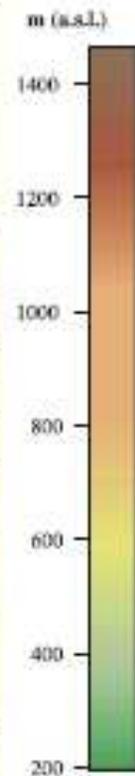
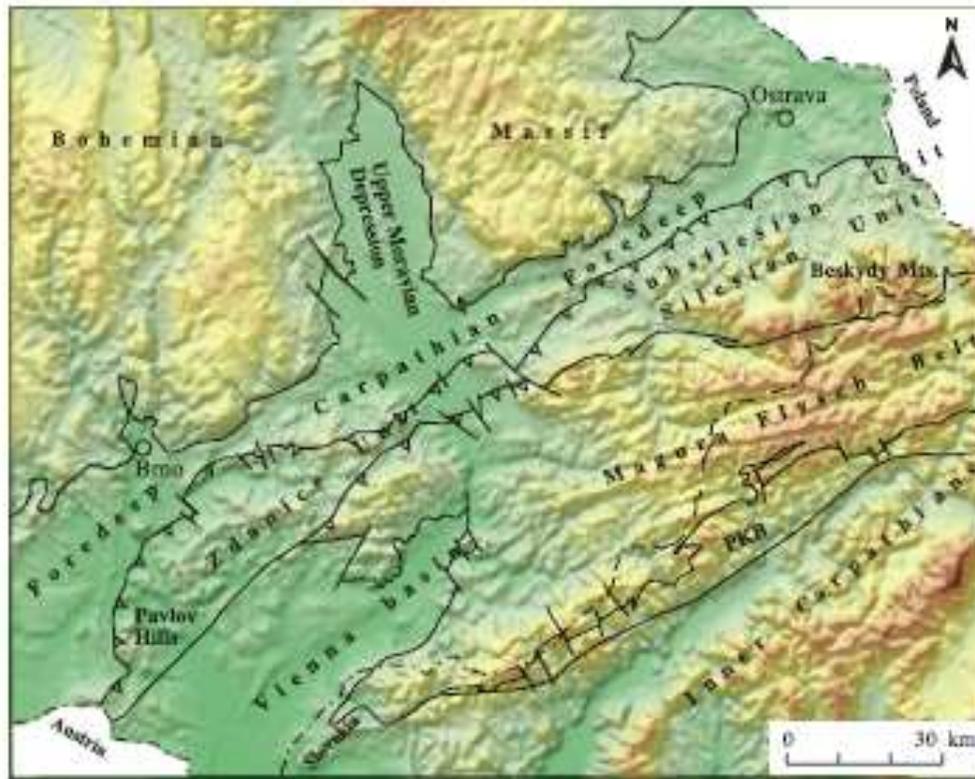


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Figure 21. Topographic map of the Western Carpathians and their European foreland in Moravia.

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Figure 1. Generalized geologic map of the Alpine–Carpathian orogenic system of Europe. Study area is located in the box. The inner zones of the Alpine–Carpathian orogen are shown in blue. Modified from Picha (1996). Cross section of AA' is shown in Figure 2. 8 # , ;\$

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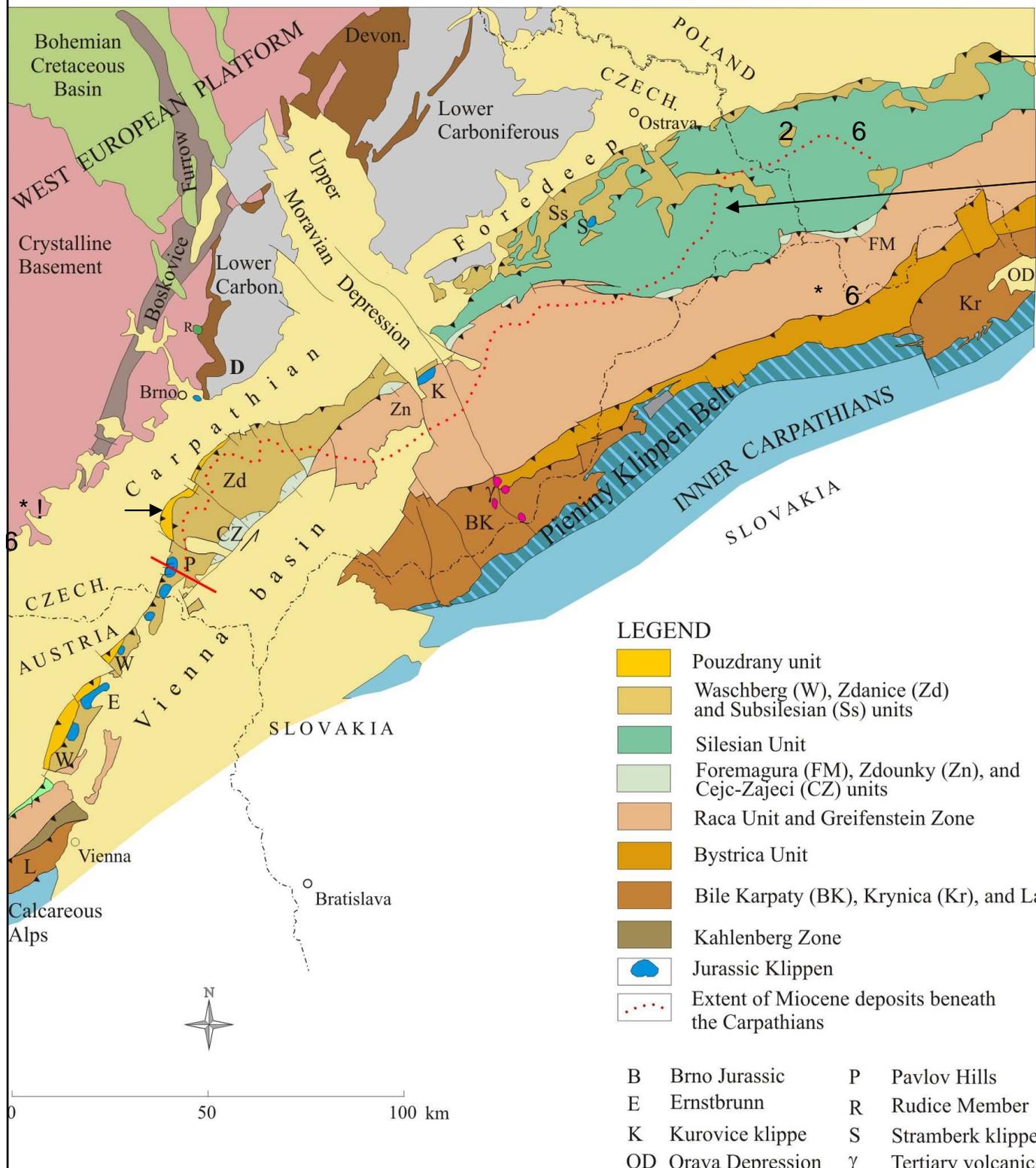
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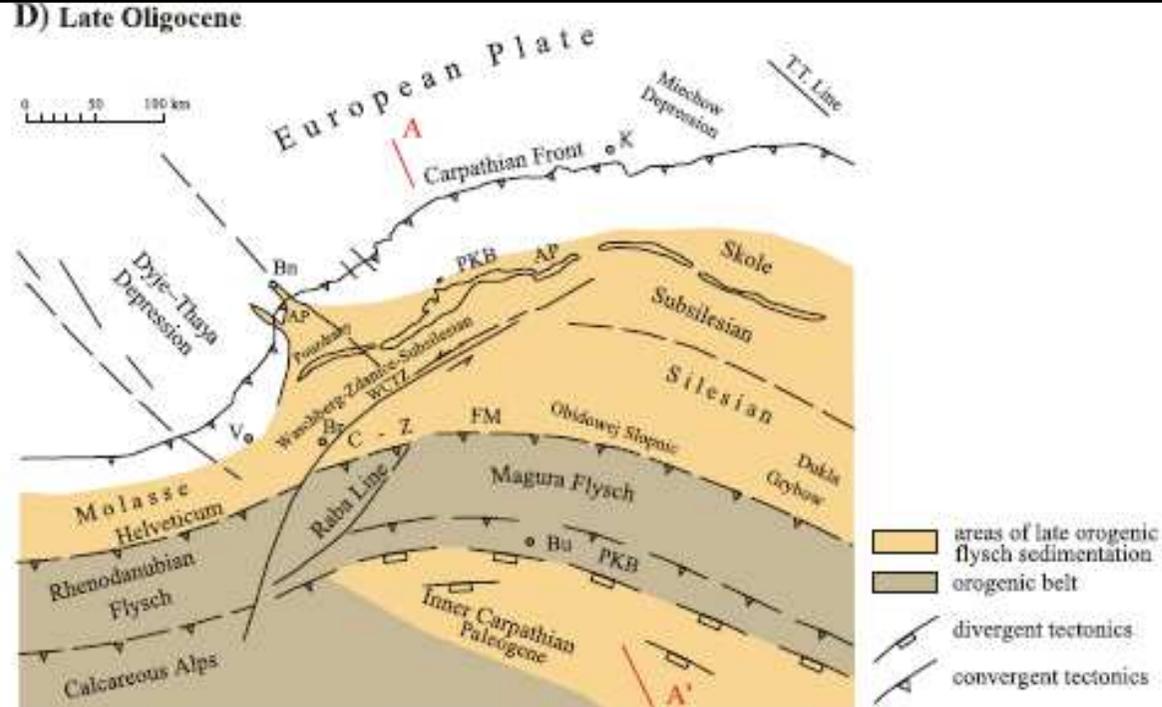


Figure 5. (cont.). In the Late Cretaceous (C), the divergent regime of the Tethyan margins changed into a convergent regime; and the motion along the Western Carpathian transfer zone reversed from dextral to sinistral. The sedimentary system spread farther northwest over the foreland. In the late Oligocene (D), the inner Magura unit was deformed and uplifted, whereas the Krosno-type flysch synorogenic sedimentation continued in the external zones of the Outer Carpathian system. The Inner Carpathian Paleogene basin formed on the top of the Inner Carpathian nappes. Line AA' marks the section used for the geotectonic reconstructions in Figure 6. AP = autochthonous Paleogene; Bn = Bmo; Br = Bratislava; Bu = Budapest; C-Z = Cejc-Zajeci unit; FM = Fore-Magura unit; K = Krakow; OK = Outer Klippen Belt carbonate buildups; PKB = Pieniny Klippen Belt; S = Stamberk carbonate buildup; V = Vienna; WCTZ = Western Carpathian transfer zone.

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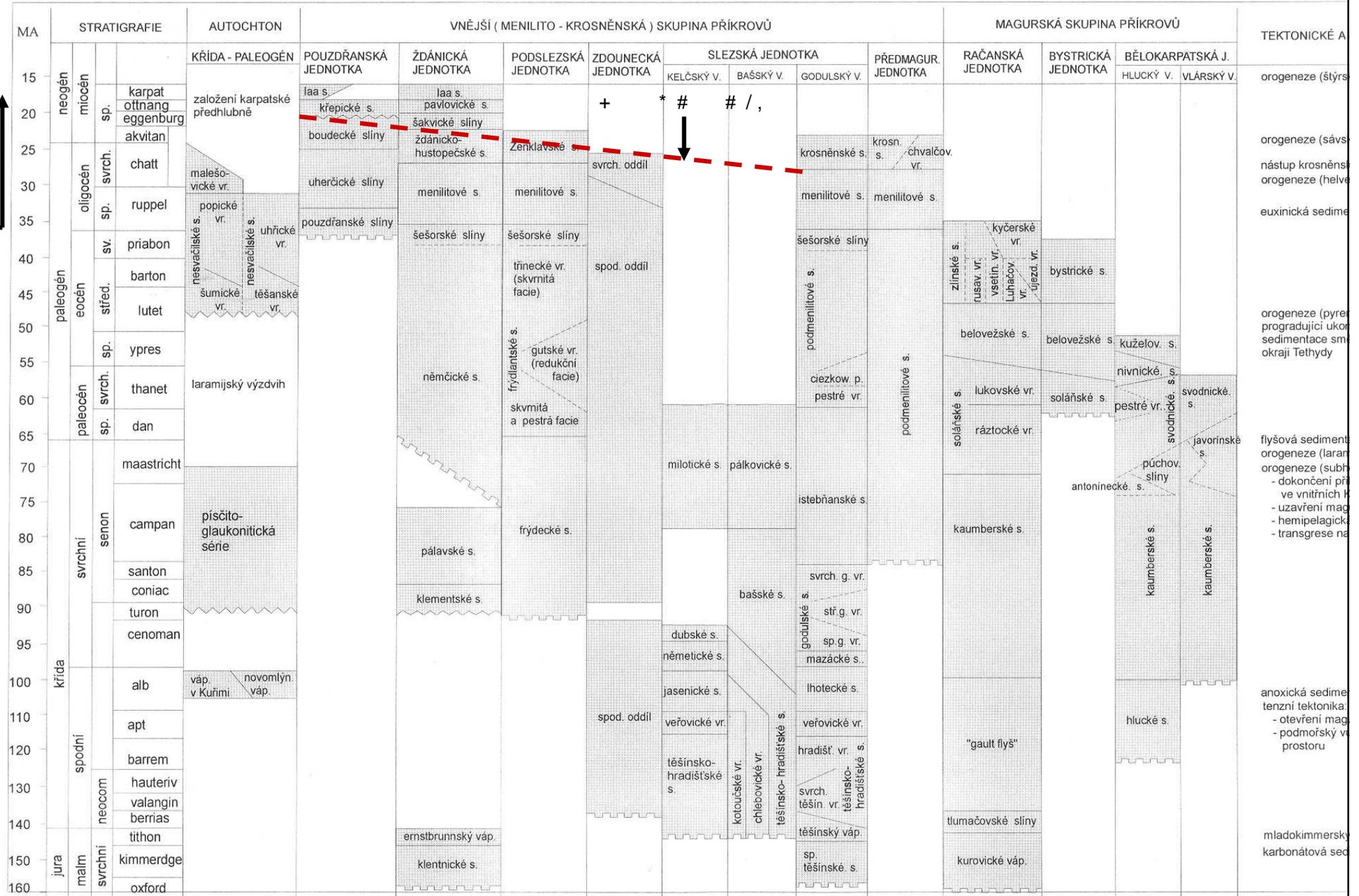
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LITOSTRATIGRAFIE JURY AŽ SPODNÍHO MIOCÉNU AUTOCHTONU A FLYŠOVÉHO PÁSMA MORAVSKO-SLEZSKÝCH KARPAT



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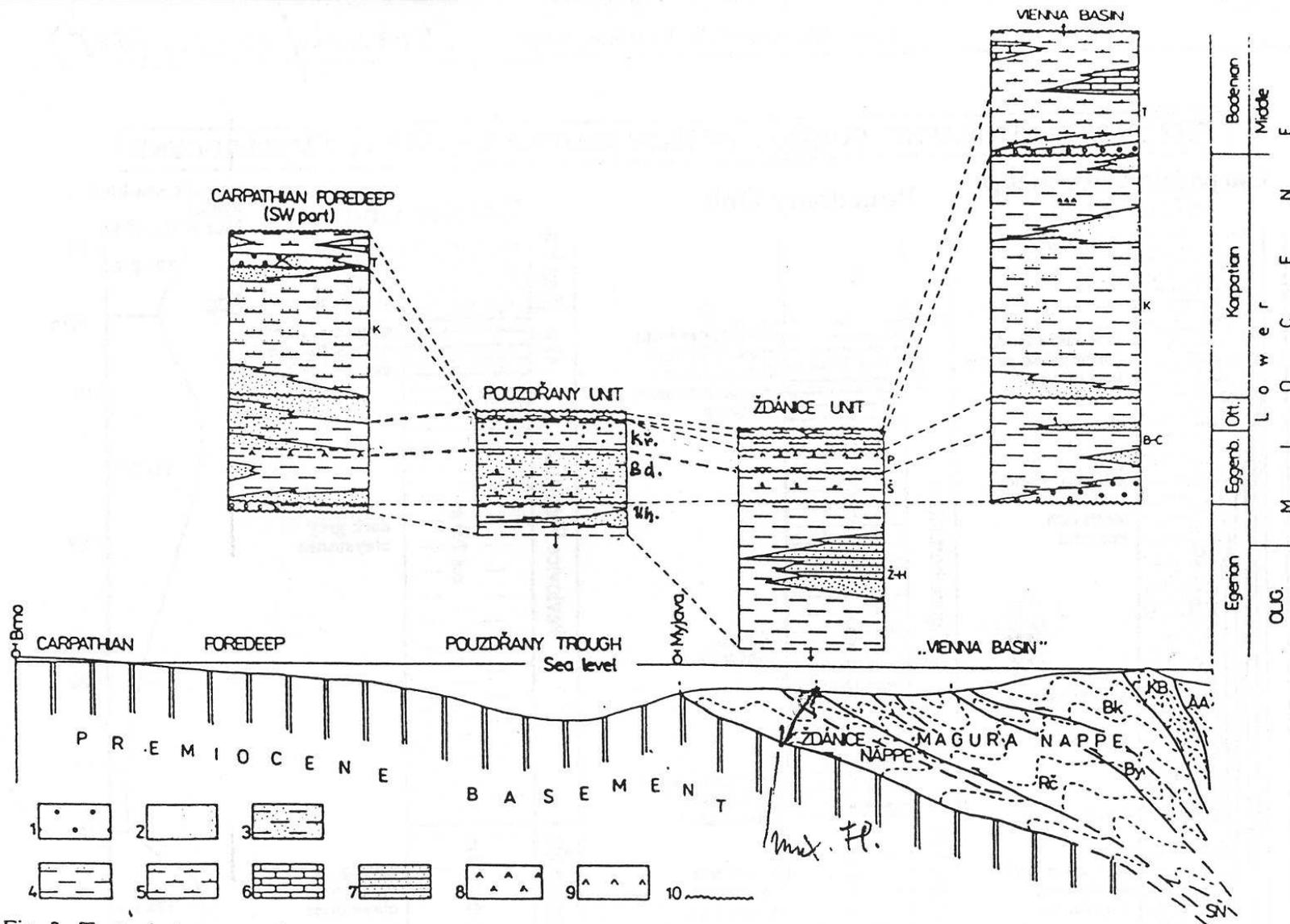


Fig. 2. Tectonic interpretation of the South Moravia during the earlier Eggenburgian (bellow); main lithofacies in the Egerian - Badenian time (top)

Explanations: 1 - Conglomerates, 2 - Sands, sandstones, 3 - Sandy clays, 4 - «Schlier», 5 - Calcareous clays (T-«Tegel», 6 - Biogenic limestones, 7 - rhythmic alternation of sandstones and claystones («Krosno» lithofacies), 8 - Tuffites, 9 - Discordance, 10 - Zdanice - Hustopeče Formation, Kř - Křepice Formation, S - Sakvice Marls, P - Pavlovce Member, B-C - Bathysiphon-Cyclammina «Schlier», K - Karpathian «Schlier», T - «Tegel», AA - Austroalpine, KB - Klippen Belt, Bk - Bílé Karpaty Unit, By - Bystrica Unit, Rc - Rača Unit, SN - Silesian Nappe

(Strašník - Krystek - Brzobohatý 1995) - upraveno

Bd. - Boudky Fu.  
Uh. - Uherčice Fu.

CHRONOSTRATIGRAPHIC CORRELATIONS IN SOUTH-MORAVIAN LOWER MIOCENE

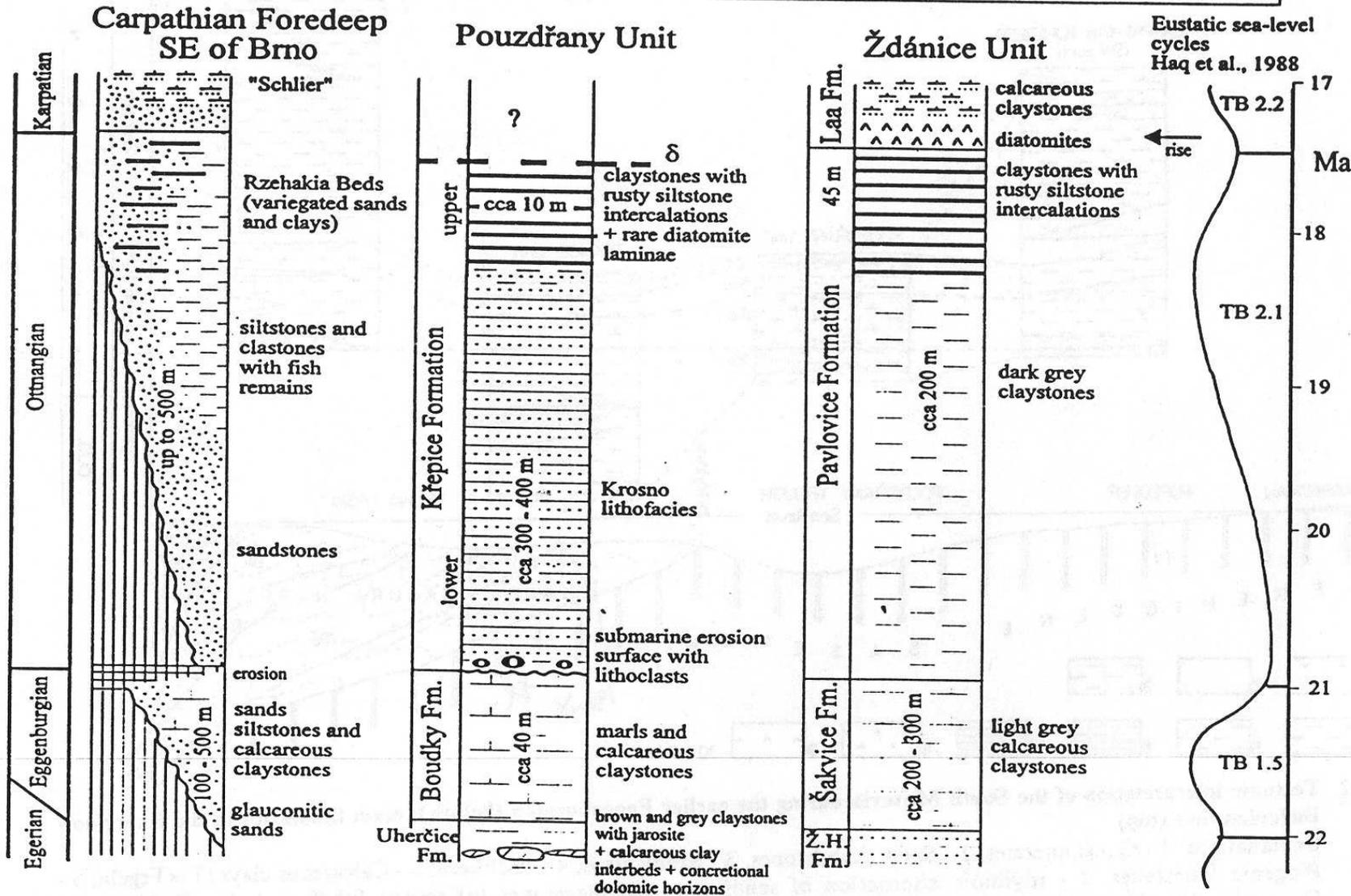
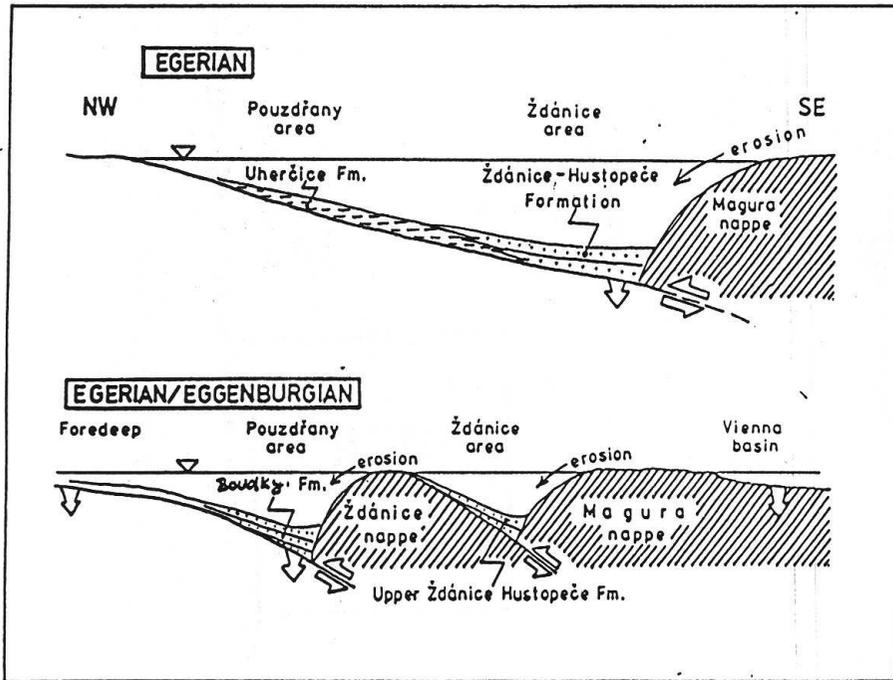


Fig. 1: Chronostratigraphic correlations of the Lower Miocene deposits in South Moravia.

|             |              |                    |                   |                    |                    |                  |
|-------------|--------------|--------------------|-------------------|--------------------|--------------------|------------------|
| OTTOMANGIAN |              |                    |                   |                    | KŘEPICE FORMATION  |                  |
|             | EGGENBURGIAN |                    | KŘEPICE FORMATION | ŠAKVICE MARL       | KŘEPICE FORMATION  | BOUDKY FORMATION |
|             |              |                    | BOUDKY MARL.      |                    | BOUDKY MARL        |                  |
| EGERIAN     |              | UHERČICE FORMATION | KŘEPICE FORMATION | UHERČICE FORMATION | UHERČICE FORMATION |                  |
|             |              | BOUDKY BEDS        | BOUDKY MARL       |                    |                    |                  |

Tab.1: Comparison of stratigraphic divisions of Miocene of the Pouzdřany Unit. (Krhovský et al. 1995)

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Fig. 17: Development of the Flysh-Belt nappe system in Southern Moravia, paleogeographic reconstruction, not to scale. The cross-sections show the Pouzdřany and Ždánice sedimentary areas at the time of restricted communication with the open sea and illustrate the time differences in the beginning of molasse sedimentation (Krosno Facies) in the particular areas. Compiled by KRHOVSKÝ.

(Straňik - Krhovský - Brzobohatý - Hauršmid, 1991) - upraveno

CORRELATION OF LOWER MIOCENE LITHOSTRATIGRAPHIC UNITS IN SOUTH MORAVIA

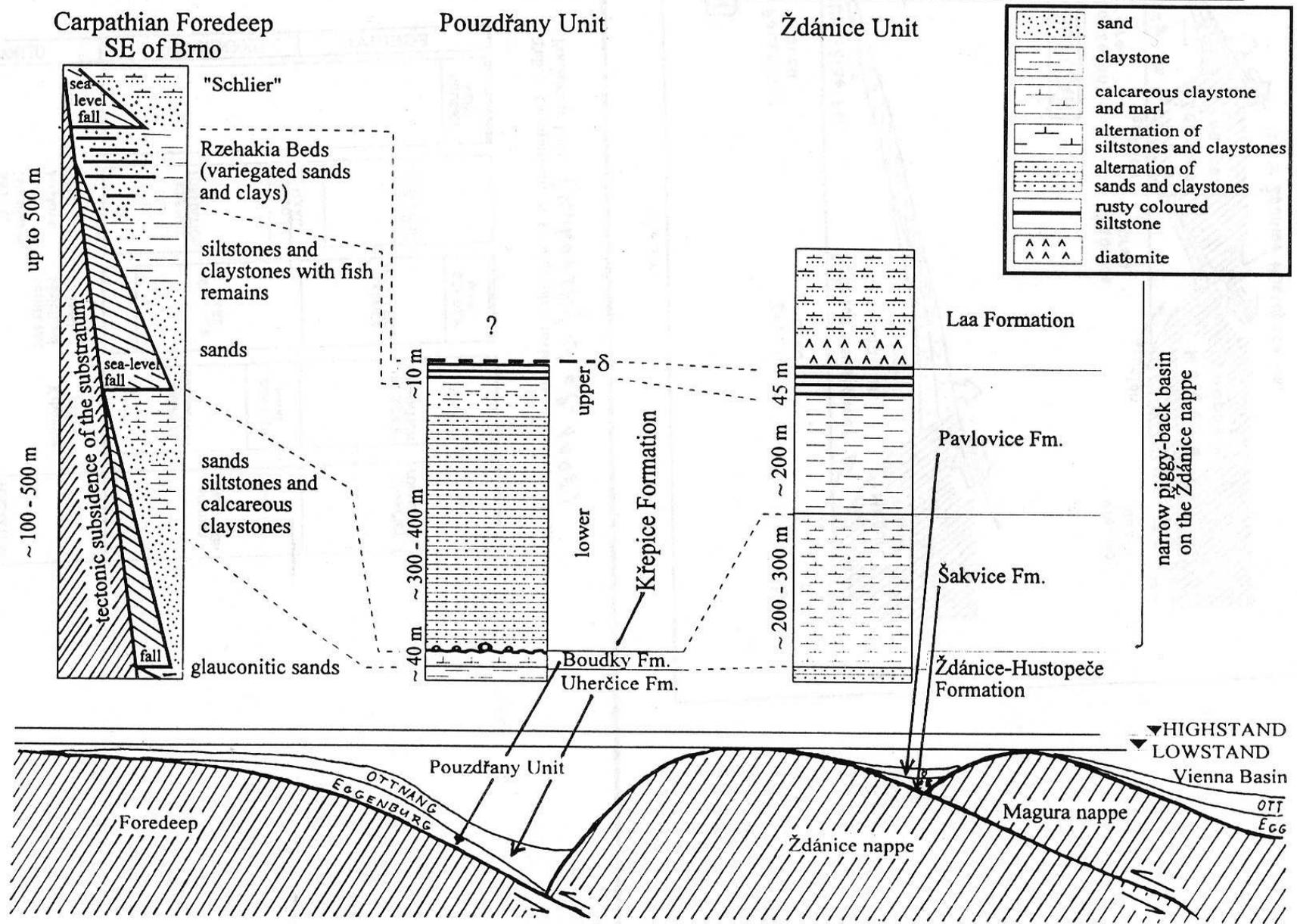
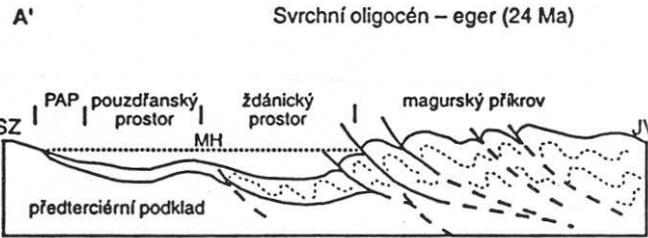
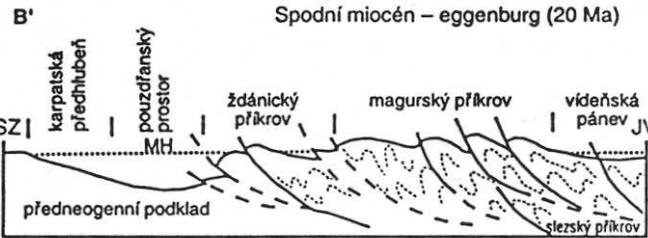
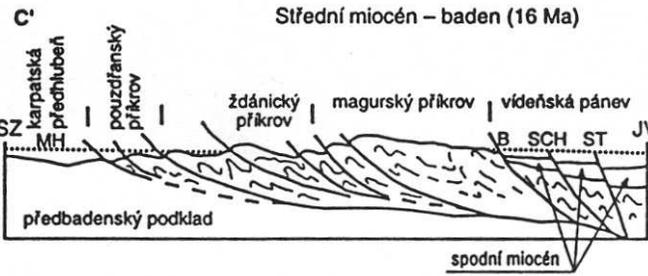
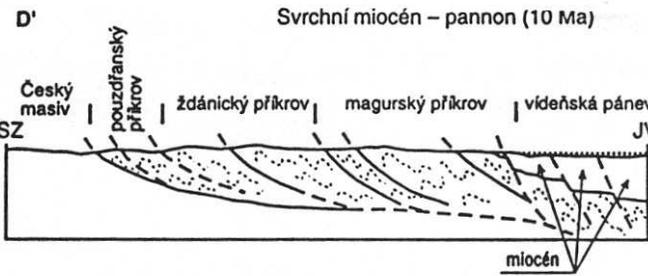
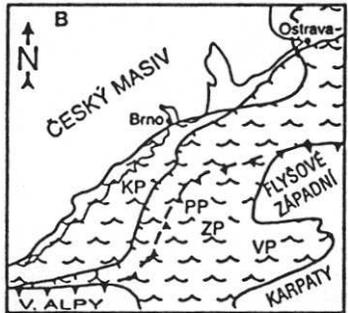
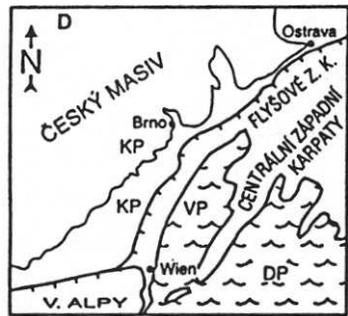


Fig. 2: Correlation of the Lower Miocene lithostratigraphic units in South Moravia.

| M.A.                                         | EPOCH         | AGE             | CENTRAL PARATETHYS | WASCHBERG UNIT              | ZDANICE UNIT                  | POUZDRANY UNIT      | BIOSTRATIGRAPHY       |                        |      |
|----------------------------------------------|---------------|-----------------|--------------------|-----------------------------|-------------------------------|---------------------|-----------------------|------------------------|------|
|                                              |               |                 |                    |                             |                               |                     | Planktic Foraminifera | Calcar. Nanno-plankton |      |
| 16.4<br>20<br>23.8<br>25<br>30<br>33.7<br>35 | Early MIOCENE | BURDIGALIAN     | KARPATIAN          | Laa Formation               | Laa Formation                 | Laa Formation       | M4                    | NN4                    |      |
|                                              |               |                 | OTTNANGIAN         | Eisenschüssige Tone / Sande | Pavlovice Fm.                 | Krepice Fm.         | M3                    | NN3                    |      |
|                                              |               |                 | EGGENBURGIAN       | Schieferige Tonmergel       | Sakvice Fm.                   | Boudky Fm.          | M2                    | NN2                    |      |
|                                              |               | AQUITANIAN      | EGERIAN            | Michelstetten Formation     | Zdanice - Hustopece Formation | Uhercice Formation  | M1                    | b                      | NN1  |
|                                              |               |                 |                    |                             |                               |                     | a                     |                        |      |
|                                              |               | CHATTIAN        | ?                  |                             |                               | P22                 |                       | NP25                   |      |
|                                              | OLIGOCENE     | RUPELIAN        | KISCELLIAN         | Thomasl Formation           | "Menilitic fm."               | Sitborice Mb.       | P21                   | b                      | NP24 |
|                                              |               |                 |                    |                             |                               |                     | a                     |                        |      |
|                                              |               |                 |                    |                             |                               |                     | P20                   |                        |      |
|                                              |               | DYNOW MARLSTONE | DYNOW MARLSTONE    | DYNOW MARLSTONE             | DYNOW MARLSTONE               | DYNOW MARLSTONE     | DYNOW MARLSTONE       | P19                    | NP23 |
|                                              |               |                 |                    |                             |                               |                     |                       |                        |      |
|                                              |               | Ottenthal Mb.   |                    |                             |                               |                     | P18                   | NP22                   |      |
|                                              | ?             |                 |                    |                             |                               | P17                 | NP21                  |                        |      |
| Late EOCENE                                  | PRIABONIAN    | PRIABONIAN      | Reingrub Formation | Nemcice Fm.                 | Sheshory Marl                 | Pouzdранy Formation |                       |                        |      |
|                                              |               |                 |                    |                             | "Green Clay mb."              | ?                   | P16                   | NP 19-20               |      |
|                                              |               |                 |                    |                             | calcareous claystones         |                     |                       | P15                    | NP18 |

Fig. 2: Correlation scheme between the Waschberg, Zdanice and Pouzdrany Units, based on the biozonation of BERGGREN et al., 1995.

(Krhovský, Rößl & Haueršmid 2001)



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Obr. 244. Paleogeografické a tektonické schéma vývoje Západních Karpat na Moravě v terciéru (Z. Stráník – R. Brzobohatý, orig.). 1 – okraj Českého masivu vystupující na povrch; 2 – dnešní okraj přesunutých Západních Karpat; 3 – vnější okraj flyšových příkrovů; 4 – mořské pánve. MH – mořská hladina; PAP – prostor autochtónního paleogénu; B – zlomový systém Bulhar; SCH – schraattenberský zlomový systém; ST – steinberský zlomový systém; RP – zbytkové (reziiduální) pánve; VP – videňská pánev; ZP – ždánický prostor; PP – pouzdřanský prostor; KP – karpatská předhlubeň; DP – dunajská pánev.

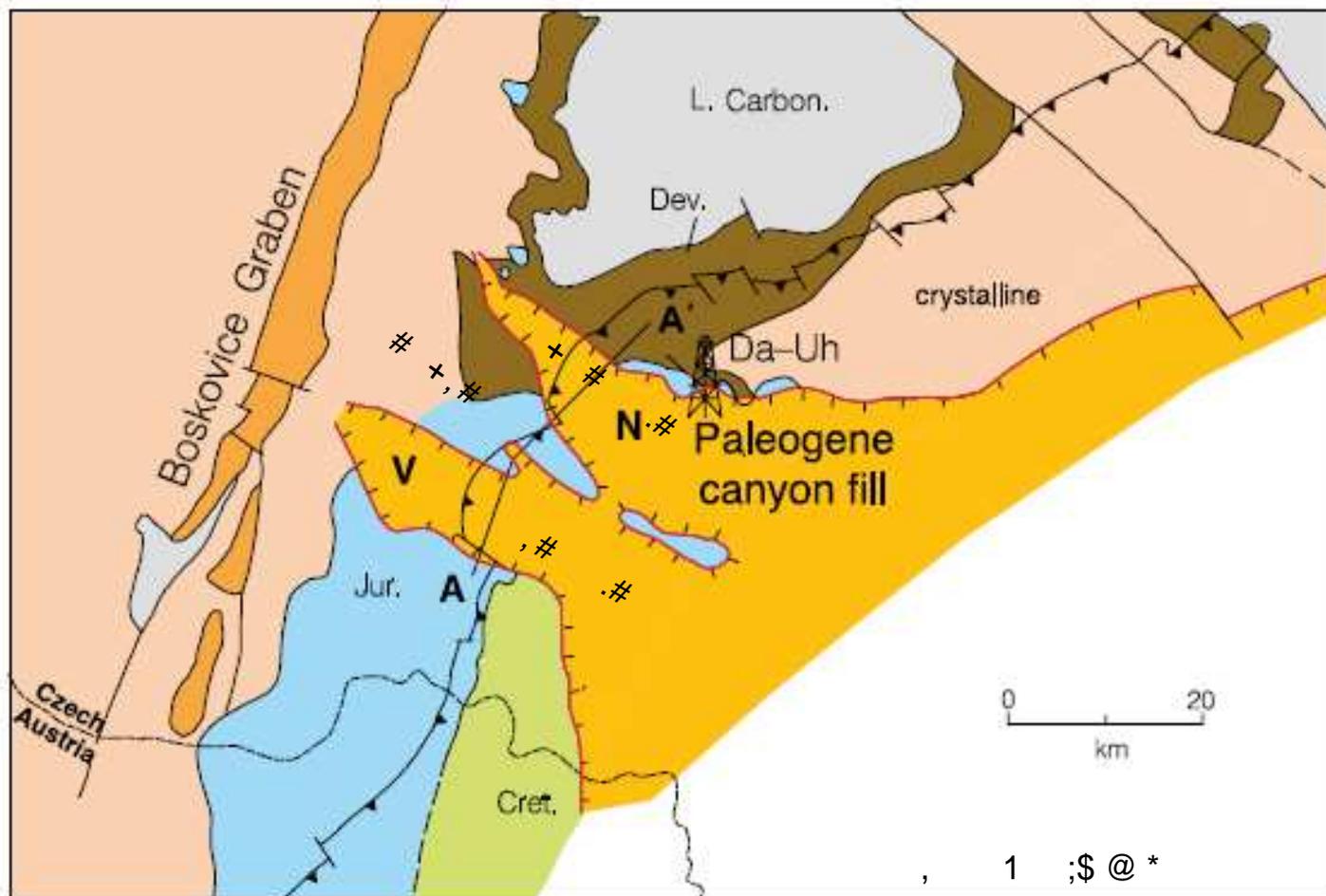


Figure 12. Pre-Neogene subcrop map showing the Nesvacilka (N) and Vranovice (V) paleovalleys cut into the European foreland plate, filled with Paleogene deposits, and later buried below the edges of the Western Carpathian thrust belt and the Neogene foredeep. Da-Uh marks the location of the Dambořice and Uhrčice oil and gas fields, respectively (Pícha, 1996). Cross section of AA' shown in Figure 13.

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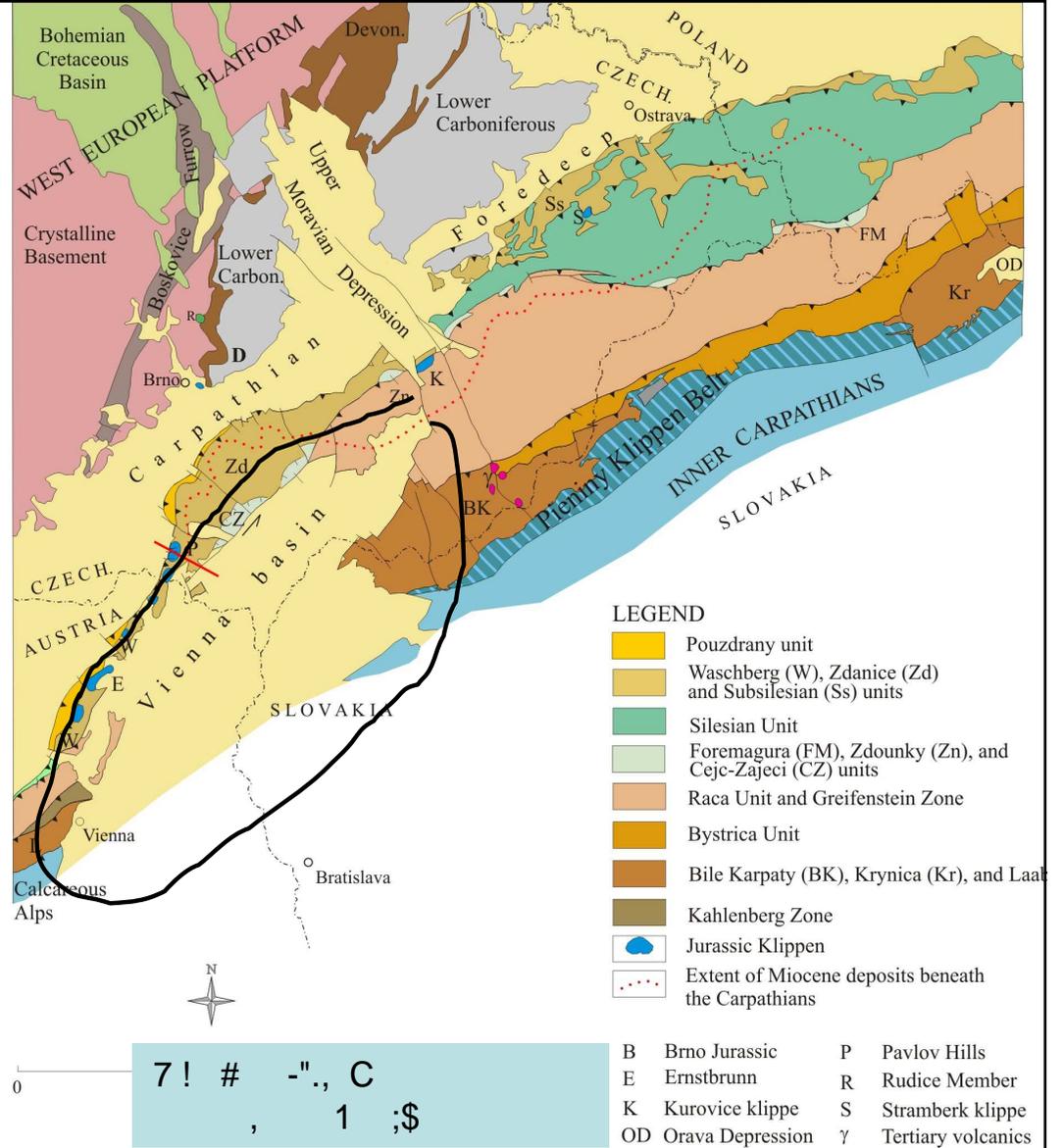
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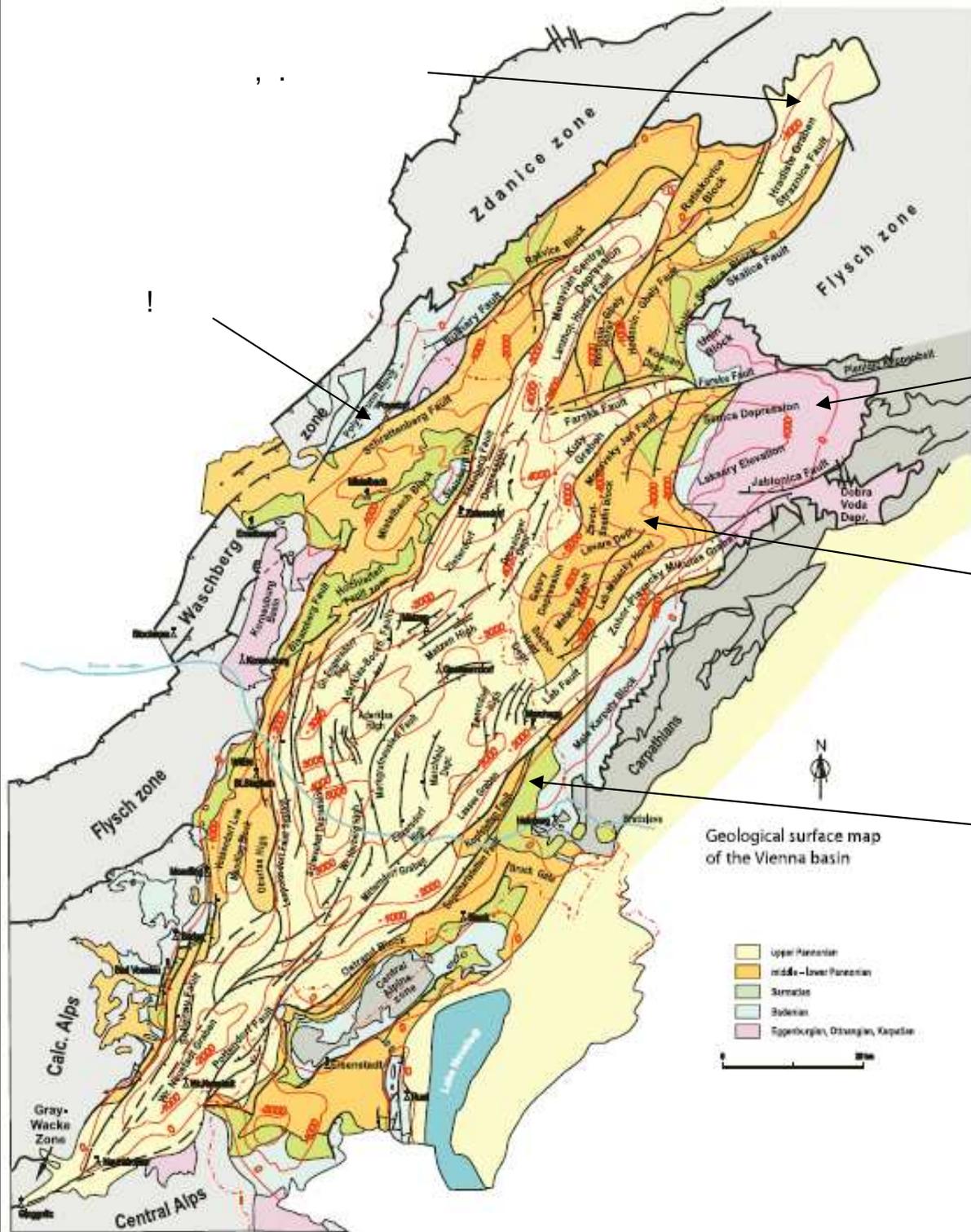


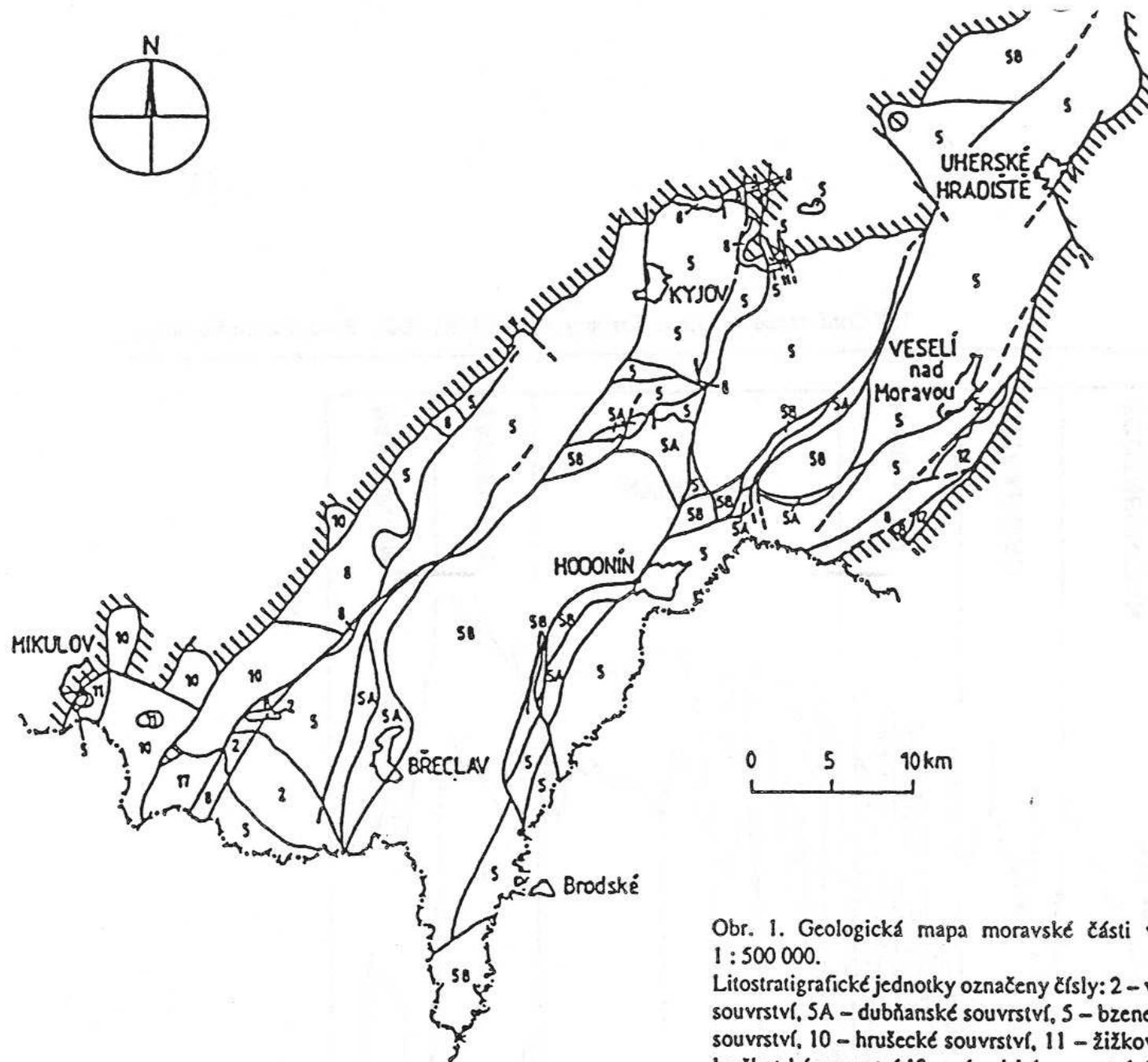
Figure 3. Geological surface map of the Vienna basin with contours of the pre-Neogene basin fill.

