

CALCAREOUS NANNOPLANKTON ACROSS THE PALEOGENE–NEOGENE BOUNDARY IN THE MOLDOVIȚA–PALTINU AREA (BUCOVINA, ROMANIA)

CARMEN M. CHIRA¹, ALIN IGRITAN¹, DORU-TOADER JURAVLE², FLORIN FLOREA³ & MIRELA VIOLETTA POPA¹

Abstract. Two sections were investigated in the external flysch of the Moldovița–Paltinu area (Bucovina - northern Moldavia), in order to highlight the nannoflora content across the Paleogene–Neogene boundary. The Paleogene–Neogene boundary (NP25–NN1 Biozones) was revealed in the upper part of the Lupoia Valley section (Moldovița). The boundary is located in the lower part of the section, while in the upper part the investigated deposits could be undoubtedly assigned to the Lower Miocene.

Lower Paleogene deposits were clearly documented in the Boului Valley section (Paltinu) by the identification of the calcareous nannoplankton biozones NN1, and NN2. *Triquetrorhabdulus carinatus* documents the NN1 Biozone while helicospheres (*Helicosphaera* cf. *compacta*, *H. recta*, *H. scissura*, *H. carteri*, *H. ampliaperita*) are characteristic for the NN2–NN4 biozones.

Keywords: Eastern Carpathians, Paleogene–Neogene boundary, biostratigraphy, calcareous nannofossils.

INTRODUCTION

The investigated area is located between Moldovița (Lupoia Valley section) and Paltinu (Boului Valley section) localities; it belongs to the northern Paleogene–Early Miocene Moldavides (Săndulescu, 1984) of the flysch succession of the Eastern Carpathians (Fig. 1). Other investigations concentrated in the Dumbravnic Brook–Moldovița locality area (Chira et al., in prep.).

The studied deposits belong to the Tarcău Nappe (Joja, 1954, 1955; Micu, 1981; Săndulescu, 1984; Juravle, 2007) (Fig. 1), a very tectonized unit preserving a diverse lithostratigraphy which reflects the changes in sedimentogenetic conditions. During the Oligocene to Lower Miocene, the western part of the basin preserved the Fusaru lithofacies, while the Moldovița lithofacies characterizes the middle area, and the Kliwa–Petricica lithofacies is typical for the east (Atanasiu, 1943; Ionesi, 1968; Mutihac & Ionesi, 1974; Gigliuto et al., 2004). The correlation of lithofacies types is given in Fig. 2.

MATERIAL AND METHODS

Our previous study on Dumbravnic Brook (Moldovița) proved the presence of a continuous section for the Paleogene–Neogene boundary (Chira et al., 2008, Chira et al., 2009, Chira et al., in prep.). In order to get additional information, twenty-five samples from Lupoia Valley (Moldovița), and twelve samples from Boului Valley (Paltinu) were investigated for their calcareous nannofossils content.

The smear slides were studied under an optical microscope, with 1000x magnification.

CALCAREOUS NANNOFOSSIL ASSEMBLAGES AROUND THE PALEOGENE-NEOGENE BOUNDARY IN BUCOVINA, ROMANIA

In terms of calcareous nannofossil zonation, the Paleogene–Neogene transition corresponds to the interval from Zone NP25 (*Sphenolithus ciperensis* Zone) to Zone

NN2 (*Discoaster druggi* Zone) as defined by Martini (1971) and Martini and Mueller (1986). For the Paratethys, the Oligocene–Miocene boundary has been placed in the upper part of the Egerian (Báldi and Seneš, 1975; Steininger et al., 1976; Rögl, 1998), close to the base of the NN1 Zone of Martini (1971). The Egerian–Eggenburgian boundary was correlated by Lehotayová and Molèiková (1975) with the NN1/NN2 zonal boundary of Martini (1971) while Rögl, (1998) correlated the boundary with the upper part of the NN2 Zone. Mărușeanu (1999) considered that in Romania the Oligocene–Miocene boundary is represented by the FO of *Helicosphaera mediterranea*. Continuous sedimentation across the Oligocene–Miocene boundary interval was reported from the flysch zone of the Central Paratethys, the Lower Austrian Molasse, the South and East Slovakian basins and the Transcarpathian Basin in Romania (Steininger et al., 1985; Holcova, 2005).

