Lakšary Mb., light orange: Závod Mb., lavender: Iváň Fm. of the Mistelbach Canyon, blue-green: Lanžhot Fm., middle grey: Jakubov Fm., light green: Sarmatian). The green line marks the prominent reflector that separates the uppermost Lužice Fm. from the upper Lužice Fm. The purple line indicates the strong reflector that separates the Závod Mb. from the underlying Lakšary Mb.

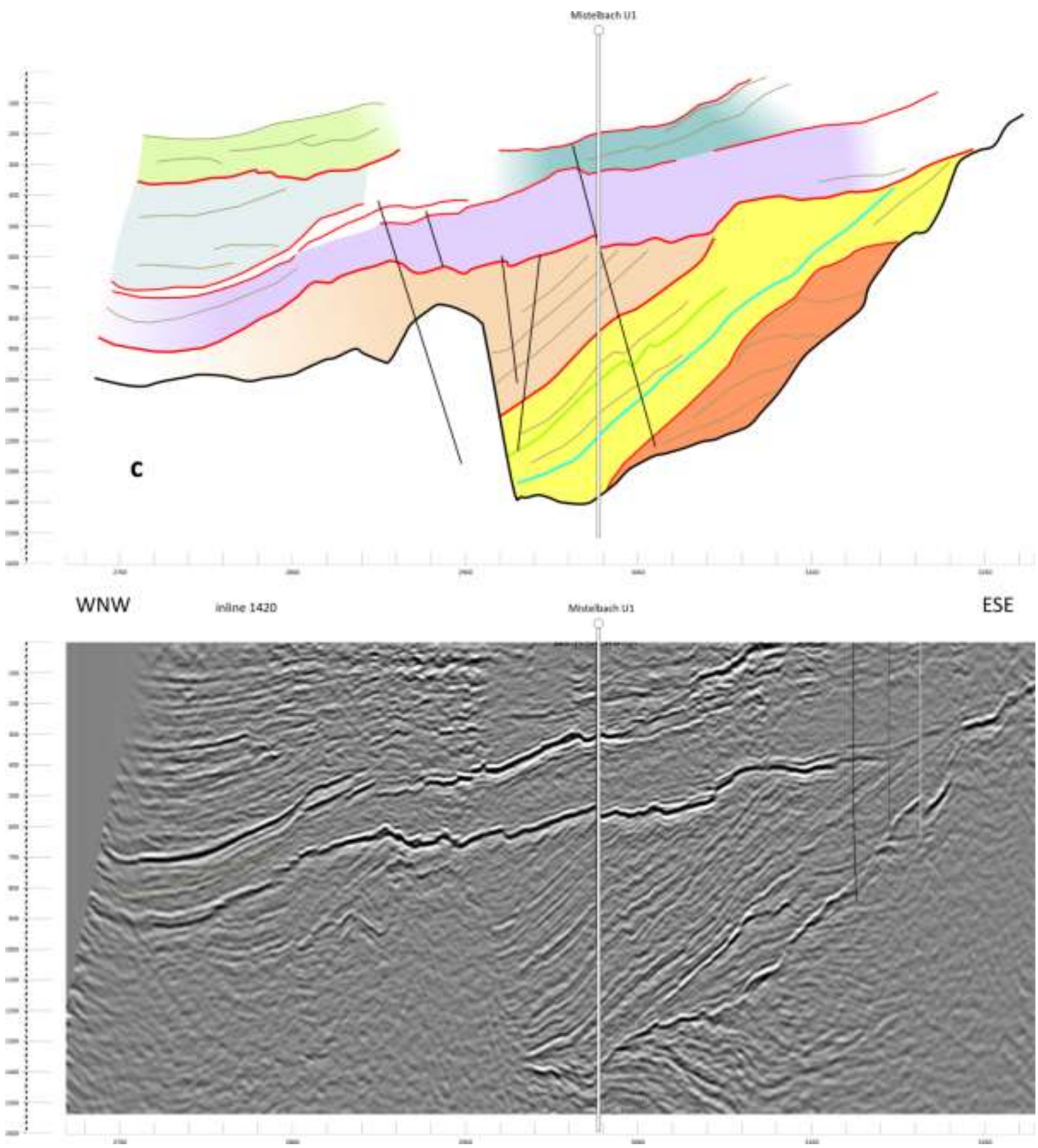


Fig. 89: WNW-ESE trending seismic line c (orange: lower Lužice Fm., yellow: upper Lužice Fm., pinkish-brown: Lakšary Mb., lavender: Iváň Fm. of the Mistelbach Canyon, blue-green: Lanžhot Fm., middle grey: Jakubov Fm., light green: Sarmatian). The green line marks the prominent reflector that separates the uppermost Lužice Fm. from the upper Lužice Fm. The blue line indicates the strong reflector that divides the upper Lužice Fm.

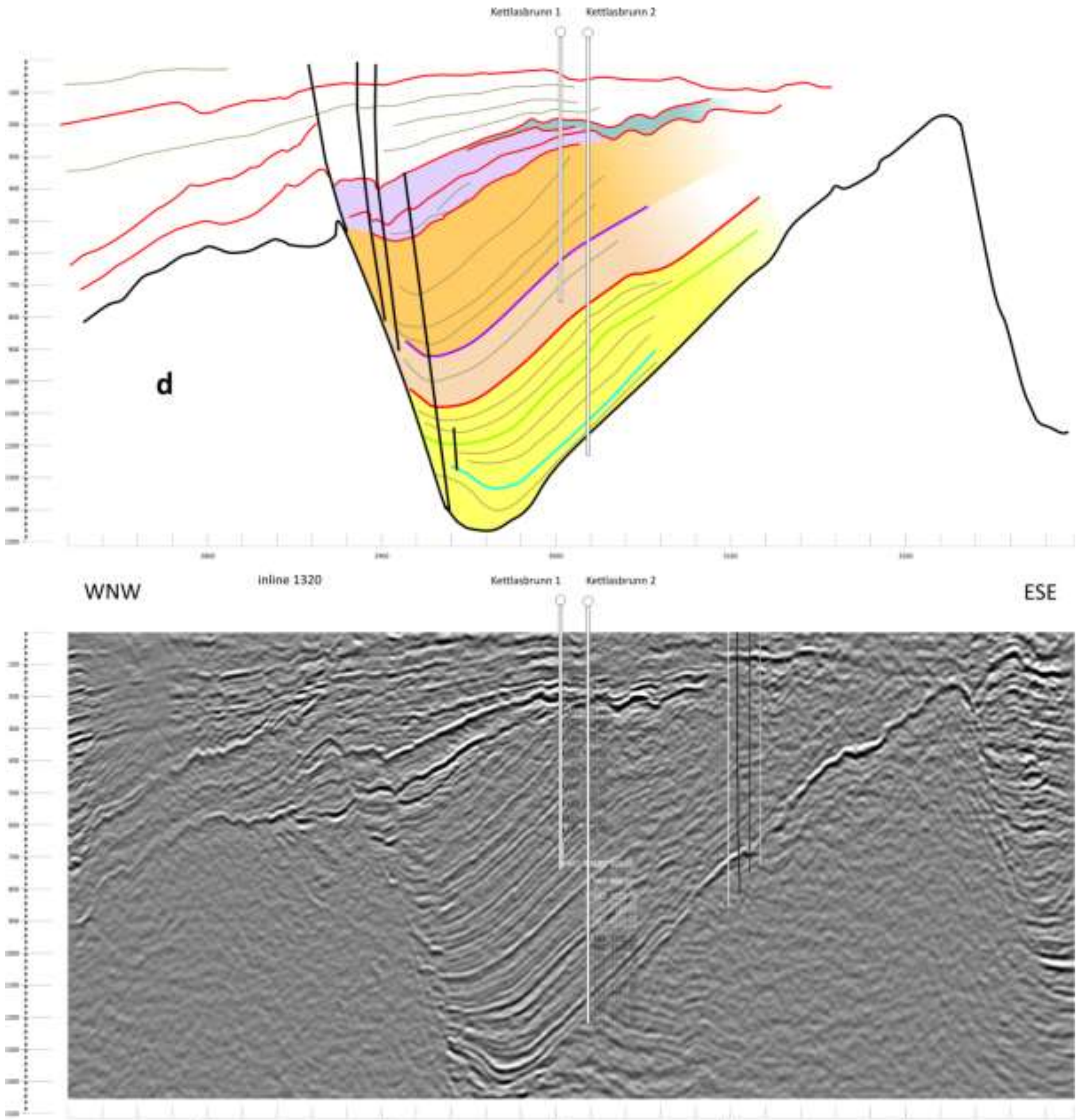


Fig. 90: WNW-ESE trending seismic line d (yellow: upper Lužice Fm., pinkish-brown: Lakšary Mb., light orange: Závod Mb., lavender: Iváň Fm. of the Mistelbach Canyon, blue-green: Lanžhot Fm). The blue line indicates the strong reflector that divides the upper Lužice Fm. The green line marks the prominent reflector that separates the uppermost Lužice Fm. from the upper Lužice Fm. The purple line indicates the strong reflector that separates the Závod Mb. from the underlying Lakšary Mb. The steep fault in the centre is the Bisamberg Fault.

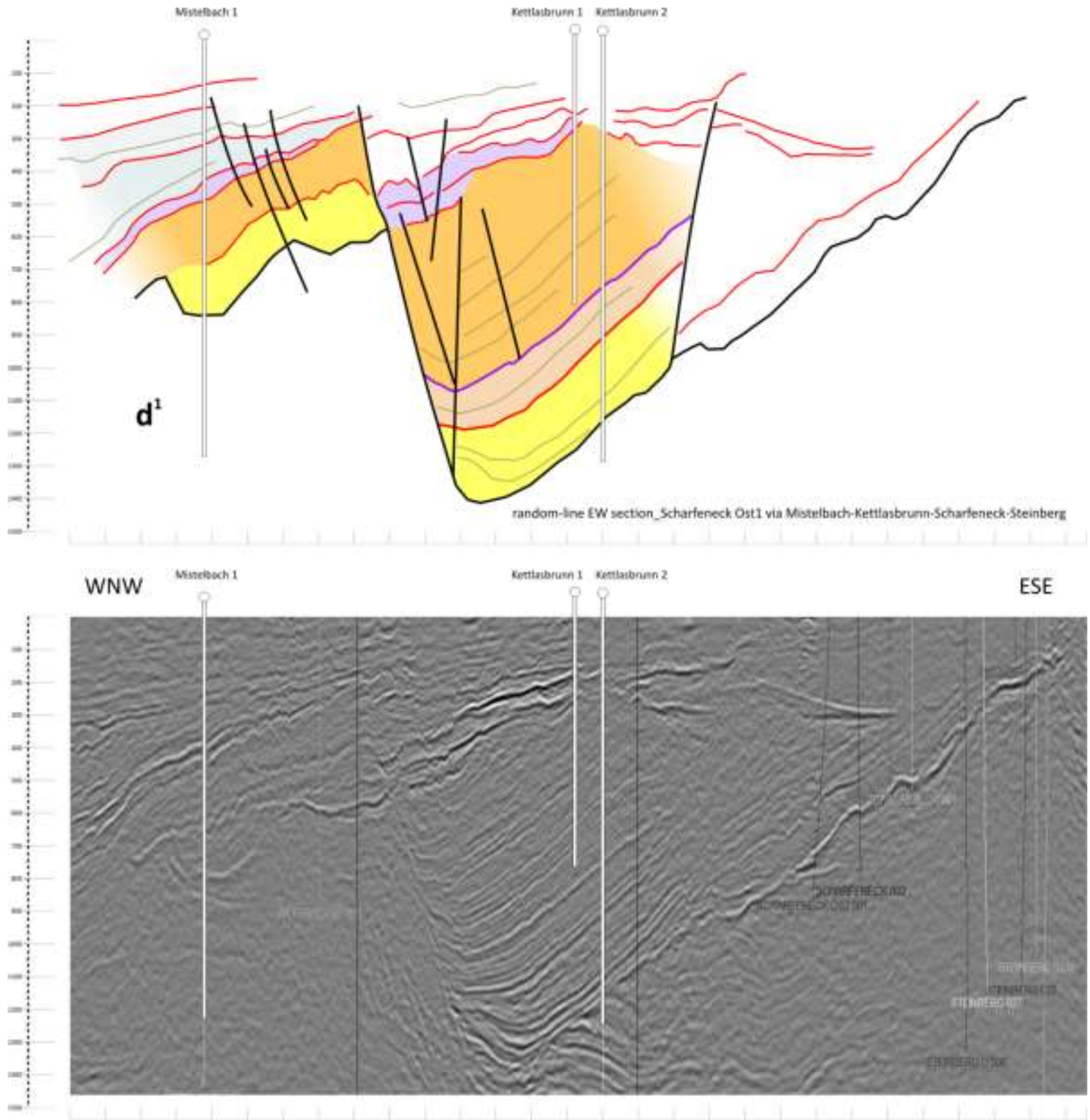


Fig. 91: WNW-ESE trending seismic line d^1 (yellow: upper Lužice Fm., pinkish-brown: Lakšary Mb., light orange: Závod Mb., lavender: Iváň Fm. of the Mistelbach Canyon, middle grey: Jakubov Fm., light grey: Studienka Fm.). The purple line indicates the prominent reflector that separates the Závod Mb. from the underlying Lakšary Mb. The steep fault in the centre is the Bisamberg Fault.

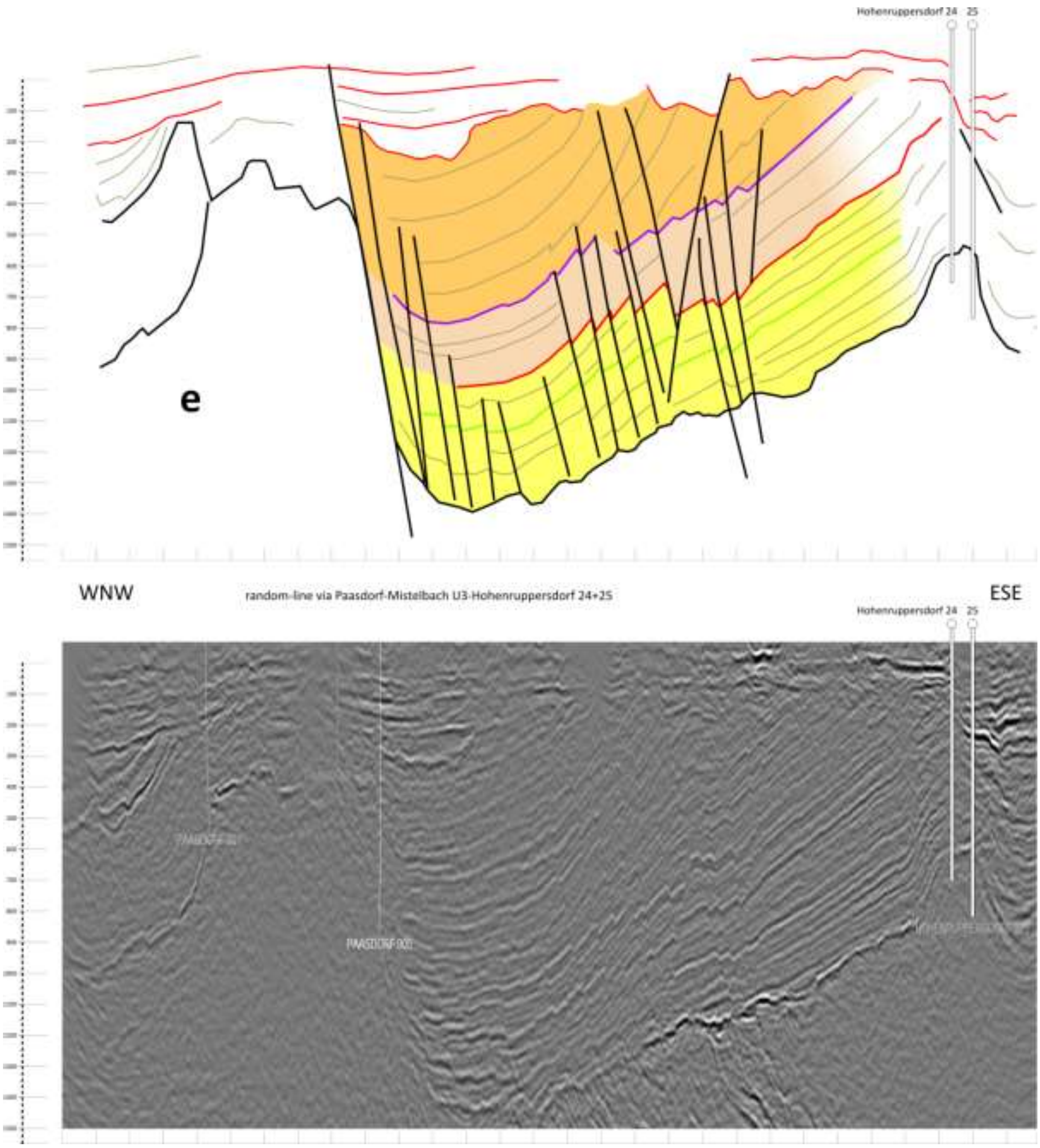


Fig. 92: WNW-ESE trending seismic line e (yellow: upper Lužice Fm., pinkish-brown: Lakšary Mb., light orange: Závod Mb.). The green line marks the prominent reflector that separates the uppermost Lužice Fm. from the upper Lužice Fm. The purple line indicates the strong reflector that separates the Závod Mb. from the underlying Lakšary Mb. The steep fault in the centre is the Bisamberg Fault.

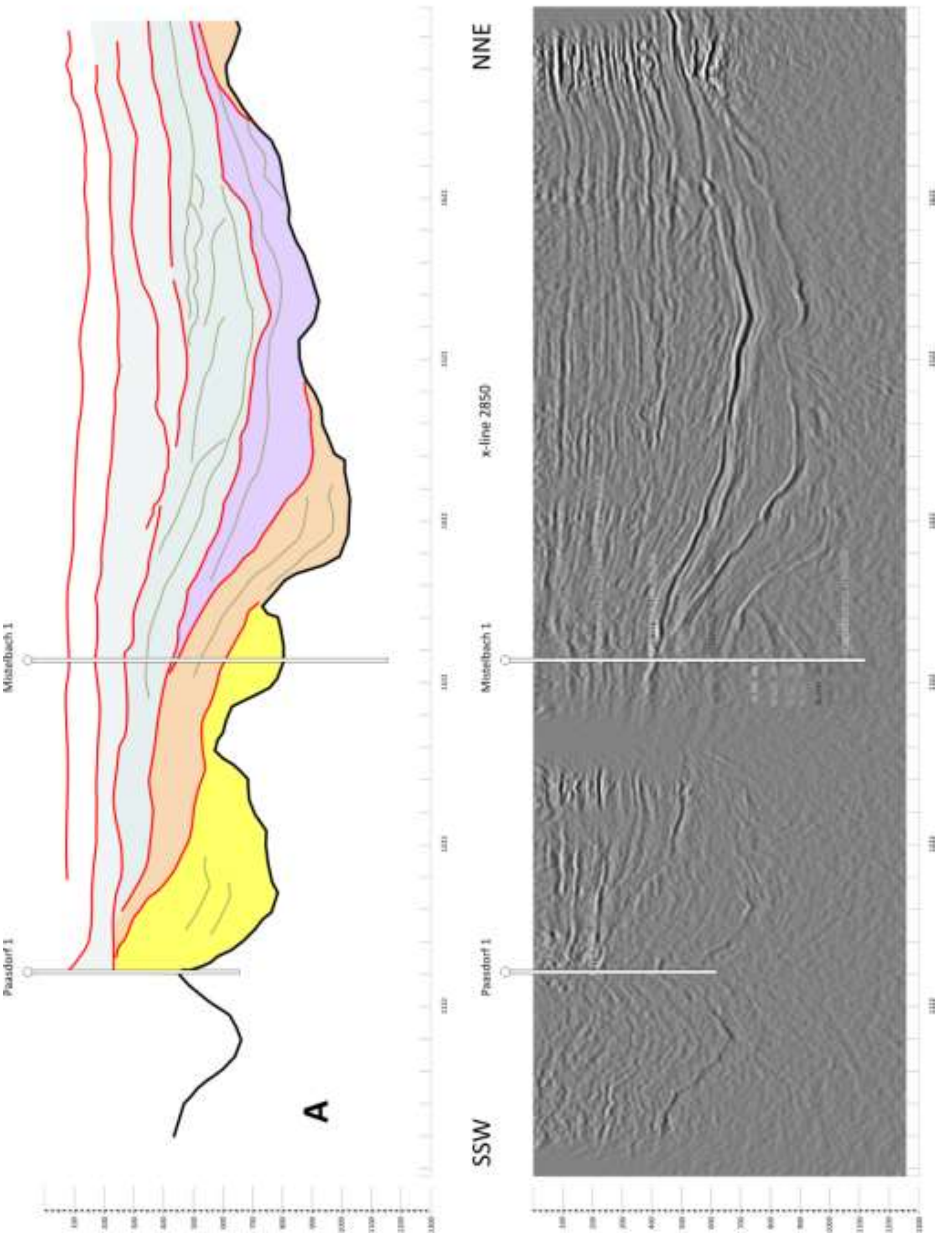


Fig. 93: SSW-NNE trending seismic line A (yellow: upper Lužice Fm., pinkish-brown: Lakšary Mb., lavender: Iváň Fm. of the Mistelbach Canyon, middle grey: Jakubov Fm., light grey: Studienka Fm.).

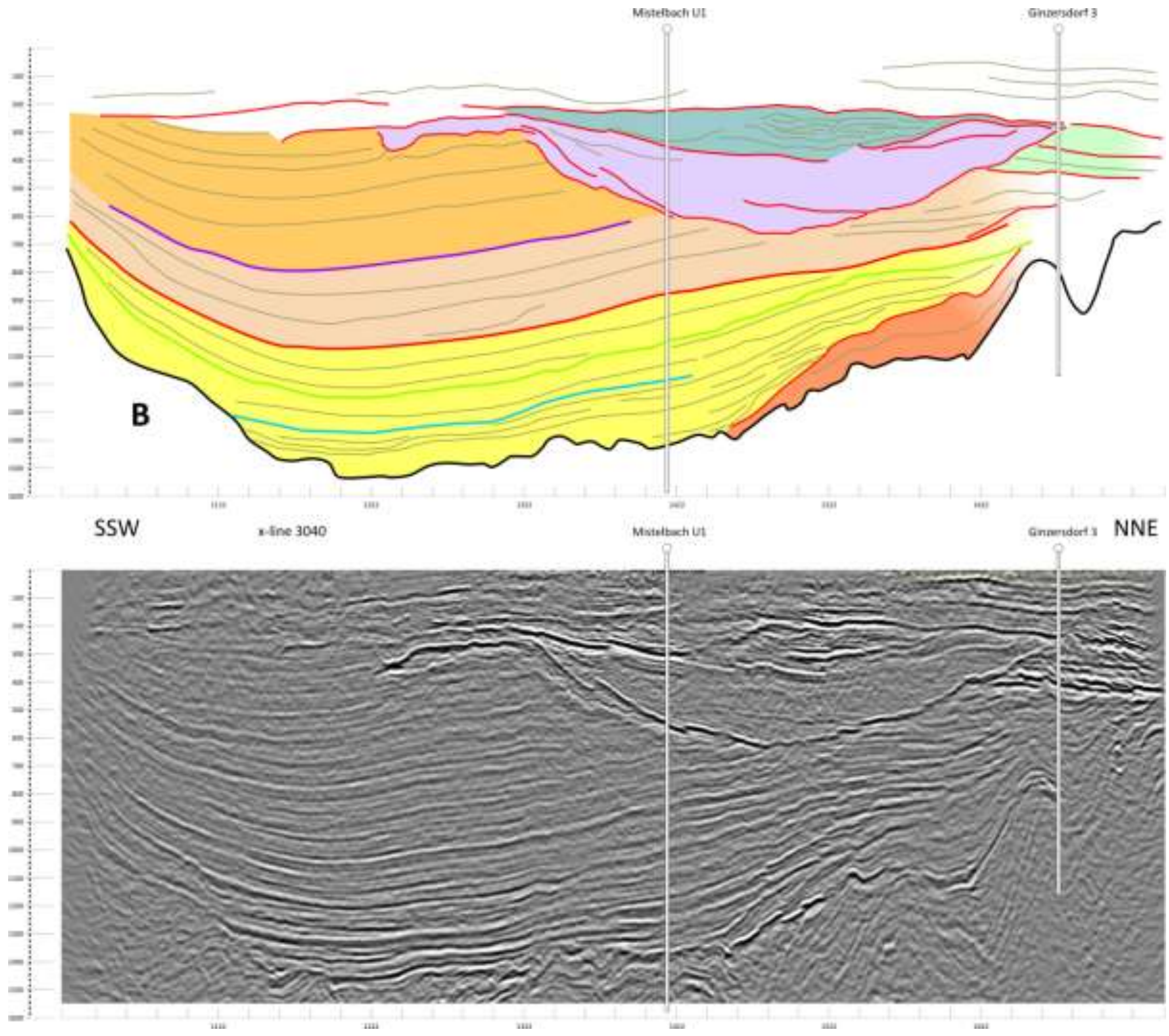


Fig. 94: SSW-NNE trending seismic line B (orange: lower Lužice Fm., yellow: upper Lužice Fm., pinkish-brown: Lakšary Mb., light orange: Závod Mb., lavender: Iváň Fm. of the Mistelbach Canyon, blue-green: Lanžhot Fm, green: Ginzersdorf Mb.). The blue line indicates the strong reflector that divides the upper Lužice Fm. The green line marks the prominent reflector that separates the uppermost Lužice Fm. from the upper Lužice Fm. The purple line indicates the strong reflector that separates the Závod Mb. from the underlying Lakšary Mb.

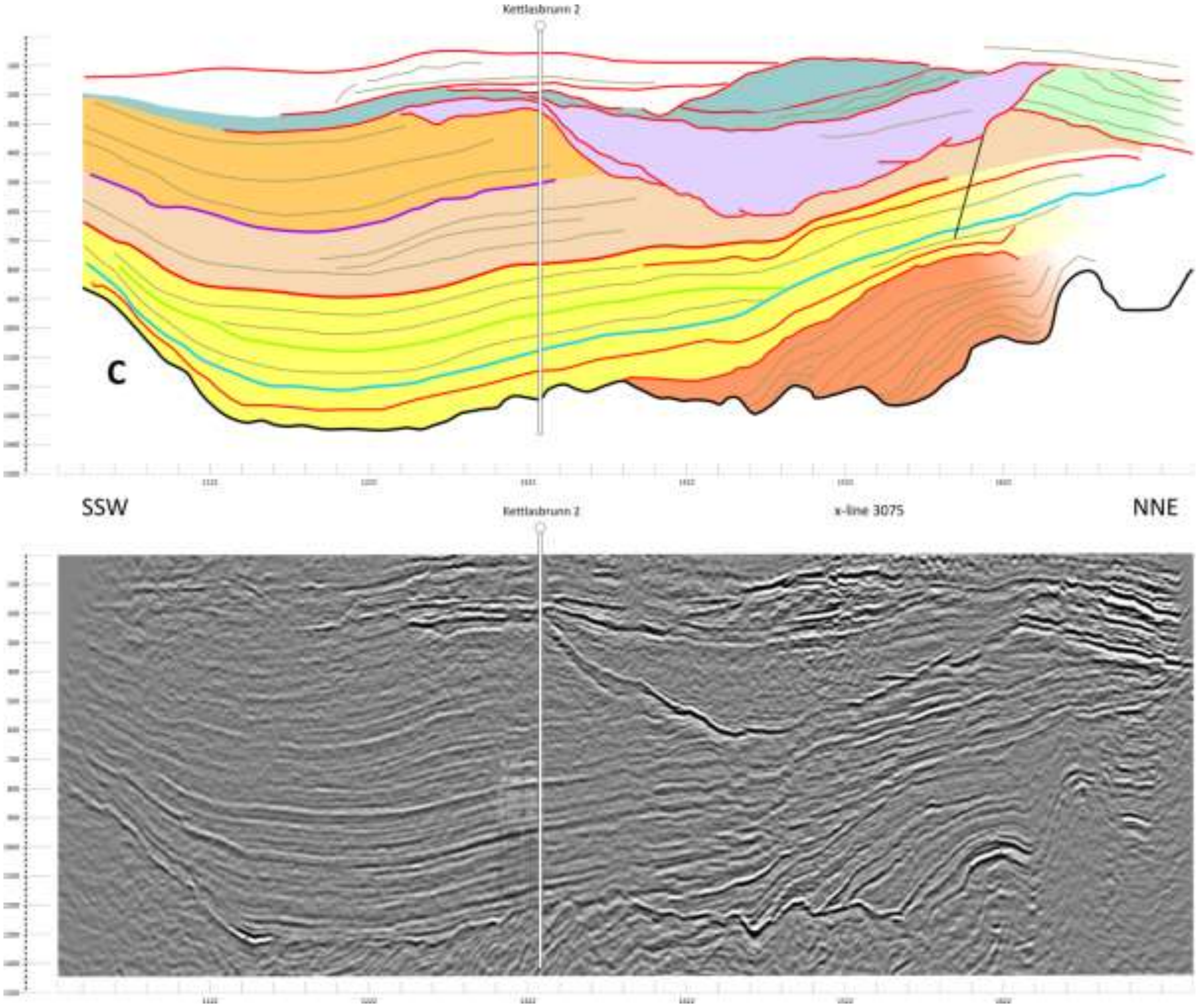


Fig. 95: SSW-NNE trending seismic line C (orange: lower Lužice Fm., yellow: upper Lužice Fm., pinkish-brown: Lakšary Mb., light orange: Závod Mb., lavender: Iváň Fm. of the Mistelbach Canyon, blue-green: Lanžhot Fm, green: Ginzersdorf Mb.). The blue line indicates the strong reflector that divides the upper Lužice Fm. The green line marks the prominent reflector that separates the uppermost Lužice Fm. from the upper Lužice Fm. The purple line indicates the strong reflector that separates the Závod Mb. from the underlying Lakšary Mb.

