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PALEOGEOGRAPHICAL DEVELOPMENT OF THE MYJAVA SEDIMENTARY AREA (WESTERN SLOVAKIA) DURING THE EXISTENCE OF THE PALEOCENE REEF COMPLEX

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Abstract: The authors offer a picture of the paleogeographical development of the basin, the torso of which is found in the area of the Myjavská pahorkatina Upland. The basin originated in the Upper Cretaceous (Coniacian) in the furrow between the Klippen Belt and the Brezovské and Čachtické Karpaty Mts. At present its width is reduced at least 5 times. It is possible to distinguish an earlier Danian - (Montian) and a later Thanetian succession from the Paleocene. During the Danian - (Montian), a reef complex arose and developed at the edge of the basin. During the Thanetian, progradation, shifting of the reef sedimentation to the interior of the basin, and emergence and karstification of the Danian - (Montian) reef limestones occurred. Lagoonal, back-reef, reef and fore-reef (seaward slope) facies can be distinguished in the reef complex. Remnants of the rocks of the reef complex in the Malé Karpaty Mts, the Váh Valley and northern Orava, show that the basin, with a minimum width of 40 km, had a length exceeding 200 km, and it was, in our opinion, connected with a similar basin in the Northern Calcareous Alps. The Myjava Basin has certain distinguishing features compared to the basin in which the Paleocene reef complex of the Middle Váh Valley and the Pieniny Mts (assigned to the Manín Unit s.l.) developed.

Key words: paleogeographic development, Western Carpathians, Paleocene, Myjava Basin, reef complex.

As a result of its special geological features, the Myjavská pahorkatina Upland is among the most interesting areas of the Western Carpathians. Up to now, dozens of publications have been devoted to it. An overview of the majority of them is given in the explanation of the 1 : 50,000 geological map (Salaj et al. 1987). Its special importance comes from the fact that it shows many common features with the Gosau development in the Northern Calcareous Alps (Salaj & Priechodská 1987) and everything points to it being its continuation into the Western Carpathian region.

In spite of intensive research lasting more than 30 years, and the publication of a 1 : 50,000 geological map and an explanation of it, many unsolved questions remain in this area. The small exposed area, and the lack of a denser network of boreholes, significantly contributes to this. The one deep borehole, Lubina-1, to a depth of 3232 m (Leško et al. 1978) brought more questions than answers (Ondra et al. 1990). The use of various methods of geological research is very limited. There are few suitable outcrops for structural geological or sedimentological research. Detailed micropaleontological and microfacial research offers greater possibilities. In this direction, the greatest interest is aroused by the rocks of the Paleocene reef complex, of which a great quantity of fragments, occur above all in the Lower Eocene beds and attracted attention from the beginning of detailed geological research in the area (geological mapping Salaj 1957 - 1960, the publication of Andrusov & Bystrická 19545; Mišík & Zelman 1959; Salaj 1960; Köhler 1961; Salaj 1961; Samuel & Salaj 1963, 1968; Samuel et al. 1980 etc.). Thanks to participation in the international correlation project UNESCO No. 286 *"Early Paleogene Benthos"*, and the granting of financial resources for research, in the form of the grant from the Slovak Academy of Sciences No. 2/999132, the authors of this contribution again researched all the known occurrences of Paleocene rocks both in situ and displaced, in the Myjavská pahorkatina Upland, and evaluated them from a facial and biostratigraphic point of view. It was found, with the help of more than 1000 evaluated thin sections, that it is possible, at least roughly, to reconstruct the Myjava sedimentary area in the Paleocene period. Connected profiles, such as those which enabled Gaemers (1978), in reconstructing the Tremp Basin of northern Spain, to define 24 basic facial types and the assemblages of organisms typical of them, were not available. With few exceptions, all the results had to be assembled from a mosaic of hundreds of pebbles and blocks, the largest of which had a diameter of about 15 m, deposited apparently chaoticly on an area of almost 200 km^2, mostly in Lower Eocene formations. It appears that this research was not wasted, and it brought a great quantity of new results about the Paleocene facies and organic assemblages.

In the submitted contribution, the authors limit themselves to reconstructing the Myjava sedimentary area during a relatively short time period of perhaps 8 million years. Most attention will be devoted to its reef complex, which has certain specific features, thanks to which it can be traced further, beyond the borders of the present Myjavská pahorkatina Upland.

An extensive literature exists, devoted to various classifications of fossil and recent reef complexes. The authors in the following text will use the terms, which are explained in detail in the works of James &MacIntyre (1985) and Fagestrom (1987).

