Reading 3: Niche Conservatism in mammalian genera from the Late Pleistocene to Late Holocene

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This team compared the geographic ranges of mammal genera and families extant in the late Pleistocene and late Holocene. Their goal was to get a better handle on what factors influence the passing of niches from one taxa to another. By looking at the ranges of genera in North America across time, they could pinpoint whether range size (as a rough proxy for niches occupied) was determined primarily by environmental factors, i.e. deglaciation, or biological ones a la cometition. The scientists selected a series of mammal genera, mapped the area covered by their fossil distribution and ranked them accordingly. They found that niches among genera were conserved on the timescale examined in the study (130,000 years). Species loss didn’t impact range size, and by the same token the number of species in a genus didn’t seem to impact the range size either. The animals that saw the greatest range reductions were small mammals. The animals that saw a range-size increase were large mammals, especially carnivores.

The topic of North American megafaunal extinction fascinates me, and I was a bit disappointed that the article didn’t address it more (although it would hardly have altered their findings). Even so, I was interested in the authors’ question—what is likely to impact mammal distribution, and to what extent it *can* be altered—and I was (mostly) satisfied with the way they went about obtaining and interpreting their results. I hadn’t given the problem any thought, but their findings seemed intuitive and their conclusions logical. It makes sense that animals such as mammals, with high levels of mobility and hardiness in extreme climates, would be less-sensitive to environmental swings on the order of glacial cycles. In addition, the conclusion that range sizes are determined more by internal factors like trait heritability rather than external factors may lend itself well to some genetics work in the future. Interestingly, the paper estimates that niches are generally conserved on the timescale of 100,000 years, which is roughly equivalent to one eccentricity cycle in Earth’s Milankovich cycles. This may not in fact be significant, as the paper points out that some genera and families predate the Pleistocene, but eccentricity is thought to be the main control on glacial cycles for the past 2.5 million years (and this paper covers only the last 130 kyr). So, while the paper writes off this intriguing coincidence, I’m not so confident; the authors cite a source saying that mean mammalian genera divergence is about 1.3 myr, which remains within the bounds of the Pleistocene.

I was a little skeptical of the way they treated the ranges of late Holocene mammals. The authors do acknowledge human interactions with mammals can have a significant impact on their ranges (they mentioned *Bison* specifically), but didn’t push it far enough in my opinion. *Canis*, probably represented primarily by the coyote, has shown itself to be highly adaptable to human settings, and can be found even in high-density American suburbs. Likewise for raccoons, who might not be so geographically successful if not for their opportunism with regards to human refuse. White-tailed deer are now regarded as pests, as they’ve benefited from more than a century of government programs to kill various top-tier predators. Meanwhile, mammals with the smallest ranges may have been recently impacted by the same development. The point is that many (though not all) of the genera with the largest modern ranges are either resilient to human expansion, or were given a leg up by misguided extermination incentives. Perhaps this would have unduly strained the project budget, but I wonder if it weren’t possible to compare late Pleistocene mammal ranges to the distributions of pre-Columbian mammal remains.

I can’t say I found their massive data table to be particularly useful, but the maps of ranges over time was perfectly appropriate. I would have liked to have seen a page of these maps, one for each genus, and perhaps grouped by the trends they displayed. These maps were intuitive, natural and easy to read. I was briefly perplexed by the sharp dividing lines cross-cutting Mexico and tracing the US-Canada border, till it was explained in the text that data from the adjacent nations was nonexistent. The graph plotting Pleistocene and Holocene ranges against each other was also easy to interpret, reasonable in the paper’s context, and helped to illustrate the results: a large Pleistocene range correlated with a large Holocene range, and so on. It would have been illustrative to have seen similar maps and graphs for family-level range changes, since the paper’s findings included niche conservatism at higher-level taxa as well, and there was no reason (besides space concerns) not to include them.