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Time averaging and stratigraphic unmixing: reconstructing ecological decline in molluscan production (Holocene, Brijuni, NE Adriatic)

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The northeastern Adriatic seafloor is formed by warm-temperate bioclastic carbonates with coralline algae, bryozoans and mollusks. These sediments represent a mixture of past and present-day production owing to low sedimentation rates and bioturbation. Although low sedimentation rates do not allow resolution of ecological history at centennial or even millennial scales on the basis of raw stratigraphic data, age unmixing based on radiocarbon-calibrated amino acid racemization shows that one of the major molluscan sediment producers – the infaunal suspension-feeder *Timoclea ovata* – markedly peaked in production ~5,000 years during the maximum flooding and earliest highstand phase and significantly diminished in abundance during the late highstand phase at Brijuni, with a large proportion of dead shells now present in surface sediments representing shells that are several centuries old. This species still occurs in living assemblages but our analyses indicate that its former production was by several orders of magnitude higher. In contrast, stratigraphic trends in absolute and proportional abundance of this species in ~1.5 m-thick sediment cores show a gradual or a very mild upcore decline, indicating that raw stratigraphic data do not efficiently detect millennial-scale ecological dynamic. The temporal decline in production of *Timoclea ovata* is associated with an increase in water depth and an increase in sediment-accumulation rate, and led to a transition from molluscan oyster-scallop shell bed to late highstand bryomol sediments.