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A new Late Pleistocene fauna from arid coastal India: Implications for inundated coastal refugia and human dispersals

August G. Costa

Rice University, USA

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ABSTRACT

A diverse Late Pleistocene fossil assemblage was recovered from a sea cliff locality near Gopnath in Gujarat, northwestern India. These remains are the first large sample of Pleistocene faunal materials from arid northwestern India. Several taxa known primarily from coarse alluvial deposits of central India are documented for the first time from an undisturbed open-air site adjoining the Great Indian Desert. The sample includes a new species of antelope from a lineage considered extinct outside of Africa since the Early Pleistocene. The paleoenvironmental context, faunal composition and type of fossil preservation reported here is unique. The Gopnath fauna accumulated in a pond within a carbonate dune field that formed part of a larger coastal oasis ecosystem. This paleoscape occupied the Cambay Gulf during hyper-arid glacial low stands. The Gopnath fossils are correlated to Late Acheulean lithics from a coastal cliff locality (<8 km) at Madhuban. These finds provide the first vertebrate evidence of glacial low stands and their influence on Late Pleistocene paleobiogeography within the dynamic dry coastal corridor linking India to Africa. They offer a rare glimpse of a lost landscape and an obscure fossil community that are critical to understanding the paleobiogeography of the hinterland along the Arabian seashore and informing models of early human dispersals.

1. Introduction

The desert littoral of the north Arabian Sea plays a key role in many models of early human dispersal out of Africa and into southern Asia (Stringer, 2000; Mellars, 2006a; Field et al., 2007; Petraglia, 2007; Dennell and Petraglia, 2012). However, the tyranny of the fossil record in this area has proven nearly insurmountable (Boivin et al., 2013). No substantial fossil remains have been reported from the swath of arid lowlands linking Africa to India along the tropical Arabian coastline. Most of the Nubo-Sindian floral zone, from the Nile to the Indus Valley is a "black hole" of Pleistocene paleoanthropology and vertebrate paleobiology (Dennell and Roebroeks, 2005; Dennell, 2009). Although lithic evidence demonstrates that Pleistocene human groups occupied the interior of southern Arabia (Rose, 2010; Armitage et al., 2011; Petraglia et al., 2011; Rose et al., 2011; Delagnes et al., 2012) and the Sind–Thar Desert (Allchin et al., 1978; Misra and Rajaguru, 1986; Misra, 1995a; Biagi, 2008; Blinkhorn, 2012; Noguchi et al., 2012; Blinkhorn et al., 2013), few fossils are available to put these finds into an ecological context (Groucutt and Petraglia, 2012).

Despite enthusiasm for early human coastal migrations in southern Eurasia, there is little empirical evidence to support the assumption of a coastal route (Boivin et al., 2013). Most evidence for Late Pleistocene early human dispersals comes from inland areas suggesting that many early humans took the high-roads out of Africa (Korisettar, 2007; Boivin et al., 2013). Yet the limited preservation potential of dynamic marginal lowlands is expected, particularly along broad continental shelves where vast areas could have been exposed, submerged and or reworked by glacial–interglacial sea level flux. The scarcity of evidence is expected for a coastal dispersal, but remains problematic nonetheless. If early humans did follow a coastal superhighway out of Africa, we have little idea what that road may have been like.

This paper describes the first Late Pleistocene faunal assemblage recovered from the tropical Arabian coastal corridor. A large vertebrate collection from a glacial stage coastal oasis was recovered near Gopnath, on the Saurashtra peninsula in Gujarat State, northwestern India (Fig. 1). The fossils come from the Gopnath Formation, a heavily weathered carbonate fossil dune system. No evidence of early humans was observed, however the Gopnath

E-mail address: augustcosta@rice.edu.

