Using Quantitative Fatty Acid Signature Analysis (QFASA) to Estimate Diet in Young Steller Sea Lions (SSL) in Prince William Sound, Alaska

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When weaning occurs and what prey species young SSL depend on are important questions in investigating the decline of SSL populations in Alaska. We employed QFASA to investigate these questions in young (2.5-48.0 month old) SSL in Prince William Sound (PWS). We used 207 blubber biopsy samples, 21 undigested milk samples, and a previously published fatty acid (FA) prey database from PWS (26 species) to estimate diet. QFASA requires that prey species be differentiated based on their FA signature. While this has previously been determined for PWS prey, we sought to determine whether milk samples as a whole (despite within-female variability from diet) could be differentiated from prey species. Milk samples were clearly distinguished from all other prey items using discriminate function analysis with 93% accuracy. To further investigate the differentiation of milk, we constructed 4 mixed-prey diets, each differing in the proportion of milk (range: 0-100%), and analyzed the ability of QFASA to estimate a simulated diet. Milk was underestimated by 18, 8 and 3% in simulation diets containing 100, 50 and 10% milk, respectively. Other components of the simulated diet (herring, pollock, salmon, and sand lance) were generally well-estimated and no milk was estimated for the simulation diet containing 0% milk. QFASA also requires calibration factors to account for FA metabolism within the predator. We used two sets of calibration factors: 1) those generated from captive SSL fed herring and 2) those generated from grey seal pups fed milk. Using SSL calibration factors, estimated diets of young SSL were dominated by herring, shrimp, sand lance, milk and squid. However, milk was approximately 8% of the diet across all ages. When modeled using the grey seal pup calibrations, milk, herring, eulachon, squid and salmon dominated, with milk showing a significant negative correlation (Pearson co-efficient=-0.331, p<0.001) with age. The results suggest that QFASA can be used to determine the proportion of milk in the diet of individual Steller sea lions, however, it will be important to determine how best to account for FA metabolism when diets contain a mixture of high fat milk and low fat fish species.
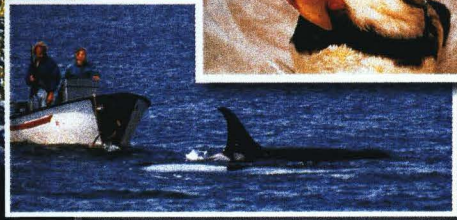
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