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Palynological evidence of cultural and environmental connections in Sudanese Nubia during the Early and Middle Holocene

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ABSTRACT

Pollen and non-pollen palynomorphs have been studied from three archaeological sites (8-B-10C, 8-B-76, and 8-B-81) on Sai Island, in the River Nile, and one (2-R-66) from the Amara West district, in northern Upper Nubia of the present Sudan. The research aimed at obtaining information on the environmental conditions and changes occurring in the area during the Early and Middle Holocene. Archaeologically, this is a crucial period as it saw one of the most relevant economic transitions from hunting–fishing–gathering to animal herding. The archaeopalynological analyses are useful to reconstruct the environment and plant landscapes that supported human plant selection in this part of North Africa, between about 8700 and 4300 cal BC. However, pollen was not present everywhere because the sediments were very poor in organic content, or damaged by the repeated hydration–dehydration cycles determined by the Nile river floodings. The data obtained, the most consistent from any archaeological site in this area, are coherent with the regional and interregional palaeoenvironmental data. The interdisciplinary studies that allowed the correct interpretation of the pollen records presented in this paper included the archaeological features, and the faunal (mainly gastropod) and algal remains from the same sites. The state of preservation of most pollen, showing thinned exine, and the remarkable records of the terrestrial alga *Fritschiella* outline the seasonality of the area that has been evident in the past as in the present. Pollen samples included prevailing amounts of grasses and sedges that, with some hygro-hydrophilous taxa, largely represent the riverine and wetland vegetation of the Nile Valley. They suggest that the land use was not intensive and was not able to substantially modify the natural cover and cyclic renewal of the soils and the vegetation. The interdisciplinary evidence from the Sai Island, showing that site 8-B-76 has been continuatively occupied during the 8.2 ka BP dry phase, proves the key role played by the great river on attracting humans and supplying resources even, and especially, during the arid oscillations of the Holocene.

1. Introduction

Ancient Nubia is a crucial region for the understanding of environmental and cultural events that occurred in Northeast Africa during the Early and Middle Holocene. The pathways towards food production and their relationships with similar processes in the Mediterranean and the Near East have been some of the most investigated topics (cf. e.g., Williams and Faure, 1980; Clark, 1984; Close, 1984; Caneva, 1988; Bower, 1995; Haaland and Magid, 1995; Wendorf and Schild, 1998, 2001; Marshall and Hildebrand, 2002; Edwards, 2004; Honegger, 2005, 2014; Hildebrand, 2006–2007; Garcea, 2006, in press; Usai, 2014; Hildebrand and Schilling, in press). Most of the research carried out in Nubia has focused on cultural contexts and economic organizations on the basis of lithic industries, ceramic assemblages, osteological remains, and other biological records discovered in the archaeological sites.

Plants typically leave direct evidence in deposits in the form of macroscopical (seeds and woods) and microscopical (pollen and phytoliths) remains that have been often interpreted as signs of human behaviour in North African archaeological sites (Mercuri,

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2008a). In Nubia, botanical records have been frequently recovered in funerary contexts revealing that plant and artefacts offerings should have had a role for these people, at least since the Neolithic, or pastoral period (Out et al., in press). Moreover, new insights have been recently obtained from combined phytoliths and human osteological remains that provided information on the human consumption of cereals (Madella et al., 2014). Further details continue to emerge on the connections between natural and anthropogenic environmental changes in this area. This is mainly obtained thanks to integrated research including bioarchaeological studies. In open-air sites of the current arid areas, however, any plant material is hardly preserved due to erosion and taphonomic issues (Horowitz, 1992; Pearsall, 2000).

Past environment and land sustainability appear to have contributed to the cultural developments in Saharan–Sahelian areas (Hassan, 2002; Anderson et al., 2007; Manning and Timpson, 2014; Mercuri and Sadori, 2014). Despite the in-depth analyses on archaeological sequences and phases of human occupation (Kuper and Kröpelin, 2006; Honegger and Williams, 2015), however, the palaeoenvironment at the archaeological sites remains still underexplored in Northeast Africa. This is a key piece of evidence showing which habitats provided the suitable background that favoured land-use choices and changes. The vegetation cover, water availability and climate conditions are at the base of the possibilities to produce food. Although the type of land-use that influenced plant assets has changed several times, this land has been suitable for continuative exploitation for thousands of years. The hypothesis underpinning this paper is that the transition from foraging to food producing subsistence strategies was based on both cultural and climatic-hydrological variables in Nubia and in the Nile Valley (Maley and Vernet, 2013; Williams et al., 2015; Garcea, in press-b).