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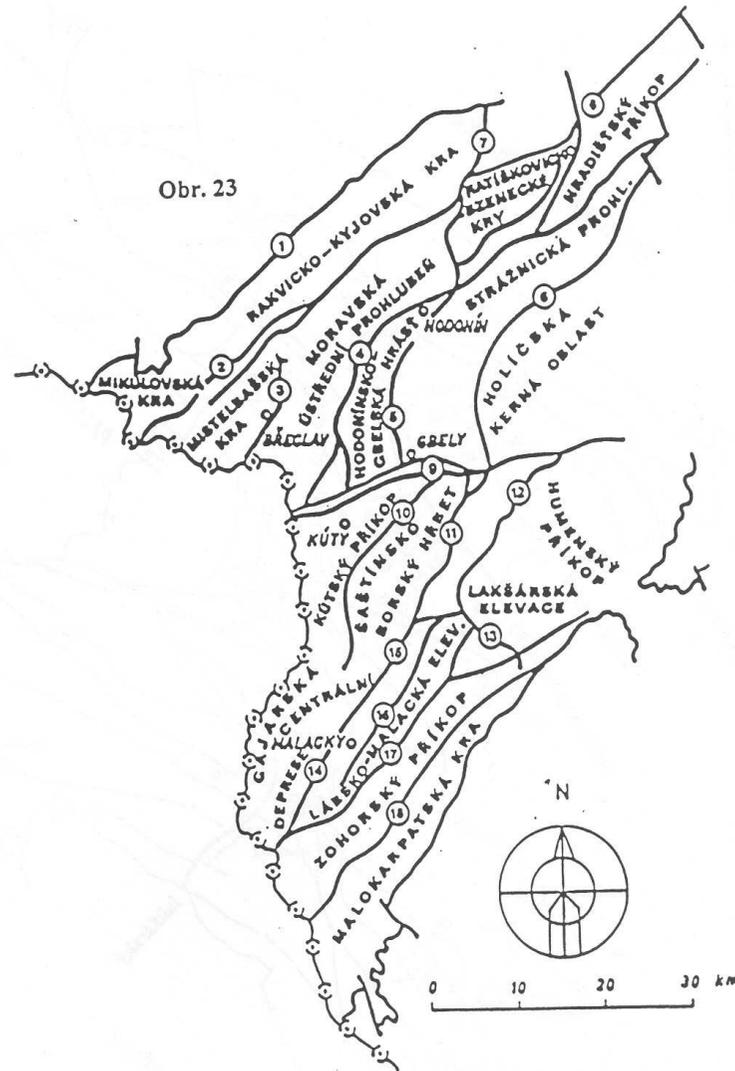
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Obr. 1. Geologická mapa moravské části vídeňské pánve v měřítku 1 : 500 000.

Litostratigrafické jednotky označeny čísly: 2 – valtické vrstvy, SB – gbelské souvrství, SA – dubňanské souvrství, S – bzenecké souvrství, 8 – blfovické souvrství, 10 – hrušecké souvrství, 11 – žižkovské a sedlecké vrstvy, 12 – lanžhotské souvrství, 13 – závodské souvrství, 17 – úvalské souvrství.

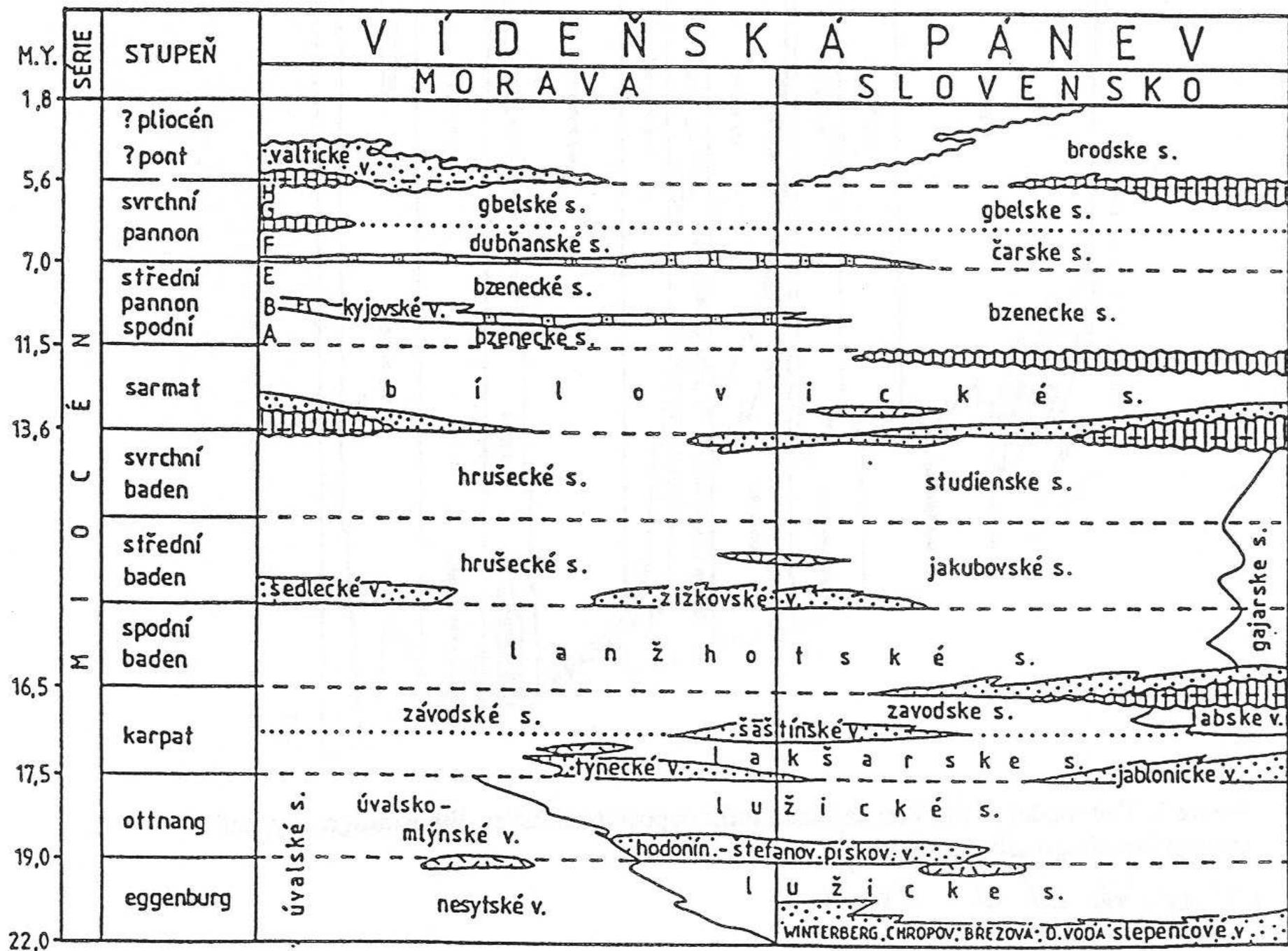




Ve vídeňské pánvi jsou na obr.23 znázorněny zlomy uvedené odpovídajícími čísly v závorce:

a/ podélné: schrattenberský zlomový systém /2/, lanžhotsko-hrušecký systém /4/, zlomy polešovický /8/, koválovský /12/, jánský /svatojánský/ /10/, medlovický, syrovínský, liděřovický, strážnicko-petrovický a skalický /6/, bulharský /1/, steinberský /3/, lábský /též lábsko-plavecký/ /17/ a lužický, hodonínsko-gbelský /5/, rohožnický /též malacký/ /16/, litavský /též okrajový malokarpatský/ /18/, šaštínský /15/, jehož součástí je jakubovský zlom /14/ a zlomy studienské, dubnický zlom, brezovský /mikulášovsko-brezovský zlom/, jablonický zlom,

b/ příčné /SZ-JV/: hlucký, napajedelský, buchlovický, lakšárský /13/, podivínské zlomy, tomecký. Směr S-J má zlom ježovský /7/, v jižní části označovaný též hodonínsko-gbelský a Z-V zlomový systém farský /9/.



Obr. 2. Korelace neogenních litostratigrafických jednotek moravské a slovenské části vídeňské pánve (stav podle ČTYROKÉHO, březen 1998b).

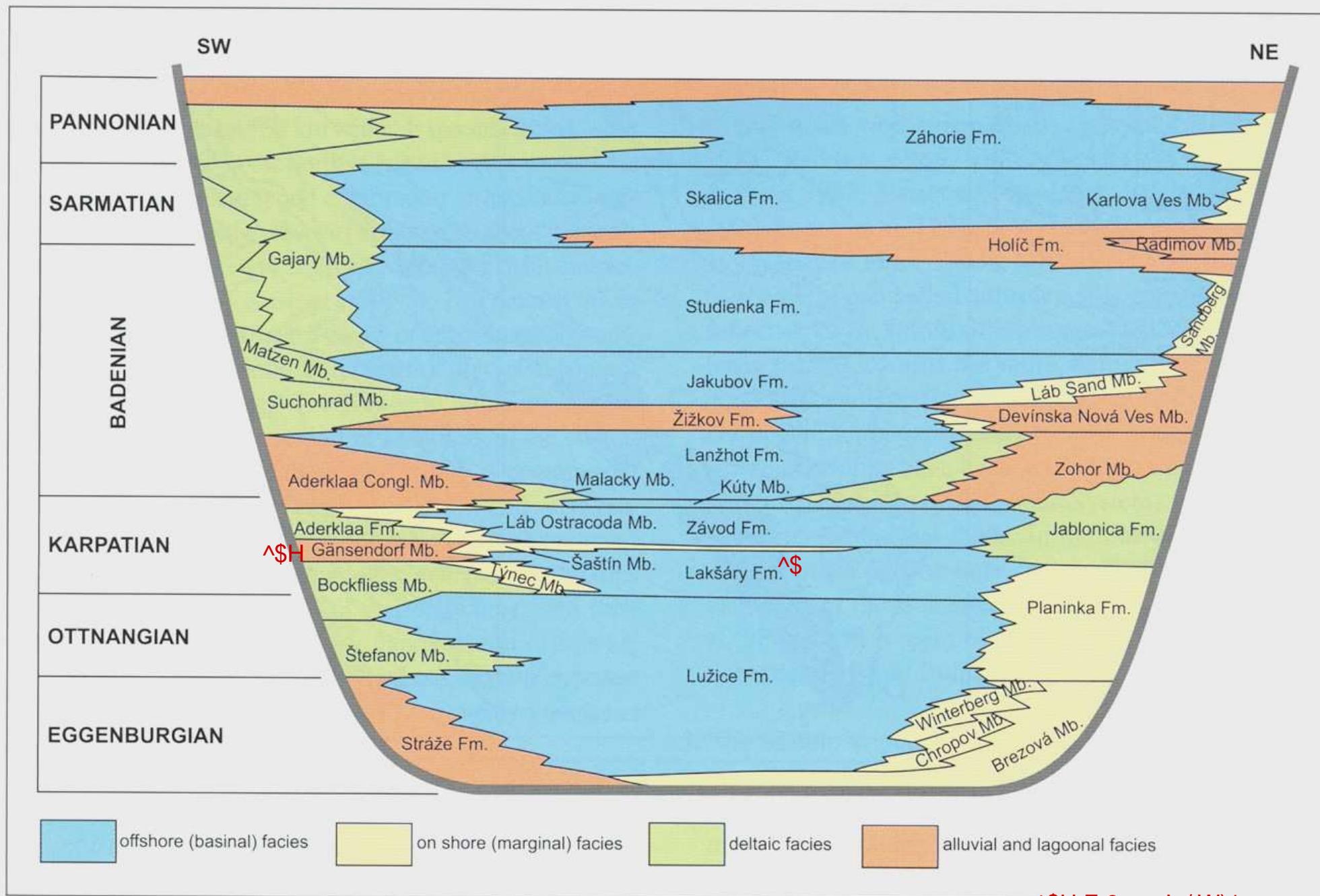


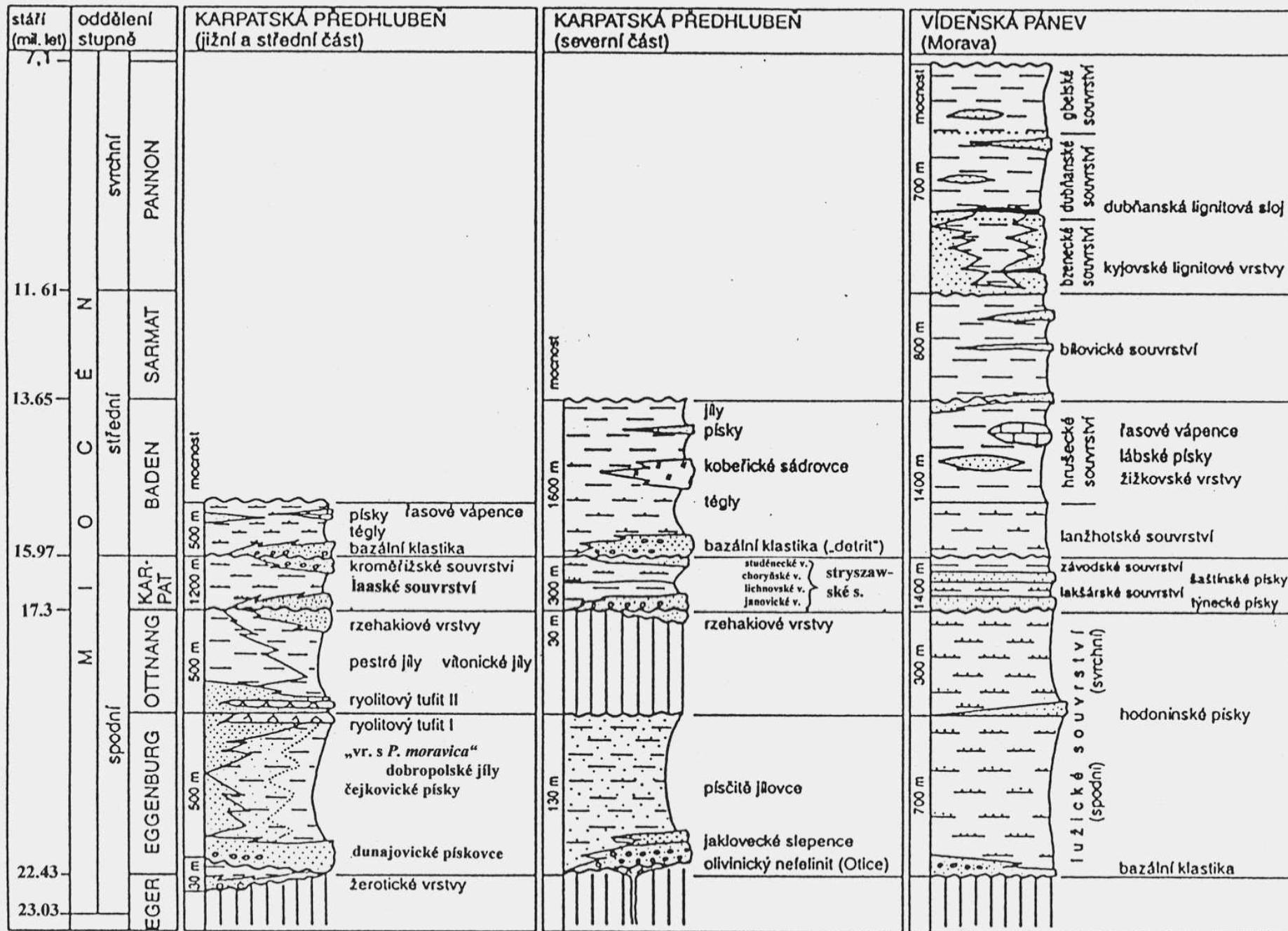
Fig. 3: Depositional systems of the Vienna Basin (modified after Baráth et al. 2001).

1B

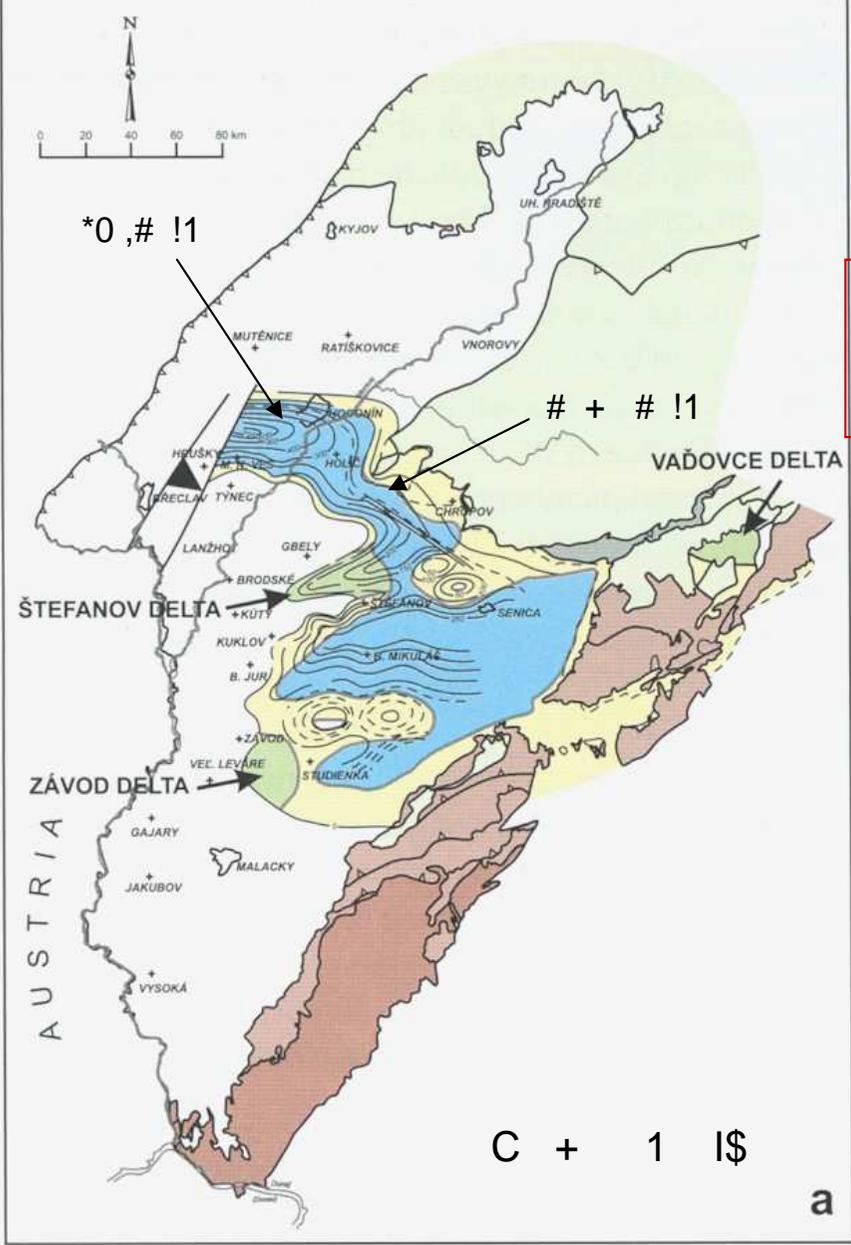
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Obr. 247. Stratigrafické schéma neogénu karpatské předhlubně a vídeňské pánve na Moravě (R. Brzobohatý, orig.).



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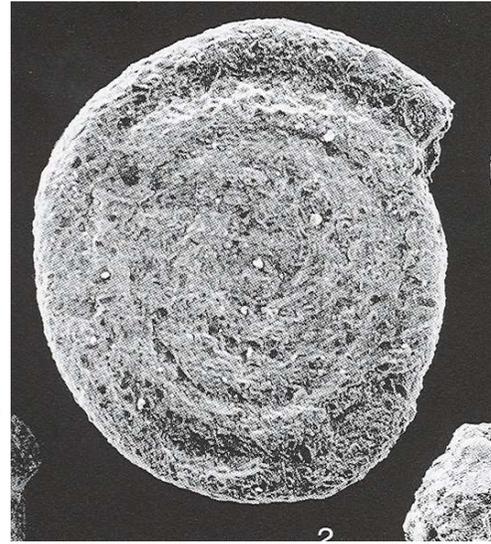
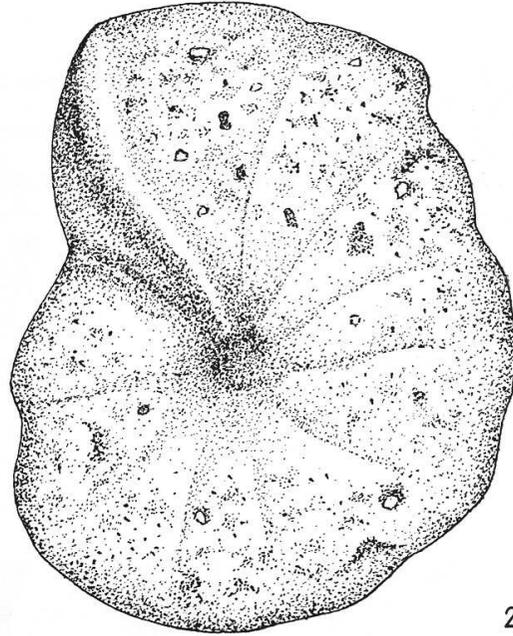
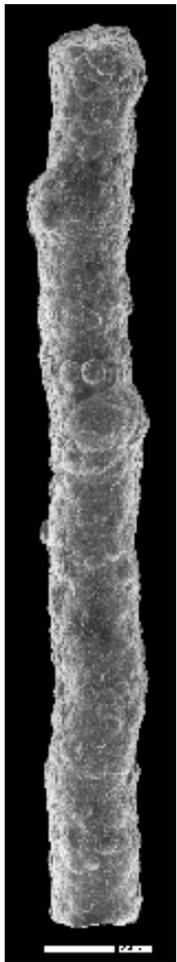
NEOGENE:  
 [yellow box] littoral  
 [green box] deltaic  
 [blue box] neritic  
 [white box] non-depositional area  
 [line with triangles] nappes boundaries  
 [line with numbers] thickness of sediments  
 [line with triangles] fault zone  
 [wavy line] present erosive boundary of dep.  
 [arrow] transport direction

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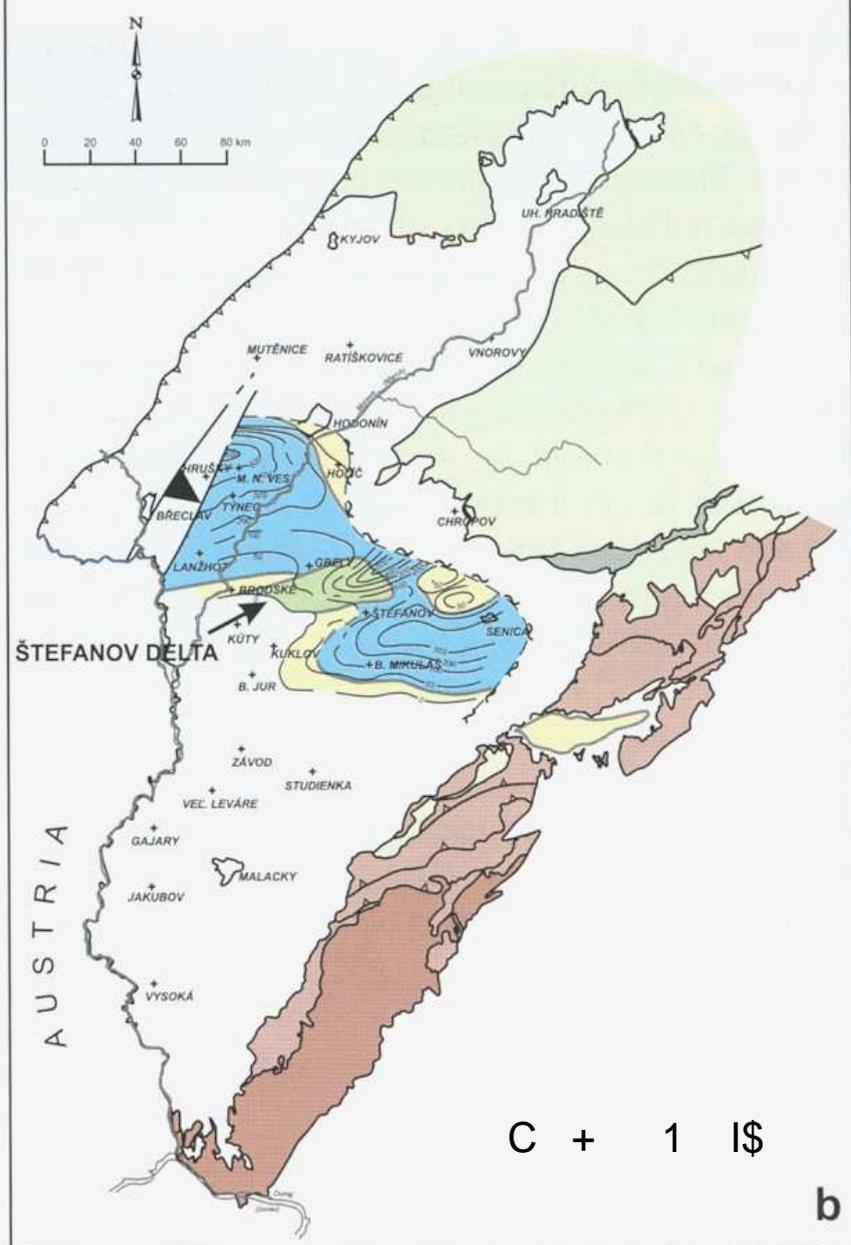
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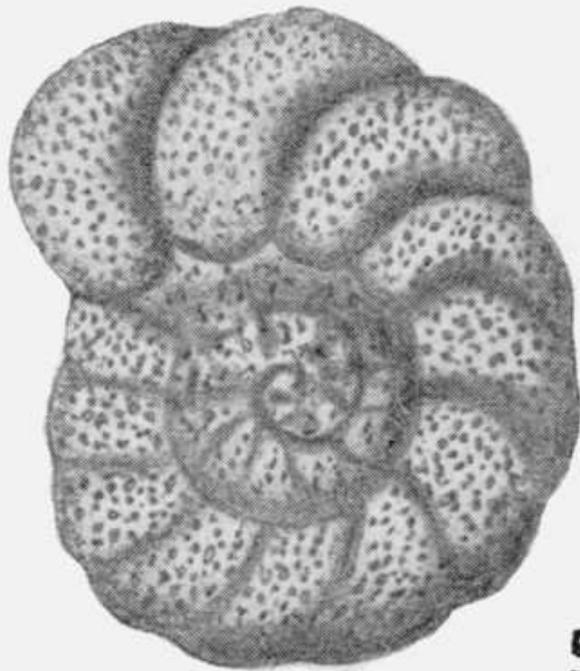
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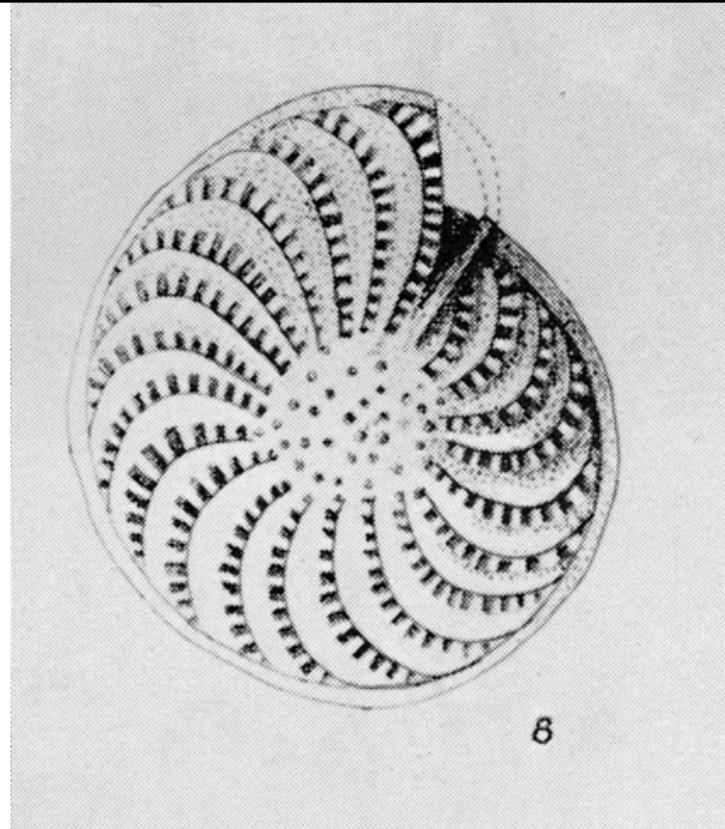
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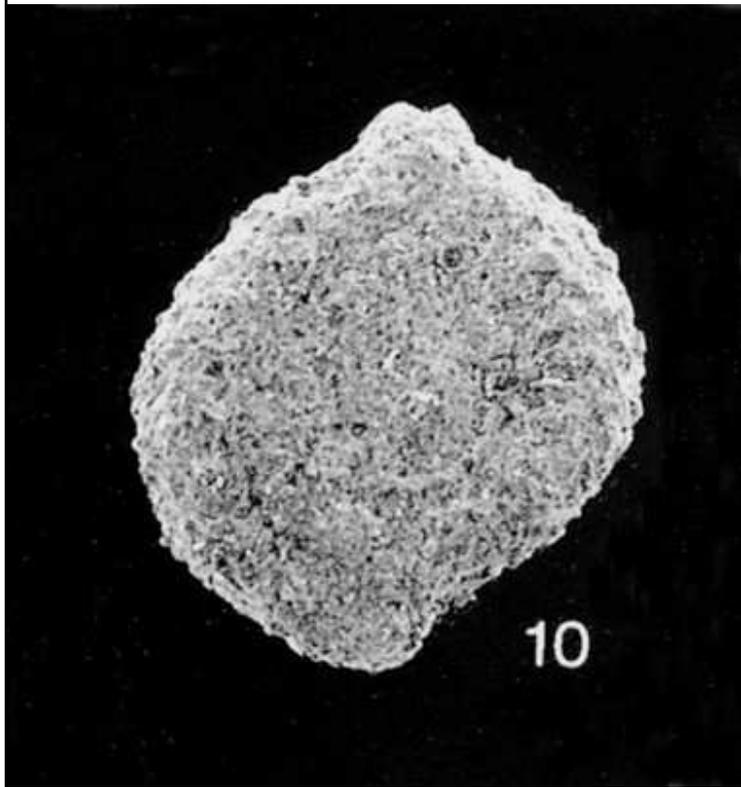
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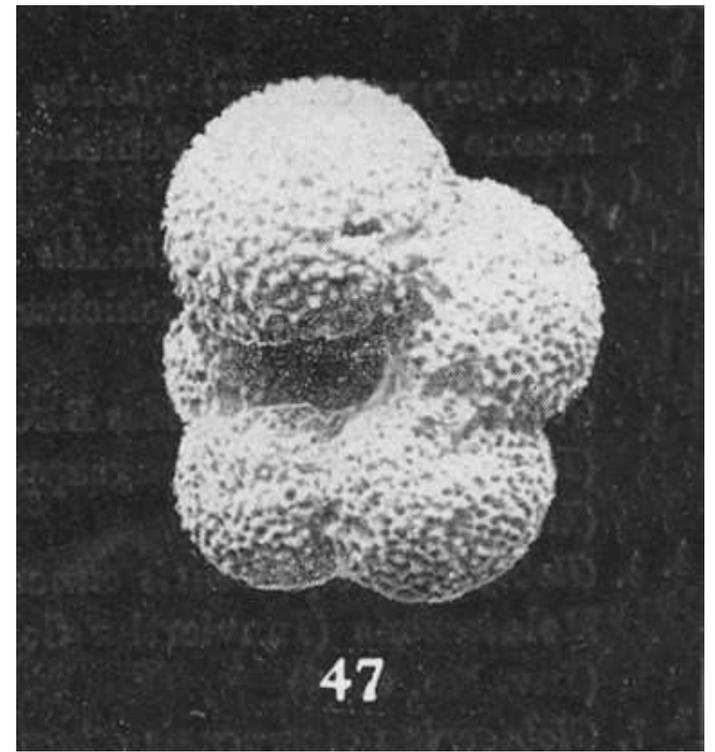
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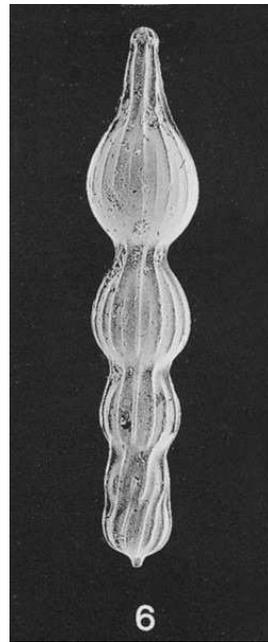


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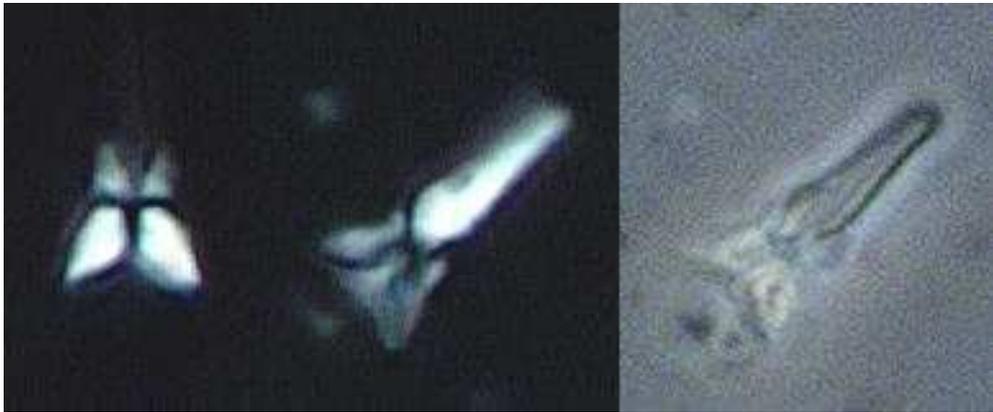


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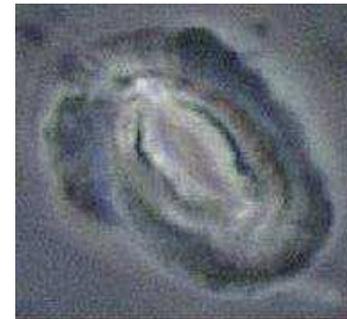


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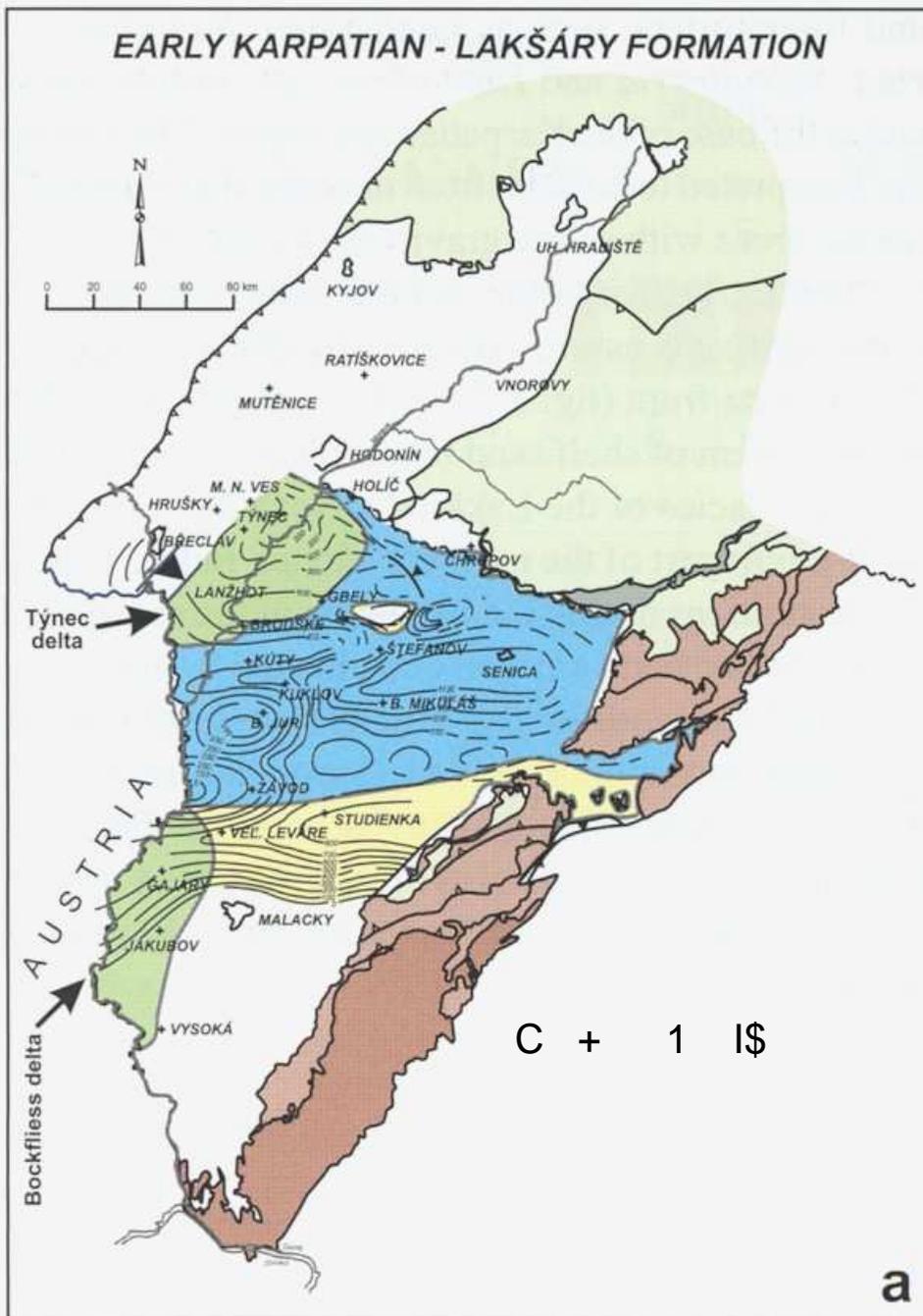
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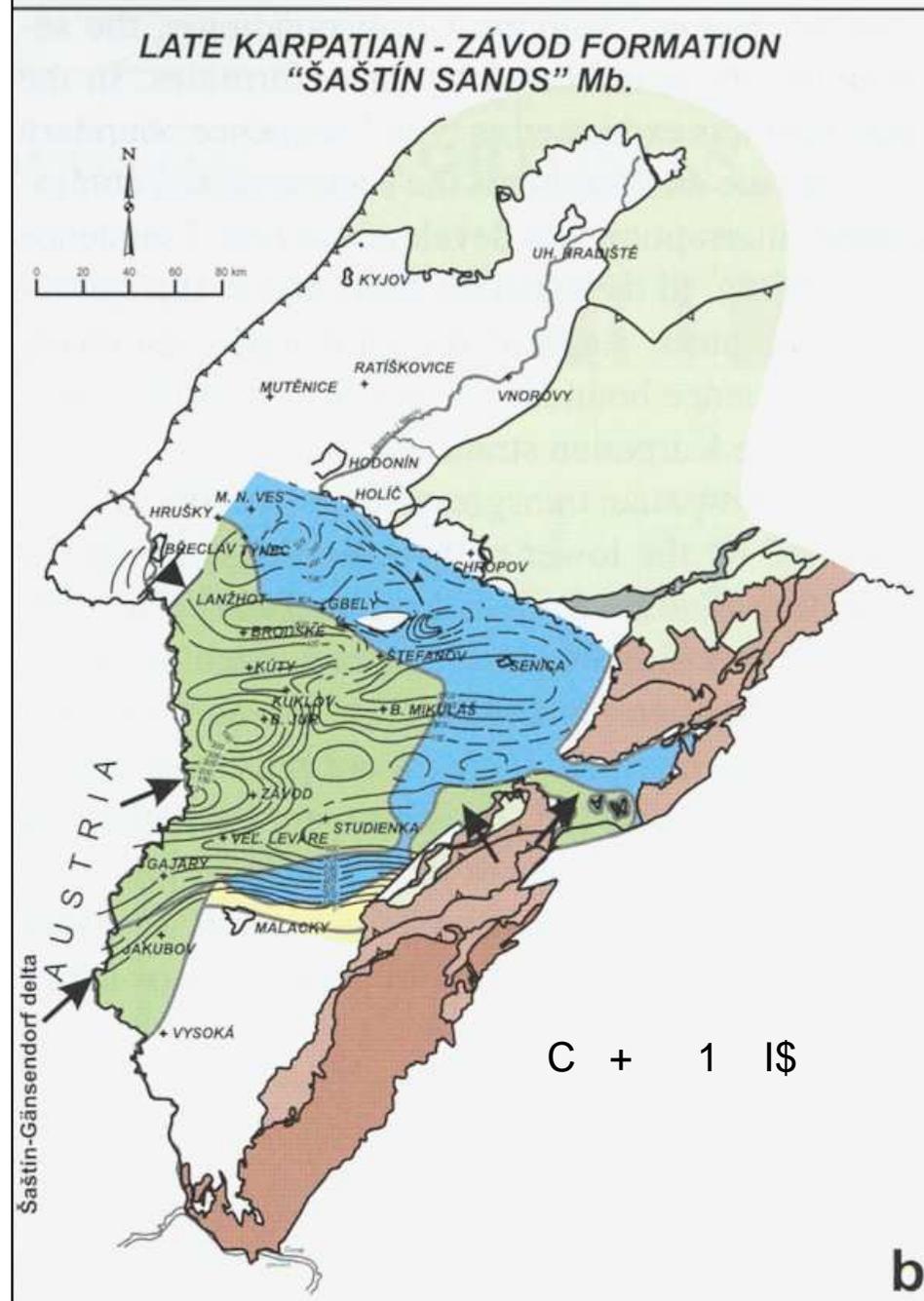
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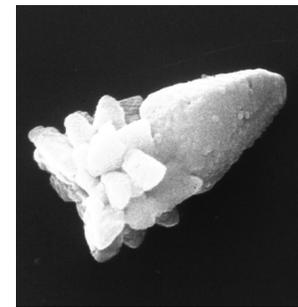
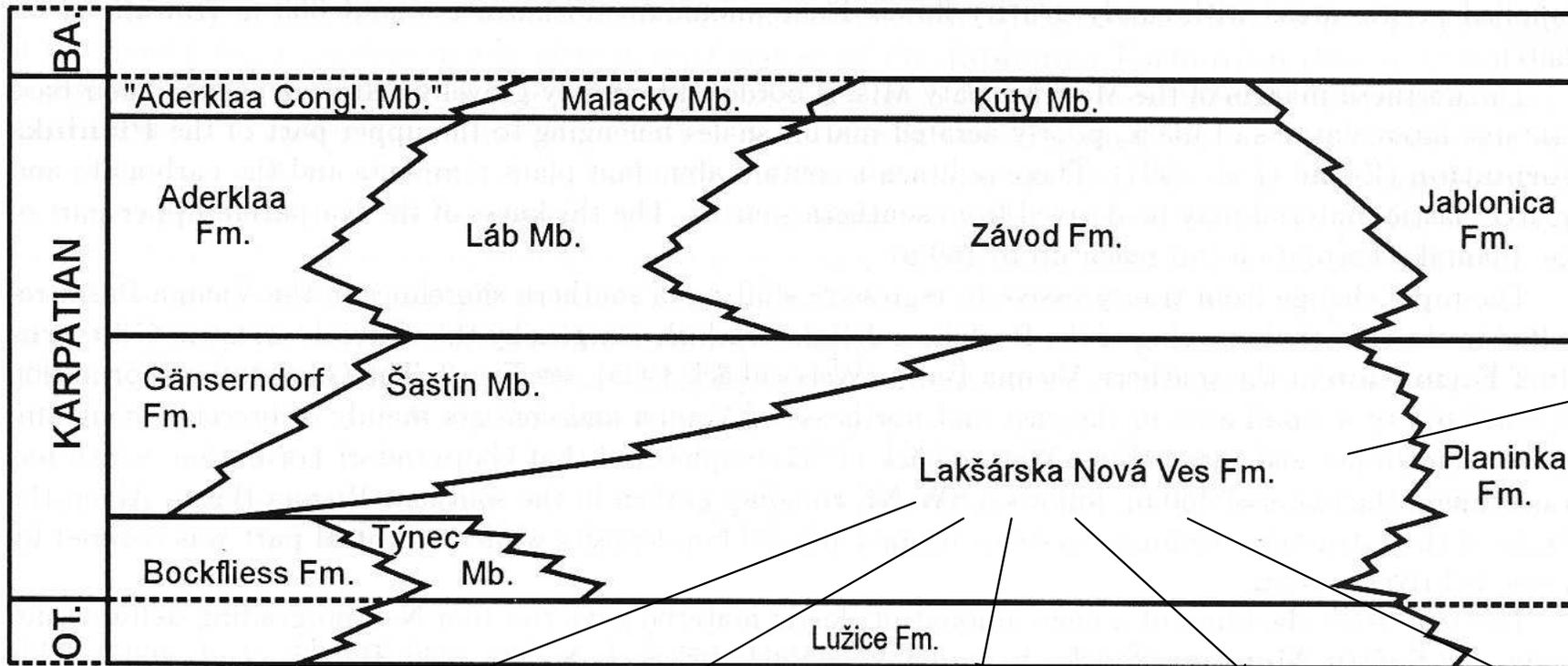


