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BIOSTRATIGRAPHIC STUDIES AND CORRELATION OF TERTIARY PLANKTONIC GASTROPODS (PTEROPODS) FROM HUNGARY

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Abstract. The Hungarian Tertiary marine sediments contain relatively rich pteropod fauna. More than 40 species, assigned to 9 genera have been identified from 33 Eocene, 21 Oligocene and 43 Miocene localities. The first planktonic gastropods appeared in the Middle Eocene, ~43 Ma ago in the C20n magnetic chron, NP16 nannozone and the last occurrence is in the Miocene (Badenian), NN5 nannozone, in chron C5ADn with an age of ~14.2 Ma, according to time scale of Berggren et al. (1995).

Keywords: Planktonic gastropods, Euthecosomata, biostratigraphy, magnetostratigraphy, Tertiary, Hungary

INTRODUCTION

The aim of this report is to present the results of a current research of Tertiary pteropods in Hungary, particularly the correlation with biostratigraphic and magnetostratigraphic data.

Tertiary marine sediments in Hungary contain a relatively rich pteropoda fauna. From the Middle Eocene up to the Middle Miocene 44 species assigned to 9 genera (*Limacina, Skaptotion, Creseis, Praehyalocylis, Clio, Styliola, Vaginella, Diacrolinia, Ireneia*) of Euthecosomata subordo have been recognised.

Pteropoda studies of the last years have confirmed that this group of molluscs is an effective biostratigraphic tool for the subdivision and correlation of Tertiary sediments in Hungary as well (Bohn-Havas 1992, 2003, Bohn-Havas & Zorn 1993, 1994, 1995, 2002, Bohn-Havas et al. 2003).

Most of Tertiary pteropod occurrences are known from boreholes in Hungary. It is particularly important that nannoplankton, planktonic foraminiferal and magnetostratigraphic zonation are available from most part of the boreholes. These offer an opportunity to mark the first and last appearance dates and the change of the planktonic gastropod fauna much more precisely. This multidisciplinary approach in correlation during the whole Tertiary is unique.

EOCENE PLANKTONIC GASTROPODS

In Hungary pteropods can be found only in the Eocene sedimentary basins of Transdanubian Central Range. Three boreholes sections were measured by magnetostratigraphy: Somlóvásárhely Sv-1, Csetény Cs-72, Oroszlány O-2370.(Fig.1.)

From 33 localities, 16 species assigned to 5 genera (*Limacina, Skaptotion, Creseis, Praehyalocylis, Clio*) have been recognised from the pelitic deposits (Padrag Formation, Csolnok Formation). The most characteristic species: *Limacina aff. pygmea (*LAMARCK, 1804), *Limacina umbilicata* (BORNEMANN, 1855), *Limacina tutelina* (CURRY,.1965), *Limacina sp. 1.* (ZORN, 1991). *Skaptotion bartonense* CURRY, 1965, *Creseis hastata* (MEYER, 1886) *Praehyalocylis annulata* (TATE, 1887) and probably new species: *Limacina sp. 4., Limacina sp. 5., Clio sp.1. (?Creseis), Clio sp.2.,Clio sp.3.* (Bohn-Havas, 2003).

The first planktonic gastropods (*Limacina pygmea, Creseis hastata, Praehyalocylis annulata*) appeared in the upper part of the Lutetian, about 43 Ma ago, in NP16 nannozone, *Morozovella lehneri* planktonic foraminiferal zone, in the magnetic chron C20n in the SW part of Transdanubian Central Range (Kollányi et al. 2003) (Fig. 1.)

Pteropods in the Eastern Basins of the Transdaubian Central Range occured later, in the Csetény-Dudar Basin they appeared in NN16 nannozone, about 41.5Ma, C19n magnetic chron (Csetény-72 borehole) and in the Pusztavám-Oroszlány Basin ~41 Ma ago in chron C18r (Oroszlány-2370 borehole) (Fig. 1.).

During the whole Bartonian and the lower part of Priabonian rich pteropod fauna can be found in the Eocene sedimentary basins (NP17 nannozone, *Orbulinoides beckmanni and Truncorotaloides rohri* foraminiferal zone (Kollányi & Báldi-Beke, 2002).

The last occurence of pteropods in the Hungarian Eocene sediments is ~36 Ma ago, at the end of NP 18 nannozone, *Globigerinatheca semiinvoluta* planktonic foraminiferal zone, in chron C16n (Kollányi et al. 2003).