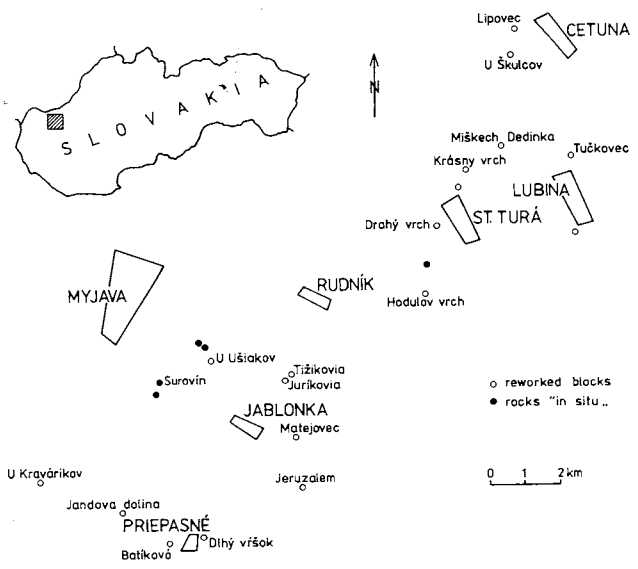


Fig. 1. Map of localities in Myjavská pahorkatina Upland.

Extensive lists of other useful literature are found in these works. When assessing the paleoecology of individual organic groups, it was possible to gather most information from the summarizing work of Ghose (1977).

Pre-Paleogene development of the sedimentary area

Some works have already been devoted to the localization and development of the sedimentary area in the region of the present day Myjavská pahorkatina Upland (e.g. Salaj & Began 1983; Maheľ 1980).

The sedimentary basin began to form during the Upper Cretaceous. Its oldest beds are the transgressive Baranec Beds of Coniacian age. On one side, the basin was bounded by the elevation of the Klippen Belt, which was created by Laramian movements, and on the other side by the elevation of the present Brezovské and Čachtické Karpaty Mts. A trough arose here, and the sea penetrated into it. While in the central part of the trough, deposition of a mostly marly formation occurred, on its margins shallow shelves were formed, with a significant contribution of detritic material from the land. Shallow water organodetritic to sandy limestones, with conglomerates in places were deposited on them. The characteristic fossils of the shelves during the Upper Senonian were orbitoid foraminifers (genera *Orbitoides, Pseudosiderolites, Siderolites, Omphalocyclus* etc.). The shelves bordered the basin on both opposite sides (localities Jandova dolina Valley, Matejovec, Fig. 1).

The present width of the above mentioned sedimentary area does not exceed 7 km*. The development of a whole range of facies from coastal to basinal, during the Upper Cretaceous, and especially during the Paleocene, shows that the present width, is reduced by at least 5 times compared to the original. The authors suppose a width for the basin of at least 40 km. Its length, as will be mentioned in the following text, exceeded 200 km (Fig. 2). The reduction of the width of the basin, occurred during various phases, with a very significant one occurring during the Lower Eocene. In this phase, the complete destruction and displacement occurred of a great part of the rocks of the Paleocene reef complex, as well as the shelves of Upper Cretaceous to Lower Eocene rocks (localities U Kravárikov, Dlhý vŕšok Hill, Krásny vrch, Drahý vrch, Hodulov vrch Hills and others). The fore-reef sediments of the marine slope partly escaped destruction (Surovín, Dedkov vrch Hill and others). In later phases the central part of the basin disappeared (Jablonka strike slip fault), while the marginal parts are preserved in places. Transverse faulting of the sediments of the Myjava Basin occurred in the post-Paleogene, chiefly post-Oligocene and Miocene periods.

It has already been said that sedimentation in the basin occurred from the Coniacian. The small variety of the Upper Cretaceous sediments bears witness to a relatively simple configuration of the sedimentary area. Fragments of limestones of lagoonal facies of uncertain Upper Cretaceous age (localities U Škulcov, Podlipovec, Krajnianska hora Mt) may show that, at least a rudimentary reef complex could already have formed in places during the Upper Cretaceous.

On the Cretaceous - Paleocene boundary, a significant Laramian movement in the area of the Klippen Belt, an interruption of sedimentation on the margins, (calm sedimentation of marlstones continued only in the deepest part of the basin - Podlipovec, Matejovec), and a change in the form of the basin occurred. The originally simple basin form was significantly complicated. In the area of the Klippen Belt, an archipelago zone was formed mediating a connection with the open sea of the Magura Basin (Salaj 1962). The Brezovské and Čachtické Karpaty Mts formed a connected barrier, which prevented the progress of the sea into the area of the Inner Carpathians. Todays' north-western edge of the Brezovské Karpaty Mts cannot be considered definitive, and their submergence under the structure of the Biele Karpaty Mts is not excluded.