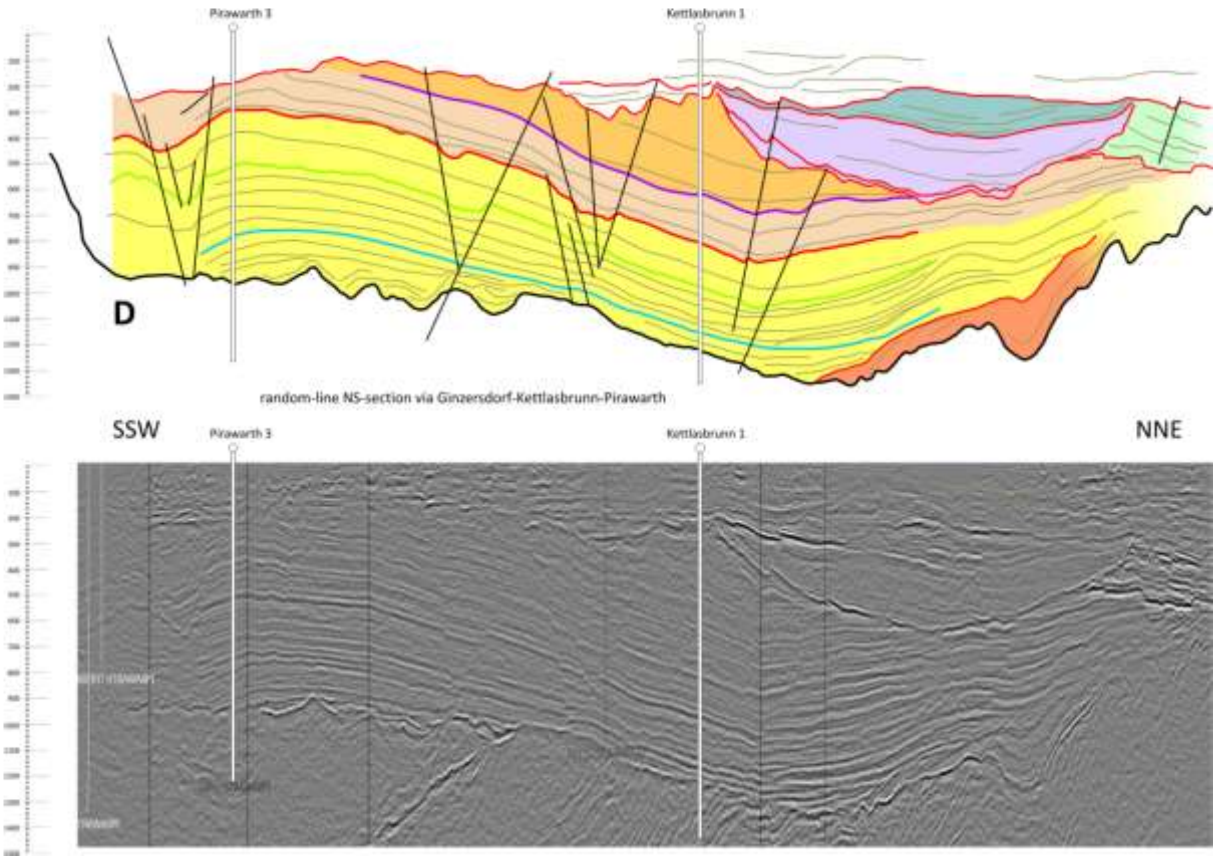


Fig. 96: SSW-NNE trending seismic line D (orange: lower Lužice Fm., yellow: upper Lužice Fm., pinkish-brown: Lakšary Mb., light orange: Závod Mb., lavender: Iváň Fm. of the Mistelbach Canyon, blue-green: Lanžhot Fm, green: Ginzersdorf Mb.). The blue line indicates the strong reflector that divides the upper Lužice Fm. The green line marks the prominent reflector that separates the uppermost Lužice Fm. from the upper Lužice Fm. The purple line indicates the strong reflector that separates the Závod Mb. from the underlying Lakšary Mb.

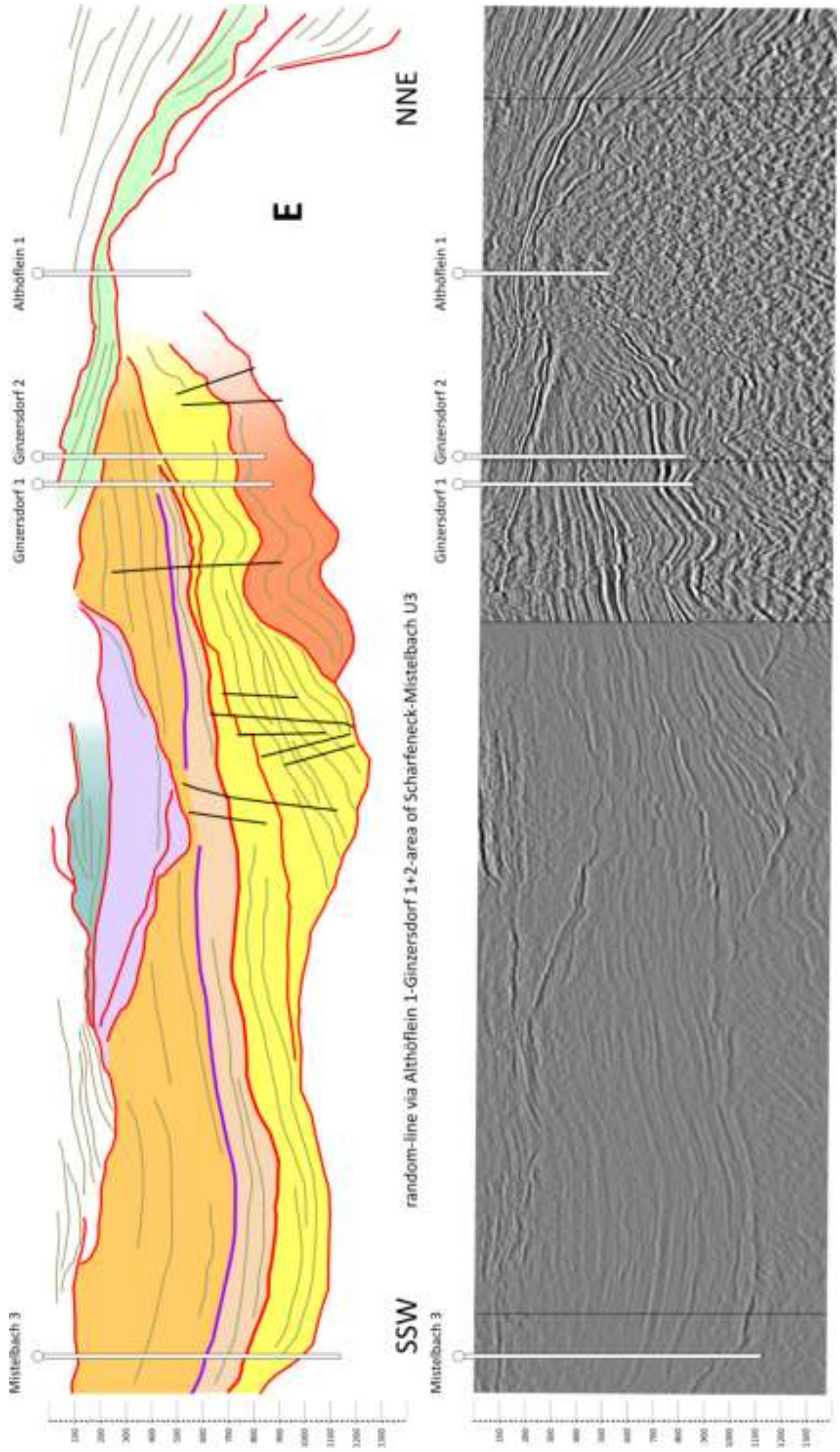


Fig. 97: SSW-NNE trending seismic line E (orange: lower Lužice Fm., yellow: upper Lužice Fm., pinkish-brown: Lakšary Mb., light orange: Závod Mb., lavender: Iváň Fm. of the Mistelbach Canyon, blue-green: Lanžhot Fm, green: Ginzersdorf Mb.). The purple line indicates the prominent reflector that separates the Závod Mb. from the underlying Lakšary Mb.

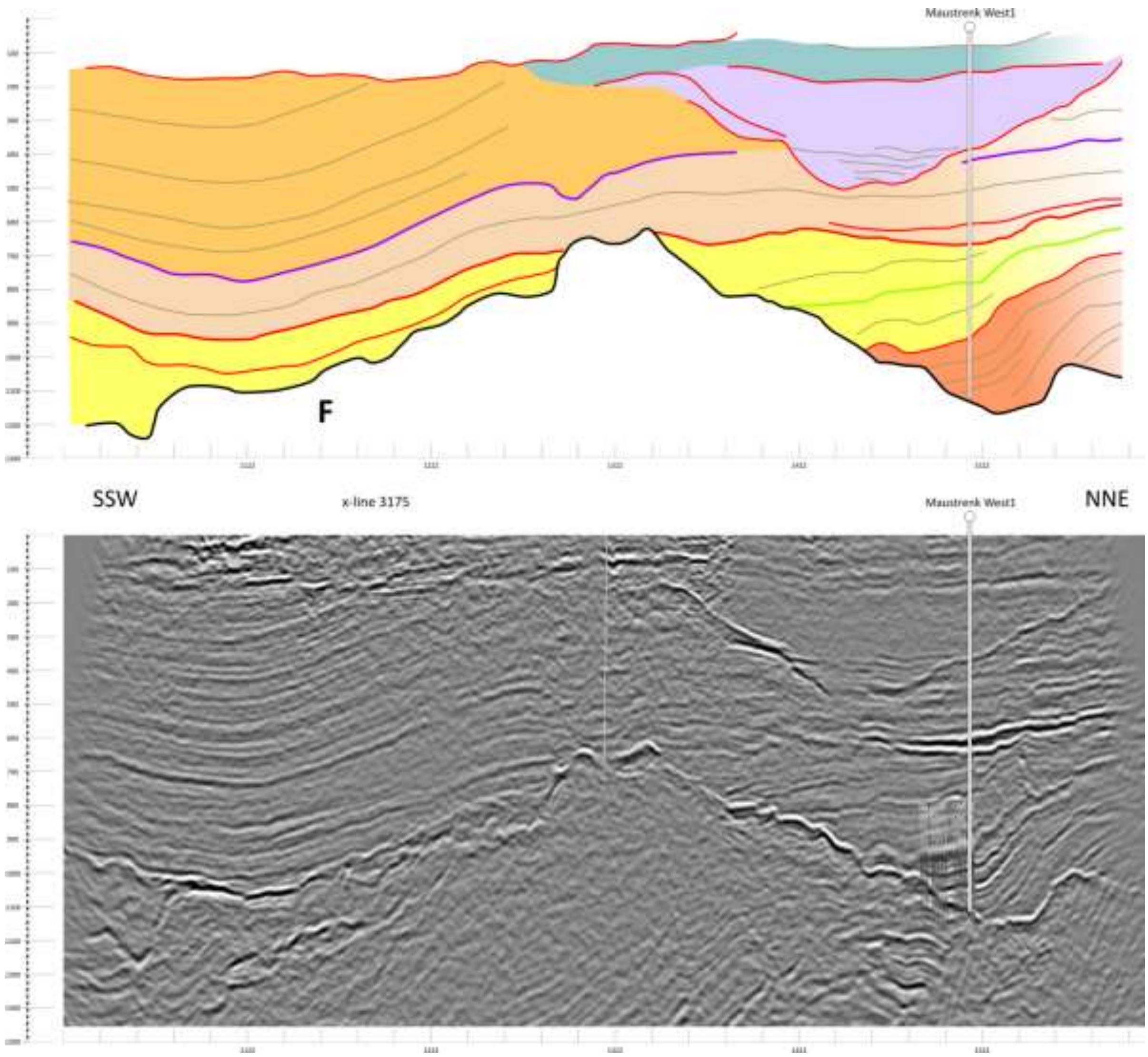


Fig. 98: SSW-NNE trending seismic line F (orange: lower Lužice Fm., yellow: upper Lužice Fm., pinkish-brown: Lakšary Mb., light orange: Závod Mb., lavender: Iváň Fm. of the Mistelbach Canyon, blue-green: Lanžhot Fm.). The green line marks the prominent reflector that separates the uppermost Lužice Fm. from the upper Lužice Fm. The purple line indicates the strong reflector that separates the Závod Mb. from the underlying Lakšary Mb.

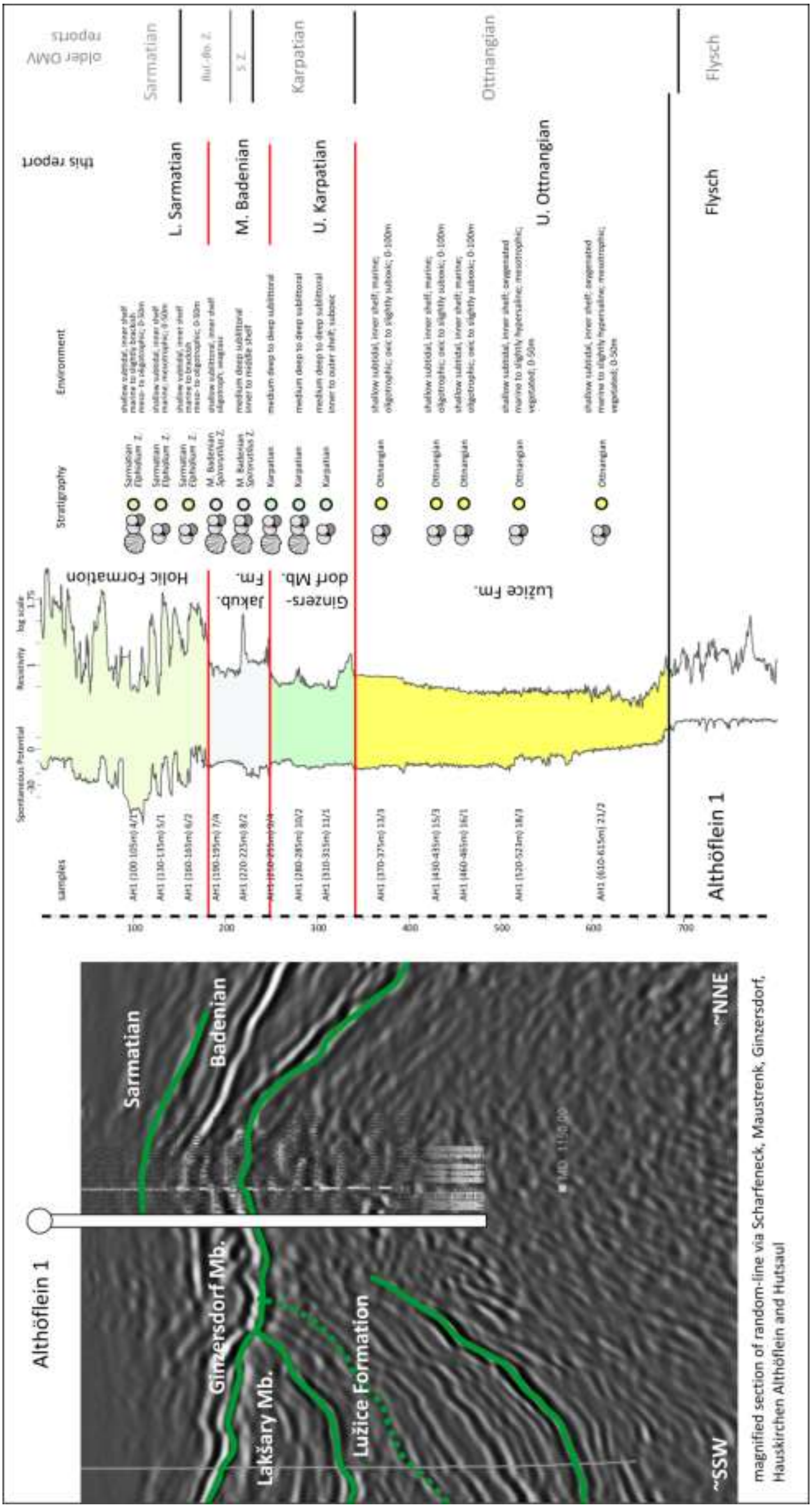


Fig. 99: Summary of the bio- and lithostratigraphic and palaeoecological results together with the SP- and RES-logs, seismic data and information from older OMV reports of the Althöflein 1-well.

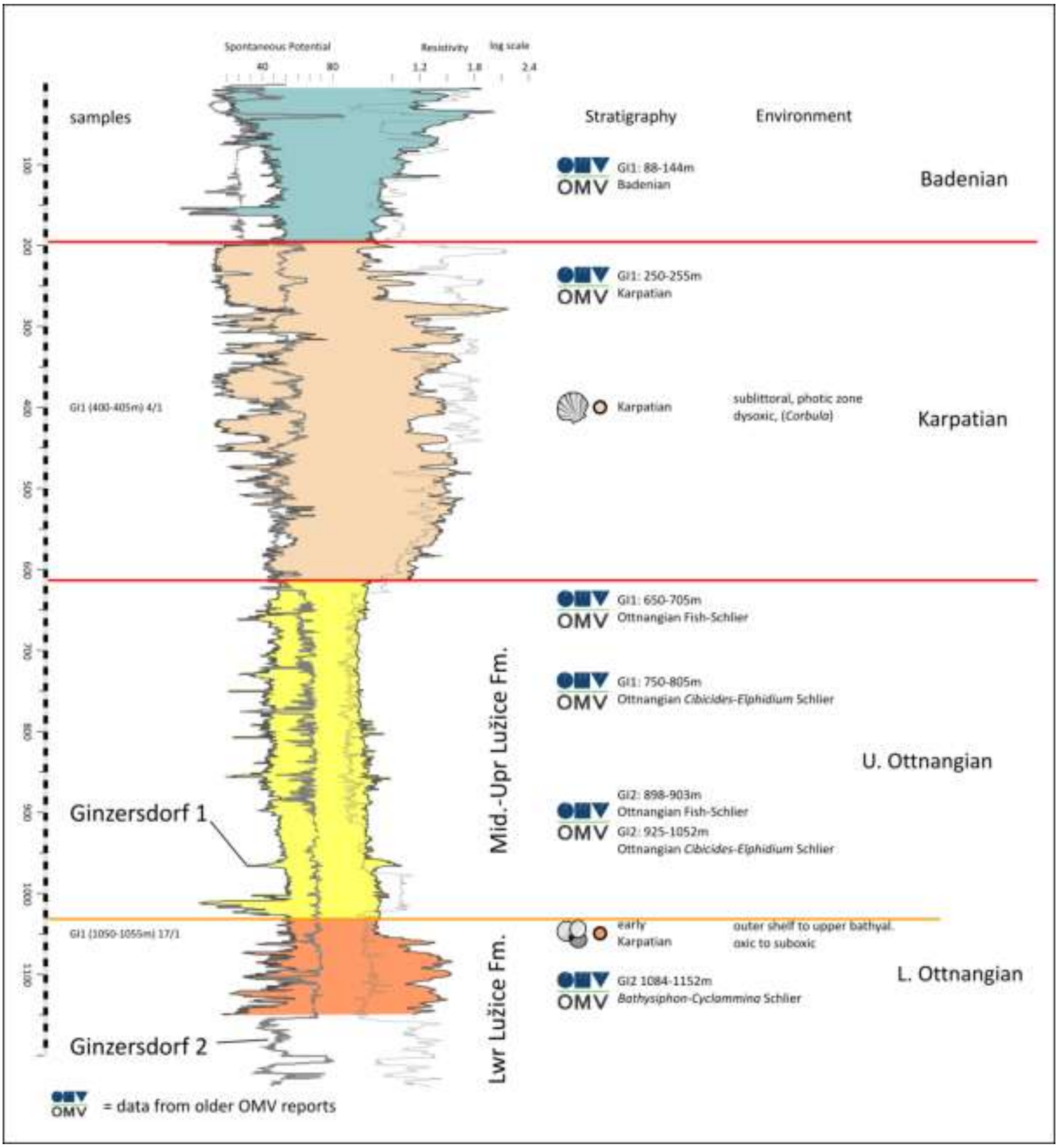


Fig. 100: Summary of the bio- and lithostratigraphic and palaeoecological results and sample positions together with the SP- and RES-logs and information from older OMV reports of the Ginzersdorf 1+2-wells.

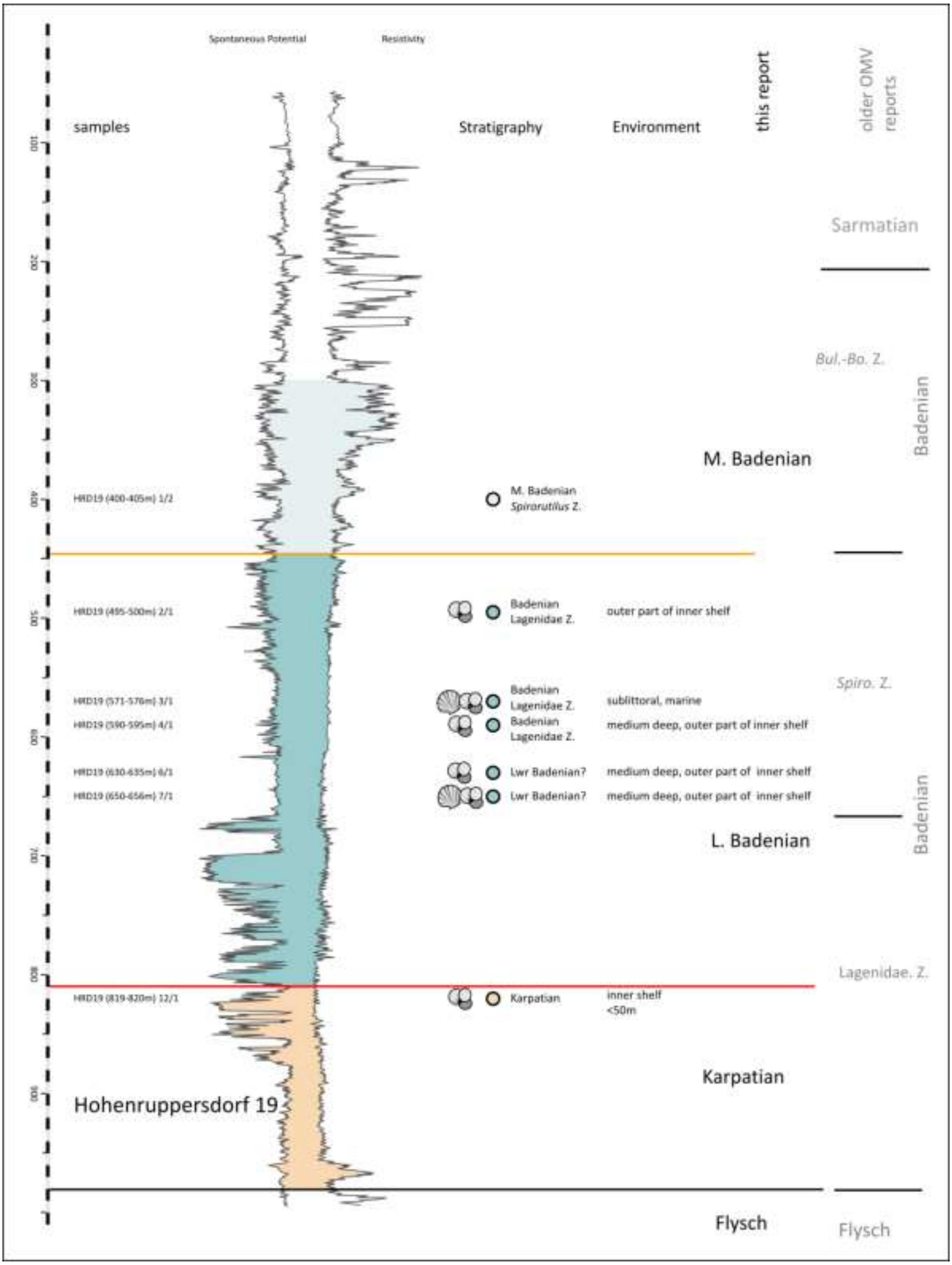


Fig. 101: Summary of the bio- and lithostratigraphic and palaeoecological results and sample positions together with the SP- and RES-logs and information from older OMV reports of the Hohenruppersdorf 19-well.

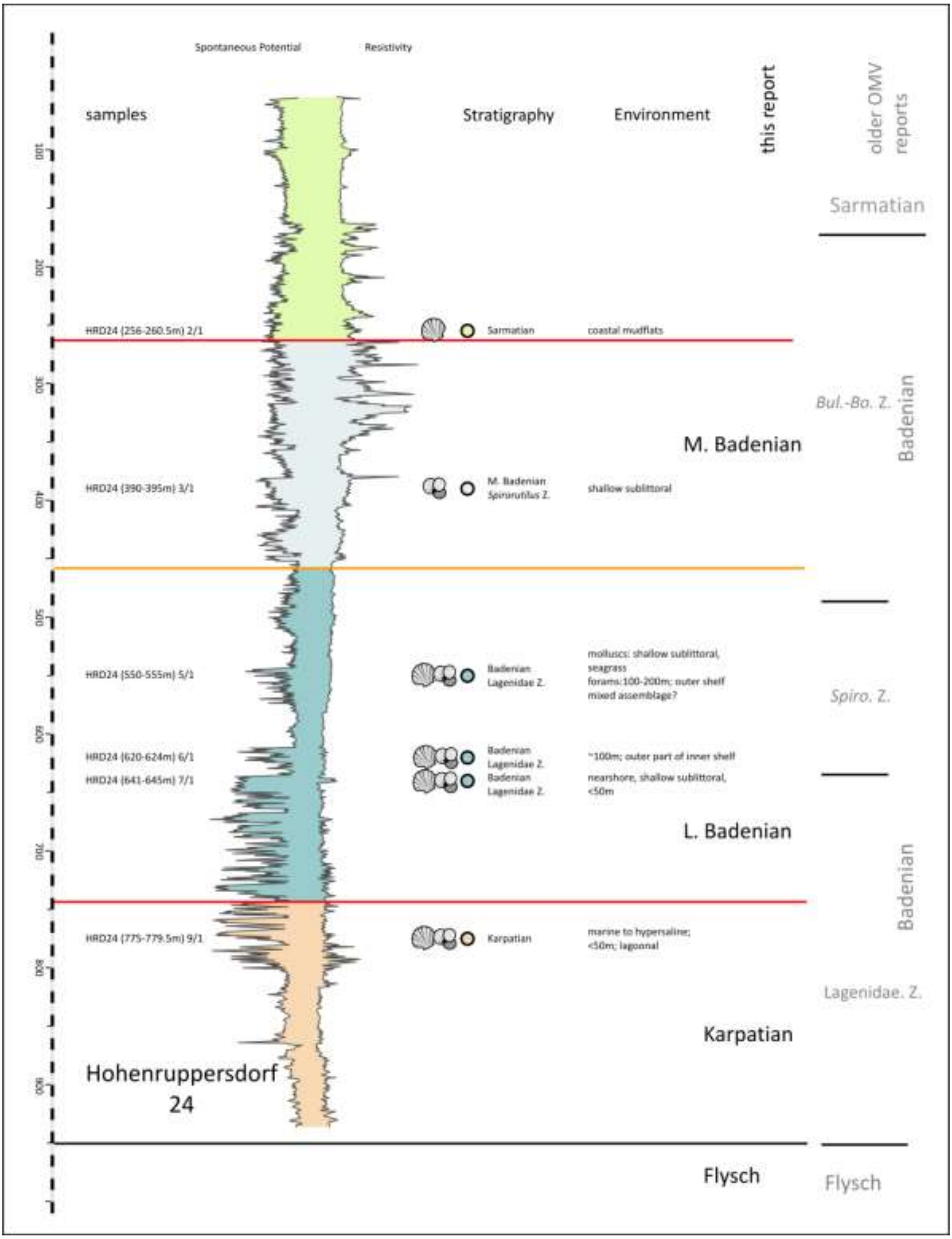


Fig. 102 Summary of the bio- and lithostratigraphic and palaeoecological results and sample positions together with the SP- and RES-logs and information from older OMV reports of the Hohenruppersdorf 24-well.