The first appearance of *Clio* (*Clio sp*. 3., Bakonycsernye-18 borehole) in the Lower Bartonian, at the top of NP16 nannozone, about 40 Ma ago, is probably the oldest occurrence of the genus (Bohn-Havas & Lantos, 2000).

OLIGOCENE PLANKTONIC GASTROPODS

Oligocene sediments of 21 localities (5 outcrops, 16 drillings) also contain a rich pteropod fauna. 6 genera (*Limacina, Creseis, Praehyalocylis, Clio, Ireneia*, *Vaginella*) and 16 species have been recognised (Zorn & Bohn-Havas 1996, Bohn-Havas 2003).

The first pteropods (*Limacina =Spiratella* zone)

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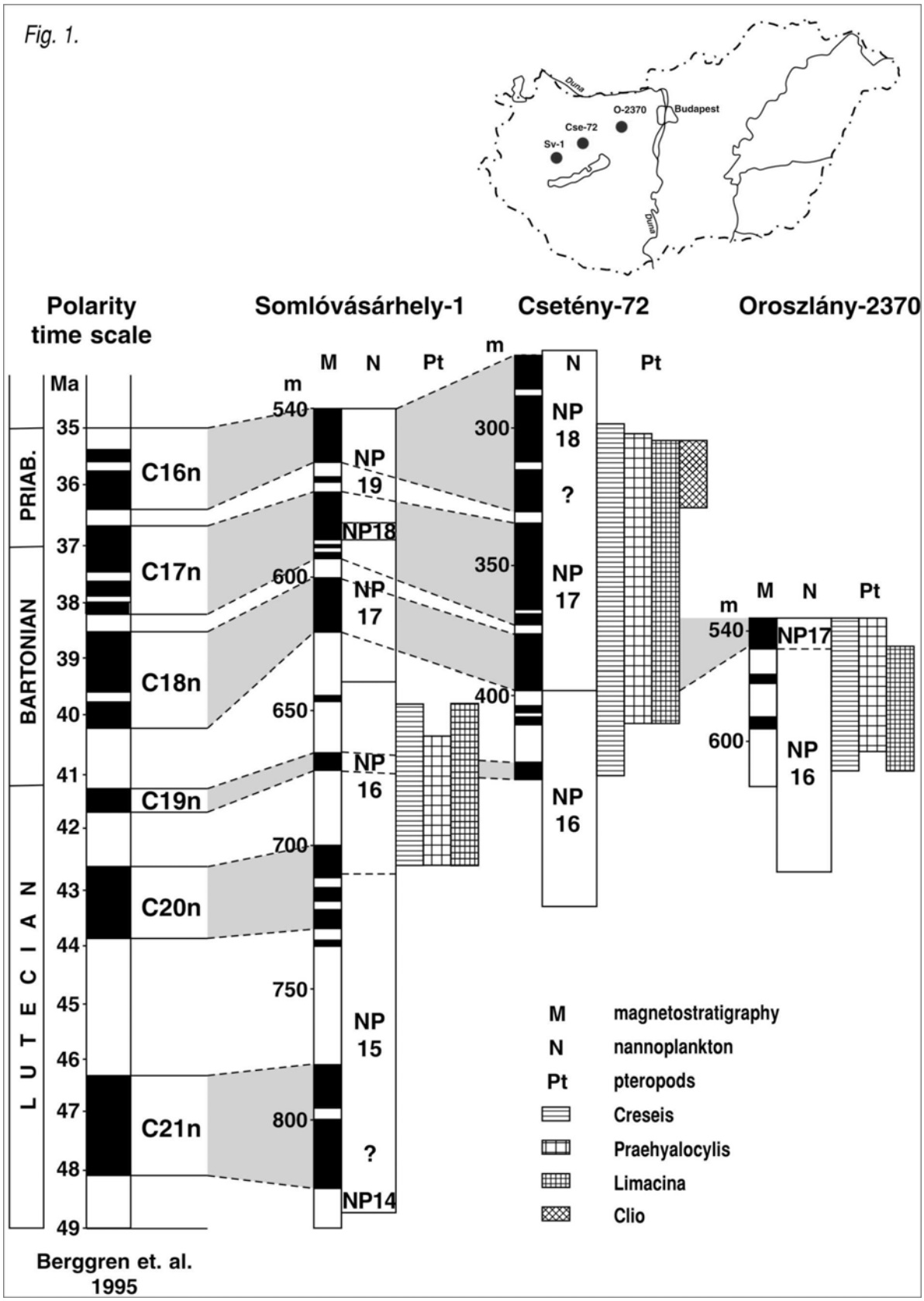