Development of the sedimentary area during the Danian (Montian)

The mostly carbonate rocks lying near the emerged area and the coast, the warm tropical climate and suitable tectonic conditions enabled the origin of narrow carbonate platforms bordering the basin. In places, suitable conditions for the origin of a reef complex were formed on the platforms. While in the Thanetian**, the individual reef environments are significantly differenciated, at the beginning of the Paleocene the differentiation was delineated only in general features. In the central part of the basin, marlstones and varied claystones with layers of sandstone were sedimented (Polianka). They contain planktonic foraminifers and calcareous nannoplankton.

A community with *Globoconusa daubjergensis* (Brönnimann), *Globigerina varianta* Subbotina and *Turborotalia (Acarinina) inconstans* (Subbotina) point to a Danian age. From the calcareous nannoplankton (determined by Gašpariková, in Salaj et al. 1987), a community with *Braarududosphaera bigelowi* (Gran & Braarud), *Coccolithus savus* Hay & Mohler, *Markalius inversus* (Deflandre) Bramlette & Martini, *Thoratosphaera operculata* Bramlette & Martini, *Zygodiscus sigmoides* Bramlette & Sullivan, corresponds to the Lower Da-

*The extent of the Paleogene sediments is a little inaccurate on the 1 : 50,000 geological map. The authors found that the Rašov Development (Santonian - Campanian) and the Valchov Conglomerates (Coniacian, Santonian, Campanian) represented to the north and north-east of Stará Turá, are in reality of Eocene age (locality Tučkovec).

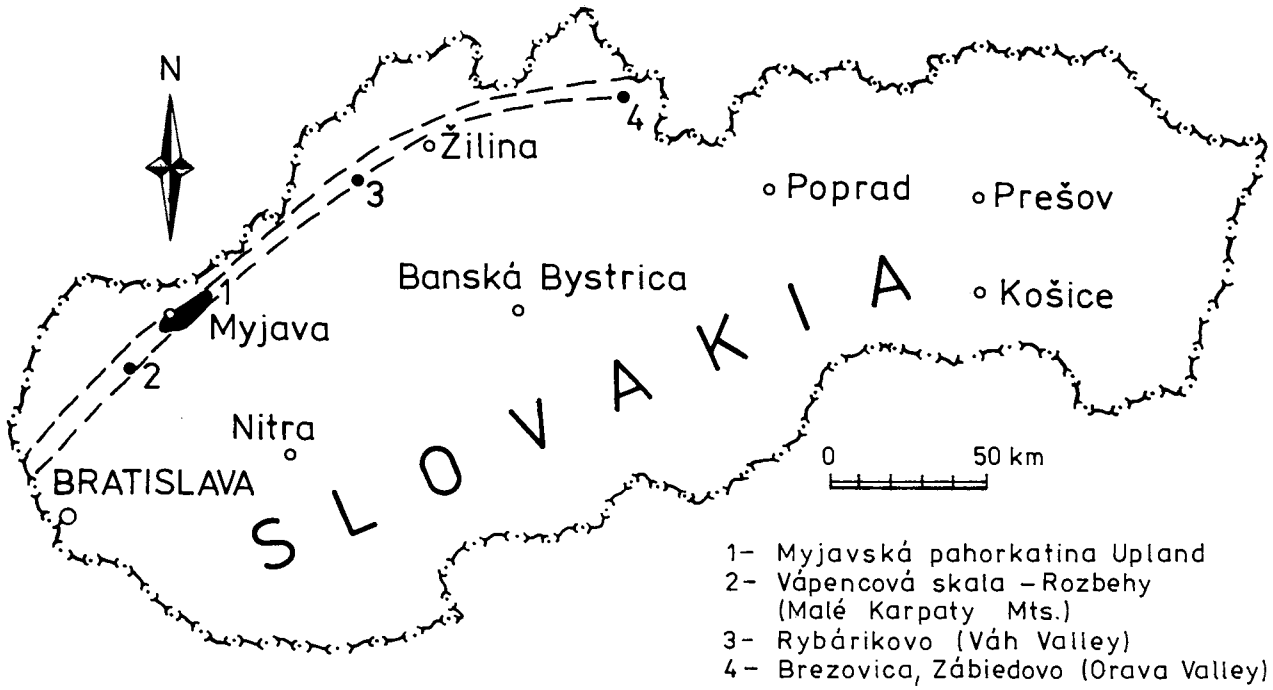


Fig. 2. The supposed course of the Myjava sedimentary basin on the territory of Slovakia.

nian. A community with *Chiasmolithus danicus* (Brotzen) Hay & Mohler, *Coccolithus cavus* Hay & Mohler, and others, corresponds to the Upper Danian.

