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Calcareous nannoplankton from the Korytnica basin (Middle Miocene; Holy Cross Mountains, Poland)

ABSTRACT: Calcareous nannoplankton from the Korytnica basin, Holy Cross Mountains, Central Poland, indicate the presence of standard nannoplankton zones NN 5 (Sphenolithus heteromorphus Zone) and NN 6 (Discoaster exilis Zone) in the Lower Opolian Formation. Species present and correlations to the Central Paratethys, the Mediterranean area, and the North Sea Basin are discussed. They indicate that the Korytnica Clays are equivalent to the upper part of the type Langhian, and they cannot be correlated with the type Tortonian.

INTRODUCTION

The Korytnica Clays developed on the southern slopes of the Holy Cross Mts, Central Poland, belong to the regional Lower Opolian, which is considered to represent the lowest part of the "Tortonian transgression" in the Fore-Carpathian Depression (Radwański 1969). In Korytnica Bay at the northern shores of the Fore-Carpathian Depresion a diversified facies pattern was described by Radwański (1974). The sedimentation starts with an oyster lumachelle in near-shore areas, which grades to clays off-shore. These clays may reach 40 to 60 meters in thickness in the deepest parts. The faunal assemblages found in the clays indicate a successive shallowing through the time of deposition of the Korytnica Clays, and the Lower Opolian in the Korytnica area terminates with a lithothamnian limestone. The present-day outcrops of the Korytnica Clays are found in an area between villages Korytnica and Jawor, as well as near Chomentów and Karsy, from which 23 samples were collected (Text-fig. 1).

The stratigraphic position of these samples within the Korytnica Clay succession is not precisely known, but according to the nannoplankton assemblages, it seems to represent at least two levels within

