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

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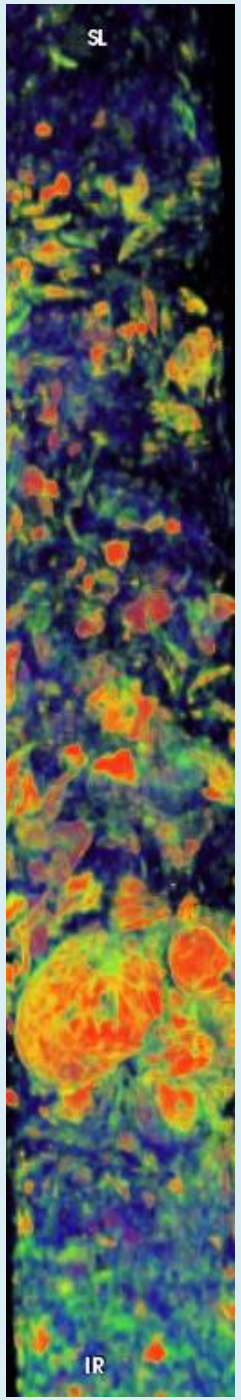



Schnedl et al. 2018 Holocene
Gallmetzer et al. 2019 Palaios

→ ~1-1.5 m-thick sediment cores collected at Brijuni at 44 m water depth, spanning highstand and transgressive deposits

→ a distinctive shell bed with scallops, oysters, encrusters at 90-120 cm core depth

→ dominated by infaunal bivalve *Timoclea ovata*

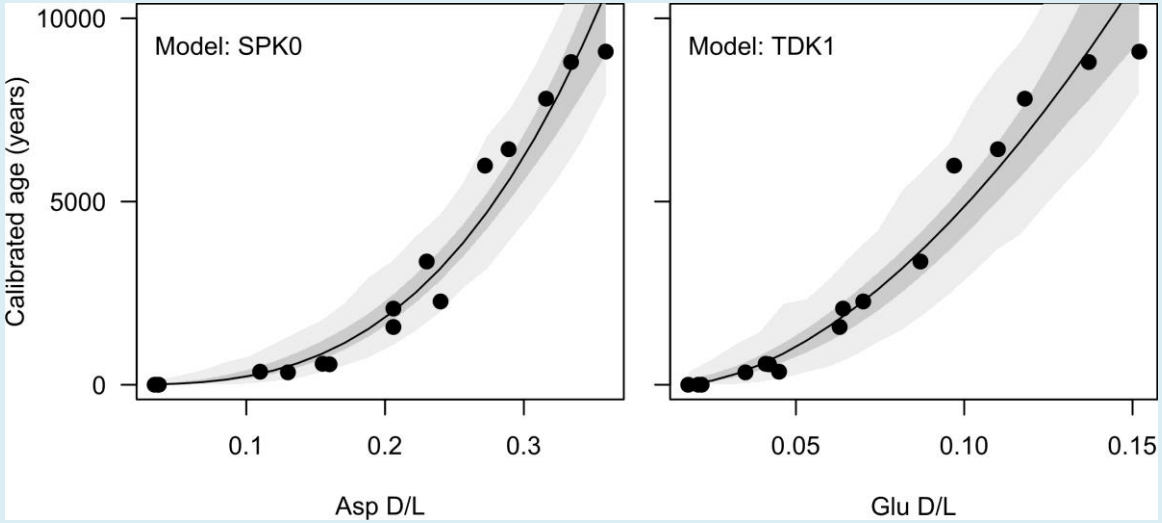
→ seafloor is formed by warm-temperate bioclastic carbonates with coralline algae, bryozoans and mollusks. These sediments represent a mixture of past and present-day production owing to low sedimentation rates and bioturbation

Sediments formed by warm-temperate bioclastic carbonates with coralline algae, bryozoans and mollusks → represent a mixture of past and present-day production owing to low sedimentation rates and bioturbation – it is unclear how does the sitratigraphic signal survives this.