The following species of calcareous nannoplankton are characteristic of the Montian: *Cruciplacolithus subrotundus* Perch-Nielsen, *Ericsonia subpertusa* Hay & Mohler, *Toweius crasiculus* Hay & Mohler. During the Montian (Upper Danian in the sense of Cavelier & Pomerol 1986), shallowing of the sedimentary area, a retreat of planktonic forms and the appearance of large benthonic foraminiferal species occurred. Among the large foraminifers, the primitive form of *Miscelanea* sp. scarcely appears in the rocks of the reef complex.

Among the rocks of the reef complex we could identify:

a - Biomicrites with *Elianella* - large nodules of the algae *Elianella elegans* Pfender & Basse are dominant in the rocks, and the coralline algae *Ethelia alba* (Pfender), *Peyssonnelia* sp., *Sarosiella ferremolis* Segonzac, *Pieninia oblonga* Borza & Mišík, *Acicularia* sp., cyclostomate bryozoa, fragments of bivalves, gastropods, ostracods, sea-urchin spines, crinoid segments and brachiopod tests are also present. From the small foraminifers, there are parts of thin walled miliolids, sessile forms (*Planorbulina cretae* (Marsson)), agglutinates and small benthos. They represent a lagoonal environment (locality U Kravárikov, Dlhý Vŕšok).

b - Biomicrites with dasycladacean algae (Pl. 1: Fig. 1) - barrel shaped cross-sections of *Broeckella belgica* Morellet & Morellet, crustacean coralline algae and *Ethelia alba* (Pfender) are most noticeable. Fragments of bivalves, gastropods, ostracods, crinoid segments, among small foraminifers miliolids and rotalids, among large foraminifers subglobular *Miscellanea* sp. are rarer. Fragments of coral bunches bear witness to the proximity of coral structures. The rock originated in the back-reef protected shallow water environment on the reef platform (locality Jandova dolina Valley, U Kravárikov).

c - Biomicrites with corals (Pl. 1: Fig. 3) - contain coral bunches, belonging above all to the genus *Actinacis,* crustacean coralline algae are frequent, but stems of *Ethelia alba* (Pfender), nodules of *Elianella elegans* Pfender & Basse, cyclostomate bryozoa, fragments of bivalves, ostracods, sea-urchin spines, among small foraminifers miliolids, agglutinates, sessile *Planorbulina* and small benthos are less frequent. The rocks belong to the reef framework (large fragments of coral bunches may show that originally it was a fragment of the foot of the reef body) (locality U Kravárikov).

d - Biosparites (Pl. 1: Fig. 5) - with frequent disseminated fragments of quartz contain nodules and stems of coralline algae, occasional nodules of *Elianella elegans* Pfender & Basse, cross-sections of stems of *Acicularia sp., Broeckella belgica* Morellet & Morellet, cyclostomate and cheilostomate bryozoa, fragments of gastropods, bivalves, coral bunches, crinoid segments, sea-urchin spines, among small foraminifers thin and coarse walled miliolids, agglutinates, anomalines, lagenids and small benthos. The rock originated in a forereef environment on a slope, which sloped down moderately to the basin. Planktonic foraminifers from the deeper central part of the basin were not brought to these shallower coastal zones (locality Jandova dolina Valley, north of Lipovec Hill).

**Although alternative views exist, up to now the authors identify with the standard scale of the Paleogene, which Cavelier & Pomerol (1986) proposed, and which received positive international acceptance. According to it, the Paleocene includes only two stages: a Lower Danian and an Upper Thanetian. The Montian is considered as the upper part of the Danian. Since the Montian was distinguished in the Paleocene of the Western Carpathians, and also in other regions (especially in North Africa), the authors mention it in connection with Danian, at least in brackets.

The organic remnants in the rocks of the reef complex do not enable us to distinguish between Lower Danian and Upper Danian (Montian) limestones. Their pre-Thanetian age is shown above all by dasycladacean algae, above all *Sarosiella ferremolis* Segonzac (compare Buček & Köhler 1987), *Broeckella belgica* Morellet & Morellet (compare Bystrický 1976), as well as the lack of large foraminifers (with the exception of rare tests of *Miscellanea* sp.)

Comparison of these limestones with the Montian reef limestones of the Paris Basin (e.g. from Vigny, Bignot 1992) show many common features of the composition of the organic association, but also distinguishing features.

Many blocks, found in the Lower Eocene strata, bear traces of later dissolution, with irregular cavities measuring up to 10 cm. The cavities are sometimes internally bordered with calcite borders, and filled with coarse crystalline sparite, or sandy sediment with sharp-edged fragments of quartz. There is no doubt that the reef complex emerged, was karstified, and during a later submergence, the karst cavities were filled. The authors consider that the emergence and karstification of the limestones could have occurred as early as the beginning of the Thanetian, when, during progradation, sedimentation in the reef complex moved in the direction of the basin and the pre-Thanetian coastal rocks could have emerged.