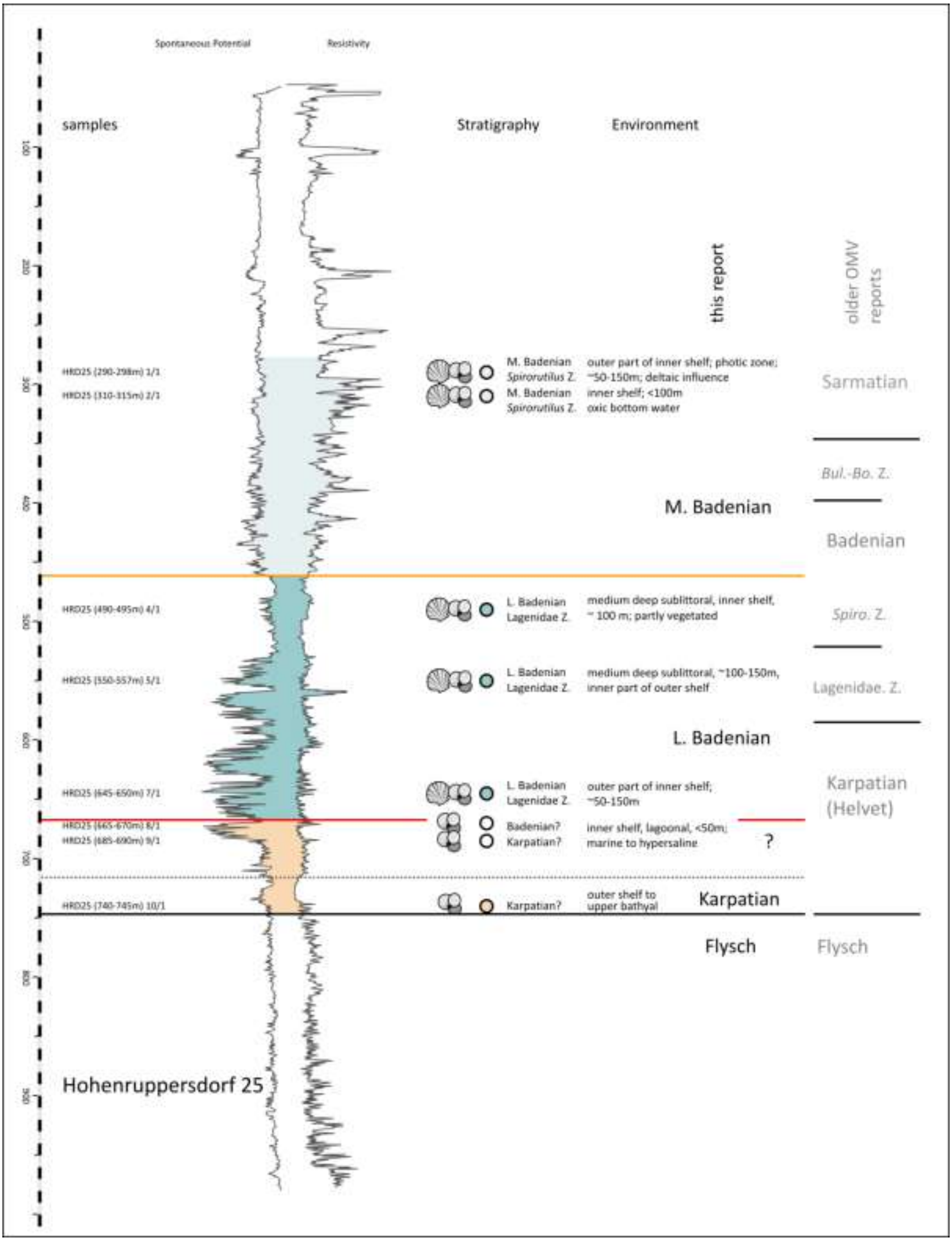


Fig. 103: Summary of the bio- and lithostratigraphic and palaeoecological results and sample positions together with the SP- and RES-logs and information from older OMV reports of the Hohenruppersdorf 25-well.

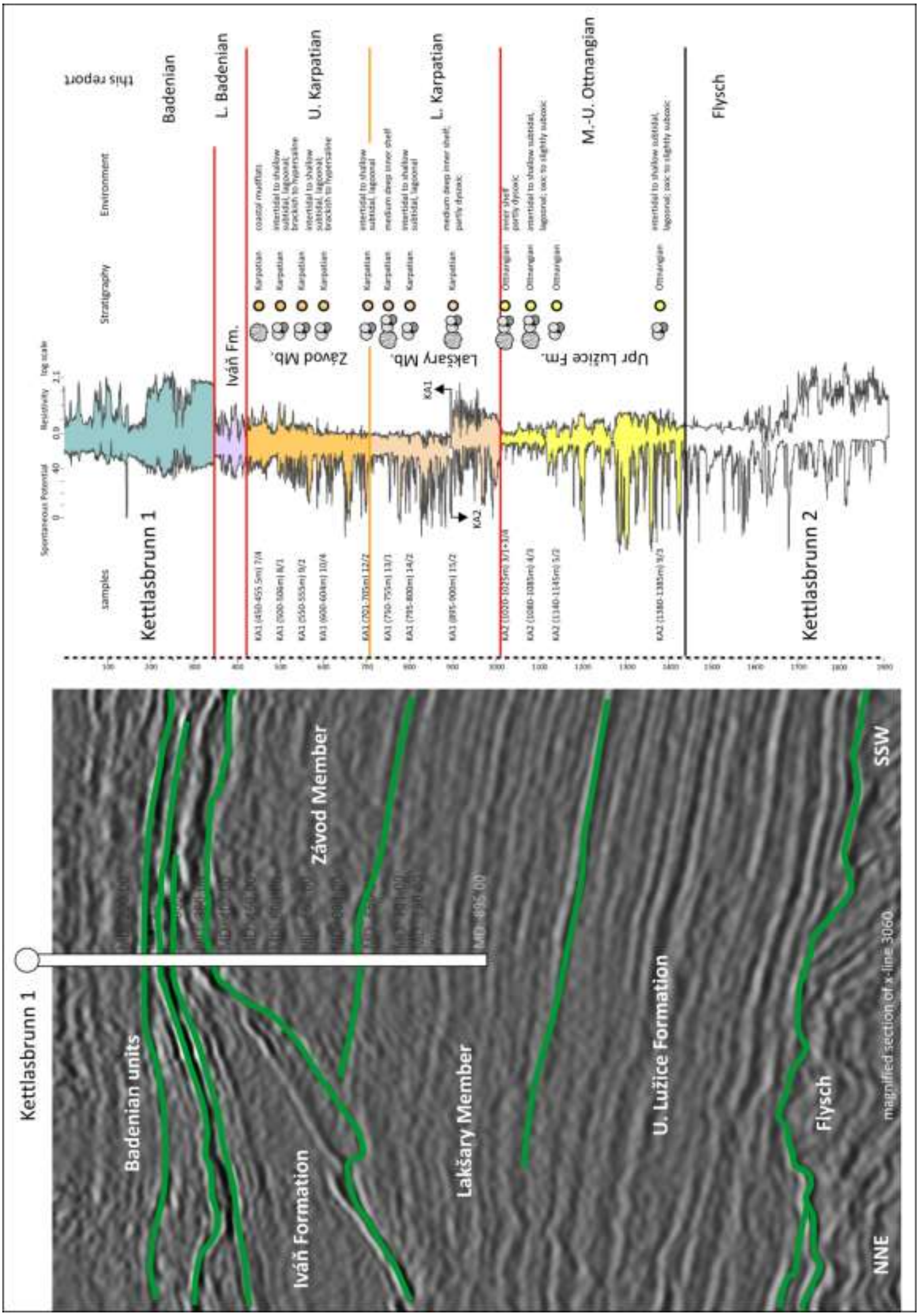


Fig. 104: Summary of the bio- and lithostratigraphic and palaeoecological results and sample positions together with the SP- and RES-logs and seismic data of the Kettlasbrunn 1+2-wells.

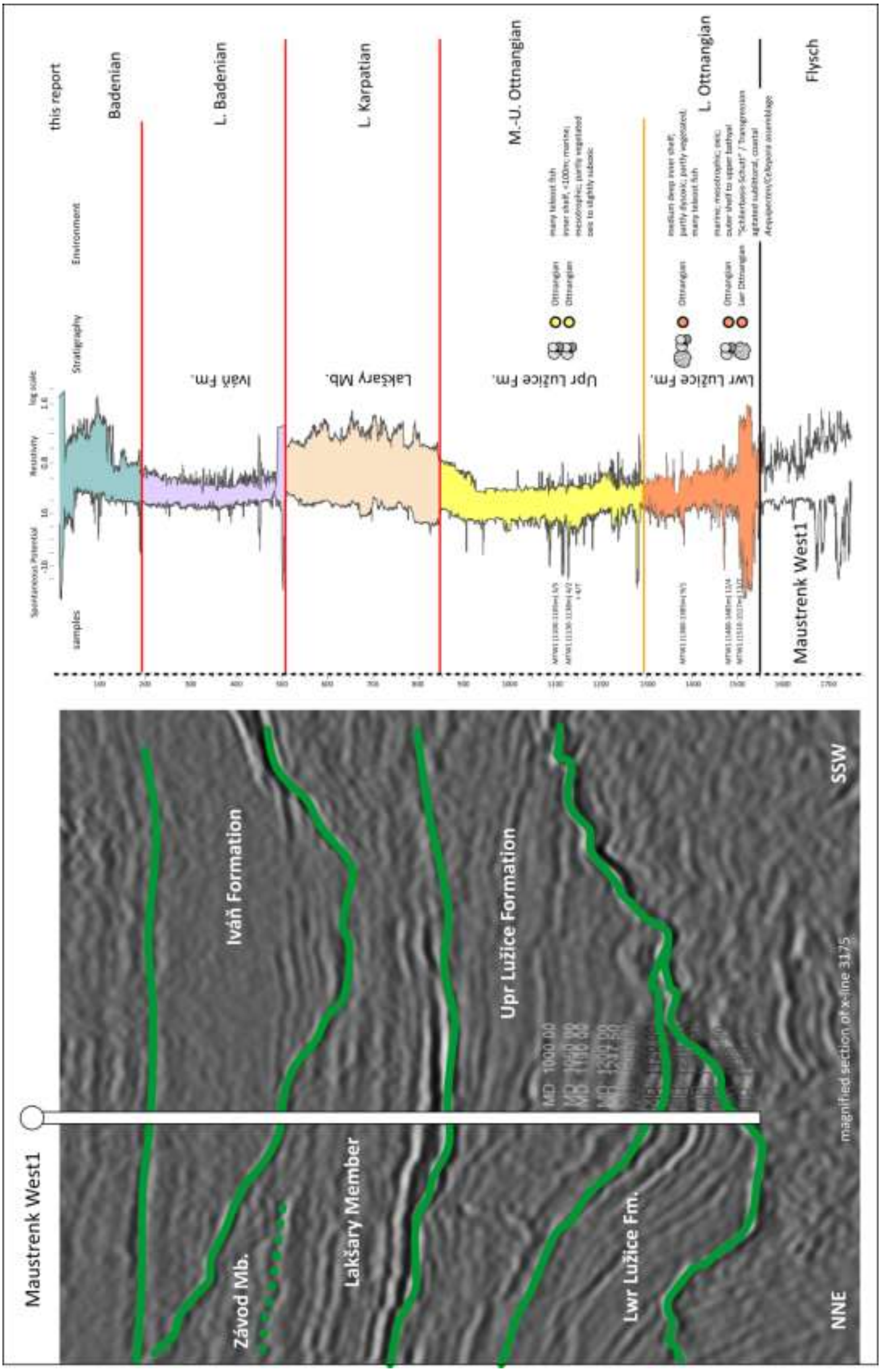


Fig. 105: Summary of the bio- and lithostratigraphic and palaeoecological results and sample positions together with the SP- and RES-logs and seismic data of the Maustrenk West1-well.

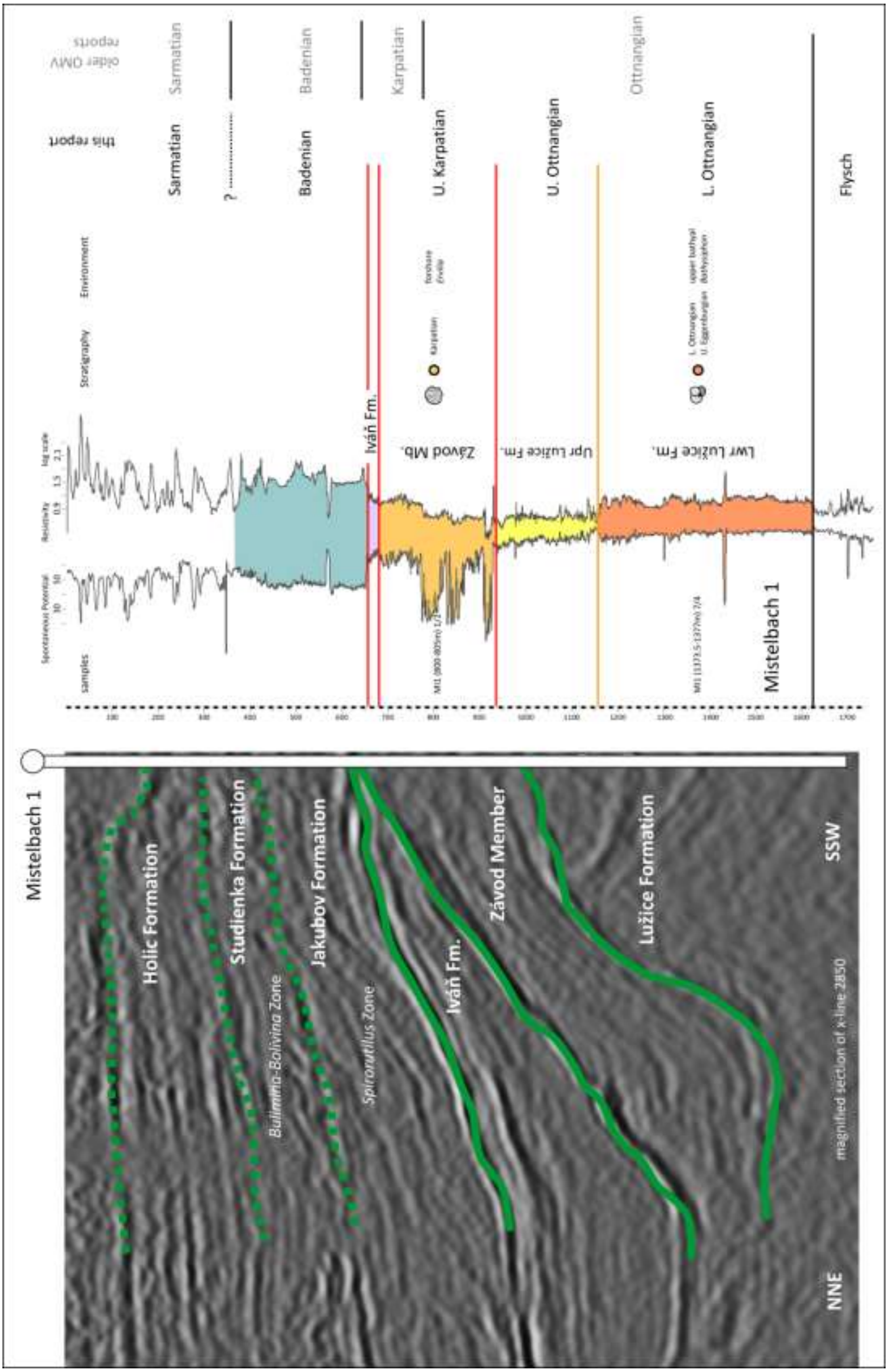


Fig. 106: Summary of the bio- and lithostratigraphic and palaeoecological results and sample positions together with the SP- and RES-logs, seismic data and information from older OMV reports of the Mistelbach 1-well.

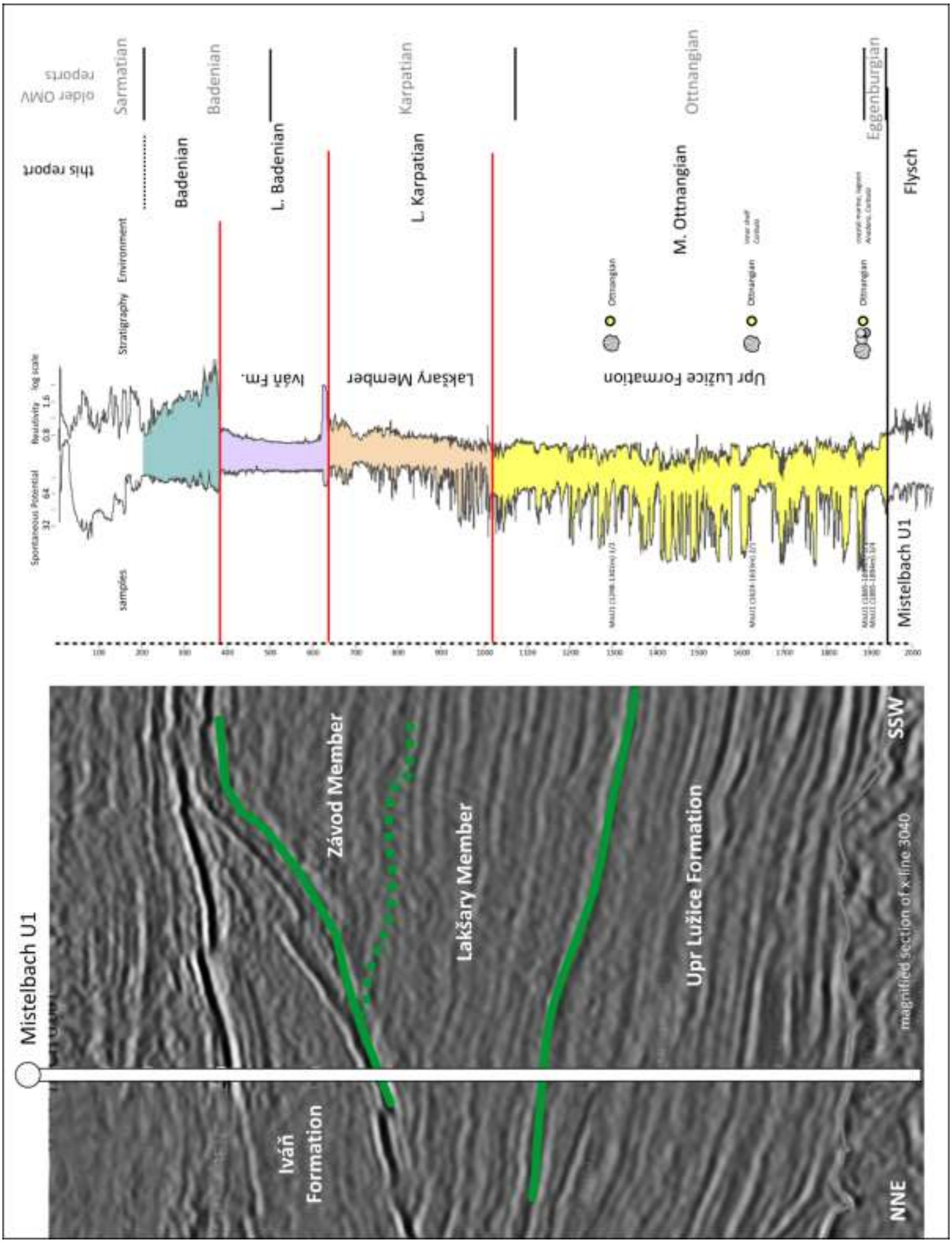


Fig. 107: Summary of the bio- and lithostratigraphic and palaeoecological results and sample positions together with the SP- and RES-logs, seismic data and information from older OMV reports of the Mistelbach U1-well.

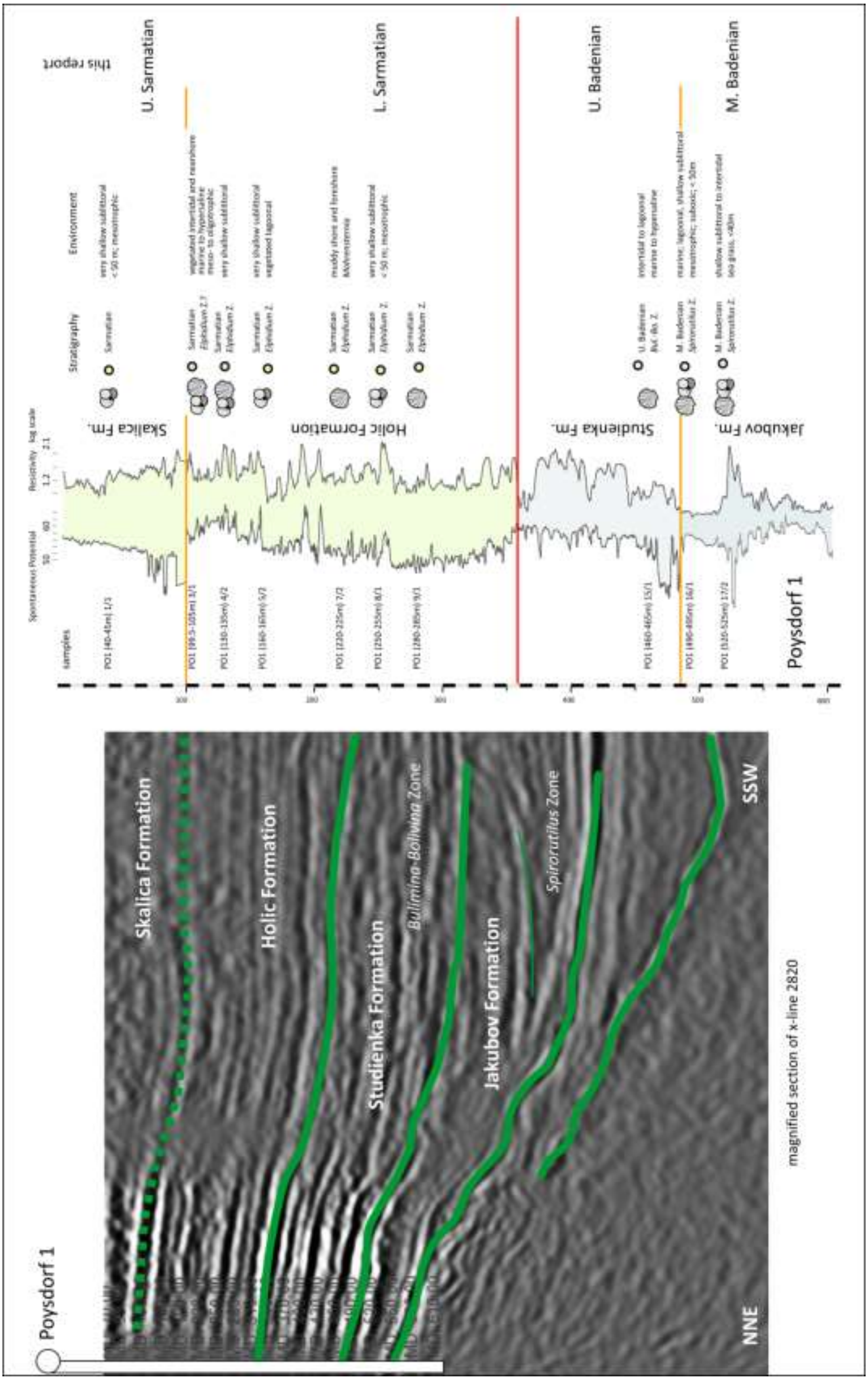


Fig. 108: Summary of the bio- and lithostratigraphic and palaeoecological results and sample positions together with the SP- and RES-logs and seismic data of the Poysdorf 1-well.

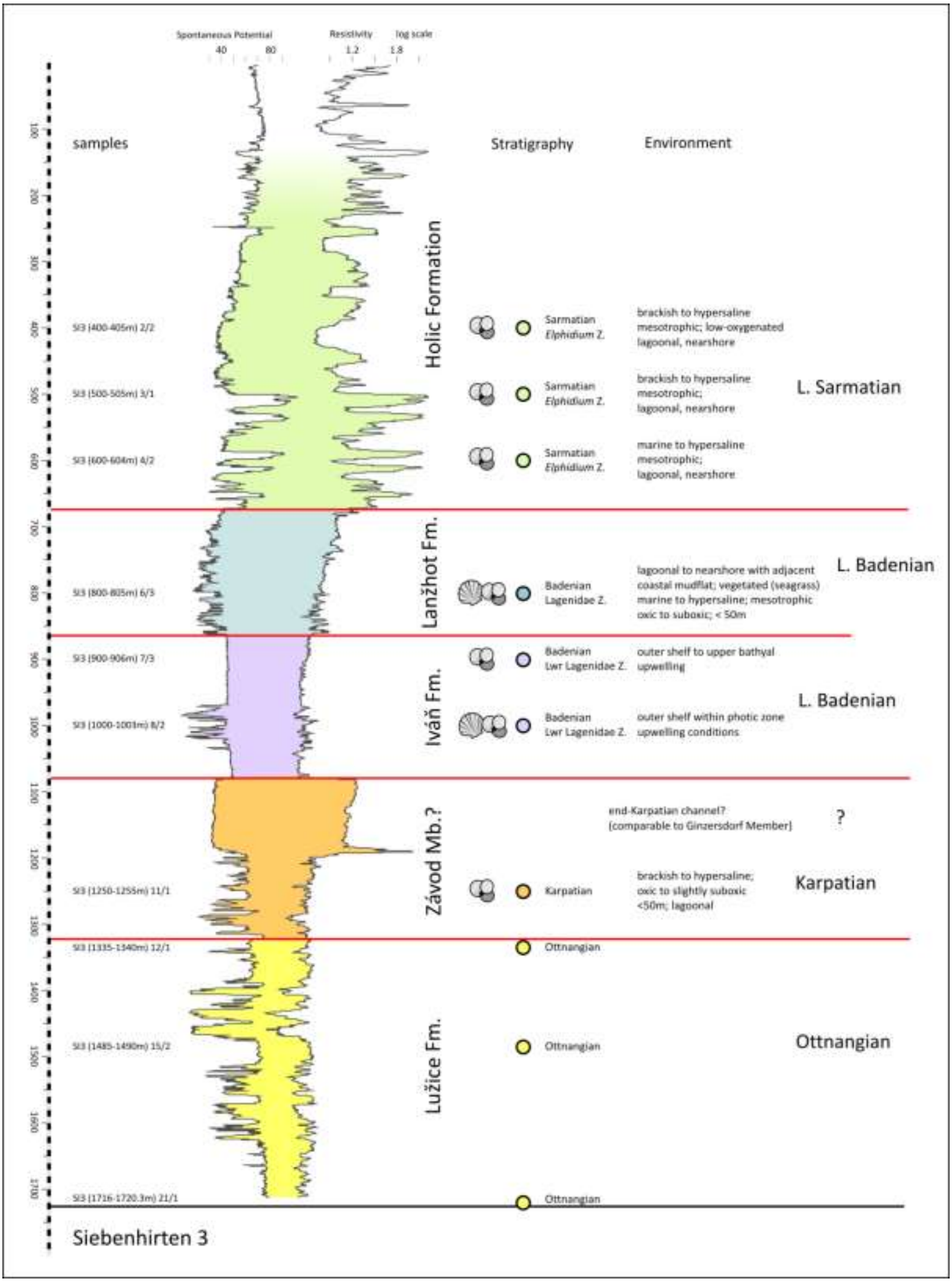


Fig. 109: Summary of the bio- and lithostratigraphic and palaeoecological results and sample positions together with the SP- and RES-logs of the Siebenhirten 3-well.

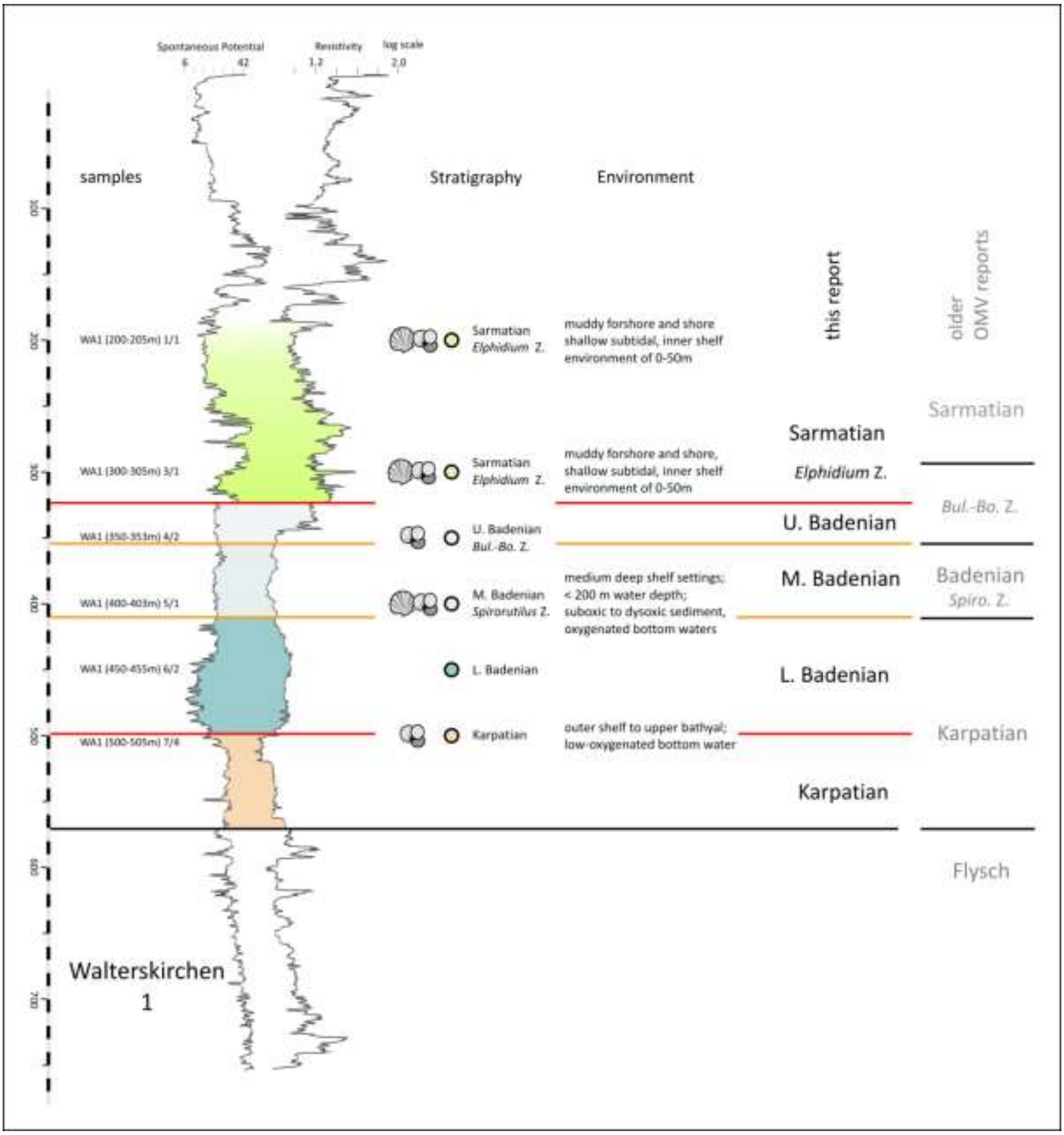


Fig. 110: Summary of the bio- and lithostratigraphic and palaeoecological results and sample positions together with the SP- and RES-logs and information from older OMV reports of the Walterskirchen 1-well.

6. Major results and considerations

6.1. Micropalaeontology

Nowadays the time-consuming preparations and work with foraminiferal assemblages often get neglected and seem somehow antiquated, esp. since more recent, encouraging and allegedly "quicker" techniques such as cyclo-, magneto- or sequence stratigraphic analyses are further developed. For these investigations preferably undisturbed, well-preserved and thick successions are required to gain reliable results and allow dependable correlations with regional and international standards. Often these requirements are not fully fulfilled, e.g. if you have to deal with older drillings, stored sedimentary material, missing log data etc. In such cases it is inevitable to draw on available micro- and macrofossil material to improve the stratigraphic framework.