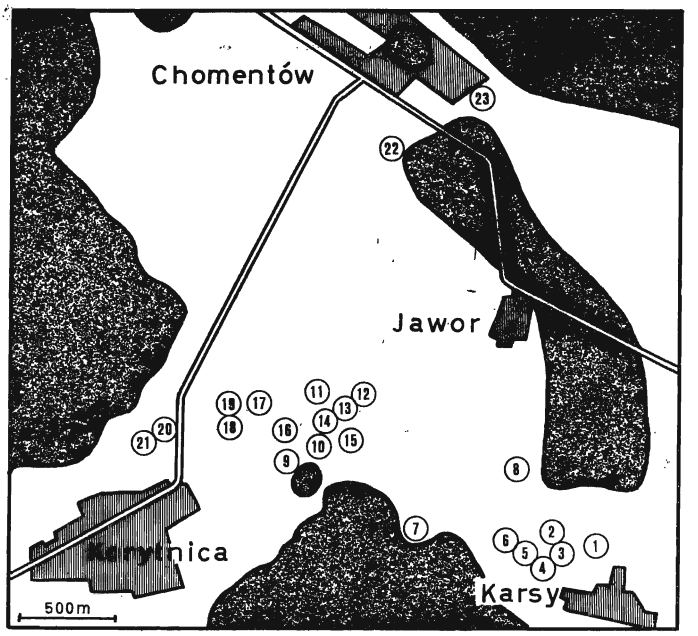
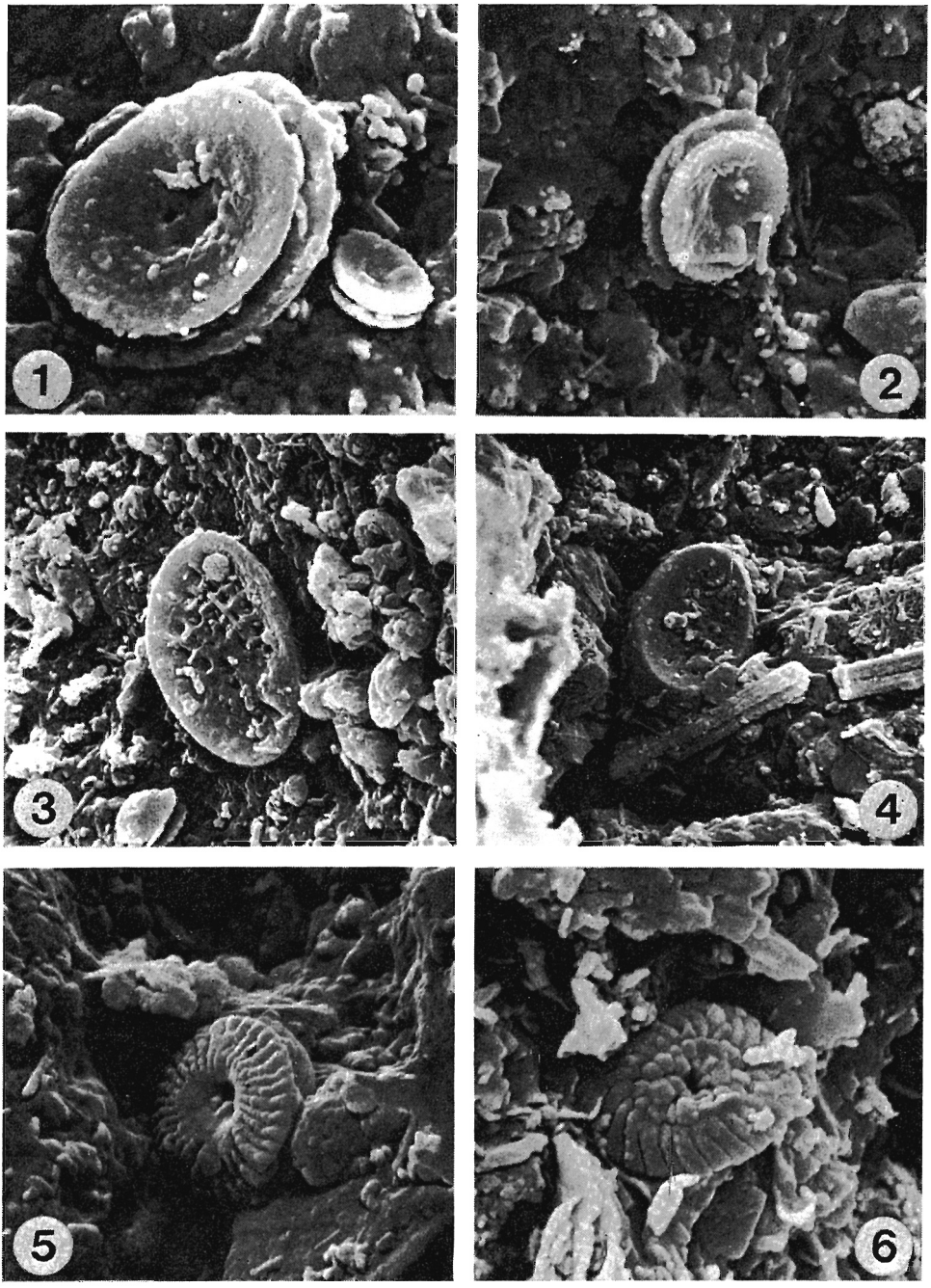


Fig. 1. Paleoenvironmental sketch of the Korytnica basin, showing areas of clay sedimentation (*blank*), and land or islands (*hachured*) during Badenian time; numbers refer to collected samples of the Korytnica Clays, the oyster lumachelle (sample *9*) and marly sands (sample *23*) including. Map slightly modified from Bałuk & Radwański (1977, Text-fig. 2).

the clays. Despite the statement of Radwański (1974, p. 98) that there are no index fossils in the whole "Tortonian" sequence of the Fore-Carpathian Depression, some calcareous nannoplankton clearly indicate correlations to areas outside of the Fore-Carpathian Depression as discussed below. Unfortunately no samples from a borehole penetrating the total thickness of the Korytnica Clays were available for the present study, which probably could show a detailed and diversified succession of calcareous nonnoplankton assemblages within the Korytnica Clays.

CALCAREOUS NANNOPLANKTON ASSEMBLAGES

The Korytnica calcareous nannoplankton asemblages are dominated by *Coccolithus pelagicus* (Wallich), *Helicosphaera carteri* (Wallich) and *Reticulofenestra* sp.; all other species are more or less rare. The species *Braarudosphaera bigelowi* (Gran & Braarud), which is most common in near-shore and shallow water areas, was found in several samples (*see* Text-fig. 2). The species *Sphenolithus heteromorphus* Deflandre is present in samples *10, 11, 14* and *20*, but *Helicosphaera ampliaperta* Bramlette & Wilcoxon was not found in these samples. As standard nannoplankton zone NN 5 (Sphenolithus heteromorphus Zone) is defined