Development of the sedimentary area during the Thanetian

During the Thanetian progradation, the emergence and intensive erosion, not only of the earlier Paleocene sediments, but also of the Upper Cretaceous rocks of Campanian - Maastrichtian age, occurred. Organic remnants from Cretaceous rocks broken up by water, (especially fragments of the tests of orbitoids) can often be found in the fore-reef and slope sediments. In the Thanetian, there were significantly differentiated lagoonal, reef platform, reef framework and fore-reef (slope) sedimentary environments. The ramp in the fore-reef zone was significantly inclined, as is shown by frequent layers of organodetritic limestones in the marlstones and claystones of the deeper part of the basin (localities Dedkov vrch Hill, road cutting Myjava - Jablonka and others). Fragments of reef framework are also not uncommon in their detritic material.

A Thanetian microfauna of the *Morozovella aequa* zone was identified in the marlstones: *Glomospira charoides* (Jones & Parker), *Ammodiscus hoernesi* (Karrer), *Dendrophrys robusta* Grzybowski, *Subbotina triloculinoides* (Plummer), *S. trivialis* (Subbotina). Bystrická (1963) described the species *Discoaster* cf. *gemmeus* Stradner, *D. multiradiatus* Bramlette & Riedel, *Heliolithus riedeli* Bramlette & Sullivan and *Coccolithus consuetus* Bramlette & Sullivan, from this zone.

The following types of facies are identified as lagoonal:

a - Biomicrites with *Elianella* - large nodules of *Elianella elegans* Pfander & Basse, and large miliolids (*Idalina* sp.) prevail among the organic remnants. The coralline algae, *Ethelia alba* (Pfender), *Acicularia* sp., cyclostomate bryozoa, fragments of bivalves, tests of gastropods, small ostracods, sea-urchin spines, and among small foraminifers also agglutinates, rotalids and sessile forms (Dlhý vŕšok Hill) are scarcer.

b - Biomicrites with *Elianella* and dasycladacean algae (Pl. 1: Fig. 2) - dasycladacean algae represented by species of the genera *Dactylopora, Frederica, Jodotella, Linoporella, Neomeris, Orioporella, Sandalia, Uteria* and *Terquemella* are added to the organic remnants already mentioned (localities Matejovec, Jeruzalem).

To the back-reef platform can be assigned:

c - Biomicrites with branched corals - branched corals are dominant in them. They do not show traces of damage and are found in growth layers. Coralline algae, nodules of *Elianella elegans* Pfender & Basse, bryozoa, fragments of bivalves and ostracods, and sea-urchin spines are also frequent. Among small foraminifers, miliolids, rotalids, agglutinates and small benthos are frequent (locality Jeruzalem).

d - Biomicrites with *Glomalveolina* - the characteristic fossil is the globular *Alveolina (Glomalveolina) primaeva* Reichel, and *Miscellanea juliettae* Leppig is also not uncommon. Coralline algae increase in the rock, while nodules of *Elianella elegans* Pfender & Basse are rather rare. Stems of *Distichoplex biserialis* (Dietrich) Pia are not frequent. Fragments of coral bunches occur occasionally. Agglutinates belonging to the genus *Haddonia*, miliolids, rotalids, among the sessile forms, *Nubecularia* sp. and *Planorbulina cretae* (Marsson), are frequent. Among bryozoa, cheilostomate forms also appear. These are not known from a lagoonal environment (localities Stará Turá, Krásny vrch Hill).

These can be identified as facies of the reef framework:

e - Biomicrites with massive corals (Pl. 1: Fig. 4) - the rock is formed by massive corals, growing on themselves, belonging to the genus *Actinacis*, with frequent internal cavities filled with sediment. In the cavities, stems of coralline algae can also be found, stems of *Ethelia alba* (Pfender) and *Peyssonnelia* sp., fragments of bivalves and ostracods are frequent. Among small foraminifers, miliolids, agglutinated and sessile forms are frequent (localities Hodulov vrch Hill, Stará Turá).

f - Biomicrites with corals and coralline algae - apart from coral bunches, crustacean coralline algae, encrusting corals and fillings of internal cavities are frequent. The bryozoa are represented by cyclostomate and cheilostomate forms. Among small foraminifers, placopsilines and planorbulines are most frequent (locality Stará Turá).

g - Biomicrites with corals and bryozoa - represent the outer part of the reef framework facing the open sea. Coralline algae form only thin coatings, and the problematic algae *Pieninia oblonga* Borza & Mišík frequently occurs. Apart from irregular cyclostomate forms, species forming a complex crustacean texture are present among the bryozoa. Corals are represented by massive forms of the genus *Actinacis* (Hodulov vrch Hill, Stará Turá).

