

Sexual dimorphism and the evolution of seasonal variation in sex allocation in the Hawaii akepa

Leonard A. Freed¹, Rebecca L. Cann²
and Karl Diller²

¹*Department of Zoology and* ²*Department of Cell and Molecular Biology,*
University of Hawaii at Manoa, Honolulu, Hawaii, USA

ABSTRACT

Questions: Can changing sexual dimorphism of fledglings during different months reflect seasonal variation in sex allocation, given that such changes are expected? Can a major shift in the sex ratio of young birds be attributed to food limitation that affects seasonal variation in sex allocation? How is sexual dimorphism related to seasonal variation in sex allocation?

Hypotheses: Hawaii akepa females have an advantage of producing male offspring early in the breeding season, either by increasing the fitness of their sons or by minimizing their own costs of moult–breeding overlap. Sexual dimorphism in bill length is maintained by stabilizing selection on the two sexes. Dismantling of seasonal variation in sex allocation by competition with an introduced bird will be based on decline of the sex that is most exposed to the competition as a nestling or fledgling.

System: Hawaii akepa (*Loxops coccineus coccineus*).

Location: Hakalau Forest National Wildlife Refuge, Island of Hawaii.

Methods: Fledglings were captured during June–September from 1987 to 2005, weighed, and measured. Sex was determined by future plumage of survivors and by CHD gene test for non-survivors. Sex was similarly determined for second-year birds captured throughout the year. Age was determined by plumage for males at all ages and for second-year and older females.

Results: The consistency over years of changing sexual dimorphism of fledglings fits the predictions of seasonal variation of sex allocation. In association with food limitation, the sex ratio of young birds became strongly biased towards males, the larger sex, with a significant change in adult sex ratio favouring males in all study sites. Stabilizing selection on male bills, particularly during sub-adult ages, indicates a fitness advantage to females that produce long-lived sons, with adequately sized bills, when food is more abundant. Females that produce sons early in the breeding season also have reduced costs of moult–breeding overlap while the bills of their sons are still growing.



www.evolutionary-ecology.com

***Evolutionary Ecology Research* is delighted that you wish to consult one of its articles.**

You may if your library or laboratory subscribes.

Ask your librarian or library committee why your place does not already subscribe to the low-cost journal that is publishing splendid science in a socially responsible manner. *EER*'s low prices have helped librarians to rein in the indefensible cost increases that have reduced our access to science all over the world! Just ask our partners at [SPARC](#) — the Scholarly Publishing & Academic Resources Coalition of the Association of Research Libraries.

Or maybe you should just remind the folks who order your journals to contact us and subscribe! You need — and they should support — the journal that:

- Invented the instant publication of reviewed, revised and accepted e-editions.
- Vests the copyrights of all articles in their authors while preserving the rights of educational and research groups to use its material in classes, seminars, etc. at no additional cost.
- Maintains a unified data-base of articles, thus doing away with your need to worry about issue numbers, author order, and other such impediments to easy access.
- Provides *Webglimpse* so that you can search any word, place, species, variable, phrase or author in any article *EER* has ever published.
- Pioneered e-only subscriptions while maintaining, at the same time, a traditional print edition, too.

Some 10,000 readers per week have it right. *EER* is the place to go for great science, responsible publication policies and easy access!

[Click here for the Table of Contents](#) of the most recent issue of *Evolutionary Ecology Research*

[Click here for full access to a sample issue](#) of *Evolutionary Ecology Research*

[Click here for SUBSCRIPTION INFORMATION](#)