Calcareous nannoplankton from the Korytnica Clays (sample 8); Middle Miocene (Badenian)

1 *Coccolithus pelagicus* (Wallich) Schiller; proximal side, *SEM* × 7000

2 *Reticulofenestra* sp.; proximal side, *SEM* × 7000

3—4 *Discolithina multipora* (Kamptner) Martini: 3 distal, 4 proximal side; *SEM* × 3500

5 *Umbilicosphaera jafari* Müller; distal side, *SEM* × 7000

6 Reworked from the Upper Cretaceous: *Watznaueria barnesae* (Black) Perch-Nielsen; distal side, *SEM* × 7000

X rare to few

● common

Samples		Braarudosphaera bigelowi	Coccolithus pelagicus	Cyclococcolithus rotula	Discoaster ex gr. musicus	Discolithina cf. callosa	Discolithina multipora	Helicosphaera carteri	Helicosphaera euphratis	Helicosphaera walbersdorfensis	Micrantholithus cf. vesper	Pontosphaera sp.	Reticulofenestra cf. pseudoumbilica	Reticulofenestra sp.	Rhabdosphaera procera	Sphenolithus heteromorphus	Sphenolithus sp.	Syracosphaera cf. histrica	Trochoaster deflandrei	Umbilicosphaera jafari	reworked Cretaceous
Korytnica	1	X	●					X		X		X		●						X	X
	2	X	●		X		X			X				●			X			X	●
	3	X	●					X			X			●							X
	4	X	●	X				X						●						X	●
	5		●					X						●							X
	6		X					X						●						X	X
	7		●					X	X	X				●						X	●
	8	X	●	X			X	●						●				X		●	X
	9		●					X						●					X	X	X
	10	X	●					X						●		X	X	X		X	●
	11		●											●		X					X
	12		●					X						●						X	X
	13		X					X						X				X		X	X
	14		●					X						●	X	X				X	X
	15		●					X		X				●				X		●	●
	16		●					X					X	●							X
	17		●					X						X						X	●
	18		X																		X
	19	X	●			X		X		X			X	●						X	●
	20	X	●					X	X					●		X					X
	21		X					X						●						X	X
	22		●											X						X	X
	23		X											●							X

Distribution of calcareous nannoplankton in samples from the Korytnica basin (*cf.* Text-fig. 1)

as the interval from the last occurrence of *Helicosphaera ampliaperta* to the last occurrence of *Sphenolithus heteromorphus*, these samples clearly belong to zone NN 5. A few samples (numbers *1, 2, 7, 15* and *19*) contain *Helicosphaera walbersdorfensis* Müller, and in sample *2 Discoaster* ex *Discoaster musicus* group was noted. As these samples do not contain *Sphenolithus heteromorphus* they most probably belong to zone NN 6 (Discoaster exilis Zone). The remaining samples cannot be placed in a certain nannoplankton zone due to the lack of indicative species, but all are within the range of calcareous nannoplankton assemblages found in the Badenian of the Central Paratethys.

Besides Miocene species, reworked calcareous nannoplankton from the Jurassic and Cretaceous deposits was found in all samples studied (*cf.* Text-fig. 2 and Pl. 1, Fig. 6), although a certain degree of variation in numbers of reworked specimens was noted. The Cretaceous nannoplankton includes the following species:

Ahmuellerella octoradiata (Górka) Reinhardt, 1966
Arkhangelskiella cymbiformis Vekshina, 1959
Cretarhabdus ?anthophorus (Deflandre) Bramlette & Martini, 1964
C. conicus Bramlette & Martini, 1964
C. crenulatus Bramlette & Martini, 1964
Cribrosphaèrella ehrenbergi Archangelsky, 1912
Eiffellithus eximius (Stover) Perch-Nielsen, 1968
E. turriseiffeli (Deflandre) Reinhardt, 1965
Gartnerago obliquum (Stradner) Reinhardt, 1964
Glaukolithus diplogrammus (Deflandre) Reinhardt, 1964
Kamptnerius magnificus Deflandre, 1959
Lucianorhabdus cayeuxi Deflandre, 1959
Microrhabdulus decoratus Deflandre, 1959
Micula staurophora (Gardet) Stradner, 1963
Predicosphaera cretacea (Archangelsky) Gartner, 1963
P. spinosa (Bramlette & Martini) Gartner, 1968
Tetralithus obscurus Deflandre, 1959
Watznaueria barnesae (Black) Perch-Nielsen, 1968,

the presence of which indicates the erosion of marine Campanian to Lower Maastrichtian sediments in the land areas south of the shoreline of the Opolian sea (*cf.* Radwański 1969, Text-figs 24—25).