Fig. 1. Eocene. Correlation of polarity zones, nannoplankton and pteropods of the studied drillings

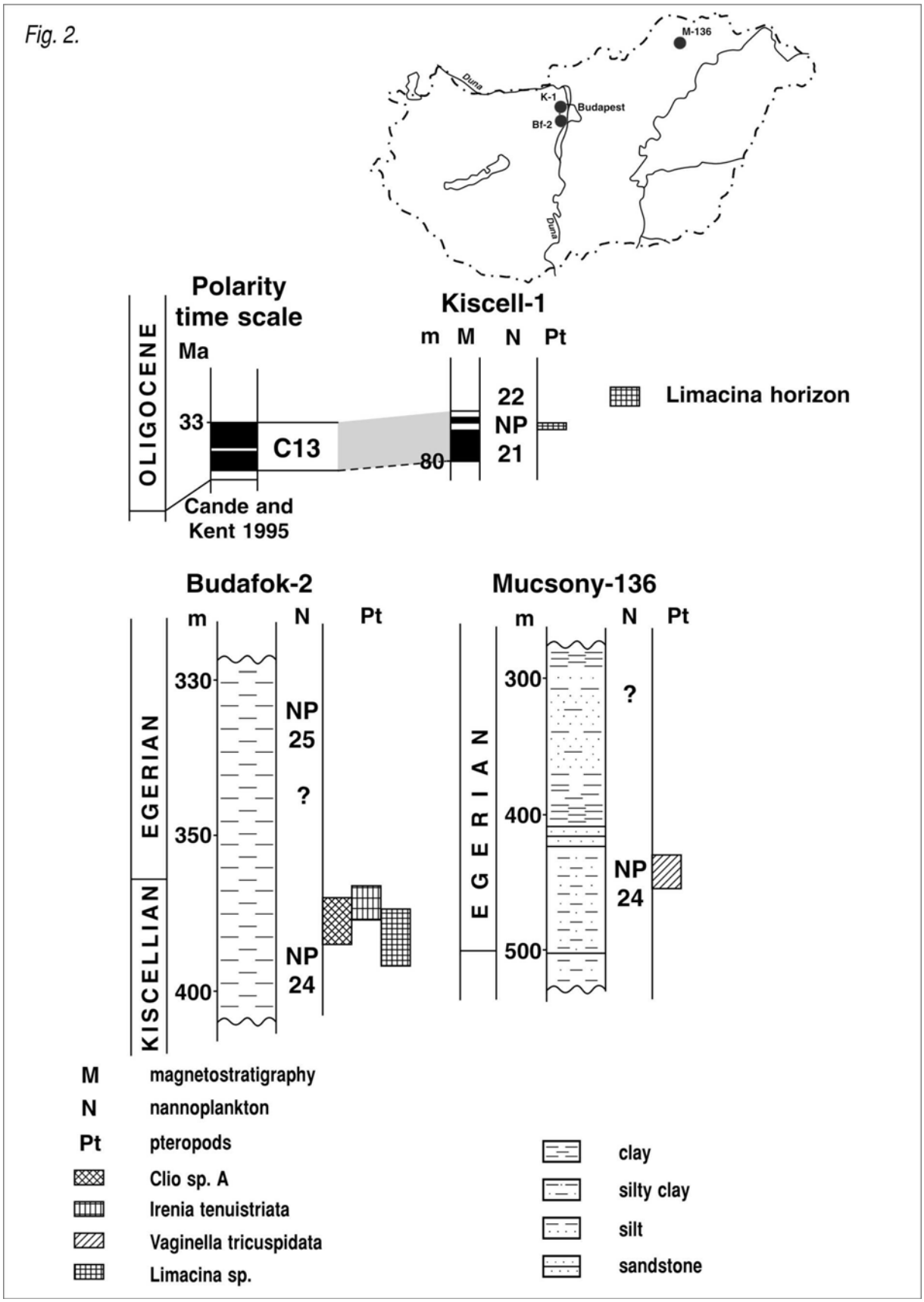

Fig. 2. Oligocene. Correlation of polarity zones, nannoplankton and pteropods of the studied drillings