LATE KARPATIAN - ZÁVOD FORMATION

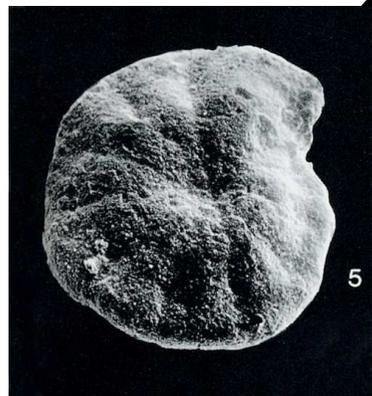
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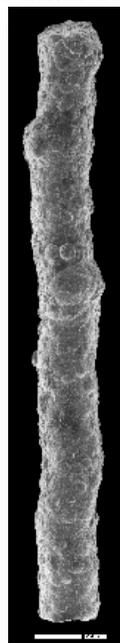
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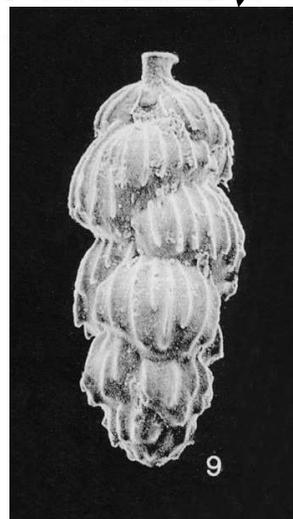
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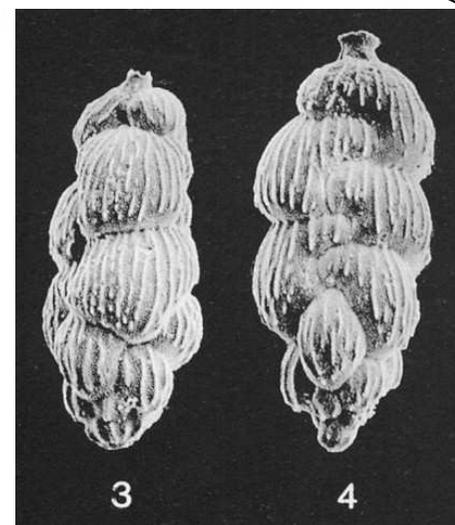
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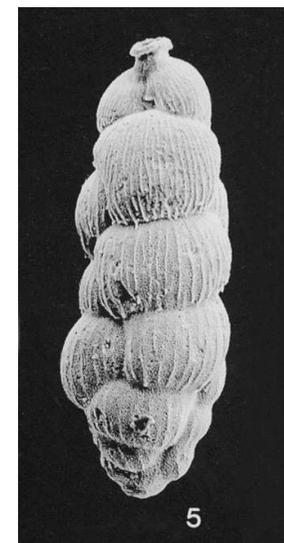
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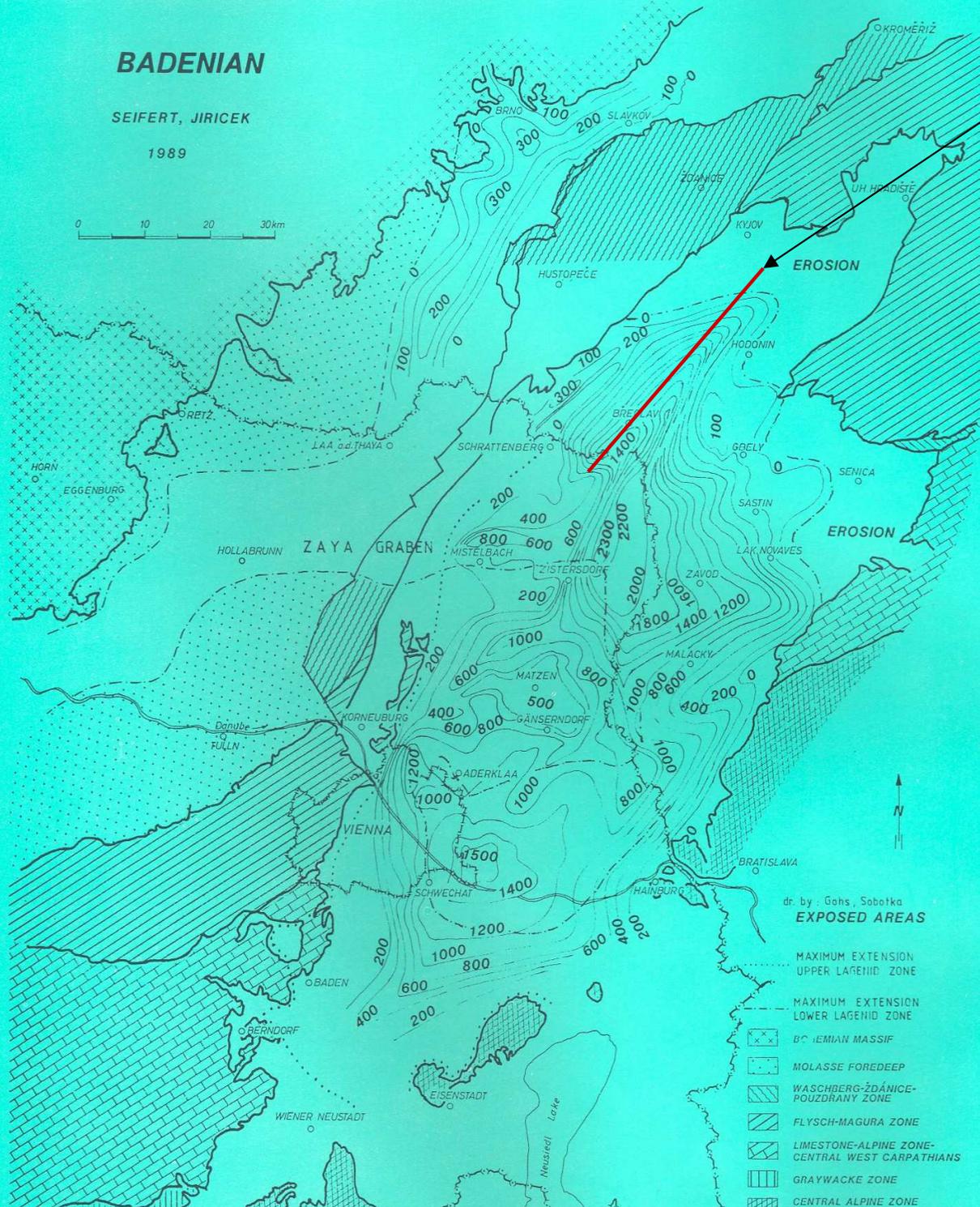
# VIENNA BASIN AND MOLASSE FOREDEEP PALEOGEOGRAPHIC MAP WITH ISOPACHS



## BADENIAN

SEIFERT, JIRICEK

1989



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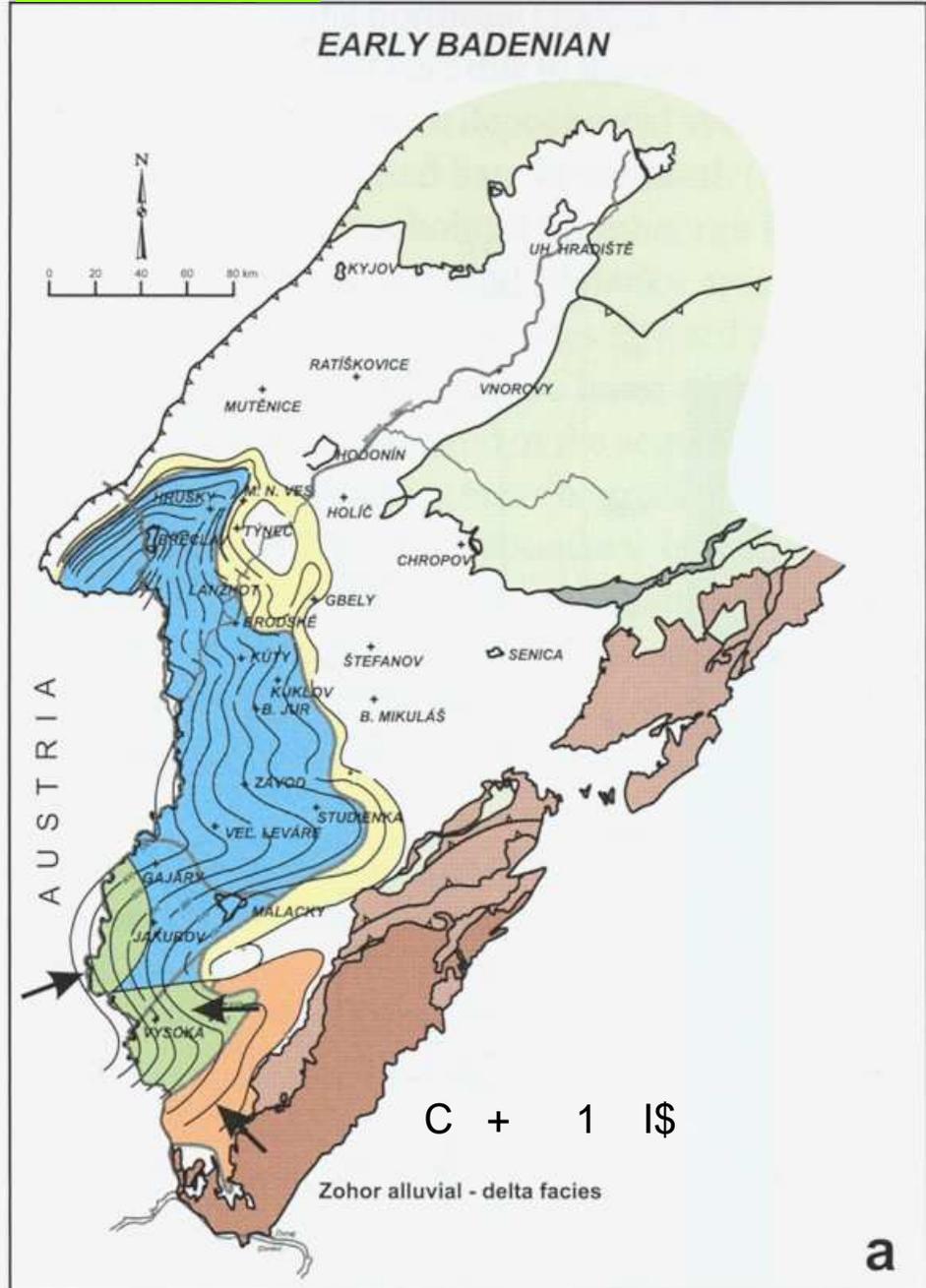
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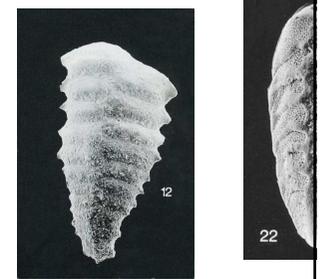
**LATE BADENIAN**

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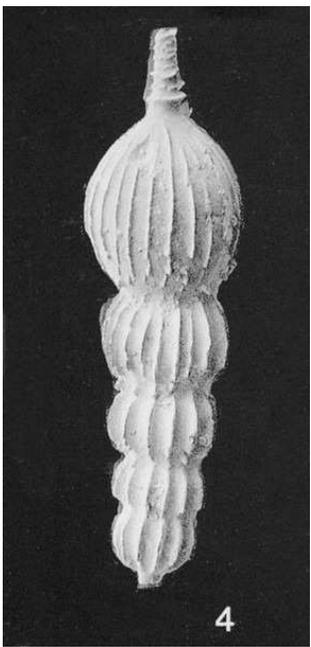
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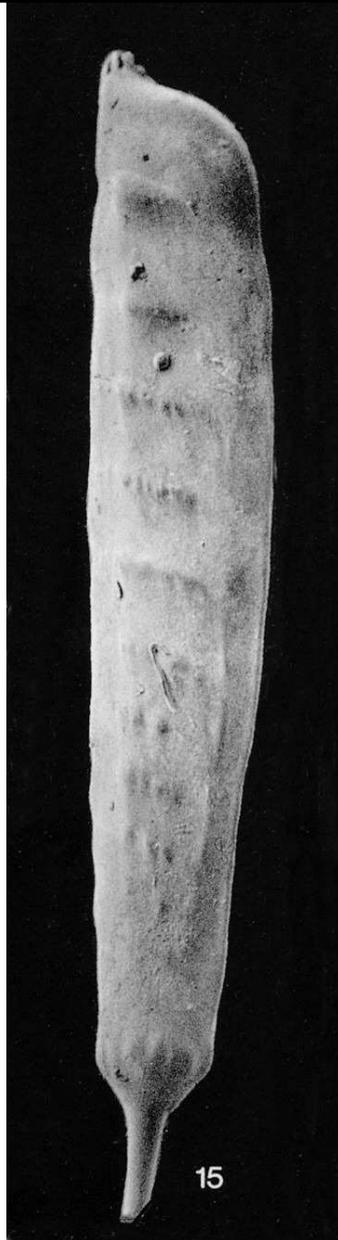
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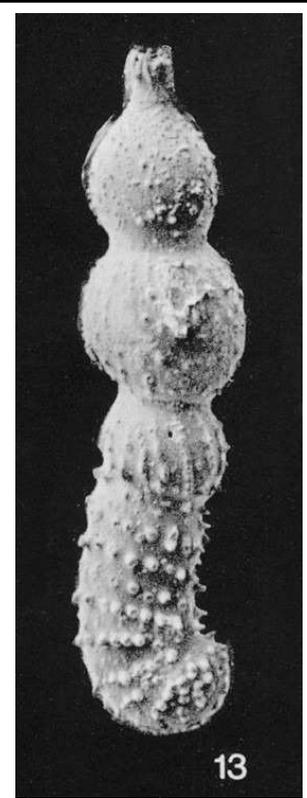
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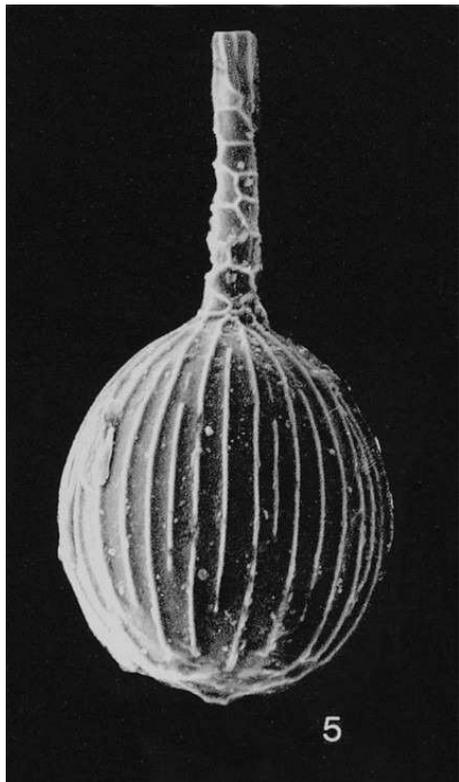


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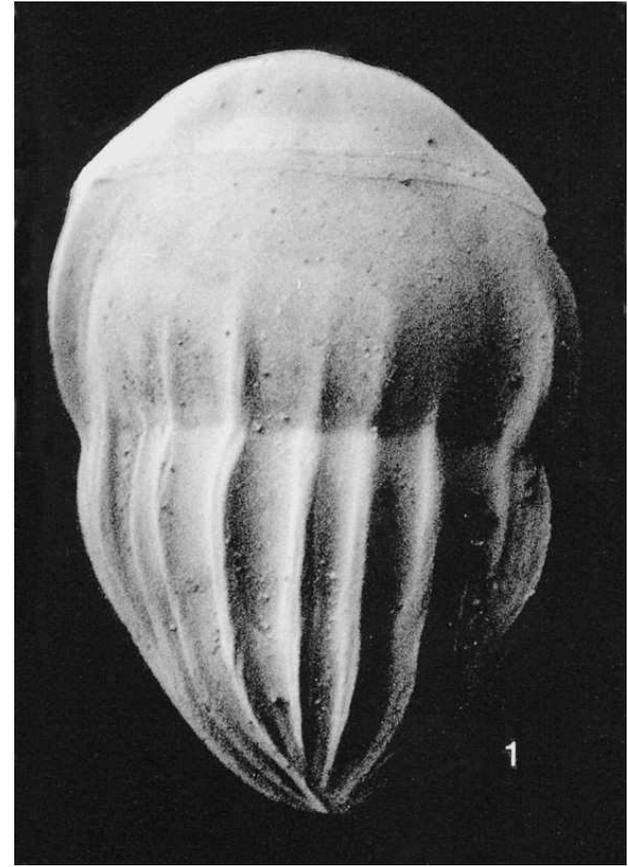
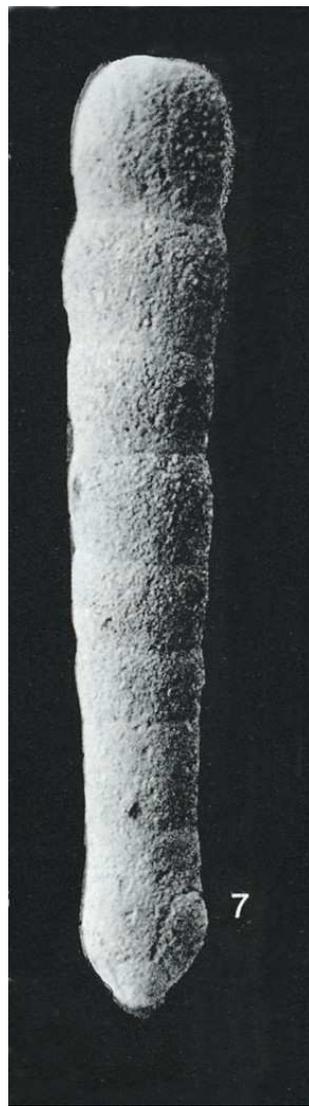
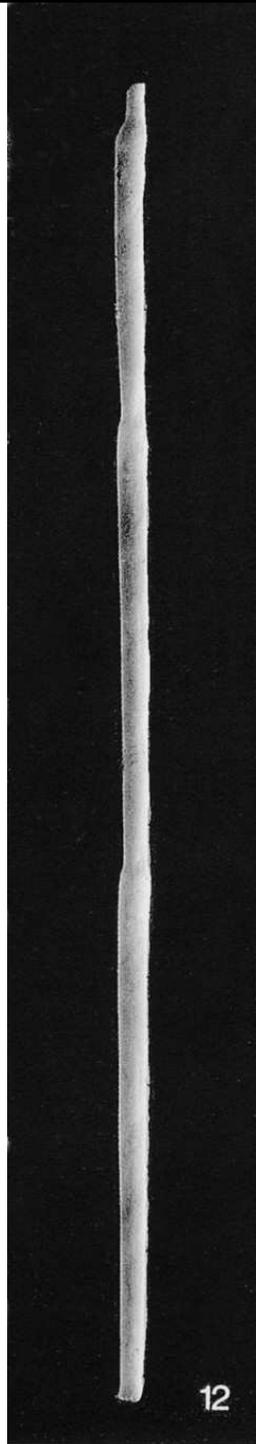
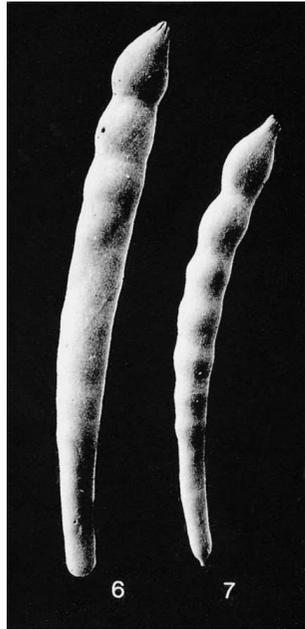
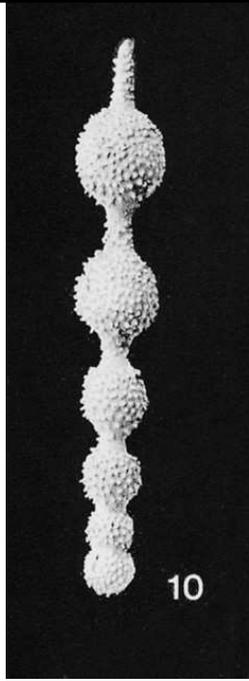
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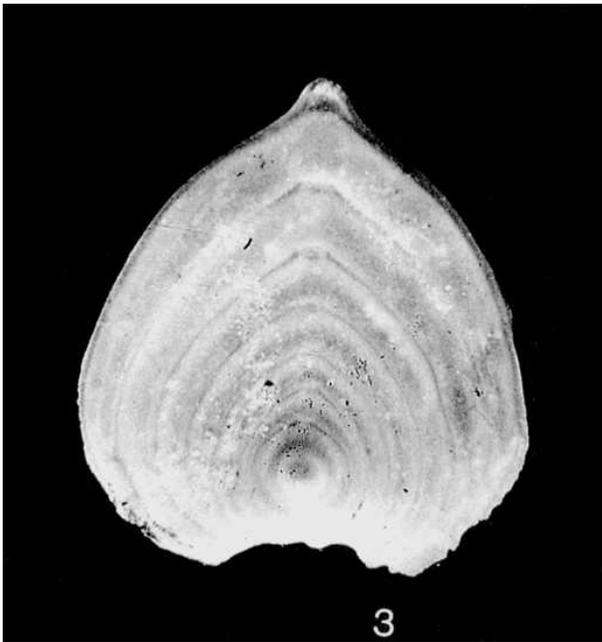
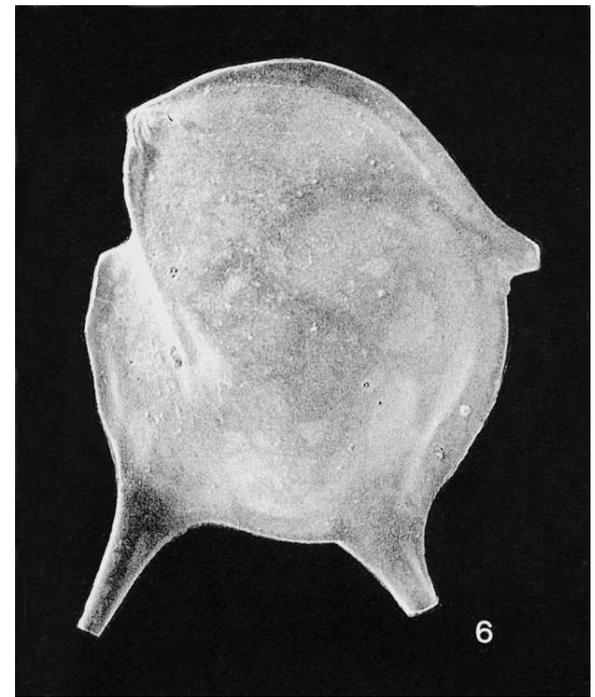
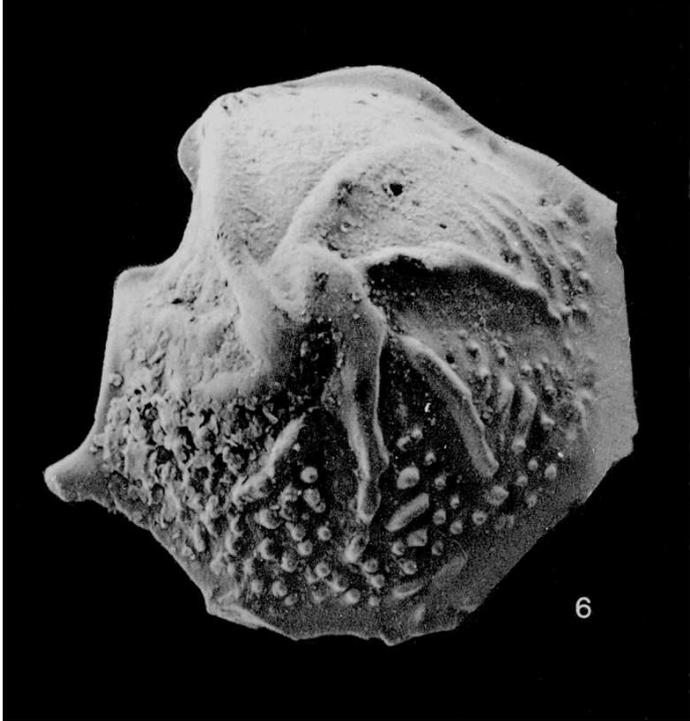
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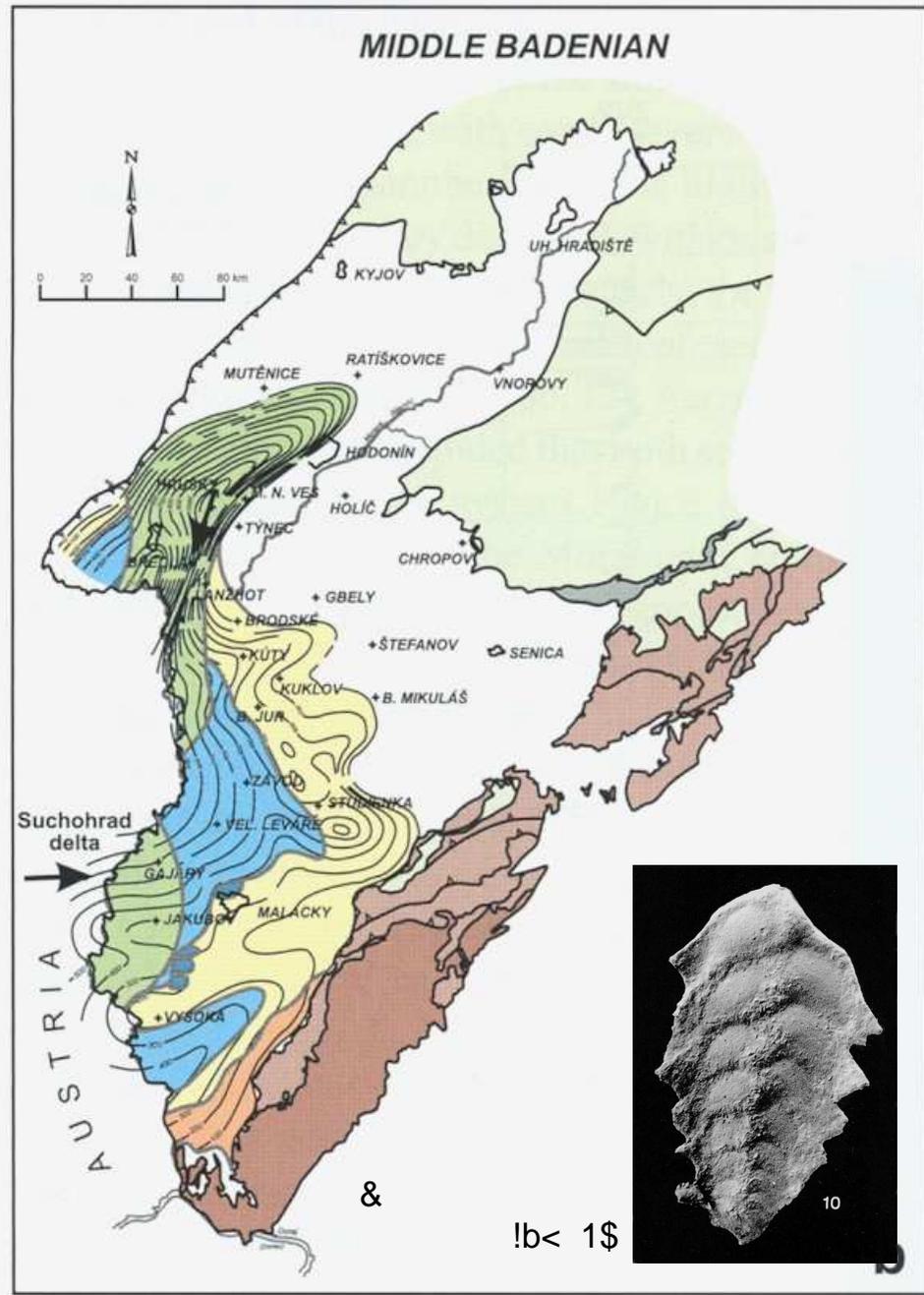
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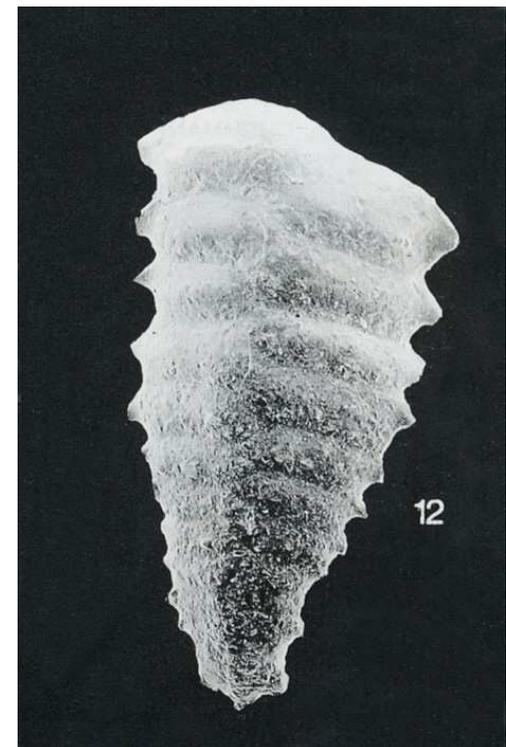
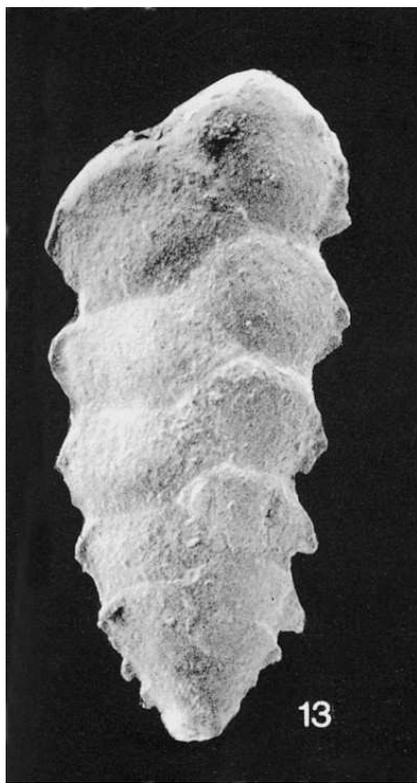
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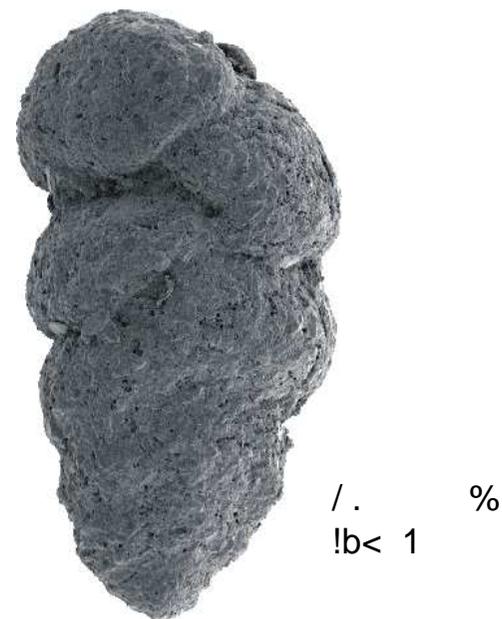
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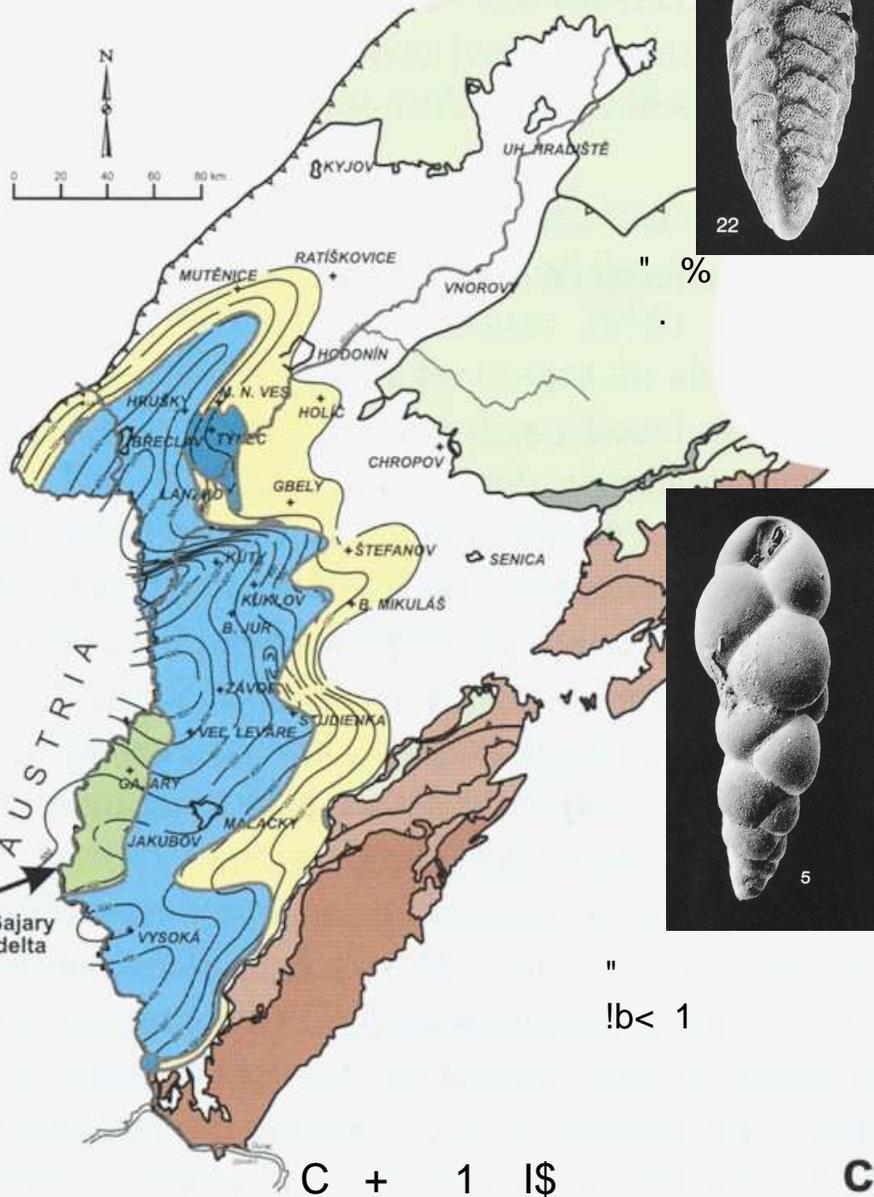


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# LATE BADENIAN



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## NEOGENE:

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- neritic
- alluvial sediments
- non-depositional area
- nappes boundaries
- thickness of sediments
- transport direction
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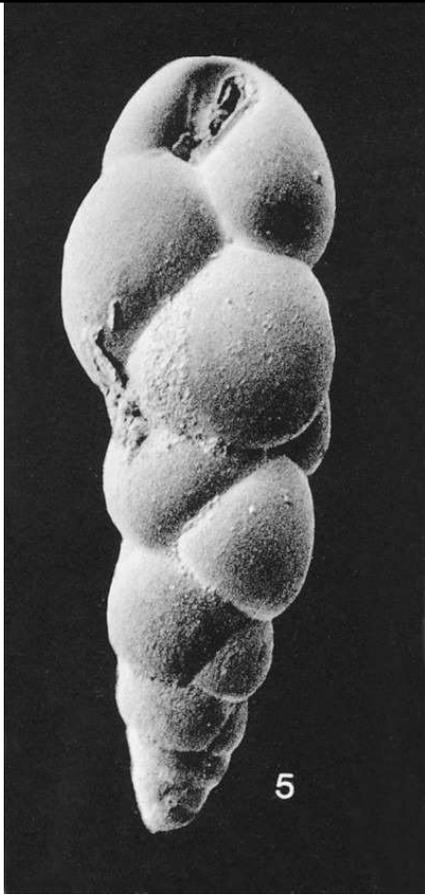
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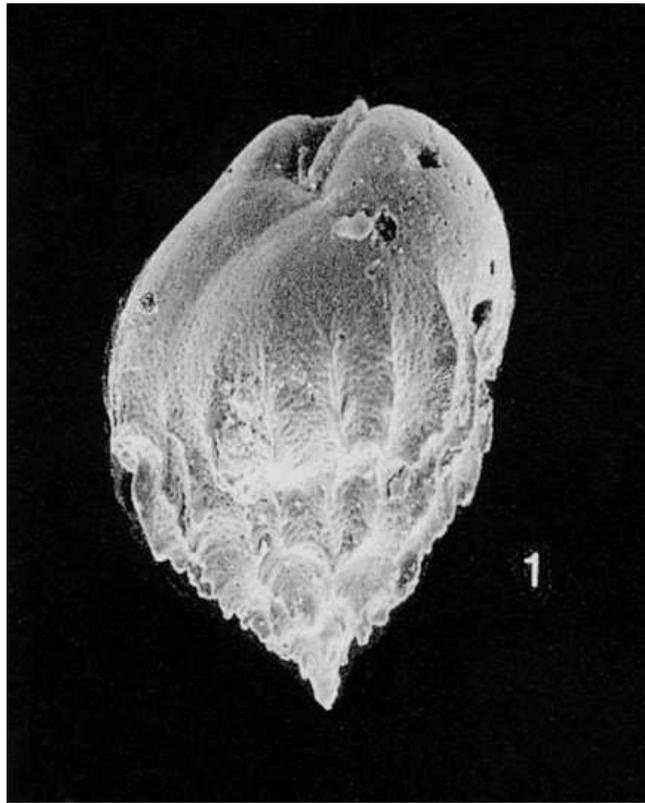
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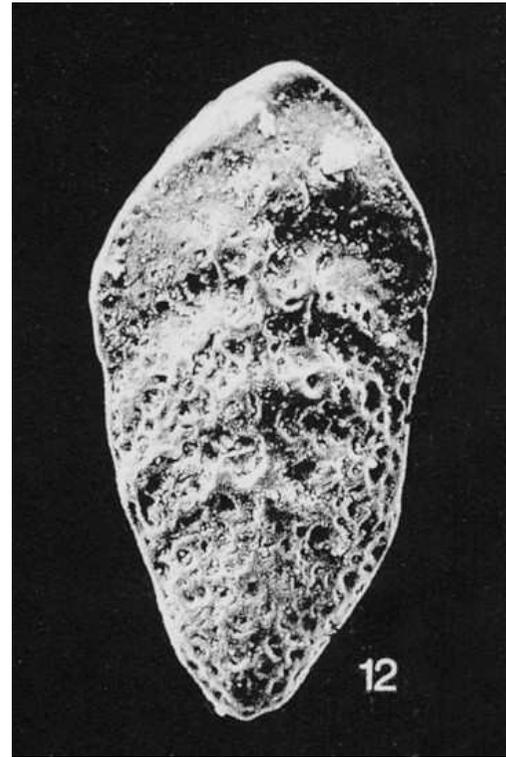
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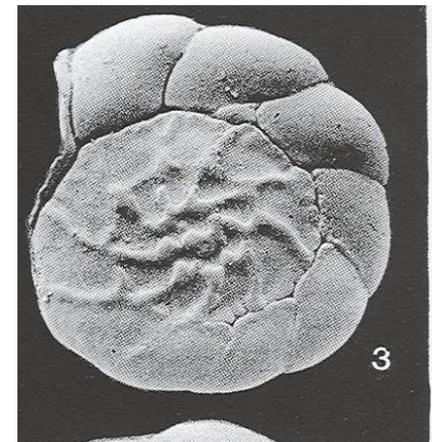
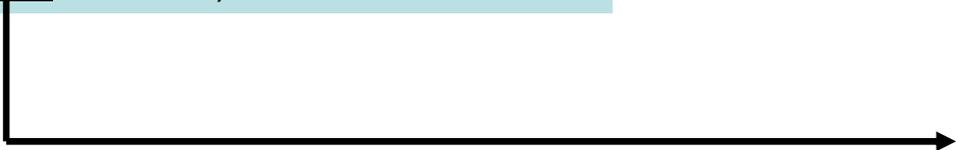


