



Contents lists available at ScienceDirect

Quaternary International

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

Late Quaternary sea-level changes and early human societies in the central and eastern Mediterranean Basin: An interdisciplinary review

J. Benjamin ^{a, *}, A. Rovere ^{b, c}, A. Fontana ^d, S. Furlani ^e, M. Vacchi ^f, R.H. Inglis ^{g, h}, E. Galili ⁱ, F. Antonioli ^j, D. Sivan ^k, S. Miko ^l, N. Mourtzas ^m, I. Felja ⁿ, M. Meredith-Williams ^o, B. Goodman-Tchernov ^p, E. Kolaiti ^q, M. Anzidei ^r, R. Gehrels ^s

^a Flinders University of South Australia, Department of Archaeology, GPO Box 2100, Adelaide, SA 5001, Australia

^b MARUM, Center for Marine Environmental Sciences, University of Bremen, Germany

^c ZMT, Leibniz Centre for Tropical Marine Research, Bremen, Germany

^d University of Padova, Department of Geosciences, Italy, CoNISMa, Italy

^e University of Trieste, Department of Mathematics and Geosciences, Italy

^f Université P. Valéry Montpellier 3, CNRS ASM, UMR 5140, Montpellier, France

^g University of York, Department of Archaeology, The King's Manor, YO1 7EP, United Kingdom

^h Macquarie University, Department of Environmental Sciences, NSW 2109, Australia

ⁱ University of Haifa, Zinman Institute of Archaeology, Haifa 3498838, Israel

^j ENEA, Laboratory Climate Modelling and Impacts, Roma, Italy

^k University of Haifa, Department of Maritime Civilizations, L. H. Charney School of Marine Sciences, Leon Recanati Institute for Maritime Studies (RIMS), Haifa 3498838, Israel

^l Croatian Geological Survey, Sachsova 2, Zagreb, Croatia

^m Gaiaergon Ltd, Athens, Greece

ⁿ University of Zagreb, Department of Geology, Faculty of Science, Horvatovac 102a, 10000 Zagreb, Croatia

^o La Trobe University, Department of Archaeology and History, Kingsbury Drive, Melbourne, VIC 3086, Australia

^p University of Haifa, Department of Marine Geosciences, L. H. Charney School of Marine Sciences, Haifa 3498838, Israel

^q University of the Peloponnese, Kalamata, Greece

^r Istituto Nazionale di Geofisica e Vulcanologia, Rome, Italy

^s University of York, Environment Department, Heslington, York YO10 5NG, United Kingdom

ARTICLE INFO

Article history:

Received 1 September 2016

Received in revised form

9 May 2017

Accepted 14 June 2017

Available online xxx

Keywords:

Sea-level change

Pleistocene

Holocene

Mediterranean Archaeology

ABSTRACT

This article reviews key data and debates focused on relative sea-level changes since the Last Interglacial (approximately the last 132,000 years) in the Mediterranean Basin, and their implications for past human populations. Geological and geomorphological landscape studies are critical to archaeology. Coastal regions provide a wide range of resources to the populations that inhabit them. Coastal landscapes are increasingly the focus of scholarly discussions from the earliest exploitation of littoral resources and early hominin cognition, to the inundation of the earliest permanently settled fishing villages and eventually, formative centres of urbanisation. In the Mediterranean, these would become hubs of maritime transportation that gave rise to the roots of modern seaborne trade. As such, this article represents an original review of both the geo-scientific and archaeological data that specifically relate to sea-level changes and resulting impacts on both physical and cultural landscapes from the Palaeolithic until the emergence of the Classical periods. Our review highlights that the interdisciplinary links between coastal archaeology, geomorphology and sea-level changes are important to explain environmental impacts on coastal human societies and human migration. We review geological indicators of sea level and outline how archaeological features are commonly used as proxies for measuring past sea levels, both gradual changes and catastrophic events. We argue that coastal archaeologists should, as a part of their analyses, incorporate important sea-level concepts, such as indicative meaning. The interpretation of the indicative meaning of Roman fishtanks, for example, plays a critical role in reconstructions of late Holocene Mediterranean sea levels. We identify avenues for future work, which include the consideration of glacial isostatic adjustment (GIA) in addition to coastal tectonics to explain vertical movements of coastlines, more research on Palaeolithic island colonisation, broadening of Palaeolithic studies to include materials from the entire coastal landscape and not just coastal resources, a focus on rescue of archaeological sites under threat by

* Corresponding author.

