

DIMITRIJ ANDRUSOV, VIERA SCHEIBNEROVÁ¹**ON THE ORIGIN OF REDEPOSITIONS OF FORAMINIFERA IN THE CRETACEOUS AND PALEOGENE OF CARPATHIANS****O PŮVODE REDEPOZITOV FORAMINIFER V KRIEDE A PALEOGÉNE KARPÁT**

Abstract. Many redepositions of Foraminifera in the Cretaceous and Paleogene originated probably in consequence of olistostromes-phenomena, described by M. Marchetti (1957) in the Tertiary series of Sicily.

Occurrences of Foraminifera both smaller and larger are known from various portions of the Cretaceous and Paleogene of West Carpathians and they are a reason of many difficulties and omissions in age determination of competent suites.

Redepositions originate by various ways. One of them is that during an immersion of some zones took place denudation and destroy of rocks bearing microfossils which are washed and transported in more or less great area into younger sedimentary district where they are deposited together with younger microfossils. In this case microfossils are frequently reworked and corroded but it is not as a rule. Other way of origin of redepositions is that of tear off and transport and deposition of whole the blocks of older rocks together with microfauna, so that it is isolated from younger microfauna of competent sedimentary basin. In such case the microfauna does not carry traces of transport and most frequently it is not mixed with younger microfauna.

Further we shall deal with the last way of origin of redepositions which are of a great interest and importance in recent time.

During our investigations of some outcrops in the Cretaceous and Paleogene of Carpathians in Slovakia we had an opportunity to study the beds with many redeposited smaller Foraminifera well preserved and contemporarily to explain their origin.

Typical instances of such phenomenon we found in breccia-conglomerate-like formations in which besides pebbles and fragments of solid rocks more or less reworked we may find fragments and blocks of solid claystone and marlstone rocks without traces of decomposition. Very typical outcrop in which was studied such phenomenon is represented in the Paleocene — Lower Eocene suite in notch of road near Stará Turá where occurs a suite of variegated lithological composition. The age of this suite was formerly studied by D. Andrusov (1938, 1945, 1952) who regarded this complex as of the Upper Santonian age. M. Mišík and J. Zelman (1959) studied organogenous reefal blocks

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occurring in this outcrop and determined their age as Paleocene. E. Köhler (1961) regarded them as Middle Paleocene to Ypresian.

At the beginning of the mentioned outcrop of about 63 m length and 12 m height near railway bridge occurs a suite of light-grey green-grey locally brown slates with leaf-like disjunction which are alternated with portions of brown sandstones. In the sandstones we may see graded bedding. The suite is erected to 60°. The sandstones are fine- to medium-grained and grade upwards into more fine-grained conglomerates with polymict material. The mentioned slates carry impoverished and scarce microfauna composed of these species: *Globorotalia planoconica* Subbotina, *Globorotalia crassata* (Cushman), *Globorotalia triplex* Subbotina. Besides these Paleocene — Middle Eocene species were in the sample redeposited Upper Maastrichtian forms such as *Globotruncana stuarti* (Lapparent), *Globotruncana linneiana linneiana* (d'Orb.), *Pseudotetularia varians* Rzehak, *Neoflabellina rugosa* (d'Orb.), *Bolivinoidea draco draco* (Marsson), *Bolivinoidea decorata gigantea* Hiltermann et Koch, *Pseudovigenerina cristata* (Marsson), *Gümbelina globulosa* (Ehrenberg), *Stensiöina pommerana* (Brotzen). In form of pebbles and irregular intercalations between grey marls of the Maastrichtian occur dark-grey marly slates with fine-prismatic disjunction and grey marly limestones. The marly limestones afforded the following association of Foraminifera: *Ticinella roberti* (Gand.), *Hedbergella infracretacea* Glaessner. In these beds was found undeterminable Ammonite.

In the central part of the outcrop mainly in the Maastrichtian marls occur the reefal blocks studied by M. Mišik and J. Zelman (1959). At the end of the outcrop occur again the Lower Eocene fine leaf-like slates alternating with sandstones. Locally occur also sandy slates of brown colour in which was not found a microfauna but lithologically they are identical with the Paleocene-Middle Eocene slates.