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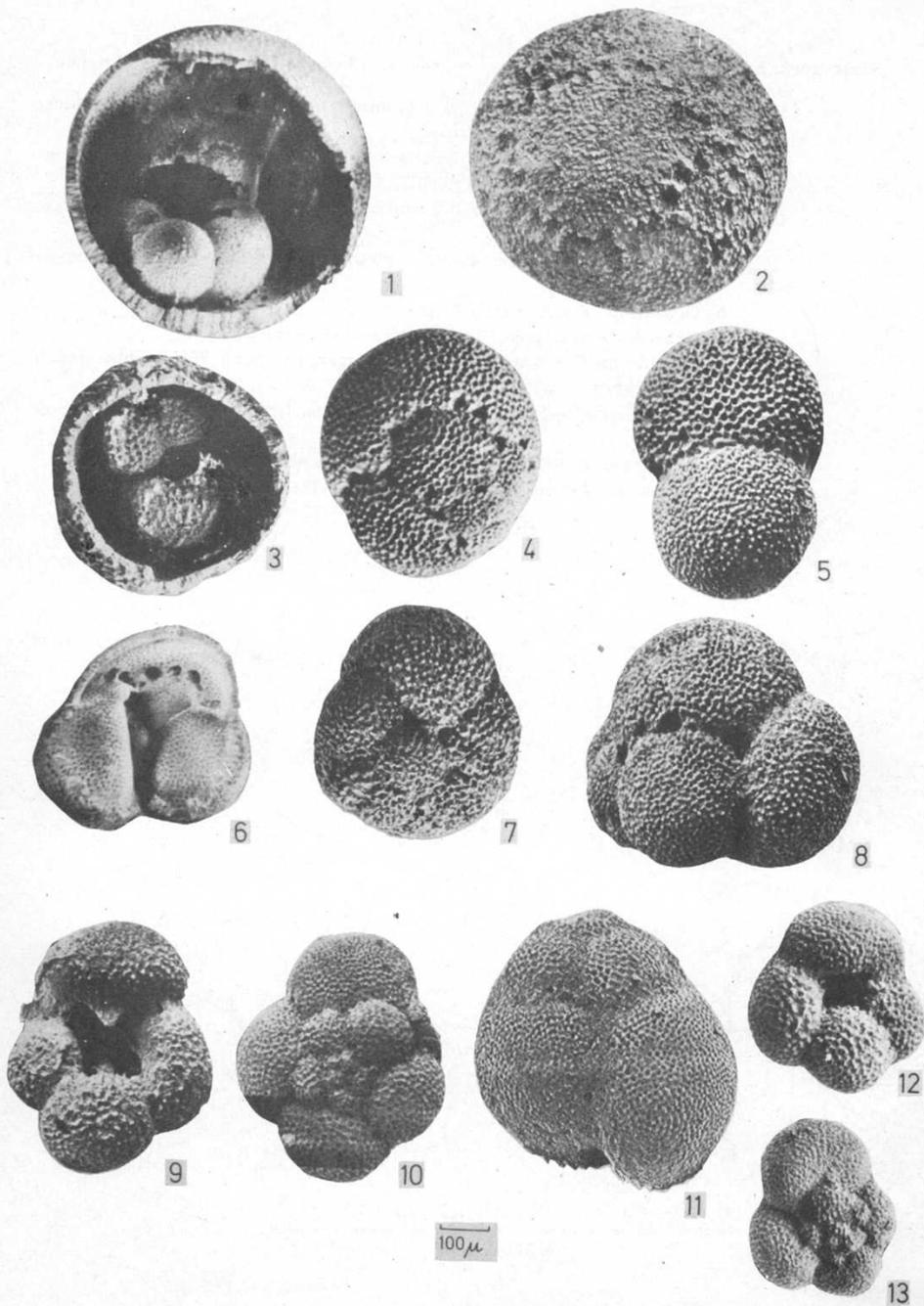
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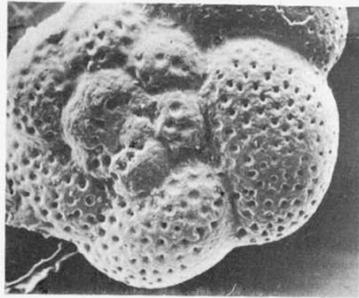
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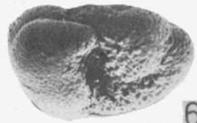
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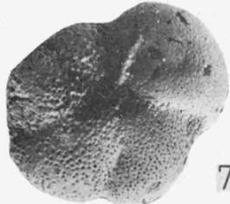
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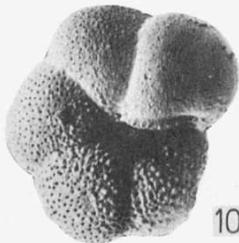
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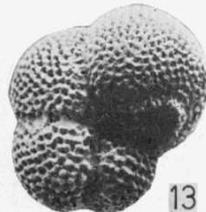
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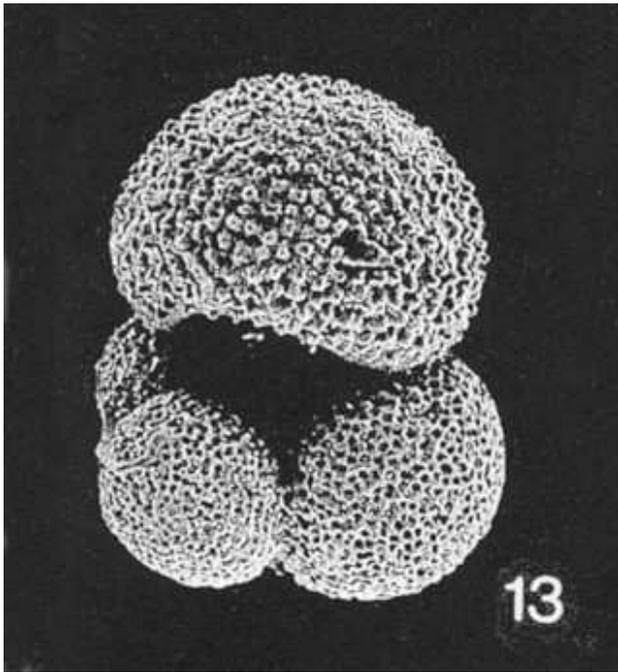
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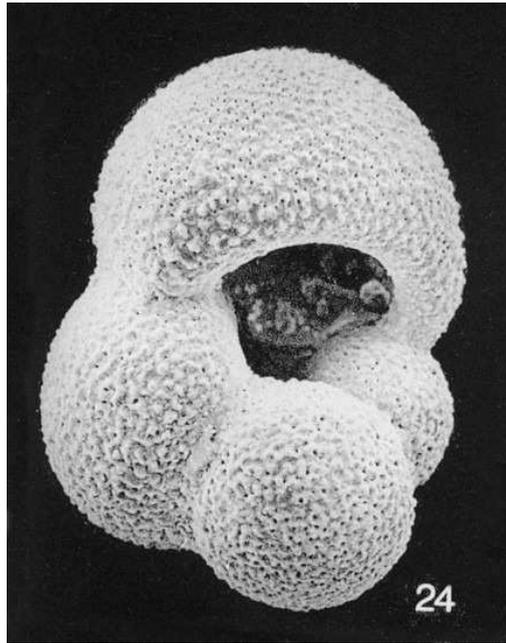
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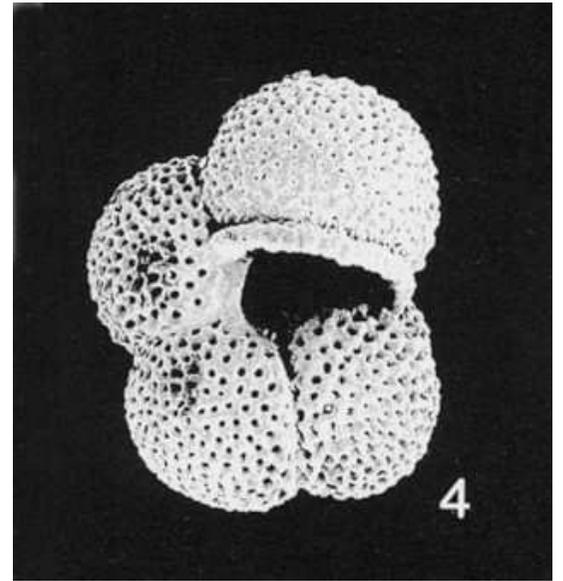
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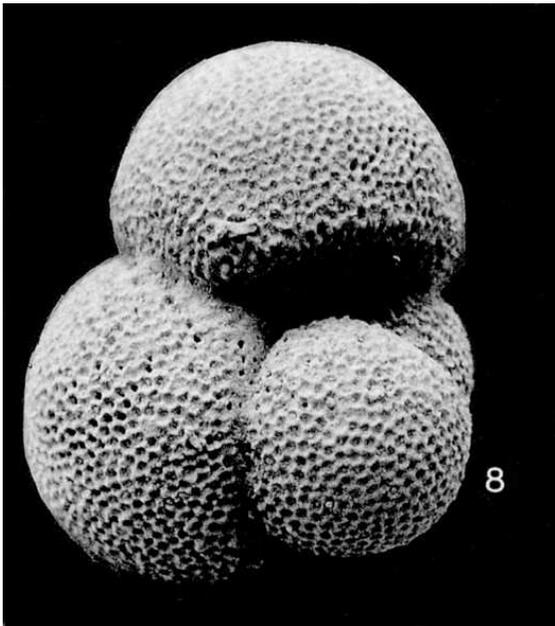


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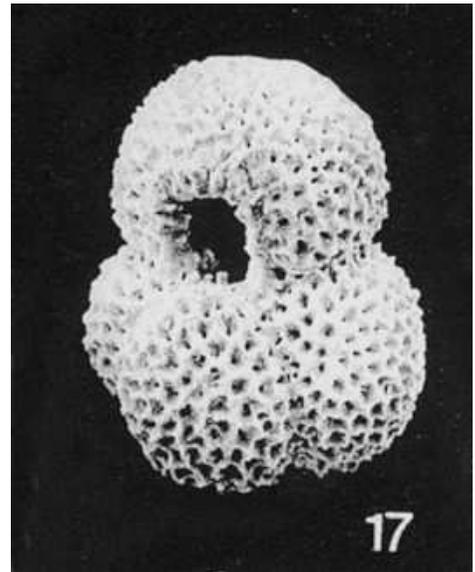
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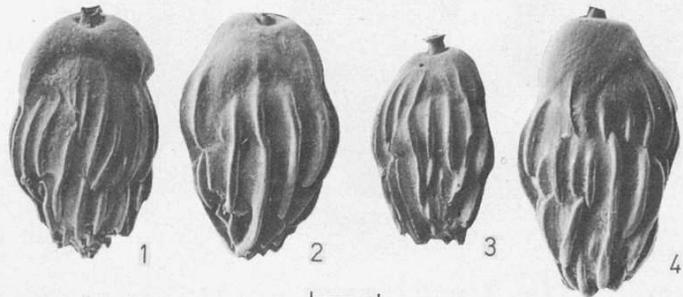
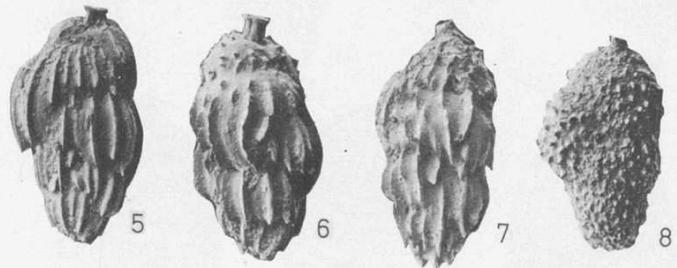
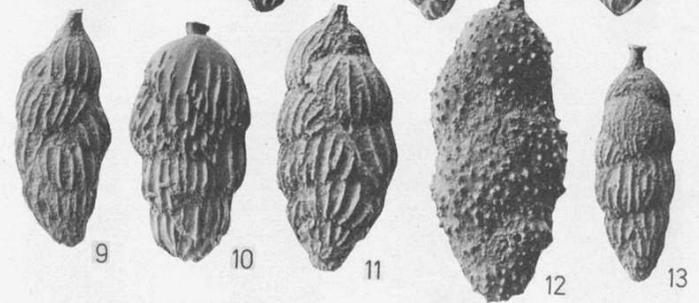
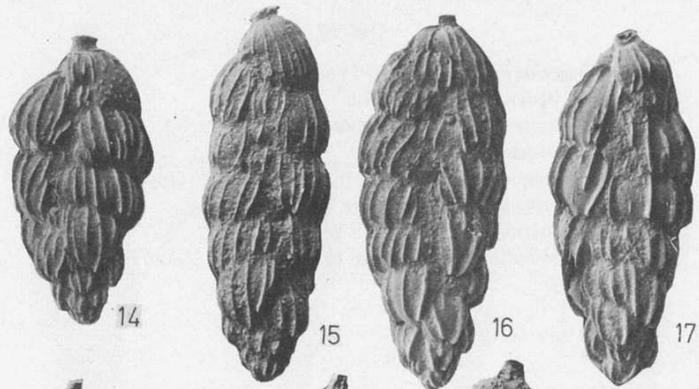
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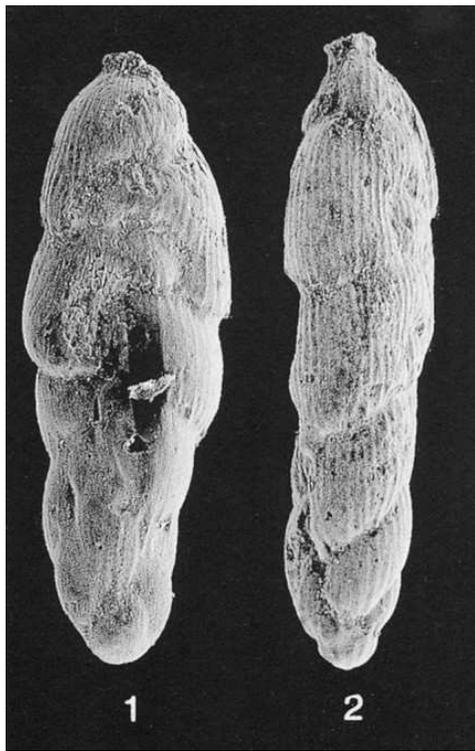
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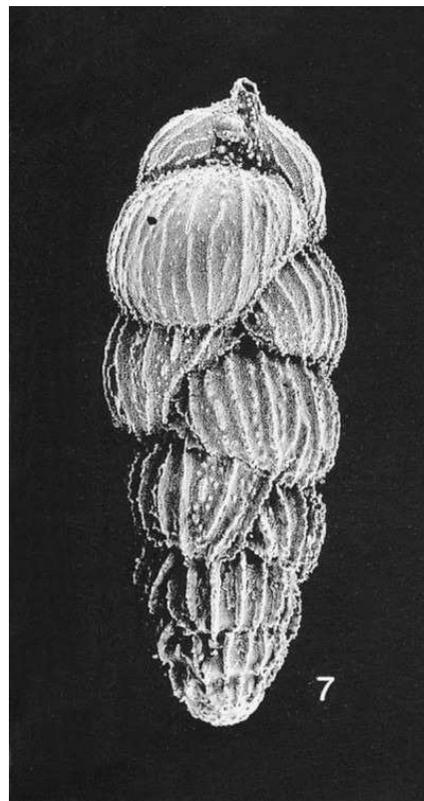
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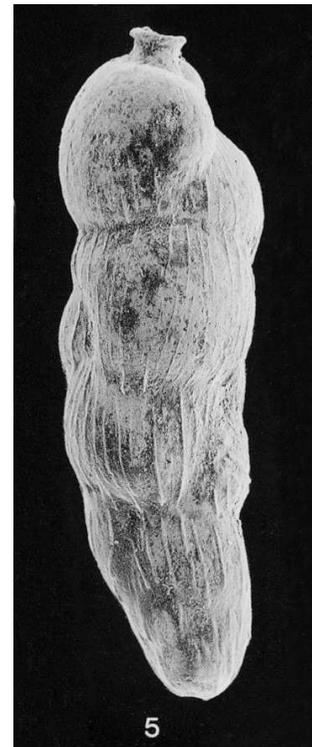


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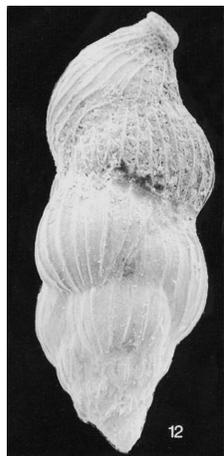
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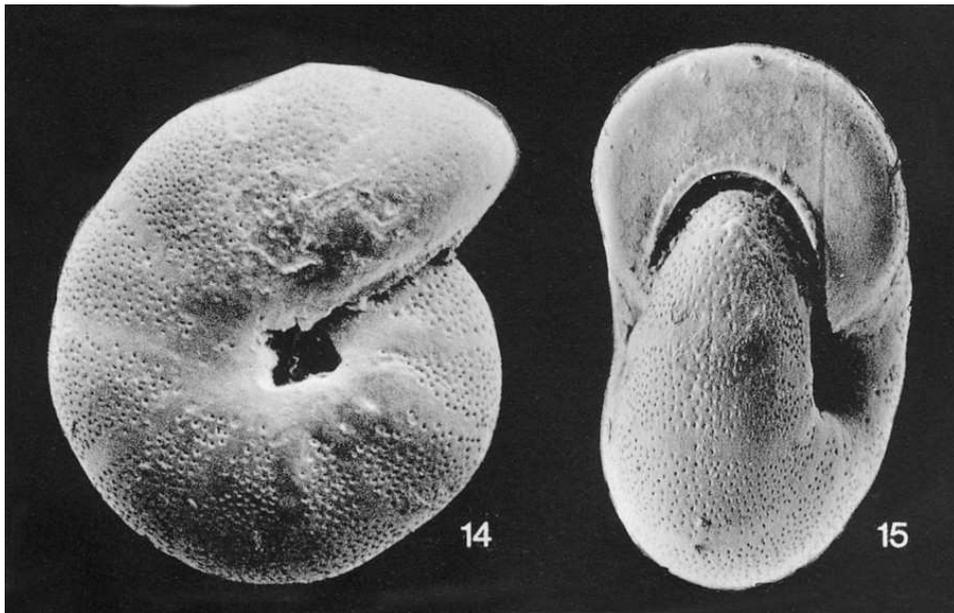
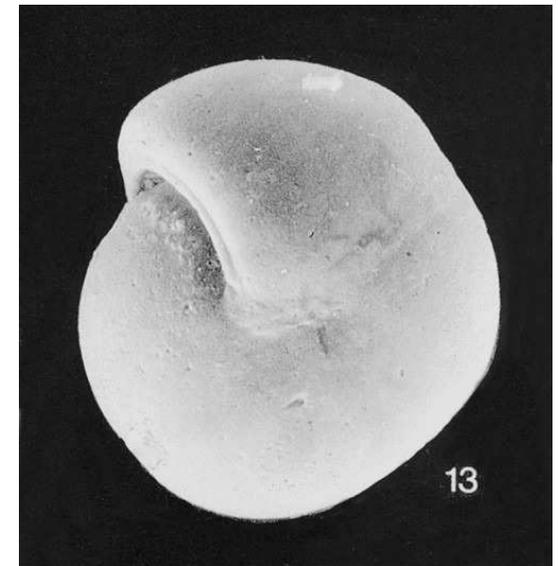
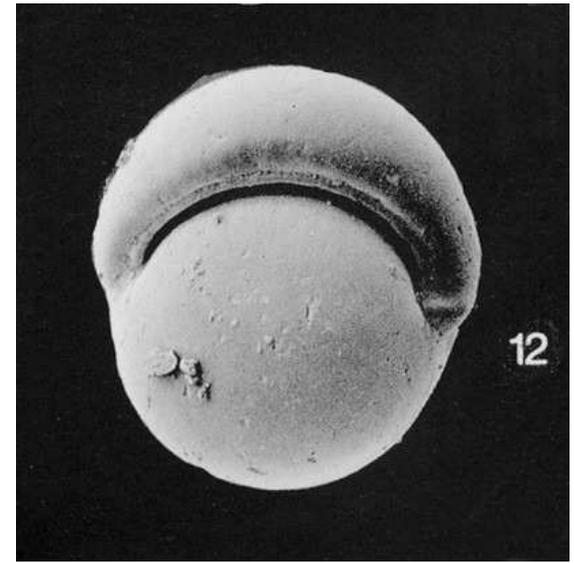
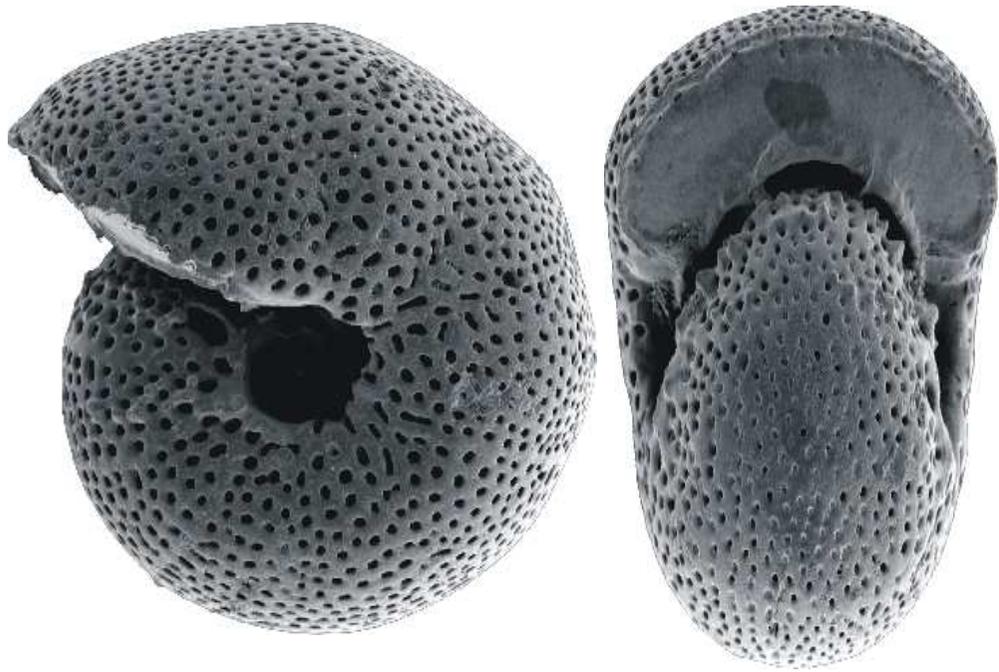
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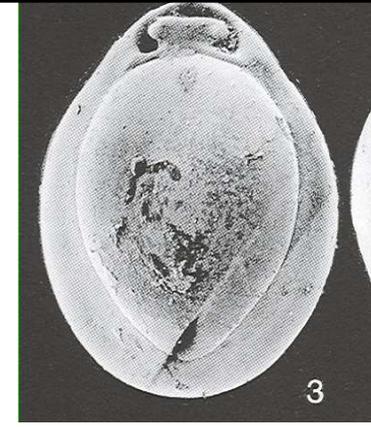
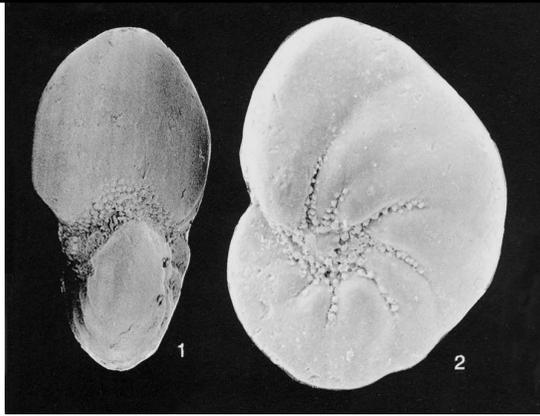
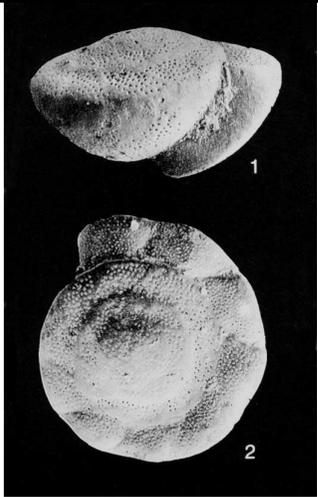
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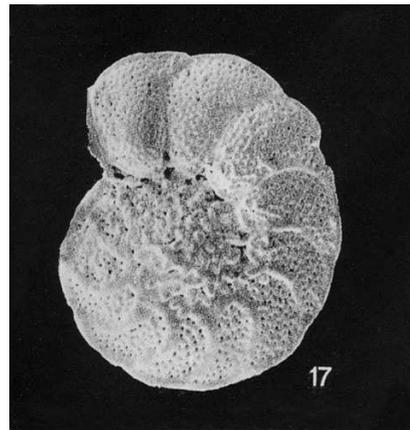
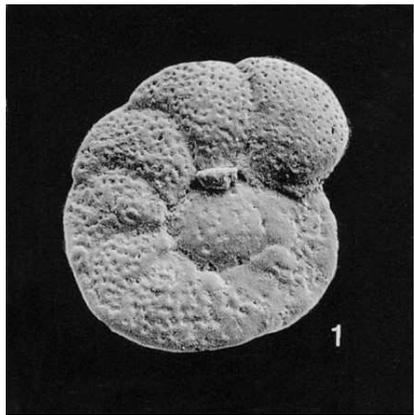
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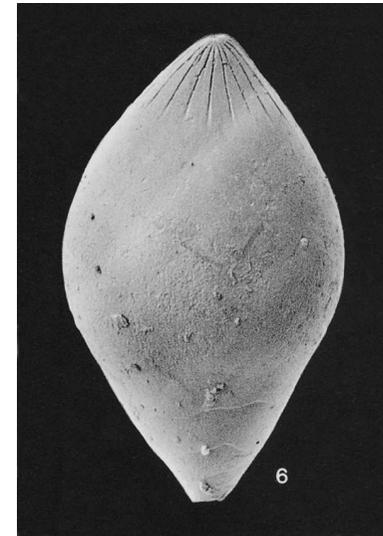
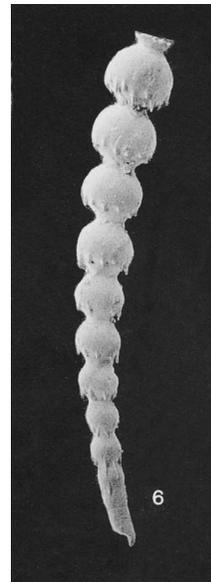
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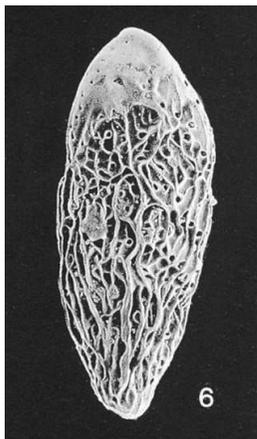


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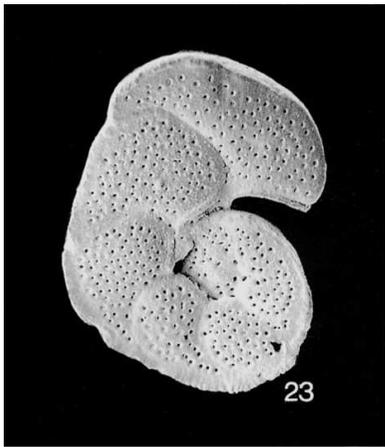
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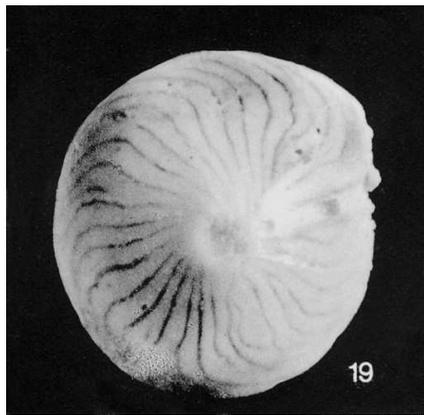
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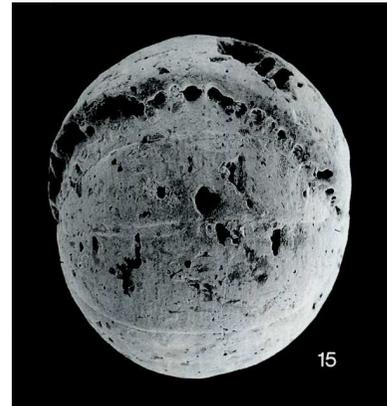
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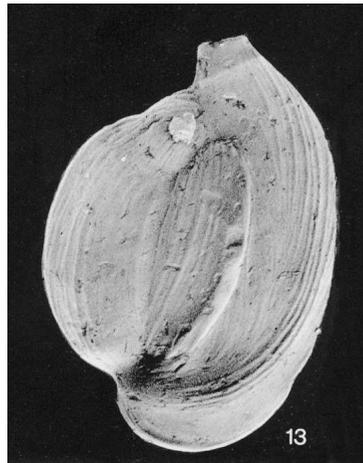
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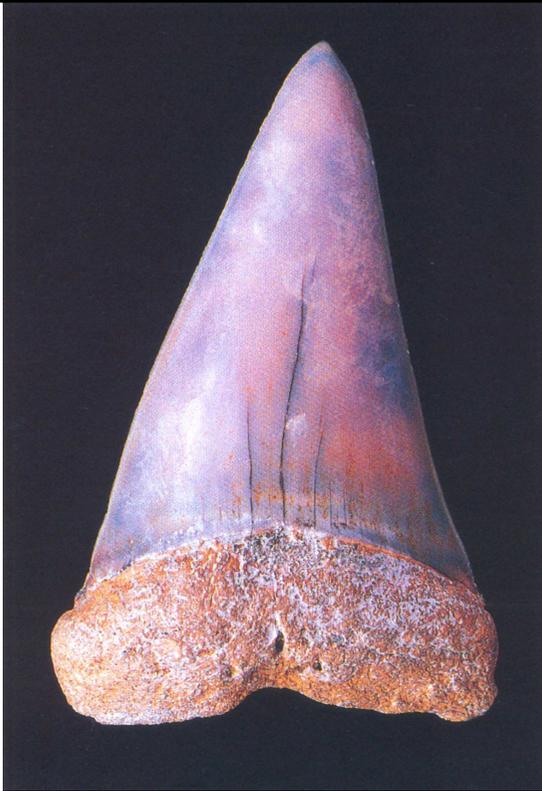
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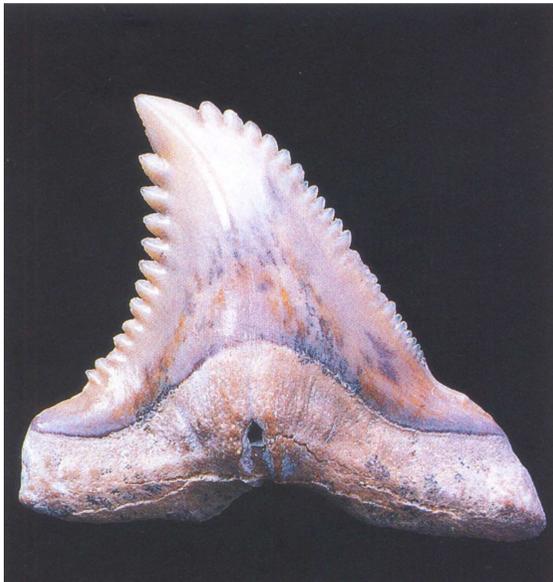
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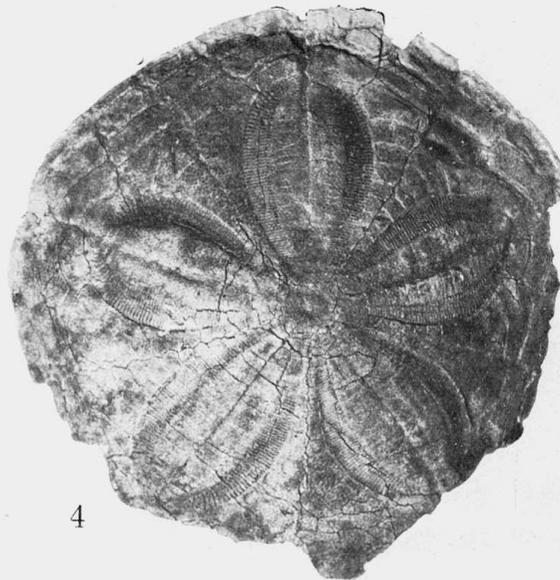
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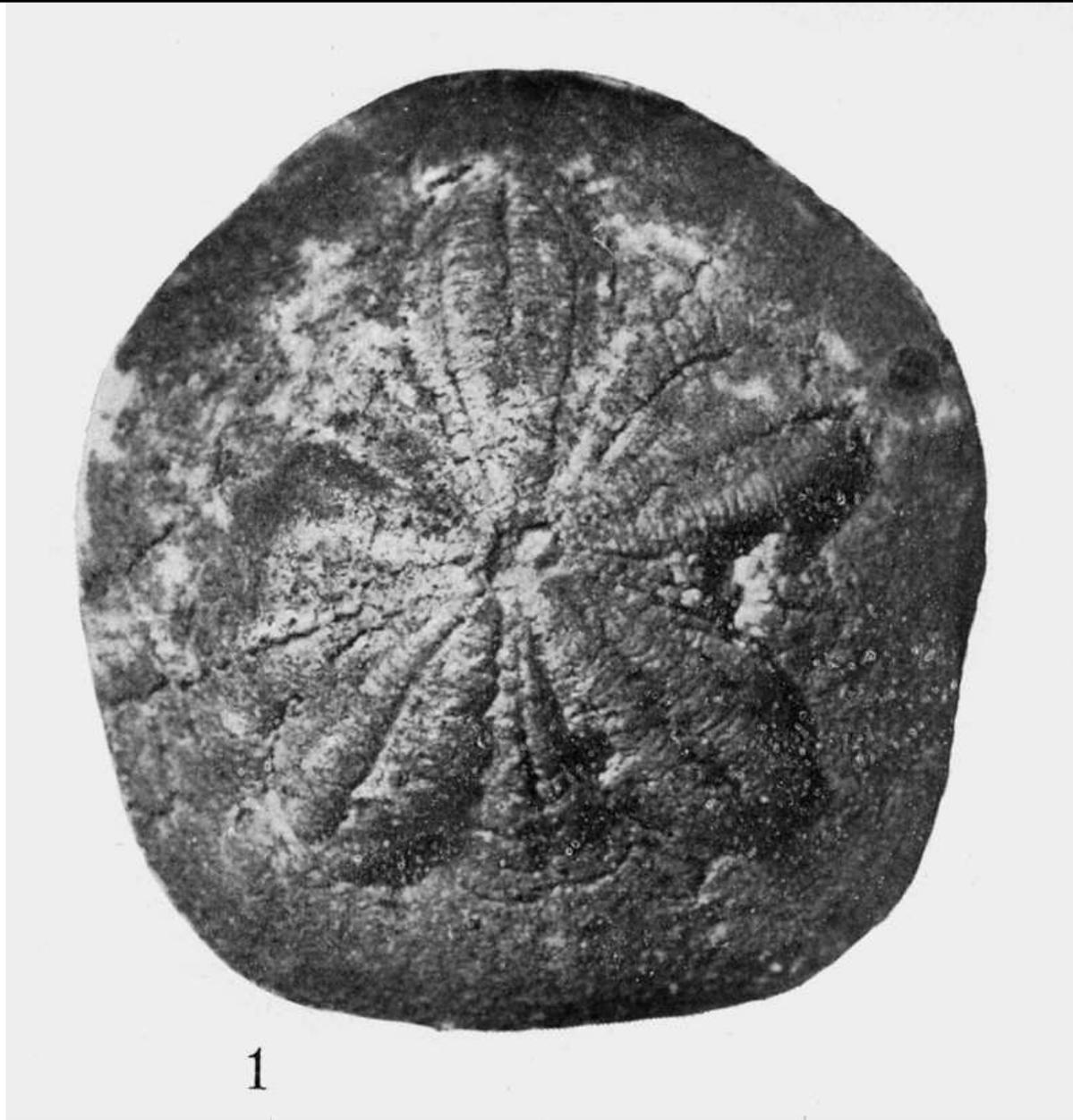
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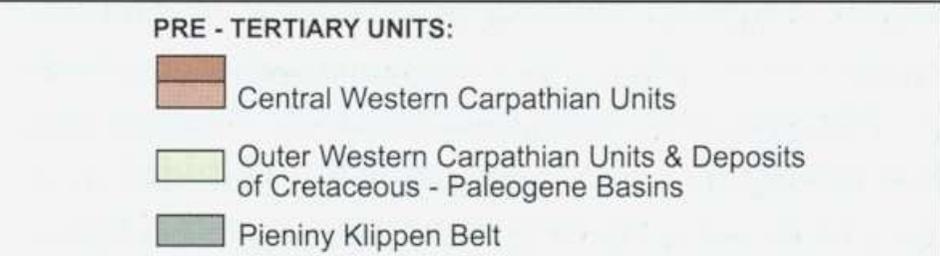
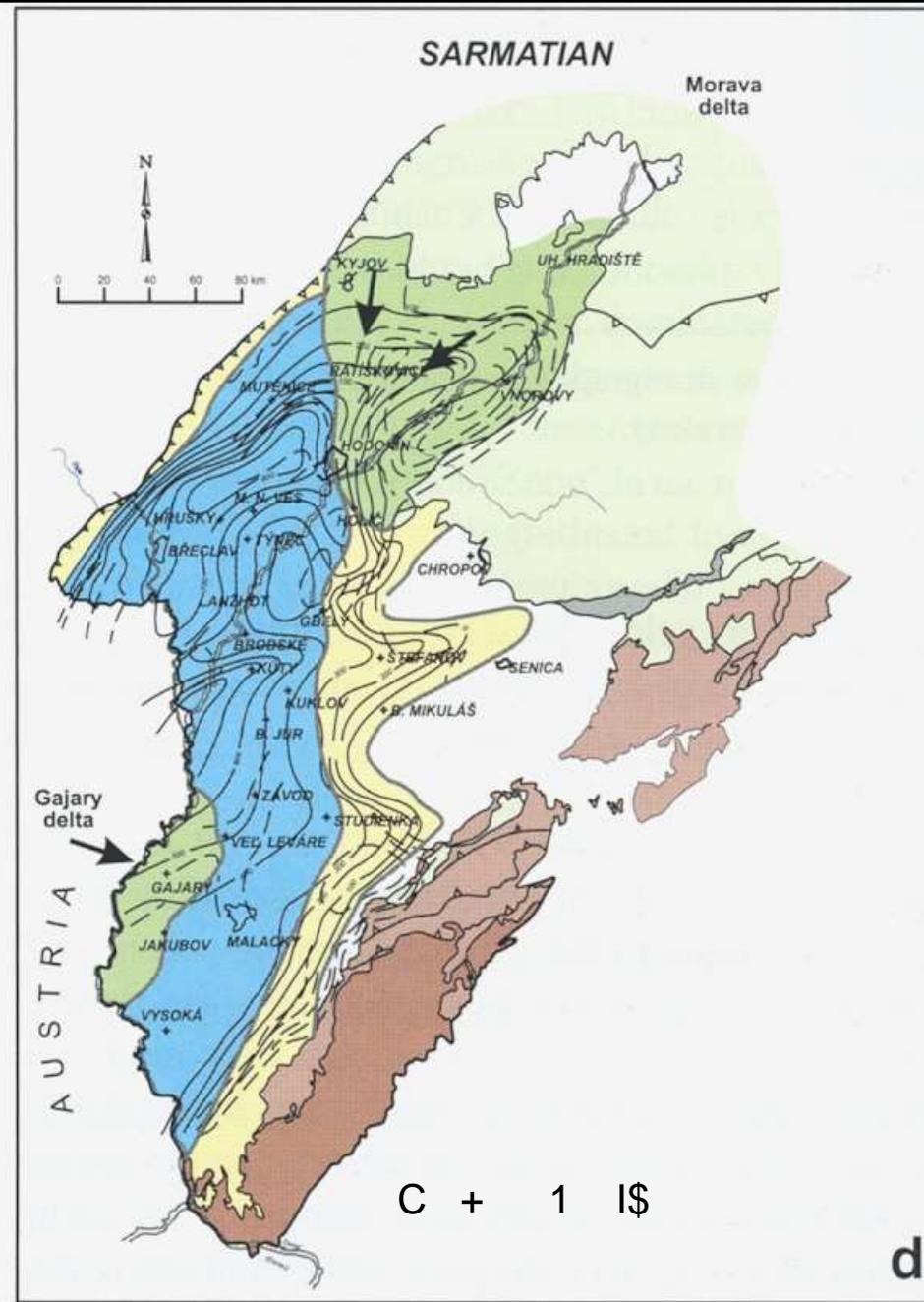
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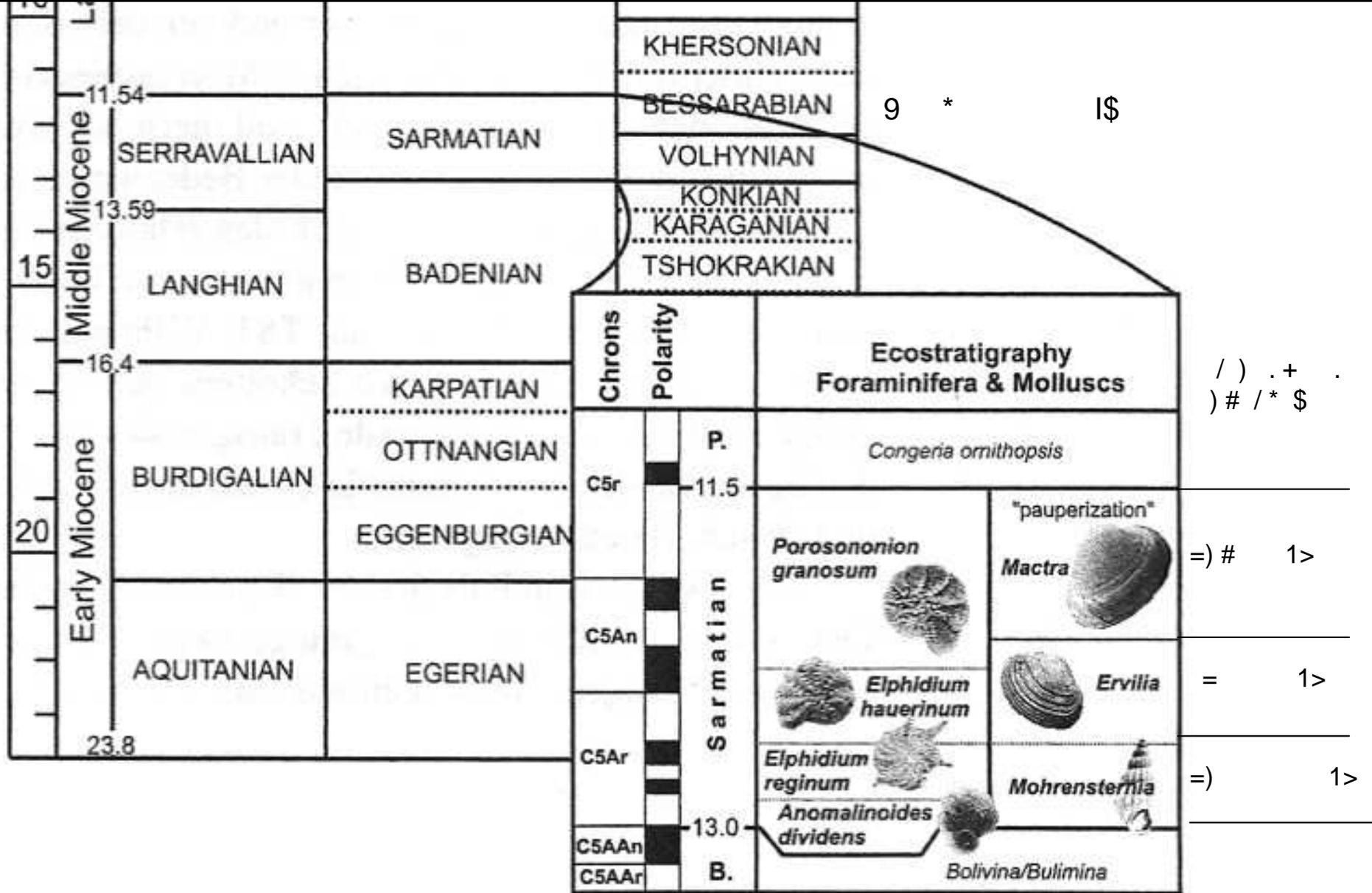
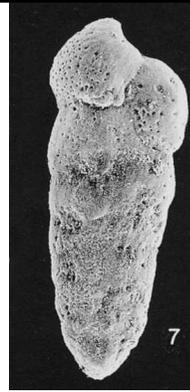


Fig. 1: Miocene chronostratigraphy of Europe modified after RÖGL (1998) with ecostratigraphic zonation of the Sarmatian based on molluscs and benthic foraminifera.

