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The Myriad Microfauna of Yellowstone Lake

Moss on a Hot Vent

Monitoring Birds of Prey

Shorts

Elk Antler and Neonatal Remains Record Landscape Use

Miller, J.H. 2012. Spatial fidelity of skeletal remains: Elk wintering and calving grounds revealed by bones on the Yellowstone landscape. *Ecology* 93(11): 2474–2482.

Establishing how animals use their landscapes and how those needs change across seasons and years is essential for successful wildlife conservation and management. While species' landscape use (including home ranges, birthing grounds, and breeding areas) often varies across annual, decadal, and longer timescales, the available data with which we understand these patterns are often based on few individuals sampled across a restricted number of seasons and generations. Given the common absence of historical multi-season, multi-decadal population studies, other methods are needed to obtain extended temporal perspectives and more fully investigate the effects of climate change and other anthropogenic influences on animal communities.

Bones can persist on landscape surfaces for centuries in temperate settings and millennia in arctic latitudes. Landscape bone accumulations also faithfully record local diversity and past population changes. To discover whether bone accumulations additionally capture fine-scale patterns of season-specific landscape use, I compared the locations of shed elk antlers (which are dropped annually in late winter) and the skeletal remains of newborn elk calves (produced in spring) found across Yellowstone National Park's northern range to known bull elk wintering areas and elk calving grounds. To survey the bone accumulation, I sampled 10 plots in each of four habitats (grassland, forest, lake margin, and river margin) and logged the number of encountered shed antlers and the bones of newborns. The plots were 1 km in length and varied in width from 30 to 100 meters depending on habitat type. Using these data, I calculated the concentrations of antlers per square kilometers in each of the 40 sample plots and noted where neonatal remains were present or absent.

J. MILLER

A section of elk antler found on the park's landscape during Miller's research.

The concentrations of shed elk antlers tightly corresponded to areas used by bull elk as reported in late-winter aerial surveys; regions with higher antler concentrations had been used by higher concentrations of bull elk (bulls/km^2). Highlighting the long-term, multigenerational nature of landscape bone assemblages, antler concentrations were generally more faithful to decadally averaged patterns of bull elk landscape use than were individual aerial surveys themselves. Additionally, despite the susceptibility of newborn elk to bone loss due to weathering and consumption or dispersal by carnivores, they were found in all sampled calving areas and were not found in areas without documented use for calving and early rearing activity. These results indicate that bone accumulations can record highly faithful data on landscape use and that bone surveys offer a powerful new tool for providing historical perspectives on species' landscape use—data that are currently unavailable for most ecosystems.

—Joshua H. Miller, University of Cincinnati

Response of Lake Trout to 15 Years of Harvest in Yellowstone Lake

Syslo, J.M, C.S. Guy, P.E. Bigelow, P.D. Doepke, B.D. Ertel, and T.M. Koel. 2011. Response of nonnative lake trout (*Salvelinus namaycush*) to 15 years of harvest in Yellowstone Lake, Yellowstone National Park. *Canadian Journal of Fisheries and Aquatic Sciences* 68(12):2132–2145.

Yellowstone National Park's lake trout (*Salvelinus namaycush*) removal program was initiated in 1995—a year after the nonnative species was verified to be present in Yellowstone Lake, which contains genetically pure Yellowstone cutthroat trout (*Oncorhynchus clarkii bouvieri*). This program, intended to provide protection for the Yellowstone cutthroat trout population, is the longest ongoing lake trout removal project in the Intermountain West. Using data from 1996 to 2009, including individual growth, body condition, fecundity, length and age at maturity, and mortality of lake trout, the authors evaluated the success of the removal program. They also applied a demographic model to simulate several scenarios of fishing mortality and the subsequent effects on population growth.

Models indicated the lake trout population was still increasing, even after more than a decade of removal efforts. It is likely that the drastic decline in the Yellowstone cutthroat