As is obvious from the mentioned data in the Paleocene-Middle Eocene complex of slates and sandstones to fine-grained conglomerates and reefal blocks occur blocks of marly slates of the Upper Maastrichtian and pebbles and smudges of slates and marly limestones of the Albian. This phenomenon we may explain as follows: during sedimentation in the Paleocene-Lower Eocene sedimentary district took place an origin of reefs. In this time near the sedimentary district emerged the suites of the klippen belt which probably formed a steep slope from which were torn off blocks and quickly transported into the Paleogene sedimentary district. Thus, within the Paleogene suite occur marls and marly slates of the Senonian and hard blocks, frequently worked. On this variegated mixture of rocks deposited again slates and sandstones of the Paleogene with competent microfauna.

Described outcrop corresponds to M. P. Marchetti's (1957) olistostrome on a whole and single redeposited blocks to olistoliths of the same author. The microfauna in this outcrop occurs partly in single redeposited blocks and smudges (Albian) and redeposited into younger rocks.

Similar outcrop is known in Orava near Kňažia, Zaskal and Jelšava (E. Scheibner, V. Scheibnerová, 1961). In the mentioned localities is developed a suite composed of fragments or little pebbles of marls and marly limestones of grey, resp. reddish colour jointed with marly cement of various colours, in general of the same character as fragments and pebbles. Near Kňažia

occur similar breccias unconformably overlaid by basal Paleogene with Nummulites (D. Andrusov, 1945).

Near Jelšava on the right bank of the river Orava was found and described further outcrop (E. Scheibner, V. Scheibnerová, 1961) which allowed an explanation of character and origin of the Zaskal breccias. Although the profile was already described we regard as very interesting to present here its description again.

East-north-eastwards to the village Jelšava we may see the following profile. At the beginning occur variegated marls, marlstones, calcareous marlstones of the Santonian-Campanian of some tens m thickness. Further we see a few portions of bedded polymict sandstones changed by light-grey massive fine-grained calcareous marlstones of the Santonian-Campanian age. Further occurs a flysch suite composed of grey bedded calcareous sandstones with numerous hieroglyphs. The sandstones are alternated with grey marly slates, locally sandy and sometimes predominate. In grey and red slates occurs a portion of breccias and "conglomerates" resembling the Zaskal breccias from the locality near Zaskal. Their thickness is to 5 m. Fragments of the breccias are composed of various marls and marly limestones of the Middle Cretaceous of the Pienidy series and on the other hand of material from substratum only slightly worked. We observe irregular, fluidal folding of detrital portions which serve as evidence of possibility that in their origin may take a place submarine slides. In underlying grey and red marls and in the cement of the breccias was found the Campanian microfauna. In overlying red marlstones was found the Maastrichtian microfauna.

On the mentioned localities we made detailed micropaleontological study and on the basis of found microfauna were gained very interesting results. In red and variegated marls of fragments was found microfauna descending from various horizons of the Cretaceous from the Upper Albian to Lower Turonian and further of the Middle Senonian inclusively Campanian. Typical Maastrichtian associations were not found. The mentioned authors (E. Scheibner, V. Scheibnerová, 1961) made conclusion that the breccias near Jelšava and other occurrences represent the endostratic breccias originated due to the mechanic affect of submarine slides. The transport of torn off blocks was very short. The present tectonic does not allow to study the position of original source of the clastic material. After denudation or deepening of this source continued sedimentation in marly facies of the Maastrichtian. In accordance to Marchetti (1957) this profile represents a typical olistostrome.

Another instance of this phenomenon we may found in profile between the town Žilina and the village Vranie at the right bank of the river Kysuca. At the beginning of the profile near Vranie occurs a suite of conglomerates and slates with pebbles of the Lower Turonian age. Above this suite occurs a suite of the Senonian age (probably Santonian) of conglomerates and flysch-like beds in which in marly blocks and smudges was found a microfauna of the Albian and Cenomanian age and in the slates of the flysch-like beds a microfauna of the Santonian age. From the mentioned it is obvious that the blocks and fragments with the older microfauna which occurs without distinct superposition, chaotically, represent olistoliths, redeposited in younger suite.

In connection with the mentioned instances we may establish some new terms, namely olistolithic conglomerate, i. e. conglomerate with many olistoliths

and conglomerate olistostrome, i. e. olistostromes with many conglomerate materials.

Occurrences of olistoliths, olistostromes and phenomena connected with submarine slides, very frequent mainly in the various flysch formations of Carpathians where they were studied by R. Marschalko (1961) and in Poland by M. Książkiewicz (1958), A. Radomski (1958) and others.

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