**GOAL**

→ reconstructing temporal changes in production of *Timoclea ovata* on the basis of two sediment cores at Brijuni

→ contrasting stratigraphic changes with unmixed (chronological) changes




**Methods**

→ amino acid racemization calibrated by radiocarbon ages based on 16 shells of *T. ovata*

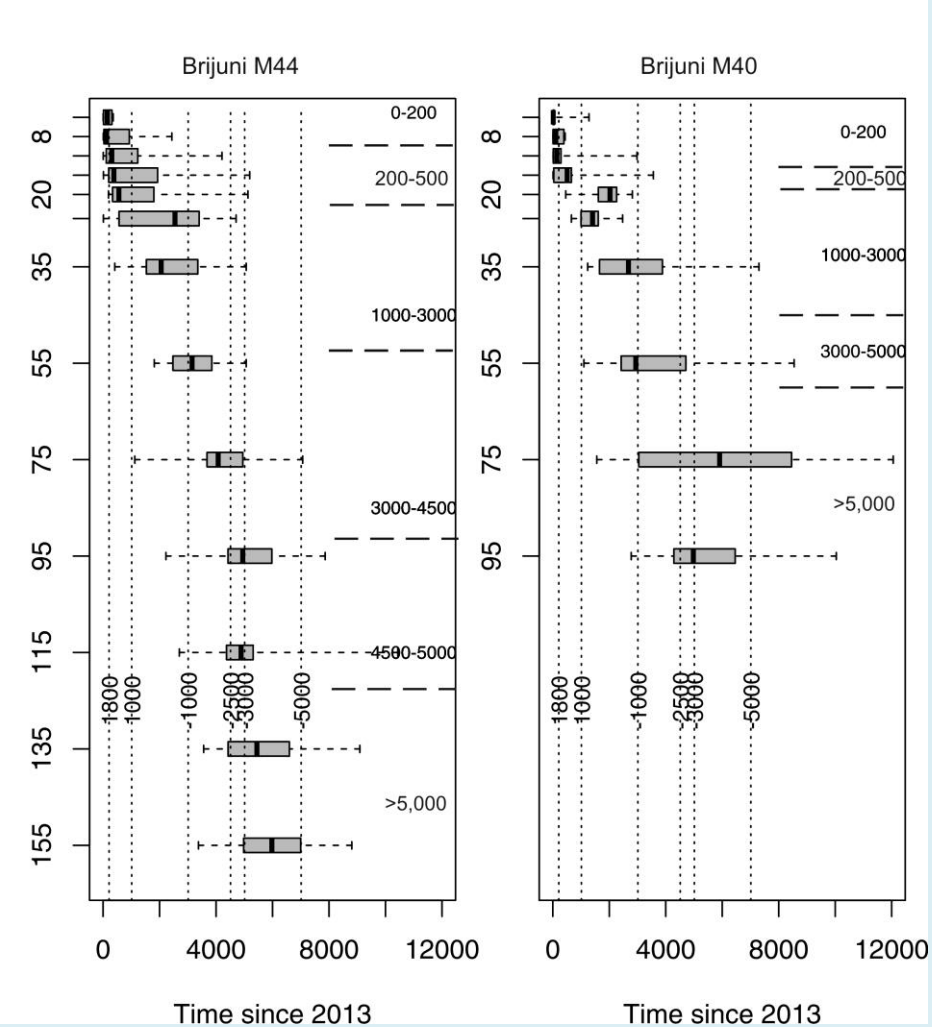
→ AAR measurements in 418 shells of *Timoclea* in two sediment cores

→ age unmixing (Tomasovych et al. 2017 Geology)