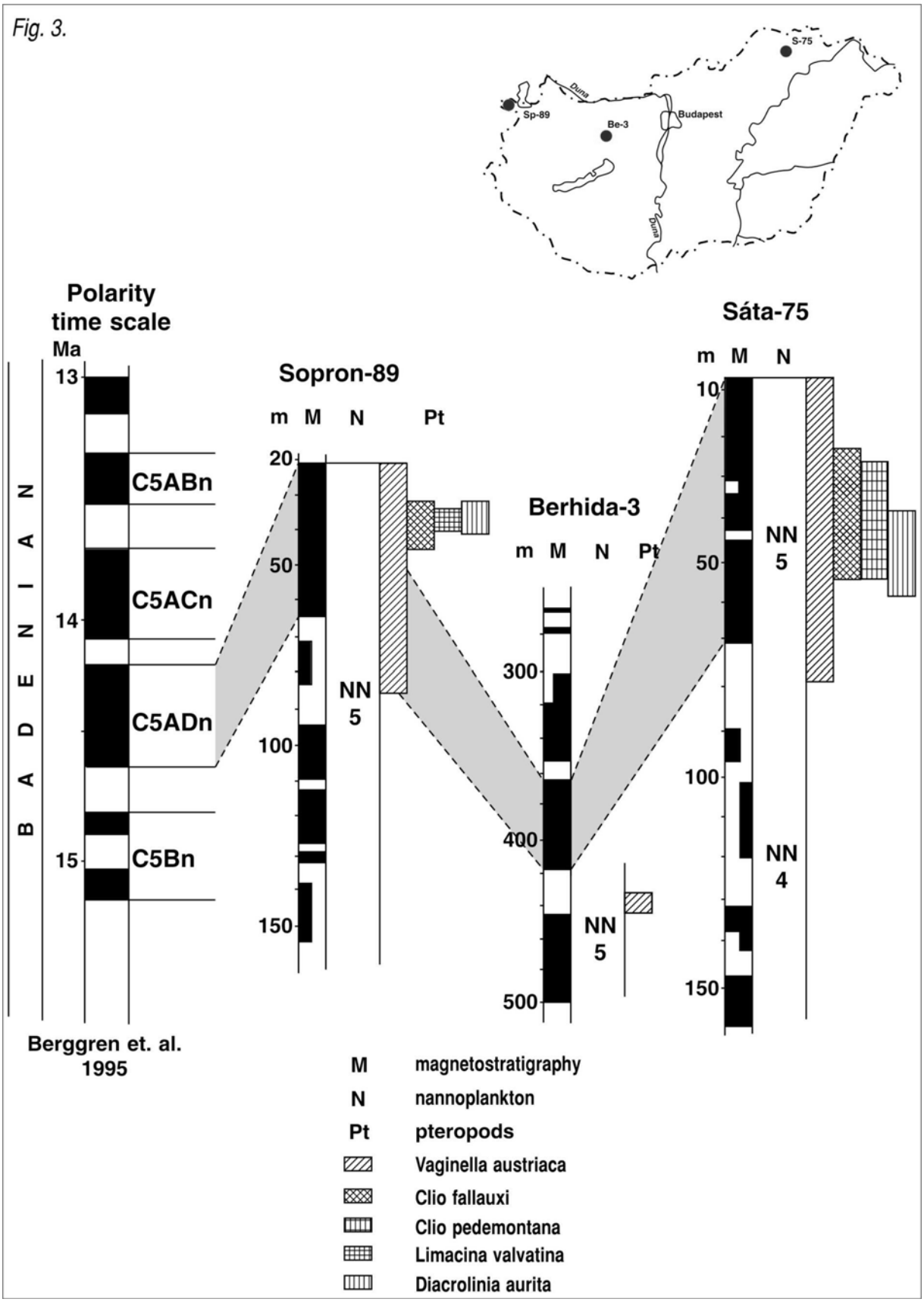

Fig. 3. Miocene. Correlation of polarity zones, nannoplankton and pteropods of the studied drillings

occured in the Early Kiscellian (Early Oligocene) at about 33,2 Ma ago in NP 21/22 nannozone, chron C13n (Kiscell-1 borehole, Báldi 1986, Korpás et al. 1999) (Fig. 2.).