Fore-reef slope facies:

h - Biosparites with coralline algae (Pl. 1: Fig. 6) - very frequently contain fragments of coralline algae, *Ethelia alba* (Pfender), *Peyssonnelia* sp., among bryozoa, cyclostomate as well as cheilostomate forms, fragments of bivalves,crinoid segments, sea-urchin spines, tubes of worms of *Ditrupa* sp., tests of brachiopods, among large foraminifers, *Daviesina garumniensis* Tambareau, *Discocyclina ramaraoi* Samanta, *D. seunesi* Douvillé, *Miscellanea juliettae* Leppig, *Operculina azilensis* Tambareau, *O. heberti* Munier-Chalmas, as well as redeposited tests of the Upper Cretaceous genera *Siderolites, Pseudosiderolites* and *Orbitoides* (localities Juríkovia, Tižíkovia, Hodulov vrch Hill).

i - Biosparites with fragments of coralline algae, bryozoa, fragments of bivalves, gastropods, ostracods, sea-urchin spines, remnants of echinoderms, fragments of coral bunches, tubes of worms, among large foraminifers tests of *Discocyclina seunesi* Douvillé, among small foraminifers, agglutinates, rotalids and sessile forms are frequent (localities Tižíkovia, Drahý vrch Hill and others).

It is interesting that only one fragment of carbonate slope breccia was found (locality Dlhý vŕšok Hill).

The Thanetian age of these rocks is proved especially by the large foraminifers, among which *Alveolina (Glomalveolina) primaeva* Reichel, *Discocyclina seunesi* Douvillé and *Operculina heberti* Munier-Chalmas, are among the most important Thanetian fossils. The calcareous nanoplankton from the marly layers also confirm this age.

Some blocks bear unmistakable signs of later karstification, surface dissolution and filling of cavities with sandy sediments (locality Stará Turá). The karstification occurred before their displacement into the Lower Eocene sediments.

At the end of the Thanetian, the completion of the development of the reef complex, and its destruction, occurred suddenly. Among the hundreds of blocks studied, not even one was found, which could be identified as younger than Thanetian in age. At the end of the Thanetian, a radical change of regime in the basin, and the destruction of the carbonate platforms at its edges, must have occurred.

Reconstruction of the Myjava sedimentary environment

At present, only a small torso of the original basin, in the area of the Myjavská pahorkatina Upland, is preserved. To imagine the sedimentary area as a miniature basin, would be a mistake, since the reef complex facies, mentioned above, can also be found at other places in western and north-western Slovakia (Fig. 2). The following were studied in more detail:

a - Vápenková skala Hill near Rozbehy - Malé Karpaty Mts. In a publication from 1984, Köhler & Borza mention the occurrence of beds with orbitoids of Campanian age, from this locality. Overlying them, in the surroundings of the Vápenková skala Hill, crumbling Miocene (Karpatian) conglomerates, with blocks of reef limestone, measuring up to 1 m, which may be compared with the Danian - (Montian) limestones of the Myjavská pahorkatina Upland. They are biomicrites, mostly formed by nodules and crusts of coralline algae, and nodules of Elianella elegans Pfender & Basse; the dasycladacean algae Sarosiella ferremolis Segonzac, bryozoa; fragments of bivalves and gastropods, fragments of coral bunches, crinoid segments, sea-urchin spines, among small foraminifers, miliolids, agglutinates and sessile forms are also present. Large foraminifers were not found.

The continuation of this development to the south west, in Austria, is not sufficiently proved, mainly because, up to now, Paleocene reef rocks have not been researched in detail on Austrian territory. Plöchinger (1980) mentioned, that in the Northern Calcareous Alps, blocks of reef limestones are found in two areas:

- In the Gosau area, there are Paleocene - Lower Eocene beds known as Zwieselalmschichten (thickness 250 m). In the conglomerates of this coarse detritic formation, small blocks of reef limestone occur.
- In the Grünbach area, overlying Campanian - Maastrichtian beds with orbitoids, are the Zweiersdorfschichten (thickness up to 200 m), assigned to the Paleocene. They also have blocks of reef limestone in conglomerate layers.

Tollmann (1990) mentions that during the Paleocene, barrier reef limestone, known as Kambühel Limestone, was formed, on the southern edge of the Gosau Sea, in the Calcareous Alps and Western Carpathians.

b - To the north-east of the Myjavská pahorkatina Upland, occurrences of the Myjava development are known, in the area of the village of Rybárikovo (formerly Makovec) near Považská Bystrica. Samuel & Salaj 1963, Began et al. (1970) and Samuel et al. (1972) researched them in detail. On an area of several km^2, a formation of sandstones of Paleocene age, with horizons of organodetritic sandstones and blocks of reef limestones outcrop. It is interesting, that in the heavy bedded organodetritic limestones, apart from large foraminifers of Thanetian age (*Discocyclina seunesi* Douvillé, *Fallotella alavensis* Mangin, *Alveolina (Glomalveolina) primaeva* Reichel and others), tests of redeposited Upper Cretaceous large foraminifers, belonging to the genera *Omphalocyclus, Orbitoides* and *Lepidorbitoides*, occur. In composition, they are indistinguishable from rocks of the fore-reef (slope) facies of the Myjavská pahorkatina Upland, not only in organic content, but also in fragmentary material.

