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New Technologies, Hazards and Geoarchaeology

Paolo Pirazzoli in memoriam

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NEW TECHNOLOGIES, HAZARDS AND GEOARCHAEOLOGY

PAOLO PIRAZZOLI IN MEMORIAM

INTERNATIONAL CONFERENCE

ORGANISERS



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Siltation, contamination, legislation – Approaching the management of environmental and anthropogenic hazards in the Antique Harbour of Ephesos

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ABSTRACT

Harbours located at estuaries and marine embayments face the constant threat of losing their function due to the accumulation of sediments from riverine input or longshore drift, thus requiring continuous efforts by the local population in order to maintain their function. Delta progradation of the ancient Kaystros (modern Küçük Menderes) which endangered the harbour of Ephesos was amongst the most dramatic ones in the Mediterranean: Since the Hellenistic period, delta progradation and siltation of the marine embayment accounted for approximately 5 kilometres. Besides natural factors, the speed of the shift in the shoreline was mainly governed by the riverine sediment load, which, in turn, was very much dependent on the human impact on the vegetation cover of the drainage basin. As documented by several proxies in geoarchaeological archives, human impact strongly increased in the region during the late 2nd / early 1st millennium BCE: The shift from forest towards secondary formations (macchia, garrigue) in the “Beyşehir occupation phase” observed in regional pollen profiles is one example, another one is the strong increase in sedimentation rates from only up to 1 mm/year to 4 – 30 mm/year. The latter ones are not only document for the harbour basin, but also for the lake of Belevi, approximately 10 kilometres northeast to Ephesos.

However, an additional factor influencing siltation of the harbour basin must have been direct waste disposal: A drill core (EPH-393) close to the modern harbour basin yielded numerous plant macroremains (e. g. grape pips, cone scales and cracked seed shells from stone pine) from the Geometric to Archaic period shoreline, which seem to originate from kitchen refuse. These are taken as an indicator that apart from “regular” sewage discharges, also a part of solid waste was disposed of in the harbour basin during certain periods, adding up to the total

siltation. Furthermore, later legal regulations from the Roman Imperial period explicitly prohibited the cutting of marble next to the harbour basin, which suggests that this practice may have been a factor as well.

In order to cope with these hazards threatening harbour function, Antique administrations took various measures: The most conspicuous one was the creation of the still existing harbour canal, connecting the harbour to the sea. Likewise, continuous dredging is already documented for the settlement, both by written sources and erosional disconformities in drill cores from the harbour basin. Legal regulation of waste disposal (as the aforementioned ban of cutting marble) was another means of limiting siltation of the harbour basin.

Numerous drilling campaigns carried out since 2008 by the Institute of Geography at the University of Cologne have yielded an extensive amount of sediment cores from within in and around the ancient settlement of Ephesos. In 2017, a new project led by the Austrian Archaeological Institute (ÖAI-ÖAW) has been launched focusing on the transdisciplinary evaluation of several of these cores within their environmental and socioeconomic context. The project's overall goal is to better understand the interdependency of the *metropolis* and its environs by integrating geoarchaeological and palynological data with the rich archaeological and textual sources from Ephesos.

Palaeoparasitological studies aim at getting an idea of the abundance of intestinal helminths afflicting the townspeople by estimating the wastewater influx into the harbour basin. The palynological studies together with the geoarchaeological analyses will model the environment of the city, and will give a general image of human impact on the forest cover and the herbaceous vegetation. This will also aid in assessing the importance of local agriculture and pastoral farming. Geochemical analyses will complement this image of a probably mostly anthropogenic ecosystem at the Kaystros estuary. Heavy mineral analyses will be conducted in order to identify corundum in the harbour sediments – a mineral which Pliny mentioned as a means for cutting and polishing marble – and which therefore serves as an indicator for verifying the historically documented ban on marble processing.

Keywords: Ephesus, western Anatolia, land use, human impact, vegetation history, harbour management, Antiquity, palynology, geoarchaeology, geochemistry, parasitology.

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