1.1. Regional setting

According to De Menocal et al. (2000), the African Humid Period (AHP), which lasted from the Late Glacial to the late mid-Holocene (from c. 12,800 to c. 3500 cal BC), was a period of high rainfall and recharge of the aquifers. The renewal of water reservoirs and the expansion of the savannah vegetation date to the beginning of the Holocene (Cremaschi et al., 2014, and references therein). During the AHP, the main climatic events were driven by the extension of the summer monsoon from Western Africa and the migration of the Intertropical Convergence Zone (ICZ) to northern latitudes (Gasse, 2000). Early Holocene climate fluctuations affected water levels and salinities of hydrologically isolated lake systems, and the lakes in the Eastern Sahara registered short-term climatic events, as long as they were isolated from large-scale artesian groundwater systems (Rodriguez et al., 2000; Hoelzman et al., 2010). During the Early Holocene, open grassland with wet environments was the natural set for hunter–gatherers (Mercuri, 2008b). The penetration of Tropical plant taxa, as revealed by pollen of *Celtis*-type, *Alchornea*, *Syzygium*-type and *Piliostigma*, into areas currently with Sahelian and Saharan climates, started ~8500 cal BC (Watrin et al., 2009). The ITCZ migration resulted in the expansion of Holocene pluvial conditions, which began ~7800 cal BC (Maley, 1991). Although plant species have responded individually to climate oscillations, leading to communities without analogues to the present vegetation, Sahelian plants such as *Acacia* migrated north into the Saharan regions since ~6300–5800 cal BC (Mercuri, 2008b; Watrin et al., 2009).

In the Middle and Upper Nile Valley, intensive resource exploitation including gathering, fishing and hunting was practiced by the populations associated with the Early Khartoum and Khartoum Variant cultures between ~8000 and ~5000 cal BC (Friedman, 2002; Gatto, 2006; Garcea and Hildebrand, 2009; Garcea, 2011–2012). Then, from ~6500 cal BC, pastoralists of cattle spread in different areas of Northeast Africa (Caneva, 1988; Reinold, 2000, 2007; Salvatori and Usai, 2008; Linseele et al., 2014; Garcea, in press-a). Plant food production was known later (Wengrow, 2006; Hildebrand, 2006–2007). Asian crops with wheat and barley reached Northern Sudan ~5000 cal BC (Madella et al., 2014).

During the 5th millennium BC, social stratification and long-distance trade had intensified in Egypt and in the areas to the South; and multiple cultural groups existed along the Nile and in the surrounding regions. These changes entailed social differentiation, both within and between cultural groups (Garcea and Hildebrand, 2009; Garcea, in press-b).

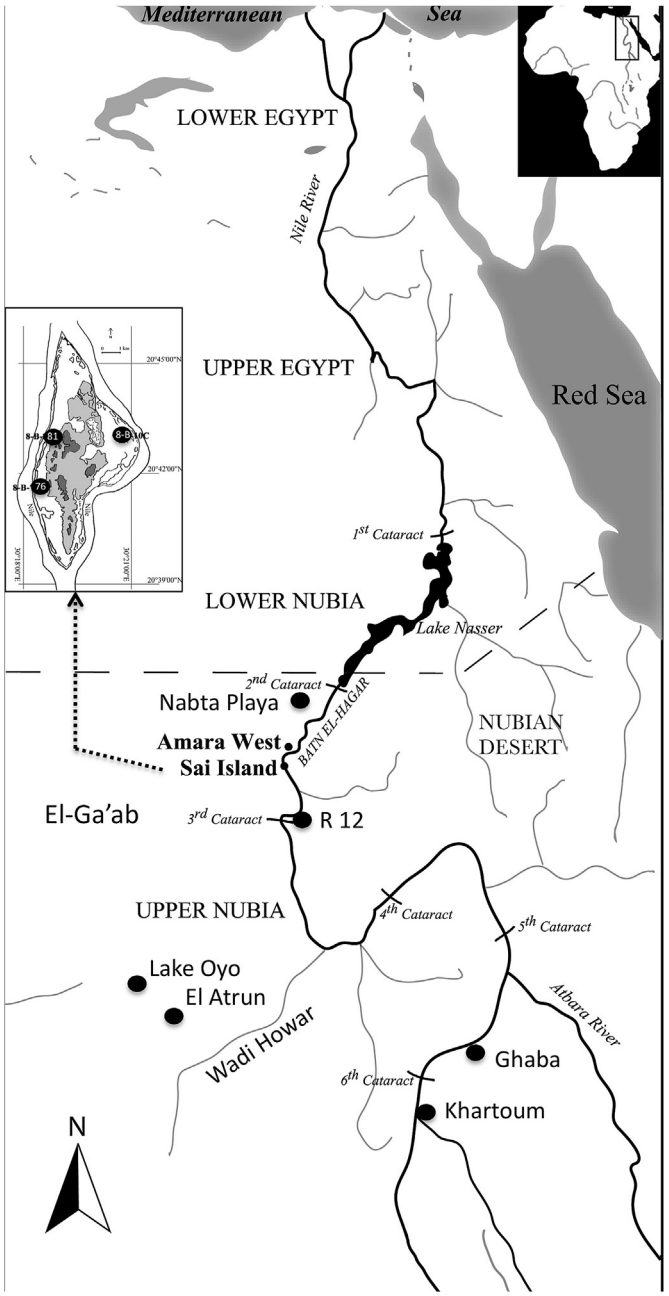

Fig. 1. Location map of the studied area and sites cited in the text; the site 8-B-10C is located at the East side, while sites 8-B-81 (at North) and 8-B-76 (at South) are located at the West side of the Sai Island.

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