It is necessary to recall that only a few km from Rybárikovo, on the edge of the town of Považská Bystrica, blocks of reef limestones, belonging to the algal reef complex are known. Hričovské podhradie is the most important locality for this development (compare Samuel et al. 1972).

c - In 1968, Mišík et al. described pebbles of Paleocene reef limestones, from paraconglomerates of Upper Eocene - Lower Oligocene age in northern Orava (Brezovica, Zábiedovo). Bystrický (1976) studied dasycladacean algae from them. The pebbles were again studied by the authors of this publication. It was found that blocks of lagoonal biomicrites with dasycladacean algae and *Elianella* occur here, while blocks of coral biomicrites from the reef framework are rarer, and it is interesting that rocks of the fore-reef slope were not found up to now. Reconstruction of this development on the basis of pebble material will be given in another publication. Apart from the Paleocene Danian - (Montian) reef limestones, pebbles of Maastrichtian sandstones and sandy limestones with orbitoids are also frequent at these localities.

Conclusions

The authors suppose that on the inner side of the Klippen Belt, a sedimentary basin was formed in the Upper Cretaceous (Fig. 3). On its margins, detritic and carbonate rocks were se-

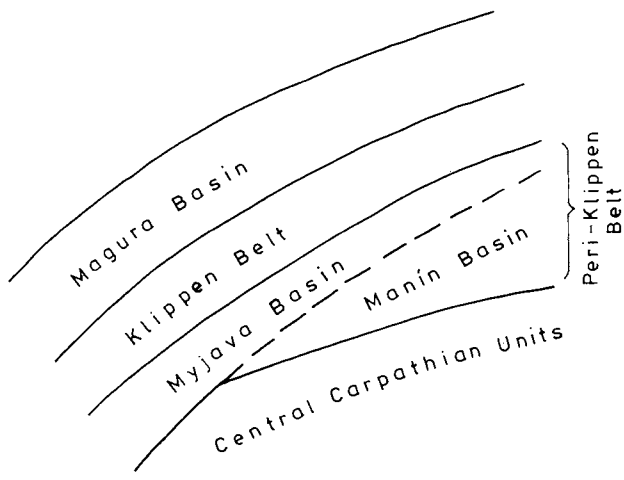
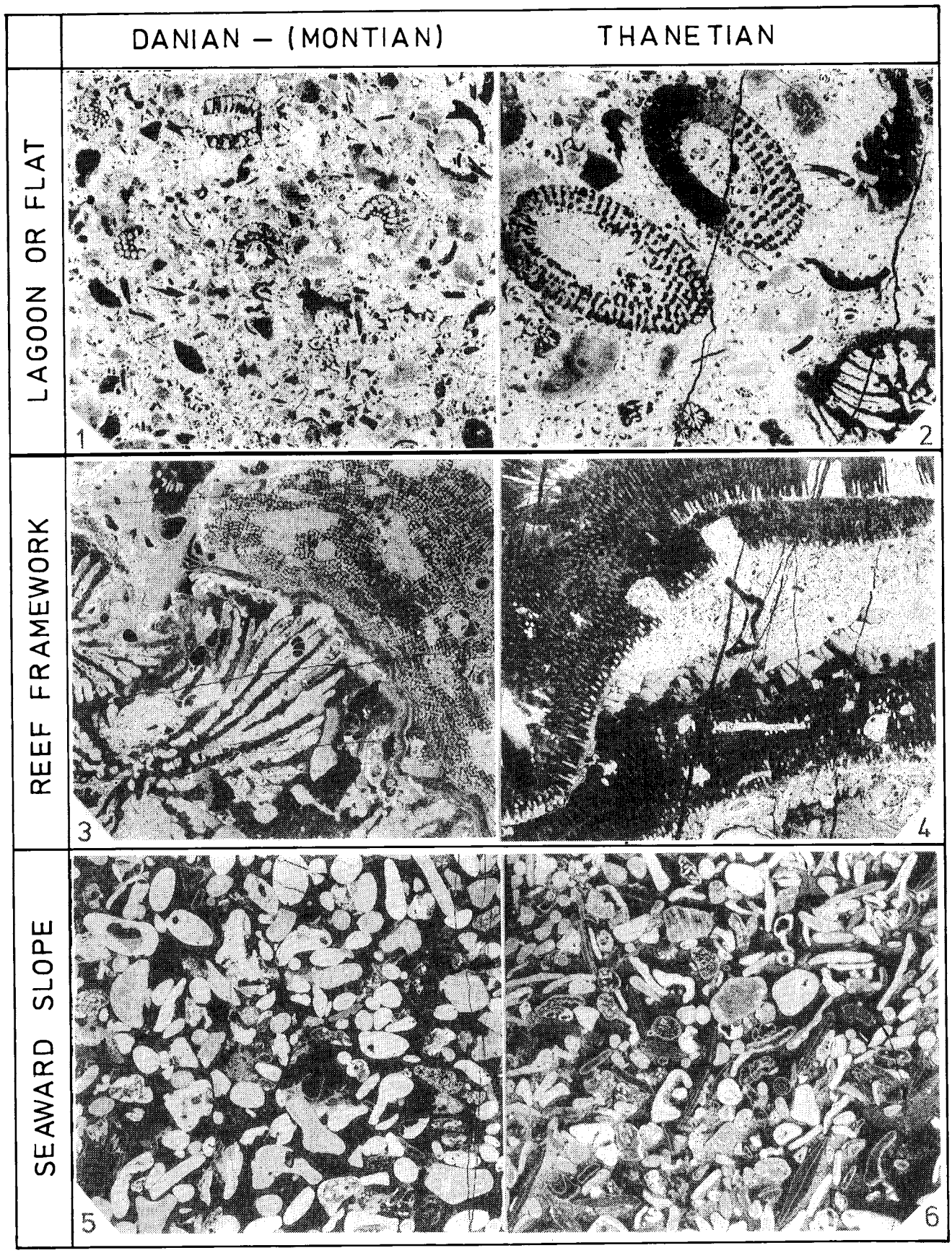


