

All mixed up and no place to grow? Integrating captive and field studies to examine the effects of prey intake patterns on physiology and diet reconstruction of Steller sea lions (*Eumetopias jubatus*)

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The synergistic effect of mixed diets and prey switching may have important consequences for Steller sea lion population health. We tested the effects of different temporal levels of diet mixing (constant versus sequential mix of four prey species) on body mass, body composition, stress levels and metabolic rates in a group of 8 captive Steller sea lions over 4 months. Scats were collected for prey hard remains and prey DNA diet reconstruction and compared with diet estimates using blubber biopsy fatty acid signatures (QFASA). These three dietary techniques were also compared using samples collected in the field. Body mass changes varied between diets, but only in the final month, while stress levels and metabolism did not differ. There was no apparent effect of diet regime on the ability to withstand or recover from induced month long periods of food restriction. Stress (cortisol) levels in scats did not change during this restriction, but drops in resting metabolic rate and a thyroid hormone (T3) were noted. Occurrence indices strongly over-represented infrequently consumed species in captive studies while a combination of mass-based and genetic approaches provided greater accuracy. DNA prey identification of field samples increased species diversity in 45% of 110 scat comparisons, as a result of 75 (20%) additional prey occurrences unidentified by prey hard remains and leading to DNA highlighting different key species compared to hard remains. Inclusion of QFASA estimates showed overlap in the importance of herring and gadids across all three techniques, but only QFASA predicted high quantities (~30%) of rockfish, compared to 5-7%. Our results indicate the value of using different dietary reconstruction techniques that integrate diet over different periods. Significant physiological consequences of our prey mixing regime were only apparent after many months, highlighting the need for sequential sampling across time in both captive and field studies.

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