SYSTEMATIC PALEONTOLOGY

Description of species found in the Korytnica Clays (Text-fig. 2) is arranged in alphabetical order and is restricted to full reference of name, indication of an illustration comparable with the present material and some remarks on the frequency of species in the Korytnica samples as well as on their occurrence elsewhere. As the preservation of specimens found is moderate, only some pictures will be given (Pl. 1).

Braarudosphaera bigelowi (Gran & Braarud) Deflandre, 1947

1935. *Pontosphaera bigelowi* n. sp; Gran & Braarud, *J. Biol. Board Canada*, vol. 1, p. 388, Fig. 67.

1960. *Braarudosphaera bigelowi* (Gran & Braarud); Stradner, *Erdoel Z.*, vol. 76, p. 431, Fig. 2.

This species indicating shallow water conditions is present in samples *1* to *4*, *8*, *10*, *19* and *20*. The size of specimens found vary between 4.5µ and 6.0µ.

Coccolithus pelagicus (Wallich) Schiller, 1930

1877. *Coccosphaera pelagica* n. sp.; Wallich, *Ann. Mag. Nat. Hist., ser. 4*, vol. 19, p. 348, Pl. 17, Figs 1, 3—7, 10.

1969. *Coccolithus pelagicus* (Wallich); Martini, *N. Jb. Geol. Paläont., Abh.* 132 (3), p. 286, Pl. 26, Figs 1—2.

This is the most common species in the Korytnica Clays (*cf.* Pl. 1, Fig. 1); it is the only one present in all samples (*cf.* Text-fig. 2) and shows great variation in size. Specimens with a cross-like structure across the central opening were not observed with the lightmicroscope, but may be present as they occur at Walbersdorf, Austria.

Cyclococcolithus rotula (Kamptner) Kamptner, 1956

1948. *Tremalithus rotula* n. sp.; Kamptner, *Sitz. Ber. Österr. Akad. Wiss., Math.-Naturwiss. Kl., Abt. I*, vol. 157 (1/5), p. 8, Pl. 2, Fig. 15.

1963. *Cyclococcolithus rotula* (Kamptner); Bachmann, Papp & Stradner, *Mitt. Geol. Ges. Wien*, vol. 56 (1), p. 158, Pl. 24, Fig. 10.

Compared with the occurrences in the Badenian of Austria this species is extremely rare in the Korytnica Clays as it occurs only sporadicly in samples *4* and *8*.

Discoaster ex gr. *musicus* Stradner, 1959

1959. *Discoaster musicus* n. cent.; Stradner, *Proc. 5th World Petrol. Congr., sect. I, paper 60*, p. 1088, Fig. 28.

1972. *Discoaster musicus* Stradner; Stradner, *Initial Rep. Deep Sea Drilling Project*, vol. 13, p. 1198, Pl. 39, Fig. 12.

A single specimen comparable with the drawings of Stradner was found in sample *2*. The central part is slightly arched and rays are short. This group is highly variable and needs restudy in a continuous section.

Discolithina cf. *callosa* Martini, 1969

1969. *Discolithina callosa* n. sp.; *Martini, N. Jb. Geol. Paläont., Abh.* 132 (3), p. 287, Pl. 26, Figs 7—9.

One specimen occurred in sample *19*, but its pores are somewhat obscured by secondary growth of calcite, and it is placed tentatively into this species.

Discolithina multipora (Kamptner) Martini, 1965

194?. *Discolithus multiporus* n. sp.; Kamptner, *Sitz. Ber. Österr. Akad. Wiss., Math.-Naturwiss. Kl., Abt. I*, vol. 157 (1/5), p. 5, Pl. 1, Fig. 9.

1969. *Discolithina multipora* (Kamptner); Martini, *N. Jb. Geol. Paläont., Abh.* 132 (3), p. 288, Pl. 26, Figs 5—6.

