

Actualistic paleoecology and taphonomy of the Holocene benthic assemblages in the northern Adriatic Sea: Links with the Middle Miocene ecosystems of the Vienna Basin

ADAM TOMAŠOVÝCH¹, NATÁLIA HUDÁČKOVÁ² and TOMÁŠ FUKSI¹

¹Earth Science Institute, Slovak Academy of Sciences, Dúbravská cesta 9, 84005, Slovakia; geoltoma@savba.sk

²Department of Geology and Paleontology, Comenius University, Mlynská dolina, Ilkovičova 6, 842 15 Bratislava, Slovakia; natalia.hudackova@uniba.sk

Actualistic paleoecological and taphonomic analyses of the present-day northern Adriatic ecosystems and depositional environments can constrain paleoenvironmental and paleoecological inferences when interpreting the dynamic of benthic communities in the Miocene successions of the Central Paratethys and their responses to oceanographic regime changes (e.g., Seneš 1988a–c, 1989; Seneš & Ondrejčková 1991; McKinney & Jaklin 2001; McKinney & Hageman 2006; Zuschin & Stachowitsch 2009; Sawyer & Zuschin 2010). However, the northern Adriatic benthic communities were affected by significant anthropogenic disturbances and stresses over the past centuries and decades (Stachowitsch et al. 2012; Gallmetzer et al. 2019). One of the similarities between the present-day northern Adriatic (affected by anthropogenic impacts) and the Middle Miocene Central Paratethys basins is represented by the so-called *Corbula gibba* community that is characterized by relatively low diversity of molluscan species and by unique size structure of *C. gibba* assemblages, with high abundance of individuals >10 mm. Ecological and paleoecological analyses of the present-day Adriatic communities and Miocene paleocommunities independently indicate that this species is more resistant to seasonal oxygen depletion, pollution and sediment disturbance than most other molluscan species. Here, we show that shell-size distributions of *C. gibba* in the Danube Basin were dominated by small individuals (<5 mm) along the onshore–offshore during the Middle Miocene. In contrast, size distributions in the Vienna Basin show an increase in shell size towards deeper, offshore environments, i.e., with unimodal size-frequency distributions in shoreface sands (with most shells <5 mm), heavy-tailed size-frequency distributions at sandy oyster-reef marginal sites, and bimodal size-frequency distributions with high abundance of individuals >10 mm in deeper muddy embayments. To summarize, size distributions in the Danube Basin do not consist of individuals >10 mm whereas size distributions in the Vienna Basin are domi-

nated by individuals >10 mm. This gradient in shell-size increase correlates with an increase in proportional abundance of *Bulimina* and *Bolivina* in foraminiferal assemblages. Geographic and stratigraphic variation in proportional abundance and size of *C. gibba* can be a useful paleoecological index tracing past changes in the degree of water-column stratification and in bottom-water oxygen concentrations.

References

- Gallmetzer I., Haselmair A., Tomašových A., Mautner A.K., Schnedl S.M., Cassin D., Zonta R. & Zuschin M. 2019: Tracing Origin and Collapse of Holocene Benthic Baseline Communities in the Northern Adriatic Sea. *Palaios* 34, 121–145.
- McKinney F.K. & Jaklin A. 2001: Sediment accumulation in a shallow-water meadow carpeted by a small erect bryozoan. *Sedimentary Geology* 145, 397–410.
- McKinney F.K. & Hageman S.J. 2006: Paleozoic to modern marine ecological shift displayed in the northern Adriatic Sea. *Geology* 34, 881–884.
- Sawyer J.A. & Zuschin M. 2010: Intensities of drilling predation of molluscan assemblages along a transect through the northern Gulf of Trieste (Adriatic Sea). *Palaeogeography, Palaeoclimatology, Palaeoecology* 285, 152–173.
- Seneš J. 1988a: The Island Banjole — A type region of recent marine ecosystems on North Adriatic shelf. *Geologický Zborník — Geologica Carpathica* 39, 713–738.
- Seneš J. 1988b: Principles of study of Adriatic shelf ecosystems from the viewpoint of applications in geology. *Geologický Zborník — Geologica Carpathica* 39, 285–300.
- Seneš J. 1988c: Quantitative analysis of north and south Adriatic shelf ecosystems. *Geologický Zborník — Geologica Carpathica* 39, 675–712.
- Seneš J. 1989: North Adriatic inter-island shelf ecosystems of the Rovinj area. *Geologický Zborník — Geologica Carpathica* 40, 333–354.
- Seneš J. & Ondrejčková A. 1991: Proposal for the terminology of fossil marine benthic shelf ecosystems. *Geologica Carpathica* 42, 231–240.
- Stachowitsch M., Riedel B. & Zuschin M. 2012: The return of shallow shelf seas as extreme environments: Anoxia and Macrofauna Reactions in the Northern Adriatic Sea. In: *Anoxia*. Springer, Dordrecht, 353–368.
- Zuschin M. & Stachowitsch M. 2009: Epifauna-dominated benthic shelf assemblages: lessons from the modern Adriatic Sea. *Palaios* 24, 211–221.