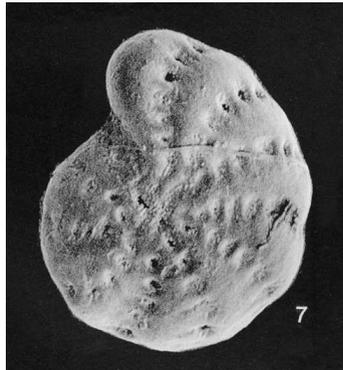


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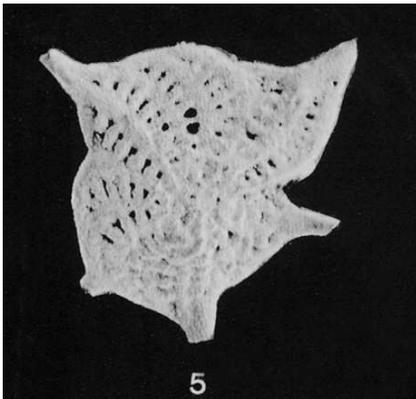
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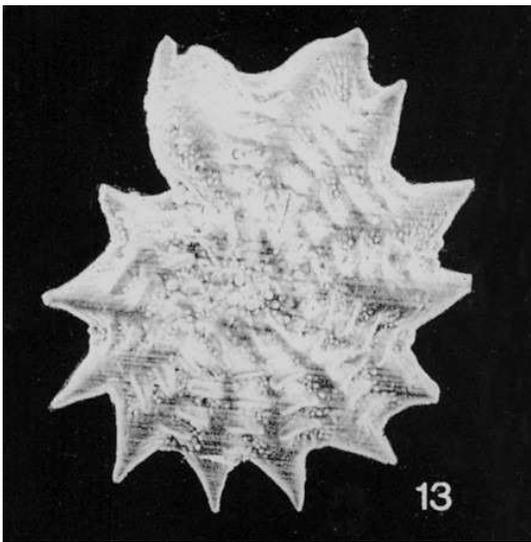
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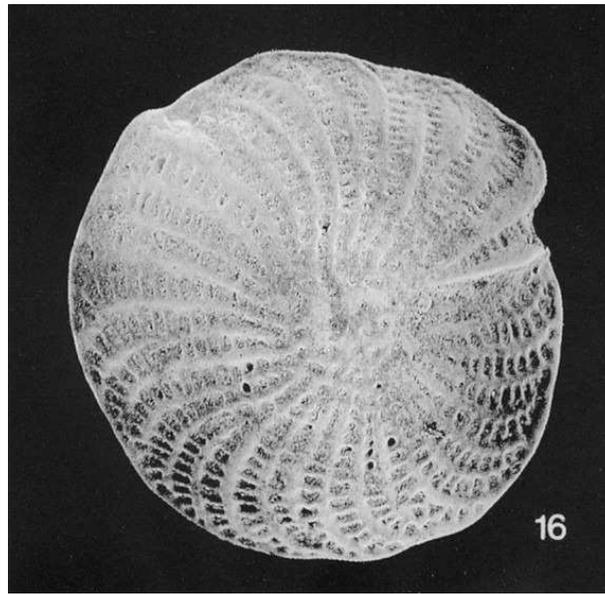
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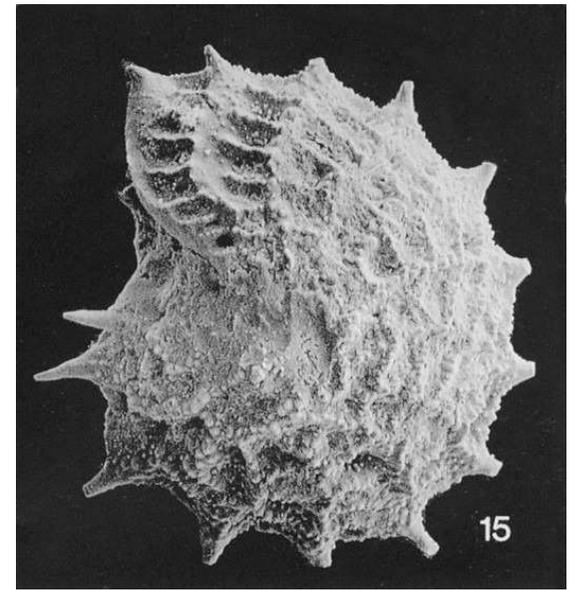
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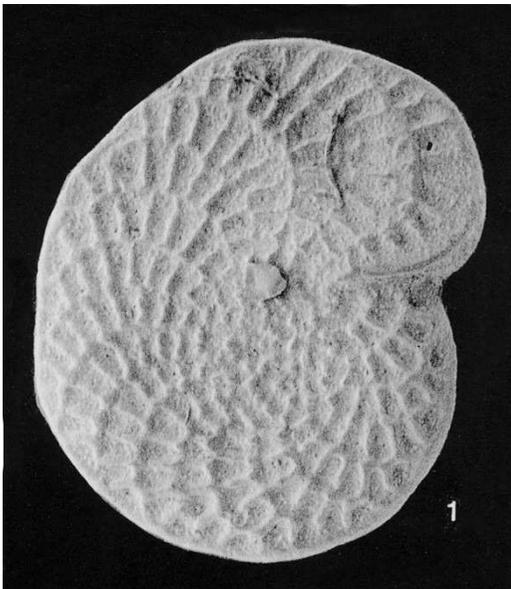
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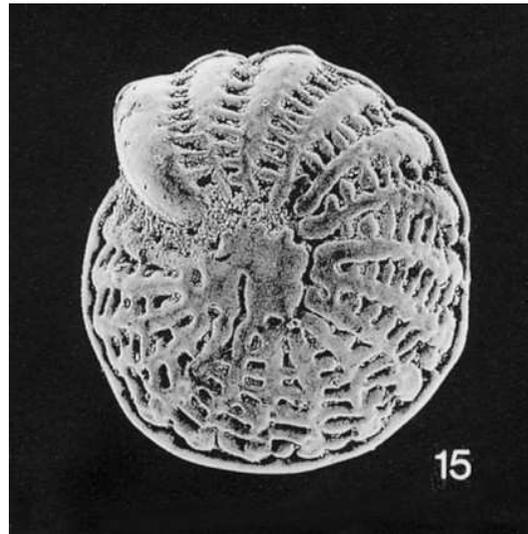
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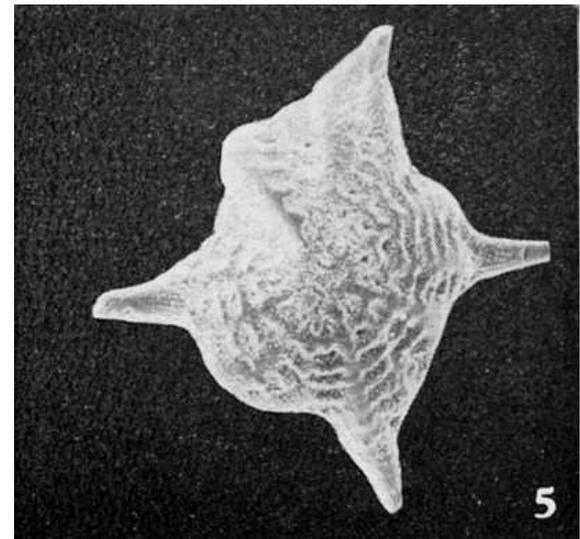
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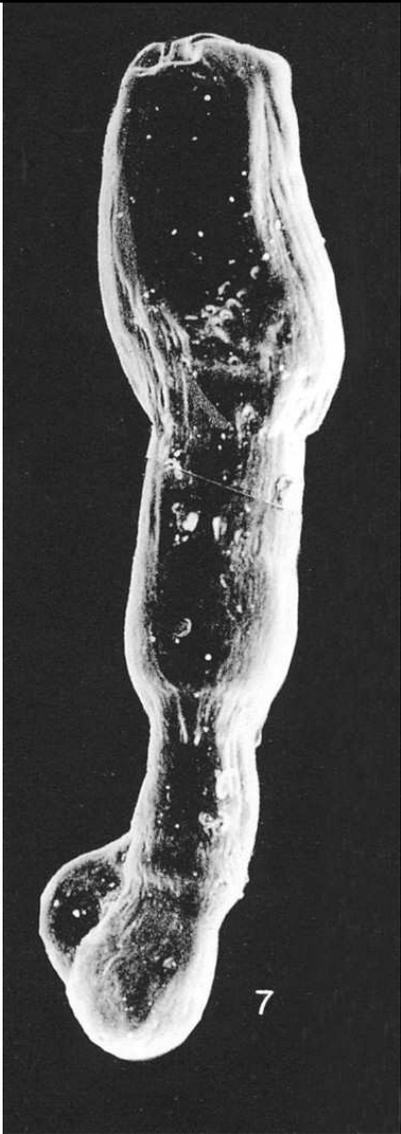


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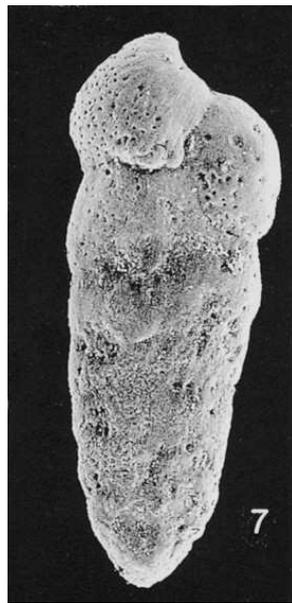
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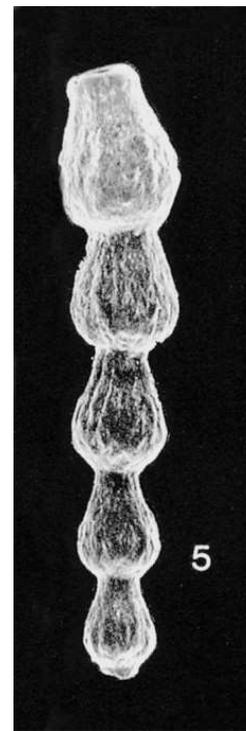
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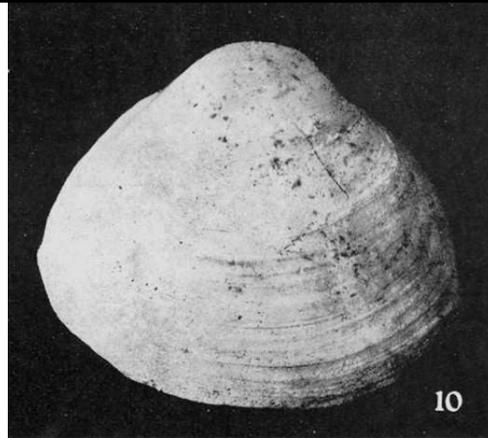


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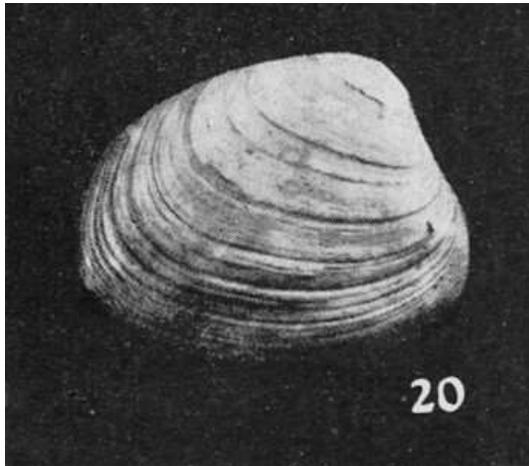
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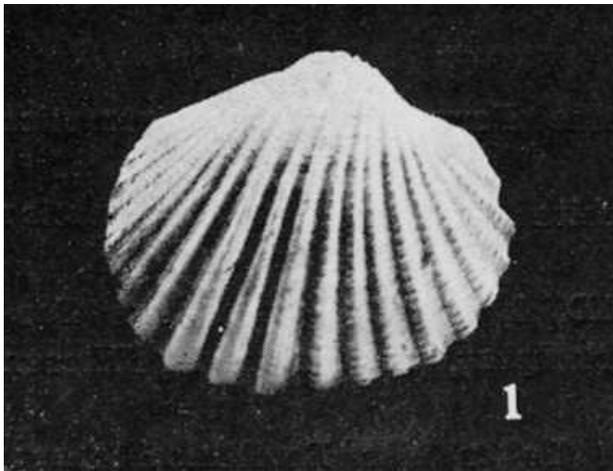
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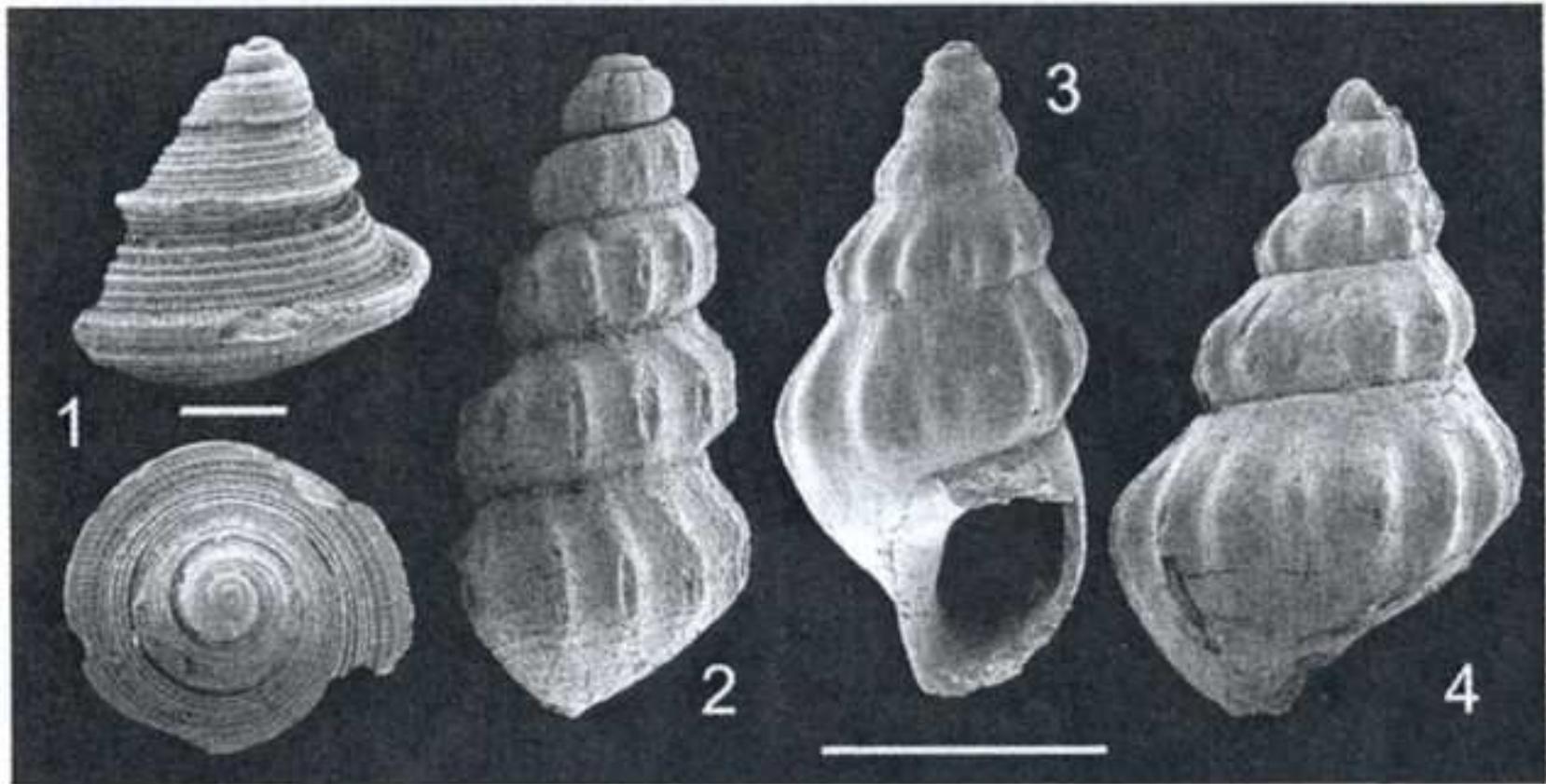


Fig. 10: Gastropods from the section Klapping which are restricted to the Lower Sarmatian *Mohrensternia* Zone. 1: *Calliostoma marginatum* (EICHWALD), 2: *Mohrensternia pseudoangulata* HILBER, 3: *Rissoe turricula* (EICHWALD), 4: *Mohrensternia sarmatica* (FRIEDBERG) (scale bar: 1 mm).



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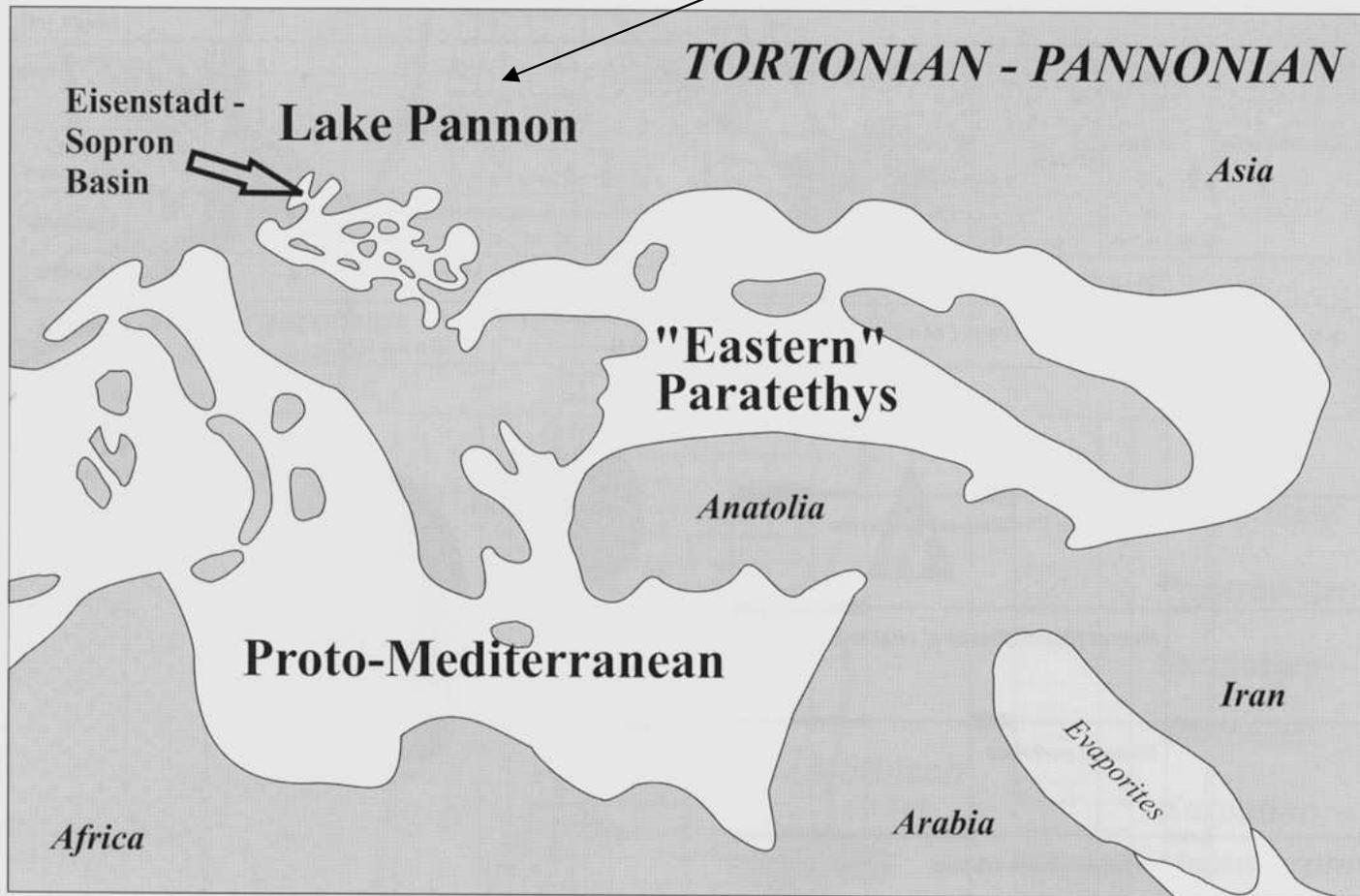


Fig. 4: Paleogeography of Lake Pannon, the Eastern Paratethys, and the Proto-Mediterranean during the Pannonian (after RÖGL, 1999)

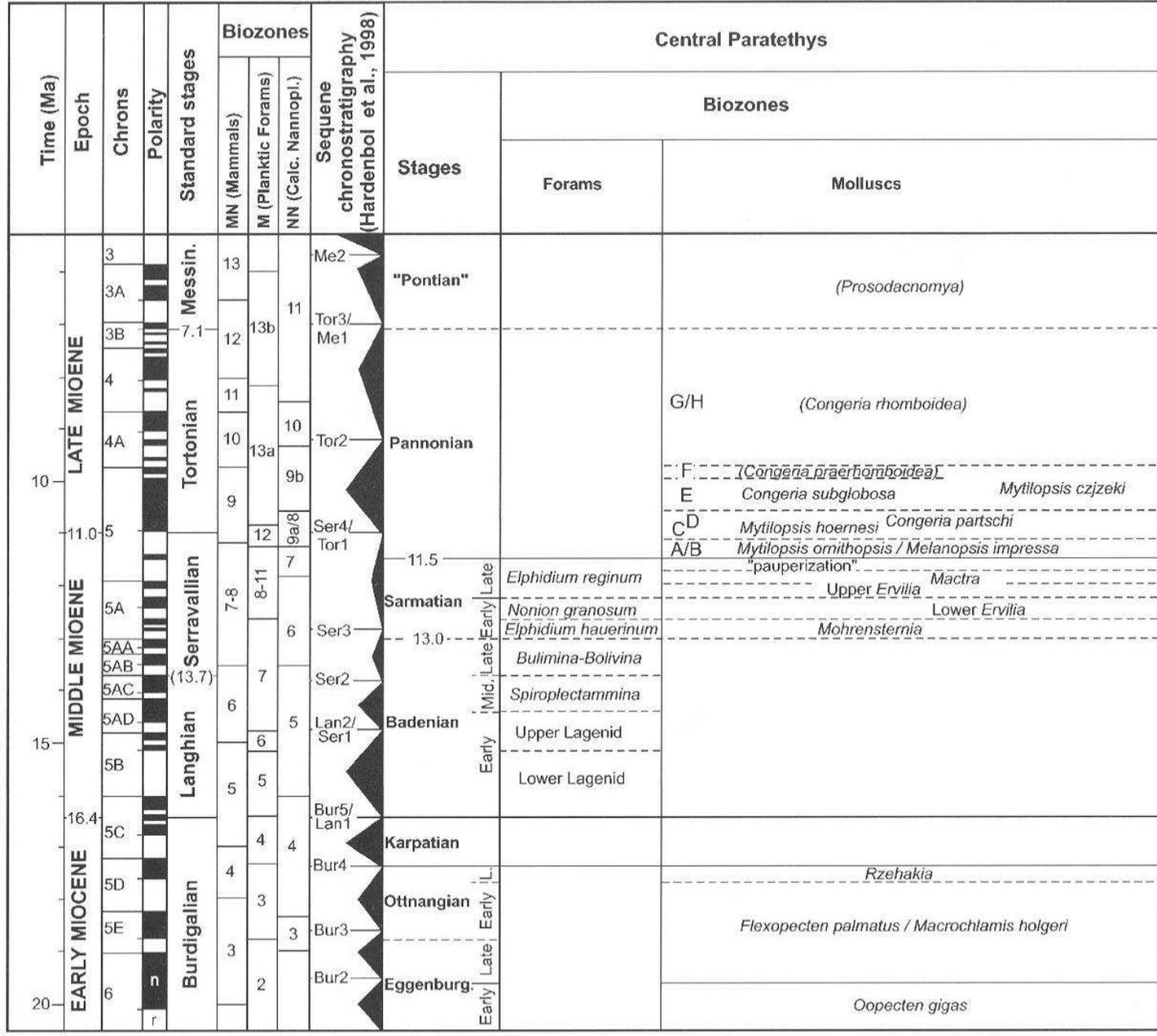


Fig. 1: Stratigraphic correlation chart of the standard scale with the Central Paratethys regional stage system and the foraminifera and mollusc biozones.

The Badenian sections are famous for the yellowish-white Leitha Limestone, which was already exploited during Roman times. An extensive introduction into the sedimentology, regional geology, and paleoecology of these deposits was given by SCHMID et al. (2001). Slightly younger sediments of the late Middle Miocene Sarmatian stage and the Late Miocene Pannonian stage crop out at the sand pit "Zollhaus". This pit is situated in the communal forest close to the Austrian/Hungarian border (geological map ÖK

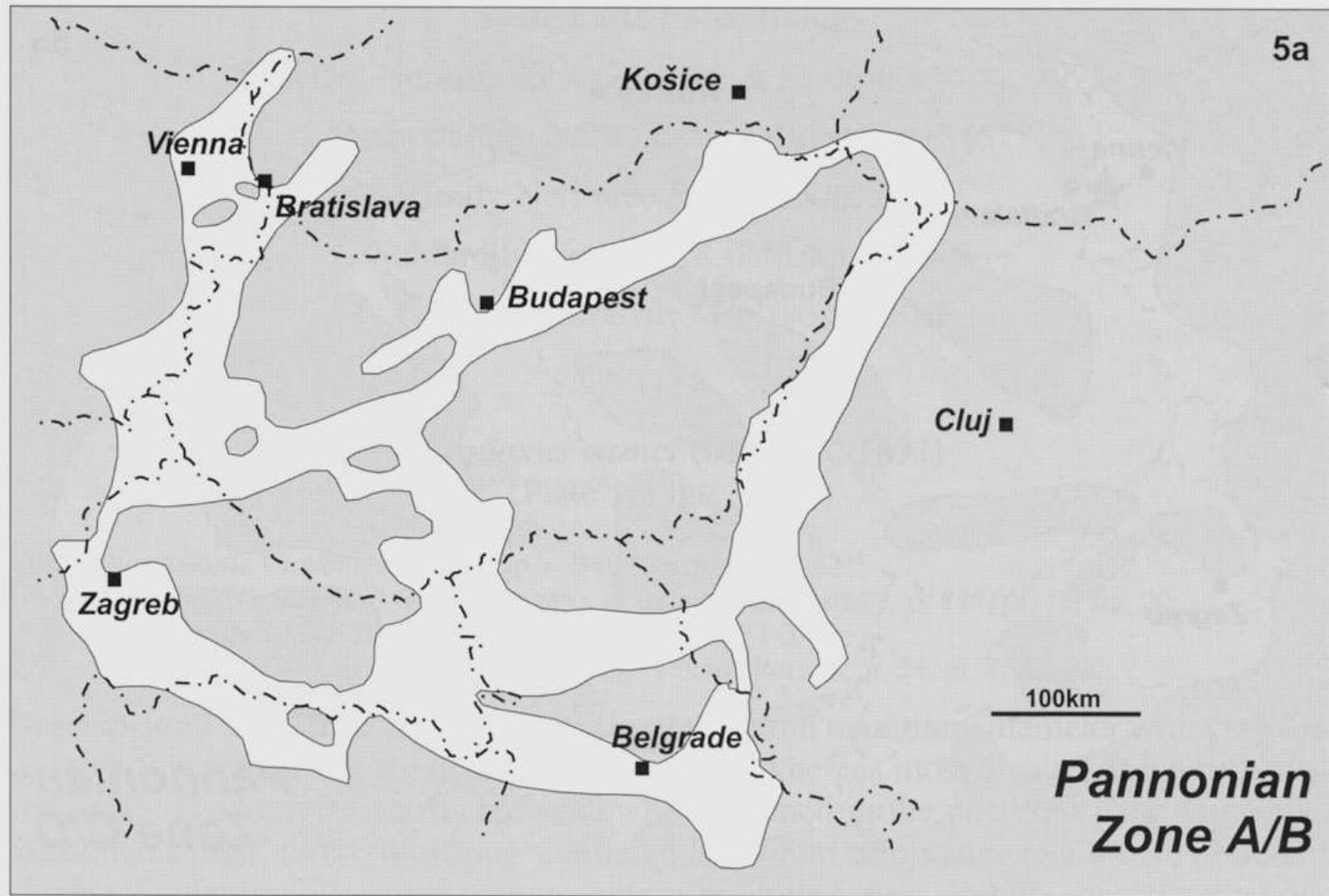
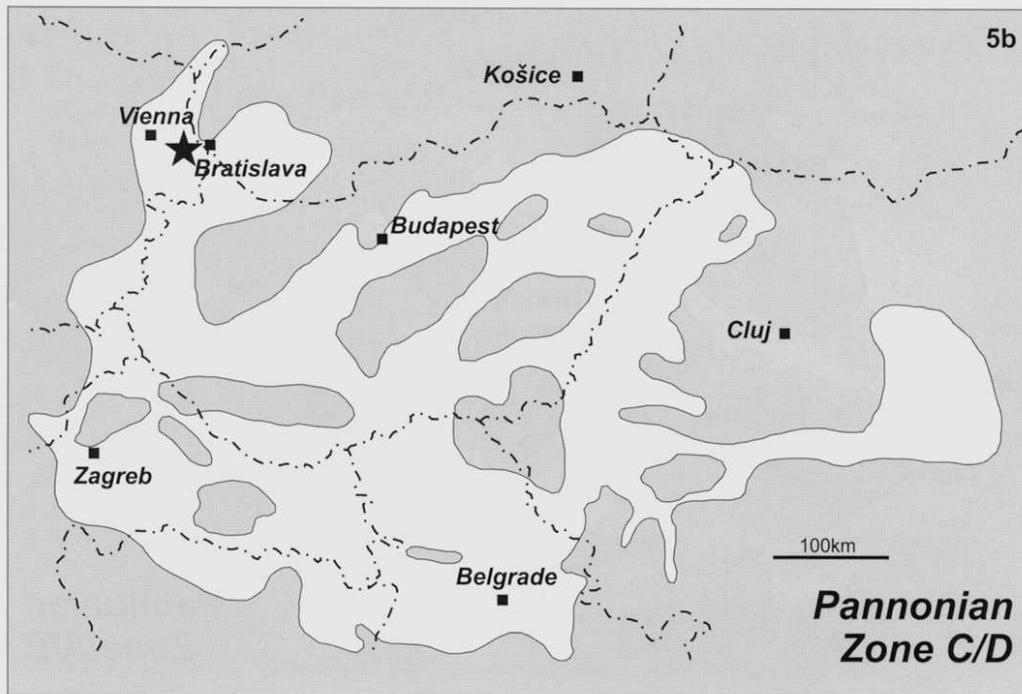
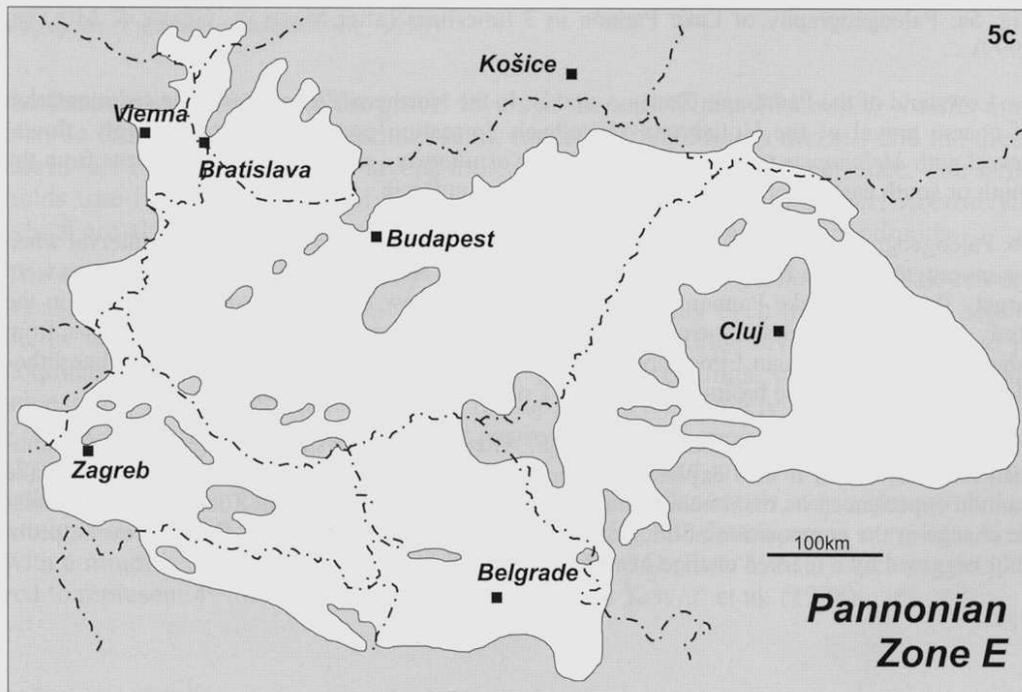


Fig. 5a: Paleogeography of Lake Pannon in 3 timeslices (after MAGYAR, GEARY & MÜLLER, 1999)

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Fig. 5b-c (continued): Paleogeography of Lake Pannon in 3 timeslices (after MAGYAR, GEARY & MÜLLER, 1999)

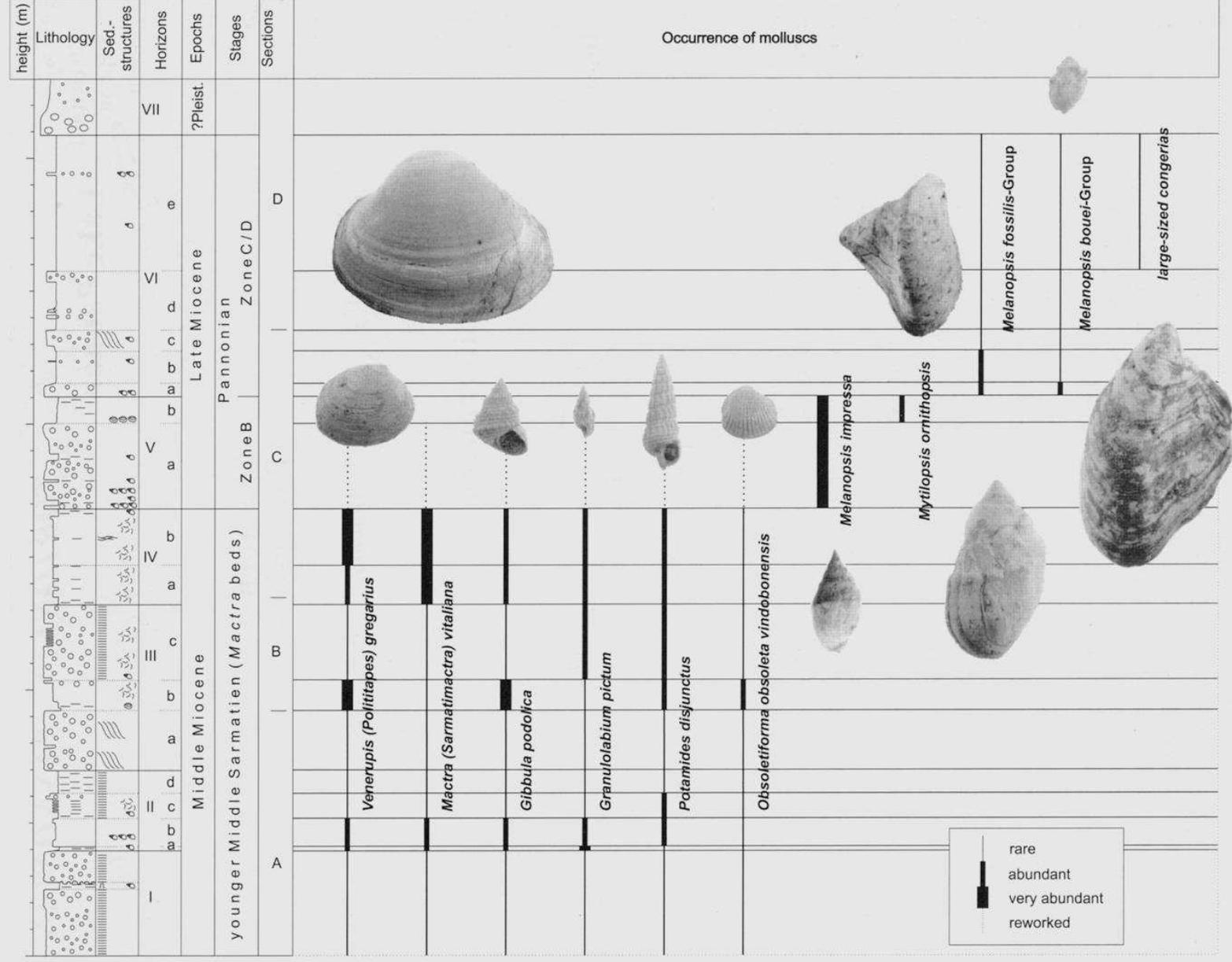
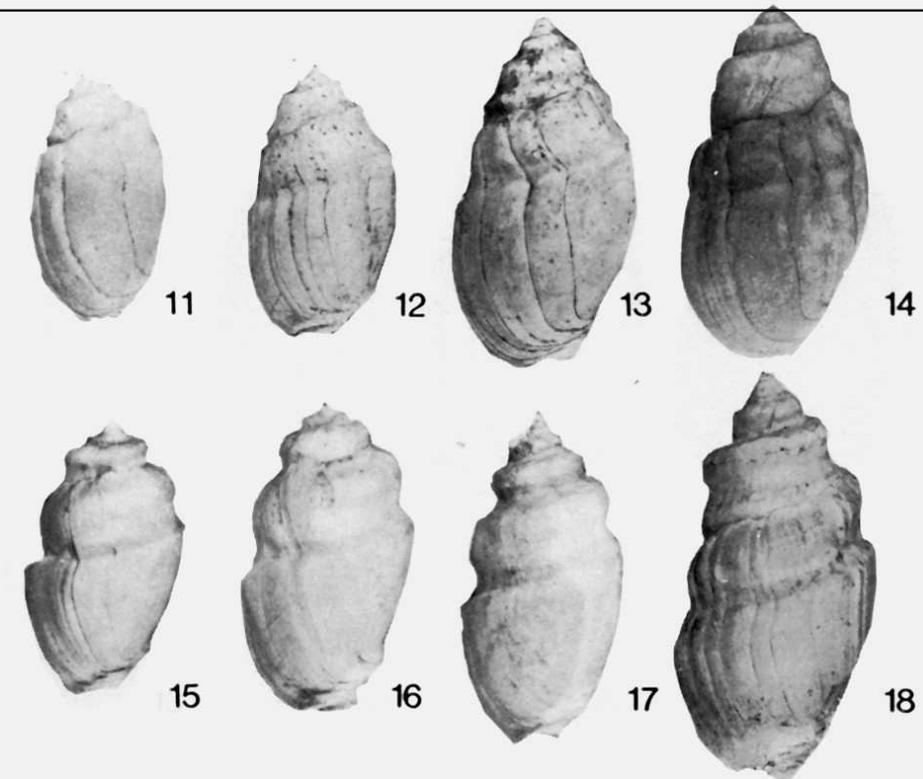
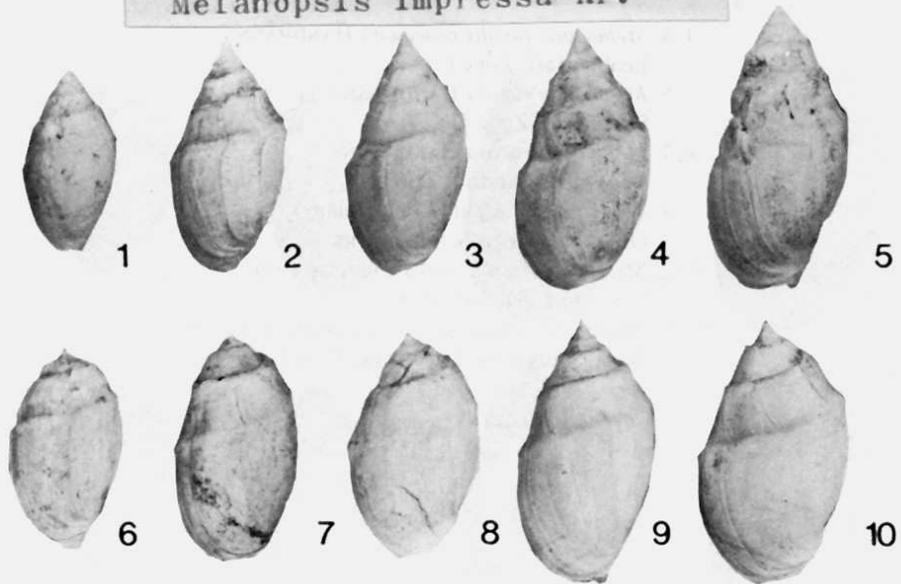


Fig. 3: Idealised log of the section with correlation of biozones.

Towards the top of the succession, only scattered layers (1-4 cm thickness) of fine gravel can be detected which are enriched in shells of various melanopsid species. Rare lithoclasts of Late Sarmatian marl are bound either to the high energetic, basal marls of

Melanopsis impressa Kr.

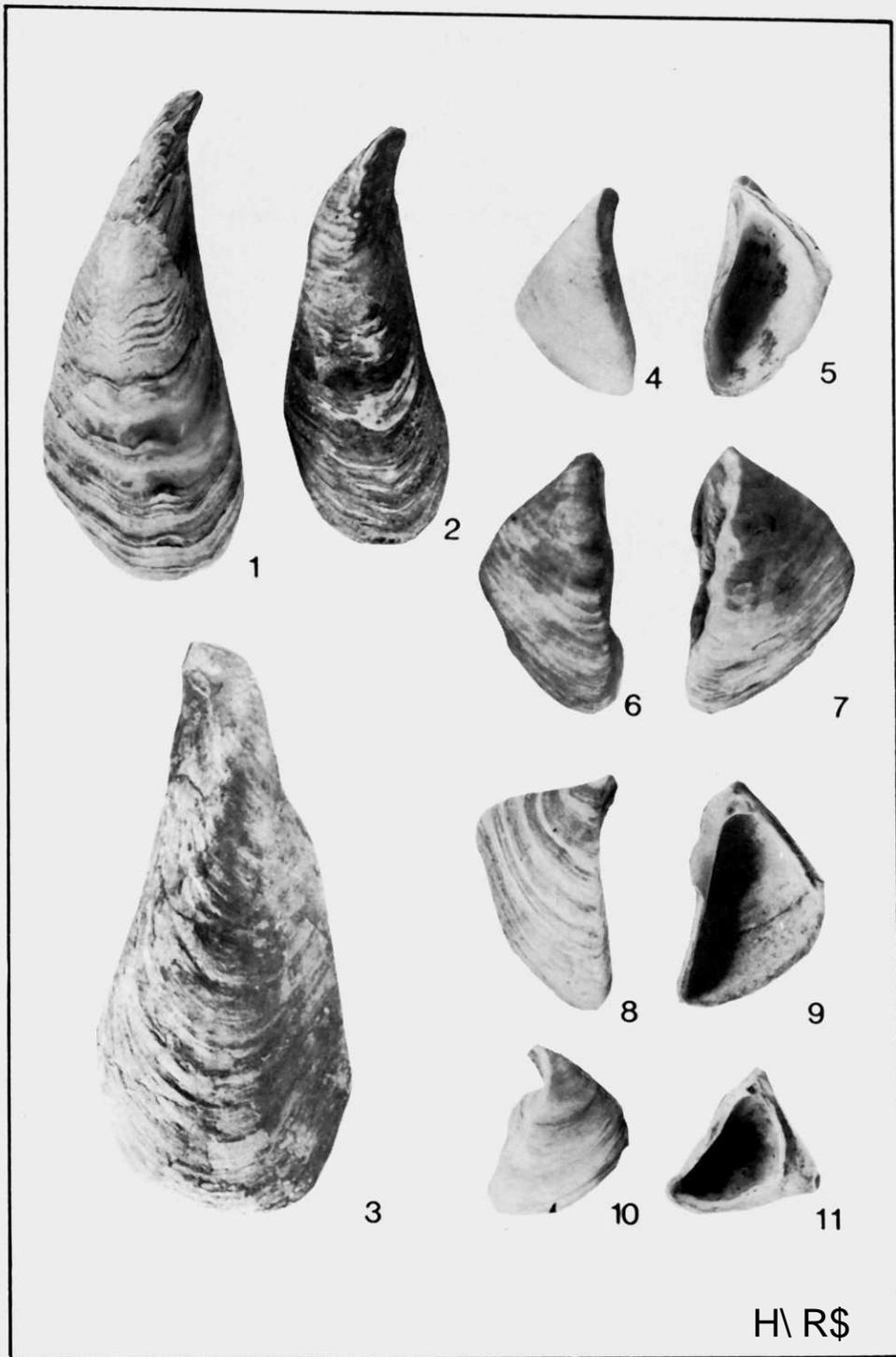


Melanopsis fossilis (M.-Gm.)

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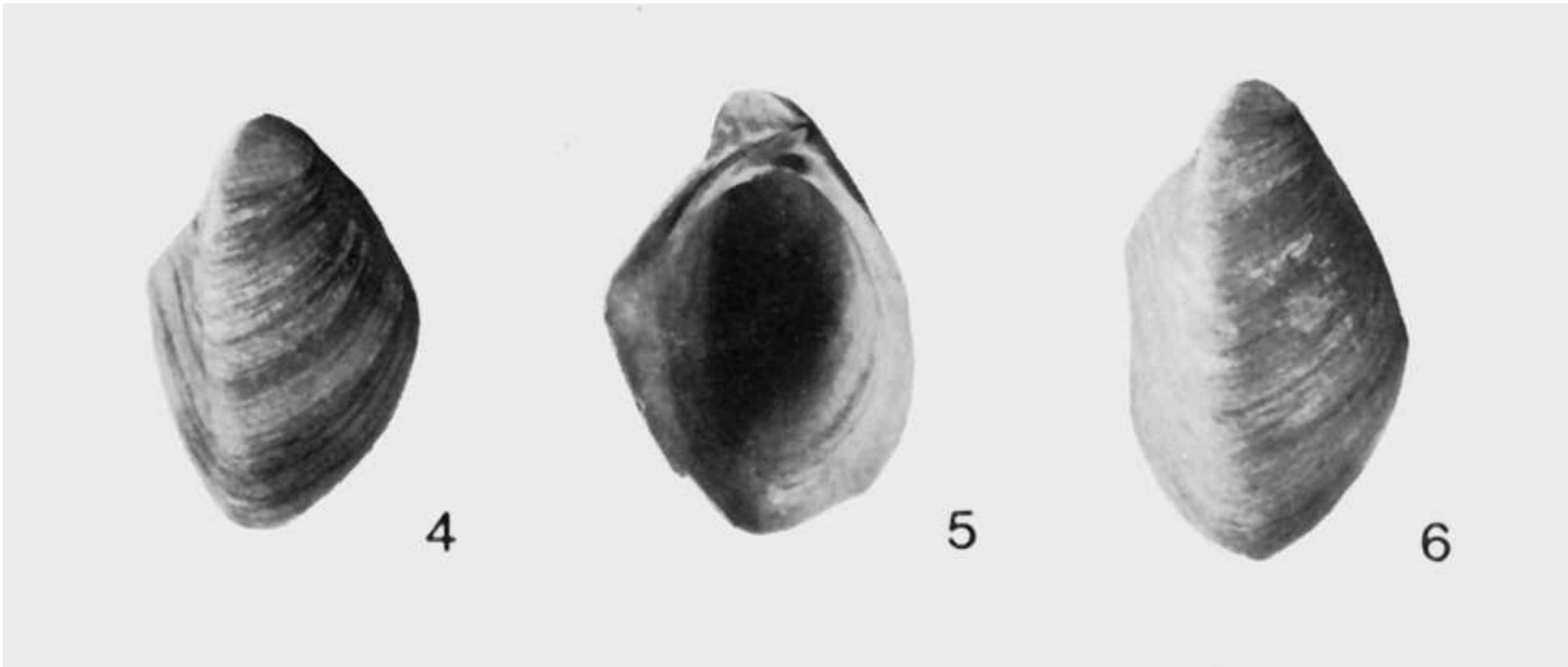
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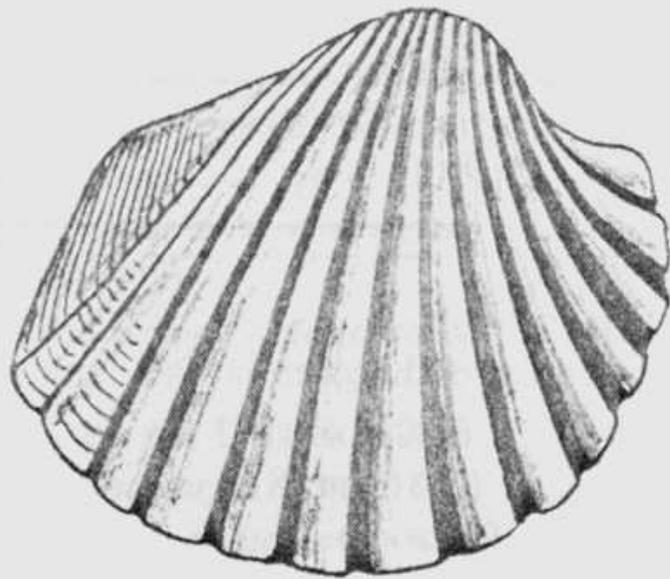
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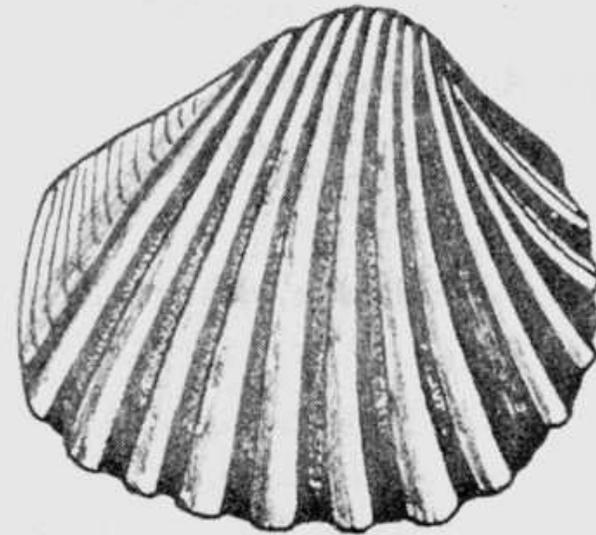
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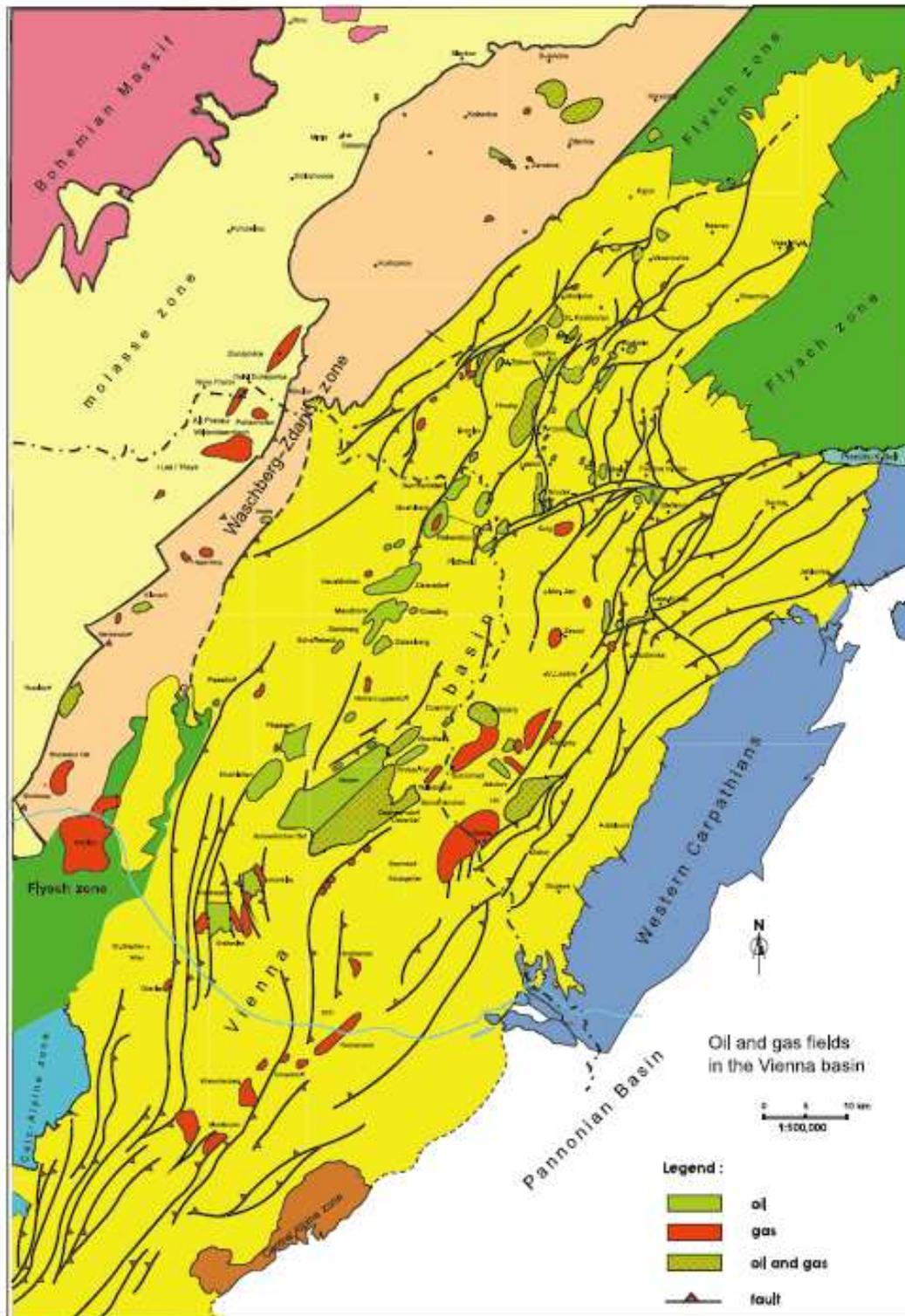
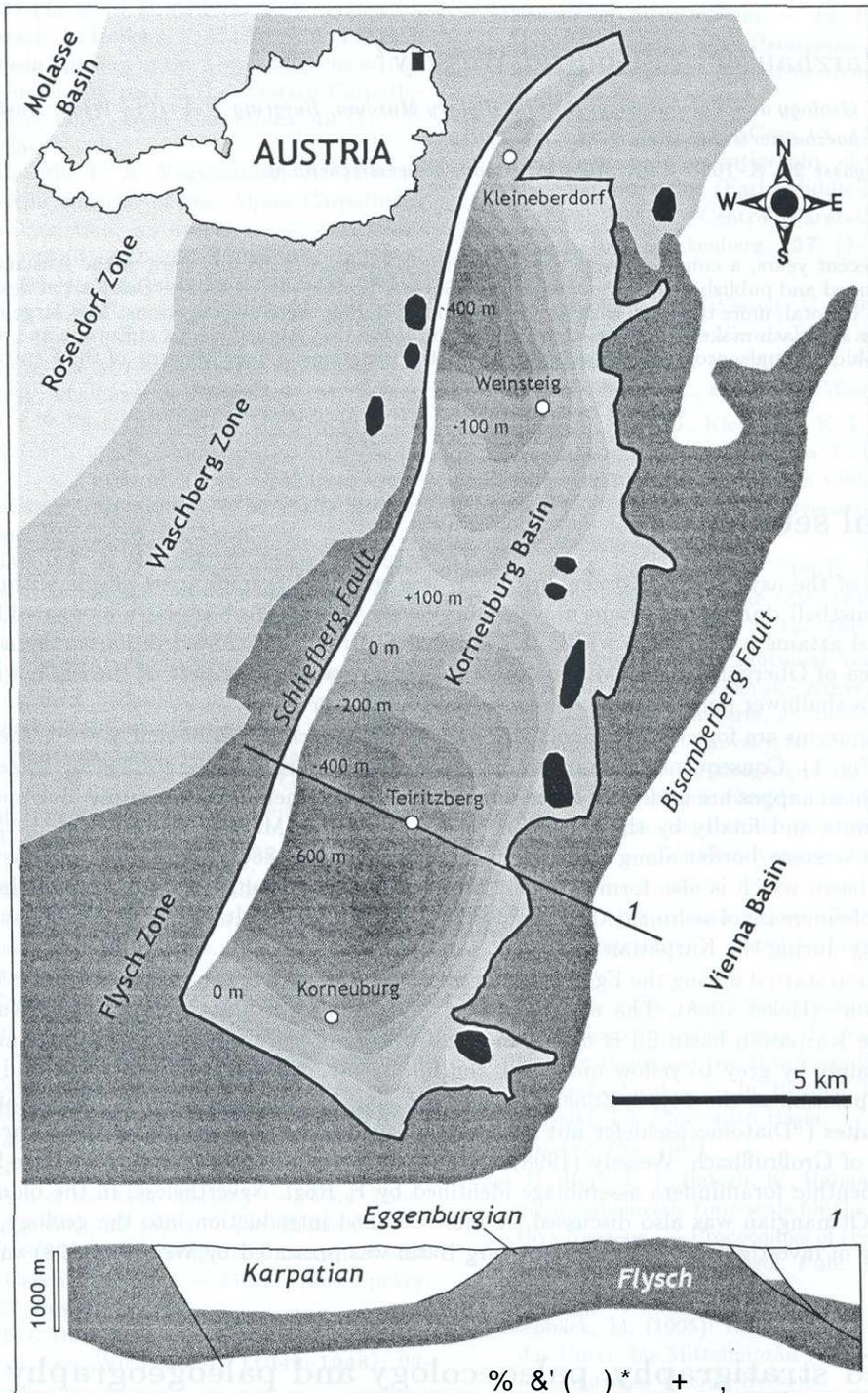


Figure 6. Oil and gas fields in the Vienna basin.

