



NORTH PACIFIC UNIVERSITIES
MARINE MAMMAL
RESEARCH CONSORTIUM

Raising a Stink Over Sea Lions

If asked to describe the work of a marine biologist, the average person may envision a somewhat idyllic lifestyle: swimming with dolphins, diving on remote coral reefs, or piloting submersibles to uncharted depths. The reality, however, is that most marine biology is not this romantic. In the case of scientists studying the decline of Steller sea lion populations in Alaska, one important but less glamorous aspect of the work involves collecting and analyzing samples of scat, or fecal matter.



Arguably not a job for the weak-of-stomach, scat analysis has proven to be a useful tool for furthering our understanding of the sea lion diet. By removing and identifying the 'hard parts' from a scat sample, such as bones from different fish species, researchers can deduce the contents of a sea lion's recent meals. But what about soft-bodied prey such a squid, or fish with fragile bones that do not survive digestion? Because the analysis of 'hard parts' does not always paint a complete dietary picture, scientists have turned to DNA analysis to fill in the blanks.

In a study recently published in the journal *Molecular Ecology*, Bruce Deagle and Mark Hindell (University of Tasmania), Dominic Tollit and Andrew Trites (University of British Columbia), and Simon Jarman and

Nick Gales (Australian Antarctic Division) conducted controlled feeding trials on two female Steller sea lions at the Vancouver Aquarium Marine Science Centre. The sea lions were placed on three diets consisting of varying amounts of herring, smelt, salmon, squid, capelin and pollock. Regular scat samples were collected, and DNA analysis was performed on both intact sub-samples and 'blended' samples.



While much of the DNA obtained came from cells shed from the sea lions' gut, the researchers also successfully detected DNA from each prey type. In fact, they detected DNA from relatively small portions of the diet (squid and sockeye salmon) just as successfully as that of the more abundant menu items (smelt and herring). Prey DNA was detected more consistently from the blended samples than from scat sub-samples, suggesting that prey DNA is not distributed evenly within a single scat – a finding that will likely influence sampling protocols in future studies.

One of the study's more significant findings was that the amounts of prey DNA in the scat samples were roughly proportional to the mass of

the prey consumed. Based on this result, it may be possible to combine DNA analysis with other approaches to assess both the type and quantity of prey species in the Steller sea lion diet.

In order to fully address the sharp population decline of Alaska's Steller sea lions, scientists must better understand their subjects from the inside out. The field of scat analysis may not serve to inspire legions of future marine biologists, but it is lending considerable insight into what sea lions eat and how they metabolize different prey species. This information, in conjunction with ongoing research into sea lion energy requirements, could play an invaluable role in saving the species from extinction.

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<http://www.marinemammal.org/2005/deagle.php>

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Molecular scatology as a tool to study diet: analysis of prey DNA in scats from captive Steller sea lions.

Deagle, B.E., D.J. Tollit, S.N. Jarman, M.A. Hindell, A.W. Trites and N.J. Gales. 2005.

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