

Estimating daily energy gain of lactating Weddell seals using animal-borne video and accelerometers

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Weddell seals *Leptonychotes weddellii* are top predators in the Southern Ocean Ecosystem. Knowledge about their energy budgets is crucial for understanding the energy flux of this Ecosystem. Therefore, this study aimed to estimate daily energy gain of Weddell seals during lactation period in McMurdo Sound using bio-logging methods to record prey encounter events and calculate behavioural time budgets. We analysed data from 20 lactating female Weddell seals in McMurdo Sound in November and December 2018 by attaching behavioural tags and video cameras to three parts of the body: 1) an accelerometer to the lower jaw to detect mouth openings as an index of prey capture, 2) a video camera to the head to record prey types, and 3) a multiple sensor tag that recorded depth, swim speed, acceleration, and magnetism to the back to reconstruct dive paths of the seals. The seals spent the following percentage of time in three behavioral states: 65% “on the ice”, 24% in “shallow (< 20 m) dive”, and 11% in “deep dive”. Because previous research showed the foraging occurs primarily during deep dives, we focused our analysis on this behavioral category. Mean number of mouth-opening event per deep dive was 38 ± 25 . On average, the duration of deep dive ranged between 20-30 minutes. Antarctic silverfish *Pleuragramma antarcticum* was the most common prey item recorded in the video data. We estimated that seals consumed approximately 190-266 per day. Daily energy gain of Weddell seals was estimated to be 3610-5054 kcal when prey species was only Antarctic silverfish which has an energy value of 19 kcal. A previous study reported the daily resting metabolic rate of 15275 kcal for Weddell seals (425 kg). Our results show that the daily energy budget of Weddell seals during lactating period is not sufficient, suggesting that either role of foraging is not high priority for lactating females or that key foraging events were not recorded. Foraging activity during lactation do not fully support the daily metabolic demands, but may play a role in slowing the rate of body mass loss for adult females during this time.

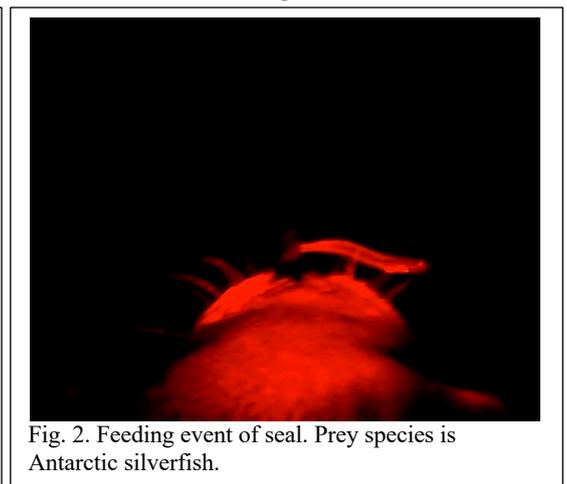
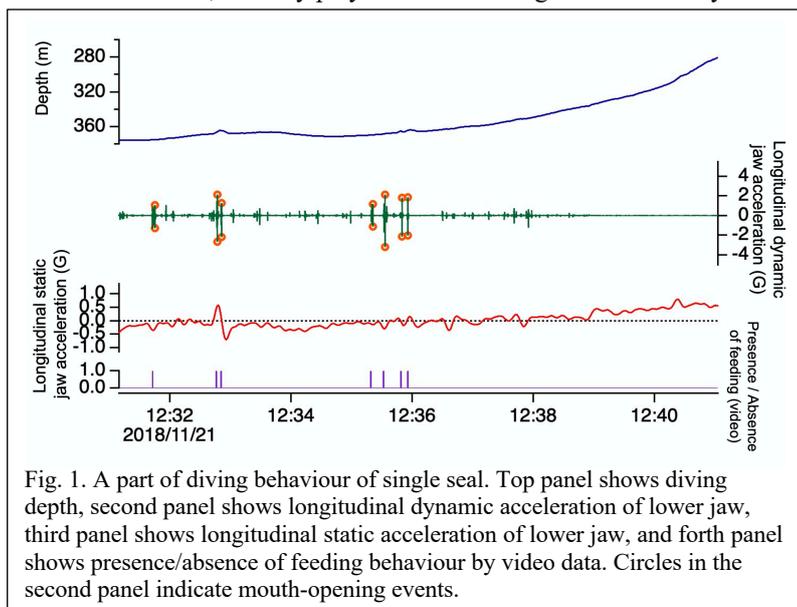


Fig. 2. Feeding event of seal. Prey species is Antarctic silverfish.