

Sediment cores from Lake Urmia (Iran) suggest the inhabitation by parthenogenetic *Artemia* around 5,000 years ago

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Abstract In Lake Urmia area, northwestern Iran, parthenogenetic *Artemia* and the bisexual *Artemia urmiana* Günther 1890 are found to occupy different ecological niches determined by salinity. Given the fluctuations of the lake over geological times, we thus hypothesized that species identification of *Artemia*

cysts, buried in the sediments, can provide information on lake conditions in the past. Therefore, encysted embryos of *Artemia* were recovered from lake sediments by augering at a site near the present shoreline. Cysts and associated plant remains from two studied levels yielded radiocarbon ages in the range 5,000–6,700 YBP. For determination of the type of *Artemia*, the constant synonym mutation in exon-7 of the Na/K ATPase gene was verified, and the diameter of the recovered cysts was compared with that of modern cysts from the Lake Urmia region. The results show that the cysts represent a parthenogenetic type of *Artemia*, whose cyst diameter is somewhat different from that of present-day local parthenogenetic *Artemia*. The present study firstly confirms the stability of DNA in ancient *Artemia* cysts for molecular analysis. Moreover, it suggests variation in Lake Urmia's conditions over time, and based on comparison with salinity preferences of contemporary *Artemia* populations, it more specifically suggests that Lake Urmia was a brackish lake dominated by a parthenogenetic *Artemia* population in the geological period sampled. It finally illustrates how, like in the study of freshwater propagule banks, paleogenetic analysis of *Artemia* DNA recovered from sediment cores can be used as a tool in the paleoecological study of generally highly fluctuating saline habitats.

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