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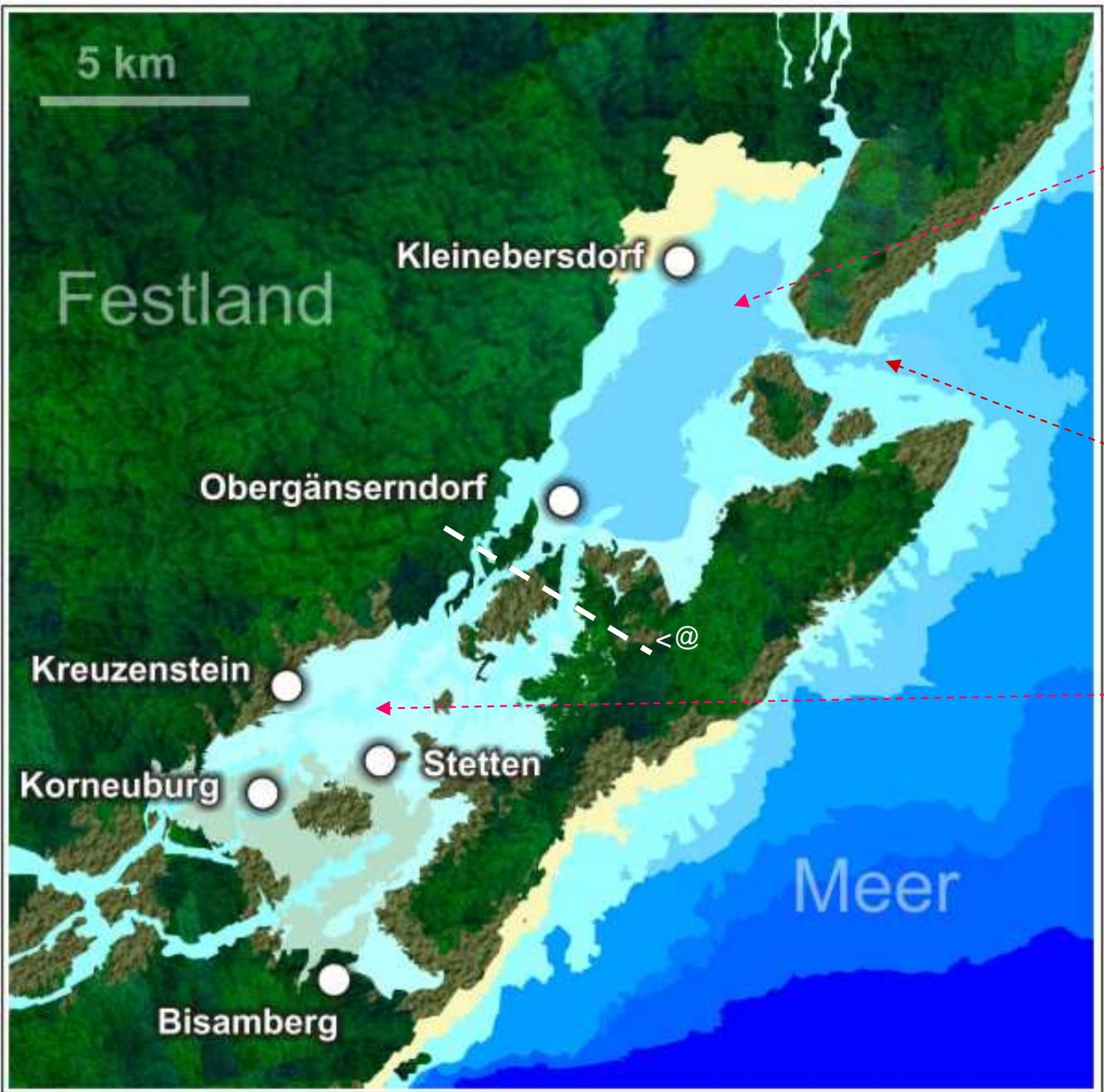
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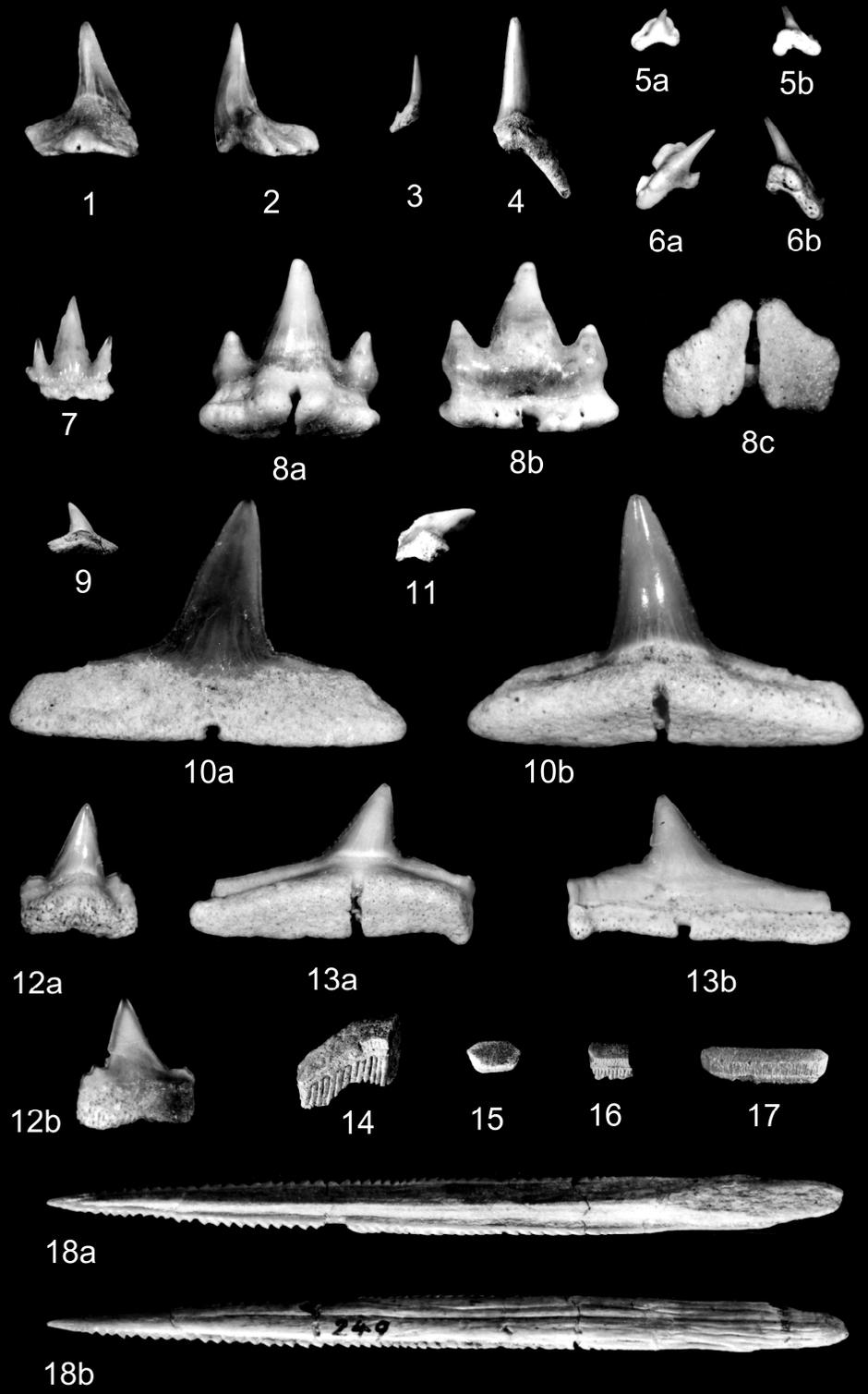
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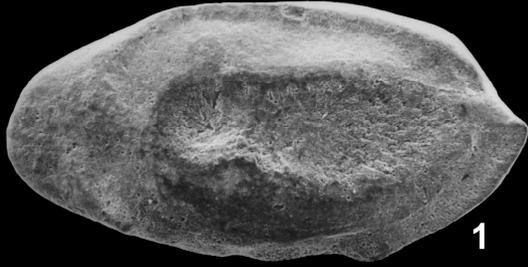
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*Ogilbia sovisi* Reichenbacher, 1998



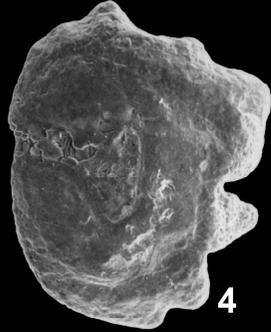
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*Batrichthys steiningeri*  
Reichenbacher, 1998



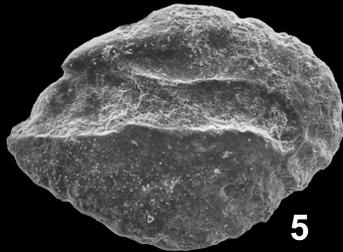
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*Atherina austriaca*  
Schubert, 1906



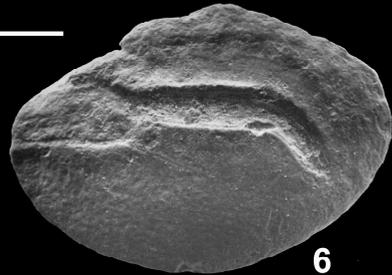
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*Paraplagusia roseni*  
Nolf & Cappetta, 1980



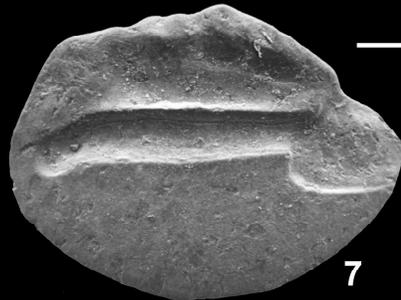
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*Gerres* sp.



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*Pomadasys arcuatus*  
(Bassoli & Schubert, 1906)



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*Brachydeuterus latior* (Schubert, 1906)



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*Lesueurigobius vicinalis* (Koken, 1891)



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*Gobius multipinnatus*  
(H. v. Meyer, 1852)

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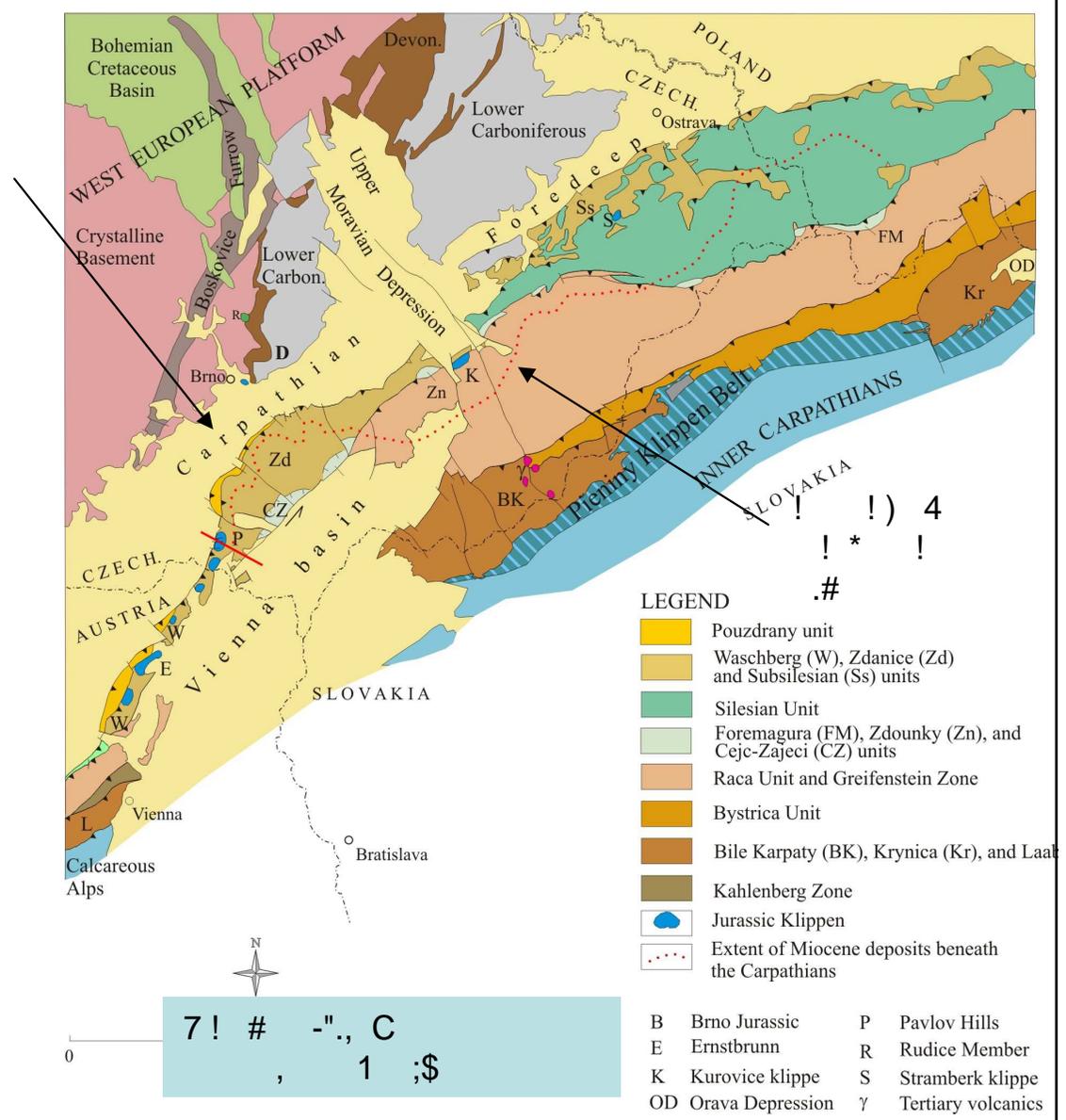
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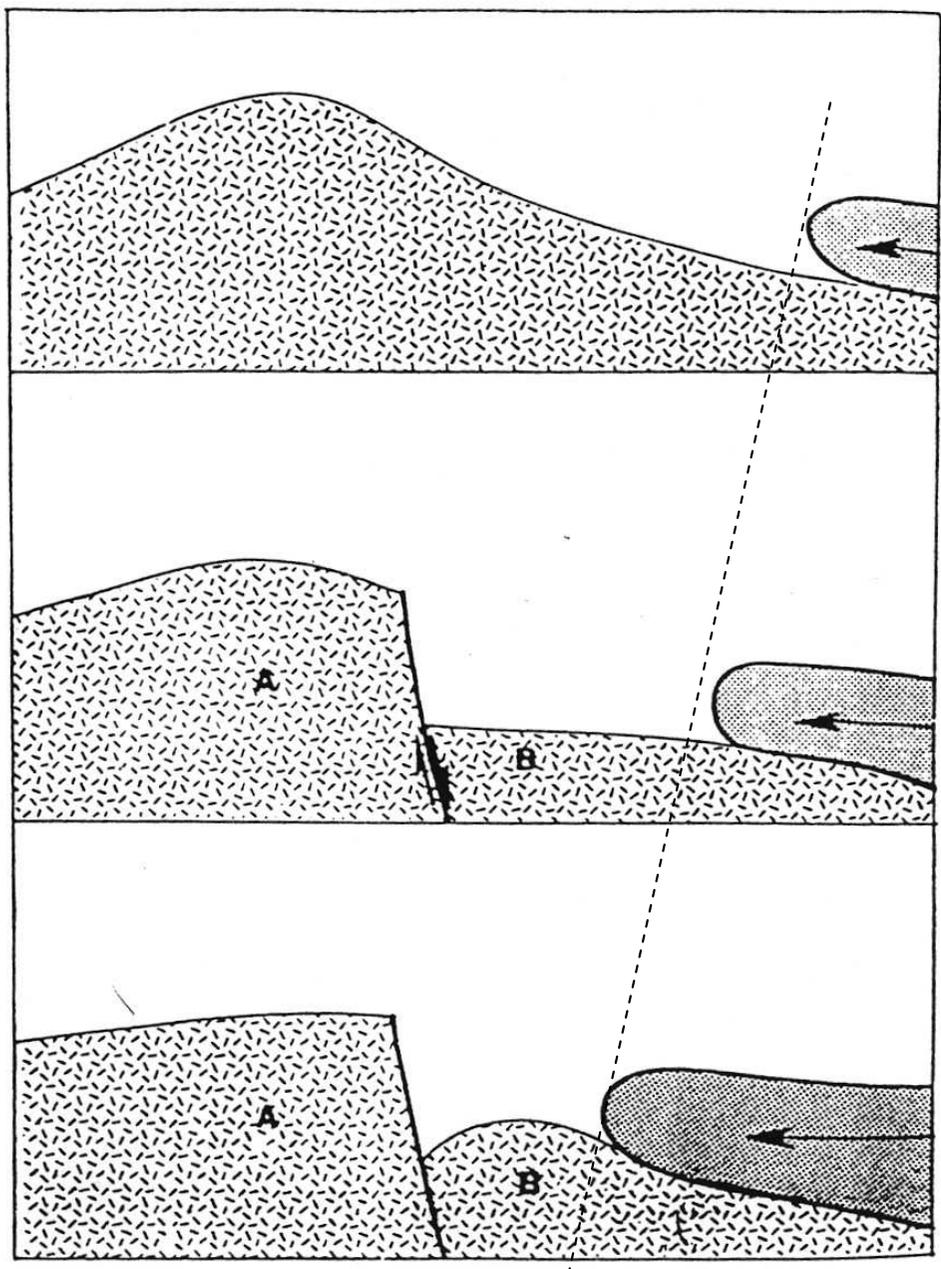
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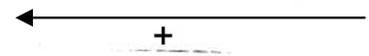


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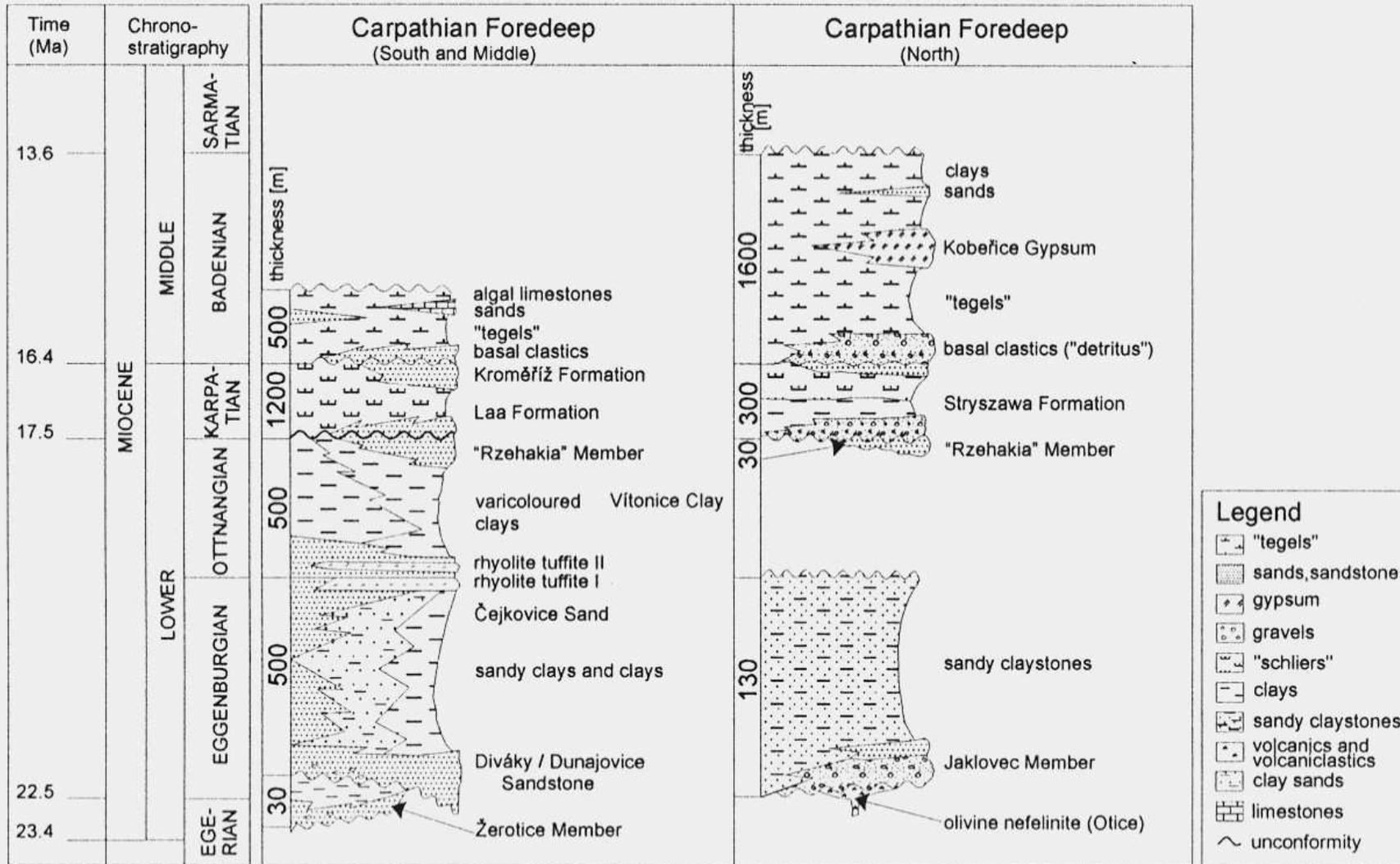
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Figure 21 Conceptual model for the development of flexure in separate fault blocks. Detailed description given in text.



# Stratigraphic scheme of the Miocene of the Carpathian Foredeep in Moravia (modified after Brzobohatý in Chlupáč et al. 2002, Adámek et al. 2003 and Adámek 2003)



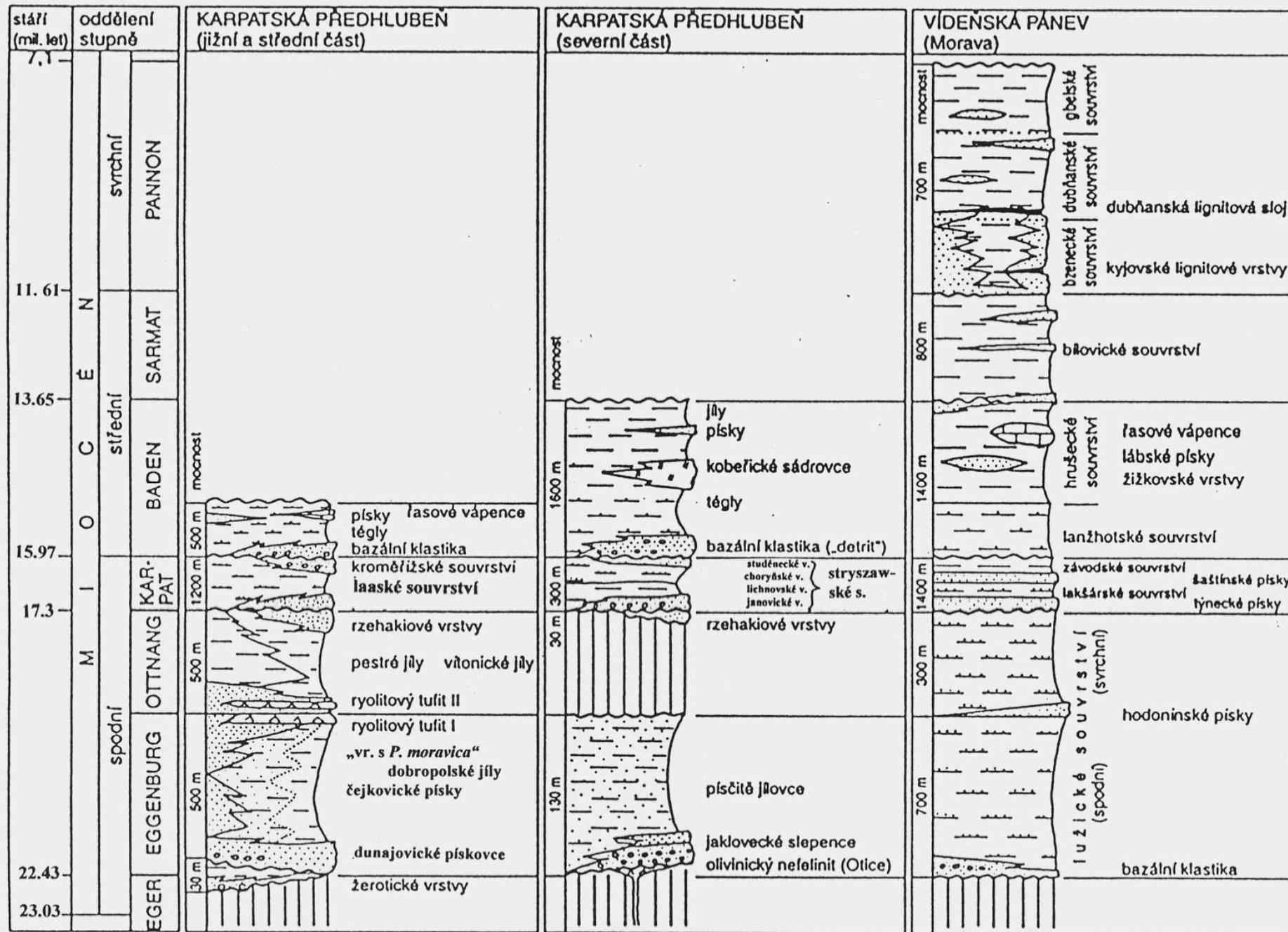
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Obr. 247. Stratigrafické schéma neogénu karpatské předhlubně a vídeňské pánve na Moravě (R. Brzobohatý, orig.).



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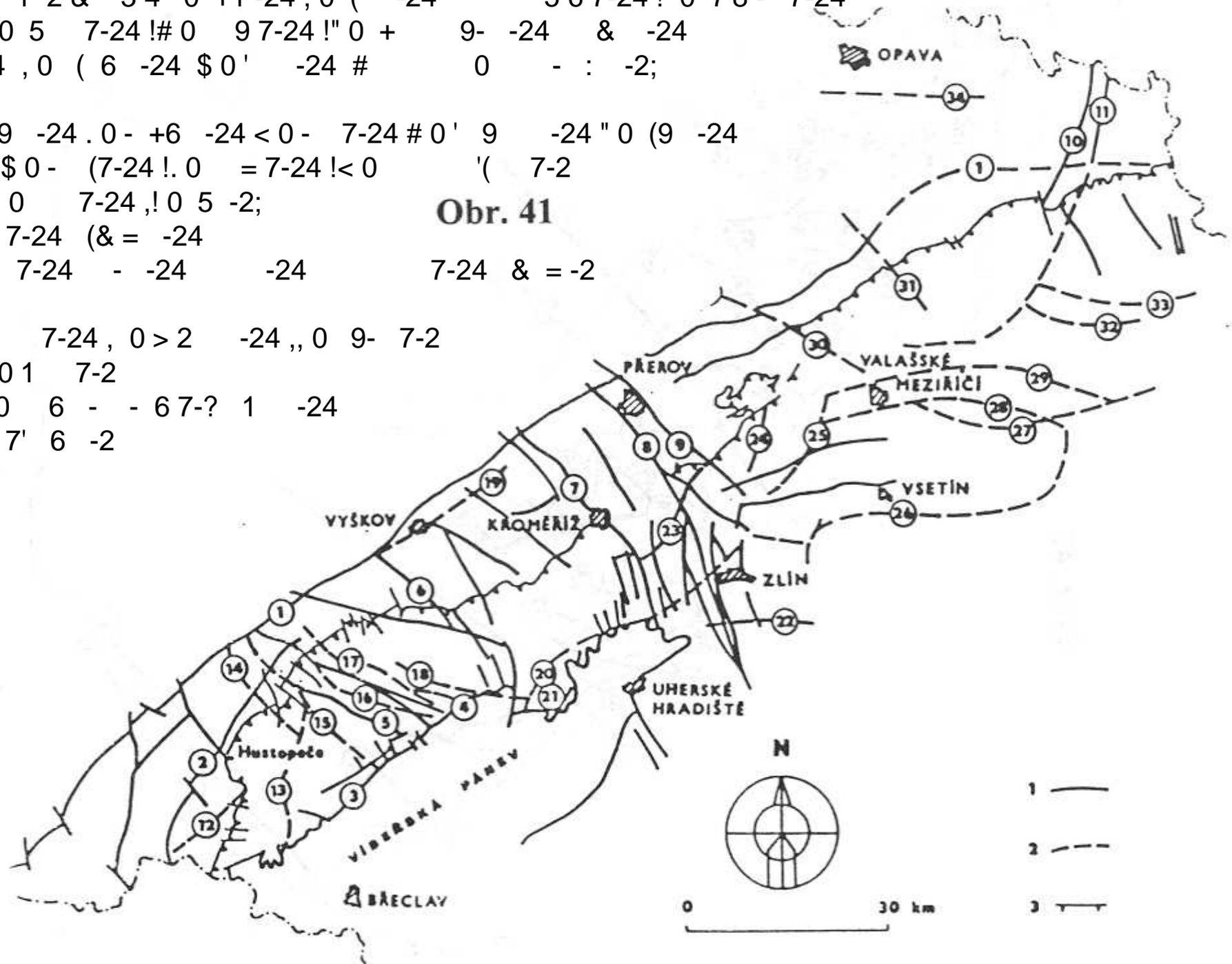
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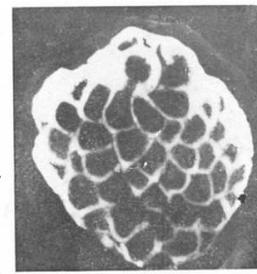
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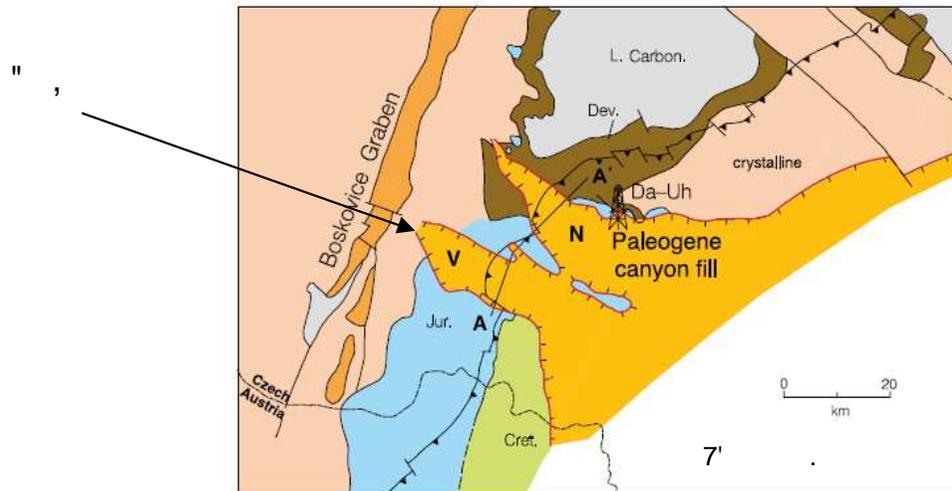


Figure 12. Pre-Neogene subcrop map showing the Nisvacilka (N) and Vranovice (V) paleovalleys cut into the European foreland plate, filled with Paleogene deposits, and later buried below the edges of the Western Carpathian thrust belt and the Neogene foredeep. Da-Uh marks the location of the Damborice and Uhrice oil and gas fields, respectively (Picha, 1996). Cross section of AA' shown in Figure 13.

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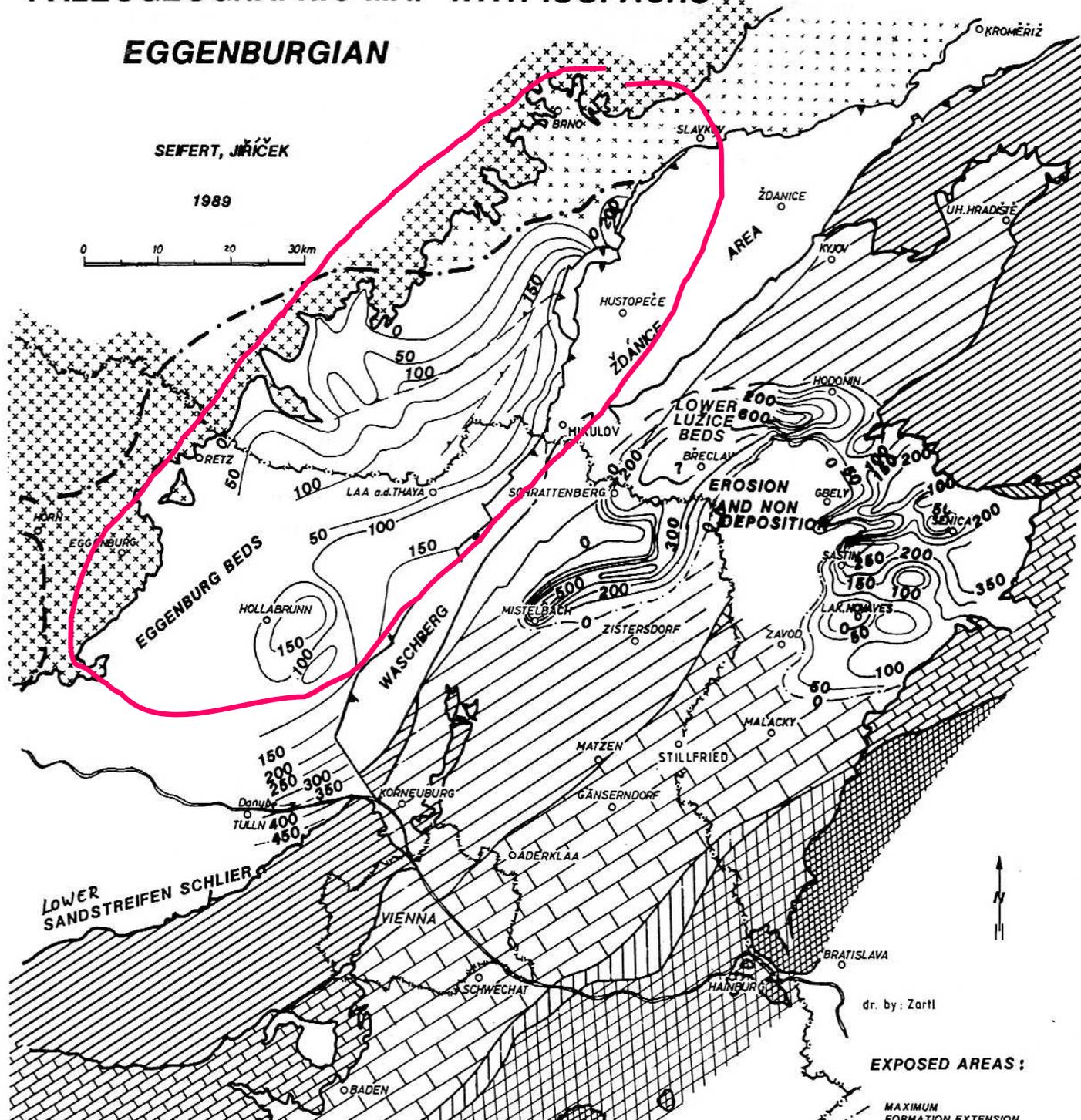
# VIENNA BASIN AND MOLASSE FOREDEEP PALEOGEOGRAPHIC MAP WITH ISOPACHS

@ = 6 - !"\$

## EGGENBURGIAN

SEIFERT, JŘIČEK

1989

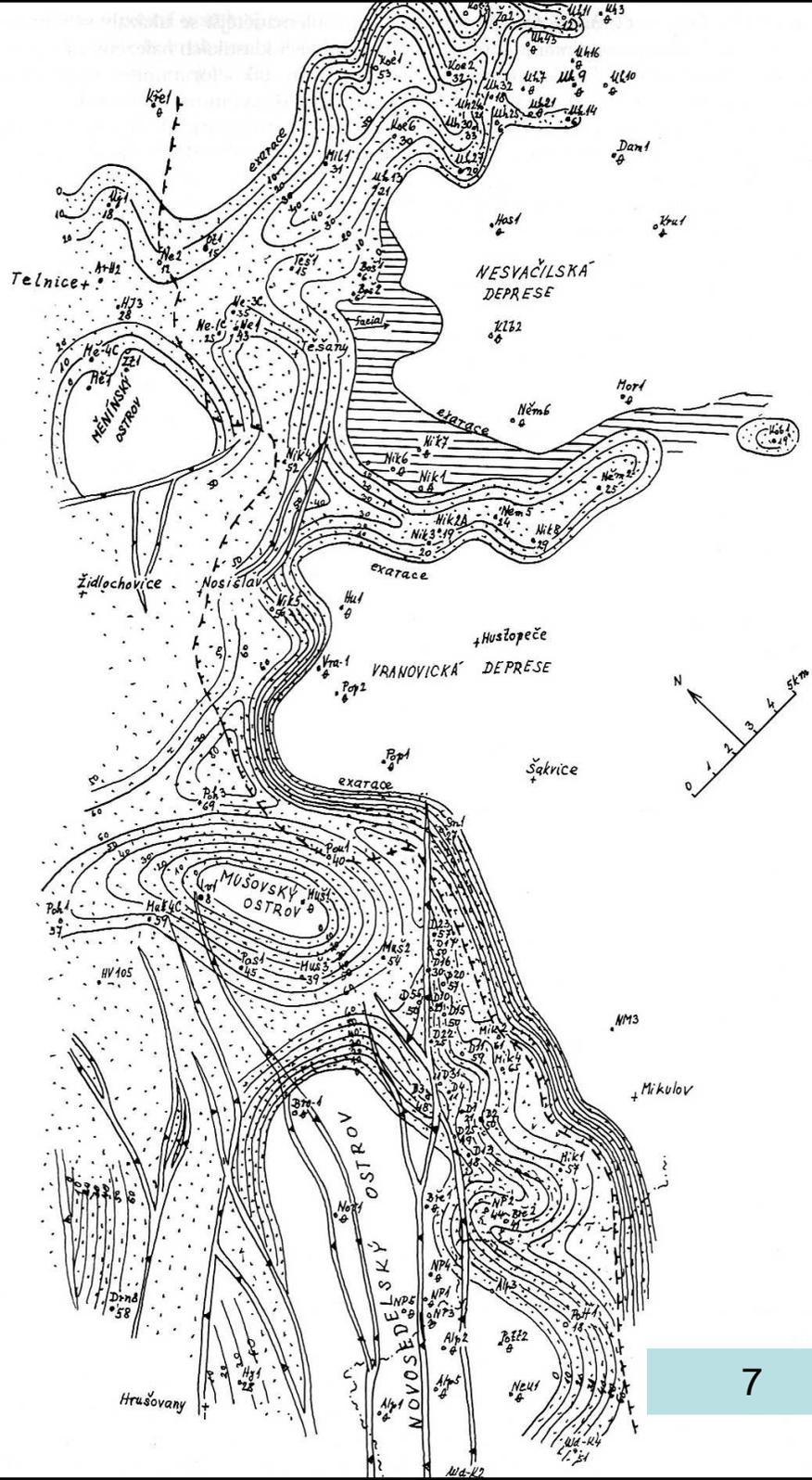


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dr. by: Zartl

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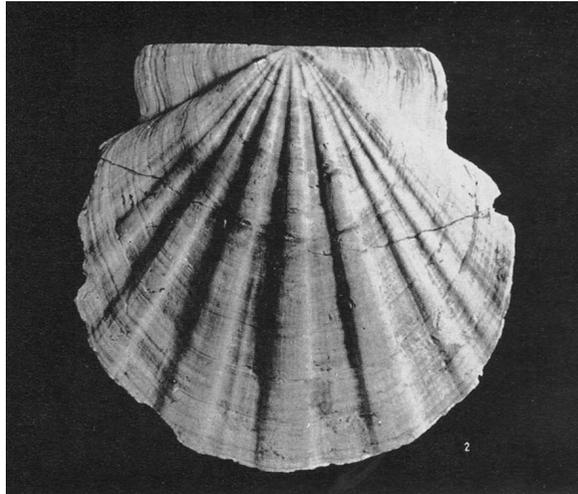
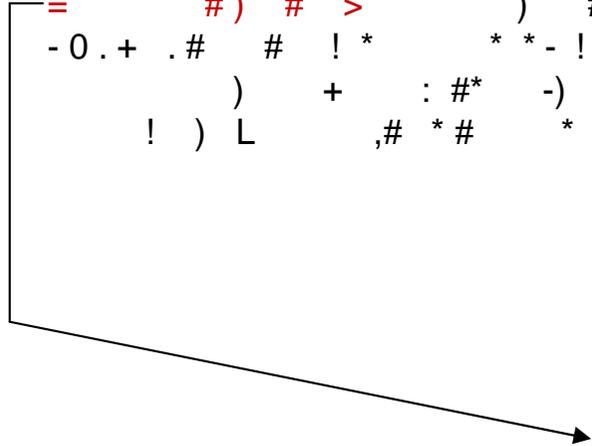
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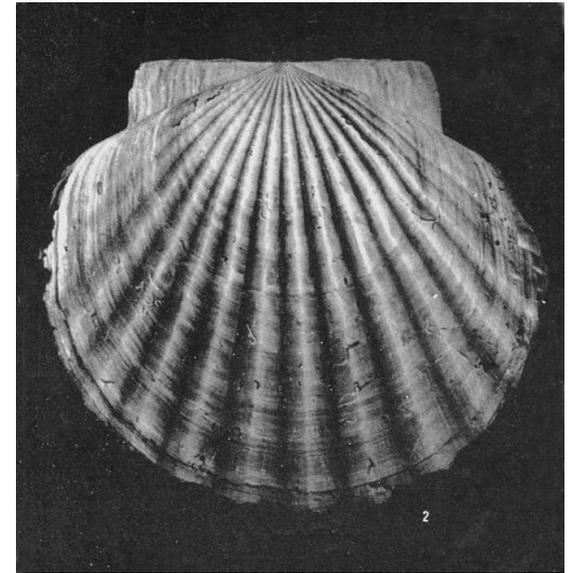


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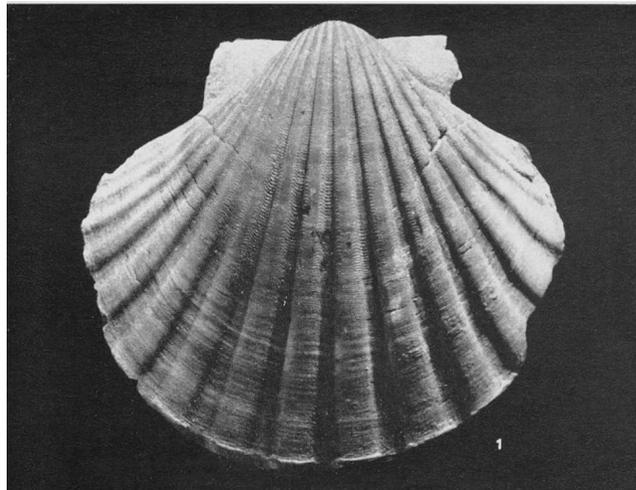
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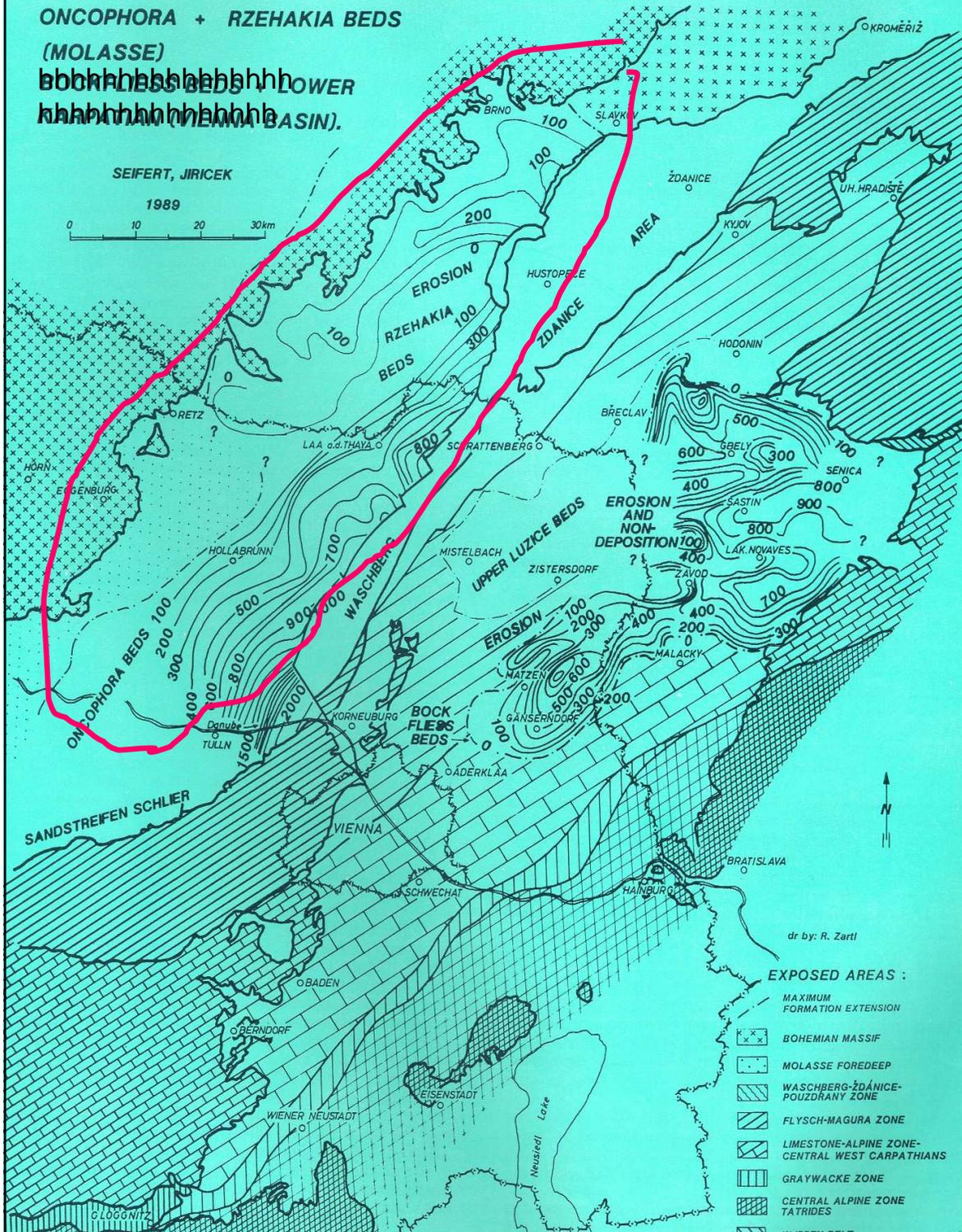


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# VIENNA BASIN AND MOLASSE FOREDEEP PALEOGEOGRAPHIC MAP WITH ISOPACHS

ONCOPHORA + RZEHAKIA BEDS

(MOLASSE)  
BOCKFLIESS BEDS LOWER  
BASIN (VIENNA BASIN).