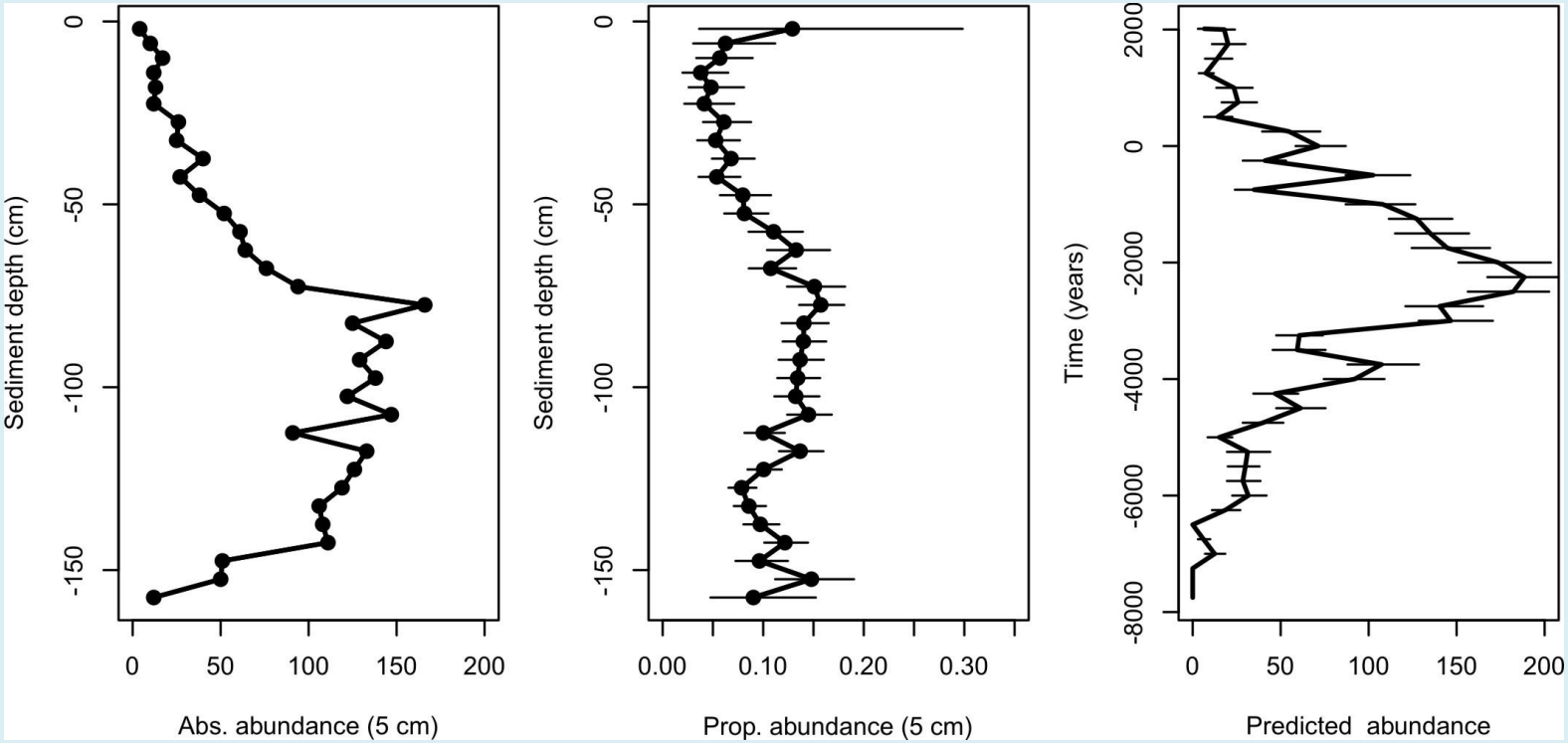
**RESULTS** – distributions of *Timoclea ovata* ages in two cores

→ millennial-scale time averaging

→ shell bed at 90-12 cm at M44 and at 45-60 cm at M40



## RESULTS




→ A-B. **Stratigraphic** trends in abundance of *T. ovata* observed in the sediment core M40 show an initial increase in the lower parts of the core, followed by a relatively strong decline in the upper half of the core on the basis of absolute abundance (a) and a less strong decline on the basis of proportional abundance (b).

→ C. The **chronological** history in production on the basis of AAR dating (c) shows a relatively unimodal trajectory peaking at ~4500 years ago. Stratigraphic changes in absolute and proportional abundance both peak at 75-80 cm.

**CONCLUSIONS**

- Age unmixing based on radiocarbon-calibrated amino acid racemization shows that one of the major molluscan sediment producers – the infaunal suspension-feeder *Timoclea ovata* – 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.

- *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, so 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.