Fig. 3. Reconstruction of the sedimentary basin on the western edge of the Carpathians during the Paleocene.


DANIAN – (MONTIAN)
THANETIAN
LAGOON OR FLAT
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dimented, in the central part of the basin, marlstones and claystones were deposited. The characteristic fossils of the marginal part are orbitoid foraminifers (Borza et al. 1977). The basin reached a width of at least 40 km, and its length on Slovak territory exceeded 200 km. A continuation into the area of the Northern Calcareous Alps (Gosau, Grünbach) is very probable, but up to now a detailed comparison of the microfacies and organic communities from the Alpine and Carpathian regions is lacking.

During the Paleocene, narrow carbonate platforms, on which a reef complex developed, in which lagoonal, back-reef (reef flat), reef framework and fore-reef (slope) environments can be identified, were formed on the margins of the basin. During gradual progradation of the platform, the limestones emerged and were karstified. The Thanetian is the period of the greatest flourishing of the reef complex. At the end of the Thanetian, a sudden destruction of the reef complex, and an extensive change of regime in the basin occurred.

The authors express the view that the Myjava development has certain individual features, which distinguish it from the Hričov-Haligovce development (in the sense of Scheibner 1968 or Andrusov 1969). During the creation of the reef bodies in the Myjava Basin, coral had a dominant role. Progradation and the progress of the reef complex to the interior of the basin occurred, and here it is closely connected with the underlying Upper Cretaceous beds (frequent redeposition of orbitoid foraminifers). In reefs of the Manín area, communities of algae dominated.

It is necessary to take the present situation of this basin with reserve. The organic remnants present indicate a warm Tethide sea, and cast doubt on the direction of transgression from the north-west, a transgression from the south-west would be more favourable. The possibility of a post-Paleogene rotation of the basin (at least 90° in a clockwise direction) is also taken into account here.

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Plate 1: Fig. 1 - biomicrite with *Broeckella belgica* Morellet et Morellet. Danian - (Montian), loc. U Kravárikov, thin section 1360-B-SAV, magnified 5x. Fig. 2 - biomicrite with *Zittelina radoičičae* (Bystrický). Thanetian, loc. Juríkovia, thin section 1452-B-SAV, magnified 5x. Fig. 3 - coral biomicrite. Danian - (Montian), loc. Jandova dolina Valley-crest, block 3, magnified 5x. Fig. 4 - biomicrite with coral covers. Thanetian, loc. Stará Turá, block 3, magnified 5x. Fig. 5 - biosparite with a prevalence of fragments of coralline algae. Danian - (Montian), loc. U Kravárikov, block 3, magnified 5x. Fig. 6 - biosparite with fragments of coralline algae and cross sections of *Discocyclina seunesi* Douvillé. Thanetian, loc. Tižíkovia, block 10, magnified 5x. Figs.1 - 6 - negative print. Photographed by H. Brodnianska.

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