The most characteristic species are *Limacina hospes* (ROLLE, 1861), *Praehyalocylis raricostata* (NOSZKY, 1940*), Irenea tenuistriata* (SEMPER, 1861), *Clio jacobae* JANSSEN, 1989, and some probably new *Clio* species.

The presence of *Ireneia tenuistriata* marks the base of pteropod zone 16 (Janssen & King, 1988), which corresponds to the Early part of Late Oligocene.

The Egerian deposits (the upper part of the Late Oligocene) contain a poor pteropod fauna. *Vaginella tricuspidata* ZORN & JANSSEN, 1993 is an important species of correlation of Late Oligocene deposits in Europe (Zorn & Janssen, 1993). This species was recognised in North Hungary (Mucsony-136 borehole, NP 24/25 nannozone, Báldi-Beke in Zorn & Janssen, 1993) (Fig. 2.).

MIOCENE PLANKTONIC GASTROPODS

Miocene marine sediments in 43 localities contain 11 species of 6 genera (*Limacina, Clio, Diacrolinia, Creseis, Vaginella, Styliola*) distributed all over Hungary. The magnetic zones were determined in three boreholes (Sopron Sp–89, Berhida Be–3, Sáta St–75) and the zones based on nannoplankton have been correlated with the time scale of Berggren et al. (1995) (Fig. 3).

The first planktonic gastropod (*Vaginella austriaca* KITTL, 1886) occurred in the Karpatian (Middle Miocene). Late Egerian, Eggenburgian and Ottnangian (Early Miocene) sediments have not yielded any pteropods yet.

Vaginella austriaca can be found in the Karpatian Schlier (Garáb Formation) NN4 nannozone (Horváth & Nagymarosy, 1979) in North Hungary.

Only small number of it have been recognised at the beginning of the Early Badenian, chron c5adr around 14.9 Ma (Bohn-Havas et al., 2003).

Following this period a rapid increase is characteristic in species, specimens and geographical distribution, this time corresponds to the middle part of NN5 nannozone (Nagymarosy, 1983). About 14,5 Ma ago, (c5adn chron) a rich pteropod fauna appeared: among others *Limacina valvatina* (REUSS, 1867), *Limacina miorostralis* (KAUTSKY, 1925), *Clio pedemontana* (MAYER 1868*), Clio fallauxi* (KITTL, 1886*), Clio multistriata* (BELLARDI 1873), *Diacrolinia aurita* (BELLARDI, 1873) *Creseis spina (*REUSS, 1867) *Styliola subula* (QUAY & GAIMARD, 1827) at the same time accompanied by *Vaginella austriaca.* Among the above-mentioned, the latter is the most widespread in space and time (from the Late Karpatian to the end of the Middle Badenian). *Limacina miorostralis, Clio pedemontana, Clio fallauxi and Diacrolinia aurita* have been found only in the Early Badenian in Hungary, the last two species are index fossils in the Central Paratethys, restricted to the Early Badenian (Bohn-Havas & Zorn, 2002).

After this boom period planktonic gastropods show a rapid decrease in the diversity and the number of specimen. The last pteropods have been found at the end of chron c5adn about 14.2 Ma ago in Hungary.

The mass occurrence of *Limacina* (=*Spiratella* horizon) that is very characteristic to the Late Badenian deposits in the Central Paratethys, has not been identified in Hungary yet.

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PLATE I.

EOCENE

1. *Limacina* sp. 4., Bakonycsernye Bcs-18 borehole , 339m 47x
2. *Limacina* sp. 5., Oroszlány O-2370 borehole , 611.2m 24x
3. *Praehyalocylis annulata* (TATE), Cseteny Cse-72 borehole, 395,7m 9x
4. *Creseis hastata* ((MEYER), Csetény Cs-72 borehole, 395m 8x

OLIGOCENE

5. *Vaginella tricuspidata* (ZORN & JANSSEN), Mucsony M-136 borehole, 430m 15x
6. *Irenea tenuistriata* (SEMPER), Romhány 10x
7. *Praehyalocylis raricostata* (NOSZKY) Budapest, Kiscell 10x