E-mail address: jonathan.benjamin@flinders.edu.au (J. Benjamin).

coastal change, and expansion of underwater archaeological explorations in combination with submarine geomorphology. This article presents a collaborative synthesis of data, some of which have been collected and analysed by the authors, as the MEDFLOOD (MEDiterranean sea-level change and projection for future FLOODing) community, and highlights key sites, data, concepts and ongoing debates. © 2017 Elsevier Ltd and INQUA. All rights reserved.

Contents

1. Introduction	00
2. Indicators of past sea-level changes	00
2.1. Depositional, bio-constructional and erosional RSL indicators	00
2.1.1. Depositional sea-level indicators	00
2.1.2. Biological sea-level indicators	00
2.1.3. Erosional sea-level indicators	00
3. MIS 5	00
3.1. Sea level	00
3.1.1. MIS 5.5	00
3.1.2. MIS 5.1 – MIS 5.3	00
3.2. Human populations during MIS 5	00
4. MIS 4, MIS 3 and MIS 2	00
4.1. Sea level	00
4.2. Human populations from MIS 4 to MIS 2	00
5. Significant palaeoenvironmental phases of the Upper Pleistocene	00
6. LGM through the early Holocene	00
6.1. Sea level	00
6.2. Human populations during the early Holocene	00
7. Middle and late Holocene	00
7.1. Sea level	00
7.2. Human populations: protohistory and urbanisation	00
8. Archaeological RSL indicators	00
8.1. Early, middle and late Holocene archaeological sea-level indicators	00
8.2. The debate on Roman fish tanks	00
9. Concluding remarks	00
Acknowledgements	00
References	00

1. Introduction

The study of past sea-level changes in the Mediterranean Sea has been a focus of coastal scientists for almost two centuries. While interest in vertical land and sea movements is recorded at least as early as the Roman Period (e.g., Strabo, 1st century AD), the first modern sea-level studies may be attributed to Lyell (1833) and Négris (1903a, 1903b; 1904). Gignoux (1913), Issel (1914) and Blanc (1920), were the first to define the ‘Tyrrhenian’ (the Last Interglacial) as a chronostratigraphic subunit along the Tyrrhenian coasts of Italy, especially in Sardinia, Tuscany and Lazio. Coastal and sea-level studies flourished especially post World War II, with the early studies of Bonifay and Mars (1959) and Stearns and Thurber (1965) in the western Mediterranean. In the late 1970s, and through the 1980s and 1990s, the investigations of Mediterranean Sea levels grew to become a stand-alone scientific discipline championed by geologists, archeologists, biologists, geophysicists and geochemists. Scientists increasingly acknowledged the connection between past sea-level changes and human migrations along the coasts. Changes in coastal conditions impacted upon landscapes, waterways, ecological zones and people as the coastlines migrated as a result of sedimentation, erosion and relative land-sea-level changes.

In parallel, archaeologists throughout the 20th century documented coastal sites, which demonstrated intensive maritime activity around the Mediterranean basin, though much of the focus remained on the relatively recent periods since the adoption of

metal and written language, while less attention was given to earlier periods and the archaeological significance of coastal changes over longer periods of time. In many respects, the eastern Mediterranean, where Africa and Eurasia meet, is an ideal study area, and important for the integrated studies of landscape evolution and archaeology; it has contributed significantly to our understanding of human dispersals and migrations, as well as terrestrial and maritime trade routes.

The overarching aim of this article is to define the state of the art of Mediterranean sea-level studies, a century after its inception, and to consider the impacts of past sea-level and coastal changes on human-environment interaction. We identify and highlight the major on-going discussions and gaps in knowledge which we expect to, at least partially, define the next decade of integrated sea-level research into past coastal environments and archaeology (Fig. 1). In doing so, we aim to bring together the research of the geomorphological and archaeological communities and promote interdisciplinary work specifically related to sea-level change.

This article stems from the efforts of the “MEDiterranean sea-level change and projection for future FLOODing” (MEDFLOOD, Rovere et al., 2012) community, and is focused primarily on the central and eastern Mediterranean basin. This review is not designed to be geographically all-inclusive and there are some references to specific data or sites from further afield, for example the western Mediterranean, where they are representative,

Download English Version:

<https://daneshyari.com/en/article/5113049>

Download Persian Version:

<https://daneshyari.com/article/5113049>

[Daneshyari.com](https://daneshyari.com)