This study shows that microfossils, esp. the studied foraminiferal faunas, are still a powerful and hardly replaceable tool to deliver a biostratigraphic backbone one can use to calibrate and order litho- and other stratigraphic data but also to bring more local and complex sedimentary depositions - like the one in the Vienna Basin - into a broader and maybe even international standard correlation context.

Furthermore, the microfauna is not only useful for stratigraphic reasons but proves to be a stable and reliable instrument in terms of palaeoecological interpretation and environmental reconstructions using quantitative analyses.

With this herein investigated foraminiferal faunas and applied statistical methods I was able to 1) deliver biostratigraphic information for tuning the ages of the different lithostratigraphic units (together with additional macrofossils and the seismic data) and 2) better describe the palaeoecological conditions in the different depositional environments of the Lower and Middle Miocene Mistelbach Halfgraben.

6.1.1. Summary of characteristics for all defined lithostratigraphic units

6.1.1.1. Schlierbasis-Schutt

Age: early Ottnangian, based on molluscs

Core material: sandy marl intercalated with thick fine- to medium-grained sand layers

Lithofacies: conglomerate, breccia, gravel, sandstone

Foraminifera: no foraminiferal data

Diversity indices: no foraminiferal data

Palaeoecological Parameters: no foraminiferal data

Macrofossils: pectinids (*Aequipecten* sp.), celleporid bryozoans

Depositional environment: archipelago-type landscape with various nearshore settings (rocky or sandy shores, gravelly beaches, agitated shallow sublittoral), fully marine and warm-temperate to tropical mollusc fauna

Seismics: similar to lower Lužice Fm., not distinguishable

e-logs: very high amplitudes in SP- and RES-logs (figs. 35 (1500-1550 m depth), 105)

6.1.1.2. lower Lužice Formation

Age: early Ottnangian, based on molluscs

Core material: greyish sandy, partly laminated marl with ripple structures, intercalated sandy layers, mollusc remains

Lithofacies: laminated grey calcareous clays, silt and sandstones with intercalations of sands

Foraminifera: *Bathysiphon taurinensis*, *Bathysiphon filiformis*, *Cyclammina bradyi*, *Cribrostomoides subglobosus*, *Reticulophragmium karpaticum*, *Ammodiscus miocenicus*, *Laevidentalina boueana*, *Sigmoilinita tenuis*, *Amphicoryna ottnangensis* and other ubiquitous species

Diversity indices: No. of taxa between 6 and 15, Fisher Alpha (α) between 1.1 and 5.1 (low diverse), Equitability J between 0.66 and 0.72 (more balanced), Dominance D between 0.18 and 0.36 (no dominating species); the Diversity Indices hint at low diverse but balanced foraminiferal communities

Palaeoecological Parameters: habitat: mainly epifaunal (Ø 40%) and epifaunal to shallow infaunal taxa (Ø 22%), about 5% infaunal taxa, no deep infaunal ones; bottom water oxygenation: mainly oxic indicators (Ø 34%), rarely suboxic (Ø 4%), no O/S, S/D and D indicators; water depths: preferably outer neritic, no inner neritic taxa

Depositional environment: open marine pelagic, outer shelf to partly even bathyal, oxygenated to low-oxygenated conditions, muddy to sandy, marine, mesotrophic conditions, eventually hard substrate available, possible high nutrient flux and high sedimentation rates (*Bathysiphon*-dominated faunas)

Seismics: continuous high amplitude but low frequency reflectors, separated by thicker units of low amplitude reflectors, strongly tectonised and W tilted unit, downlaps on Flysch basement

e-logs: both SP- and RES-logs generally lower amplitudes, ordinary, some peaks with higher amplitudes indicate coarser intercalations

6.1.1.3. upper Lužice Formation

Age: Ottnangian

Core material: grey-brown, fine sandy and micaceous marl with mollusc-rich layers and carbonised plant debris, brownish or light grey, micaceous silt and fine- to medium-grained sand with clayey intercalations, implied lamination and molluscs

Lithofacies: laminated grey calcareous clays, silt and siltstones with intercalations of sands

Foraminifera: *Cibicidoides* spp. (e.g. *C. budayi*, *C. lopjanicus*), *Cibicides* spp., elphidiids (e.g. *E. ortenburgense*, *E. subtypicum*) together with *Ammonia* spp., *Reticulophragmium karpaticum*, *Asterigerinata planorbis*, *Porosononion granosum*, *Quinqueloculina* spp., *Lenticulina* spp., *Lobatula lobatula*, *Heterolepa dutemplei* and *Globigerina praebulloides*

Diversity indices: No. of taxa up to 26, α up to 8.5 (low to moderate diversity), J between 0.62 and 1.00 (clearly balanced), D between 0.15 and 0.68 (rare clearly dominating species); the indices suggest low to moderate diverse but clearly balanced foraminiferal communities

Palaeoecological Parameters: habitat: mainly epifaunal to shallow infaunal (Ø 45%) and epifaunal taxa (Ø 23%), about 4% infaunal taxa, no deep infaunal ones; bottom water oxygenation: mainly oxic to suboxic (Ø 32%) and oxic indicators (Ø 24%), rarely suboxic (Ø 1%), no S/D and D indicators; water depths: preferably inner neritic; no hint at increased organic matter flux and environmental stress

Macrofossils: assemblages with *Anadara diluvii*, *Corbula gibba*, *Anomia* sp., *Ostrea digitalina*

Depositional environment: basinal areas: open marine pelagic, widespread suboxic bottom conditions, coastal areas: seagrass meadows, bryozoan thickets, foraminiferal faunas suggest muddy sand, hard substrates, vegetation, marine to slightly hypersaline, mesotrophic, oxic to slightly suboxic environments on the inner shelf (0-50m, lagoonal, shallow subtidal)

Seismics: continuous, subparallel, high amplitude and high frequency reflectors, seals relief, strongly tilted WNW, lower part with downlaps

e-logs: generally SP-logs with higher amplitudes than RES-logs, SP-logs of lower half of the unit (figs. 104, 107) show strongly serrated succession with very strong peaks and a slight upsection decrease in variance and amplitude (decrease in sandy input by turbidites due to shallowing trend)

6.1.1.4. uppermost Lužice Formation

Age: late Ottnangian

Core material: grey, clayey silt and fine sand

Lithofacies: laminated grey calcareous clays, silt and siltstones with intercalations of sands

Foraminifera: impoverished small fauna with mainly *Ammonia viennensis*, *Porosononion granosum*, additionally Amoebina genus *Silicoplacentina* and numerous fish remains

Diversity indices: No. of taxa between 2 and 10, Fisher Alpha between 0.3 and 2.7 (very low diverse), J between 0.13 and 0.77 (Ø 0.54, more balanced), D between 0.24 and 0.97 (Ø 0.52, more frequent taxa possible); the Diversity Indices hint at very low diverse, slightly more balanced foraminiferal communities

Palaeoecological Parameters: mode of life: mainly epifaunal (Ø 48%) and epifaunal to shallow infaunal (Ø 40%), no infaunal and deep infaunal taxa; oxygenation: mainly oxic (Ø 43%) and oxic to suboxic indicators (Ø 43%), rarely suboxic (Ø 3%), no S/D and D indicators; water depths: preferably inner neritic; no hint at increased organic matter flux and environmental stress

Macrofossils: assemblages with *Gouldia minima*, *Corbula gibba*, *Turbonilla* sp., numerous fish remains (bones, scales)

Depositional environment: shallow sea on the inner shelf (shallow subtidal), widespread suboxic bottom conditions, marine, mesotrophic, hard substrate, *Silicoplacentina* indicates shallow marine, low-salinity environment with reducing conditions and high productivity

Seismics: similar to underlying upper and lower Lužice Fm. but slightly less prominent, separated from underlying unit by very strong reflector with minor erosive features (e.g. figs. 90, 95)

e-logs: differ from underlying upper Lužice Fm. in much more stable SP-log with rarer peaks and higher general values (decrease in sandy layers) (figs. 104, 105, 107)

6.1.1.5. Lakšary Member, Laa Fm.

Age: early Karpatian

Core material: light-grey, marly, micaceous silty fine- to medium-grained sand or sandstone with mollusc remains

Lithofacies: laminated grey to brownish calcareous clays, silt and siltstones with intercalations of sands (Schlier-facies)

Foraminifera: *Elphidium ortenburgense*, *Cibicidoides lopjanicus*, *Porosononion granosum*, *Ammonia viennensis*, *Nonion commune*, *Heterolepa dutemplei* among others

Diversity indices: No. of taxa between 2 and 7, α between 0.3 and 1.7 (very low diverse), J between 0.11 and 0.42 (Ø 0.26, unbalanced), D between 0.80 and 0.94 (dominating species present); the indices hint at very low diverse and unbalanced foraminiferal communities which are dominated by one or few species

Palaeoecological Parameters: habitat: mainly epifaunal to shallow infaunal taxa (Ø 96%), about 2% epifaunal and 1% infaunal taxa, no deep infaunal ones; bottom water oxygenation: mainly oxic to suboxic indicators (Ø 96%), rarely oxic (Ø 2%) and suboxic (Ø 1%) indicators, no S/D and D indicators; water depths: almost entirely inner neritic, barely deeper water indicators; no hint at increased organic matter flux and environmental stress

Macrofossils: assemblages with *Gouldia minima*, *Corbula gibba*, *Turbonilla* sp., *Ervilia pusilla*, *Profundinassa fuchsi*, *Stenothyroides schwartzi*, *Agapilia* sp.

Depositional environment: outer shelf to upper bathyal, open marine pelagic, turbiditic and widespread dysoxic bottom conditions, cool, nutrient-rich, upwelling-influenced surface waters, stressed bottom environments, foraminiferal assemblages positioned in the upper part of this member already hint at the subsequent shallowing trend with brackish to hypersaline, oligotrophic, oxic to suboxic, lagoonal, intertidal to shallow subtidal environments with patches of vegetation

Seismics: do not differ considerably from underlying units aside from slightly weaker reflectors, base indicated by strong reflector with erosive features but concordant (figs. 90, 94)

e-logs: SP-logs reminiscent of those of the upper Lužice Fm. but display characteristic fining upward trend with overall decreased in amplitudes, RES-logs are clearly more uniform (figs. 104, 105, 107)

6.1.1.6. Závod Member, Laa Fm.

Age: late Karpatian

Core material: brown clayey to silty fine sand, grey-brown sandy marl partly with thin sand intercalations

Lithofacies: grey clay with intercalations of sand and thin light-grey limestones

Foraminifera: *Ammonia* spp., *Cibicidoides lopjanicus*, *Elphidium ortenburgense*, *E. fichtelianum*, *Globigerina praebulloides*, *G. ottnangensis*, *Nonion commune*, *Cassidulina laevigata*, *Ceratocancris haueri*

Diversity indices: No. of taxa between 5 and 12, Fisher Alpha between 0.9 and 2.6 (low diverse), J between 0.17 and 0.50 (Ø 0.37, unbalanced), D between 0.49 and 0.89 (Ø 0.70, dominating taxa present); the Diversity Indices suggest low diverse and unbalanced foraminiferal communities

Palaeoecological Parameters: mode of life: mainly epifaunal to shallow infaunal (Ø 92%), about 4% epifaunal and 1% infaunal taxa, no deep infaunal ones; oxygenation: mainly oxic to suboxic indicators (Ø 92%), rarely oxic (Ø 4%), no S, S/D and D indicators; water depths: almost entirely inner neritic, barely deeper water indicators; no hint at increased organic matter flux and environmental stress

Macrofossils: assemblages with *Agapilia pachii*

Depositional environment: initially open marine, later shallowing trend indicated by *Ammonia*-assemblages, subtropical, brackish to hypersaline, oligotrophic, oxic to suboxic, lagoonal, intertidal to shallow subtidal, shallow marine settings with patches of vegetation

Seismics: separated from Lakšary Mb. by prominent reflector, generally reflectors more uniform slightly weaker, often with erosive features and partly discontinuous compared to Lakšary Mb. (figs. 91, 95, 98)

e-logs: compared to Lakšary Mb. e-logs have higher resistivity values, strongly serrated SP-logs display trend towards higher values with decreasing variance, very top dominated by funnel-shaped signatures which are typical of channel fills (figs. 100, 104, 109)

6.1.1.7. Ginzersdorf Member

Age: Karpatian, based on presence of *Uvigerina graciliformis*

Core material: light grey-brown, micaceous, fine sandy marl, partly with fine lamination, clayey flakes, bedding structures, small pebbles, molluscs and carbonised plant remains

Lithofacies: grey clay with intercalations of sand and thin light-grey limestones

Foraminifera: marker *Uvigerina graciliformis*, together with *Uvigerina* spp., *Pappina breviformis*, *Pappina primiformis*, *Cibicidoides* spp. (e.g. *C: lopjanicus*), elphidiids, *Ammonia* spp., *Bulimina* spp., *Lenticulina* spp., *Bolivina dilatata*, *Melonis pompilioides*, *Porosononion granosum*, *Globigerina bulloides*, *G. praebulloides*, *G. tarchanensis* and many others

Diversity indices: No. of taxa between 11 and 48 (Ø 33), α between 9.3 and 16.7 (diverse), J between 0.79 and 0.85 (Ø 0.82, balanced), D between 0.07 and 0.19 (Ø 0.12, no dominating species); the Diversity Indices hint at diverse and clearly balanced foraminiferal communities

Palaeoecological Parameters: habitat: mainly epifaunal (Ø 45%) and infaunal taxa (Ø 23%), only 4% E/SI and 1% deep infaunal taxa; bottom water oxygenation: mainly oxic (Ø 24%) and suboxic indicators (Ø 36%), rarely O/S (Ø 4%), S/D (Ø 7%) and D (Ø 1%); water depths: preferably outer neritic; slightly increased organic matter flux and environmental stress

Macrofossils: assemblages with *Polinices* cf. *cerovaensis*, *Profundinassa fuchsi*, otoliths from *Diaphus* sp., scaphopods *Gadila* sp.

Depositional environment: deeper marine conditions on outer shelf or even upper bathyal indicated by microfauna and molluscs (mesotrophic, rather suboxic, about 100-150 m depth)

Seismics: overlays and sharply truncates the reflectors of the Laa Fm., set of very prominent high amplitude reflectors, followed upsection by continuous, subparallel and dense but low amplitude reflectors, tilted NE (figs. 94-96)

6.1.1.8. Iváň Formation

Age: early Badenian

Core material: light brown or grey-brown, sandy marl, partly thin sand intercalations

Lithofacies: brown-grey marly clay with intercalations of sand

Foraminifera: very rich Lagenidae assemblages; *Uvigerina venusta*, *U*. *grilli U*. *macrocarinata*, *Orbulina suturalis*, *Lenticulina americana*, *Lenticulina spinosa*, *Pappina parkeri*, *Bulimina* spp., *Bolivina* spp., numerous globigerinids and many others

Diversity indices: No. of taxa between 58 and 70 (Ø 64, highly diverse), α between 12.6 and 15.3, J between 0.72 and 0.82 (Ø 0.77, balanced), D between 0.05 and 0.10 (no dominating species); the Diversity Indices hint at highly diverse and balanced foraminiferal communities

Palaeoecological Parameters: mode of life: mainly infaunal (Ø 39%) and epifaunal taxa (Ø 17%), about 3% E-SI and 4% deep infaunal taxa; oxygenation: mainly suboxic (Ø 31%), S/D (Ø 14%) and oxic indicators (Ø 11%), rarely D (Ø 4%) and O/S (Ø 2%); water depths: preferably outer neritic; increased organic matter flux and environmental stress

Macrofossils: assemblages with *Bittium spina*, *Corbula gibba*, *Ebala* cf. *nitidissima*, *Limopsis anomala*, *Profundinassa fuchsi*, otoliths from *Diaphus* sp., *Diaphus* aff. *acutirostrum* and *Gadiculus argenteus*, echinoid spiculae

Depositional environment: marine, outer shelf or even upper bathyal (micro- and macrofauna), marine, mesotrophic, oxic to suboxic conditions

Seismics: discordantly overlays and erodes underlying tilted deposits, seismic facies chaotic, relatively isotropic without noticeable internal reflectors, thus separable from planar high amplitude reflectors of the Laa Fm., top and base indicated by strong high amplitude reflectors (e.g. figs. 89, 94-98)

e-logs: characterised by very low variability in SP and RES values resulting in typical chimney-like shale-line profile (e.g. figs. 107, 109)

6.1.1.9. Lanžhot Formation, Baden Group

Age: early Badenian

Core material: grey, micaceous and very marly fine sand, brownish micaceous clay with carbonised plant remains, intercalated silt and clay layers, bedded, brownish, clayey-silty sandstone with thin clay intercalations and carbonised plant debris, gastropod shells

Lithofacies: grey-blue bioturbated clayey to sandy calcareous silts (Tegel) with subordinate lenses of silt and sand with rich biogenic material

Foraminifera: representatives of Lower and Upper Lagenidae Zone; important species are *Borelis melo*, *Quinqueloculina haidingeri*, *Qu. hauerina*, Qu. *triangularis*, *Cycloforina badenensis*, *C. gracilis*, *Adelosina longirostra, A. schreibersi*, *Cibicidoides austriacus*, *Triloculina scapha*, *Amphistegina radiata*, *Lagena haidingeri*, *Ammonia* spp., *Elphidium advenum*, *Sigmoilinita tschokrakensis* and many others

Diversity indices: No. of taxa between 5 and 22 (more diverse), α between 2.3 and 6.5, J between 0.37 and 0.89 (Ø 0.66, more balanced), D between 0.16 and 0.62 (Ø 0.28, no dominating species); the indices hint at more diverse and balanced foraminiferal faunas

Palaeoecological Parameters: habitat: mainly epifaunal taxa (Ø 50%), subordinate infaunal (Ø 19%) and E-SI (Ø 18%) taxa, no deep infaunal ones; bottom water oxygenation: mainly suboxic (Ø 34%) and O/S indicators (Ø 25%), rarely oxic (Ø 9%) and S/D (Ø 4%) ones, no D indicators; water depths: preferably inner and middle neritic; slightly increased organic matter flux and environmental stress

Macrofossils: assemblages with *Agapilia picta*, *Bittium reticulatum*, *Chrysallida* sp., *Nassarius* spp., *Turbonilla* sp., *Turritella vindobonensis*, *Manzonia scalaris*, otoliths from *Diaphus* sp. and Notoscolepus sp., echinoid spiculae

Depositional environment: various tropical marine habitats, lagoonal to outer shelf, foraminiferal assemblages suggest hard substrate, vegetated, marine, mesotrophic, rather suboxic conditions in 50-200 m depths on the outer part of the inner shelf and middle shelf

Seismics: available seismic inadequate to map and describe reliably, partly subparallel reflectors with somewhat higher amplitudes visible

e-logs: SP-logs rather regularly and strongly serrated with higher amplitude values and with a general slight fining upward trend (except Ginzersdorf 1), RES-logs generally much more uniform with distinctly lower amplitude values than SP-logs (e.g. figs. 101-104)

6.1.1.10. Jakubov Formation, Baden Group

Age: middle Badenian

Core material: greenish, light grey or grey-green, fine sandy, micaceous marl with molluscs and carbonised plant debris, fine-grained, marly, micaceous and light to dark grey sand, mollusc remains

Lithofacies: grey to greenish-grey clays and calcareous clays with subordinate sand layers (Tegel)

Foraminifera: *Spirorutilus* Zone; important species are *Cycloforina contorta*, *C. lucida*, *C. badenensis*, *Adelosina longirostra*, *Sigmoilopsis foeda*, *Quinqueloculina triangularis*, *Qu. haidingeri*, *Spirolina austriaca*, *Borelis melo*, *Uvigerina venusta*, *Spirorutilus carinatus*, *Paravulvulina serrata*, *Textularia mariae*, *Globigerinoides quadrilobatus*, *Cibicidoides austriacus*, *Cornuspira plicata*, *Pyrgoella ventruosa*, *Bitubulogenerina reticulata* and many others

Diversity indices: No. of taxa between 3 and 47, Fisher Alpha between 4.8 and 11.1 (diverse), J between 0.71 and 0.95 (Ø 0.81, balanced), D between 0.07 and 0.36 (Ø 0.15, no dominating species); the Diversity Indices suggest diverse and balanced foraminiferal communities

Palaeoecological Parameters: habitat: mainly epifaunal (Ø 40%) taxa followed by epifaunal to shallow infaunal taxa (Ø 18%) and infaunal ones (Ø 16%), about 1% deep infaunal taxa; bottom water oxygenation: mainly O/S (Ø 26%), oxic (Ø 18%) and suboxic (Ø 13%) indicators, rarely S/D (Ø 2%) and D (Ø 1%) indicators; water depths: preferably inner to middle neritic; slightly increased organic matter flux and environmental stress

Macrofossils: well-preserved and diverse assemblages with *Aequipecten macrotis*, *Alvania* spp., *Bittium spp.*, *Cerithidium* spp., *Chrysallida* spp., *Corbula gibba*, *Gouldia minima*, *Mangelia* sp., *Gibborissoia* spp., *Nassarius* spp., *Saccella commutata*, *Sandbergeri perpusilla*, *Turritella* spp., otoliths from *Lesueurigobius vicinalis* and *Diaphus* cf. *cahuzaci*, bryozoans: *Smittina* sp., *Pleuronea* sp., *Myriapoda truncata*, *Biflustra* sp., *Cellepora* sp., *Ceriopoda* sp., scaphopods *Gadilina jani*, polychaete *Ditrupa cornea*

Depositional environment: shallow marine settings, seagrass meadows and hard substrate, marine, mesotrophic, oxic to suboxic, 0-100 m, lagoonal, sublittoral, inner shelf

Seismics: available seismic inadequate to map and describe reliably, partly subparallel reflectors with somewhat higher amplitudes visible, in some sections unit of prograding clinoforms noticeable (e.g. fig. 93)

e-logs: SP-logs slightly more uniform and with lower amplitude values than RES-logs, which show more distinct peaks, both logs generally with lower amplitude values compared to e.g. logs of Laa or Lužice Fm. (figs. 101-103, 108)

6.1.1.11. Studienka Formation, Baden Group

Age: late Badenian

Core material: greenish or grey-green, partly micaceous marl or light brown, sandy marl with distinct lamination and partly clasts of sandstone, carbonised plant remains and gastropods

Lithofacies: dark-grey calcareous clays and sands

Foraminifera: strongly impoverished fauna; mainly *Ammonia* spp., *Quinqueloculina triangularis*, keeled elphidiids, *Aubignyna* sp., *Heterolepa dutemplei*, *Siphonina reticulata* and *Bulimina elongata*

Diversity indices: No. of taxa between 1 and 16, α between 0.8 and 7.0 (low diverse), J between 0.00 and 0.94 (Ø 0.40, more unbalanced), D between 0.18 and 1.00 (dominating species possible); the Diversity Indices hint at low diverse but slightly more unbalanced foraminiferal communities

Palaeoecological Parameters: habitat: mainly epifaunal (Ø 49%) and epifaunal to shallow infaunal taxa (Ø 33%), about 12% infaunal taxa, no deep infaunal ones; bottom water oxygenation: mainly oxic (Ø 43%) and O/S (Ø 34%) indicators, rarely suboxic (Ø 9%) and S/D (Ø 3%) ones, no D indicators; water depths: preferably inner neritic, no outer neritic or bathyal taxa; no hint at increased organic matter flux and environmental stress

Macrofossils: assemblages with *Agapilia tuberculata*, *Tornus* sp.

Depositional environment: marine offshore, stratified water column, frequent oxygen-depleted bottom conditions, foraminifera indicate marine to hypersaline, more oligotrophic, oxic to slightly suboxic, inner neritic environments

Seismics: available seismic inadequate to map and describe reliably, partly subparallel reflectors with somewhat higher amplitudes visible

e-logs: similar to SP- and RES-logs of Jakubov Fm.

6.1.1.12. Skalica and Holic Formations

Age: early Sarmatian

Core material: brown-grey, greenish or grey-green, fine sandy marl partly with sand layers, lamination, carbonised plant remains and molluscs, light to middle grey or greenish, micaceous, marly fine- to medium-grained sand or sandstone

Lithofacies: siliciclastics

Foraminifera: typical Sarmatian communities with *Elphidium grilli*, *Elphidium hauerinum*, *Elphidium aculeatum*, other elphidiids, *Aubignyna* sp., *Ammonia viennensis*, *A. pseudobeccarii*, *Porosononion granosum* and *Nonion bogdanowiczi*

Diversity indices: No. of taxa between 5 and 15, α between 0.8 and 5.0 (low to moderate diverse), J between 0.43 and 0.87 (Ø 0.69, more balanced), D between 0.12 and 0.50; the Diversity Indices suggest low to moderate diverse but more balanced foraminiferal communities

Palaeoecological Parameters: mode of life: mainly epifaunal (Ø 31%) and infaunal taxa (Ø 22%), about 19% E-SI and 1% deep infaunal ones; bottom water oxygenation: mainly oxic (Ø 29%) and O/S (Ø 26%) indicators, rarely S/D (Ø 6%), suboxic (Ø 1%) and dysoxic (Ø 1%) indicators; water depths: preferably inner neritic, no outer neritic or bathyal taxa; slightly increased organic matter flux and environmental stress

Macrofossils: marker genus *Mohrensternia*, together with *Hydrobia* spp., *Mitrella sarmatica*

Depositional environment: very shallow marine, often nearshore and coastal settings, muddy shores and foreshores with algae and seagrass (Holic Fm.), slightly brackish to marine, meso- to oligotrophic, oxic to slightly suboxic conditions on the inner shelf (0-50 m, lagoonal, shallow sublittoral); agitated shoals with ooid dunes (Skalica Fm.)

Seismics: internal structure not resolved by available seismic data, base recognisable as set of high amplitude reflectors forming erosive relief on underlying strata (fig. 87), within the seismic panel erosive features and channels frequent

e-logs: both SP- and RES-logs rather regularly and distinctly serrated with mainly higher amplitudes, SP-logs mirror RES-logs

6.2. The onset of sedimentation in the Vienna Basin: Ottnangian rather than Eggenburgian

Traditionally, the first marine ingression in the area of the later Vienna Basin is considered to have occurred in Eggenburgian times coinciding with the deposition of first marine deposits (e.g. Kováč et al., 2004). This assumption was partly based on erroneous identification of pectinid bivalves and partly on a now outdated concept of the Eggenburgian/Ottnangian boundary. The stratigraphic allocation of the earliest sediments is also of major impact for the understanding of tectonic processes and sets a clear limit when the subsidence of first depocentres commenced.

Neglecting the principles of sequence stratigraphy, the extraordinary strong transgression, which gave rise to the warm-temperate carbonates of the Zogelsdorf Formation along the Bohemian Massif and which is also expressed as major reworking of Eggenburgian formations was traditionally included into the Eggenburgian stage (Steiniger et al., 1971; Mandic and Steininger, 2003) although it has always been known for interfingering with and passing into the clays of the Ottnangian Zellerndorf Formation. A marker species of this phase is the ubiquitous pectinid bivalve *Pecten hornensis* Deperet and Roman, 1902, which is also reported from several localities of the basal marine ingression in the Vienna and Korneuburg Basins. Consequently, these deposits were correlated with the Eggenburgian stage. In modern concepts (e.g. Piller et al., 2007) the Zogelsdorf Fm. and its equivalents (e.g. the siliciclastic Retz Formation) are treated as basal transgressive systems tract of the Ottnangian cycle (fig. 113). Therefore the initial flooding of the Vienna Basin occurred at ~18.1 Ma, roughly 2 Ma younger than in previous concepts (e.g. Strauss et al., 2006).

Of course the presence of Eggenburgian deposits in the area of the modern Vienna Basin (e.g. in the Slovak territory) cannot be excluded. As the idea of Eggenburgian deposits in the Vienna Basin is rooted in early investigations of the herein investigated wells in the Mistelbach Halfgraben it is supposed that it simply became unreflecting “tradition”.

6.3. The Lužice Formation represents a single cycle spanning the entire Ottnangian

The Lužice Fm. spans the entire Ottnangian (fig. 113). Its initial transgression, reflected as Schlierbasis-Schutt, allowed the development of agitated coastal environments with bryozoan carpets and numerous pectinids, comparable to the bryozoan facies of the Zogelsdorf Fm. in the

Eggenburg area in the North Alpine Foreland Basin. Above follows the lower part of the Lužice Fm. coinciding with a very rapid deepening, peaking in even upper bathyal conditions in the area of the Mistelbach Halfgraben. The characteristic *Bathysiphon*-assemblages developed, which are adapted to instable deep water conditions. This "instability" was caused by turbiditic depositional environments. The deep marine part of the lower Lužice Fm. is strongly tectonised, only drilled in few wells and clearly shows signs of synsedimentary tectonics.

The much thicker upper Lužice Fm. reflects a gradual shallowing trend leading to the establishment of outer to inner shelf environments terminating in eutrophic, lagoonal conditions. Synsedimentary tectonic is recognisable only in its basal parts. Throughout its development the marine micro- and macrofaunas remained, although freshwater discharge becomes important in the terminal stage. The top of the formation is indicated by strong erosion suggesting that this area became terrestrial. Based on the total thickness, rather high sedimentation rates of ~0.85 m/ka have to be assumed reflecting a first phase of major subsidence from 18.1 to 17.2 Ma.

6.4. There are no "*Oncophora* Beds" in the Vienna Basin

The term "*Oncophora* (or *Rzehakia*) Beds" appears in nearly all lithostratigraphic schemes dealing with the lower Miocene of the Vienna Basin and the adjacent North Alpine Foreland Basin. This concept is rooted in misidentifications of marine venerid bivalves in cores of the Bockfließ Formation by the Viennese palaeontologist Adolf Papp. This becomes more understandable knowing that the presence of an enigmatic phase of endemic development in Paratethyan molluscs during the late Ottnangian was a "hot" topic in the 1970ies (e.g. Čtyroký, 1968). At that time, the age of the Bockfließ Formation was unknown and the "conceptual" correlation with the *Oncophora* Beds appeared as an obvious and elegant solution.

