

Foraging and fasting in the annual cycle of Adelie penguins

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When would be the most critical time period of foraging, over the annual cycle of Adelie penguins? When do they need to achieve high foraging success? This would be an important question to understand the life history of Adelie penguins in relation to the seasonal cycle of Antarctic marine environment. Here, we address this question based on the year-round tracking of foraging and fasting in Adelie penguins, by using geolocation and depth recorders, at Hukuro Cove colony, Lutzow-Holm Bay, in East Antarctica. We combined the data on diving effort and fasting periods with values on daily energy expenditure obtained from literatures to estimate daily energy demand and foraging success required. Depth and wet-dry records showed that penguins had two major fasting events, for molting in March (17.5 days on average) and for courtship and incubation from November to December (42.2 and 22.5 days on average for males and females). Daily diving effort varied throughout the annual cycle, with three periods of high diving effort (5-7 hours diving/day): late February, late April, and October, which corresponded with pre-molting, post-molting and pre-arrival to the colony. Energetic calculations suggest that penguins would have high daily energy demand during pre-molting and pre-arrival periods, to store energy needed for the long fasting events. Penguins appear to compensate high daily energy demand by high diving effort, and they need to achieve only slightly higher foraging success during pre-molting and pre-arrival periods compared to other time of year. Instead, penguins need to achieve relatively high foraging success around mid-winter in July, when their diving effort is limited (2-4 hours diving/day) presumably by short daylight hours.