

Middle Eocene Rastiš formation and upper Eocene–Oligocene? Adriatic flysch formation in southern Montenegro (South Adriatic zone)

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In the area of southern Montenegro, north of the town of Ulcinj, clastic sediments of Eocene age are developed, *i.e.*, molassic sediments of the Rastiš Formation (middle Eocene), and sediments of the Adriatic Flysch Formation (upper Eocene–Oligocene?).

The Rastiš Formation is 450 m thick and comprises sandstones, marls, aleurolites and clays in the lower part, and conglomerates and coarse-grained sandstones in the upper part. Calcareous sandstones are the dominant member of the lower part of the formation. They are represented by litharenites and sublitharenites. Main components are quartz, rock fragments, feldspars and mafic minerals, while the matrix is composed of carbonate. Horizontal and cross-bedded stratification is common in these rocks. Sandstones often contain the ichnofossil *Ophiomorpha* sp. In the upper part of the formation, conglomerates and coarse-grained sandstones are equally represented. Conglomerates are poorly sorted, with clast size up to 15 cm, rarely larger, consisting of Upper Cretaceous and middle Eocene limestones, rarely cherts and volcanic clasts. Coarse-grained sandstones often have graded bedding. These rocks actually represent molassic sediments, formed under shallow-marine conditions on the upper part of continental shelf, at times dominated by fluvial processes of sedimentation, and they are not turbidites as previously interpreted. The age of the series, based on calcareous nannoplankton (*Blackites gladius*, *Chiasmolithus gigas*, *Chiasmolithus grandis*, *Coccolithus formosus*, *Discoaster barbadiensis*, *Dictyococcites hesslandii*, *Sphenolithus spiniger*, *Reticulofenestra dictyoda*, etc.) is determined as middle Eocene (Lutetian), *i.e.*, it belongs to nannoplankton biozones NP14/NP15.

In the Adriatic Flysch Formation, that is around 140 m thick, it is possible to observe sequences with graded calcarenites (Ta), a lower interval of parallel lamination with coarse-grained laminae (Tb), an interval of cross lamination, ripple lamination and convolute lamination (Tc), upper interval of parallel lamination with fine-grained laminae (Td), and interval with pelagic to hemipelagic clayey or marly sediments (Te). Dominant members of this series are thin-bedded sandstones with carbonate grains and matrix, while clayey and marly sediments are rare. Sedimentary structures are often represented by linguiform flute casts, and rarely by overlapping elongated flute casts and groove casts. In sandstones, trace fossils are represented by ichnogenera *Scolicia* (trace made by echinoids) and *Palaeodictyon*. Čađenović *et al.* (2010) considered these sediments to be of late Eocene to Oligocene age in the region of Bar. Calcareous nannoplankton sampling north of Ulcinj did not indicate this age, but also gave middle Eocene forms. Considering that these are flysch sediments, it is possible that these forms are reworked, so late Eocene to Oligocene age is conditionally accepted. Further sampling of marly sediments for calcareous nannoplankton will give a more accurate age.

Clastic sediments of Eocene age in southern Montenegro indicate a gradual deepening of the basin, where shallow-water molassic sediments of the Rastiš Formation were deposited first, and after that the depositional environment changed, so that turbidite deposits of the Adriatic Flysch Formation were formed.

REFERENCES

- Čađenović, D., Milutin, J., Kilibarda, Z., Radulović, N. 2010. Paleogene in Southern Adriatic Zone (Montenegro). *Proceedings of the 15th Congress of the Geologists of Serbia*, 143–147.