Nevertheless, this influential correlation was wrong on various levels: the mollusc fauna of the Bockfließ Fm. comprises a diverse and normal marine, lagoonal assemblage, which has nothing in common with the highly endemic *Rzehakia* faunas of Bavaria, Lower Austria and Moravia, which lack fully marine taxa (Mandic and Ćorić, 2007). The presence of the bivalve genus *Rzehakia* in the Bockfließ Fm. could not be proofed by any subsequent investigations. This biogeographic separation strongly argues against any palaeogeographic connection between the marine embayment of the Carpathian Foredeep (= Bockfließ Fm.) and the isolated brackish lakes of the *Rzehakia* ecosystems (see Harzhauser and Mandic, 2008; Neubauer et al., 2015). The Bockfließ Fm. can be correlated with the early and middle Ottnangian and suggests that the maximum flooding in the lower part of the Bockfließ Fm. correlates with the maximum flooding in the Lužice Fm. (unpublished data, Harzhauser). Therefore the Bockfließ Fm. is distinctly older than the late Ottnangian *Rzehakia* Beds (= Traisen Fm.) in Lower Austria. The stratigraphic equivalent of the *Rzehakia*-phase is most probably expressed by a hiatus in top of the Bockfließ Fm. (unpublished data, Harzhauser).

6.5. The Karpatian as "warm repetition" of the Ottnangian cycle

In all national lithostratigraphic concepts the Karpatian of the Vienna Basin and the adjacent North Alpine Foreland Basin has been recognised as twofold. Herein, the Laa Formation is also separated into two members (Lakšary and Závod Mb.), which in our opinion represent a single 3rd order cycle (fig. 113).

The basal Lakšary Mb. reflects the renewed flooding of the area and a rapid deepening, which is comparable to the lower Lužice Fm. even in terms of wire-log development. Again outer to middle shelf conditions became established. Although upwelling caused rather cool surface waters and frequent phases of dysoxic bottom conditions (Auer et al., 2015) the overall climate became warmer with a distinct seasonality and hot and dry summers (Kern et al., 2010). Reddish palaeosol and anhydrite layers formed in exposed parts of floodplains of the Gänserndorf Fm. in the central Vienna Basin (Weissenbäck, 1995; unpublished data, Harzhauser). With the ongoing transgression, the river system in the southern Vienna Basin became affected as well and the maximum transgression might be reflected by the appearance of marshland taxa of marine origin in the basal Aderklaa Formation (Weissenbäck, 1995; unpublished data, Harzhauser).

Already during the middle Karpatian the transgressive pulse lost its power and a long highstand systems tract of the Závod Member started to develop. This is reflected by the progradation of delta fans, such as the Šaštín Delta in the Slovak part of the Vienna Basin (Kováč et al., 2004) and by a clear shallowing trend in the Mistelbach Halfgraben. The open marine faunas disappear and are replaced by characteristic shallow-water assemblages mainly dominated by *Ammonia* spp. The sporadic molluscs found in the wells are similar to those from the Korneuburg Basin and indicate shallow sublittoral to littoral conditions. Figure 111 shows its position within a larger geographic frame.

Sedimentation rates slowed down slightly compared to the Ottnangian and ranged around 0.6 m/ka in average.

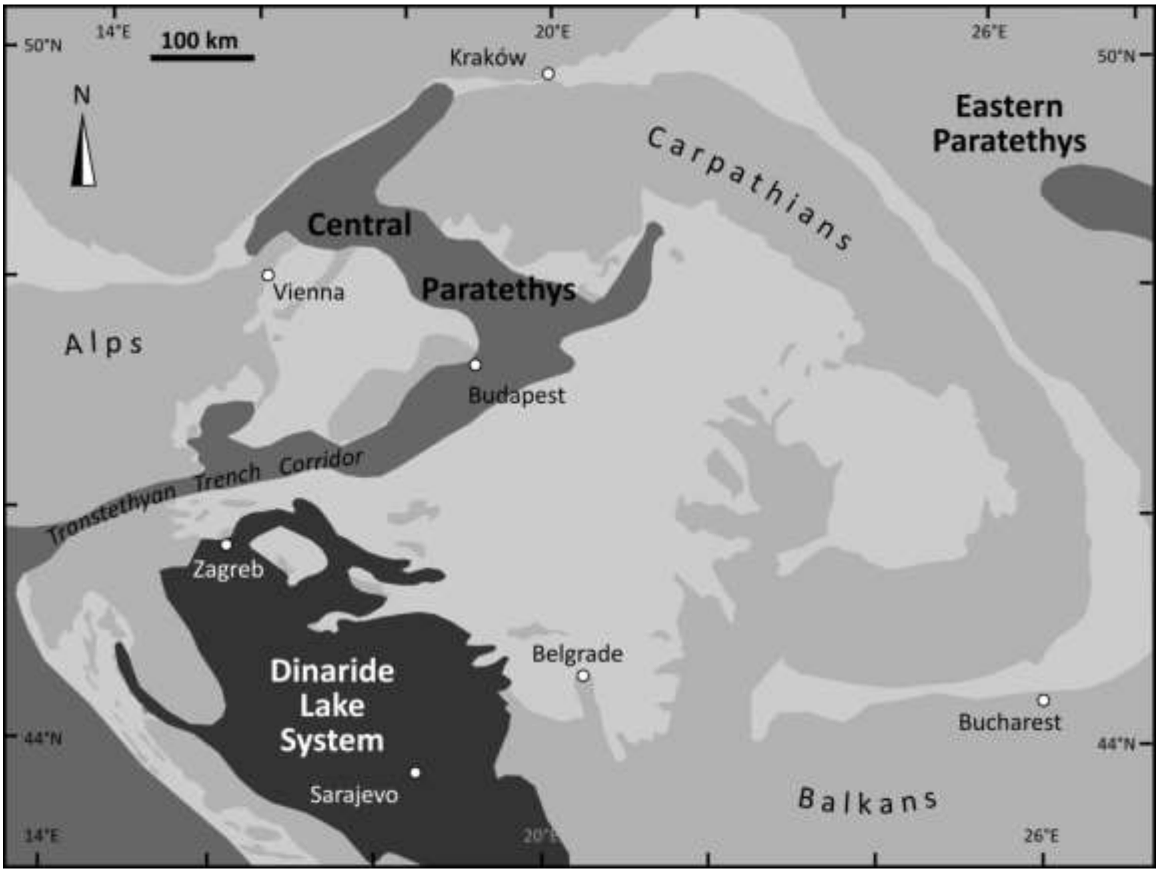


Fig. 111: Palaeogeography during the Karpatian modified after Mandic et al. (2012). At that time the Paratethys was a mere appendix of the Proto-Mediterranean Sea depending on a narrow connection via the Transtethyan Trench Corridor in the SW.

6.6. The Ginzersdorf Member as result of "pre-Styrian" tectonics

A discordance and erosive surface is developed in the Ginzersdorf-Althöflein area in the top of the Závod Mb. (fig. 112). The overlying units can biostratigraphically be dated as Karpatian and the assemblages suggest a deeper marine environment, than represented by the surrounding Závod Mb. This unit can be traced also into the Mistelbach Canyon, where it forms an older but largely destroyed erosive feature in the base and parts of the slopes of the younger Mistelbach Canyon. Interestingly, a comparable channel structure with unquestionable Karpatian fauna was described by Dellmour and Harzhauser (2012) from surface outcrops at Laa and termed "Laa Channel" (not identical with their Iváň Canyon). Therefore, these structures are interpreted as channels that formed on the shallow Karpatian shelf during first tectonic movements roughly around 16 Ma, during the late Early Miocene (fig. 113). The severe erosion during the early Middle Miocene and the tilting of the lower Miocene strata led to a near complete destruction of this Karpatian unit.

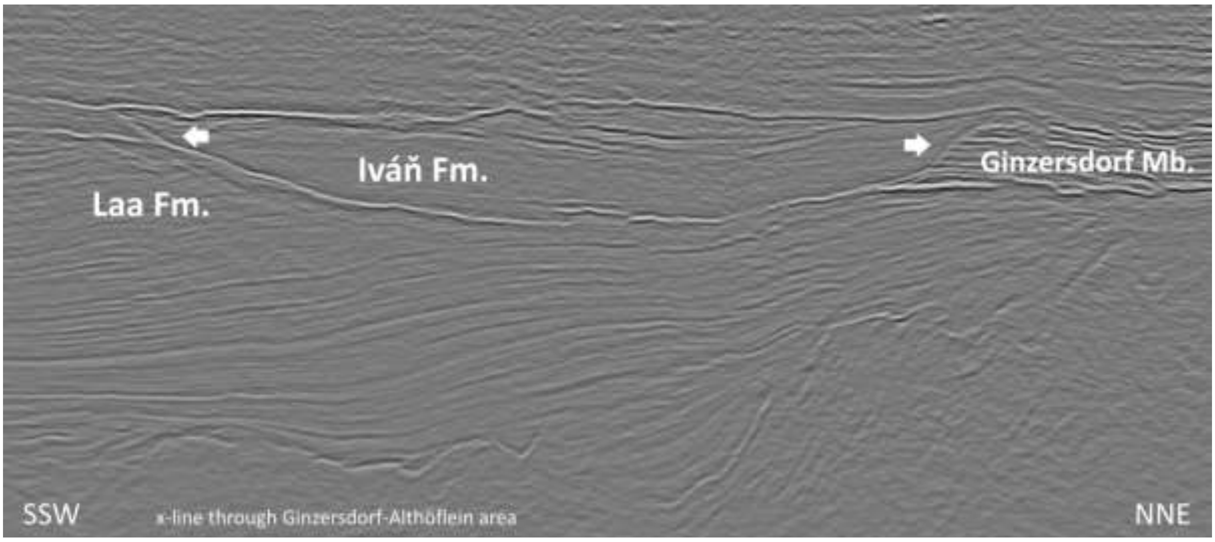


Fig.112: The terminal Karpatian Ginzersdorf Member is a relic of a late Karpatian channel and acted as precursor of the Mistelbach Canyon, which cut and eroded most of the deposits of the new found member.

6.7. The Styrian Phase took place during the early Middle Miocene

Onset: The Badenian/Karpatian boundary is variously placed at 16.3 Ma (Hohenegger et al., 2014) or at 15.97 Ma (Piller et al., 2007). The latter date coincides with the global Early/Middle Miocene boundary (Gradstein et al., 2012), which however is bound to a palaeomagnetic event and not to a biostratigraphic horizon, i.e. FO *Praeorbulina sicana*. I tentatively prefer the 15.97 Ma date as it allows accommodating the ~1000 m-thick Karpatian units in the Mistelbach Halfgraben within the frame of realistic sedimentation rates.

The tectonic tilting and subsequent heavy erosion of the lower Miocene deposits is an expression of the Styrian tectonic phase (Stille, 1924; Rögl et al., 2007), which is also marked by tilting and erosion of Karpatian deposits in the Styrian Basin (Schreilechner and Sachsenhofer, 2007). Hohenegger et al. (2014) placed the Styrian tectonic phase at ~16.5-16.4 Ma. based on studies in the only 25 m-thick succession in the Wagna brickyard in Styria. Aside from the blur and subjectivity in their palaeomagnetic correlations, this would require a termination of Karpatian deposition around 16.5 Ma. In respect to the 17.2 Ma age of the Straning-Tuff in top of the Ottnangian Zellerndorf Fm. – constraining the Ottnangian/Karpatian boundary – this leaves 700 ka for the ~1000 m-thick Karpatian in the Mistelbach Halfgraben. This would result in a sedimentation rate of 1.4 m/ka, which appears unrealistically high in respect to the offshore depositional environment of the Lakšary Member and is in clear contradiction to other data (Auer et al., 2015).

Based on our data, I suppose that Early Miocene marine sedimentation ceased in the Vienna Basin around 16.0 Ma. Hence, whatever stratigraphic concept is followed, the tectonic phase did not occur at the Early/Middle Miocene boundary or earlier but took place during an early Middle Miocene interval.

Termination: The upper boundary for the Styrian tectonic phase is set with the first deposits, which discordantly overly the tilted units. These are the Aderklaa Conglomerate in the southern and central Vienna Basin (e.g. Weissenbäck, 1995) and the Iváň Formation in the Mistelbach Canyon. The 105 m-thick marine clastics in the North Alpine Foreland Basin in the Roggendorf-1 well (Ćorić and Rögl, 2004) and the Iváň Formation in the Iváň Canyon in the Laa area (Dellmour and Harzhauser, 2012) are coeval structures and emphasise the wide geographic extent.

The presence of *Orbulina* in the canyon fill of the Siebenhirten 3-well is a major step for the dating of the sedimentary fill. Unfortunately the first appearance of this genus, though widely used as biostratigraphic marker, is controversial. Most authors still follow Berggren et al. (1995) in placing the FAD of *Orbulina suturalis* at 15.1 Ma, although Iaccarino et al. (2011) currently revised that FAD to 14.58 Ma. Such an offset results either from taxonomic or from stratigraphic bias and should be tested in future by a direct comparison of independently dated Paratethyan, Mediterranean and global records. For now, one can simply test both scenarios and discuss their fits and misfits:

Scenario 1: A dating at 15.1 Ma fits excellently to the fact that *Orbulina* occurs also in the Grund Formation and that the marine clastics below cross the NN4/NN5 boundary (=14.91 Ma) with the last occurrence of the nannofossil *Helicosphaera ampliaperta* (Ćorić and Rögl, 2004). Moreover, the finding of a tektite in the Grund Formation at the Immendorf section (specimen in NHMW collection, unpublished) allows a correlation to the Ries Impact at 15.0 Ma (Rocholl et al., 2011). All these dates point at an age of about 15.0 Ma (note that the first occurrence of *Orbulina* in the Paratethyan record does not necessarily coincide with its earliest evolutionary appearance).

This implies a hiatus between the latest Karpatian and earliest Badenian marine strata of c. 1 Ma. The advantage of this scenario is that all available data fit the model.

Scenario 2: This would shift the date of the marine ingression distinctly higher to about 14.6 Ma and would provide more time for the Styrian Phase. This dating requires ignoring the nannoplankton data of Ćorić and Rögl (2004) for the Roggendorf 1-well. Moreover, the Immendorf tektite would have to be considered as reworked, which is not very likely given its excellent surface preservation.

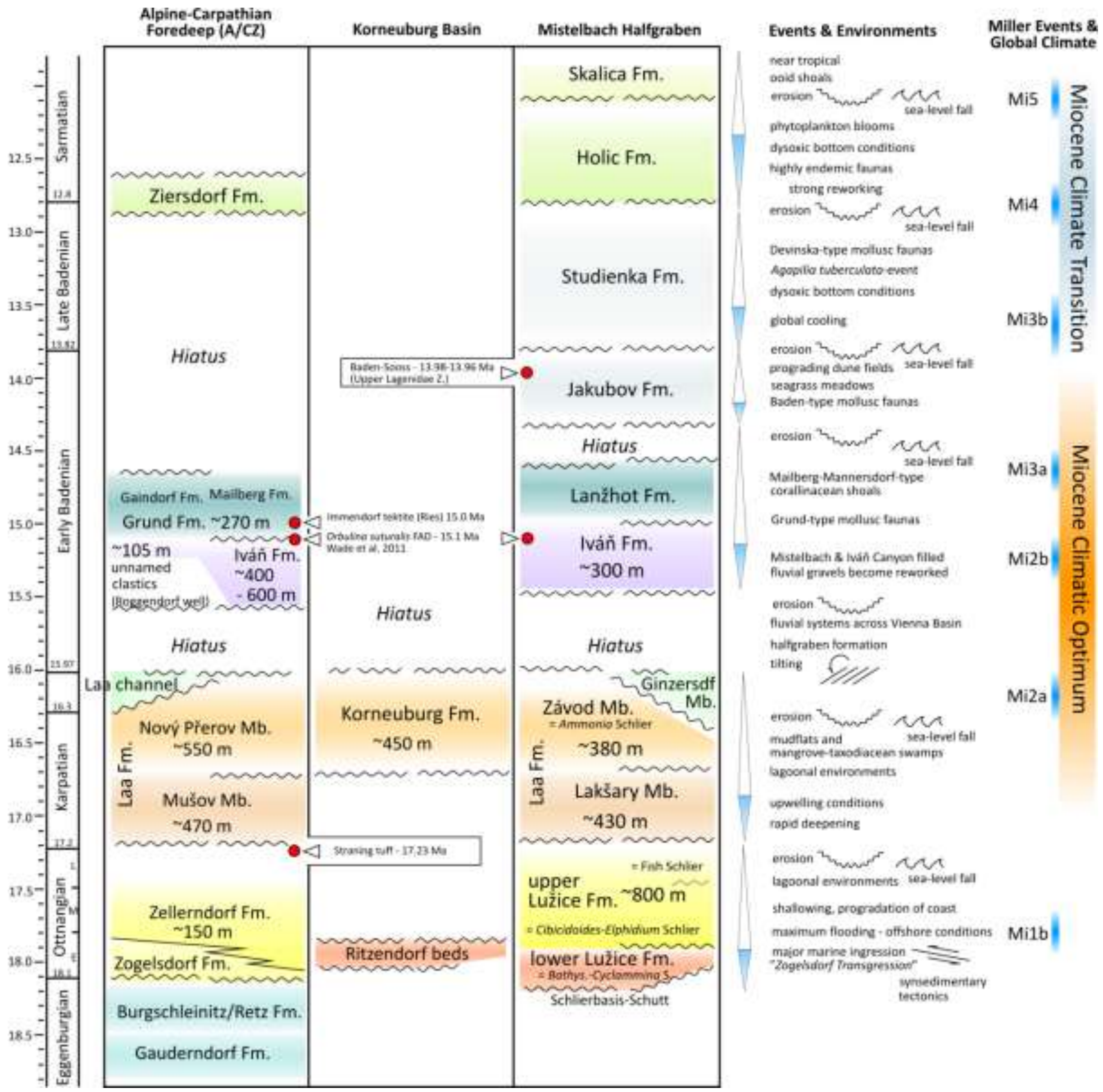
Therefore, I prefer scenario 1 but have no possibility to exclude scenario 2. For both scenarios the HCO (highest common occurrence) of the nannofossil *Helicosphaera waltrans* at 14.357 Ma sets an upper limit for the Grund Formation.

Scenario 1 provides a period of about 1 Ma for the tectonic reorganisation and the development of terrestrial environments with extended floodplains in the entire Vienna Basin and Alpine-Carpathian Foreland Basin. Parts of the fluvial gravel became subsequently reworked by the marine ingression. Scenario 2 offers about 1.5 Ma for the Styrian Phase.

6.8. The position of the Badenian/Sarmatian boundary

The Badenian-Sarmatian Boundary is set at 12.7-12.8 Ma. (Harzhauser and Piller, 2004a, b; Hohenegger et al., 2014; fig. 113) and is less controversial than most other Paratethyan stage boundaries. Due to the biotic crisis, known as the Sarmatian-Badenian Extinction Event (Harzhauser and Piller, 2007) the Badenian and Sarmatian micro- and macrofaunas differ considerably and the separation between Badenian and Sarmatian strata is trivial in outcrops. Therefore, it was surprising to detect severe discrepancies between the Badenian/Sarmatian boundary in previous OMV reports and the herein proposed boundaries (e.g. Althöflein 1). An explanation for this is the high amount of reworked Badenian microfaunas in lower Sarmatian deposits, which often dominate the assemblages. Obviously, former workers have focused on the frequent Badenian taxa but neglected the rare but significant Sarmatian specimens. In respect to the fact that coarse clastic lowstand systems tract deposits and channel lags of the earliest Sarmatian, sealed by thick clay units of the Lower Sarmatian *Mohrensternia* Zone, might represent potential plays, the exact allocation of the Badenian/Sarmatian boundary could be of interest.

Within the current study, mostly lower Sarmatian samples were investigated. In seismics and in surface outcrops the upper Sarmatian is represented as well. Especially the carbonates of this phase document the last subtropical and arid phase in the Vienna Basin, coinciding with the development of extended ooid shoals.



Alpine-Carpathian Foredeep (A/CZ)
Korneuburg Basin
Mistelbach Halfgraben
Events & Environments
Miller Events & Global Climate
Sarmatian
Late Badenian
Early Badenian
Karpatian
Ottnangian
Eggenburgian
12.5
13.0
13.5
14.0
14.5
15.0
15.5
16.0
16.5
17.0
17.5
18.0
18.5
Skalica Fm.
Holic Fm.
Ziersdorf Fm.
Studienka Fm.
Hiatus
Jakubov Fm.
Hiatus
Gaindorf Fm.
Mailberg Fm.
Grund Fm. ~270 m
Lanžhot Fm.
Iváň Fm. ~300 m
~105 m unnamed clastics (Roggendorf well)
Iváň Fm. ~400 - 600 m
Hiatus
Hiatus
Hiatus
Laa channel
Ginzersdf Mb.
Nový Přerov Mb. ~550 m
Korneuburg Fm. ~450 m
Závod Mb. = Ammonia Schlier ~380 m
Laa Fm.
Mušov Mb. ~470 m
Lakšary Mb. ~430 m
Zellerndorf Fm. ~150 m
Zogelsdorf Fm.
Ritzendorf beds
upper Lužice Fm. ~800 m
= Fish Schlier
= Cibicidoides-Elphidium Schlier
lower Lužice Fm.
= Bathys.-Cyclammina S.
Schlierbasis-Schutt
Burgschleinitz/Retz Fm.
Gauderndorf Fm.
Immendorf tektite (Ries) 15.0 Ma
Orbulina suturalis FAD - 15.1 Ma Wade et al. 2011
Straning tuff - 17.23 Ma
near tropical
ooid shoals
erosion
sea-level fall
phytoplankton blooms
dysoxic bottom conditions
highly endemic faunas
strong reworking
erosion
sea-level fall
Devinska-type mollusc faunas
Agapilia tuberculata-event
dysoxic bottom conditions
global cooling
erosion
prograding dune fields
sea-level fall
seagrass meadows
Baden-type mollusc faunas
erosion
sea-level fall
Mailberg-Mannersdorf-type corallinacean shoals
Grund-type mollusc faunas
Mistelbach & Iváň Canyon filled
fluvial gravels become reworked
erosion
fluvial systems across Vienna Basin
halfgraben formation
tilting
erosion
sea-level fall
mudflats and mangrove-taxodiacean swamps
lagoonal environments
upwelling conditions
rapid deepening
erosion
sea-level fall
lagoonal environments
shallowing, progradation of coast
maximum flooding - offshore conditions
major marine ingression "Zogelsdorf Transgression"
synsedimentary tectonics
Mi5
Mi4
Mi3b
Mi3a
Mi2b
Mi2a
Mi1b
Miocene Climate Transition
Miocene Climatic Optimum

Fig. 113: Critical re-evaluation of the lithostratigraphy and chronostratigraphy in the Vienna Basin and the adjacent North Alpine Foreland Basin and Korneuburg Basin. Red dots indicate tie-points: Straning Tuff constraining the Ottnangian/Karpatian boundary (Roetzel et al., 2014), FAD of Orbulina *(see discussion in chapter 6.7.), dating of the Ries Impact (Rocholl et al., 2011), astrochronologic dating of the Baden-Sooss core (Hohenegger et al., 2009). The thicknesses of the formations are given only for lower and lower Middle Miocene ones, which are reliably represented in the investigation area. For most of the younger formations total thicknesses cannot be estimated due to the huge erosional gaps. It is supposed that many of the observed erosive surfaces separating the lithostratigraphic units are related to global sea-level changes except for the long gap in the early Badenian. This one is clearly tectonically forced (although a global sea-level low coincides as well). The global Miocene climatic development and the respective Miller glacials (Miller et al., 1996) show a good fit with the regional development (e.g. Middle/Late Badenian boundary = Mi3b; Badenian/Sarmatian boundary = Mi4; early/late Sarmatian boundary = Mi5). Therefore it is assumed that the not very accurately dated termination of the M1b event might be related to the extraordinary Ottnangian transgression and the sea-level drop initiated by the Mi2a event might have amplified the tectonically induced sea-level drop in the late Karpatian. The obvious misfit of the Mi3a event with the herein proposed stratigraphy might be a hint to stratigraphic problems of either the Mi3a or duration of the Grund and Lanžhot Fms. The "*Agapilia tuberculata *event" indicated for the Studienka Fm. refers to the sudden appearance of a small, ornamented neritid gastropod, which is restricted to the late Badenian in the entire Paratethys.*

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	App. 1 – part 1	AH1 (100-105m) 4/1	AH1 (130-135m) 5/1	AH1 (160-165m) 6/2	AH1 (190-195m) 7/4	AH1 (220-225m) 8/2	AH1 (250-255m) 9/4	AH1 (280-285m) 10/2	AH1 (310-315m) 11/1	AH1 (370-375m) 13/3	AH1 (430-435m) 15/3	AH1 (460-465m) 16/1	AH1 (520-523m) 18/3	AH1 (610-615m) 21/2	GI1 (1050-1055m) 17/1	GI2 (1084-1086.7m) 10/2	HRD19 (400-405m) 1/2	HRD19 (495-500m) 2/1	HRD19 (571-576m) 3/1	HRD19 (590-595m) 4/1	HRD19 (630-635m) 6/1	HRD19 (650-656m) 7/1	HRD19 (819-820m) 12/1
AGGLUTINATED FORAMINIFERA	*Ammodiscus miocenicus* Karrer	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	0	0	0	0	0	0
	Ammodiscus sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bathysiphon filiformis M. Sars	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bathysiphon taurinensis Sacco	0	0	0	0	0	0	0	1	0	0	0	13	0	8	0	0	0	0	0	0	0	0
	Cribrostomoides subglobosus (M. Sars)	0	0	0	0	0	0	0	0	0	0	0	0	0	119	0	0	0	0	0	0	0	0
	Cyclammina bradyi Cushman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cyclammina karpatica Cicha & Zapletalova	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
	Glomospira saturniformis Grzybowski	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haplophragmoides carinatus Cushman & Renz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Karreriella chilostoma (Reuss)	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Martinottiella communis (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Paravulvulina serrata (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pseudogaudryina mayeriana (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Reticulophragmium karpaticum Cicha & Zapletalova	0	0	0	0	0	0	0	0	52	114	4	12	24	102	16	0	0	0	0	0	0	0
	Reticulphragmium sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Semivulvulina deperdita (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Semivulvulina pectinata (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	10	3	1	0
	Siphotextularia concava (Karrer)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Spirorutilus carinatus (d'Orbigny)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0
	Textularia gramen d'Orbigny	0	1	1	11	1	3	1	1	0	0	0	0	0	0	0	0	4	0	0	6	0	0
	Textularia gramen maxima Cicha & Zapletalova	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Textularia laevigata d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Textularia mariae d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Textularia pala Czjzek	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Trochamminoides contortus Mallory	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Agglutinated indet. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MILIOLID FORAMINIFERA	*Adelosina longirostra* (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Adelosina schreibersi (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Borelis melo (Fichtel & Moll)	0	0	0	13	2	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0
	Borelis melo haueri (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cornuspira plicata (Czjzek)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cycloforina badenensis (d'Orbigny)	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cycloforina contorta (d'Orbigny)	0	0	0	14	20	0	4	0	1	0	0	0	0	0	0	0	0	0	6	0	0	0
	Cycloforina gracilis (Karrer)	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cycloforina lucida (Karrer)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cycloforina nussdorfensis (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cycloforina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pseudotriloculina consobrina (d'Orbigny)	0	3	0	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pyrgo simplex (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pyrgoella ventruosa (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina agglutinans d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	0	0	0
	Quinqueloculina akneriana d'Orbigny	0	0	0	35	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina boueana d'Orbigny	0	0	0	0	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina buchiana d'Orbigny	1	0	0	17	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Quinqueloculina haidingeri d'Orbigny	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
	Quinqueloculina hauerina d'Orbigny	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina seminulum Linné	0	0	0	0	0	0	0	0	1	5	0	1	5	0	0	0	0	0	0	0	0	1
	Quinqueloculina triangularis d'Orbigny	0	0	0	0	8	0	1	0	3	6	0	0	0	0	0	0	1	0	19	0	0	0
	Quinqueloculina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
	Quinqueloculina sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0
	Quinqueloculina sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina sp. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina sp. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina sp. 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina sp. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sigmoilinita tenuis (Czjzek)	0	0	0	0	2	0	0	0	0	1	0	0	0	3	0	0	0	0	0	0	0	0
	Sigmoilinita tschokrakensis Gerke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0
	Sigmoilopsis celata (Costa)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sigmoilopsis foeda (Reuss)	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sigmoilopsis schlumbergeri (Silvestri)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0

