Palaeogeography, Palaeoclimatology, Palaeoecology 484 (2017) 7–21

Contents lists available at ScienceDirect

Palaeogeography, Palaeoclimatology, Palaeoecology

journal homepage: www.elsevier.com/locate/palaeo

Shell sclerochronology and stable isotopes of the bivalve *Anomalocardia flexuosa* (Linnaeus, 1767) from southern Brazil: Implications for environmental and archaeological studies

André Carlo Colonese [a,*], Sérgio Antônio Netto [b], André Silva Francisco [b], Paulo DeBlasis [c], Ximena S. Villagran [c], Raquel de Almeida Rocha Ponzoni [d], Y. Hancock [d,e], Niklas Hausmann [a,f], Deisi Sunderlick Eloy de Farias [g], Amy Prendergast [h], Bernd R. Schöne [h], Francisco William da Cruz [i], Paulo César Fonseca Giannini [i]

[a] BioArCh, Department of Archaeology, University of York, Environment Building, Wentworth Way, York, YO10 5DD, UK.
[b] Marine Science Laboratory, Universidade do Sul de Santa Catarina (UNISUL), Av J. Acácio Moreira, 787, Dehon, Tubarão 88704-900, Brazil.
[c] Museu de Arqueologia e Etnologia, Universidade de São Paulo (USP), Av. Prof. Almeida Prado, 1466, Butantã, São Paulo 05508-070, Brazil.
[d] Department of Physics, University of York, Heslington, York YO10 5DD, UK.
[e] York Centre for Complex Systems Analysis, University of York, York YO10 5GE, UK.
[f] Institute of Electronic Structure and Laser, Foundation for Research and Technology - Hellas, P.O. Box 1527, GR-711 10 Heraklion, Greece.
[g] Grupep, Universidade do Sul de Santa Catarina (UNISUL), Av J. Acácio Moreira, 787, Dehon, Tubarão 88704-900, Brazil.
[h] Institute of Geosciences, University of Mainz, J.-J.-Becher-Weg 21, 55128 Mainz, Germany.
[i] Instituto de Geociências, Universidade de São Paulo (USP), R. do Lago, 562, Cidade Universitária, São Paulo 05508-080, Brazil.

ARTICLE INFO

Article history:
Received 3 August 2016
Received in revised form 5 December 2016
Accepted 4 January 2017
Available online 6 January 2017

Keywords:
Eastern South America
Coastal lagoon
Anomalocardia flexuosa shells
Sclerochronology
Light stable isotopes

ABSTRACT

This study presents the first stable isotopic and sclerochronological calibration of the bivalve *Anomalocardia flexuosa* (Linnaeus, 1767) in relation to environmental variables in a subtropical coastal area of southern Brazil. We investigate incremental shell growth patterns and $\delta^{18}O$ and $\delta^{13}C$ values of modern specimens collected alive from the Laguna Lagoonal System (LLS). Shells of *Anomalocardia flexuosa* are also one of the main biological components of pre-Columbian archaeological shell mounds and middens distributed along the Brazilian coastline. We therefore selected archaeological specimens from a local late Holocene shell mound (Cabeçuda) to compare their stable carbon and oxygen isotope values with those of modern specimens. Shell growth increments, $\delta^{18}O$ and $\delta^{13}C$ values respond to a complex of environmental conditions, involving, for example, the effects of temperature and salinity. The isotopic information extracted from archaeological specimens from Cabeçuda shell midden in the LLS indirectly indicates that environmental conditions during the late Holocene were different from present day. In particular, intra-shell $\delta^{18}O$ and $\delta^{13}C$ values of archaeological shells reveal a stronger marine influence at 3 ka cal BP, which is in contrast to the seasonal freshwater/seawater balance that currently prevails at the LLS.

1. Introduction

Highly-resolved palaeoenvironmental information for tropical and subtropical coastal areas of South America predominantly come from pollen records, calcareous nanofossil assemblages and geomorphological evidence (e.g. Baker and Fritz, 2015; França et al., 2013; Gyllencreutz et al., 2010). Whereas these records provide robust palaeoclimate and palaeoenvironmental information spanning decadal to millennial timescales, there is still a need for archives resolving sub-annual environmental conditions (e.g. Carré et al., 2005; Yan et al., 2012). For example, data on intra-annual sea surface temperature and biological productivity are crucial for assessing the impact of extreme ocean-atmosphere phenomena, such as the El Niño/Southern Oscillation, on local/regional hydrological and biological processes at seasonal time-scales (Aravena et al., 2014; Garcia et al., 2003; Stenseth et al., 2002). Furthermore, several lines of evidence point to considerable reorganisations of coastal ecosystems from the middle Holocene to present-day in response to relative sea-level changes in eastern South America (Angulo et al., 2006). In some tropical and subtropical areas geomorphological and palynological records reveal a marked retraction or disappearance of rich aquatic ecotones, such as estuaries and coastal lagoons, during this period (Carvalho do Amaral et al., 2012; Carvalho et al., 2004; Fornari et al., 2012; França et al., 2013). Although it is well known that present day human populations inhabiting these areas are extremely vulnerable to increasing climate and environmental

* Corresponding author.
E-mail address: andre.colonese@york.ac.uk (A.C. Colonese).

http://dx.doi.org/10.1016/j.palaeo.2017.01.006
0031-0182/