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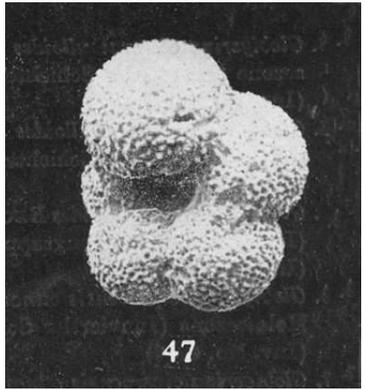
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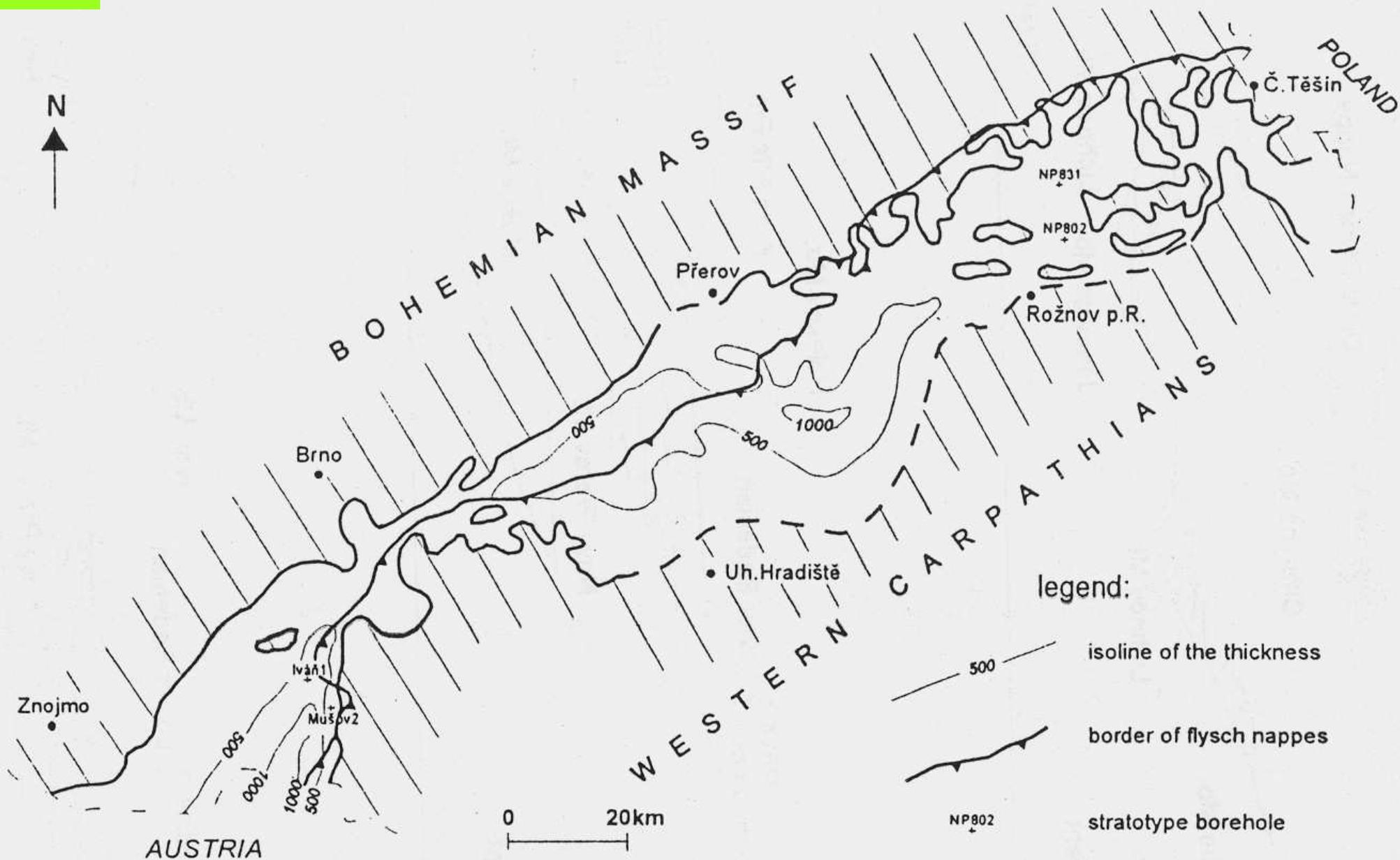
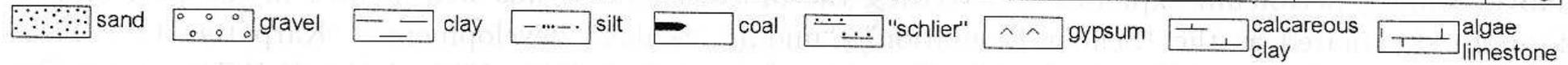
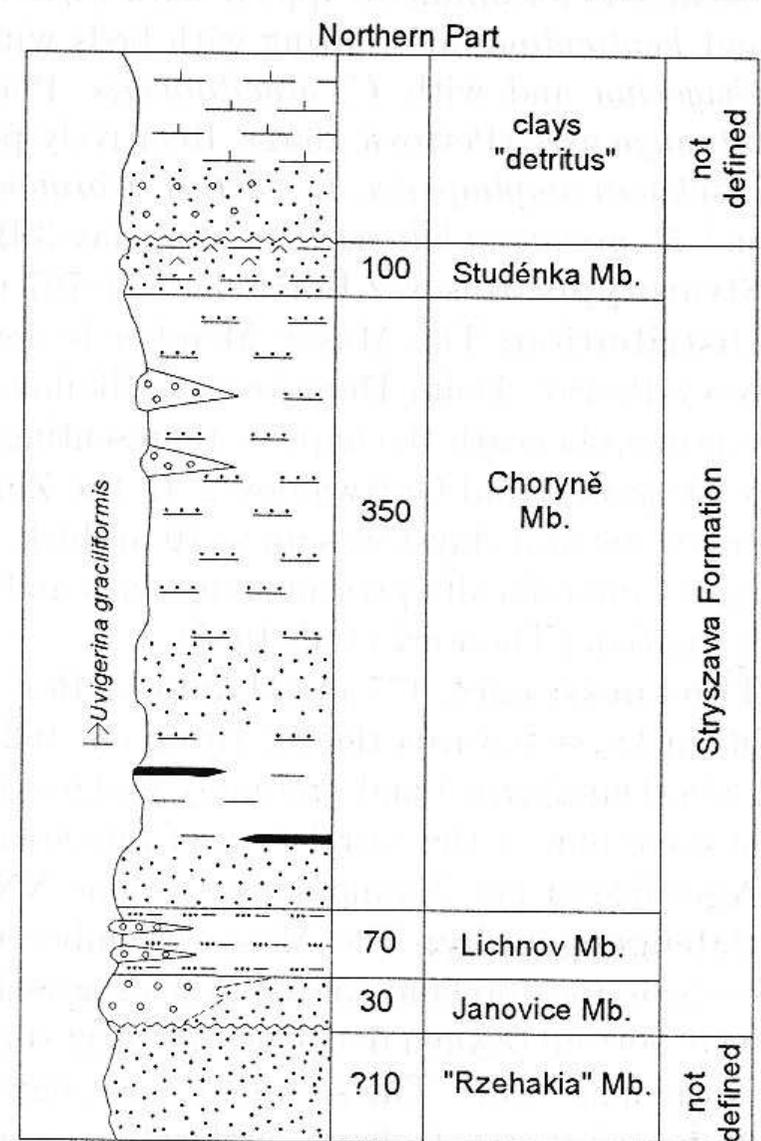
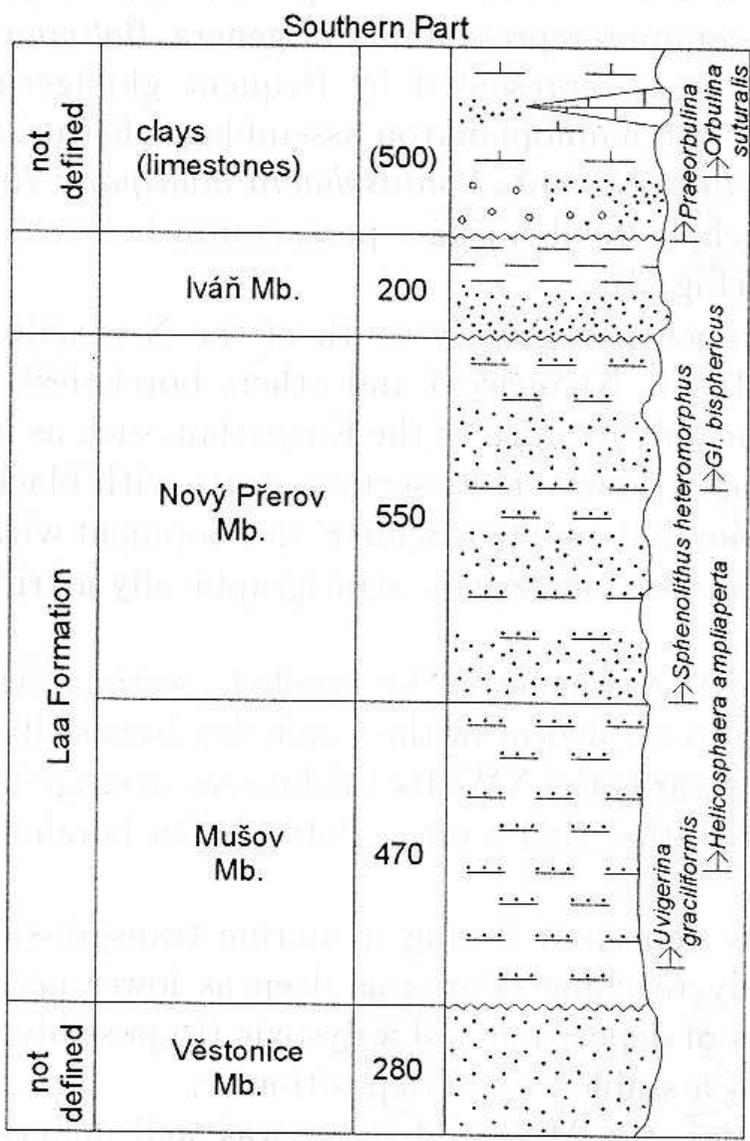


Figure 1: Thickness map of the Karpatian deposits of the Carpathian Foredeep (Moravia).

| Time (Ma) | Chronostratigraphy |                    | Biostratigraphy |
|-----------|--------------------|--------------------|-----------------|
|           | Mediterranean      | Central Paratethys |                 |
| 16,4      | M. Miocene         | Langhian           | NN 5            |
|           |                    | Lower Badenian     |                 |
| 17,5      | Lower Miocene      | Burdigalian        | NN 4            |
|           |                    | Karpatian          |                 |
|           |                    | Ottnangian         |                 |

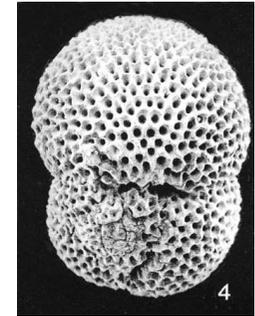
Rögl et al. (2002)

| Lithostratigraphy - Lithology |         |           |                                                         |           |         |            |
|-------------------------------|---------|-----------|---------------------------------------------------------|-----------|---------|------------|
| Formations                    | Members | Thickness | Lithology and occurrence of the most indicative species | Thickness | Members | Formations |



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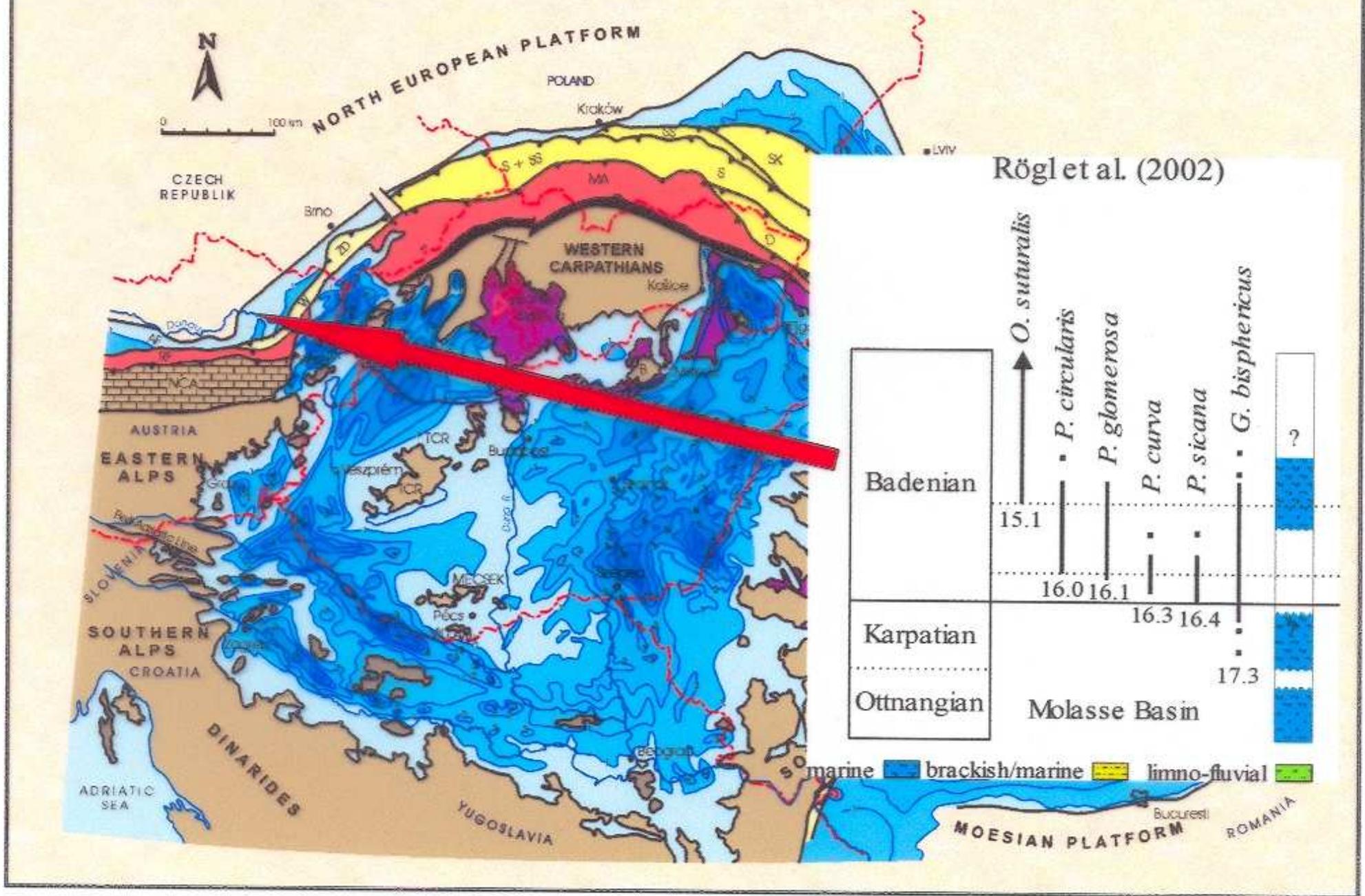
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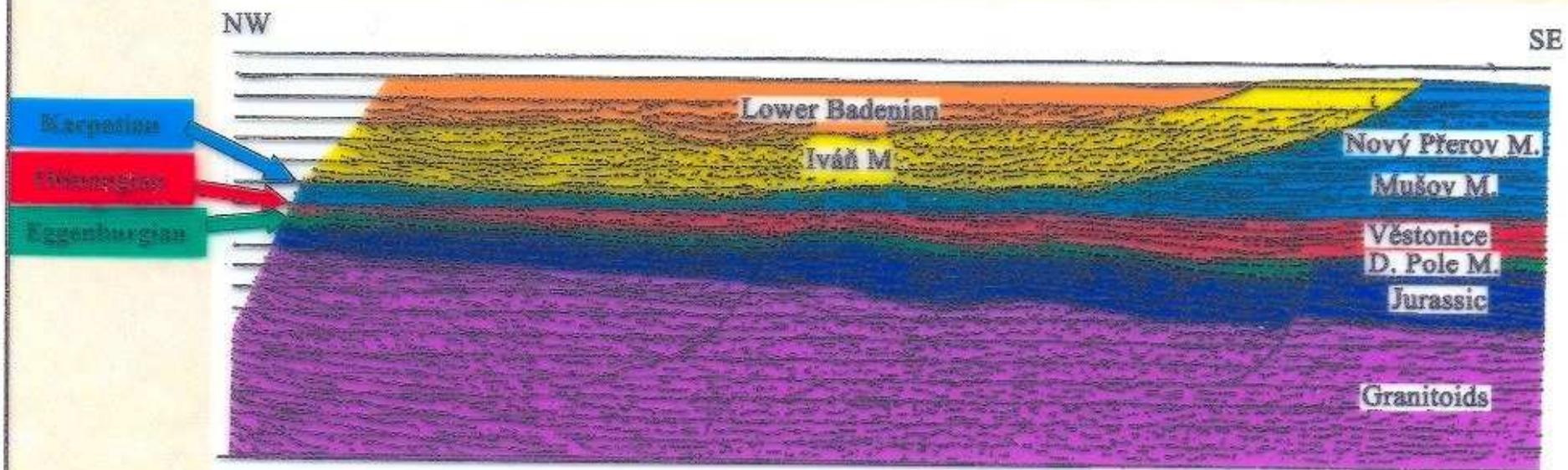
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# LOWER AND UPPER BOUNDARY OF THE KARPATIAN AND SEDIMENTATION PROFILES IN SEVERAL BASINS OF THE CENTRAL PARATETHYS



# SEISMIC PROFILE 317/84

(CARPATHIAN FOREDEEP, SOUTH MORAVIA)



Seismic profile 317/84 (Carpathian Foredeep, South Moravia: Jiříček 1995, compiled by Adámek 2002)

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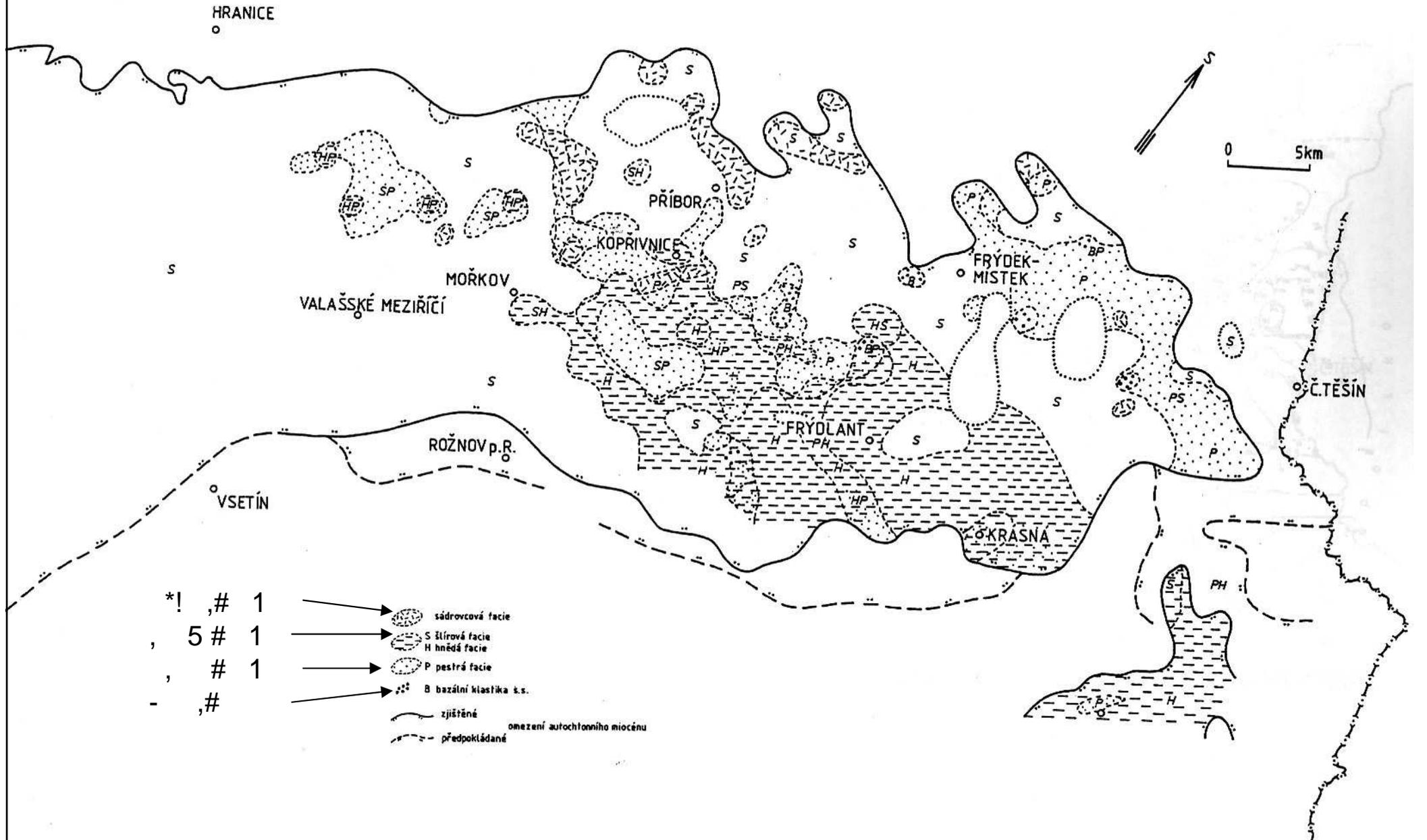
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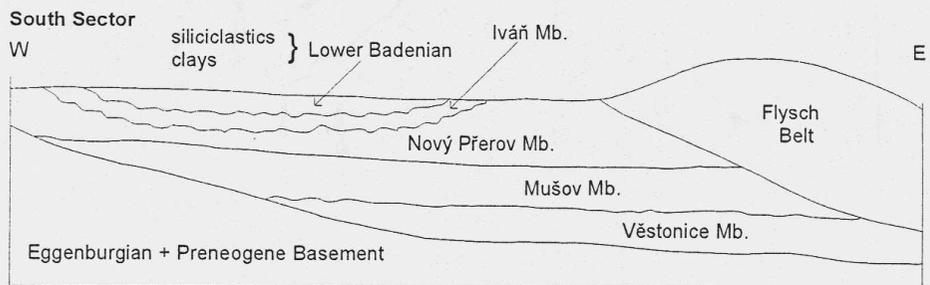
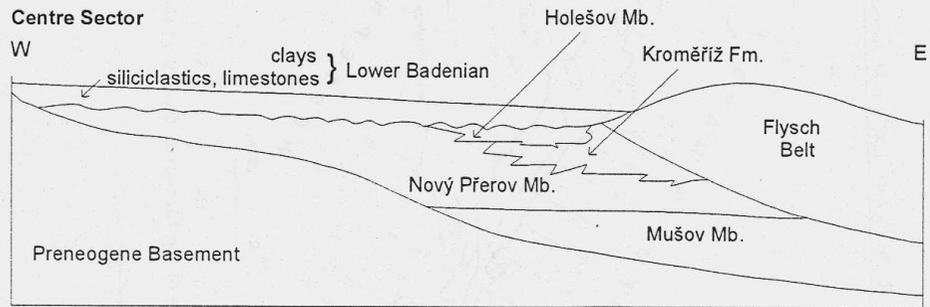
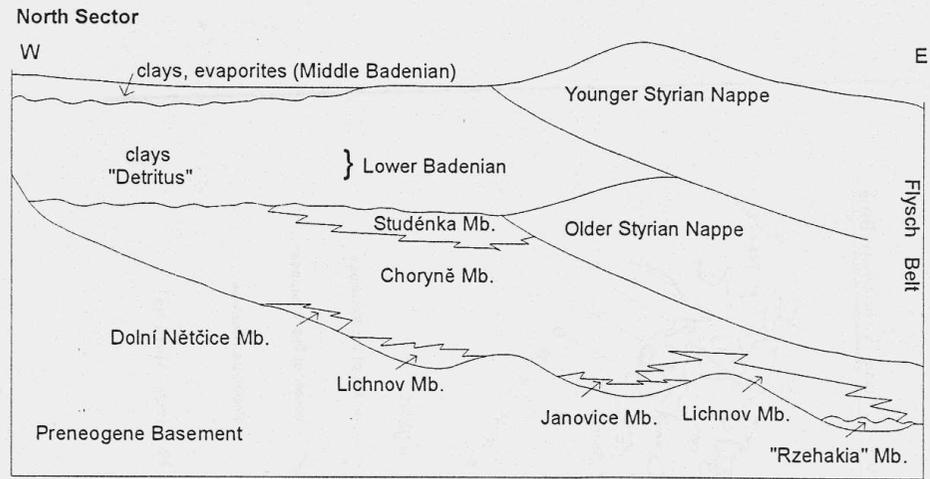
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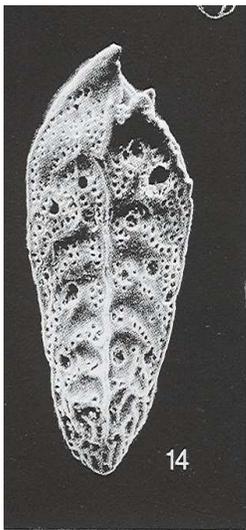
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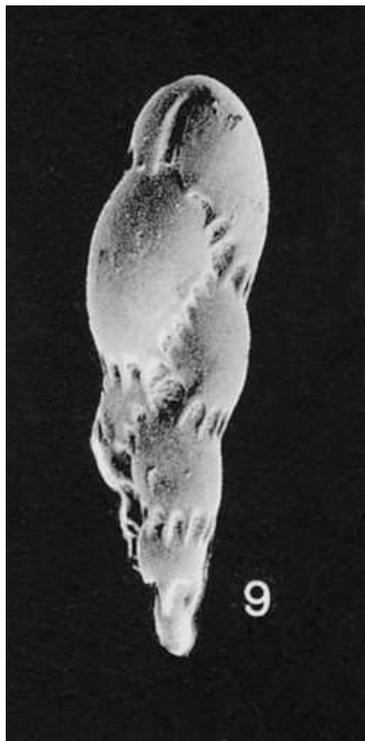
Figure 5: Model of the Carpathian Foredeep (Moravia) considering Karpatian lithostratigraphic units.



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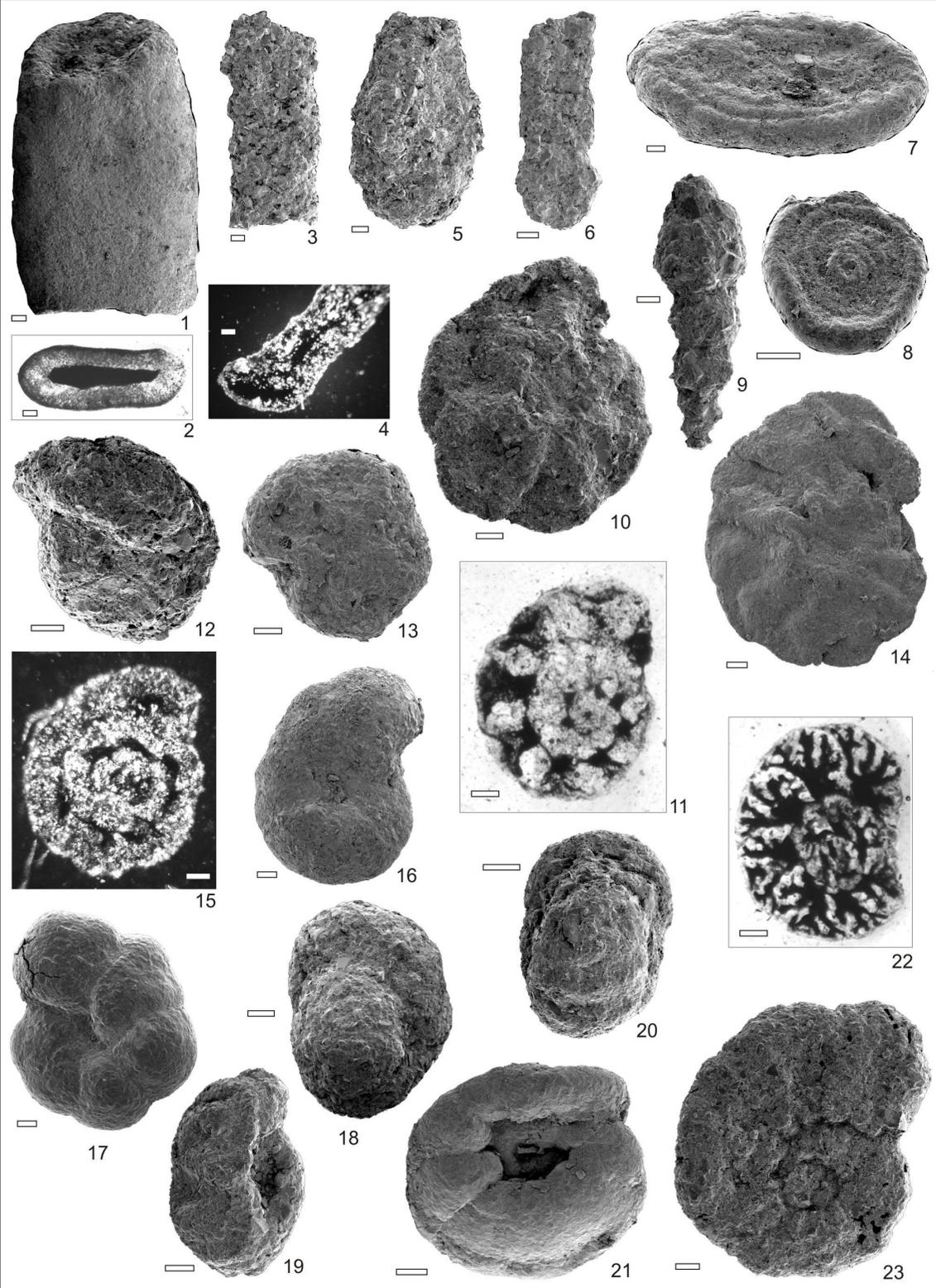
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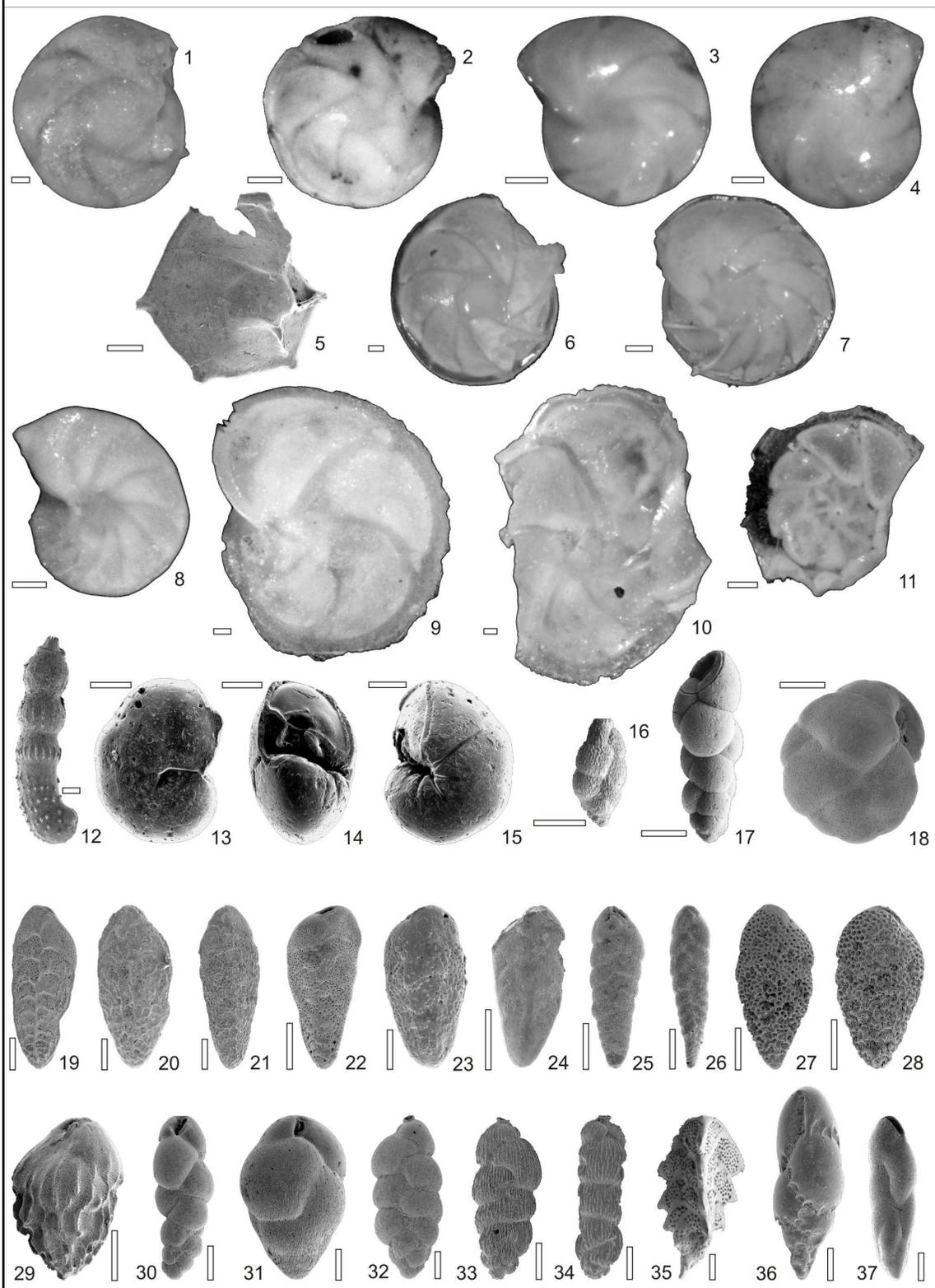
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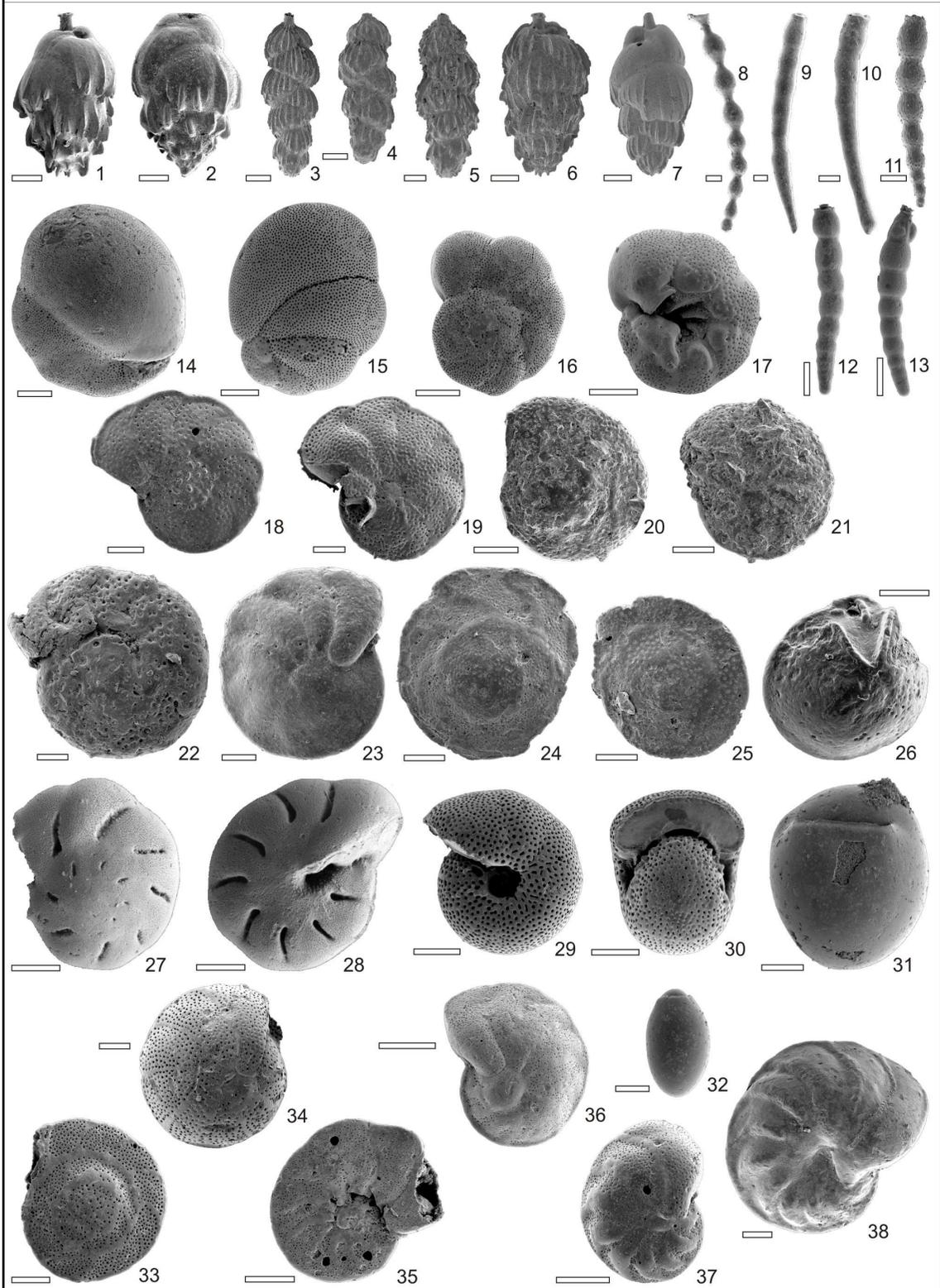
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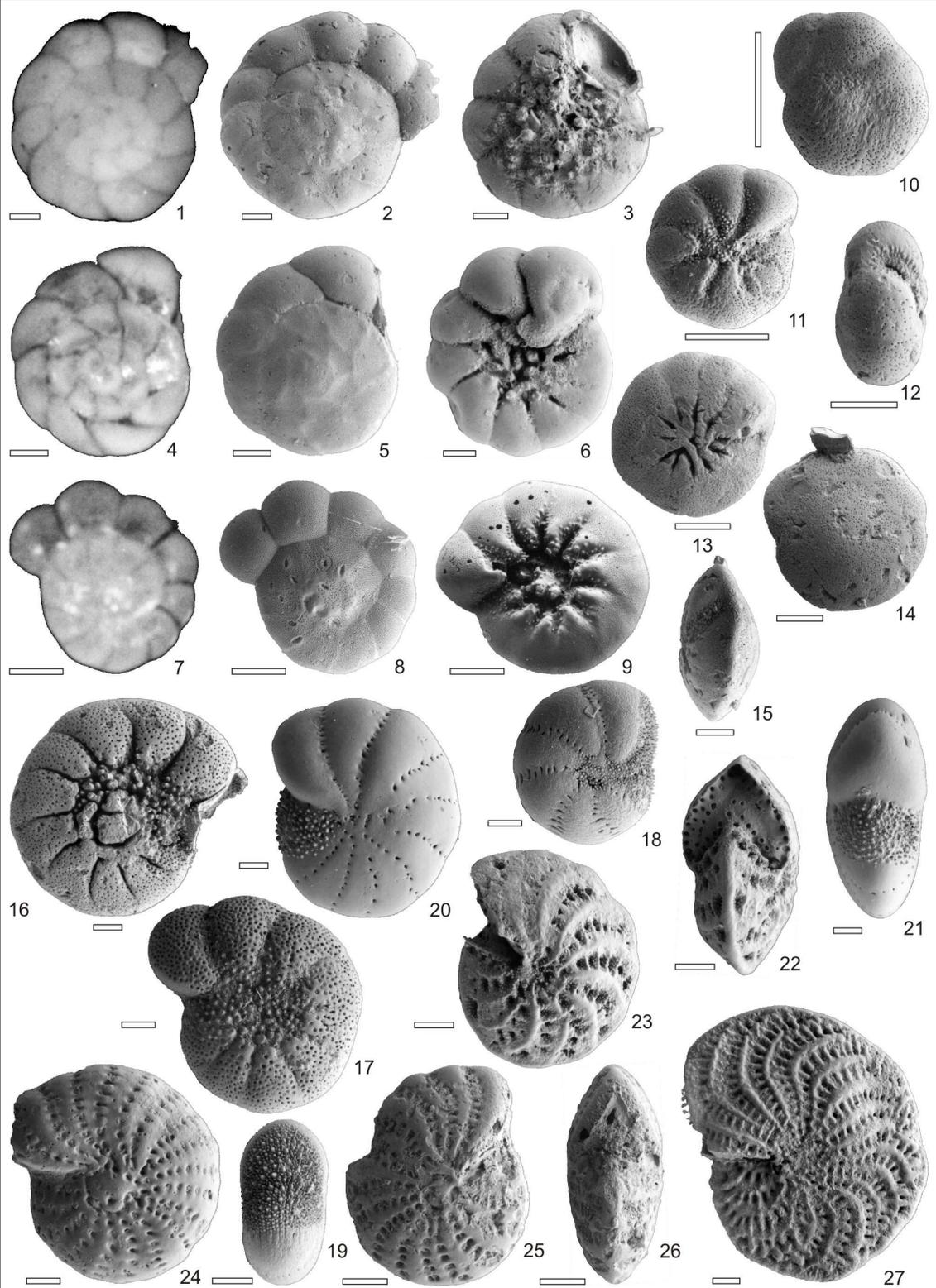
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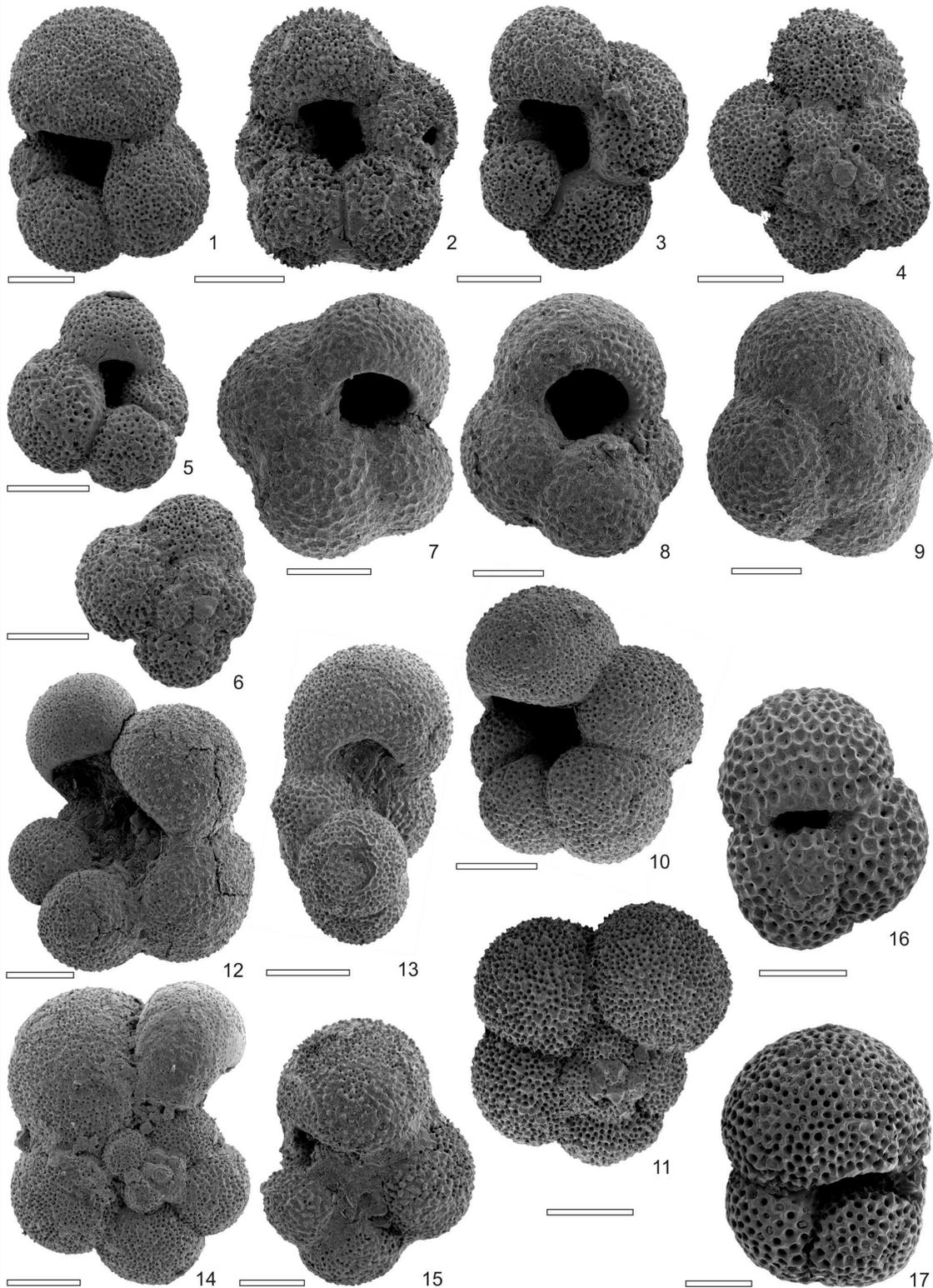
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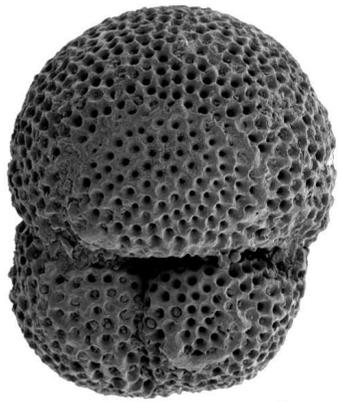
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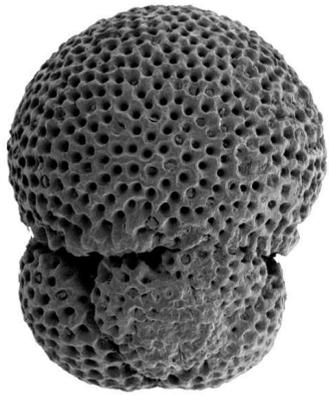