MILIOLID FORAM.	*Sigmoilopsis* sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Spirolina austriaca d'Orbigny	0	0	0	5	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Spirolina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Spiroloculina canaliculata d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Spiroloculina excavata d'Orbigny	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Triloculina eggeri (Bogdanovich)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Triloculina gibba d'Orbigny	0	0	0	13	10	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Triloculina inflata d'Orbigny	0	1	0	2	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Triloculina scapha d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
	Miliolidae indet. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HYALINE FORAMINIFERA	*Ammonia pseudobeccarii* (Putrya)	137	2	0	1	28	0	3	0	4	1	0	3	1	0	0	0	1	0	2	0	0	16
	Ammonia tepida (Cushman)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Ammonia viennensis (d'Orbigny)	127	9	252	171	68	1	13	0	17	22	0	5	3	0	0	2	3	0	4	0	2	43
	Amphicoryna badenensis (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Amphicoryna hispida (d'Orbigny)	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Amphicoryna ottnangensis (Toula)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Amphimorphina haueriana Neugeboren	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Amphistegina radiata (Fichtel & Moll)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Asterigerinata planorbis (d'Orbigny)	1	33	0	8	6	0	15	3	13	24	0	9	4	0	0	0	0	0	0	0	0	0
	Astrononion stelligerum (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Aubignyna sp. 1 (see Schütz et al. 2007)	13	11	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
	Biapertorbis biaperturatus Pokorny	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bitubulogenerina reticulata Cushman	0	0	0	0	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bolivina dilatata Reuss	0	8	0	0	21	0	3	3	1	0	0	1	1	0	0	0	0	0	1	66	0	0
	Bolivina hebes MacFadyen	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bolivina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bulimina buchiana d'Orbigny	0	2	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bulimina elongata d'Orbigny	0	53	1	1	4	1	9	0	0	1	0	0	0	0	0	0	117	0	63	9	0	0
	Bulimina elongata longa (Venglinskyi)	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bulimina striata d'Orbigny	1	15	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	Cancris auriculus (Fichtel & Moll)	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cassidulina laevigata d'Orbigny	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Caucasina schischkinskayae (Samoylova)	0	4	1	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Caucasina subulata(Cushman & Parker)	0	5	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ceratocancris haueri (d'Orbigny)	0	0	2	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cibicidoides austriacus (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cibicidoides budayi (Cicha & Zapletalova)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cibicidoides lopjanicus (Myatlyuk)	0	0	0	0	0	0	8	4	0	3	0	0	0	0	0	0	2	0	1	8	0	0
	Cibicidoides pachyderma (Rzehak)	0	0	3	2	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
	Cibicidoides ungerianus ungerianus (d'Orbigny)	0	0	0	1	12	0	2	4	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Cibicidoides sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Cibicidoides sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Cibicidoides sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dentalina acuta d'Orbigny	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dentalina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Discorbinoides sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidiella minuta (Reuss)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium aculeatum (d'Orbigny)	1	7	11	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium advenum (Cushman)	0	4	0	7	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium angulatum (Egger)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium antoninum (d'Orbigny)	12	3	0	0	0	0	0	0	11	20	0	7	0	0	0	0	0	0	0	0	0	0
	Elphidium crispum (Linné)	1	18	5	97	2	0	29	0	31	42	0	13	5	0	2	0	0	0	0	0	0	0
	Elphidium fichtelianum (d'Orbigny)	0	12	0	11	5	0	0	1	3	2	0	0	0	0	0	0	0	0	1	0	0	0
	Elphidium flexuosum (d'Orbigny)	0	0	0	17	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	0	0	0
	Elphidium grilli Papp	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium hauerinum (d'Orbigny)	0	2	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium josephinum (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium karpaticum Myatlyuk	0	0	0	0	0	0	6	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0
	Elphidium koberi Tollmann	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium listeri (d'Orbigny)	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium macellum (Fichtel & Moll)	0	1	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium obtusum (d'Orbigny)	7	0	20	5	2	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium ortenburgense (Egger)	0	0	0	0	0	0	5	0	0	6	1	1	9	0	0	0	1	0	0	0	0	0
	Elphidium reussi Marks	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	1
	Elphidium rugosum (d'Orbigny)	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium subtypicum Papp	0	0	0	0	0	0	0	1	0	6	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium ungeri (Reuss)	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium sp. (see Cicha et al. 1998)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	Elphidium sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Elphidium sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

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Elphidium sp. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 11	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 12	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eponides repandus (Fichtel & Moll)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Escornebovina ? trochiformis (Andreae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Favulina geometrica (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Favulina hexagona (Williamson)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fissurina laevigata Reuss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fissurina marginata (Montagu)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fontbotia wuellerstorfi (Schwager)	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Fursenkoina acuta (d'Orbigny)	1	11	0	0	12	0	1	0	0	0	0	0	0	0	0	0	0	0	0	207	0	0
Glabratella sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glandulina ovula d'Orbigny	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globulina gibba d'Orbigny	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globulina punctata d'Orbigny	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globulina striata (Egger)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globulina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grigelis pyrula (d'Orbigny)	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Guttulina austriaca d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Guttulina communis (d'Orbigny)	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hansenisca soldanii (d'Orbigny)	0	0	0	1	1	0	0	1	0	3	0	0	1	0	0	0	0	0	0	0	0	0
Heterolepa dutemplei (d'Orbigny)	0	14	1	1	6	0	18	8	6	3	0	2	2	0	14	0	1	0	5	1	0	0
Hoeglundina elegans (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyalinonetrion clavatum (d'Orbigny)	0	2	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Laevidentalina boueana (d'Orbigny)	0	0	0	0	0	0	1	0	0	1	0	0	0	3	0	0	0	0	0	0	0	0
Laevidentalina communis (d'Orbigny)	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laevidentalina elegans (d'Orbigny)	0	0	0	0	9	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laevidentalina inornata (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Laevidentalina scripta (d'Orbigny)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	0	0
Laevidentalina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagena gracilicosta Reuss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagena haidingeri (Czjzek)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Lagena striata (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagena sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagena sp. 2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina americana (Cushman)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina austriaca (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina cultrata (de Montfort)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina inornata (d'Orbigny)	0	0	0	0	0	8	7	0	2	0	0	0	0	0	4	0	0	1	59	14	16	10
Lenticulina melvilli (Cushman & Renz)	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	1	2	0	11	3	0
Lenticulina orbicularis (d'Orbigny)	0	0	0	0	0	0	4	38	1	2	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina spinosa (Cushman)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina vortex (Fichtel & Moll)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lobatula lobatula (Walker & Jacob)	0	20	33	1	19	0	0	0	3	2	0	1	2	0	0	0	0	0	0	0	0	0
Marginulina hirsuta (d'Orbigny)	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melonis affinis (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melonis pompilioides (Fichtel & Moll)	0	4	0	0	4	0	4	4	1	2	0	0	0	0	0	0	0	0	0	0	0	0
Myllostomella recta (Palmer & Bermúdez)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neoeponides schreibersi (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neugeborina irregularis (d'Orbigny)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neugeborina longiscata (d'Orbigny)	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nodosaria sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nodosaria sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nodosaria sp. 3	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nonion bogdanowiczi Voloshinova	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nonion commune (d'Orbigny)	0	18	7	4	83	0	11	6	1	2	0	0	1	0	0	0	13	0	127	253	9	0
Nonion tumidulus Pishvanova	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Nonionella turgida (Williamson)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nonionoides karaganicus (Krasheninnikov)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orthomorphina columella (Karrer)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pappina breviformis (Papp & Turnovsky)	0	0	0	0	0	0	14	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Pappina parkeri (Karrer)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pappina primiformis (Papp & Turnovsky)	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parafissurina carinata (Buchner)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pararotalia aculeata (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Pararotalia rimosa ? (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Planularia kubinyi (Hantken)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plectofrondicularia digitalis (Neugeboren)	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plectofrondicularia raricosta (Karrer)	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plectofrondicularia striata (Hantken)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Porosononion granosum (d'Orbigny)	3	1	224	18	86	0	7	1	2	12	0	3	1	0	0	0	0	0	1	0	0	6
Praeglobobulimina pupoides (d'Orbigny)	0	5	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Praeglobobulimina pyrula (d'Orbigny)	0	12	6	0	4	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Pseudonodosaria brevis (d'Orbigny)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pullenia bulloides (d'Orbigny)	0	7	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pullenia quinqueloba (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmaeoseistron hispidum (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Reussella spinulosa (Reuss)	0	0	0	0	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0
Schackoinella imperatoria (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Siphonina reticulata (Czjzek)	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Siphonodosaria consobrina (d'Orbigny)	0	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeroidina bulloides d'Orbigny	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stilostomella adolphina (d'Orbigny)	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina aculeata d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina acuminata Hosius	0	1	0	0	0	0	1	1	0	2	0	0	0	0	0	0	0	0	1	0	0	0
Uvigerina graciliformis Papp & Turnovsky	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina gracilis Reuss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina grilli Schmid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina macrocarinata Papp & Turnovsky	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina mantaensis Cushman & Edwards	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina pygmoides Papp & Turnovsky	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina semiornata d'Orbigny	0	2	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina venusta Franzenau	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vaginulinopsis hauerina (d'Orbigny)	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Valvulineria complanata (d'Orbigny)	0	0	0	0	4	0	0	1	0	0	0	0	0	0	0	0	0	0	0	5	0	0
Virgulopsis tuberculatus (Egger)	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina bulloides d'Orbigny	0	71	4	1	10	0	45	27	7	3	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina concinna Reuss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina diplostoma Reuss	0	6	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina falconensis Blow	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina ottnangensis Rögl	0	0	0	0	0	0	29	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina praebulloides Blow	0	5	0	0	0	0	0	26	4	5	0	3	6	0	0	0	2	0	0	0	0	0
Globigerina tarchanensis Subbotina & Chutzieva	0	4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
Globigerina sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina sp. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina sp. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerinella obesa (Bolli)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerinella regularis (d'Orbigny)	0	4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerinoides bisphericus Todd	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerinoides quadrilobatus (d'Orbigny)	0	17	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerinoides trilobus (Reuss)	0	1	0	0	3	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globoquadrina cf. *altispira* (Cushman & Jarvis)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globorotalia bykovae Aisenstat	2	1	3	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Globorotalia peripheroronda Blow & Banner	0	6	2	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Globorotalia transsylvanica Popescu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globoturborotalita woodi (Jenkins)	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Orbulina suturalis Brönnimann	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paragloborotalia ? mayeri (Cushman & Ellisor)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Turborotalita quinqueloba (Natland)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 6	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 7	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 8	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 9	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 10	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Hyaline indet. 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	336	438	601	510	580	21	278	183	174	304	5	75	74	266	39	5	150	9	311	620	37	79

15 = only Sarmatian taxa used

	App. 1 – part 2	HRD24 (256-260.5m) 2/1	HRD24 (390-395m) 3/1	HRD24 (550-555m) 5/1	HRD24 (620-624m) 6/1	HRD24 (641-645m) 7/1	HRD24 (775-779.5m) 9/1	HRD25 (290-298m) 1/1	HRD25 (310-315m) 2/1	HRD25 (490-495m) 4/1	HRD25 (550-557m) 5/1	HRD25 (645-650m) 7/1	HRD25 (665-670m) 8/1	HRD25 (685-690m) 9/1	HRD25 (740-745m) 10/1	KA1 (450-455.5m) 7/4	KA1 (500-506m) 8/1	KA1 (550-555m) 9/2	KA1 (600-604m) 10/4	KA1 (701-705m) 12/2	KA1 (750-755m) 13/1	KA1 (795-800m) 14/2	KA1 (895-900m) 15/2
AGGLUTINATED FORAMINIFERA	*Ammodiscus miocenicus* Karrer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ammodiscus sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bathysiphon filiformis M. Sars	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bathysiphon taurinensis Sacco	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cribrostomoides subglobosus (M. Sars)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cyclammina bradyi Cushman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cyclammina karpatica Cicha & Zapletalova	0	0	13	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Glomospira saturniformis Grzybowski	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haplophragmoides carinatus Cushman & Renz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Karreriella chilostoma (Reuss)	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Martinottiella communis (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Paravulvulina serrata (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pseudogaudryina mayeriana (d'Orbigny)	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Reticulophragmium karpaticum Cicha & Zapletalova	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Reticulphragmium sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Semivulvulina deperdita (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Semivulvulina pectinata (Reuss)	0	0	7	6	0	0	0	0	9	37	0	0	0	0	0	0	0	0	0	0	0	0
	Siphotextularia concava (Karrer)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Spirorutilus carinatus (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Textularia gramen d'Orbigny	0	0	0	0	0	0	90	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Textularia gramen maxima Cicha & Zapletalova	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Textularia laevigata d'Orbigny	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Textularia mariae d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Textularia pala Czjzek	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Trochamminoides contortus Mallory	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 9	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MILIOLID FORAMINIFERA	*Adelosina longirostra* (d'Orbigny)	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Adelosina schreibersi (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Borelis melo (Fichtel & Moll)	0	2	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Borelis melo haueri (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cornuspira plicata (Czjzek)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cycloforina badenensis (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Cycloforina contorta (d'Orbigny)	0	0	0	0	0	0	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cycloforina gracilis (Karrer)	0	0	0	0	0	78	0	1	0	0	0	9	0	0	0	0	0	0	0	0	0	0
	Cycloforina lucida (Karrer)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cycloforina nussdorfensis (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cycloforina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pseudotriloculina consobrina (d'Orbigny)	0	0	0	0	1	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pyrgo simplex (d'Orbigny)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pyrgoella ventruosa (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina agglutinans d'Orbigny	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina akneriana d'Orbigny	0	0	0	0	0	0	15	5	3	6	1	0	0	0	0	0	0	0	0	1	0	0
	Quinqueloculina boueana d'Orbigny	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina buchiana d'Orbigny	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina haidingeri d'Orbigny	0	0	24	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina hauerina d'Orbigny	0	0	0	0	0	2	0	1	19	23	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina seminulum Linné	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0
	Quinqueloculina triangularis d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Quinqueloculina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina sp. 3	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina sp. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina sp. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina sp. 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina sp. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sigmoilinita tenuis (Czjzek)	0	0	4	7	0	0	0	0	1	5	0	0	0	0	0	0	0	0	0	0	0	0
	Sigmoilinita tschokrakensis Gerke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sigmoilopsis celata (Costa)	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sigmoilopsis foeda (Reuss)	0	0	4	0	0	0	9	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sigmoilopsis schlumbergeri (Silvestri)	0	0	0	0	0	0	15	0	6	20	10	0	0	0	0	0	0	0	0	0	0	0
	Sigmoilopsis sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

MILIOLID FORAMINIFERA	*Spirolina austriaca* d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Spirolina sp. 1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Spiroloculina canaliculata d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Spiroloculina excavata d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Triloculina eggeri (Bogdanovich)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Triloculina gibba d'Orbigny	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Triloculina inflata d'Orbigny	0	0	0	0	3	0	4	10	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Triloculina scapha d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HYALINE FORAMINIFERA	*Ammonia pseudobeccarii* (Putrya)	0	0	0	16	3	0	19	1	0	5	24	13	0	0	19	10	21	15	15	0	13	0
	Ammonia tepida (Cushman)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ammonia viennensis (d'Orbigny)	0	0	0	14	2	151	132	3	1	14	224	85	0	0	0	206	76	55	118	156	141	99
	Amphicoryna badenensis (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Amphicoryna hispida (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Amphicoryna ottnangensis (Toula)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Amphimorphina haueriana Neugeboren	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Amphistegina radiata (Fichtel & Moll)	0	1	0	0	0	0	0	0	1	2	1	0	1	0	0	0	0	0	0	0	0	0
	Asterigerinata planorbis (d'Orbigny)	0	0	0	0	0	0	0	0	3	2	6	0	0	0	2	1	0	0	0	0	0	0
	Astrononion stelligerum (d'Orbigny)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Aubignyna sp. 1 (see Schütz et al. 2007)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Biapertorbis biaperturatus Pokorny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bitubulogenerina reticulata Cushman	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bolivina dilatata Reuss	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bolivina hebes MacFadyen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	Bolivina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bulimina buchiana d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bulimina elongata d'Orbigny	0	0	9	12	0	2	10	3	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	Bulimina elongata longa (Venglinskyi)	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bulimina striata d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cancris auriculus (Fichtel & Moll)	0	0	0	0	0	0	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cassidulina laevigata d'Orbigny	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Caucasina schischkinskayae (Samoylova)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Caucasina subulata(Cushman & Parker)	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ceratocancris haueri (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cibicidoides austriacus (d'Orbigny)	0	0	0	0	0	0	8	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0
	Cibicidoides budayi (Cicha & Zapletalova)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Cibicidoides lopjanicus (Myatlyuk)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1
	Cibicidoides pachyderma (Rzehak)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cibicidoides ungerianus ungerianus (d'Orbigny)	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	Cibicidoides sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cibicidoides sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cibicidoides sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dentalina acuta d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dentalina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Discorbinoides sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidiella minuta (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium aculeatum (d'Orbigny)	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium advenum (Cushman)	0	0	0	0	0	0	13	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium angulatum (Egger)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium antoninum (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium crispum (Linné)	1	0	0	0	13	0	0	0	8	6	2	0	2	0	0	0	0	0	0	0	0	0
	Elphidium fichtelianum (d'Orbigny)	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium flexuosum (d'Orbigny)	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium grilli Papp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium hauerinum (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium josephinum (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium karpaticum Myatlyuk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium koberi Tollmann	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium listeri (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium macellum (Fichtel & Moll)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium obtusum (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium ortenburgense (Egger)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	1
	Elphidium reussi Marks	0	0	0	0	0	0	0	0	0	1	1	3	0	0	0	0	0	0	0	0	0	0
	Elphidium rugosum (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium subtypicum Papp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0
	Elphidium ungeri (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium sp. (see Cicha et al. 1998)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Elphidium sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eponides repandus (Fichtel & Moll)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Escornebovina ? *trochiformis* (Andreae)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Favulina geometrica (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Favulina hexagona (Williamson)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fissurina laevigata Reuss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fissurina marginata (Montagu)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fontbotia wuellerstorfi (Schwager)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fursenkoina acuta (d'Orbigny)	0	0	25	14	0	0	11	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Glabratella sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glandulina ovula d'Orbigny	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globulina gibba d'Orbigny	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globulina punctata d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globulina striata (Egger)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globulina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grigelis pyrula (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Guttulina austriaca d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Guttulina communis (d'Orbigny)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hansenisca soldanii (d'Orbigny)	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heterolepa dutemplei (d'Orbigny)	0	0	8	5	1	0	17	5	1	16	0	0	0	0	0	0	0	0	0	0	0	1
Hoeglundina elegans (d'Orbigny)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Hyalinonetrion clavatum (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laevidentalina boueana (d'Orbigny)	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laevidentalina communis (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laevidentalina elegans (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laevidentalina inornata (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laevidentalina scripta (d'Orbigny)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laevidentalina sp. 1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagena gracilicosta Reuss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagena haidingeri (Czjzek)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagena striata (d'Orbigny)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagena sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagena sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina americana (Cushman)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina austriaca (d'Orbigny)	0	0	2	5	0	0	0	0	48	163	228	0	0	0	0	0	0	0	0	0	0	0
Lenticulina cultrata (de Montfort)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina inornata (d'Orbigny)	0	0	16	13	0	5	0	0	0	0	0	1	0	12	0	0	0	0	0	0	0	0
Lenticulina melvilli (Cushman & Renz)	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina orbicularis (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina spinosa (Cushman)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina vortex (Fichtel & Moll)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lobatula lobatula (Walker & Jacob)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Marginulina hirsuta (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melonis affinis (Reuss)	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melonis pompilioides (Fichtel & Moll)	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myllostomella recta (Palmer & Bermúdez)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neoeponides schreibersi (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neugeborina irregularis (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neugeborina longiscata (d'Orbigny)	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nodosaria sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nodosaria sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nodosaria sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nonion bogdanowiczi Voloshinova	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nonion commune (d'Orbigny)	0	0	104	69	1	7	97	3	13	14	27	0	1	0	0	0	0	1	0	0	0	2
Nonion tumidulus Pishvanova	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nonionella turgida (Williamson)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nonionoides karaganicus (Krasheninnikov)	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orthomorphina columella (Karrer)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pappina breviformis (Papp & Turnovsky)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pappina parkeri (Karrer)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pappina primiformis (Papp & Turnovsky)	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parafissurina carinata (Buchner)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pararotalia aculeata (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pararotalia rimosa ? (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Planularia kubinyi (Hantken)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plectofrondicularia digitalis (Neugeboren)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

HYALINE FORAMINIFERA

Plectofrondicularia raricosta (Karrer)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plectofrondicularia striata (Hantken)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Porosononion granosum (d'Orbigny)	0	0	0	1	3	0	137	3	0	1	29	0	0	0	0	0	1	0	1	0	0	6
Praeglobobulimina pupoides (d'Orbigny)	0	0	0	0	0	0	9	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Praeglobobulimina pyrula (d'Orbigny)	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudonodosaria brevis (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pullenia bulloides (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pullenia quinqueloba (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmaeoseistron hispidum (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reussella spinulosa (Reuss)	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schackoinella imperatoria (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Siphonina reticulata (Czjzek)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Siphonodosaria consobrina (d'Orbigny)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeroidina bulloides d'Orbigny	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Stilostomella adolphina (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina aculeata d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina acuminata Hosius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina graciliformis Papp & Turnovsky	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina gracilis Reuss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina grilli Schmid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina macrocarinata Papp & Turnovsky	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina mantaensis Cushman & Edwards	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina pygmoides Papp & Turnovsky	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina semiornata d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina venusta Franzenau	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina sp. 1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vaginulinopsis hauerina (d'Orbigny)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Valvulineria complanata (d'Orbigny)	0	0	34	0	0	0	244	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Virgulopsis tuberculatus (Egger)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina bulloides d'Orbigny	0	0	0	0	0	0	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina concinna Reuss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina diplostoma Reuss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina falconensis Blow	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina ottnangensis Rögl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
Globigerina praebulloides Blow	0	0	0	0	0	1	1	0	0	0	0	0	0	2	0	0	0	6	0	0	0	0
Globigerina tarchanensis Subbotina & Chutzieva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina sp. 2	0	0	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina sp. 3	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina sp. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina sp. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerinella obesa (Bolli)	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerinella regularis (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerinoides bisphericus Todd	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerinoides quadrilobatus (d'Orbigny)	0	0	0	0	0	0	45	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerinoides trilobus (Reuss)	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globoquadrina cf. *altispira* (Cushman & Jarvis)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globorotalia bykovae Aisenstat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globorotalia peripheroronda Blow & Banner	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globorotalia transsylvanica Popescu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globoturborotalita woodi (Jenkins)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orbulina suturalis Brönnimann	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paragloborotalia ? mayeri (Cushman & Ellisor)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Turborotalita quinqueloba (Natland)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 11	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 12	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 13	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2	4	307	183	33	249	1094	85	138	321	560	113	5	15	22	219	100	82	137	161	154	111

15 = only Sarmatian taxa used

App. 1 – part 3

		KA2 (1020-1025m) 3/1	KA2 (1020-1025m) 3/4	KA2 (1080-1085m) 4/3	KA2 (1140-1145m) 5/2	KA2 (1380-1385m) 9/3	MTW1 (1100-1105m) 3/5	MTW1 (1130-1138m) 4/7	MTW1 (1130-1138m) 4/2	MTW1 (1380-1385m) 9/1	MTW1 (1480-1485m) 12/4	MI1 (1052-1057m) 3/2	MI1 (1373.5-1377m) 7/4	MisU1 (1298-1302m) 1/2	MisU1 (1885-1894m) 3/1	MisU1 (1885-1894m) 3/4	P WU3 (1123-1128m) 1/1	P WU3 (1123-1128m) 1/3	PO1 (40-45m) 1/1	PO1 (99.5-105m) 3/1	PO1 (130-135m) 4/2	PO1 (160-165m) 5/2	PO1 (250-255m) 8/1
AGGLUTINATED FORAMINIFERA	*Ammodiscus miocenicus* Karrer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ammodiscus sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bathysiphon filiformis M. Sars	0	0	0	0	0	0	0	0	0	0	3	101	0	0	0	0	0	0	0	0	0	0
	Bathysiphon taurinensis Sacco	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cribrostomoides subglobosus (M. Sars)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cyclammina bradyi Cushman	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
	Cyclammina karpatica Cicha & Zapletalova	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Glomospira saturniformis Grzybowski	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haplophragmoides carinatus Cushman & Renz	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	Karreriella chilostoma (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Martinottiella communis (d'Orbigny)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Paravulvulina serrata (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pseudogaudryina mayeriana (d'Orbigny)	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Reticulophragmium karpaticum Cicha & Zapletalova	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Reticulphragmium sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
	Semivulvulina deperdita (d'Orbigny)	0	0	0	0	0	0	0	0	1	9	0	0	0	0	0	0	0	0	0	2	0	0
	Semivulvulina pectinata (Reuss)	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Siphotextularia concava (Karrer)	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
	Spirorutilus carinatus (d'Orbigny)	0	0	0	0	0	0	0	0	0	13	0	0	1	0	0	0	0	0	0	0	0	0
	Textularia gramen d'Orbigny	0	22	0	2	0	0	3	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0
	Textularia gramen maxima Cicha & Zapletalova	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Textularia laevigata d'Orbigny	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Textularia mariae d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Textularia pala Czjzek	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Trochamminoides contortus Mallory	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 2	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Agglutinated indet. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Agglutinated indet. 5	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MILIOLID FORAMINIFERA	*Adelosina longirostra* (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	0	0	2	0	0
	Adelosina schreibersi (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
	Borelis melo (Fichtel & Moll)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Borelis melo haueri (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cornuspira plicata (Czjzek)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cycloforina badenensis (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Cycloforina contorta (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0
	Cycloforina gracilis (Karrer)	0	0	2	0	0	0	0	0	3	0	0	0	0	0	0	0	43	0	0	0	0	0
	Cycloforina lucida (Karrer)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cycloforina nussdorfensis (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cycloforina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0
	Pseudotriloculina consobrina (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0	0	0
	Pyrgo simplex (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pyrgoella ventruosa (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina agglutinans d'Orbigny	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina akneriana d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	108	0	1
	Quinqueloculina boueana d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina buchiana d'Orbigny	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina haidingeri d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Quinqueloculina hauerina d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0
	Quinqueloculina seminulum Linné	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina triangularis d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina sp. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina sp. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina sp. 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina sp. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
	Sigmoilinita tenuis (Czjzek)	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sigmoilinita tschokrakensis Gerke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sigmoilopsis celata (Costa)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sigmoilopsis foeda (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sigmoilopsis schlumbergeri (Silvestri)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sigmoilopsis sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Spirolina austriaca d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0	0	0
	Spirolina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

MILIOLID FORAMINIFERA	*Spiroloculina canaliculata* d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Spiroloculina excavata d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Triloculina eggeri (Bogdanovich)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Triloculina gibba d'Orbigny	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	Triloculina inflata d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Triloculina scapha d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HYALINE FORAMINIFERA	*Ammonia pseudobeccarii* (Putrya)	2	0	0	0	0	0	6	2	25	0	0	0	0	0	1	0	2	4	2	0	3	2
	Ammonia tepida (Cushman)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	4	0	0
	Ammonia viennensis (d'Orbigny)	4	5	112	11	47	1	3	1	6	0	0	0	1	41	1	132	158	9	21	235	1	14
	Amphicoryna badenensis (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	0	0
	Amphicoryna hispida (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Amphicoryna ottnangensis (Toula)	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0
	Amphimorphina haueriana Neugeboren	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
	Amphistegina radiata (Fichtel & Moll)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Asterigerinata planorbis (d'Orbigny)	0	0	0	0	0	0	1	0	3	2	0	0	0	0	0	0	0	4	2	23	6	8
	Astrononion stelligerum (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Aubignyna sp. 1 (see Schütz et al. 2007)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Biapertorbis biaperturatus Pokorny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bitubulogenerina reticulata Cushman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bolivina dilatata Reuss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	2	1	25
	Bolivina hebes MacFadyen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	3	0
	Bolivina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
	Bulimina buchiana d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bulimina elongata d'Orbigny	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	8	7	6
	Bulimina elongata longa (Venglinskyi)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	1
	Bulimina striata d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	3	0	0
	Cancris auriculus (Fichtel & Moll)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Cassidulina laevigata d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	7
	Caucasina schischkinskayae (Samoylova)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Caucasina subulata(Cushman & Parker)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0
	Ceratocancris haueri (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cibicidoides austriacus (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	1	0
	Cibicidoides budayi (Cicha & Zapletalova)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cibicidoides lopjanicus (Myatlyuk)	0	0	0	0	0	0	41	4	44	9	0	0	0	0	0	0	0	0	0	0	0	0
	Cibicidoides pachyderma (Rzehak)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	2	0	0
	Cibicidoides ungerianus ungerianus (d'Orbigny)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	2	1	0
	Cibicidoides sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cibicidoides sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cibicidoides sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dentalina acuta d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dentalina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Discorbinoides sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidiella minuta (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0
	Elphidium aculeatum (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	Elphidium advenum (Cushman)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	1	0	0
	Elphidium angulatum (Egger)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium antoninum (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0	0	0
	Elphidium crispum (Linné)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	3	0	1
	Elphidium fichtelianum (d'Orbigny)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	16	17	1
	Elphidium flexuosum (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium grilli Papp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0
	Elphidium hauerinum (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	54	0
	Elphidium josephinum (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium karpaticum Myatlyuk	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium koberi Tollmann	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium listeri (d'Orbigny)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	55	0
	Elphidium macellum (Fichtel & Moll)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	324	0
	Elphidium obtusum (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	59	0
	Elphidium ortenburgense (Egger)	0	0	0	0	0	0	9	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium reussi Marks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	45	0
	Elphidium rugosum (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
	Elphidium subtypicum Papp	0	0	0	0	0	0	11	0	4	10	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium ungeri (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium sp. (see Cicha et al. 1998)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0
	Elphidium sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium sp. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0

