LAELAPS BY BRIAN SWITEK

In Life's Race, Tapirs Took a Slow and Steady Pace

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Why are there tapirs in southeast Asia? They seem out of place. Out of the four living tapir species, three inhabit the lush forests of Central and South America, making the Malayan tapir of Myanmar, Thailand, and Sumatra a strange outlier.

Alfred Russel Wallace – the 19th century naturalist who independently developed the idea of evolution by natural selection around the same time as Charles Darwin – speculated on how the Asian species could have become so distant in his 1889 book *Darwinism*. "These curious animals form one of the puzzles of geographical distribution", Wallace wrote, and, looking at living species alone, it would seem that the isolation

of the Malayan species indicated a drastic reorganization of the landmasses and seas over the course of time. But there was no reason to think that this had happened. (Remember, this was nearly about twenty years before continental drift was hypothesized by Alfred Wegener and about seventy years before the concept was accepted as a reality.) The fossil record clearly illustrated that tapirs had once been widespread in Europe, Asia, and the Americas, meaning that the modern-day distribution of tapirs had been created by the extinction of some forms and, in Wallace's view, the Malayan species being pushed south by competition with other mammals. Thus, "without any hypothetical bridging of deep oceans, and with only such changes of sea and land as are indicated by the extent of the comparatively shallow seas surrounding and connecting the existing continents," Wallace concluded, "we are able to account for the anomaly of allied forms occurring only in remote and widely separated areas."

Wallace was wrong about the fixed position of the continents – something we can hardly blame him for given the scientific consensus at the time! – but he was right that the deep history of tapirs bridged the perplexing gap between the living species. That story goes back about fifty five million years or so. The very first tapirs were small creatures that were not very different from other odd-toed, hoofed herbivores such as early horses, rhinos, brontotheres, and other closely-related forms. (This is a common – and frustrating – phenomenon paleontologists face when trying to track the origin of a particular lineage or group.) One of the candidates for the title of "earliest known tapir" is *Heptodon* from the western United States, as is a contemporary creature from Ellesmere Island, Canada called *Thuliadanta*, but, while it seems likely that the first tapirs originated in North America, early tapir history remains a rough sketch.

A Malayan tapir at the Bronx Zoo takes a dip. Photo by author.

After their origin, though, tapirs had a fairly conservative anatomical history. Tapirs have almost always been inhabitants of dense, humid forests. They never underwent the kind of diversification or adaptation to grasslands seen during the evolution of horses. Species like *Paratapirus* that browsed in the warm forests of

prehistoric Switzerland around 25 million years ago were little different from their living relatives in the Amazon. Rather than cast tapirs as uninteresting evolutionary sluggards, though, paleontologists have realized that these creatures can be used to track the expansion and contraction of forests through time.

In a 2007 paper, paleontologists Larisa DeSantis and Bruce MacFadden pointed out that two complementary lines of evidence could be used to track the habitats tapirs occupied over time. The first was their anatomy – traits such as low-crowned teeth were consistent with a diet of soft leaves and other browse common in forests – and the second was the signature of Carbon isotopes contained within their teeth. Sampled from tooth enamel, these chemical traces correspond to browsing, grazing, or mixed diets, and have been used by paleontologists to test what has been hypothesized on the basis of anatomy.

DeSantis and MacFadden focused their study on the tapirs of North America. Not only did they have a good fossil record on the continent, but major environmental changes altered the assemblages of mammals present through time. Warm forests were abundant during the greenhouse world around 56 million years ago, but, after this thermal peak, these habitats began to shrink as temperatures dropped. (The global climate did not cool in a linear fashion – there were ups and downs – but temperatures never went as high again.) The proliferation of grasslands about four million years ago also cut into environments available for inhabitants of dense forests, too, but tapirs generally remained in a state of stasis through it all.

Even though tapirs have changed in proportions during the past 55 million years – gradually becoming larger before a slight reduction in size among the living species – they have been very stable in terms of diet and, as a consequence, habitat choice. All the species selected for the study retained low-crowned teeth suited for chewing soft leaves and fruit, and studies of isotopes in tapir teeth spanning the last ten million years have confirmed that they stuck to thick forests with closed canopies. As these habitats shifted south, so did the tapirs, and the descendants of the species that crossed into South America during the great exchange between North and South American animals that peaked around three million years ago maintain this close association (as does their Asian cousin).

"Tapirs may not be a good group to investigate evolution 'in the fast lane'" DeSantis and MacFadden concluded, "but they are model taxa for paleoecological reconstructions." They are creatures that have survived for millions of years as ecological changes have whittled away at the warm, wet forests they have relied upon. But we still only have a basic understanding of tapir evolution. Their deep history has been relatively under-studied – perhaps, DeSantis and MacFadden suggest, due to a belief expressed by the late paleontologist Leonard Radinsky that "For tapirs, all the evolutionary action was over after the Eocene" – but if we are going to understand evolution at all, we must to learn to appreciate an apparent lack of change as well as spectacular transformations.

[This post was written to celebrate World Tapir Day.]

Top Image: A South American tapir – *Tapirus terrestris* – photographed by a camera trap set up in Peru as part of a research project. Image by Flickr user siwild.

References:

DeSantis LRG, MacFadden B. (2007). Identifying forested environments in Deep Time using fossil tapirs: evidence from evolutionary morphology and stable isotopes *Cour Forsch Inst Senck*, 147-157

Eberle, J. (2005). A new 'tapir' from Ellesmere Island, Arctic Canada — Implications for northern high latitude palaeobiogeography and tapir palaeobiology *Palaeogeography, Palaeoclimatology, Palaeoecology, 227* (4), 311-322 DOI: 10.1016/j.palaeo.2005.06.008

Scherler, L., Becker, D., & Berger, J. (2011). Tapiridae (Perissodactyla, Mammalia) of the Swiss Molasse Basin during the Oligocene-Miocene transition *Journal of Vertebrate Paleontology, 31* (2), 479-496 DOI: 10.1080/02724634.2011.550360

Wallace, A.R. 1889. *Darwinism*. London: Macmillan and Co. pp: 352-353

Brian Switek is a freelance science writer and a research associate at the New Jersey State Museum. He is also author of the book Written in Stone.
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