The Paleogene–Neogene Boundary in the External Flysch area of the Eastern Carpathians (Northern Moldavia, Romania) has been the subject of a controversial and intense scientific debate for long time. The boundary was identified based on calcareous nannoplankton near the base of the Vinețișu and Podu Morii formations (Melinte, 1988; Ionesi & Mészáros, 1989; Mărușeanu, 1999; Melinte & Brustur, 2008, Chira et al., in press), within the NN1 Zone of Martini (1971).

The sedimentogenetic and lithological characters of the Vinețișu Formation are homogeneous in the area of Fusaru and Moldovița lithofacies. The formation shows turbiditic features, with monotonous lithology consisting of a close-packed interlayering of greyish micaceous calcareous sandstones displaying conchoidal or curbicortical structure with cm- or dm-thick grey or rarely greenish marls and clays.

Ionesi & Mészáros (1989) documented the presence of the NP25 and NN1 biozones, thus the Oligocene–Miocene boundary in the lower part of the Vinețișu Formation.

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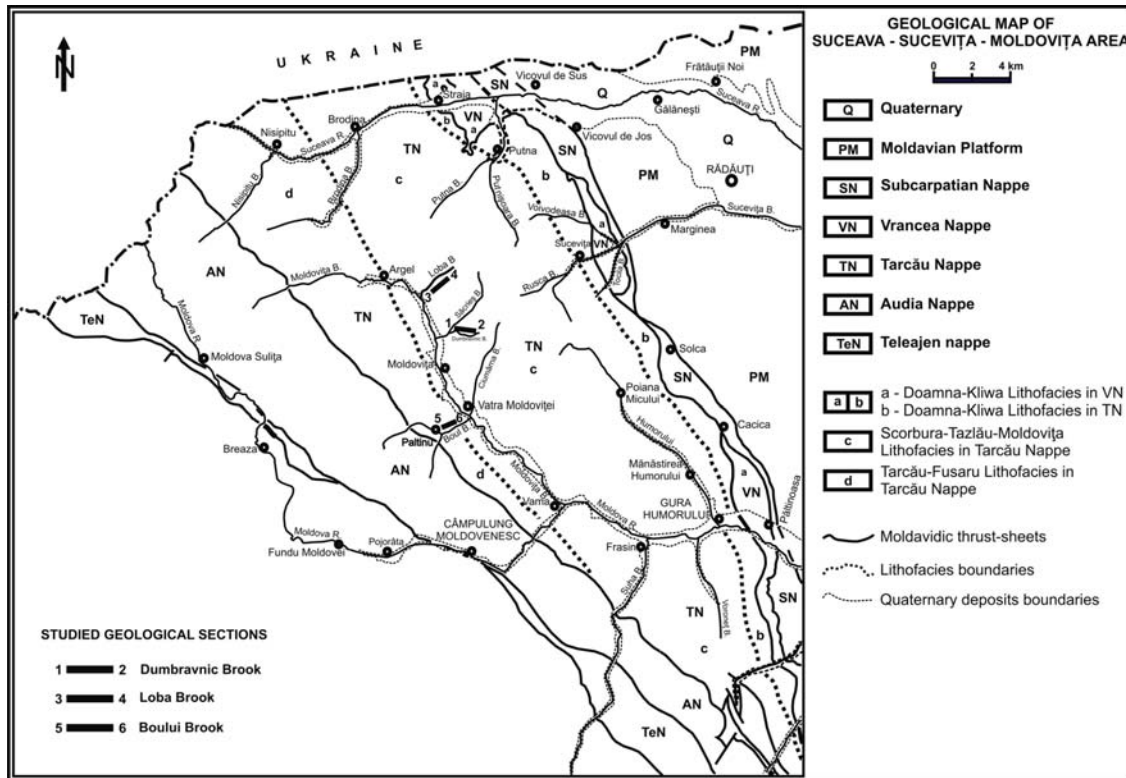


Fig 1 - Geological map of the studied area.

