

The Jurassic of the Andrychów Klippes (Western Outer Carpathians) - new paleontological studies and palaeogeographical remarks

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The Andrychów (External) Klippes (Roczyny, Targaniczanka N, Targaniczanka S, Pańska Góra N, Pańska Góra S, Inwałd W, Inwałd E) occur in the western part of the Polish Flysch Carpathians between localities Roczyny and Inwałd in a 6 km long zone directed NEE – SWW. The lithological and sedimentological character of Andrychów Klippes, (igneous rocks, shallow-water carbonates, pelagic sediments) as well as age of their sedimentary sequence (Middle Jurassic - Eocene) differ essentially from those of the surrounding flysch. The klippes also differ between themselves in age and lithological development.

In Jurassic palaeogeography they represented a marginal part of the European platform whose morphology was characterised by the presence of high standing blocks, separated by basins. During Alpine north-directed movements, some blocks were detached from the platform and incorporated into flysch sediments, mainly in the front of Silesian nappe. The Oxfordian cherty limestones show significant similarities to coeval sediments deposited on the carbonate ramp fringing southern margin of the European platform. The Tithonian shallow-water limestones with abundant nerineacean-diceratid-coral fauna, numerous algae (dasycladales, codiaceans, selenoporeaceans), forams (littorinids, miliolids, involutinids) and calcareous dinocysts show similarities to the Štramberské limestones, as well as to the carbonate sediments of the European platform which occur as detached blocks and exotics in the Outer Carpathians.

The characteristic foraminiferal assemblage of the „Inwałd“ limestones (the Inwałd klippe, the Roczyny

klippe) consists of littorinids : *Pseudocyclammina lituus* (Yokoyama), *Valvulina alpina* Dragastan, *V. lugeoni* Septfontaine, *Protomarssonella* cf. *dumortieri* (Schwager), *Palaeogaudryina varsoviensis* (Bielecka et Pożaryski); miliolids: *Quinqueloculina mitchurini* Dain, *Q. stellata* Matsieva et Temirbekova, *Istriloculina fabaria* Matsieva et Temirbekova, *Decussoloculina barbui* Neagu, *Scythiloculina confusa* Neagu; involutinids: *Trocholina alpina* Leupold, *T. burlini* Gorbachik, *Andersenolina perconigi* Neagu, *A. elongata* (Leupold). The algal association of the Inwałd limestone is composed of dasycladales: *Actinoporella podolica* (Alth), *Clypeina jurassica* Favre (rare), *Campbelliella striata* (Carozzi), *Salpingoporella annulata* Carozzi, *S. pygmaea* (Gümbel), *Eoteuloporella socialis* (Praturlon); encrusting codiaceans: *Baccinella irregularis* Radoicic, *Pseudolithocodium carpathicum* Mišik, *Lithocodium aggregatum* Elliot; encrusting solenoporaceans: *Thaumatoporella parvovesiculifera* Rainieri and rare cyanophyceans *Rivularia* sp.

The microfossil assemblages of the peri-Tethyan shelf submerged under the Flysch Carpathians (well Zagórzycze 6) or incorporated into flysch deposits as olistholites (Kruhel) are more environmentally diversified, probably due to different position of investigated sites on the platform. However, generally they represent the same neritic environment. Greater abundance of tintinnids indicates that investigated sites were situated closer to currents that distributed pelagic elements on the platform.

Calendar of geological events of Neogene in Eastern Paratethys

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As is known, Paratethys represents itself a chain of Neogene basins of Eurasia having been split off from the Mediterranean and World ocean in times of Alpine orogenesis, forming its own bioprovince.

Biochronological studies implemented in Cenozoic deposits of World ocean enable to establish a series of "waves of cooling" related mainly with manifestation of Antarctic glaciation and further variations of paleoclimate caused by oscillations of the Earth's orbit. As it has been clarified, the characteristic cyclicity in the Neogene of Eastern

Paratethys, which yet N. I. Andrusov was lucky to discover, is manifested by alternation of sediments formed in basins having salinity close to normal and sediments deposited in basins with salinity strongly deviating from the normal where the representatives of "monomorphic fauna" lived, being the extreme cases of endemism, which inhabited great spaces from Alps to Trans-Caspian region. For example, strata with *Oncophora* (Kotsakhurian regional stage), Karaganian regional stage ("strata with *Spaniodontella*"), upper Sarmatian ("Khersonian") sensu Barbot-de-Marni -