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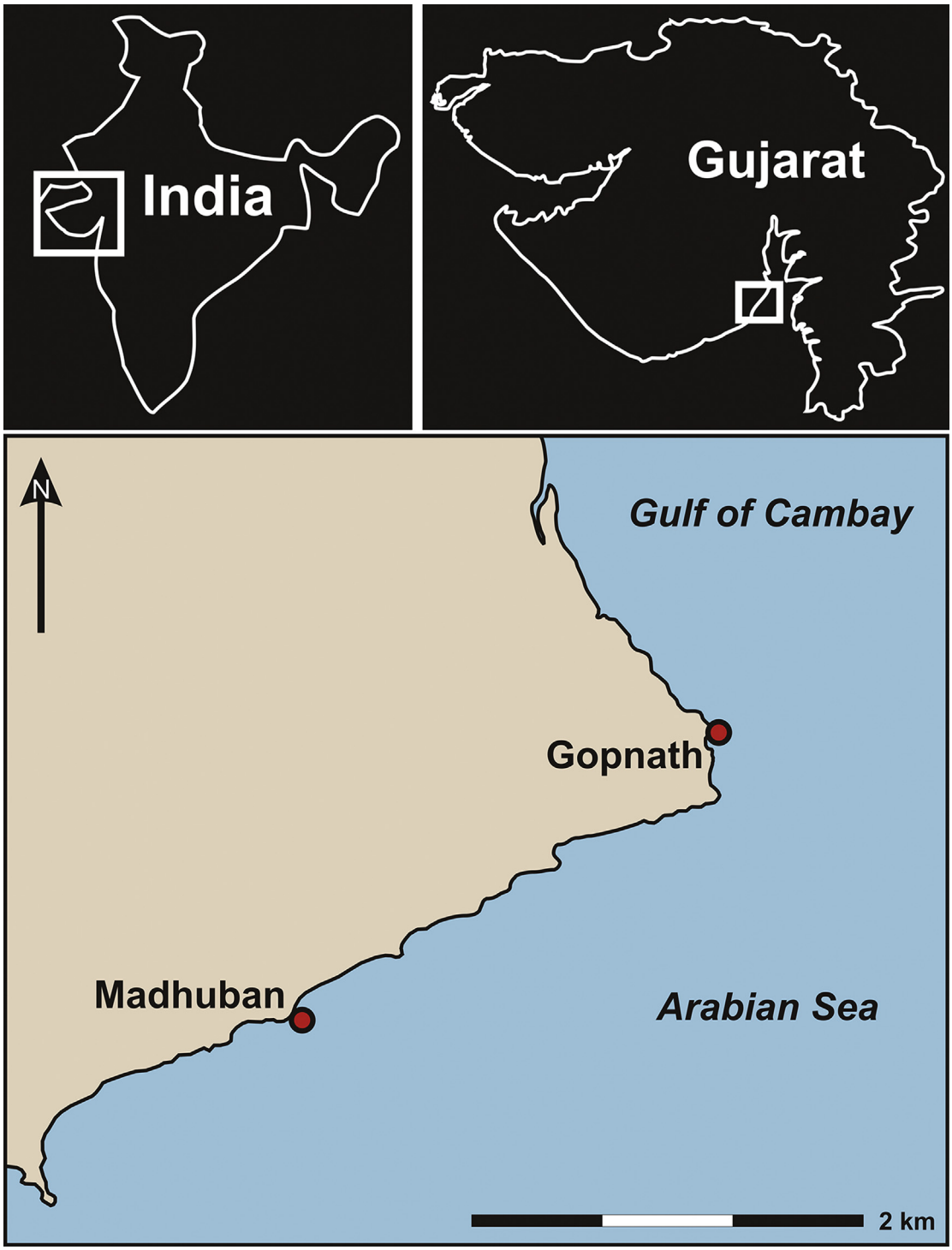

Fig. 1. Gopnath Formation location in Gujarat western India.

fauna are correlated to a previously reported Late Acheulean site at Madhuban (Marathe et al., 1995). The geologic context, taphonomy and species composition from the Gopnath site are reported here along with an assessment of the Madhuban lithic collection. Additional radiometric dating is needed, however the faunal composition, lithics and geological context indicate a broad Late Pleistocene age ~125–12 thousand years ago (ka) for the Gopnath Formation.

2. Background

2.1. South Asian Pleistocene faunal record

Like elsewhere in the Nubo-Sindian zone, the Quaternary fossil record of South Asia is patchy. Although the Neogene strata of the Siwaliks (18–0.6 Ma) are one of the most complete successions of mammalian fauna in the world, the uppermost Early Pleistocene

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