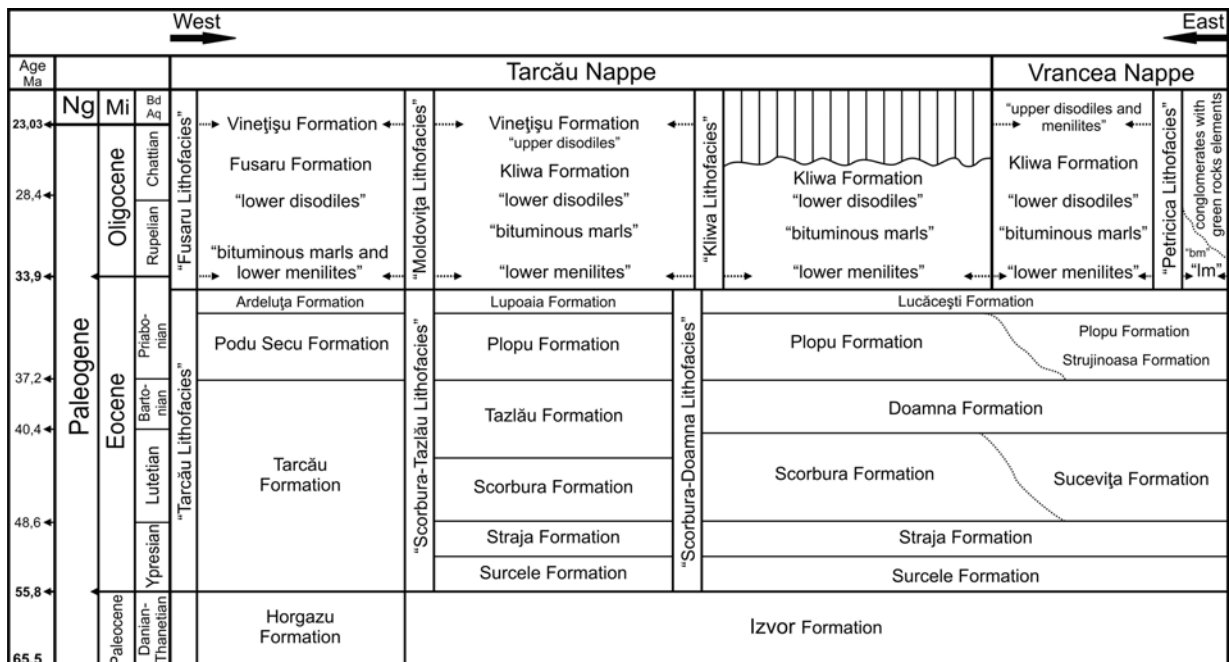


Fig 2 - Lithofacies variations in Tarcău and Vrancea domains, north from Moldovei Valley (according to Juravle et al., 2009).

Our previous study in the Moldovița area (Dumbravnic Brook - Fig. 1 – Chira et al., 2008; Chira et al., in prep.) investigated about 100 samples from the Vinețișu Formation. Beside taxa characteristic for NP21–24 zones identified in the lower part of the section, Early Miocene taxa have been clearly identified in the upper part of the section. South from Moldovița area, the calcareous nannofossils were previously studied by Martini &

Lebenzon (1971), Lebenzon (1973), Ionesi & Gheța (1978; Dicea & Dicea (1980), Melinte (1993), a.o.

We studied the Vinețișu Formation along Lupoia Brook section in Moldovița lithofacies developed on the top of the Kliwa sandstones, as well as westwards, along Boului Brook, in Fusaru lithofacies.

