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A fossil biota indicates the presence of warm and wet lowlands in central Tibet during the late Oligocene

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The evolution of the paleogeography and paleoenvironment of Tibet is crucial for the establishment of current Asian climate [1], especially the monsoon systems, but remains poorly understood [2]. The faunas and floras living in Cenozoic Tibet were archives of the paleoenvironment of this region and thus promising constraints of the rising of the plateau, but their fossil records are extremely rare. Here we report the discovery of a well-preserved biota comprising warm-loving fishes, insects and megaplants from the upper Oligocene (~26-23.5 million years ago (Ma)) of the Lunpola and Nima basins in central Tibet. In contrast to some recent paleoaltimetry studies claiming the establishment of near-modern high altitude since 50-26 Ma or even earlier [3-5], dominated by a cold and arid climate, this biota indicates sub-tropical and even tropical climate. Among the fishes, the most notable is a spiny-rayed fish with living descendants distributed mainly in tropical lowlands in south Asia and sub-Saharan Africa [6]. Similar to its living descendants, this fish also has the labyrinth organ for surviving warm and seasonally oxygen-poor waters [7] and thus indicates the presence of warm lowlands in central Tibet during the late Oligocene. This inference is reinforced by the co-existing fossil megaplants, e.g., palms and lotus, that suggest a warm and humid environment at an elevation about 1,000 m above sea level. Such a biota and the corresponding environment necessitate a paleogeographic setting that allows for the entry of southerly tropical moisture as far as to Tibetan interior. Radically different from the notions of recent paleoaltimetry studies suggesting early establishment of high and dry Tibet [3-5], our discovery calls for a critical re-evaluation of the prevailing models of the rise of the plateau and its environmental and climatic consequences.

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