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Elphidium sp. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Elphidium sp. 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eponides repandus (Fichtel & Moll)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Escornebovina ? trochiformis (Andreae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Favulina geometrica (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Favulina hexagona (Williamson)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Fissurina laevigata Reuss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fissurina marginata (Montagu)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fontbotia wuellerstorfi (Schwager)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fursenkoina acuta (d'Orbigny)	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	3	1	0
Glabratella sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Glandulina ovula d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globulina gibba d'Orbigny	0	6	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	1	1	0
Globulina punctata d'Orbigny	0	0	0	1	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Globulina striata (Egger)	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Globulina sp. 1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Grigelis pyrula (d'Orbigny)	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0
Guttulina austriaca d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Guttulina communis (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hansenisca soldanii (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
Heterolepa dutemplei (d'Orbigny)	22	42	0	0	0	0	3	2	7	32	0	0	0	0	0	0	0	15	0	36	2	1
Hoeglundina elegans (d'Orbigny)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Hyalinonetrion clavatum (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laevidentalina boueana (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0
Laevidentalina communis (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laevidentalina elegans (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	0	0
Laevidentalina inornata (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laevidentalina scripta (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laevidentalina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagena gracilicosta Reuss	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Lagena haidingeri (Czjzek)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagena striata (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagena sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagena sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina americana (Cushman)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina austriaca (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
Lenticulina cultrata (de Montfort)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina inornata (d'Orbigny)	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	4	0	0	0	0	0
Lenticulina melvilli (Cushman & Renz)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina orbicularis (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0
Lenticulina spinosa (Cushman)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina vortex (Fichtel & Moll)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina sp. 1	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lobatula lobatula (Walker & Jacob)	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	45	0	6	0	3
Marginulina hirsuta (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melonis affinis (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melonis pompilioides (Fichtel & Moll)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	8	1	0
Myllostomella recta (Palmer & Bermúdez)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
Neoeponides schreibersi (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Neugeborina irregularis (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	2	1	1
Neugeborina longiscata (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
Nodosaria sp. 1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Nodosaria sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nodosaria sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nonion bogdanowiczi Voloshinova	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nonion commune (d'Orbigny)	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	1	4	2	5	8	1
Nonion tumidulus Pishvanova	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nonionella turgida (Williamson)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nonionoides karaganicus (Krasheninnikov)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orthomorphina columella (Karrer)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Pappina breviformis (Papp & Turnovsky)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pappina parkeri (Karrer)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Pappina primiformis (Papp & Turnovsky)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Parafissurina carinata (Buchner)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pararotalia aculeata (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pararotalia rimosa ? (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Planularia kubinyi (Hantken)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plectofrondicularia digitalis (Neugeboren)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plectofrondicularia raricosta (Karrer)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

HYALINE FORAMINIFERA

Plectofrondicularia striata (Hantken)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Porosononion granosum (d'Orbigny)	7	4	0	0	0	0	0	2	0	0	0	0	0	0	9	0	0	1	3	120	383	17
Praeglobobulimina pupoides (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Praeglobobulimina pyrula (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	8	2	0
Pseudonodosaria brevis (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pullenia bulloides (d'Orbigny)	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0
Pullenia quinqueloba (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmaeoseistron hispidum (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Reussella spinulosa (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schackoinella imperatoria (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Siphonina reticulata (Czjzek)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Siphonodosaria consobrina (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaeroidina bulloides d'Orbigny	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
Stilostomella adolphina (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
Uvigerina aculeata d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Uvigerina acuminata Hosius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Uvigerina graciliformis Papp & Turnovsky	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina gracilis Reuss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina grilli Schmid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina macrocarinata Papp & Turnovsky	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	8	0	0
Uvigerina mantaensis Cushman & Edwards	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina pygmoides Papp & Turnovsky	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina semiornata d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Uvigerina venusta Franzenau	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uvigerina sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Vaginulinopsis hauerina (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Valvulineria complanata (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	12	0	0
Virgulopsis tuberculatus (Egger)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina bulloides d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	2	24	14	11
Globigerina concinna Reuss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina diplostoma Reuss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0
Globigerina falconensis Blow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Globigerina ottnangensis Rögl	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina praebulloides Blow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina tarchanensis Subbotina & Chutzieva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Globigerina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerina sp. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Globigerina sp. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerinella obesa (Bolli)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerinella regularis (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerinoides bisphericus Todd	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globigerinoides quadrilobatus (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	1	18	3	0
Globigerinoides trilobus (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globoquadrina cf. *altispira* (Cushman & Jarvis)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Globorotalia bykovae Aisenstat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	2	4	0	2
Globorotalia peripheroronda Blow & Banner	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globorotalia transsylvanica Popescu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	130	4	4	9	18
Globoturborotalita woodi (Jenkins)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orbulina suturalis Brönnimann	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	1	0
Paragloborotalia ? mayeri (Cushman & Ellisor)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Turborotalita quinqueloba (Natland)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Hyaline indet. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 14	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0
Hyaline indet. 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Hyaline indet. 16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyaline indet. 19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	40	102	114	16	47	1	97	17	122	90	3	108	2	63	14	134	257	343	126	773	1041	122

15 = only Sarmatian taxa used

App. 1 – part 4

Group	Species	PO1 (280-285m) 9/1	PO1 (430-435m) 14/3	PO1 (460-465m) 15/1	PO1 (490-495m) 16/1	PO1 (520-525m) 17/2	SI3 (400-405m) 2/2	SI3 (500-505m) 3/1	SI3 (600-604m) 4/2	SI3 (800-805m) 6/3	SI3 (900-906m) 7/3	SI3 (1000-1003m) 8/2	SI3 (1250-1255m) 11/1	SI3 (1335-1340m) 12/1	SI3 (1485-1490m) 15/2	SI3 (1716-1720.3m) 21/1	WA1 (200-205m) 1/1	WA1 (300-305m) 3/1	WA1 (350-353m) 4/2	WA1 (400-403m) 5/1	WA1 (450-455m) 6/2	WA1 (500-505m) 7/4	WA1 (640-641.5m) 11/2
AGGLUTINATED FORAMINIFERA	*Ammodiscus miocenicus* Karrer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ammodiscus sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Bathysiphon filiformis M. Sars	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bathysiphon taurinensis Sacco	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	35
	Cribrostomoides subglobosus (M. Sars)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cyclammina bradyi Cushman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cyclammina karpatica Cicha & Zapletalova	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Glomospira saturniformis Grzybowski	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
	Haplophragmoides carinatus Cushman & Renz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Karreriella chilostoma (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Martinottiella communis (d'Orbigny)	0	0	0	0	0	0	0	0	0	5	6	0	0	0	0	0	0	0	0	0	0	0
	Paravulvulina serrata (Reuss)	0	0	0	0	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pseudogaudryina mayeriana (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Reticulophragmium karpaticum Cicha & Zapletalova	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Reticulphragmium sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Semivulvulina deperdita (d'Orbigny)	0	0	0	0	26	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
	Semivulvulina pectinata (Reuss)	0	0	0	0	9	0	0	0	0	3	41	0	0	0	0	0	0	0	0	0	2	0
	Siphotextularia concava (Karrer)	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
	Spirorutilus carinatus (d'Orbigny)	0	0	0	0	0	0	0	0	0	26	22	0	0	0	0	0	0	0	0	0	0	0
	Textularia gramen d'Orbigny	0	0	0	1	11	1	0	0	0	10	14	0	1	0	0	0	0	0	4	0	0	0
	Textularia gramen maxima Cicha & Zapletalova	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Textularia laevigata d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Textularia mariae d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	Textularia pala Czjzek	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Trochamminoides contortus Mallory	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
	Agglutinated indet. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Agglutinated indet. 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Agglutinated indet. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
	Agglutinated indet. 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
	Agglutinated indet. 9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MILIOLID FORAMINIFERA	*Adelosina longirostra* (d'Orbigny)	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	Adelosina schreibersi (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Borelis melo (Fichtel & Moll)	0	0	0	0	35	0	0	0	26	0	0	0	0	0	0	0	0	0	0	0	0	0
	Borelis melo haueri (d'Orbigny)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cornuspira plicata (Czjzek)	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cycloforina badenensis (d'Orbigny)	0	0	0	0	20	0	0	0	2	0	0	0	0	0	0	0	0	0	9	0	0	0
	Cycloforina contorta (d'Orbigny)	0	0	0	1	37	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	0
	Cycloforina gracilis (Karrer)	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0
	Cycloforina lucida (Karrer)	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cycloforina nussdorfensis (d'Orbigny)	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cycloforina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pseudotriloculina consobrina (d'Orbigny)	0	0	0	0	5	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Pyrgo simplex (d'Orbigny)	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pyrgoella ventruosa (Reuss)	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina agglutinans d'Orbigny	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina akneriana d'Orbigny	0	0	0	6	42	0	0	18	0	0	1	0	1	0	0	0	0	0	6	0	0	0
	Quinqueloculina boueana d'Orbigny	0	0	0	2	16	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina buchiana d'Orbigny	0	0	0	12	41	0	0	0	0	0	33	0	0	0	0	0	0	0	20	0	0	0
	Quinqueloculina haidingeri d'Orbigny	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	Quinqueloculina hauerina d'Orbigny	0	0	0	1	4	10	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina seminulum Linné	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0
	Quinqueloculina triangularis d'Orbigny	0	0	8	0	14	0	0	0	2	0	0	0	0	0	0	1	0	0	15	5	0	0
	Quinqueloculina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina sp. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Quinqueloculina sp. 5	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina sp. 6	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
	Quinqueloculina sp. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sigmoilinita tenuis (Czjzek)	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	2	0	0	0
	Sigmoilinita tschokrakensis Gerke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sigmoilopsis celata (Costa)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sigmoilopsis foeda (Reuss)	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0

MILIOLID FORAMINIFERA	*Sigmoilopsis schlumbergeri* (Silvestri)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sigmoilopsis sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Spirolina austriaca d'Orbigny	1	0	0	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Spirolina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Spiroloculina canaliculata d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
	Spiroloculina excavata d'Orbigny	0	0	0	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Triloculina eggeri (Bogdanovich)	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Triloculina gibba d'Orbigny	0	0	0	0	10	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
	Triloculina inflata d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4	0	0	0
	Triloculina scapha d'Orbigny	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	0	0	0
	Miliolidae indet. 6	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Miliolidae indet. 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miliolidae indet. 9	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HYALINE FORAMINIFERA	*Ammonia pseudobeccarii* (Putrya)	0	0	247	0	39	8	11	2	11	1	1	0	1	0	0	15	5	1	12	0	0	0
	Ammonia tepida (Cushman)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ammonia viennensis (d'Orbigny)	9	0	11	44	76	6	51	2	29	2	2	490	9	1	0	11	0	0	78	4	0	0
	Amphicoryna badenensis (d'Orbigny)	0	0	1	0	0	3	6	0	0	21	6	0	0	0	0	0	0	0	0	1	0	0
	Amphicoryna hispida (d'Orbigny)	0	0	0	0	0	1	2	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
	Amphicoryna ottnangensis (Toula)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Amphimorphina haueriana Neugeboren	0	0	0	0	0	0	0	0	0	7	12	0	0	0	0	0	0	0	0	0	0	0
	Amphistegina radiata (Fichtel & Moll)	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Asterigerinata planorbis (d'Orbigny)	2	0	0	0	152	7	2	0	0	4	0	0	0	0	0	0	1	0	0	0	0	0
	Astrononion stelligerum (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Aubignyna sp. 1 (see Schütz et al. 2007)	0	0	3	4	0	0	0	0	0	0	0	0	0	0	0	108	392	0	0	0	0	0
	Biapertorbis biaperturatus Pokorny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bitubulogenerina reticulata Cushman	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	Bolivina dilatata Reuss	0	0	0	0	2	3	7	0	0	23	12	1	0	0	0	0	0	0	3	0	0	0
	Bolivina hebes MacFadyen	0	0	0	0	0	1	0	0	0	20	9	0	0	0	0	0	0	0	0	0	0	0
	Bolivina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bulimina buchiana d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bulimina elongata d'Orbigny	0	0	1	1	3	37	38	127	0	82	32	2	0	0	0	0	2	0	93	0	0	0
	Bulimina elongata longa (Venglinskyi)	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bulimina striata d'Orbigny	0	0	0	0	0	12	3	0	0	3	13	0	0	0	0	0	0	0	0	0	0	0
	Cancris auriculus (Fichtel & Moll)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cassidulina laevigata d'Orbigny	0	0	0	0	9	7	2	0	0	32	59	1	0	0	0	0	0	0	0	0	0	0
	Caucasina schischkinskayae (Samoylova)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
	Caucasina subulata(Cushman & Parker)	0	0	0	0	3	6	5	0	0	127	20	0	0	0	0	0	0	0	0	0	0	0
	Ceratocancris haueri (d'Orbigny)	0	0	0	0	0	0	0	0	0	23	63	0	0	0	0	0	0	0	0	0	4	0
	Cibicidoides austriacus (d'Orbigny)	0	0	0	0	129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cibicidoides budayi (Cicha & Zapletalova)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cibicidoides lopjanicus (Myatlyuk)	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	1	0
	Cibicidoides pachyderma (Rzehak)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cibicidoides ungerianus ungerianus (d'Orbigny)	0	0	0	0	27	1	0	0	0	1	10	0	0	0	0	0	0	0	0	2	0	0
	Cibicidoides sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cibicidoides sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cibicidoides sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	0
	Dentalina acuta d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dentalina sp. 1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Discorbinoides sp. 1	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidiella minuta (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium aculeatum (d'Orbigny)	0	0	1	0	0	0	5	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Elphidium advenum (Cushman)	0	0	4	0	16	0	7	3	0	0	0	0	0	0	0	0	0	0	0	3	0	0
	Elphidium angulatum (Egger)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium antoninum (d'Orbigny)	2	0	0	0	0	7	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium crispum (Linné)	4	2	0	0	37	1	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium fichtelianum (d'Orbigny)	0	0	0	0	38	3	4	0	0	0	0	0	2	0	0	0	0	0	0	0	7	0
	Elphidium flexuosum (d'Orbigny)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium grilli Papp	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	144	142	0	0	0	0	0
	Elphidium hauerinum (d'Orbigny)	0	0	0	0	1	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium josephinum (d'Orbigny)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium karpaticum Myatlyuk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium koberi Tollmann	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Elphidium listeri (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium macellum (Fichtel & Moll)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium obtusum (d'Orbigny)	4	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium ortenburgense (Egger)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Elphidium reussi Marks	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	41	0	2	2	0	0
	Elphidium rugosum (d'Orbigny)	0	0	0	0	0	1	0	0	5	0	0	0	0	0	0	1	0	0	0	0	0	0
	Elphidium subtypicum Papp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium ungeri (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium sp. (see Cicha et al. 1998)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elphidium sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Elphidium sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
Elphidium sp. 7	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 8	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 9	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 10	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elphidium sp. 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eponides repandus (Fichtel & Moll)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Escornebovina ? trochiformis (Andreae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Favulina geometrica (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Favulina hexagona (Williamson)	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fissurina laevigata Reuss	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0
Fissurina marginata (Montagu)	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fontbotia wuellerstorfi (Schwager)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fursenkoina acuta (d'Orbigny)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0
Glabratella sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glandulina ovula d'Orbigny	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
Globulina gibba d'Orbigny	0	0	0	0	2	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Globulina punctata d'Orbigny	0	0	0	0	14	0	0	0	0	0	0	1	5	0	0	0	0	0	0	0	0	0
Globulina striata (Egger)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Globulina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grigelis pyrula (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Guttulina austriaca d'Orbigny	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Guttulina communis (d'Orbigny)	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hansenisca soldanii (d'Orbigny)	0	0	0	0	3	3	3	1	0	9	27	0	1	0	0	0	0	0	1	0	0	0
Heterolepa dutemplei (d'Orbigny)	0	0	2	0	28	5	28	0	0	67	126	0	0	0	0	0	0	0	6	1	32	0
Hoeglundina elegans (d'Orbigny)	0	0	0	0	0	1	0	0	0	15	58	0	0	0	0	0	0	0	1	0	0	0
Hyalinonetrion clavatum (d'Orbigny)	0	0	0	0	0	1	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0
Laevidentalina boueana (d'Orbigny)	0	0	0	0	0	0	0	0	0	7	19	0	0	0	0	0	0	0	0	0	0	0
Laevidentalina communis (d'Orbigny)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laevidentalina elegans (d'Orbigny)	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laevidentalina inornata (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laevidentalina scripta (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0
Laevidentalina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagena gracilicosta Reuss	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagena haidingeri (Czjzek)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagena striata (d'Orbigny)	0	0	0	0	0	1	2	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0
Lagena sp. 1	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagena sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina americana (Cushman)	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina austriaca (d'Orbigny)	0	0	0	0	1	0	0	0	0	4	1	0	0	0	0	0	0	0	0	8	0	0
Lenticulina cultrata (de Montfort)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3	0	0	0
Lenticulina inornata (d'Orbigny)	0	0	0	0	3	0	0	0	0	2	0	0	0	0	0	0	0	0	0	8	59	0
Lenticulina melvilli (Cushman & Renz)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina orbicularis (d'Orbigny)	0	0	0	0	0	0	0	0	0	11	3	0	0	0	0	0	0	0	0	0	0	0
Lenticulina spinosa (Cushman)	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
Lenticulina vortex (Fichtel & Moll)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Lenticulina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina sp. 2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Lenticulina sp. 3	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Lobatula lobatula (Walker & Jacob)	1	0	1	0	24	19	5	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Marginulina hirsuta (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melonis affinis (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melonis pompilioides (Fichtel & Moll)	0	0	0	0	10	0	3	1	0	45	30	0	0	0	0	0	0	0	5	0	2	0
Myllostomella recta (Palmer & Bermúdez)	0	0	0	0	0	1	1	0	0	5	44	0	0	0	0	0	0	0	0	0	0	0
Neoeponides schreibersi (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Neugeborina irregularis (d'Orbigny)	0	0	0	0	1	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0
Neugeborina longiscata (d'Orbigny)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nodosaria sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nodosaria sp. 2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nodosaria sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nonion bogdanowiczi Voloshinova	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nonion commune (d'Orbigny)	1	0	1	6	18	8	30	4	0	47	109	3	0	0	0	0	0	3	46	3	0	0
Nonion tumidulus Pishvanova	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nonionella turgida (Williamson)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nonionoides karaganicus (Krasheninnikov)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orthomorphina columella (Karrer)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pappina breviformis (Papp & Turnovsky)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pappina parkeri (Karrer)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Pappina primiformis (Papp & Turnovsky)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parafissurina carinata (Buchner)	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Pararotalia aculeata (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pararotalia rimosa ? (Reuss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Planularia kubinyi (Hantken)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plectofrondicularia digitalis (Neugeboren)	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0
Plectofrondicularia raricosta (Karrer)	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0

HYALINE FORAMINIFERA	*Plectofrondicularia striata* (Hantken)	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
	Porosononion granosum (d'Orbigny)	6	0	2	29	94	14	29	2	0	0	2	0	0	0	0	140	44	1	78	1	0	0
	Praeglobobulimina pupoides (d'Orbigny)	0	0	0	0	0	0	13	0	0	0	29	0	0	0	0	0	0	0	20	0	0	0
	Praeglobobulimina pyrula (d'Orbigny)	0	0	0	0	0	2	5	0	0	2	18	0	1	0	0	0	0	0	0	0	0	0
	Pseudonodosaria brevis (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Pullenia bulloides (d'Orbigny)	0	0	1	0	1	5	12	2	0	51	94	0	0	0	0	0	1	0	0	0	0	0
	Pullenia quinqueloba (Reuss)	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pygmaeoseistron hispidum (Reuss)	0	0	0	0	0	2	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
	Reussella spinulosa (Reuss)	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	Schackoinella imperatoria (d'Orbigny)	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Siphonina reticulata (Czjzek)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Siphonodosaria consobrina (d'Orbigny)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Sphaeroidina bulloides d'Orbigny	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
	Stilostomella adolphina (d'Orbigny)	0	0	0	0	0	4	2	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0
	Uvigerina aculeata d'Orbigny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Uvigerina acuminata Hosius	0	0	0	0	0	2	4	0	0	46	0	0	0	0	0	0	0	0	0	0	0	0
	Uvigerina graciliformis Papp & Turnovsky	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Uvigerina gracilis Reuss	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Uvigerina grilli Schmid	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0
	Uvigerina macrocarinata Papp & Turnovsky	0	0	0	0	0	0	1	0	0	38	13	0	0	0	0	0	0	0	0	0	0	0
	Uvigerina mantaensis Cushman & Edwards	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Uvigerina pygmoides Papp & Turnovsky	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
	Uvigerina semiornata d'Orbigny	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
	Uvigerina venusta Franzenau	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0
	Uvigerina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Uvigerina sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vaginulinopsis hauerina (d'Orbigny)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Valvulineria complanata (d'Orbigny)	0	0	0	0	4	9	18	0	0	22	25	0	0	0	0	0	0	0	139	0	0	0
	Virgulopsis tuberculatus (Egger)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Globigerina bulloides d'Orbigny	1	0	0	8	2	93	32	1	0	105	37	0	0	0	0	1	4	0	0	2	0	0
	Globigerina concinna Reuss	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0
	Globigerina diplostoma Reuss	0	0	0	0	1	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
	Globigerina falconensis Blow	0	0	0	0	0	9	3	0	0	4	0	1	0	0	0	0	0	0	0	0	0	0
	Globigerina ottnangensis Rögl	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0
	Globigerina praebulloides Blow	0	0	0	0	0	0	13	0	0	8	1	9	0	0	0	0	2	0	0	0	2	0
	Globigerina tarchanensis Subbotina & Chutzieva	0	0	1	0	0	20	0	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0
	Globigerina sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Globigerina sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Globigerina sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Globigerina sp. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Globigerina sp. 5	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Globigerinella obesa (Bolli)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Globigerinella regularis (d'Orbigny)	0	0	0	2	0	2	6	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
	Globigerinoides bisphericus Todd	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
	Globigerinoides quadrilobatus (d'Orbigny)	0	0	0	0	0	0	1	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0
	Globigerinoides trilobus (Reuss)	0	0	0	0	13	4	0	0	0	1	12	0	1	0	0	0	0	0	0	0	0	0
	Globoquadrina cf. *altispira* (Cushman & Jarvis)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Globorotalia bykovae Aisenstat	1	0	0	7	4	28	2	0	0	412	84	0	0	0	0	0	0	0	0	0	0	0
	Globorotalia peripheroronda Blow & Banner	1	0	0	0	0	90	0	0	0	27	5	0	0	0	0	0	0	0	0	0	0	0
	Globorotalia transsylvanica Popescu	0	0	0	0	0	97	73	1	0	11	6	2	0	0	0	0	0	0	0	0	0	0
	Globoturborotalita woodi (Jenkins)	0	0	0	0	0	0	1	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
	Orbulina suturalis Brönnimann	0	0	0	0	0	0	3	0	0	9	0	0	0	0	0	0	0	0	1	0	0	0
	Paragloborotalia ? mayeri (Cushman & Ellisor)	0	0	1	4	0	0	14	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0
	Turborotalita quinqueloba (Natland)	0	0	0	0	0	0	0	0	0	0	79	0	0	0	0	0	0	0	0	0	0	0
	Hyaline indet. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyaline indet. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	Hyaline indet. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Hyaline indet. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Hyaline indet. 5	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyaline indet. 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyaline indet. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyaline indet. 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyaline indet. 9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyaline indet. 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyaline indet. 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyaline indet. 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyaline indet. 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyaline indet. 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyaline indet. 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyaline indet. 16	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyaline indet. 17	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyaline indet. 18	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
	Hyaline indet. 19	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0
	Total	41	2	286	129	1224	566	475	168	99	1477	1233	519	24	3	8	423	640	12	659	45	115	85

15 = only Sarmatian taxa used

App. 2 – part 1

Section	Parameter	AH1 (100-105m) 4/1	AH1 (130-135m) 5/1	AH1 (160-165m) 6/2	AH1 (190-195m) 7/4	AH1 (220-225m) 8/2	AH1 (250-255m) 9/4	AH1 (280-285m) 10/2	AH1 (310-315m) 11/1	AH1 (370-375m) 13/3	AH1 (430-435m) 15/3	AH1 (460-465m) 16/1	AH1 (520-523m) 18/3	AH1 (610-615m) 21/2	GI1 (1050-1055m) 17/1	GI2 (1084-1086.7m) 10/2	HRD19 (400-405m) 1/2	HRD19 (495-500m) 2/1	HRD19 (571-576m) 3/1	HRD19 (590-595m) 4/1	HRD19 (630-635m) 6/1	HRD19 (650-656m) 7/1	HRD19 (819-820m) 12/1
Test composition + B F vs. P F (total count + in %)	Agglutinated tests (total)	0	1	1	12	3	3	1	2	52	115	4	25	24	260	18	0	4	3	10	9	2	0
	Miliolid tests (total)	2	5	0	137	97	1	8	0	5	13	0	1	5	3	0	2	3	3	31	19	4	1
	Hyaline tests (total)	334	432	600	361	480	17	269	181	117	176	1	49	45	3	21	3	143	3	270	592	31	78
	Benthic Foraminifera (total)	316	221	556	508	562	21	201	116	161	295	5	72	68	266	39	5	148	9	311	617	37	79
	Planktonic Foraminifera (total)	0	0	0	2	18	0	77	67	13	9	0	3	6	0	0	0	2	0	0	3	0	0
	Agglutinated tests (%)	0	0	0	2	1	14	0	1	30	38	80	33	32	98	46	0	3	33	3	1	5	0
	Miliolid tests (%)	1	1	0	27	17	5	3	0	3	4	0	1	7	1	0	40	2	33	10	3	11	1
	Hyaline tests (%)	99	99	100	71	83	81	97	99	67	58	20	65	61	1	54	60	95	33	87	95	84	99
	Benthic Foraminifera (%)	100	100	100	100	97	100	72	63	93	97	100	96	92	100	100	100	99	100	100	100	100	100
	Planktonic Foraminifera (%)	0	0	0	0	3	0	28	37	7	3	0	4	8	0	0	0	1	0	0	0	0	0
Diversity Indices	Number of Taxa	10	10	5	37	44	11	48	40	26	34	2	15	18	6	7	3	15	5	22	22	10	8
	Fisher Alpha Index	2,0	2,7	0,8	9,2	11,1	9,3	16,7	15,8	8,5	9,8	1,2	5,6	7,6	1,1	2,5	3,2	4,1	4,6	5,4	4,5	4,5	2,2
	Equitability J	0,53	0,82	0,63	0,68	0,81	0,85	0,82	0,79	0,75	0,68	0,72	0,86	0,82	0,66	0,72	0,96	0,37	0,95	0,58	0,54	0,74	0,64
	Dominance D	0,38	0,19	0,42	0,16	0,07	0,19	0,07	0,10	0,15	0,18	0,68	0,12	0,15	0,36	0,31	0,36	0,62	0,23	0,25	0,29	0,26	0,36
Palaeoecological Parameters (total count + in %)	Epifaunal (total)	11	78	49	300	195	12	104	73	69	113	1	27	32	3	22	2	13	9	109	68	23	13
	Epifaunal to Shallow Infaunal (total)	264	11	252	172	96	1	16	0	73	137	4	20	28	221	16	2	4	0	6	1	2	59
	Infaunal (total)	28	16	0	12	119	6	64	34	16	30	0	21	1	11	0	1	131	0	192	481	9	0
	Deep infaunal (total)	0	0	0	0	25	0	4	3	1	2	0	1	4	0	0	0	0	0	1	66	0	0
	Inner neritic taxa (total)	289	27	252	195	100	2	24	0	32	46	0	15	4	0	0	4	4	1	6	1	2	59
	IN-MN (total)	4	54	257	27	111	0	22	4	18	38	0	13	7	0	0	0	0	0	2	0	1	6
	IN-ON (total)	10	25	16	195	87	0	44	2	42	71	1	15	23	0	2	0	3	2	26	9	1	2
	MN-ON (total)	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Inner neritic-bathyal taxa (total)	0	0	0	17	44	5	41	15	7	5	0	4	3	119	15	0	123	0	69	289	0	0
	Middle neritic-bathyal taxa (total)	3	0	0	7	126	11	57	83	9	16	0	0	4	3	5	1	17	3	199	305	30	11
	Outer neritic-bathyal taxa (total)	0	0	0	1	14	0	2	6	0	4	0	0	1	3	0	0	0	3	1	12	0	0
	Bathyal taxa (total)	0	0	0	0	0	0	0	1	0	0	0	13	0	8	0	0	0	0	0	0	0	0
	Oxic Indicators (total)	23	83	49	184	102	5	95	26	72	116	1	33	26	3	17	0	10	0	10	22	1	3
	Oxic/Suboxic Indicators (total)	264	11	252	229	141	1	19	0	25	34	0	9	9	0	0	2	6	2	30	5	3	60
	Suboxic Indicators (total)	3	0	0	5	98	11	44	73	7	9	0	0	2	0	5	1	15	3	197	286	29	10
	Suboxic/Dysoxic Indicators (total)	0	0	0	3	29	2	22	6	1	4	0	1	0	3	0	0	117	0	64	223	0	0
	Dysoxic Indicators (total)	0	0	0	0	25	0	4	3	1	2	0	1	4	0	0	0	0	0	1	66	0	0
	High nutrient-flux Indicators (total)	0	0	0	1	22	1	17	20	1	7	0	0	3	0	0	0	117	0	64	9	0	0
	Stress Indicators (total)	0	0	0	1	45	1	21	21	1	5	0	2	4	0	0	0	117	0	65	287	0	0
	Epifaunal (%)	4	74	9	59	34	57	37	40	40	37	20	36	43	1	56	40	9	100	35	11	62	16
	Epifaunal to Shallow Infaunal (%)	86	10	48	34	17	5	6	0	42	45	80	27	38	83	41	40	3	0	2	0	5	75
	Infaunal (%)	9	15	0	2	21	29	23	19	9	10	0	28	1	4	0	20	87	0	62	78	24	0
	Deep infaunal (%)	0	0	0	0	4	0	1	2	1	1	0	1	5	0	0	0	0	0	0	11	0	0
	Inner neritic taxa (%)	94	25	48	38	17	10	9	0	18	15	0	20	5	0	0	80	3	11	2	0	5	75
	IN-MN (%)	1	51	49	5	19	0	8	2	10	13	0	17	9	0	0	0	0	0	1	0	3	8
	IN-ON (%)	3	24	3	38	15	0	16	1	24	23	20	20	31	0	5	0	2	22	8	1	3	3
	MN-ON (%)	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Inner neritic-bathyal taxa (%)	0	0	0	3	8	24	15	8	4	2	0	5	4	45	38	0	82	0	22	47	0	0
	Middle neritic-bathyal taxa (%)	1	0	0	1	22	52	21	45	5	5	0	0	5	1	13	20	11	33	64	49	81	14
	Outer neritic-bathyal taxa (%)	0	0	0	0	2	0	1	3	0	1	0	0	1	1	0	0	0	33	0	2	0	0
	Bathyal taxa (%)	0	0	0	0	0	0	0	1	0	0	0	17	0	3	0	0	0	0	0	0	0	0
	Oxic Indicators (%)	8	78	9	36	18	24	34	14	41	38	20	44	35	1	44	0	7	0	3	4	3	4
	Oxic/Suboxic Indicators (%)	86	10	48	45	24	5	7	0	14	11	0	12	12	0	0	40	4	22	10	1	8	76
	Suboxic Indicators (%)	1	0	0	1	17	52	16	40	4	3	0	0	3	0	13	20	10	33	63	46	78	13
	Suboxic/Dysoxic Indicators (%)	0	0	0	1	5	10	8	3	1	1	0	1	0	1	0	0	78	0	21	36	0	0
	Dysoxic Indicators (%)	0	0	0	0	4	0	1	2	1	1	0	1	5	0	0	0	0	0	0	11	0	0
	High nutrient-flux Indicators (%)	0	0	0	0	4	5	6	11	1	2	0	0	4	0	0	0	78	0	21	1	0	0
	Stress Indicators (%)	0	0	0	0	8	5	8	11	1	2	0	3	5	0	0	0	78	0	21	46	0	0
	15 = only Sarmatian taxa used																						
P/B ratio (Murray, 1976, 1991)	P/B ratio (%)	0	0	0	0	3	0	28	37	7	3	0	4	8	0	0	0	1	0	0	0	0	0
	indicated environment	IN	IN	IN	IN	IN	IN	MN	MN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN
adv. P/B ratio (van der Zwaan, 1990)	Bi (number of infaunal species)	28	16	0	12	119	6	64	34	16	30	0	21	1	11	0	1	131	0	192	481	9	0
	Pc (corrected P/B ratio; %)	0	0	0	0	4	0	36	45	8	3	0	6	8	0	0	0	11	0	0	2	0	0
	advanced P/B ratio (m)	36	36	36	37	41	36	129	177	48	41	36	44	48	36	36	36	52	36	36	39	36	36
	indicated environment	IN	IN	IN	IN	IN	IN	ON	ON	IN	IN	IN	IN	IN	IN	IN	IN	MN	IN	IN	IN	IN	IN