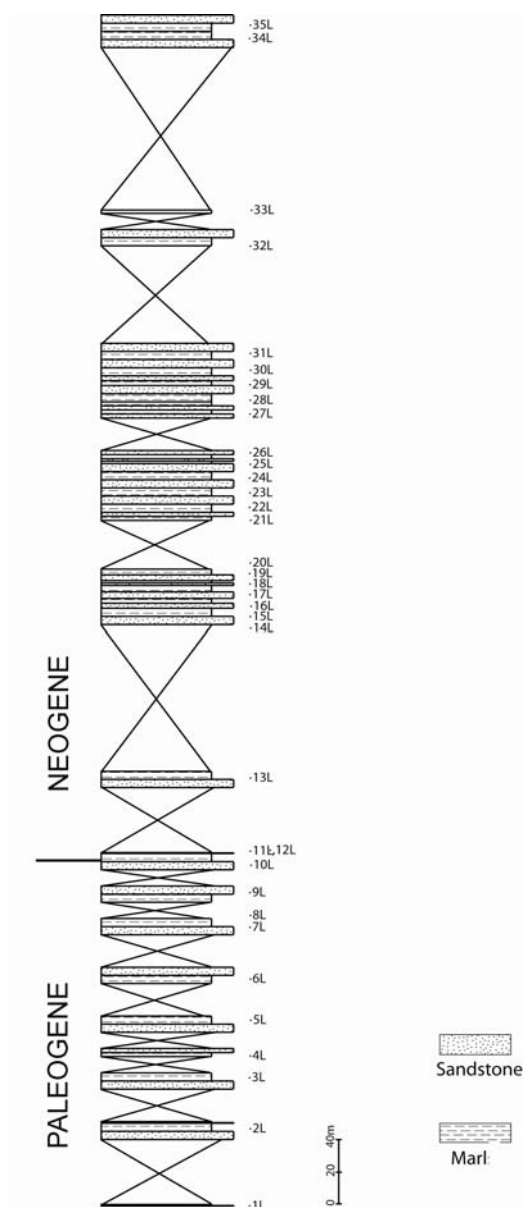


Fig 3 - Lupoia valley section (Moldovița).

1. Lupoia Valley section

In the lower part of the Lupoia Valley section, near Vatra Moldoviței locality, calcareous nannofossils are rare (Figs. 1, 3, 5).

The Oligocene – Miocene boundary could be located in the first part of the section, at the level of sample 10L.

The calcareous nannoplankton assemblages across the boundary contain: *Coccolithus pelagicus*, *C. cf. eopelagicus*, *Helicosphaera scissura*, *H. recta*, *Cyclicargolithus flordanus*, *Reticulofenestra dicyoda*, *Triquetrorhabdulus cf. carinatus*, and in the upper part of the section also *Helicosphaera ampliapertura* appear.

Samples in the upper part of the section contain only scarce calcareous nannofossils: *Coccolithus pelagicus* and rare reticulofenestrids and sphenoliths.

