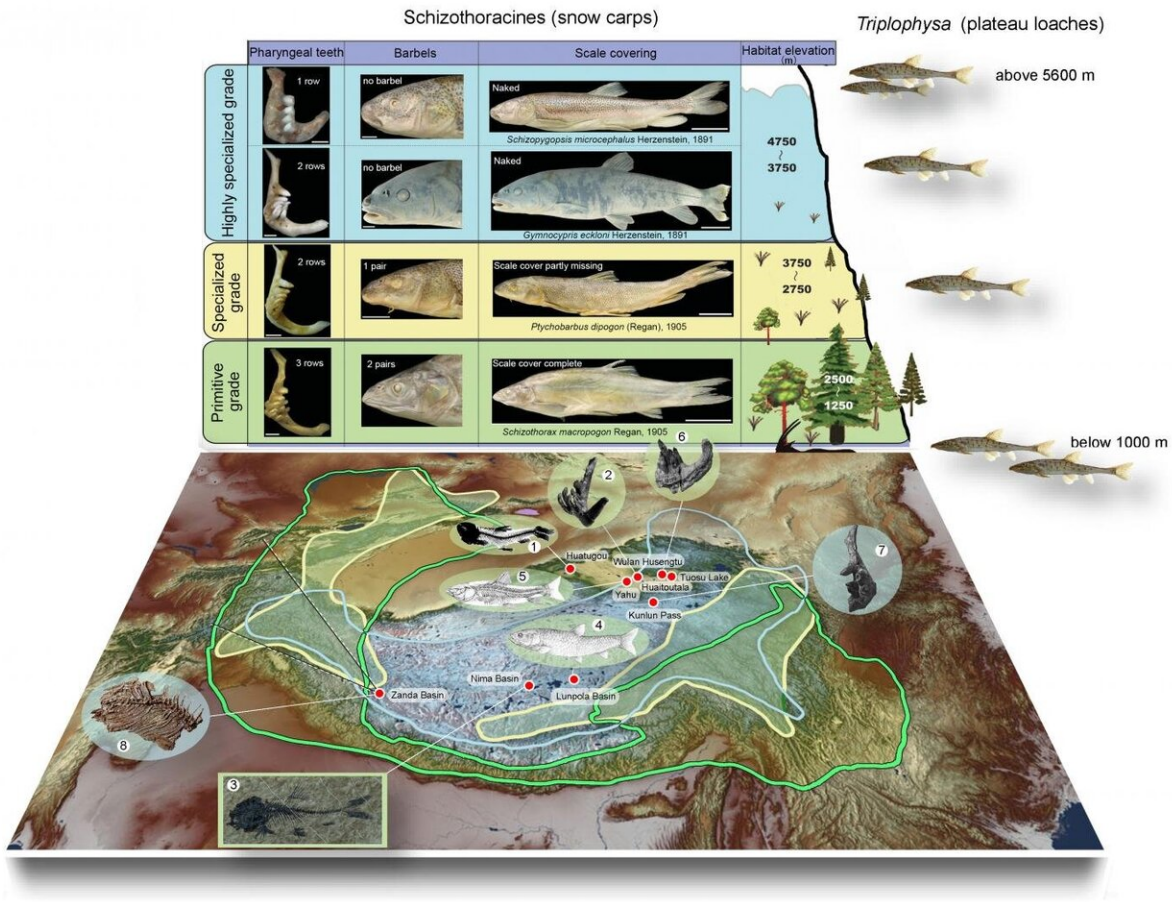
The growing Tibetan Plateau shaped modern biodiversity

December 30 2019



Local origination of endemism of fishes and mammals in the Tibetan Plateau
Credit: Science China Press

Holding particular biological resources, the Tibetan Plateau is a unique geologic-geographic-biotic interactive unit and hence plays an important role in the global biodiversity domain. The Tibetan Plateau has undergone vigorous environmental changes since the Cenozoic, and played roles as switching from "a paradise of tropical animals and plants" to "the cradle of Ice Age mammalian fauna."

