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Down-core changes in molluscan death assemblages at Panzano Bay, an impacted area in the northern Adriatic Sea

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We use a historical ecology approach to shed light on the environmental history of the northern Adriatic Sea over the last hundreds to thousands of years. We focus on down-core changes in molluscan death assemblages, which serve as proxies for ecological shifts over time. The northern Adriatic Sea is particularly suited to study ecosystem modification under human pressure because it is among the most degraded marine ecosystems worldwide. We chose a sampling station in Panzano Bay, close the Isonzo River mouth and not far from the major industrial harbours of Trieste (Italy) and Koper (Slovenia), and traced down-core changes in molluscan community structure in correlation to major anthropogenic impacts that occurred here during the last centuries. Five sediment cores (1.5 m in length and diameters of 90 and 160 mm) were taken at a water depth of 12 m. We analysed grain size composition, the concentration of heavy metals and organic pollutants, and radiometrically dated the sediment using ^{210}Pb. Furthermore, we dated shells of the abundant bivalve species *Corbula gibba* using ^{14}C calibrated amino acid-racemisation (AAR). The whole molluscan community in the cores was analysed for species composition, abundance, taxonomic similarity, evidence for ecological interactions (i.e., frequencies of drilling predation) and taphonomic conditions of shells. The granulometric analysis shows that silt and clay dominate equally throughout the cores. Radiometric sediment dating revealed an average sedimentation rate of 2.5 mm/yr during the last 120 years. Shell dating points to a comparable overall core age, with only a few shell specimens being older than 500 years in the deepest core layer. In total, 10,452 mollusc individuals were analysed and 104 species identified. The most abundant bivalve species are *Kurtiella bidentata*, *Corbula gibba* and *Abra nitida*. *Turritella communis* and *Nassarius pygmaeus* are the most frequent gastropod species. Down-core changes in species composition and molluscan abundance are conspicuous, with a high peak in abundance between 20 and 50 cm depth and another peak in the lower part of the core. These trends in community composition correlate with the concentration curves of several heavy metals (Pb, Zn, Hg) and polycyclic aromatic hydrocarbons. In the deeper core horizons, a high mercury peak signals a massive and century-long contamination caused be the Idrija mercury mine located up the Isonzo River. In the uppermost 20 cm of sediment, Pb, Zn and PAHs display high concentrations and are accompanied by a decrease of formerly abundant species (e.g. *Kurtiella bidentata*) and an increase of a few opportunists. Our study shows how pollution, among other factors, affects individual mollusc species and leads to marked and long-lasting changes on the community level.