Rare specimens were observed in samples *2* and *8* (*cf.* Pl. 1, Figs 3—4). This species is more common in the Badenian of Austria where it was reported e.g. as abundant in some layers of the Walbersdorf section by Müller (1974).

Helicosphaera carteri (Wallich) Kamptner, 1954

1877. *Coccosphaera Carterii* (Wall.); Wallich, *Ann. Mag. Nat. Hist., ser. 4*, vol. 19, p. 347, Pl. 17, Figs 3—4, ?6, 7—7a, 12s, 17.

1975. *Helicosphaera carteri* (Wallich); Jafar & Martini, *Senckenbergiana Lethaea*, vol. 56 (4/5), p. 389, Pl. 1, Figs 1, 4—5.

Present in small numbers in nearly all samples (*cf.* Text-fig. 2), with some rather large specimens similar to those in the higher part of nannoplankton zone NN 5 in the type Langhian.

Helicosphaera euphratis Haq, 1966

1966. *Helicosphaera euphratis* n. sp.; Haq, *Acta Univ. Stockholm., Stockholm Contr. Geol.*, vol. 15 (3), p. 33, Pl. 2, Figs 1, 3.

1967. *Helicosphaera parallela* n. sp.; Bramlette & Wilcoxon, *Tulane Stud. Geol.*, vol. 5 (3), p. 106, Pl. 5, Figs 9—10.

Rare specimens observed in samples *7* and *20* showing an oblique central bridge in polarized light seem to be identical with lightmicroscope pictures of specimens from the Miocene of Trinidad given by Bramlette & Wilcoxon (1967).

Helicosphaera walbersdorfensis Müller, 1974

1974. *Helicosphaera walbersdorfensis* n. sp.; Müller, *Senckenbergiana Lethaea*, vol. 55 (1/5), p. 392, Pl. 2, Fig. 15; Pl. 4, Figs 35—37, 45—46.

Small *Helicosphaera* specimens present in samples *1, 2, 7, 15* and *19*, compared well with pictures of *H. walbersdorfensis* published by Müller (1974), are included in this species.

Micrantholithus cf. *vesper* Deflandre, 1954

1954. *Micrantholithus vesper* Defl.; Deflandre *in* Deflandre & Fert, *Ann. Paléont.*, vol. 40, p. 166, Text-figs 5, 115—116; Pl. 13, Fig. 17.

1969. *Micrantholithus* cf. *vesper* Deflandre; Martini, *N. Jb. Geol. Paläont., Abh.* 132 (3), p. 291, Pl. 27, Figs 11—12.

Rare specimens found in sample *3* are identical with those from Walbersdorf (Müller 1974) and Gabon (Martini 1969), and can be differentiated from the Eocene form (Deflandre 1954) by their shorter rays.

Pontosphaera sp.

A single specimen having a small rim and a central part with two slits alined along the long axis was found in sample *1*.

Reticulofenestra cf. *pseudoumbilica* (Gartner) Gartner, 1969

1967. *Coccolithus pseudoumbilicus* n. sp.; Gartner, *Univ. Kansas Paleont. Contr.*, paper 29, p. 4, Pl. 6, Figs 1—4.

1974. *Reticulofenestra pseudoumbilica* (Gartner); Müller, *Senckenbergiana Lethaea*, vol. 55 (1/5), p. 393, Pl. 3, Fig. 19.

Rare specimens of *Reticulofenestra* with a larger central area in samples *16* and *19* are tentatively placed into this species, which was also reported from Walbersdorf by Müller (1974).

Reticulofenestra sp.

Small *Reticulofenestra* specimens are together with *Coccolithus pelagicus* the most common forms in the Korytnica Clays (*cf.* Text-fig. 2 and Pl. 1, Fig. 2), but cannot be identified as to their species; further electronmicroscope studies are necessary for a decent description.

Rhabdosphaera procera Martini, 1969

1969. *Rhabdosphaera procera* n. sp.; Martini, *N. Jb. Geol. Paläont., Abh.* 132 (3), p. 289, Pl. 26, Figs 10—11.

Only a single specimen was noted in sample *14*. This species is more common at Walbersdorf and Valea Morilor in approximately equivalent strata.

Sphenolithus heteromorphus Deflandre, 1953

1953. *Sphenolithus heteromorphus* n. sp.; Deflandre, *C.-R. Séances Acad. Sci. Paris*, vol. 237, p. 1785, Figs 1—2.

