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Sedimentation as geomorphological bias and indicator of agricultural (un)sustainability in the study of the coastal plains of South and Central Italy in antiquity

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ABSTRACT

Environmental research of ancient landscapes in the coastal plains, river valleys and uplands of the Mediterranean shows how erosion and sedimentation studies play a significant role in the evaluation of the archaeological record at the regional and local scales. As a rule, directors of landscape archaeological projects nowadays involve physical geographers in order to study erosion and sedimentation as potentially influential post-depositional processes that may expose or cover up archaeological remains (long) after regions or sites were abandoned. This is a phenomenon in the literature known as geomorphological bias, i.e. bias caused by landscape taphonomic processes. Key question here is to what extent archaeological settlement patterns are an artefact of landscape change, with deposition obscuring large parts of the ancient Mediterranean landscape. At the same time, it is important for our knowledge of past societies to establish whether these landscape processes affected the sustainability of the human environments of sites and regions already while they were settled, and how people adapted to environmental changes in accordance with the socio-political and socio-economic context. Sustainability is defined in this paper as the capacity of a rural economy to endure in a given environmental and socio-economic setting. A key question from this perspective is whether erosion and sedimentation studies can help explain why some rural landscapes in the long run were economically more viable than others. Drawing on case studies from landscape archaeological and excavation projects of the Groningen Institute of Archaeology, this paper approaches Mediterranean sedimentation history in South and Central Italy from the angles of geomorphological bias and sustainability studies. The focus is on the coastal plains of the Sibaritide in South Italy and the Pontine plain in Central Italy, both of which have been subject to profound landscape changes caused by sedimentation starting at least in the Bronze Age, and caused by erosion in their hinterlands as the result of long term human impact in combination with climatic changes, sea-level change and neotectonics. Although already settled in pre- and protohistory, both coastal plains were targeted for the first time during phases of Greek and Roman colonization as areas of organized agricultural expansion (see Table 1 for a chronological overview of archaeological periods). However, in both cases long term sustainable exploitation proved difficult due to a complex of environmental, technological, socio-economic, and political factors.

1. Introduction

Since Vita Finzi's, 1969 seminal publication *The Mediterranean Valleys: Geological Changes in Historical Times,* in which he outlined basically two phases of alluviation, a post-glacial Older Fill and a Late or post-Roman Younger Fill, each comprising several erosion and sedimentation cycles, Mediterranean landscapes have seen much geoarchaeological work detailing Mediterranean alluviation history of the later pre- and protohistorical periods and Classical Antiquity (Bell and Walker, 1992, 190–192; Walsh 2014, 81–101). Geoarchaeological research of ancient landscapes in the coastal plains, river valleys and uplands of Central and South Italy shows how erosion and sedimentation studies play a significant role in the evaluation of the archaeological record at the regional and local scales as they can elucidate geomorphological biases in data recovered from archaeological surface survey, and at the same time yield information on the sustainability of the Mediterranean landscapes of the past. As Roberts (1998, 191–192) states, historical soil erosion in the Mediterranean will often have been a combined product of natural and cultural forces, notably of climate and agricultural impact, and `thin or erodible soils, steep slopes, a vegetation vulnerable to fire, and rainfall that can be intense and erosive make the Mediterranean ecosystems sensible to uncontrolled human impact. Casana (2008), for instance, has shown how a variable precipitation regime increase,

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including extreme weather events, will have strong effects on the rate of erosion in intensively exploited landscapes, such as the Hellenistic and Roman landscapes in the Northern Levant. From an archaeological perspective, John Bintliff's 1977 publication *Natural Environment and Human Settlement in Prehistoric Greece* (1977) may be viewed as a benchmark in establishing a firmer disciplinary relationship between regional settlement history (as practiced by archaeologists) and the study of the natural environment of the Mediterranean (as practiced by geographers and biologists). However, those earlier models were still rather deterministic, as Bintliff himself readily remarked in a later overview paper on landscape change in Classical Greece published in 2000. In that paper, he concluded how between the end of the seventies and the end of the nineties rapidly growing body of empirical evidence would rather support more multi-causal interpretations 'whilst also raising important questions regarding the impact of these events on contemporary societies' Bintliff (2000), 68; see also Bintliff (1992) and Bintliff (2002). At the same time survey archaeologists working in the Mediterranean became aware of the biases erosion and sedimentation represented for the interpretation of the regional archaeological record they were mapping. As van Leusen stated in his dissertation published in 2000, geopedological research had become a required part of regional projects not only in order to map one of the most important factors in past land use, but also to map geomorphological bias in the survey results (van Leusen 2000, chapter 8, 4). This paper focuses on these two main themes that can be summarized as landscape change as a major bias in regional settlement studies and the effect of landscape change in coastal plains on sustainable land use. (See Table 1.)

