

Incipient extinction of a major population of the Hawaii akepa owing to introduced species

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ABSTRACT

Background: The akepa population in its high-density site crashed in 2006, after being non-viable from 2000 to 2005.

Hypothesis: The crash was caused by increases in certain ectoparasites and an introduced avian competitor.

Organisms: Hawaii akepa (*Loxops coccineus coccineus*), Japanese white-eye (*Zosterops japonicus*), and Phthiraptera (chewing lice in Ischnocera and Amblycera).

Field site: Hakalau Forest National Wildlife Refuge, Mauna Kea, Island of Hawaii, State of Hawaii, USA.

Methods: We mist-netted birds at a high elevation site from 1987 to 2006, documenting increased numbers of introduced Japanese white-eye from 2000 to 2005, and compared Hawaii akepa nestling mass, breeding success, fledgling mass, juvenile survival, juvenile bill length, and sex ratio of young birds before and after the increase in white-eye. We inspected birds captured in mist-nets for ectoparasites. We identified colour-banded birds through binoculars to supplement the mist-netting for estimating population changes.

Results: Declines in all demographic parameters of Hawaii akepa related to recruitment coincide with the first 5 years of increased numbers of Japanese white-eye. A severe decline in adult survival was observed in 2006, following the explosive increase in chewing lice between 2003 and 2005 and continued exposure to increased white-eyes. Further decline was observed in 2008. Mass, fault bars in feathers, fat scores, and changes in begging indicated that the decline was due to strong food limitation. The white-eye overlaps foraging substrates with all species of native birds, and additional native species have declined with the akepa.

Conclusions: There has been a collapse of every demographic parameter of the akepa. The population is continuing to decline over a large area and may go extinct without management.

Keywords: demography, environmental change, food limitation, interspecific competition, introduced species, population crash.

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