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## Foraging strategies of Adélie penguins: adjusting body condition to cope with environmental variability

Animals modulate breeding effort by balancing investment in self-maintenance against investment in their young, potentially impacting reproductive success when faced with difficult conditions. This “life history trade-off model” has previously only been evaluated for flying birds, especially those that forage over large oceanic regions of relatively sparse prey availability.

In a study published in *Marine Ecology Progress Series*, we evaluated the applicability of this model to penguins which, lacking flight, depend on reliably available prey relatively close to breeding colonies. The research was a collaboration with colleagues from H.T. Harvey and Associates and Oregon State University.

We used transponders and an automated weighing system to monitor 40 to 75 breeding Adélie penguins per season for 10 seasons (1997-2006), measuring foraging trip duration, parental mass change, and total food load delivered to chicks. The research was conducted on Ross Island, Antarctica, at one of the largest Adélie penguin colonies in the world: Cape Crozier.

Environmental conditions varied dramatically among years. Parents that lost the most mass during breeding provided more food to chicks while maintaining their own condition. In contrast, in years when adult mass was lower to begin with, parents recovered their own condition and delivered less food to chicks. Food loads were also related to environmental variables, with parents making longer trips and delivering less food when access to prey was more difficult, but delivering more food to 2-chick broods than to 1-chick broods.

Our results show that the penguins regulated their condition depending on environmental and physiological factors, with impacts on the amount of food delivered to young and pre-fledging mass.

This study shows how parental choice among multiple foraging habitats and depletion of prey in the nearest habitat due to competition with other animals can help to explain contrasting patterns observed among studies investigating the life history trade-off model in birds.

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### Main Points

- Adélie penguins usually operate with an energetic “cushion” – allowing them to lose significant mass while raising chicks, even when environmental conditions are challenging.
- Once parents lose about 8% of their mass they need to start foraging for themselves, which results in chicks receiving less food.
- There appears to be an optimal concentration of sea ice for foraging penguins – when it was about 12% total cover penguins were able to deliver the most food to their chicks

### Paper citation:

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