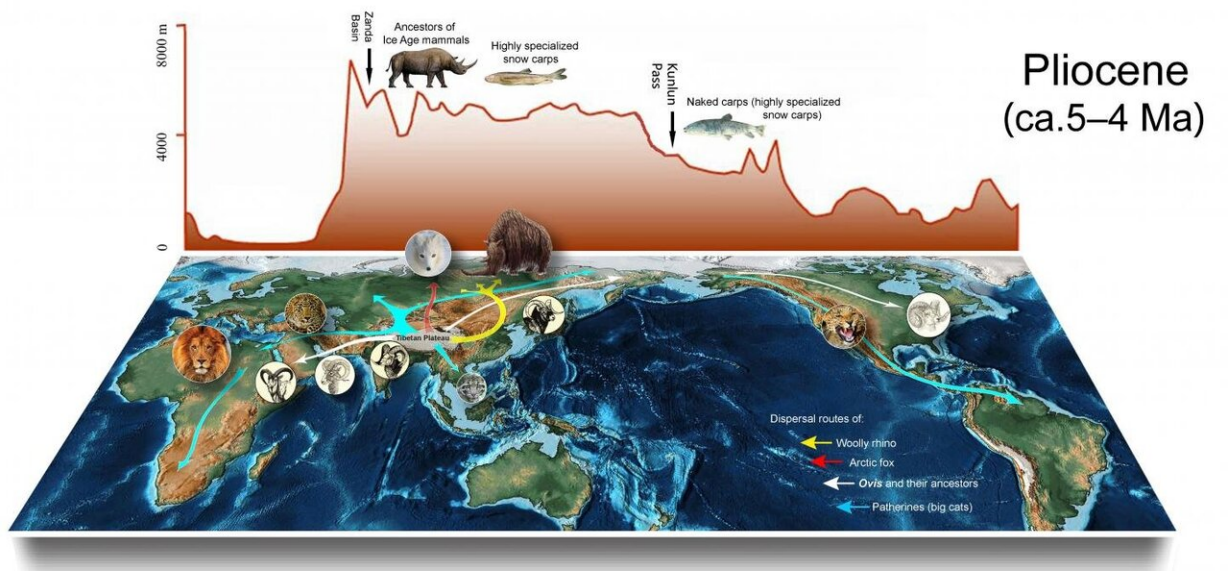
Recent significant paleontological discoveries have refined a big picture of the evolutionary history of biodiversity on that plateau against the backdrop of major environmental changes, and paved the way for the assessment of its far-reaching impact upon the biota around the plateau and even in more remote regions. Based on the newly reported fossils from the Tibetan Plateau which include diverse animals and plants, this paper presented general viewpoints of the biodiversity history on the Tibetan Plateau and its influence in a global scale.

This paper defined the Tibetan Plateau as an evolutionary junction of the history of modern biodiversity, whose performance can be categorized in the following three patterns: (1) Local origination of endemism; (2) Local origination and "Out of Tibet"; (3) Intercontinental dispersal via Tibet.

