



Multiscale Geoarchaeological Approaches from the Laurentine Shore, Castelporziano, Lazio, Italy

A.R. Bicket (1), H.M. Rendell (1), A. Claridge (2), P. Rose (2), and F.S.J. Brown (1)

(1) Dept of Geography, Loughborough University, United Kingdom (a.bicket@lboro.ac.uk), (2) Dept of Classics, Royal Holloway, University of London, Egham, Surrey, United Kingdom

The relationship between the meso-scale record of human activity during the Roman period and the larger-scale coastal development of the Tiber Delta (ca. 20 ka) is investigated using the archaeological and sedimentary record from a large aquaculture pond and its wider meso- to macro-scale geomorphological setting. The position of the pond is adjacent to the Roman period shoreline, known as the Laurentine Shore on the southern, distal flank of the Tiber delta, Lazio Italy, within what is now the Castelporziano Estate. The pond is thought to have been constructed in the wet dune slack behind the active coastal foredune. Magnetometer survey and excavation of the archaeological structures around this pond have shown them to be substantial features ca. 80m in length with high-status Imperial Roman architecture and with evidence for water management. Sedimentological analysis of sediment cores from within the ponds are supplemented with diatom analysis to assess the period of pre-construction, use and abandonment of this aquaculture pond. Diatom analysis suggests a relatively short period of use and it is argued that abandonment of the aquaculture structures may be linked to both alkali groundwater conditions and the dynamism of the coastal zone preventing effective management. Optical luminescence dating of the archaeological sediments and the post-abandonment dunes that bury part of the site suggest that the aquaculture pond was abandoned ca. 100 years prior to final abandonment of the Roman settlement. This case-study also highlights the implications for meso-scale investigations of human/environment relationships utilising relatively low-sensitivity sedimentary records without high-resolution proxy records.

D-GPS survey in conjunction with a high-quality DEM has permitted important archaeological remains to be understood relative to sea level; a key variable for examining the formation and development of the dune ridge record. These surveys have also permitted the effective mapping of dune ridges, from aerial photography, under the extremely dense vegetation that hinders easy access across much of the site. The D-GPS georeferenced DEM has been linked to the diatom analysis of a cored salt marsh to peat sediment transition providing valuable biostratigraphic information for deriving an accurate measurement of the Roman period sea level (Lambeck et al., 2004a). This measurement is in line with published literature from nearby coastal sites, ca. – 1.3m RSL (Lambeck et al., 2004b). Understanding the sites geomorphological development in the context of eustatic sea level is a key consideration for issues of sand supply driving dune formation, linked ultimately to the development of the Tiber Delta since the Last Glacial Maximum and throughout the Holocene.

On this larger spatial scale, the archaeological sites described within the Laurentine Shore, built upon the Roman period coastline, are now preserved several hundred metres inland of the contemporary shoreline. The development of the shoreline can now be investigated within the macro-scale progradation of the Tiber delta relative to eustatic sea level rise. Archaeological excavations since the 1980's have provided a rich record of high status villas, and also the supporting infrastructure of a village settlement (vicus), roads, aqueduct and the large aquaculture ponds. The dominant geomorphological features on the site are preserved coastal dune ridges. Sampling was undertaken along an alongshore transect and three inland transects. This sampling regime focuses upon the contemporary deposition of sands on the beach and the phases of dune formation, preservation and alteration recorded by the relict dune crests in relation to the archaeological record. A campaign of optical dating of the relict dune crests has provided a Late Pleistocene and Holocene record of sandsheet and dune formation linked to delta progradation that permits the larger spatial- and temporal-scale context of the archaeological record to be discussed. Sedimentary petrology techniques allow the provenance and transportation dynamics of both the

sand-sized and dust-sized sediments to be assessed. Furthermore this approach also enables an investigation of carbonate and iron oxide diagenetic cements, which are an important product of the long-term in situ weathering of the dune ridges' mineralogical assemblages, but is also a feature of short-term weathering of archaeological contexts. This work has implications for locations of interest to geoarchaeological surveys. There are also important implications for the mineralogy, provenance and preservation of luminescent minerals; and some form mineralogical/provenance analysis is recommended for all optical dating studies as a result.

In summary, the geoarchaeological approach undertaken at Castelporziano allows the meso-scale human/environment interactions to be considered within the broader temporal scales of the late Quaternary. It also permits consideration within the macro-spatial scales of the Tiber Delta's development during the last 15-20ka within the context of eustatic sea level rise.

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