While many survey projects nowadays integrate environmental work, to date there are only few studies available that have integrated such work on a regional scale. Moreover, it is uncertain whether archaeologists, or ancient historians for that matter, who work with regional settlement data always grasp the implications of erosion and sedimentation processes for a reliable interpretation of regional settlement patterns across space and time. But neither are the economic problems and opportunities that natural and man-induced landscape change brought to past societies always fully realized; in other words, how did landscape change affect the sustainability of settlement and land use in a given region in antiquity, and how did humans react to perceived changes in their environment and how did people develop and apply environmental knowledge (Walsh 2014, 7–9)?

Below I will address the issues of geomorphological bias and sustainability of Mediterranean landscapes outlined in the introduction by discussing two case studies from fieldwork projects carried out by the Groningen Institute of Archaeology in Central and South Italy (Attema et al. 2010, chapters 2 and 4 for introductions to these landscapes). First I will present examples of sedimentation regimes that had caused the profound burial of ancient land surfaces, as such seriously impeding the reading of settlement development on the regional scale. Two cases will be presented; the Sibaritide coastal plain in northern Calabria and the Pontine coastal plain in south Lazio (Fig. 1). In both cases hand augerings, the cores of which were radiocarbon dated, have revealed the sedimentary impact of erosion during the later Holocene on the lower parts of the landscape. Next, the issue of how far we may study sedimentary archives from a contemporary perspective will be dealt with, in other words: how did erosion and sedimentation actually affect the sustainability of the human environments of sites and regions while they were settled? For this aspect, I will draw on the same two case studies, the Sibaritide and Pontine plain, defining sustainability in a landscape archaeological context as the capacity of a rural economy to endure in a given environmental and socio-economic setting. I emphasize the special position of the coastal plains in the Mediterranean environment being both among the most fertile and most vulnerable landscape units.

Table 1
Periodisation used in this article (date ranges are in years BC/AD).

6500–3650	Neolithic
3650–2250	Eneolithic (Copper Age)
2250–1700	Early Bronze Age
1700–1300	Middle Bronze Age
1300–925	Late Bronze Age
925–725	Early Iron Age
725–580	Late Iron Age
580–480	Archaic period
480–30	Republican period
30–476	Imperial period
476–1000	Early Middle Ages

2. Sedimentation as geomorphological bias in South and Central Italy

The geography of South and Central Italy is characterized by inland mountainous areas, river valleys and wide coastal plains. In the latter, without exception, considerable sediments accumulated over time in their hinterlands (Brückner 1986; Abbott 1997; Abbott in Carter and Prieto 2011; Attema and Sevink, forthcoming); posing serious problems for our interpretation of regional settlement development. While early forms of urbanization in many of the South and Central Italian landscapes can now be traced back into the final phases of the Bronze Age (Pacciarelli 2000), we must realize that due to geomorphological bias we have but a partial view of rural settlement accompanying nucleated settlement. This not only holds true for prehistoric phases, but also for the landscapes of Classical Antiquity. For example, in the Metapontine plain on the Adriatic coast, many of the farmsteads of the early Archaic period (around 600 BCE) may be buried below the alluvium of the Basento and Bradano rivers and their tributaries. In the Basento river valley, they were only found when infrastructural works were carried out below the current plough zone (Carter and Prieto 2011, 641–643). However, remains of farmsteads of the Classical and Hellenistic period, whose owners did not seek locations along the river but founded their farms over the plain between the main river valleys of the Basento and Bradano, do appear in abundance in the plough zone (Carter and Prieto 2011, 677 ff.). Clearly the sedimentation regime of the Metapontine rivers has consequences for our chronological and spatial understanding of the scale of ruralisation during the Archaic period connected with Greek colonization.

The Holocene sedimentation record is not only a problem for understanding the settlement archaeology of the Metapontino, but that of other coastal plains of South Italy as well (see e.g. Abbott and Valastro 1995, Abbott 1997), and similar problems occur in the coastal landscapes and river valleys in Central and northern Italy, as exemplified by the buried prehistoric landscape of the Po plain (Calabrese et al. 2010). The two case studies of the Sibaritide and Pontine plains are therefore not exceptional as to their dynamic character, but at the same time serve to show the notable variability in timing, nature and impact of sedimentation regimes within regions across Italy, and by extension the Mediterranean.

In the plain of the Sibaritide, sedimentation has been intense, and here the entire prehistoric to (post) Roman landscape is buried under a many meters of alluvial sediment, the causes of which are debated in the geological literature (Vanzetti 2013, 24–28 for an overview). In the Pontine plain the situation is different. Here the protohistoric settlement phases are only locally deeply buried, while as a rule the Roman landscape is visible in the plough soil (Attema et al. 2010, 31–58). This signifies that sedimentation was reduced in post-Roman times, possibly because of lack of sediment supply from an already eroded hinterland. The two case studies illustrate not only the problem of how to cover serious chronological and spatial gaps in our knowledge of regional settlement development that are due to geomorphological bias but also the problem how to reconstruct evolving and contracting regional settlement on the basis of partial data.

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