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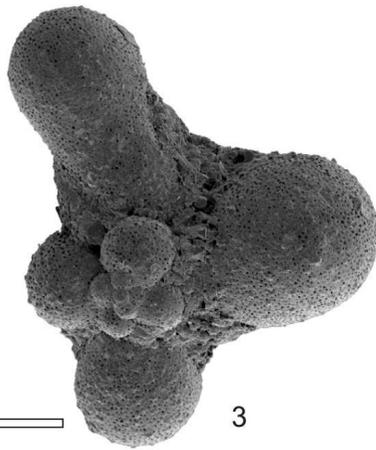
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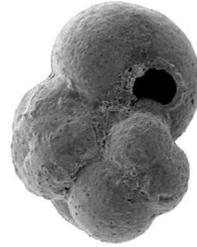
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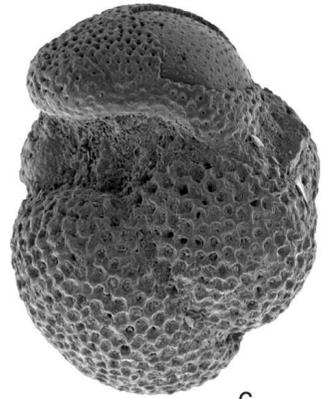
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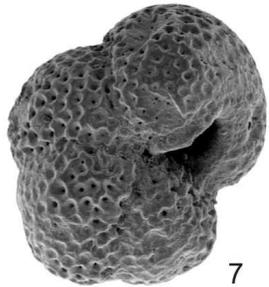
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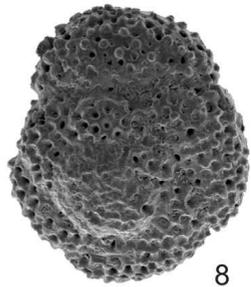
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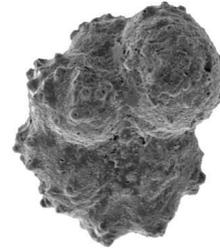
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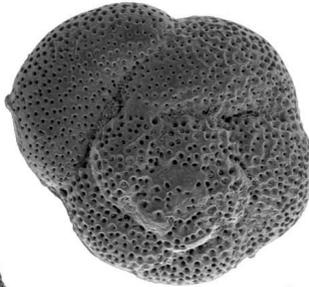
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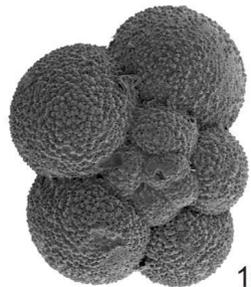
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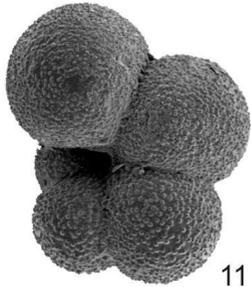
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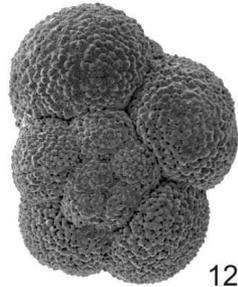
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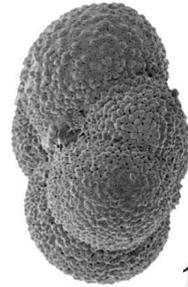
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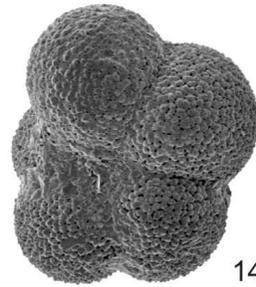
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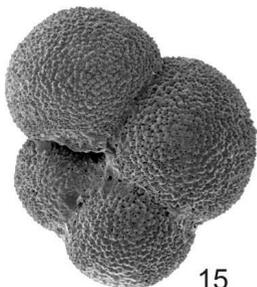
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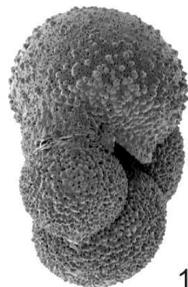
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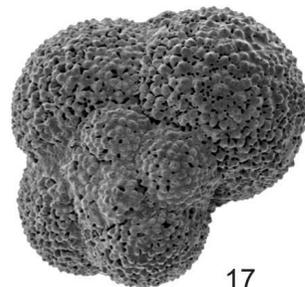
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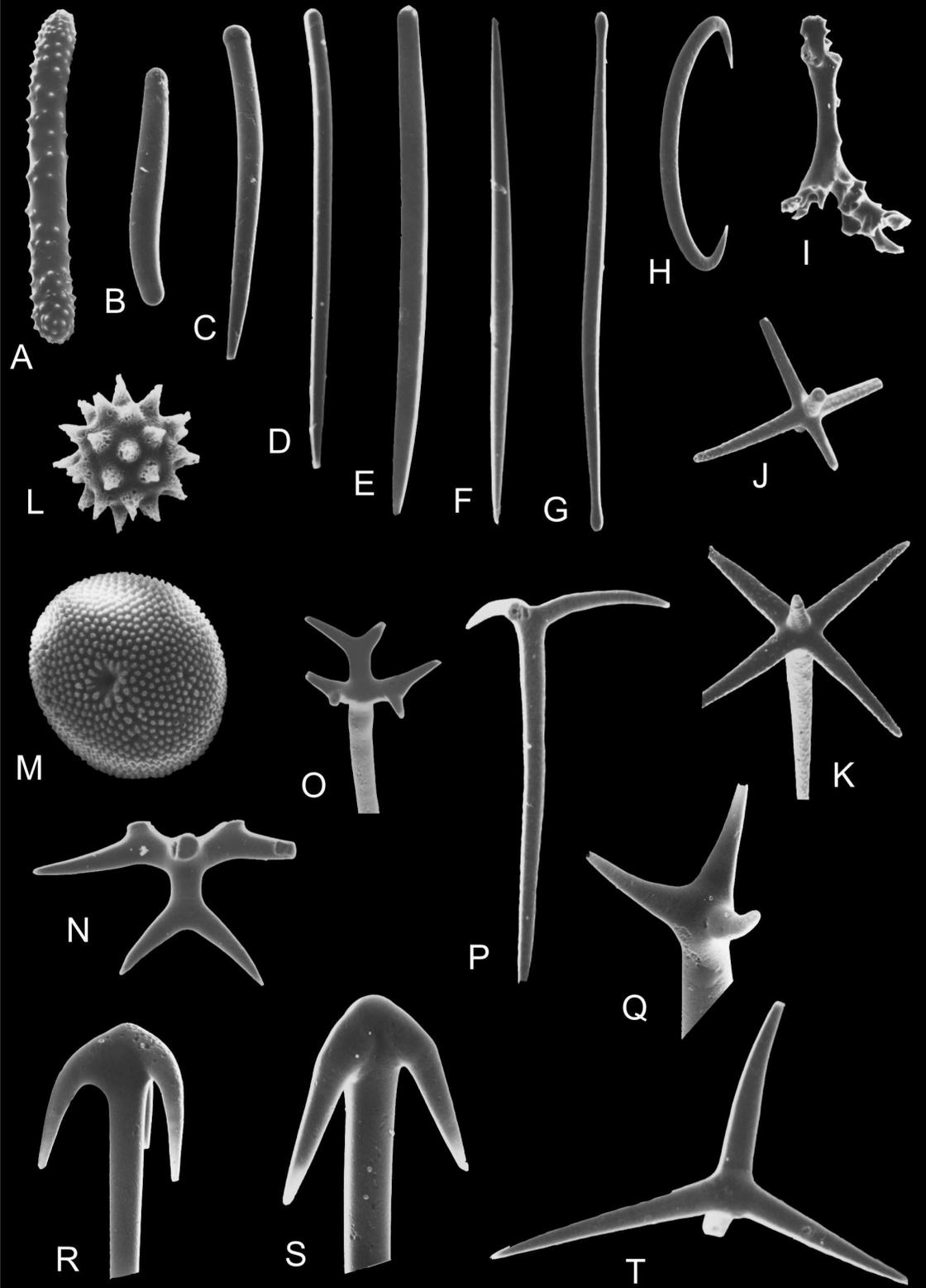
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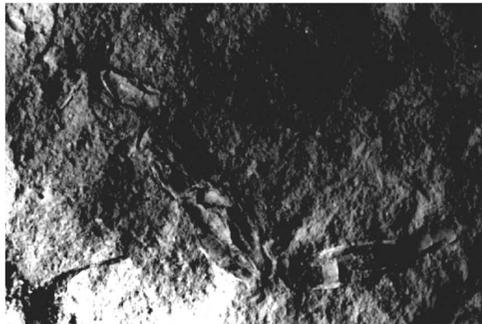
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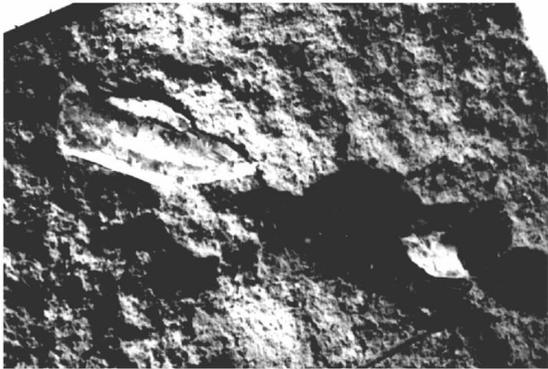
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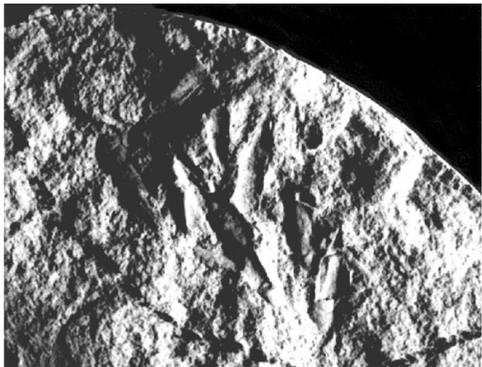
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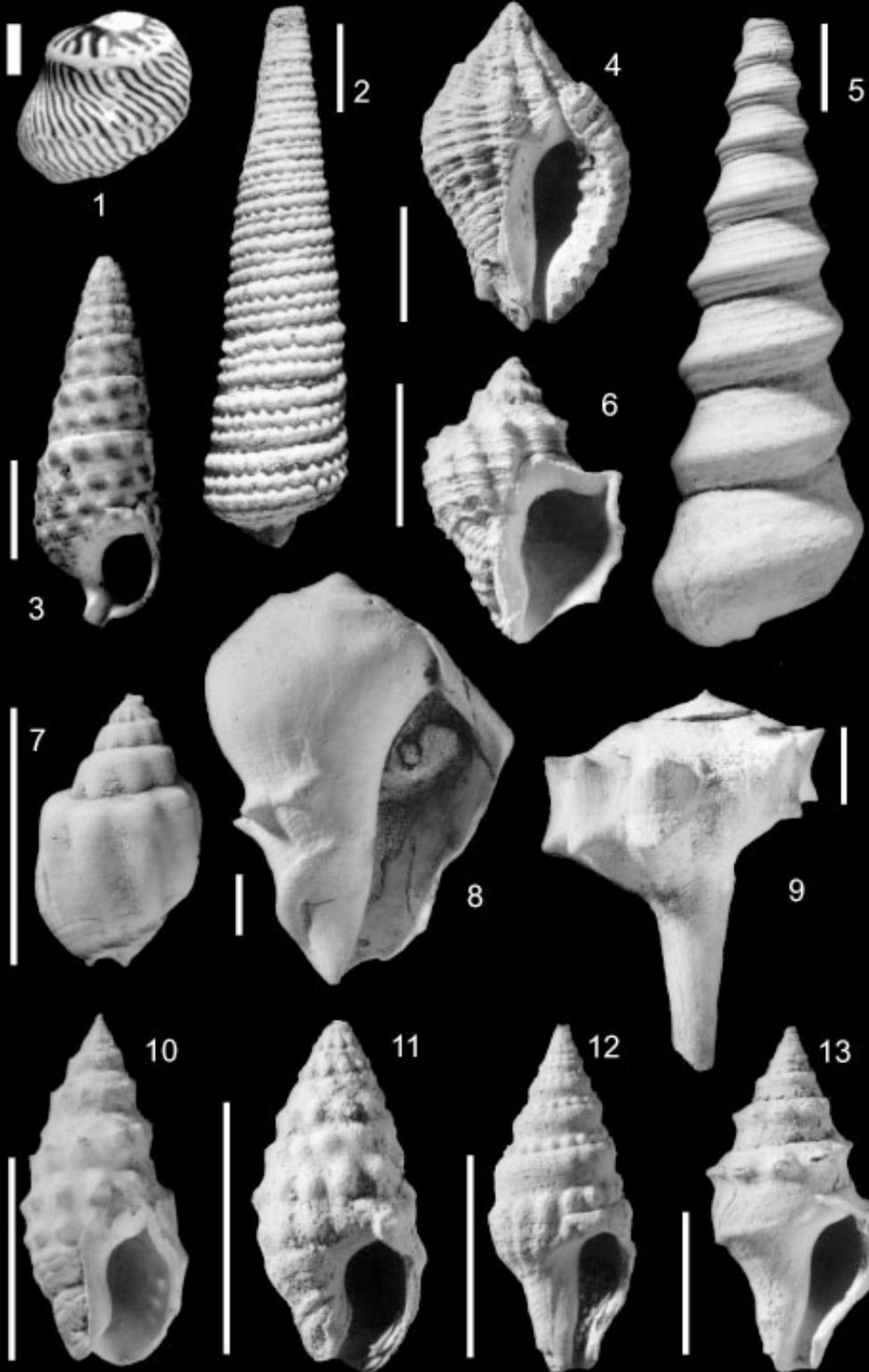


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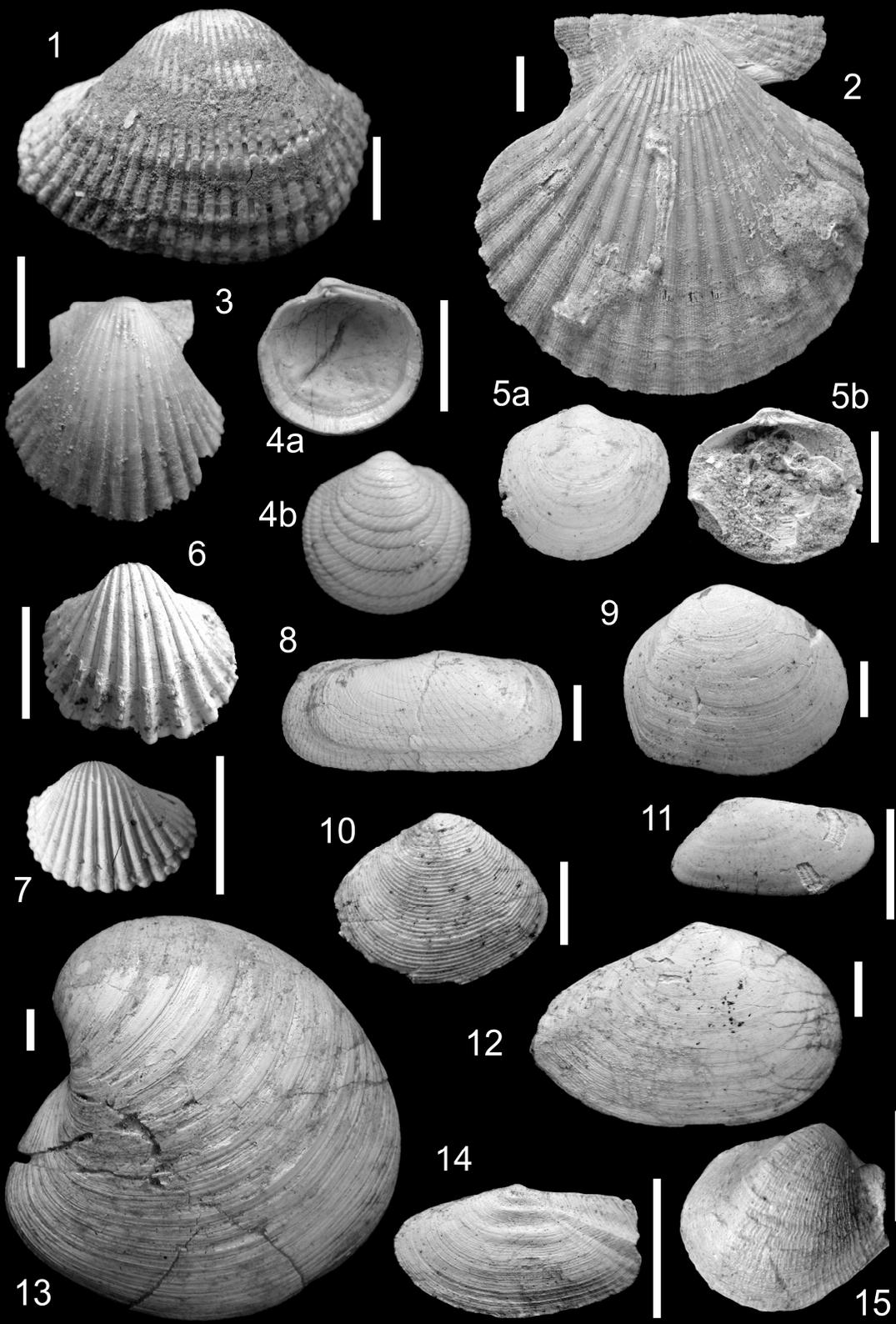
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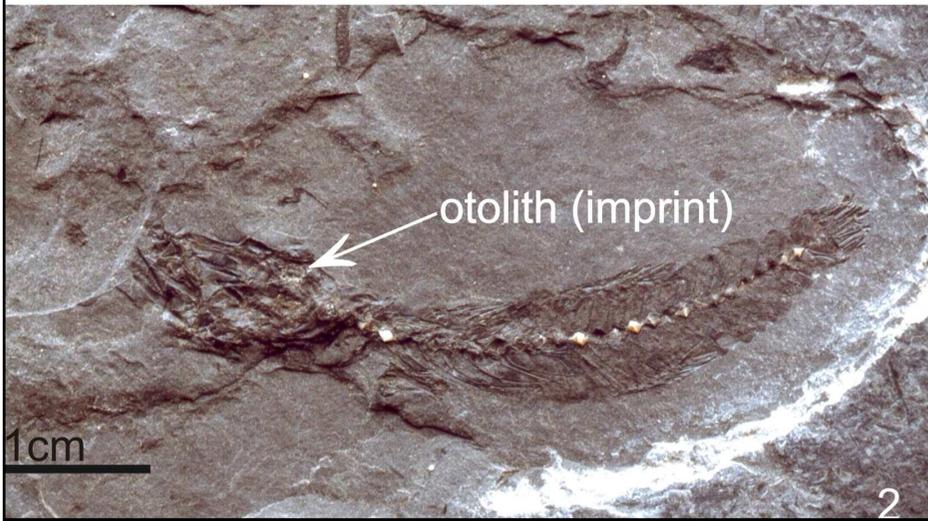
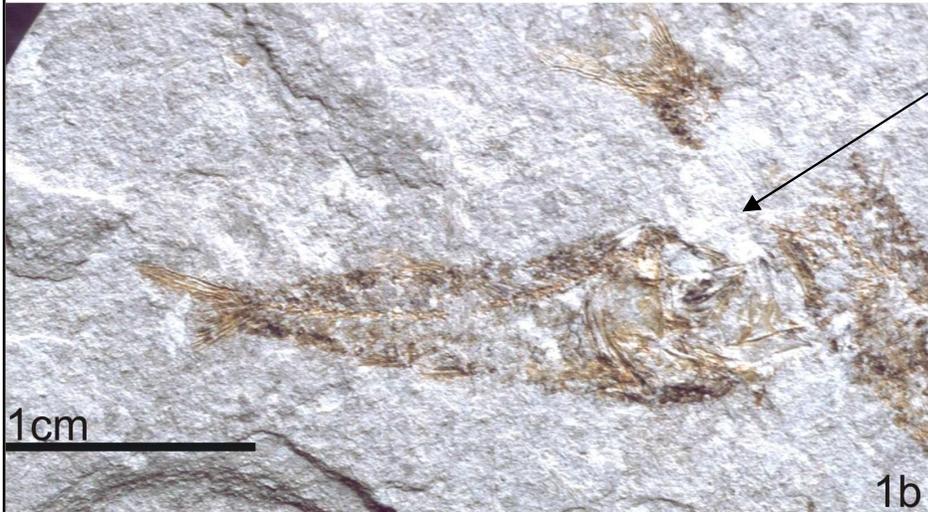
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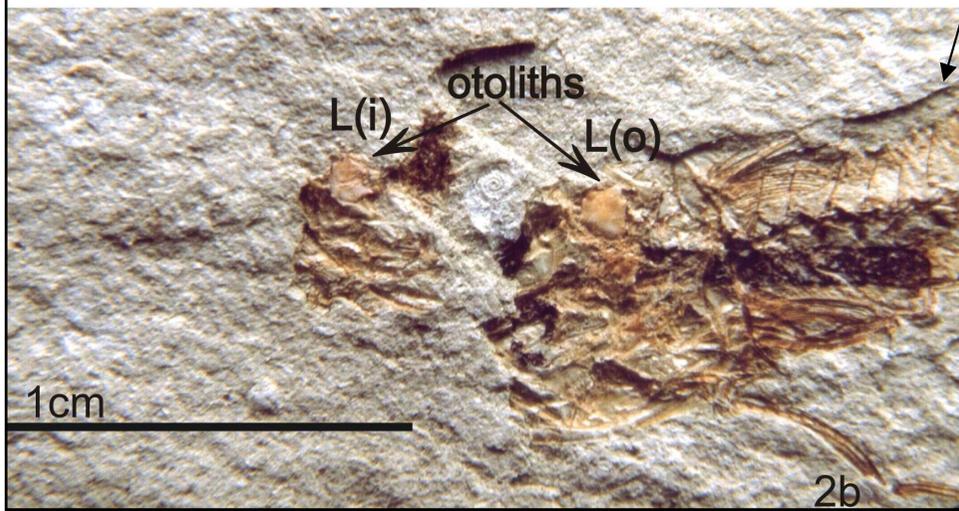
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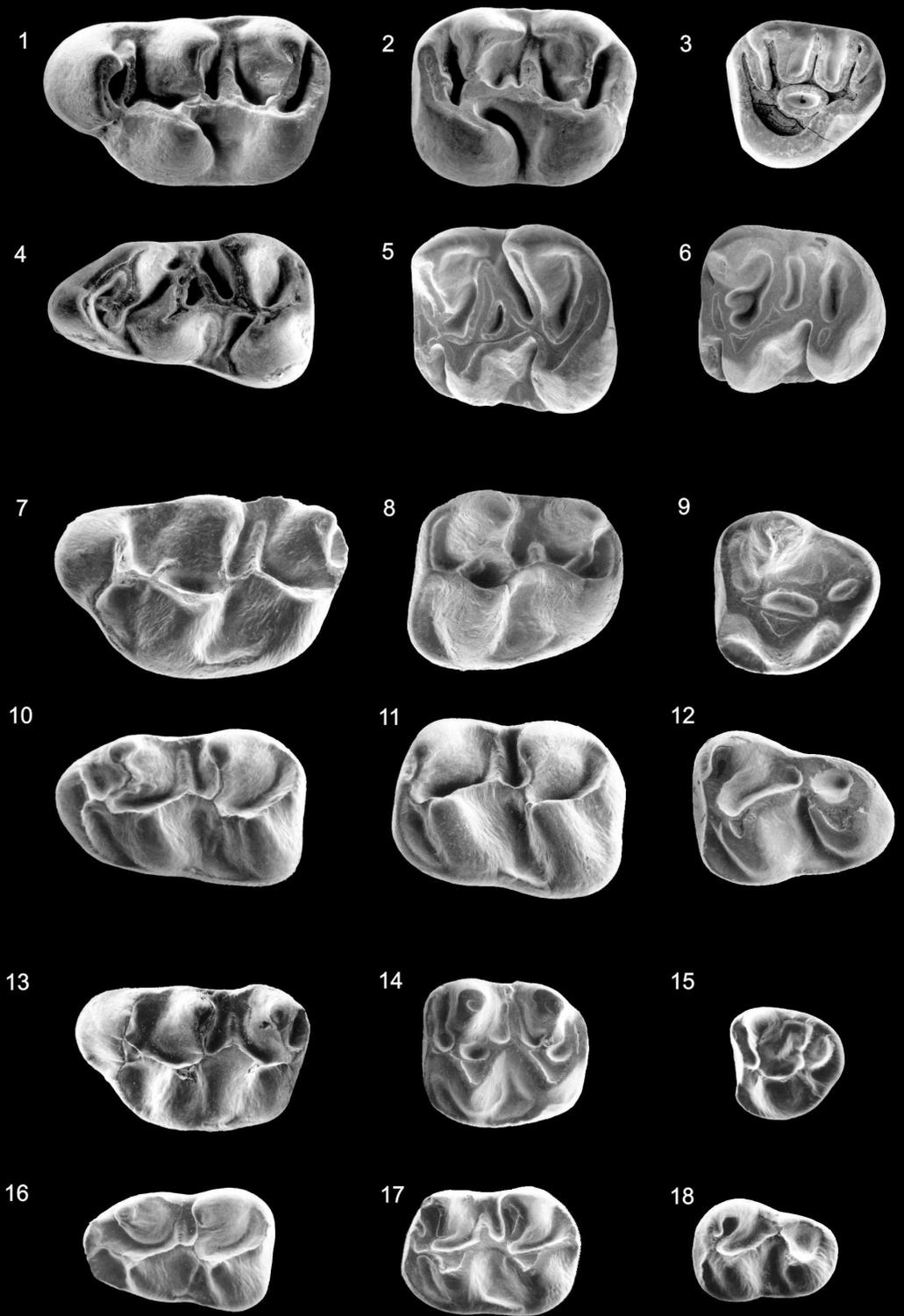
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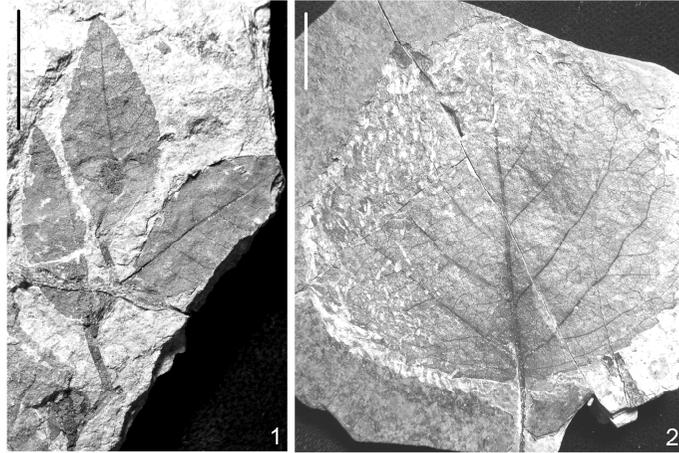


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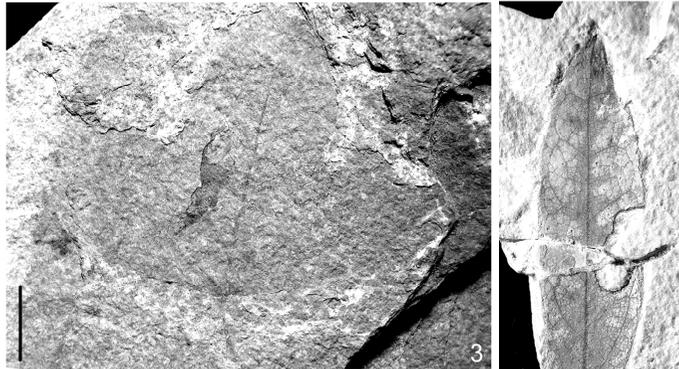
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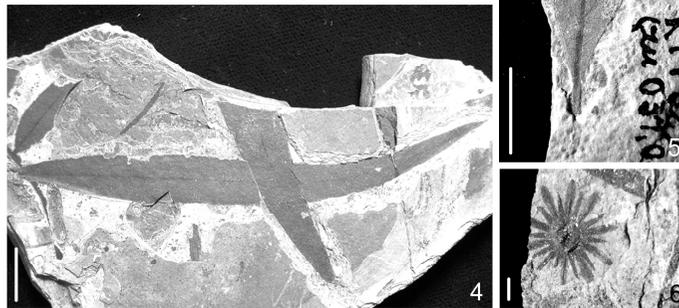
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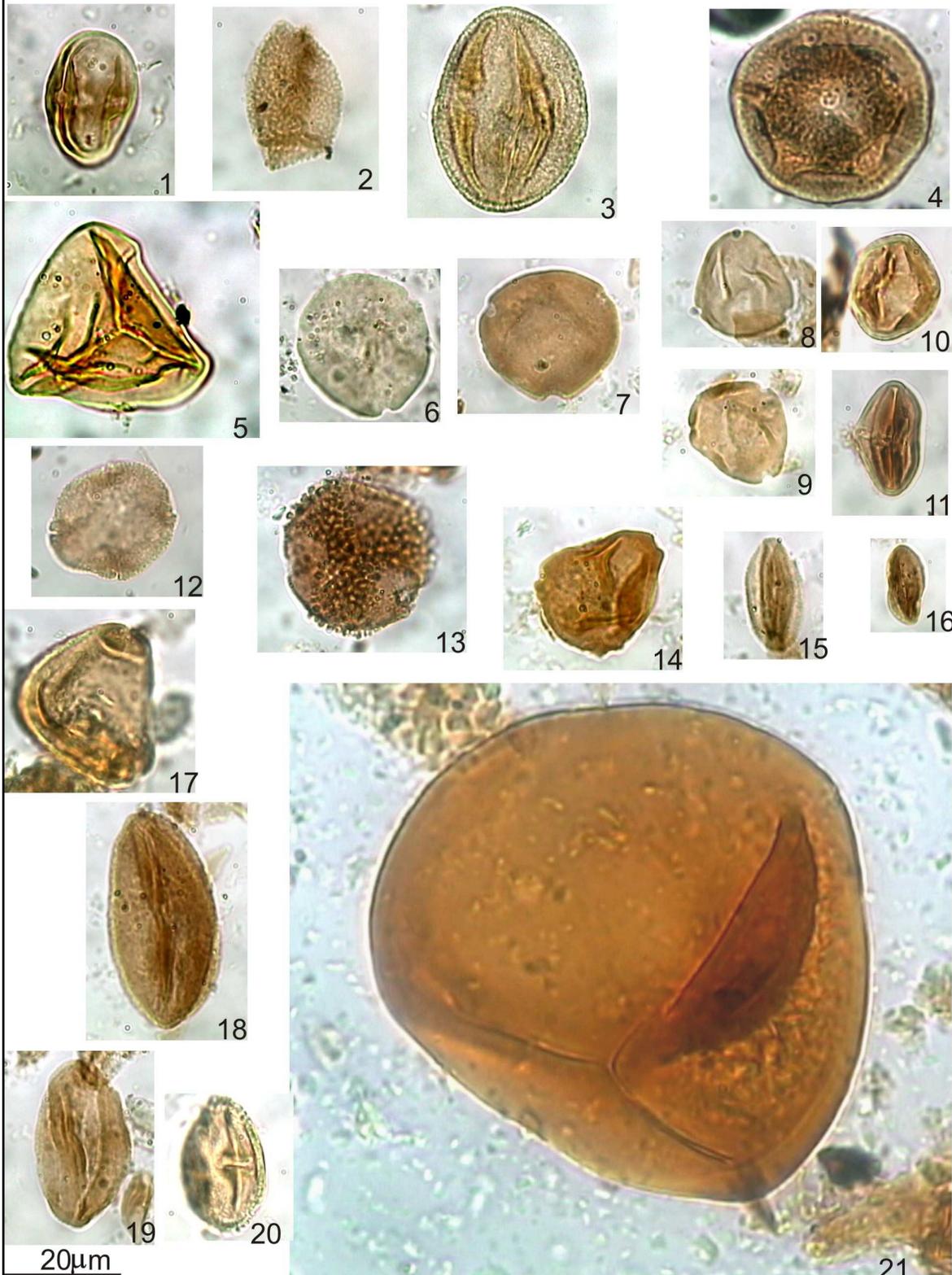
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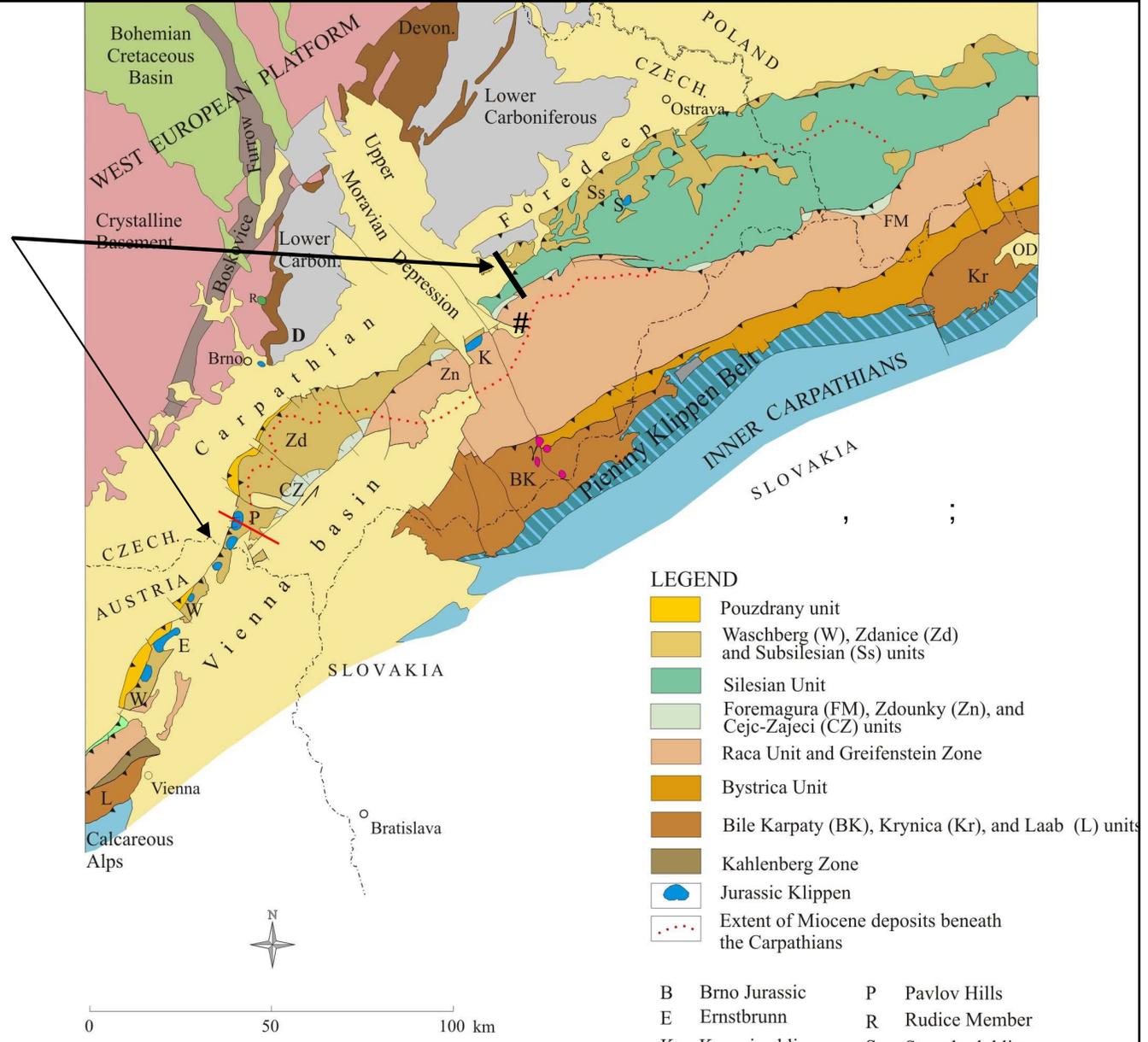
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FLEXURAL PLATE INVERSION (Cogan et al. 1993)<sub>85</sub>

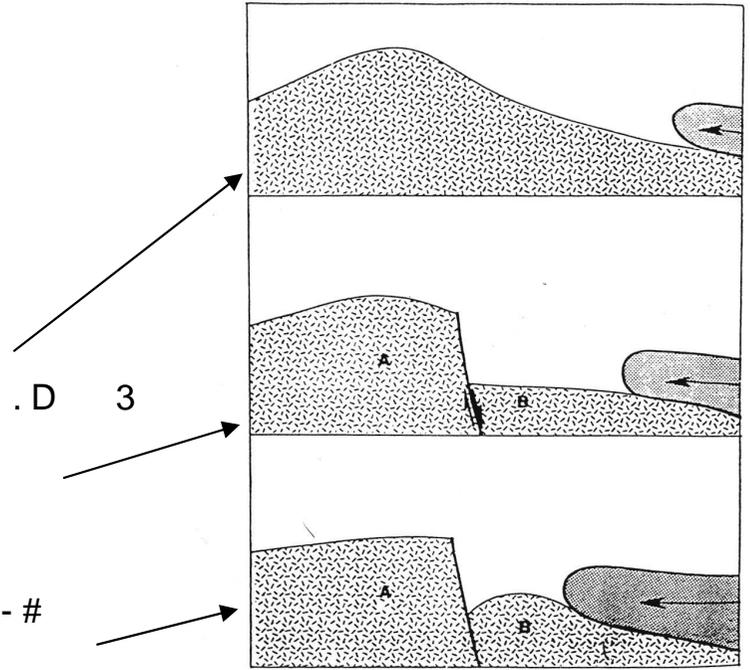


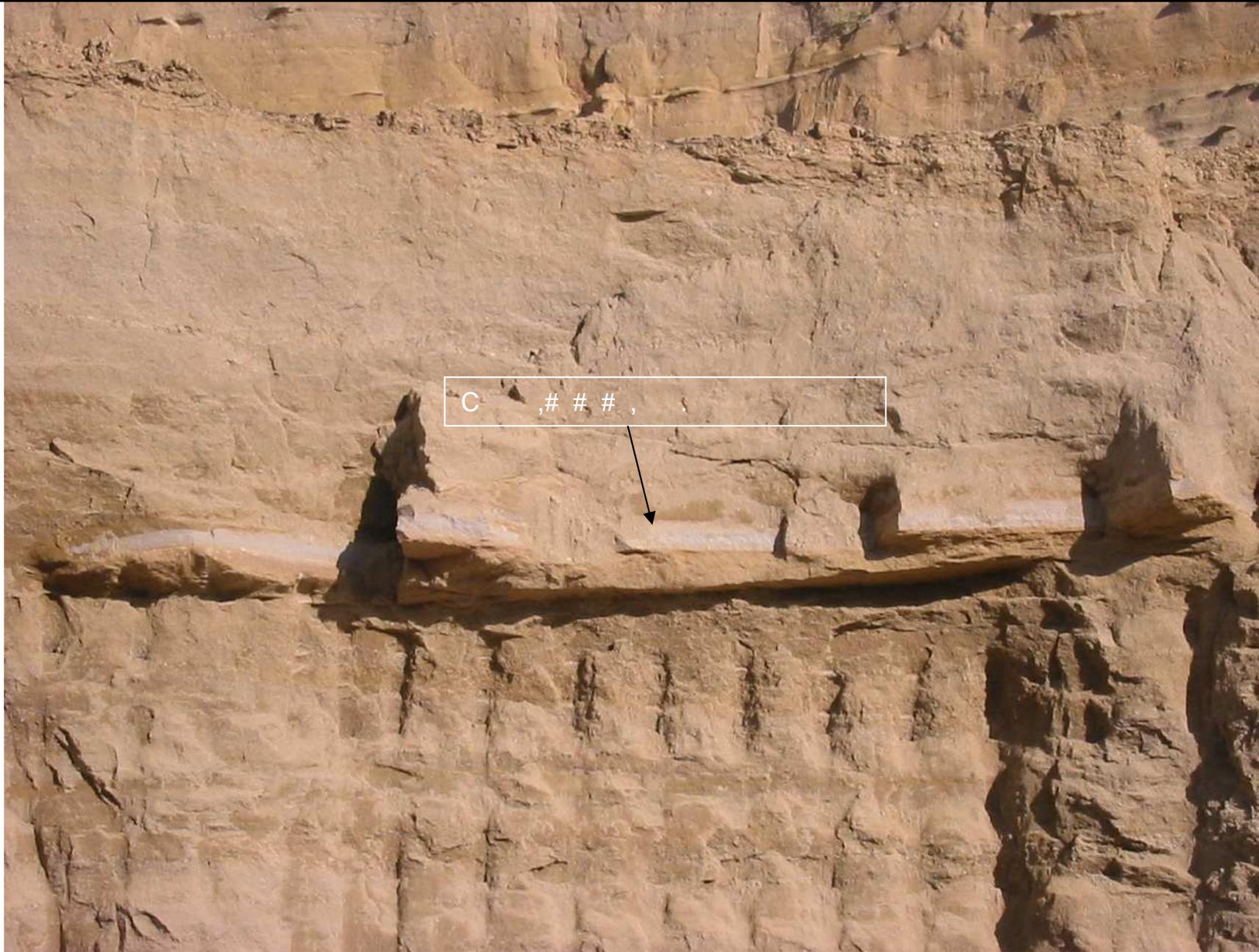
Figure 21 Conceptual model for the development of flexure in separate fault blocks. Detailed description given in text.

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