



Integrating sedimentological and palaeontological analysis for conservation strategies: the Razim-Sinoie lake complex (Danube Delta, Romania) as a model example

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Palaeoecological records can help to test ecological hypotheses essential for conservation strategies, as short-term observations can be of insufficient duration to capture natural variability. However, these palaeoecological studies typically concern timescales of millennia and longer, and usually do not cover the dramatic increase of human impact over the past centuries. Time series relevant for conservation palaeobiology therefore should also include time intervals when relevant human activities developed (e.g. deforestation, fisheries).

The decline of the unique endemic fauna in the Black Sea and Caspian Sea serves as a model example for conservation palaeobiology research. During the past million years, both the Caspian and the Black Sea basins have experienced episodes of connection, isolation and strong environmental changes. The so-called Pontocaspian fauna that have evolved in these basins have adapted to the unique brackish-water environments. They existed in the Caspian Sea and in lagoons, estuaries and deltas along the northern margin of the Black Sea. Currently, these endemic Pontocaspian biota are in decline, yet the scale and causes of the decline are not fully known. Habitat destruction, pollution and invasive species all have been proposed to play a role in their demise.

A classical Pontocaspian habitat is found in the Razim-Sinoie lagoon complex located on the Black Sea coast, in the southern parts of the Danube Delta in Romania. However, the modern fauna is mostly dominated by fresh-water species and many Pontocaspian species appear to be absent today. In the past centuries, numerous anthropogenic adjustments have been made to increase the fresh-water inflow and limit marine influence in the lagoon complex to enhance fish breeding and irrigation purposes. We investigate how the changes in lake dynamics have affected the mollusc communities.

In this interdisciplinary study, we use detailed sedimentological analyses of 11 cores to document the environmental evolution of the lake system and understand the impact of human activities. Variations in the mollusc assemblages including Pontocaspian species and communities through time are documented. By understanding their response to chronic or sudden (palaeo-)environmental changes seen in the sedimentology, we can gain insights into resilience and point to useful strategies to assist recovery of Pontocaspian species.

Our palaeoenvironmental reconstruction shows the dynamic interplay between riverine and marine processes in the system. Palaeontological analyses show a dynamic distribution of mollusc species and communities through space and time. The current decline of Pontocaspian molluscs started during 20th century transition from a semi-open marine-freshwater system to a fresh-water lagoon. Our results point to the necessity of a restoration of salinity gradients to support the conservation of Pontocaspian species in the Razim-Sinoie complex.

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