	App. 2 – part 2	HRD24 (256-260.5m) 2/1	HRD24 (390-395m) 3/1	HRD24 (550-555m) 5/1	HRD24 (620-624m) 6/1	HRD24 (641-645m) 7/1	HRD24 (775-779.5m) 9/1	HRD25 (290-298m) 1/1	HRD25 (310-315m) 2/1	HRD25 (490-495m) 4/1	HRD25 (550-557m) 5/1	HRD25 (645-650m) 7/1	HRD25 (665-670m) 8/1	HRD25 (685-690m) 9/1	HRD25 (740-745m) 10/1	KA1 (450-455.5m) 7/4	KA1 (500-506m) 8/1	KA1 (550-555m) 9/2	KA1 (600-604m) 10/4	KA1 (701-705m) 12/2	KA1 (750-755m) 13/1	KA1 (795-800m) 14/2	KA1 (895-900m) 15/2
Test composition + B F vs. P F (total count + in %)	**Agglutinated tests (total)**	0	0	26	6	0	0	117	6	9	38	2	0	0	1	0	0	0	0	0	0	0	0
	Miliolid tests (total)	1	3	47	9	10	80	89	21	30	55	13	11	0	0	0	0	1	0	0	1	0	1
	Hyaline tests (total)	1	1	234	168	23	169	888	58	99	228	545	102	5	14	22	219	99	82	137	160	154	110
	Benthic Foraminifera (total)	2	4	275	183	33	248	1000	79	138	321	560	113	5	13	22	219	100	76	135	161	154	111
	Planktonic Foraminifera (total)	0	0	32	0	0	1	94	6	0	0	0	0	0	2	0	0	0	6	2	0	0	0
	Agglutinated tests (%)	0	0	8	3	0	0	11	7	7	12	0	0	0	7	0	0	0	0	0	0	0	0
	Miliolid tests (%)	50	75	15	5	30	32	8	25	22	17	2	10	0	0	0	0	1	0	0	1	0	1
	Hyaline tests (%)	50	25	76	92	70	68	81	68	72	71	97	90	100	93	100	100	99	100	100	99	100	99
	Benthic Foraminifera (%)	100	100	90	100	100	100	91	93	100	100	100	100	100	87	100	100	100	93	99	100	100	100
	Planktonic Foraminifera (%)	0	0	10	0	0	0	9	7	0	0	0	0	0	13	0	0	0	7	1	0	0	0
Diversity Indices	**Number of Taxa**	2	3	21	22	10	10	47	22	18	20	18	6	4	3	3	5	5	9	5	6	2	7
	Fisher Alpha Index	0,0	5,5	5,1	6,5	4,9	2,1	10,0	9,6	5,5	4,7	3,6	1,4	9,3	1,1	0,9	0,9	1,1	2,6	1,0	1,2	0,3	1,7
	Equitability J	1,00	0,95	0,76	0,74	0,83	0,44	0,74	0,88	0,75	0,62	0,49	0,49	0,96	0,57	0,44	0,17	0,42	0,50	0,31	0,11	0,42	0,26
	Dominance D	0,50	0,38	0,16	0,18	0,21	0,47	0,10	0,09	0,18	0,29	0,33	0,59	0,28	0,66	0,76	0,89	0,62	0,49	0,75	0,94	0,85	0,80
Palaeoecological Parameters (total count + in %)	**Epifaunal (total)**	2	4	93	39	23	85	267	30	124	285	254	15	4	13	3	2	2	3	1	4	0	4
	Epifaunal to Shallow Infaunal (total)	0	0	0	30	5	151	152	4	1	19	248	98	0	0	19	216	97	70	133	157	154	99
	Infaunal (total)	0	0	176	106	1	10	393	16	13	16	28	0	1	0	0	0	0	2	0	0	0	2
	Deep infaunal (total)	0	0	1	3	0	0	20	17	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	Inner neritic taxa (total)	0	2	0	30	10	151	151	4	1	19	248	98	0	0	19	216	97	70	133	156	154	99
	IN-MN (total)	0	1	0	1	3	0	137	3	4	5	37	0	1	0	2	1	1	0	1	0	0	6
	IN-ON (total)	2	0	39	0	13	2	38	11	34	38	4	5	2	0	1	1	1	1	1	3	0	2
	MN-ON (total)	0	0	0	0	0	0	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Inner neritic-bathyal taxa (total)	0	0	45	37	1	3	152	9	1	17	3	0	0	0	0	0	0	2	0	0	0	1
	Middle neritic-bathyal taxa (total)	0	0	137	112	1	13	170	22	98	240	265	1	2	12	0	0	1	3	0	1	0	3
	Outer neritic-bathyal taxa (total)	0	0	48	0	0	0	254	10	0	1	0	0	0	1	0	0	0	0	0	1	0	0
	Bathyal taxa (total)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oxic Indicators (total)	1	1	12	14	17	1	158	19	20	36	13	3	4	0	3	2	1	3	1	3	0	3
	Oxic/Suboxic Indicators (total)	1	0	39	30	5	153	168	12	24	48	249	100	0	0	19	216	98	70	133	157	154	100
	Suboxic Indicators (total)	0	0	165	103	1	13	372	12	88	216	255	1	1	12	0	0	0	1	0	1	0	2
	Suboxic/Dysoxic Indicators (total)	0	0	35	27	0	2	48	4	0	0	1	0	0	0	0	0	0	1	0	0	0	0
	Dysoxic Indicators (total)	0	0	1	3	0	0	20	17	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	High nutrient-flux Indicators (total)	0	0	9	14	0	3	64	20	0	0	0	0	0	0	0	0	0	1	0	1	0	0
	Stress Indicators (total)	0	0	69	31	0	3	296	29	0	0	1	0	0	0	0	0	0	2	0	0	0	0
	Epifaunal (%)	100	100	30	21	70	34	24	35	90	89	45	13	80	87	14	1	2	4	1	2	0	4
	Epifaunal to Shallow Infaunal (%)	0	0	0	16	15	61	14	5	1	6	44	87	0	0	86	99	97	85	97	98	100	89
	Infaunal (%)	0	0	57	58	3	4	36	19	9	5	5	0	20	0	0	0	0	2	0	0	0	2
	Deep infaunal (%)	0	0	0	2	0	0	2	20	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	Inner neritic taxa (%)	0	50	0	16	30	61	14	5	1	6	44	87	0	0	86	99	97	85	97	97	100	89
	IN-MN (%)	0	25	0	1	9	0	13	4	3	2	7	0	20	0	9	0	1	0	1	0	0	5
	IN-ON (%)	100	0	13	0	39	1	3	13	25	12	1	4	40	0	5	0	1	1	1	2	0	2
	MN-ON (%)	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Inner neritic-bathyal taxa (%)	0	0	15	20	3	1	14	11	1	5	1	0	0	0	0	0	0	2	0	0	0	1
	Middle neritic-bathyal taxa (%)	0	0	45	61	3	5	16	26	71	75	47	1	40	80	0	0	1	4	0	1	0	3
	Outer neritic-bathyal taxa (%)	0	0	16	0	0	0	23	12	0	0	0	0	0	7	0	0	0	0	0	1	0	0
	Bathyal taxa (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oxic Indicators (%)	50	25	4	8	52	0	14	22	14	11	2	3	80	0	14	1	1	4	1	2	0	3
	Oxic/Suboxic Indicators (%)	50	0	13	16	15	61	15	14	17	15	44	88	0	0	86	99	98	85	97	98	100	90
	Suboxic Indicators (%)	0	0	54	56	3	5	34	14	64	67	46	1	20	80	0	0	0	1	0	1	0	2
	Suboxic/Dysoxic Indicators (%)	0	0	11	15	0	1	4	5	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	Dysoxic Indicators (%)	0	0	0	2	0	0	2	20	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	High nutrient-flux Indicators (%)	0	0	3	8	0	1	6	24	0	0	0	0	0	0	0	0	0	1	0	1	0	0
	Stress Indicators (%)	0	0	22	17	0	1	27	34	0	0	0	0	0	0	0	0	0	2	0	0	0	0
		15 = only Sarmatian taxa used																					
P/B ratio (Murray, 1976, 1991)	**P/B ratio (%)**	0	0	10	0	0	0	9	7	0	0	0	0	0	13	0	0	0	7	1	0	0	0
	indicated environment	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN
adv. P/B ratio (van der Zwaan, 1990)	**Bi (number of infaunal species)**	0	0	176	106	1	10	393	16	13	16	28	0	1	0	0	0	0	2	0	0	0	2
	Pc (corrected P/B ratio; %)	0	0	24	0	0	0	13	9	0	0	0	0	0	13	0	0	0	8	1	0	0	0
	advanced P/B ratio (m)	36	36	86	36	36	37	58	49	36	36	36	36	36	58	36	36	36	47	38	36	36	36
	indicated environment	IN	IN	MN	IN	IN	IN	MN	IN	IN	IN	IN	IN	IN	MN	IN	IN	IN	IN	IN	IN	IN	IN

App. 2 – part 3

Section	Parameter	KA2 (1020-1025m) 3/1	KA2 (1020-1025m) 3/4	KA2 (1080-1085m) 4/3	KA2 (1140-1145m) 5/2	KA2 (1380-1385m) 9/3	MTW1 (1100-1105m) 3/5	MTW1 (1130-1138m) 4/7	MTW1 (1130-1138m) 4/2	MTW1 (1380-1385m) 9/1	MTW1 (1480-1485m) 12/4	MI1 (1052-1057m) 3/2	MI1 (1373.5-1377m) 7/4	MisU1 (1298-1302m) 1/2	MisU1 (1885-1894m) 3/1	MisU1 (1885-1894m) 3/4	PWU3 (1123-1128m) 1/1	PWU3 (1123-1128m) 1/3	PO1 (40-45m) 1/1	PO1 (99.5-105m) 3/1	PO1 (130-135m) 4/2	PO1 (160-165m) 5/2	PO1 (250-255m) 8/1
Test composition + B F vs. P F (total count + in %)	Agglutinated tests (total)	2	37	0	2	0	0	4	0	3	30	3	108	1	1	1	2	0	0	0	2	0	0
	Miliolid tests (total)	2	7	2	1	0	0	3	0	7	0	0	0	0	0	0	0	84	0	42	137	2	1
	Hyaline tests (total)	36	58	112	13	47	1	90	17	112	60	0	0	1	62	13	132	173	343	84	634	1039	121
	Benthic Foraminifera (total)	40	102	114	16	47	1	95	17	122	90	3	108	2	63	14	134	256	85	75	581	654	79
	Planktonic Foraminifera (total)	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Agglutinated tests (%)	5	36	0	13	0	0	4	0	2	33	100	100	50	2	7	1	0	0	0	0	0	0
	Miliolid tests (%)	5	7	2	6	0	0	3	0	6	0	0	0	0	0	0	0	33	0	33	18	0	1
	Hyaline tests (%)	90	57	98	81	100	100	93	100	92	67	0	0	50	98	93	99	67	100	67	82	100	99
	Benthic Foraminifera (%)	100	100	100	100	100	100	98	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Planktonic Foraminifera (%)	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversity Indices	Number of Taxa	7	10	2	5	1	1	20	8	26	15	1	3	2	5	6	2	11	11	9	15	12	11
	Fisher Alpha Index	2,5	2,7	0,3	2,5	0,2	0,0	7,6	5,9	10,1	5,1	0,5	0,6	0,0	1,3	4,0	0,3	2,3	3,5	2,7	2,8	2,1	3,5
	Equitability J	0,72	0,77	0,13	0,64	0,00	0,00	0,72	0,96	0,72	0,77	0,00	0,24	1,00	0,62	0,68	0,11	0,50	0,66	0,79	0,62	0,59	0,78
	Dominance D	0,35	0,24	0,97	0,50	1,00	1,00	0,21	0,15	0,18	0,18	1,00	0,88	0,50	0,47	0,44	0,97	0,43	0,35	0,22	0,27	0,38	0,20
Palaeoecological Parameters (total count + in %)	Epifaunal (total)	26	78	2	3	0	0	81	9	76	72	0	0	1	0	0	0	93	56	27	182	134	14
	Epifaunal to Shallow Infaunal (total)	7	5	112	11	47	1	9	3	31	0	0	0	1	41	2	134	162	13	23	235	4	16
	Infaunal (total)	0	1	0	0	0	0	3	0	8	4	3	101	0	0	0	0	1	4	20	19	128	7
	Deep infaunal (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	25
	Inner neritic taxa (total)	6	5	112	11	47	1	9	3	31	0	0	0	1	41	2	132	162	13	40	235	117	16
	IN-MN (total)	7	4	0	0	0	0	2	2	5	2	0	0	0	0	9	0	0	50	5	149	389	28
	IN-ON (total)	2	7	0	1	0	0	26	3	8	10	0	0	0	0	0	0	0	7	6	138	128	2
	MN-ON (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Inner neritic-bathyal taxa (total)	24	71	0	2	0	0	7	3	10	48	0	0	1	0	0	0	0	10	3	14	7	31
	Middle neritic-bathyal taxa (total)	0	7	0	0	0	0	47	4	56	12	0	0	0	0	0	0	11	0	0	5	8	1
	Outer neritic-bathyal taxa (total)	1	0	0	0	0	0	1	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0
	Bathyal taxa (total)	0	0	0	0	0	0	0	0	0	0	3	101	0	0	0	0	0	0	0	0	0	0
	Oxic Indicators (total)	24	70	0	3	0	0	76	10	71	68	0	0	1	12	0	0	5	56	19	48	247	13
	Oxic/Suboxic Indicators (total)	8	12	112	11	47	1	10	3	31	0	0	0	1	41	2	132	162	13	29	354	4	17
	Suboxic Indicators (total)	1	7	0	0	0	0	7	0	11	3	0	0	0	0	0	0	5	0	0	5	8	1
	Suboxic/Dysoxic Indicators (total)	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	4	3	14	7	6
	Dysoxic Indicators (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	25
	High nutrient-flux Indicators (total)	1	1	0	0	0	0	0	0	0	0	3	101	0	0	0	0	0	1	2	8	7	6
	Stress Indicators (total)	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	10	3	11	7	31
	Epifaunal (%)	65	76	2	19	0	0	84	53	62	80	0	0	50	0	0	0	36	71	37	33	21	18
	Epifaunal to Shallow Infaunal (%)	18	5	98	69	100	100	9	18	25	0	0	0	50	65	14	100	63	16	32	42	1	20
	Infaunal (%)	0	1	0	0	0	0	3	0	7	4	100	94	0	0	0	0	0	5	27	3	20	9
	Deep infaunal (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	32
	Inner neritic taxa (%)	15	5	98	69	100	100	9	18	25	0	0	0	50	65	14	99	63	16	55	42	18	20
	IN-MN (%)	18	4	0	0	0	0	2	12	4	2	0	0	0	0	64	0	0	63	7	27	60	35
	IN-ON (%)	5	7	0	6	0	0	27	18	7	11	0	0	0	0	0	0	0	9	8	25	20	3
	MN-ON (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Inner neritic-bathyal taxa (%)	60	70	0	13	0	0	7	18	8	53	0	0	50	0	0	0	0	13	4	3	1	39
	Middle neritic-bathyal taxa (%)	0	7	0	0	0	0	48	24	46	13	0	0	0	0	0	0	4	0	0	1	1	1
	Outer neritic-bathyal taxa (%)	3	0	0	0	0	0	1	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0
	Bathyal taxa (%)	0	0	0	0	0	0	0	0	0	0	100	94	0	0	0	0	0	0	0	0	0	0
	Oxic Indicators (%)	60	69	0	19	0	0	78	59	58	76	0	0	50	19	0	0	2	71	26	9	38	16
	Oxic/Suboxic Indicators (%)	20	12	98	69	100	100	10	18	25	0	0	0	50	65	14	99	63	16	40	64	1	22
	Suboxic Indicators (%)	3	7	0	0	0	0	7	0	9	3	0	0	0	0	0	0	2	0	0	1	1	1
	Suboxic/Dysoxic Indicators (%)	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	5	4	3	1	8
	Dysoxic Indicators (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	32
	High nutrient-flux Indicators (%)	3	1	0	0	0	0	0	0	0	0	100	94	0	0	0	0	0	1	3	1	1	8
	Stress Indicators (%)	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	13	4	2	1	39
	15 = only Sarmatian taxa used																						
P/B ratio (Murray, 1976, 1991)	P/B ratio (%)	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	indicated environment	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN
adv. P/B ratio (van der Zwaan, 1990)	Bi (number of infaunal species)	0	1	0	0	0	0	3	0	8	4	3	101	0	0	0	0	1	4	20	19	128	7
	Pc (corrected P/B ratio; %)	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	advanced P/B ratio (m)	36	36	36	36	36	36	39	36	36	36	36	36	36	36	36	36	37	36	36	36	36	36
	indicated environment	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN

App. 2 – part 4

Group	Parameter	PO1 (280-285m) 9/1	PO1 (430-435m) 14/3	PO1 (460-465m) 15/1	PO1 (490-495m) 16/1	PO1 (520-525m) 17/2	SI3 (400-405m) 2/2	SI3 (500-505m) 3/1	SI3 (600-604m) 4/2	SI3 (800-805m) 6/3	SI3 (900-906m) 7/3	SI3 (1000-1003m) 8/2	SI3 (1250-1255m) 11/1	SI3 (1335-1340m) 12/1	SI3 (1485-1490m) 15/2	SI3 (1716-1720.3m) 21/1	WA1 (200-205m) 1/1	WA1 (300-305m) 3/1	WA1 (350-353m) 4/2	WA1 (400-403m) 5/1	WA1 (450-455m) 6/2	WA1 (500-505m) 7/4	WA1 (640-641.5m) 11/2
Test composition + B F vs. P F (total count + in %)	Agglutinated tests (total)	0	0	0	1	102	1	0	0	0	48	83	0	1	0	7	0	0	0	8	0	3	85
	Miliolid tests (total)	1	0	8	23	317	11	2	18	38	9	41	0	1	1	0	1	0	5	126	7	1	0
	Hyaline tests (total)	40	2	278	105	805	554	473	150	61	1420	1109	519	22	2	1	422	640	7	525	38	111	0
	Benthic Foraminifera (total)	38	2	284	108	1204	148	197	157	99	847	1002	502	23	3	8	422	632	12	657	43	113	85
	Planktonic Foraminifera (total)	3	0	2	21	20	0	0	0	0	630	231	17	1	0	0	1	8	0	2	2	2	0
	Agglutinated tests (%)	0	0	0	1	8	0	0	0	0	3	7	0	4	0	88	0	0	0	1	0	3	100
	Miliolid tests (%)	2	0	3	18	26	2	0	11	38	1	3	0	4	33	0	0	0	42	19	16	1	0
	Hyaline tests (%)	98	100	97	81	66	98	100	89	62	96	90	100	92	67	13	100	100	58	80	84	97	0
	Benthic Foraminifera (%)	93	100	99	84	98	100	100	100	100	57	81	97	96	100	100	100	99	100	100	96	98	100
	Planktonic Foraminifera (%)	7	0	1	16	2	0	0	0	0	43	19	3	4	0	0	0	1	0	0	4	2	0
Diversity Indices	Number of Taxa	15	1	16	16	71	17	15	7	13	70	58	12	11	3	4	10	16	7	42	17	14	4
	Fisher Alpha Index	8,5	0,8	3,7	4,8	16,4	5,0	3,8	1,5	4,0	15,3	12,6	2,2	7,9	0,0	3,2	1,8	3,0	7,0	10,0	9,9	4,2	0,9
	Equitability J	0,87	0,00	0,26	0,75	0,81	0,86	0,79	0,33	0,78	0,72	0,82	0,13	0,82	1,00	0,88	0,59	0,43	0,94	0,71	0,89	0,56	0,67
	Dominance D	0,12	1,00	0,75	0,19	0,05	0,12	0,16	0,70	0,18	0,10	0,05	0,89	0,20	0,33	0,34	0,29	0,43	0,18	0,11	0,10	0,35	0,44
Palaeoecological Parameters (total count + in %)	Epifaunal (total)	9	2	17	24	811	41	19	20	48	160	297	2	5	0	0	146	186	5	124	33	102	0
	Epifaunal to Shallow Infaunal (total)	9	0	258	44	115	14	62	4	40	18	61	490	10	1	0	26	5	1	91	4	0	0
	Infaunal (total)	7	0	7	11	65	70	80	127	1	589	477	6	1	0	2	109	397	4	289	5	4	35
	Deep infaunal (total)	0	0	0	0	2	4	7	0	0	45	68	1	1	0	0	0	0	0	23	0	0	0
	Inner neritic taxa (total)	16	0	261	48	180	21	66	4	67	7	4	490	10	1	0	134	397	1	92	4	0	0
	IN-MN (total)	9	0	3	29	295	40	36	3	0	6	2	0	0	0	0	140	45	1	78	1	0	0
	IN-ON (total)	5	2	13	21	215	15	12	19	16	3	40	0	3	0	0	146	185	0	49	11	8	0
	MN-ON (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Inner neritic-bathyal taxa (total)	0	0	3	2	67	59	53	127	1	360	249	3	2	0	0	0	4	1	110	2	34	0
	Middle neritic-bathyal taxa (total)	1	0	3	7	210	8	30	0	0	325	381	6	2	0	0	1	0	3	106	23	65	0
	Outer neritic-bathyal taxa (total)	0	0	1	0	12	0	0	0	0	110	229	0	1	0	1	0	1	0	142	0	0	0
	Bathyal taxa (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	35
	Oxic Indicators (total)	21	2	9	1	512	38	21	2	24	124	178	2	4	0	0	145	186	3	47	11	41	0
	Oxic/Suboxic Indicators (total)	9	0	266	65	239	24	64	22	43	6	44	490	11	1	0	27	5	1	138	9	1	0
	Suboxic Indicators (total)	1	0	3	6	63	8	30	0	0	367	454	4	2	0	0	1	3	3	194	20	62	0
	Suboxic/Dysoxic Indicators (total)	0	0	1	1	17	55	46	127	0	264	115	2	0	0	1	0	2	1	100	1	3	0
	Dysoxic Indicators (total)	0	0	0	0	2	4	7	0	0	45	68	1	1	0	0	0	0	0	23	0	0	0
	High nutrient-flux Indicators (total)	0	0	1	1	22	37	38	127	0	293	239	3	1	0	0	0	2	0	119	0	2	0
	Stress Indicators (total)	0	0	1	1	9	53	48	127	0	269	151	3	1	0	0	0	2	1	256	0	0	0
	Epifaunal (%)	22	100	6	19	66	28	10	13	48	11	24	0	21	0	0	35	29	42	19	73	89	0
	Epifaunal to Shallow Infaunal (%)	22	0	90	34	9	10	31	3	40	1	5	94	42	33	0	6	1	8	14	9	0	0
	Infaunal (%)	17	0	2	9	5	48	41	83	1	40	39	1	4	0	25	26	62	33	44	11	3	41
	Deep infaunal (%)	0	0	0	0	0	3	4	0	0	3	6	0	4	0	0	0	0	0	3	0	0	0
	Inner neritic taxa (%)	39	0	91	37	15	14	34	3	68	0	0	94	42	33	0	32	62	8	14	9	0	0
	IN-MN (%)	22	0	1	22	24	27	18	2	0	0	0	0	0	0	0	33	7	8	12	2	0	0
	IN-ON (%)	12	100	5	16	18	10	6	12	16	0	3	0	13	0	0	35	29	0	7	24	7	0
	MN-ON (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Inner neritic-bathyal taxa (%)	0	0	1	2	5	40	27	83	1	24	20	1	8	0	0	0	1	8	17	4	30	0
	Middle neritic-bathyal taxa (%)	2	0	1	5	17	5	15	0	0	22	31	1	8	0	0	0	0	25	16	51	57	0
	Outer neritic-bathyal taxa (%)	0	0	0	0	1	0	0	0	0	7	19	0	4	0	13	0	0	0	22	0	0	0
	Bathyal taxa (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0	41
	Oxic Indicators (%)	51	100	3	1	42	26	11	1	24	8	14	0	17	0	0	34	29	25	7	24	36	0
	Oxic/Suboxic Indicators (%)	22	0	93	50	20	16	32	14	43	0	4	94	46	33	0	6	1	8	21	20	1	0
	Suboxic Indicators (%)	2	0	1	5	5	5	15	0	0	25	37	1	8	0	0	0	0	25	29	44	54	0
	Suboxic/Dysoxic Indicators (%)	0	0	0	1	1	37	23	83	0	18	9	0	0	0	13	0	0	8	15	2	3	0
	Dysoxic Indicators (%)	0	0	0	0	0	3	4	0	0	3	6	0	4	0	0	0	0	0	3	0	0	0
	High nutrient-flux Indicators (%)	0	0	0	1	2	25	19	83	0	20	19	1	4	0	0	0	0	0	18	0	2	0
	Stress Indicators (%)	0	0	0	1	1	36	24	83	0	18	12	1	4	0	0	0	0	8	39	0	0	0
	15 = only Sarmatian taxa used																						
P/B ratio (Murray, 1976, 1991)	P/B ratio (%)	7	0	1	16	2	0	0	0	0	43	19	3	4	0	0	0	1	0	0	4	2	0
	indicated environment	IN	IN	IN	IN	IN	IN	IN	IN	IN	ON	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN
adv. P/B ratio (van der Zwaan, 1990)	Bi (number of infaunal species)	7	0	7	11	65	70	80	127	1	589	477	6	1	0	2	109	397	4	289	5	4	35
	Pc (corrected P/B ratio; %)	9	0	1	18	2	0	0	0	0	71	31	3	4	0	0	0	3	0	1	5	2	0
	advanced P/B ratio (m)	49	36	37	68	38	36	36	36	36	443	106	41	42	36	36	37	41	36	37	43	39	36
	indicated environment	IN	IN	IN	MN	IN	IN	IN	IN	IN	UB	ON	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN

Curriculum vitae

Full name:	Dörte Theobalt
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Nationality:	German
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Education

March 2013 – 2016	PhD candidate and project researcher of University of Graz, Institute for Earth Sciences (OMV project: *"Integrated stratigraphy of the Lower Miocene depositional systems in the western Vienna Basin"*)
June 2013	International School on Foraminifera, University Urbino, Italy
Sept. 2012	Diploma in Geology/Palaeontology, Steinmann Institute for Geology, Mineralogy and Palaeontology, University Bonn, Germany
Sept. 2008	Prediploma in Geology/Palaeontology, Institute of Geosciences, University Mainz, Germany
March 2005	Secondary School graduation (A-level)

Other research experience

Nov. 2012	inventory of the micropalaeontological collection, Natural History Museum Vienna, Austria
Mai – Nov. 2011	diploma thesis on planktonic foraminifera at Natural History Museum Vienna, Austria
Sept. 2010	internship at the Natural History Museum Vienna, Austria
Aug. 2008	excavation assistant at fossillagerstätte Stöffel (Enspel/Westerwald, Germany), Directorate-General Cultural Heritage Rhineland-Palatinate, Germany
2007-2008	student assistant in palaeontological/sclerochronological laboratory, University Mainz

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[…] And these few precepts in thy memory
See thou character. Give thy thoughts no tongue,
Nor any unproportioned thought this act.
Be thou familiar, but by no means vulgar.
Those friends thou hast, and their adoption tried,
Grapple them to thy soul with hoops of steel,
But do not dull thy palm with entertainment
Of each new-hatch'd, unfledged comrade. Beware
Of entrance to a quarrel, but being in,
Bear't that the opposed may beware of thee.
Give every man thy ear, but few thy voice;
Take each man's censure, but reserve thy judgment.
Costly thy habit as thy purse can buy,
But not express'd in fancy, rich not gaudy;
For the apparel oft proclaims the man,
And they in France of the best rank and station
Are of a most select and generous chief in that.
Neither a borrower nor a lender be;
For loan oft loses both itself and friend,
And borrowing dulls the edge of husbandry.
This above all: to thine ownself be true,
And it must follow, as the night the day,
Thou canst not then be false to any man. […]

(from Hamlet, William Shakespeare)