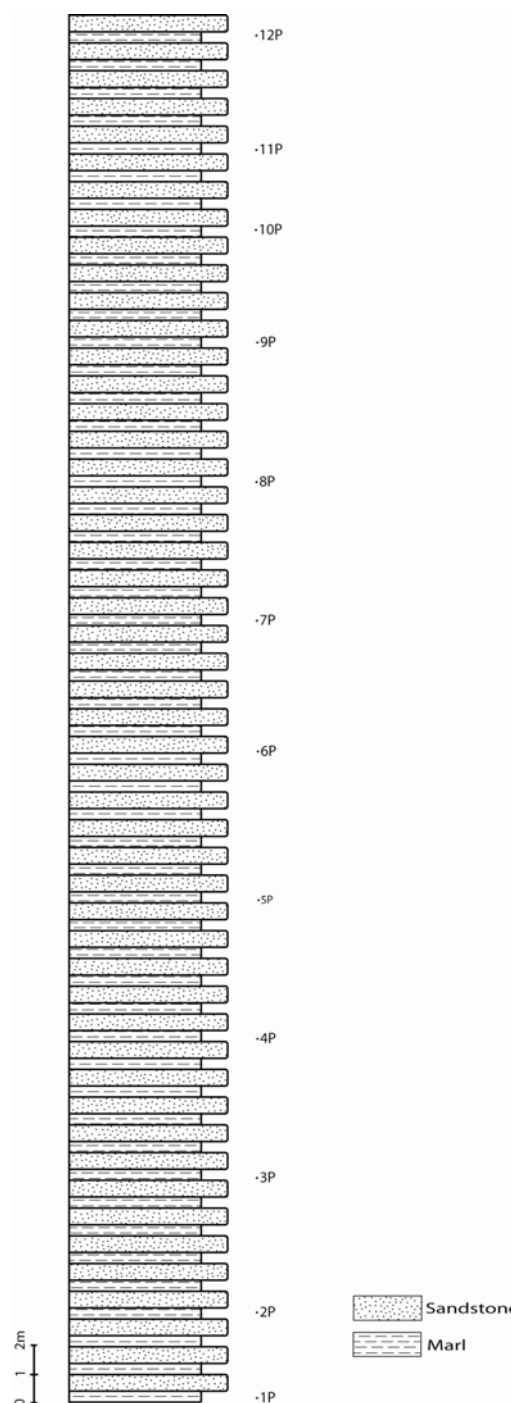


Fig 4 - Boului valley section (Paltinu).

2. Boului Valley section

The analyzed section from Boului Valley at Paltin (Figs. 1, 4, 6) proved the presence of abundant calcareous nannofossil assemblages belonging to the Lower Miocene. The presence of *Triquetrorhabdulus carinatus* suggests the NN1 Biozone (Lower Miocene) while the helicospheres (*Helicosphaera cf. compacta*, *H. recta*, *H. scissura*, *H. carteri*, *H. ampliapertura*) are characteristic for NN2-NN4 zones.

