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Mid Hollocene climate reconstruction using d18O of catfish otolith and its relation to Indus civilization

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1. Introduction
Otoliths (ear stones) of hardhead catfish (Aropsis spp.) from archaeological deposits in North West India were geochemically analyzed to evaluate if they preserve climatic information of the past. Because otoliths generally precipitate in equilibrium of ambient water, paleo-temperature and oxygen stable isotope ratio can be reconstructed. If d18Owater is constraind, paleo-temperature can be estimated in high precision by using published equations.
2. Study area
Study area is around Gujarat, North West India. Gujarat is a peninsula which faces Western Arabian Sea, and arid area (Rajasthan) range over the north of Gujarat. A climate of Gujarat belongs to sub-tropical and air temperature is relatively stable, but precipitation is not. There is a huge amount of precipitation in summer monsoon, but few in winter monsoon.
3. Material and Method
Modern catfish were caught in near Gulf of Khambhat and their otoliths (sagittae) were removed. Archaeological otoliths from 4ka and 10ka were obtained from the archaeological deposit.
From metrical features, we assumed two types of catfish, one is named Ariopsis spp. TypeA and the other is Ariopsis spp. TypeB. Otoliths were cut along the transverse plane because this plane best revealed incremental growth features and permitted sampling at high resolution. Otoliths were divided for various purposes; (1) powder, (2) particle, (3) thin section, and (4) archive. Powder sample was analyzed for X-ray diffraction to evaluate diagenesis and for bulk oxygen and carbon isotope analysis. Particles of fossil otoliths were used in order to determine their 14C age. Large part of thin sections were micromilled on a computer controlled three-dimensional positioning stage set under a fixed high-precision dental drill, and remains of thin section were used for EPMA to analyze concentrations of Sr, Ba, Mg, and Ca of otoliths. Stable oxygen and carbon isotopic compositions of resulting powders were analyzed.
5. Acknowledgement
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Keywords: otolith, Indus civilization, oxygen isotope, paleo-temperature, North West India