1967. *Sphenolithus heteromorphus* Deflandre; Bramlette & Wilcoxon, *Tulane Stud. Geol.*, vol. 5 (3), p. 122, Pl. 2, Figs 6—9.

Specimens found in samples *10, 11, 14* and *20* compared well with those from the Upper Karpatian and Lower Badenian of Austria, which are slightly smaller than those from the open oceans.

Sphenolithus sp.

Rare and poorly preserved specimens found in samples *2* and *20* show relations to sturdy forms of *Sphenolithus abies* Deflandre, 1954, but are covered by debris and cannot be identified with certainty.

Syracosphaera cf. *histrica* Kamptner, 1941

1941. *Syracosphaera histrica* n. sp.; Kamptner, *Ann. Nat. Hist. Mus. Wien,* vol. 51, p. 84, Pl. 6, Figs 65—68.

1974. *Syracosphaera* sp.; Müller, *Senckenbergiana Lethaea,* vol. 55 (1/5), p. 398, Pl. 1, Fig. 9.

Specimens of a *Syracosphaera* species are present in samples *8, 10, 13* and *15*. Identical specimens were found fairly common in samples from Valea Morilor and are also present in the Walbersdorf section (figured as *Syracosphaera* sp. *in* Müller, 1974). They were recently reported from the Middle Miocene of the Rumanian Carpathians by Dumitrica, Gheta & Popescu (1975). As there is some doubt of the identity of the Recent *S. histrica* and the fossil forms, our specimens are placed tentatively in *Syracosphaera histrica.*

Trochoaster deflandrei (Stradner) Martini & Stradner, 1960

1959. *Polycladolithus deflandrei* n. cent.; Stradner, Erdoel Z., vol. 75, p. 437, Text-fig. 76.

1961. *Trochoaster deflandrei* (Stradner); Stradner & Papp, *Jb. Geol. Bundesanst. Wien,* Sonderbd. 7, p. 132, Pl. 42, Figs 5-6e-h.

A single specimen was found in sample *9*, which compares well with the above cited pictures of Stradner.

Umbilicosphaera jafari Müller, 1974

1974. *Umbilicosphaera jafari* n. sp.; Müller, *Senckenbergiana Lethaea,* vol. 55 (1/5), p. 394, Pl. 1, Figs 1—3; Pl. 4, Figs 43—44.

This rather small species is present in most samples from the Korytnica Clays (*cf.* Text-fig. 2 and Pl. 1, Fig. 5) and is fairly common in the Walbersdorf section from where is was first described by Müller (1974).

CORRELATIONS

On basis of the calcareous nannoplankton the following correlations are possible (Text-fig. 3).

In the Central Paratethys the Badenian includes most of standard nannoplankton zone NN 5 (Sphenolithus heteromorphus Zone) as well as zone NN 6 (Discoaster exilis Zone) and NN 7 (Discoaster kugleri Zone). Zone NN 8 (Catinaster coalitus Zone) has not been identified with certainty as yet (Müller 1974; Steininger, Rögl & Martini 1976), whereas in the underlying Karpatian zones NN 4 (Helicosphaera ampliaperta Zone) and part of NN 5 are present (Martini & Müller 1975). The nannoplankton assemblages from the Korytnica Clays can be best correlated with those from Sooss (zone NN 5) and with the lower part of the Walbersdorf section (approximately zone NN 6).

