Stratigraphic changes in shell size of a turritellid gastropod in the Holocene fossil record of the Po prodelta (Northern Adriatic Sea)

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Over the last century, the northern Adriatic Sea has faced multiple ecological threats such as hypoxic events, eutrophication, pollution by heavy metals and plastics, and bottom trawling. These impacts were associated with major changes in the composition of benthic communities, particularly a decline in the abundance of Turritellinella tricarinata (= Turritella communis), the dominant gastropod species in the previously widespread Turritella-biocenosis of the northern Adriatic muddy bottoms. In this study, we reconstruct changes in abundance and size structure of T. tricarinata populations over the last 6000 years to better understand the drivers responsible for its recent decline and to provide a historical baseline for assessing potential recovery.

We studied sediment cores from two locations in the western Northern Adriatic Sea: (1) distal zones of Po prodelta based on a 3-meter-long gravity core collected at 31 m water depth comprising a condensed record of the last ~9,100 years, (2) proximal zones of Po prodelta based on five 1.5-meter-long piston cores taken at 21 m water depth in the Po prodelta, which capture the last 100-150 years. Core chronologies are based on radiocarbon-calibrated amino-acid racemization analyses of bivalve shells.

We analysed changes in the abundance and shell height of T. tricarinata in each increment of the cores. In total, 600 specimens have been measured. All stations show a similar pattern in shell abundance: a climax in the early 20th century and a strong decrease in the late 20th century.

The proximal records of Po prodelta show a negative correlation between abundance and median shell size, with larger size and lower abundance in the late the 20th century, a period characterized by recurrent severe hypoxic events. The 3-meter-long offshore core contains on average smaller specimens, but reflects a similar pattern: the number of larger specimens (>10 mm) and median shell sizes increase slightly towards the core top while total abundance declines. This trend towards larger shell size and lower abundance may reflect the complex effect of nutrient enrichment in a highly disturbed environment. During the last century Turritella communis might experience higher growth rates and lower predation but simultaneously reduced recruitment due to hypoxia and pollution.