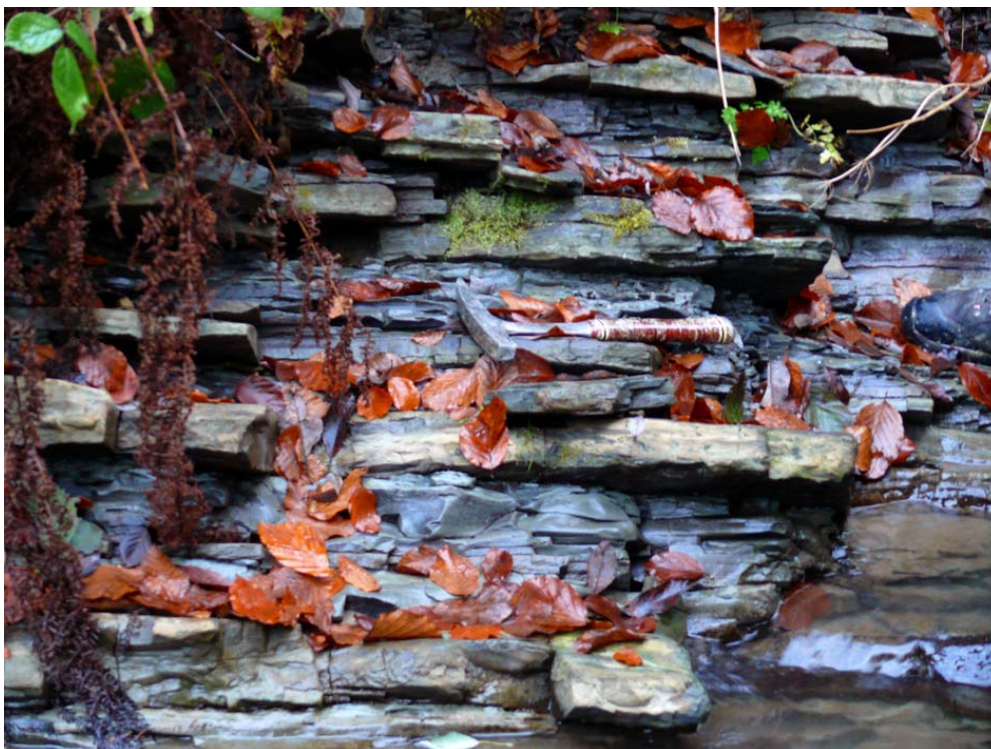


Fig 5 - Paleogene/Neogene boundary on Lupoia valley.



Fig 6 - Lower Neogene deposits on Boului valley.

CONCLUSIONS

On Lupoia Valley (Vatra Moldoviței), the Paleogene–Neogene boundary could be located in the lower part of the section, where Early Miocene taxa could be clearly identified. Only scarce calcareous nannofossils could be

found in the upper part of the section.

The analyzed section from Boului Valley (Paltin) proved the presence of rich calcareous nannofossil assemblages belonging to the Lower Miocene. The biozones NN1 to NN4 were clearly identified.

Acknowledgments

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PLATES

PLATE I

- 1, 2. *Helicosphaera scissura* MILLER, 1981
3. *Helicosphaera* cf. *scissura* MILLER, 1981
- 4, 5. *Helicosphaera ampliaperta* BRAMLETTE & WILCOXON, 1967
6. *Helicosphaera mediterranea* MUELLER, 1981
- 7, 8. *Cyclicargolithus floridanus* (ROTH & HAQ ET AL., 1967) BUKRY, 1971
9. *Reticulofenestra* cf. *umbilicus* (LEVIN, 1965) MARTINI & RITZKOWSKI, 1968
10. *Dictyococcites bisectus* (HAY ET AL., 1966) BUKRY & PERCIVAL, 1971
- 11, 12. *Reticulofenestra dictyoda* (DEFLANDRE IN FERT, 1954) STRADNER IN STRADNER & EDWARDS, 1968
13. *Calcidiscus bicircus* BOWN, 2005
14. *Coccolithus pelagicus* (WALLICH, 1877) SCHILLER, 1930
- 15, 16. *Coccolithus eopelagicus* (BRAMLETTE & RIEDEL, 1954) BRAMLETTE & SULLIVAN, 1961
- 17, 18. *Triquetrorhabdulus carinatus* MARTINI, 1965
- 19, 20. *Sphenolithus anarrhopus* BUKRY & BRAMLETTE, 1969
21. *Sphenolithus moriformis* (BROENNIMANN & STRADNER, 1960) BRAMLETTE & WILCOXON, 1967
- 22, 23. *Sphenolithus capricornutus* BUKRY & PERCIVAL 1971
- 24, 25. *Sphenolithus conicus* BUKRY, 1971
26. *Sphenolithus* cf. *ciperoensis* BRAMLETTE & WILCOXON, 1967
- 27, 28, 29, 30. Calcispheres