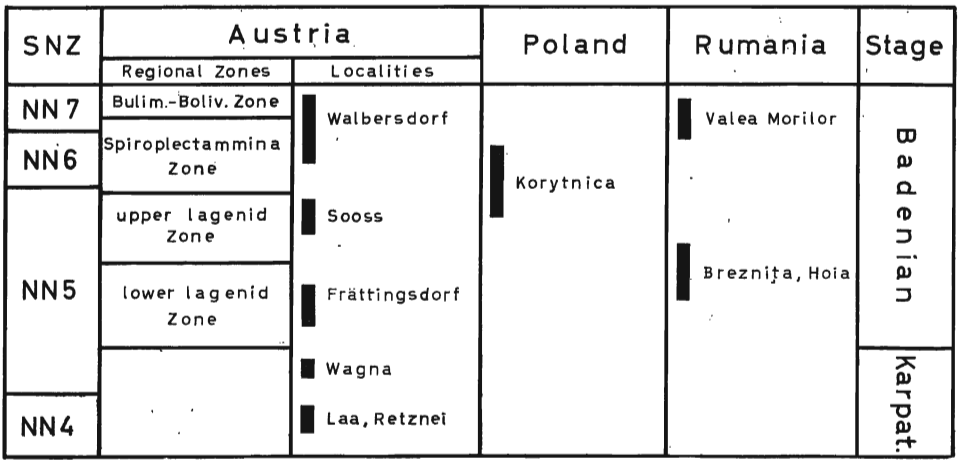


Fig. 3. Correlation of well known localities of Karpatian and Badenian age in the Paratethys, and their position in relation to the standard nannoplankton zonation *(SNZ)*

In Rumania the Sphenolithus heteromorphus Zone (NN 5) is present in the Dej Formation in the Cluj area (Martini & Moisescu 1974), and was recently described by Dumitrica, Gheta & Popescu (1975) in the tuff and Globigerina Marl horizon from the Rumanian Carpathians, whereas the Radiolarian Shale horizon and the Spiralis Marl horizon are considered to belong to the Discoaster exilis Zone (NN 6) by the same authors. Nannoplankton from the famous locality Breznita, which was reported earlier to belong to zone NN 8 (Catinaster coalitus Zone) by Martini (1971) on basis of a specimen of *Catinaster coalitus* Martini & Bramlette found in a sample from the Fuchs-collection, has to be placed in the Sphenolithus heteromorphus Zone (NN 5) according to a new set of samples recently investigated. The restudy of the specimen of *Catinaster coalitus* in the Fuchs-sample led to serious doubts of its identification as *Catinaster coalitus*, and is now considered to represent a specimen of *Discoaster musicus* with rather short rays, an endemic discoaster of the Paratethys described in detail by Stradner & Papp (1961). Sediments of Valea Morilor contain a calcareous nannoplankton assemblage of the Upper Badenian (zone NN 6 and/or NN 7) according to Müller (1974) and the Author's own observations.

Outside the Paratethys, beds with nannoplankton zones NN 5 to NN 7, the interval in question for the Korytnica Clays, have been identified in the Mediterranean area in Italy in the upper part of the type Langhian (Martini 1968 and 1971: NN 5 to NN 6) and in the lower part of the type Serravallian (Müller 1975: NN 7). On Malta, calcareous nannoplankton of this interval was found in the Gobigerina Limestone

(Martini 1971: NN 5) and in the lower and middle part of the Blue Clay (Martini 1971: NN 6 and NN 7).

Nannoplankton zone NN 5 was also reported from Muro, Mallorca (Martini 1974), but seems to represent the lower part of that zone, as also nannoplankton of the Helicosphaera ampliaperta Zone (NN 4) was found nearby. The species *Sphenolithus heteromorphus* is also present in the Hemmoorian in the North Sea Basin (Martini & Müller 1974), but these beds may also be correlated only with the lower part of zone NN 5 as indicated by Hinsch, Kaever & Martini (1977).

Summarizing these data, the Korytnica Clays are equivalent to the middle part of the Badenian of the Central Paratethys and to the upper part of type Langhian in Italy, but cannot be correlated at all with the type Tortonian, in which nannoplankton zones NN 9 (Discoaster hamatus Zone) through NN 11 (Discoaster quinqueramus Zone) are present (Martini 1975).

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REFERENCES

BACHMANN A., PAPP A. & STRADNER H. 1963. Mikropaläontologische Studien im „Badener Tegel" von Frättingsdorf, N. Ö. *Mitt. Geol. Ges. Wien,* **56** (1), 117—211. Wien.

BAŁUK W. & RADWAŃSKI A. 1977. Organic communities and facies development of the Korytnica basin (Middle Miocene; Holy Cross Mountains, Central Poland). *Acta Geol. Polon.,* **27** (2) *[this issue]*. Warszawa.

CICHA I., HAGN H. & MARTINI E. 1971. Das Oligozän und Miozän der Alpen und der Karpaten. Ein Vergleich mit Hilfe planktonischer Organismen. *Mit. Bayer. Staatssamml. Paläont. Hist. Geol.,* **11**, 279—293. München.