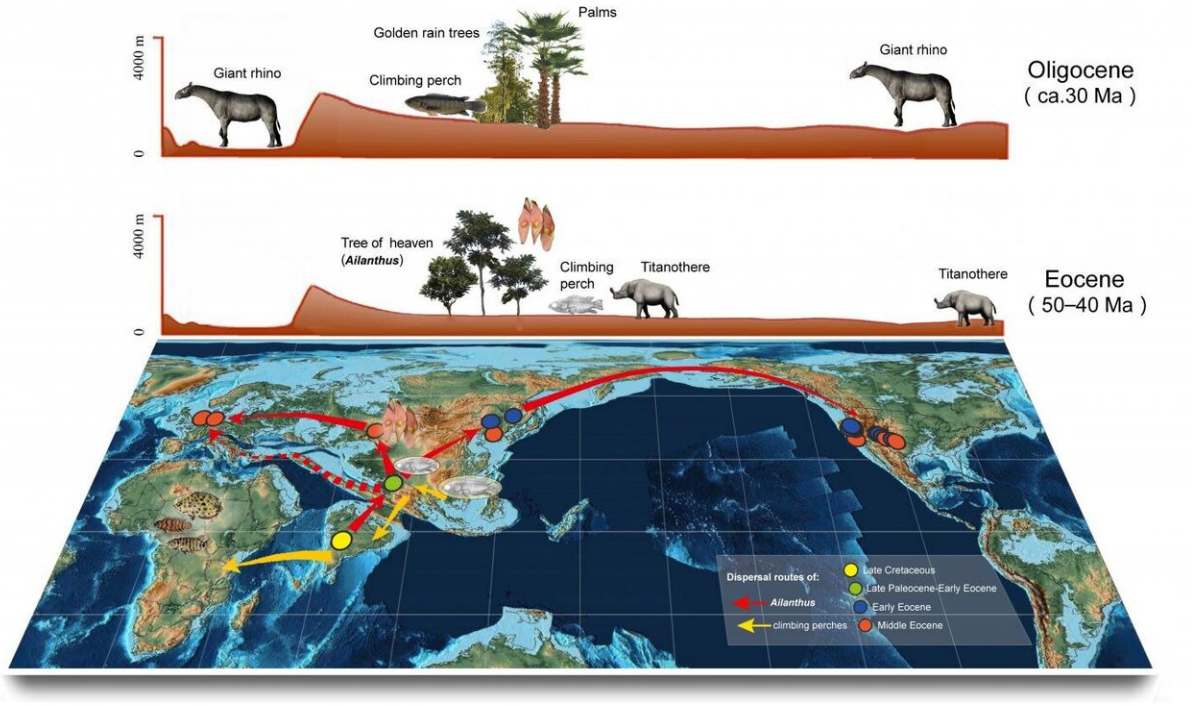
The first pattern is exemplified by snow carps (schizothoracine fishes), the major component of freshwater fish fauna on the plateau, whose temporal distribution pattern of the fossil schizothoracines approximately mirrors the spatial distribution pattern of their living counterparts. Through ascent with modification, their history reflects the biological responses to the stepwise uplift of the Tibetan Plateau.

The second pattern is represented by the dispersal history of some mammals since the Pliocene and some plants. The ancestors of some Ice Age mammals, e.g., the wooly rhino, Arctic fox, and argali sheep first originated and evolved in the uplifted and frozen Tibet during the

Pliocene, and then migrated toward the Arctic regions or even the North American continent at beginning of the Ice Age. The ancestor of pantherines (big cats) first rose in the Tibetan Plateau during the Pliocene, followed by the disperse of its descendants to other parts of Asia, Africa, North and South America to function as top predators in local ecosystems. The early members of some plants, e.g., Elaeagnaceae appeared in Tibet during the Late Eocene and then dispersed and widely distributed to other regions.



Local origination and "Out of Tibet" of mammals in the Tibetan Plateau Credit: Science China Press



Intercontinental dispersals via Tibet, taking Ailanthus and climbing perches as examples Credit: Science China Press

The last pattern is typified by the history of the tree of heaven (Ailanthus) and climbing perch. Ailanthus originated in the Indian subcontinent, then colonized into Tibet after the Indian-Asian plate collision, and dispersed from the Tibetan Plateau to East Asia, Europe and even North America. The climbing perches among freshwater fishes probably arose in Southeast Asia during the Middle Eocene, dispersed to Tibet and then migrated into Africa via a docked India.

These cases highlight the role of Tibet, which was involved in continental collision, in intercontinental biotic interchanges. The three evolutionary patterns above reflect both the history of biodiversity on the

plateau as well as the biological and environmental effects of tectonic uplift.

Since the initiation of the Second Tibetan Plateau Scientific Expedition in 2017, this review is the first comprehensive conclusion on the relationship between the uplift of the Tibetan Plateau and the evolution of biota based on latest numerous fossil records. It provides important scientific evidence for the influence of the uplift of the Tibetan Plateau on the environment and biota.

More information: Tao Deng et al, Tibetan Plateau: An evolutionary junction for the history of modern biodiversity, *Science China Earth Sciences* (2019). DOI: 10.1007/s11430-019-9507-5

Provided by Science China Press