PLATE II

- 1, 2. *Helicosphaera scissura* MILLER, 1981
- 3, 4. *Helicosphaera ampliaperta* BRAMLETTE & WILCOXON, 1967
5. *Helicosphaera bramlettei* MUELLER, 1970
- 6, 7. *Helicosphaera recta* (HAQ, 1966) JAFAR & MARTINI, 1975
8. *Helicosphaera compacta* BRAMLETTE & WILCOXON, 1967
9. *Helicosphaera carteri* (WALLICH, 1877) KAMPTNER, 1954
10. *Helicosphaera euphratis* HAQ, 1966
- 11, 12. *Reticulofenestra* cf. *lockeri* MUELLER, 1970
13. *Reticulofenestra lockeri* MUELLER, 1970
- 14, 15. *Reticulofenestra bisecta* (HAQ et al., 1966) ROTH, 1970
- 16, 17. *Reticulofenestra dictyoda* (DEFLANDRE IN DEFLANDRE ET FERT, 1954) STRADNER IN STRADNER & EDWARDS, 1968
18. *Cyclicargolithus floridanus* (ROTH & HAQ ET AL., 1967) BUKRY, 1971
- 19, 20. *Coccolithus pelagicus* (WALLICH, 1877) SCHILLER, 1030
21. *Chiasmolithus grandis* (BRAMLETTE & RIEDEL, 1954) RADOMSKI, 1968
22. *Cruciplacolithus frequens* (PERCH-NIELSEN, 1977) ROMEIN, 1979
23. *Zygrabolithus bijugatus* (DEFLANDRE IN DEFLANDRE ET FERT, 1954) DEFLANDRE, 1959
24. *Triquetrorhabdulus carinatus* MARTINI, 1965
25. *Sphenolithus moriformis* (BROENNIMANN & STRADNER, 1960) BRAMLETTE & WILCOXON, 1967
- 26, 27. *Sphenolithus anarrhopus* BUKRY & BRAMLETTE, 1969
28. *Sphenolithus spiniger* BUKRY, 1971
29. *Discoaster* sp.
30. Calcispheres

Appendix: Alphabetic list of taxa

- Calcidiscus bicircus* Bown, 2005
Calcispheres
Chiasmolithus grandis (BRAMLETTE & RIEDEL, 1954) RADOMSKI, 1968
Coccolithus eopelagicus (BRAMLETTE & RIEDEL, 1954) BRAMLETTE & SULLIVAN, 1961 *Coccolithus pelagicus* (WALLICH, 1877) SCHILLER, 1030
Cruciplacolithus frequens (PERCH-NIELSEN, 1977) ROMEIN, 1979
Cyclicargolithus floridanus (ROTH & HAQ ET AL., 1967) BUKRY, 1971
Discoaster sp.
Dictyococcites bisectus (HAY ET AL., 1966) BUKRY & PERCIVAL, 1971
Helicosphaera ampliaperta BRAMLETTE & WILCOXON, 1967
Helicosphaera bramlettei MUELLER, 1970
Helicosphaera carteri (WALLICH, 1877) KAMPTNER, 1954
Helicosphaera compacta BRAMLETTE & WILCOXON, 1967
Helicosphaera euphratis HAQ, 1966

CALCAREOUS NANNOPLANKTON ACROSS THE PALEOGENE–NEOGENE BOUNDARY IN THE MOLDOVIȚA–PALTINU AREA

- Helicosphaera mediterranea* MUELLER, 1981
Helicosphaera recta (HAQ, 1966) JAFAR & MARTINI, 1975
Helicosphaera scissura MILLER, 1981
Reticulofenestra bisecta (HAQ ET AL., 1966) ROTH, 1970
Reticulofenestra dictyoda (DEFLANDRE IN FERT, 1954) STRADNER IN STRADNER & EDWARDS, 1968
Reticulofenestra lockeri MUELLER, 1970
Reticulofenestra cf. umbilicus (LEVIN, 1965) MARTINI & RITZKOWSKI, 1968
Sphenolithus anarrhopus BUKRY & BRAMLETTE, 1969
Sphenolithus capricornutus BUKRY & PERCIVAL, 1971
Sphenolithus cf. ciperoensis BRAMLETTE & WILCOXON, 1967
Sphenolithus conicus BUKRY, 1971
Sphenolithus moriformis (BROENNIMANN & STRADNER, 1960) BRAMLETTE & WILCOXON, 1967
Sphenolithus spiniger BUKRY, 1971
Triquetrorhabdulus carinatus MARTINI, 1965
Zygrabolithus bijugatus (DEFLANDRE IN DEFLANDRE ET FERT, 1954) DEFLANDRE, 1959

