The shallow northern Adriatic Sea was formed at the end of the last glaciation by the rising sea level. Since historical times, it has been strongly influenced by human activities (e.g. fishing, coastal development, pollution, eutrophication), making it one of the most degraded marine ecosystems worldwide. Our study reconstructs environmental changes and anthropogenic impacts since the onset of the Holocene transgression using down-core changes in molluscan death assemblages as indicators for ecological shifts. The sediment cores were taken at three stations (Brijuni Islands, Croatia; off Piran, Slovenia; off Venice, Italy), each representative of specific sediment and nutrient conditions and degrees of habitat exploitation. The cores were 1.5 m long and had diameters of 90 or 160 mm. For the molluscan shell analyses, sediment subsamples were examined for species composition, abundance and taxonomic similarity. In total, 98,700 shells were investigated and 113 bivalve and 178 gastropod species recorded.

Sedimentation rates derived from $^{210}$Pb dating are very low, between 0.15 cm/yr at Brijuni and 0.25 cm/yr at Piran station. The dating of bivalve shells ($Lucinella$ divaricata, $Timoclea$ ovata and $Gouldia$ minima) with $^{14}$C calibrated amino-acid racemisation revealed that the cores at all three stations cover at least 6000 to 8000 years. Time averaging is high, especially in the lower core layers of Piran station, probably due to strong bioturbation. Molluscan assemblages show significant interregional differences that correlate with grain size, nutrient concentration and the occurrence of organic pollutants and heavy metals. Down-core changes in molluscan communities are also conspicuous in all cores. They partly reflect long-term changes in water depth, vegetation cover or grain size distribution caused by natural fluctuations of environmental conditions over the past millennia. In the uppermost core layers, however, these changes can be interpreted as indicators of anthropogenic impacts.