MIOCENE

8. *Vaginella austriaca* KITTL, Sopron Sp-89 borehole, 37m 90x
9. *Vaginella austriaca* KITTL , Paks P-4/c borehole, 563.5m 90x
10. *Limacina valvatina* (REUSS), Paks P-4/c borehole, 563.5m 90x
11. *Diacrolinia aurita* (BELLARDI), dorsal, Sopron Sp-89 borehole, 37m 6x
12. *Diacrolinia aurita* (BELLARDI), ventral Sopron Sp-89 borehole, 37m 6x
13. *Clio fallauxi* (KITTL), Sopron Sp-89 borehole, 37m 8x

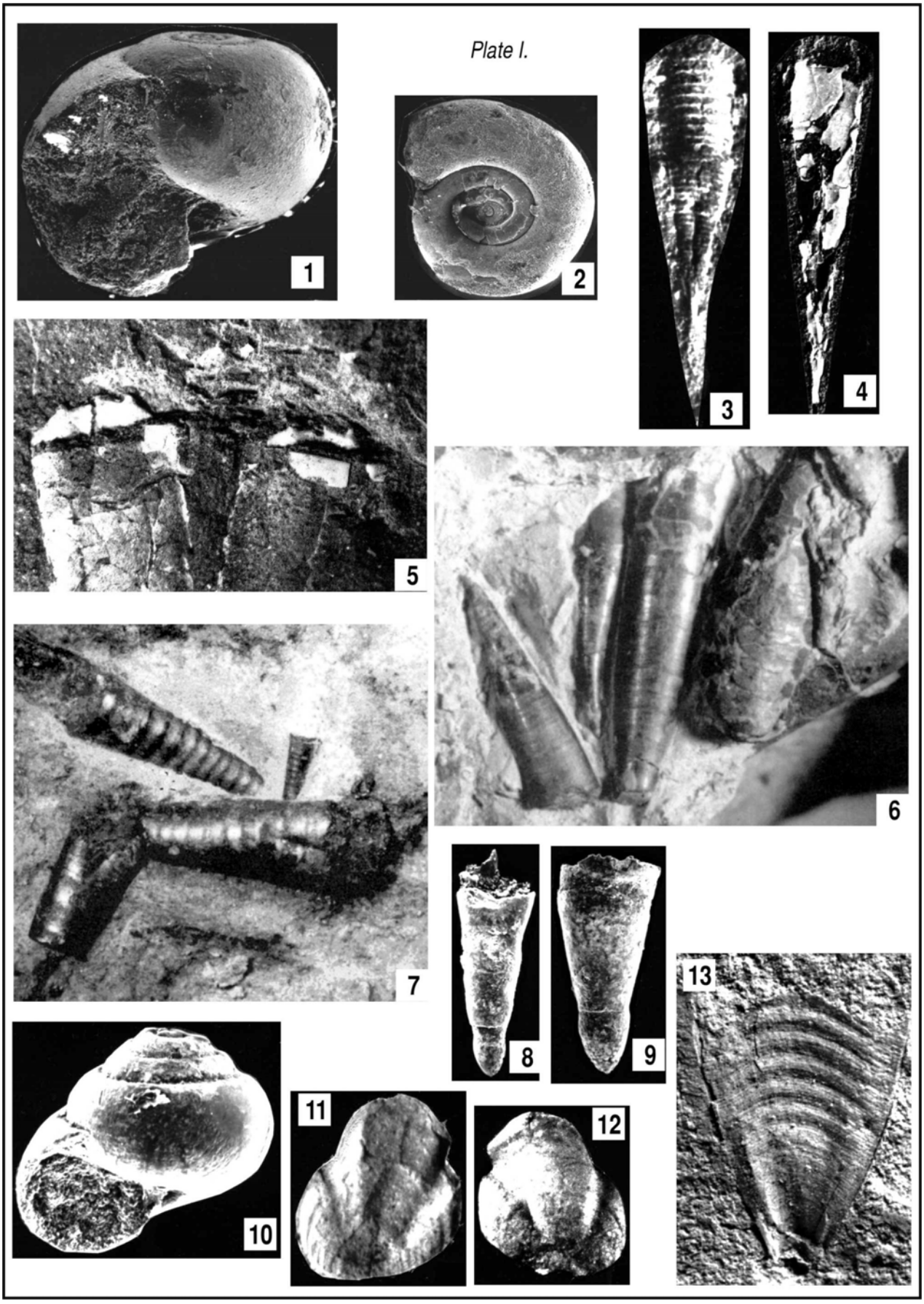
Plate I.
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