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Peninsular Thailand as a part of the Pleistocene savanna corridor: isotopic evidence of mammalian tooth enamel from the cave of Tham Phedan

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How climatic and environmental conditions contributed to early human migration between mainland and island Southeast Asia during the Pleistocene is one of the most hotly debated topics in paleoanthropological communities today. As Peninsular or Southern Thailand is regarded as an obligatory pathway for humans and mammals during their dispersal between these two terrestrial areas, the understanding of paleoenvironments and vegetation covers in this region is highly relevant. The hypothesis of a “savanna corridor” or a band of open vegetation (seasonal forests and grasslands) stretching from Central Thailand to Java during several periods of lowering sea level and exposed land bridges though the Pleistocene has been suggested for explaining the facilitated route of early humans and associated large mammals in migrating out of mainland Southeast Asia towards Sundaland southwards. However, the existence of savanna grasslands in Peninsular Thailand during the Pleistocene has rarely been demonstrated due to the scarcity of available proxies.

Here we reconstructed the Pleistocene vegetation and environments of the region using stable isotope analyses of mammalian tooth enamel from the channel cave deposits of Tham Phedan (Nakhon Si Thammarat Province in Peninsular Thailand) where diversified large mammal fossils were collected. The mammal fauna is tentatively attributed to a late Middle to early Late Pleistocene age according to the presence of an extirpated spotted hyaena *Crocuta crocuta ultima*. The stable carbon isotope results, ranging from -13.9‰VPDB to +4.3‰VPDB, reveal that an open vegetation/forest-grassland mosaic was dominant in this region, unlike the present-day landscapes that are mostly covered by rainforests, thus confirming the existence of a savanna corridor in Peninsular Thailand during that time. The extreme southward distribution of some grassland-related taxa (such as spotted hyaenas and Himalayan gorals), which were common in mainland Southeast Asia during the Pleistocene, reflects the habitat continuity from north to south of Thailand. However, the lack of fossil records of these two taxa in Peninsular Malaysia and the islands of Indonesia suggests that the open vegetation band did not extend far beyond the transequatorial region. Further investigations of the Pleistocene mammal faunas in the Thai-Malay Peninsula will be helpful to identify such a corridor and to examine the paleobiogeographic

affinities of Southeast Asian large mammals in the future, providing empirical data for understanding the timing and pathways of human migrations into island South-East Asia.