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Multiproxy analysis on Indian wild ass (*Equus hemionus khur*) dung from Little Rann of Western India and its implications for the palaeoecology and archaeology of arid regions

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ABSTRACT

The dung of the Indian wild ass was analyzed using biotic and abiotic proxies to determine its dietary habits in relation to the plant diversity and ecology in the arid region of western India. The presence of both micro and macrobotanical remains of Poaceae, Chenopodiaceae, and Fabaceae indicates they are the primary food plants of the wild ass. The continuous recovery of arboreal pollen taxa chiefly, *Prosopis*, *Acacia*, and *Ephedra* is indicative of dry thorny forest under semi-arid to arid conditions which display the existing vegetation and climate in the region. The recovery of marshy pollen taxa like Cyperaceae and Onagraceae along with *Arcella* indicates utilization of water-logged environments in the habitat. Spores of coprophilous fungi, *Sporormiella*, *Sordaria*, and *Podospora* are also present in the dung samples. The low value of stellate trichomes in winter dung samples reflects the seasonal migration of wild ass. Average $\delta^{13}\text{C}$ values ranging between -15.8‰ and -26.3‰ are indicative of a mixed diet of both C_3 and C_4 plants. The generated multiproxy data from dung samples can provide a reliable counterpart to modern data for the interpretation of the palaeoecology in relation to the palaeoherbivory and palaeodietary analysis in the region. This study also provides a basis to distinguish between wild and domesticated herbivores by analyzing coprolites and cultural sediments in archaeological sites.

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1. Introduction

The Indian wild ass (*Equus hemionus khur*), an endangered subspecies of the Asian wild ass (Feh et al., 2002; Shah and Quershi, 2007; Kaczensky et al., 2016; Bennett et al., 2017) is today restricted to small areas in western India. Recent studies of the dung of endangered megaherbivores in tropical, subtropical and temperate regions of India to analyze their dietary patterns relative to the existing vegetation have been conducted as part of the modern analogue, species

conservation, and restoration strategy (Basumatary and McDonald, 2017; Tripathi et al., 2019; Basumatary et al., 2019, 2020, 2021). Building on these previous studies of modern herbivore dung as well as on coprolites of extinct species (Bryant Jr. and Larson, 1968; Bryant Jr., 1974; Riskind, 1970; Ghosh et al., 2003; Wood et al., 2008, 2021; Gill et al., 2009, 2013; Velazquez and Burry, 2012; Marinova et al., 2013; Gravendeel et al., 2014; Rawlence et al., 2016; Birks et al., 2018; Harrault et al., 2019; Van Geel et al., 2019) we have examined the dung of the Indian wild ass to better understand the species dietary plant preferences and ecology.

Likewise, the examination of botanical remains preserved in modern herbivore dung can also be applied to dung preserved in archaeological sites and can be a source of data for the interpretation of the palaeoecology, palaeovegetation, and climate in relation to the development of

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