PLATE I

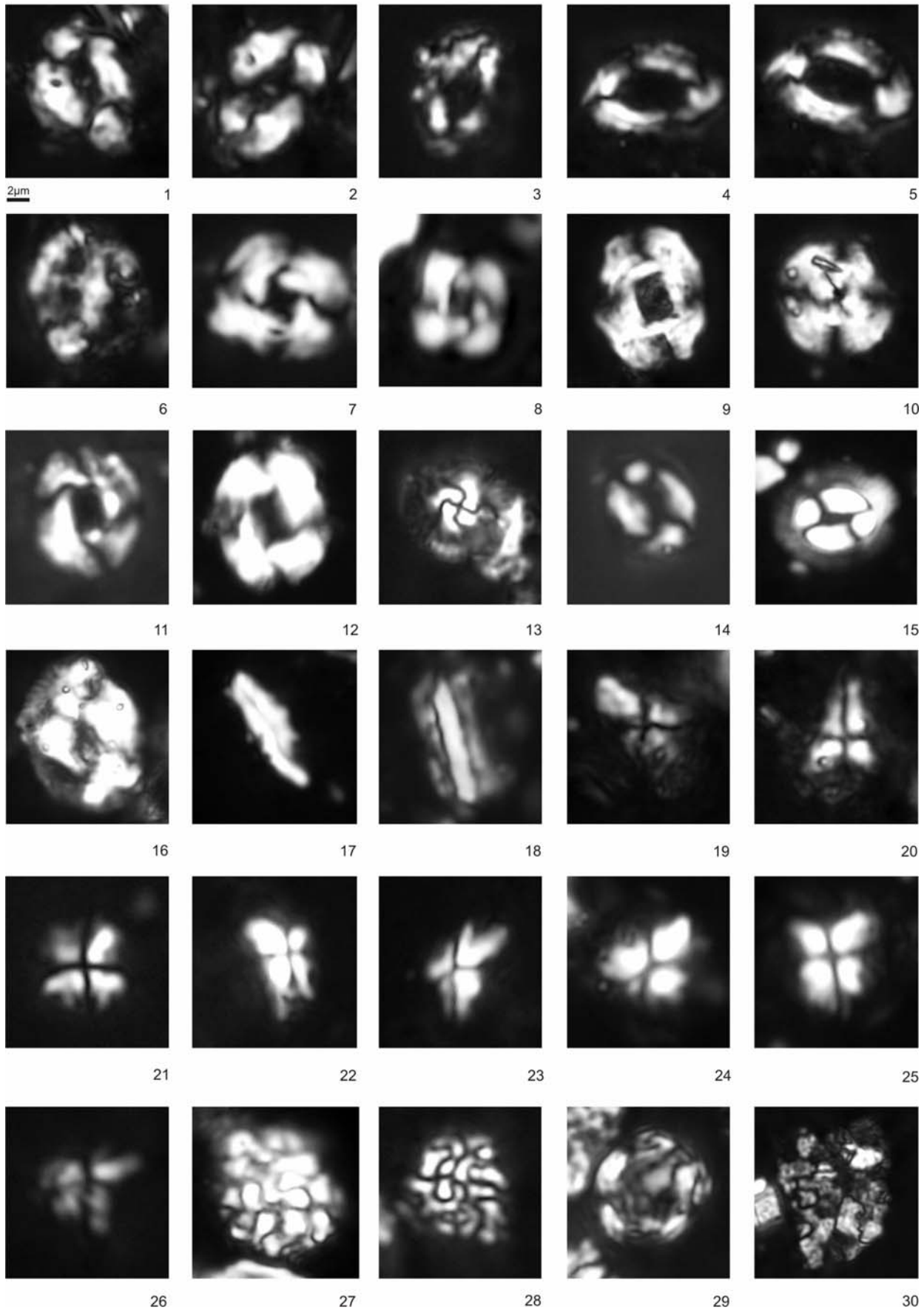


PLATE II