DUMITRICA P., GHETA N. & POPESCU G. 1975. Date noi cu privire la biostratigrafia si corelarea miocenului mediu din aria carpatica. *Dari de Seama,* **61**, 65—84. Bucuresti.

HINSCH W., KAEVER M. & MARTINI E. 1977. Campan und marines Mittel-Miozän bei Nieheim (Ostwestfälisch-Lippisches Bergland). *Paläont. Z.,* **51** (1/2). Stuttgart.

MARTINI E. 1968. Calcareous nannoplankton from the type Langhian. *Giorn. Geol.,* **35** (2), 163—172. Bologna.

— 1971. Standard Tertiary and Quaternary calcareous nannoplankton zonation. *Proc. II. Planktonic Conf., Roma 1970,* **2**, 739—785. Rome.

— 1974. Calcareous nannoplankton from the type Andalusian and some other Neogene areas in Spain. *Mém. Bur. Rech. Géol. Minér.,* **78** (1), 421—426. Paris.

— 1975. Calcareous nannoplankton from the type Tortonian. *Proc. 6th Congr. Mediterran. Neogene Stratigr.*, **1**, 53—56. Bratislava.
— & MOISESCU V. 1974. Nannoplankton-Untersuchungen in oligozänen Ablagerungen zwischen Cluj und Huedin (NW Siebenbürgisches Becken, Rumänien). *N. Jb. Geol. Paläont., Mh.* 1974 (1), 18—37. Stuttgart.
— & MÜLLER C. 1973. Nannoplankton-Gemeinschaften im Miozän und Pliozän des Nordseebeckens. *N. Jb. Geol. Paläont., Mh.* 1973 (9), 555—564. Stuttgart.
MÜLLER C. 1974. Nannoplankton aus dem Mittel-Miozän von Walbersdorf (Burgenland). *Senckenbergiana Lethaea*, **55** (1/5), 389—405. Frankfurt a.M.
— 1975. Calcareous nannoplankton from the type Serravallian. *Proc. 6th Congr. Mediterran. Neogene Stratigr.*, **1**, 49—52. Bratislava.
RADWAŃSKI A. 1969. Lower Tortonian transgression onto the southern slopes of the Holy Cross Mts. *Acta Geol. Polon.*, **19** (1), 1—164. Warszawa.
— 1974. Fore-Carpathian Depression. *In:* Polen-Ekskursionen 1973, I. Kollokvie--Rapport, 94—132. *Geologisk Institut, Aarhus Universitet.* Aarhus.
STEININGER F., RÖGL F. & MARTINI E. 1976. Current Oligocene/Miocene biostratigraphic concept of the Central Paratethys (Middle Europe). *Newsl. Stratigr.*, **4** (3), 174—202. Berlin.
STRADNER H. & PAPP A. 1961. Tertiäre Discoasteriden aus Österreich und deren stratigraphische Bedeutung. Mit Hinweisen auf Mexiko, Rumänien und Italien. *Jb. Geol. Bundesanst.*, Sonderband **7**, 1—160. Wien.

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NANNOPLANKTON WAPIENNY Z IŁÓW KORYTNICKICH

(Streszczenie)

Nannoplankton wapienny występujący w osadach wypełniających basen Korytnicy (głównie w iłach korytnickich, a także w muszlowcach ostrygowych oraz piaszczystych marglach — *por.* fig. 1—2) wskazuje na przynależność tych osadów do poziomów *NN 5* (poziom Sphenolithus heteromorphus) oraz *NN 6* (poziom Discoaster exilis) w standardowym podziale nannoplanktonowym (*SNZ*). Wśród napotkanych tutaj form (patrz fig. 2 and pl. 1) zwraca uwagę obecność licznych okazów redeponowanych z osadów kredowych, a nawet jurajskich. Znalezione formy mioceńskie, które w pracy zostały krótko scharakteryzowane pod względem paleontologicznym, zezwalają na korelację osadów korytnickich z osadami środkowego badenu innych basenów centralnej części Paratetydy (fig. 3), a także z osadami strefy śródziemnomorskiej oraz neogeńskiego basenu Morza Północnego. Przedstawiona korelacja wskazuje, że iły korytnickie odpowiadają górnej części stratotypowego profilu langianu we Włoszech, natomiast nie mogą być one paralelizowane z osadami stratotypowego profilu tortonu Włoch, który jest znacznie młodszy (poziomy *NN 9* do *NN 11*).
