

FEATURE ARTICLES

INCREASE IN AVIAN MALARIA AT UPPER ELEVATION IN HAWAI'I

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Abstract. Hawaiian honeycreepers (Aves: Drepanidinae) evolved in the absence of mosquito-borne diseases such as avian malaria (*Plasmodium* spp.). Malaria has been largely responsible for the recent wave of extinctions and endangerment among Hawaiian forest birds, which began by the 1920s. Most honeycreepers, especially endangered species, now persist only in forests above 1500 m elevation, where cool temperatures prevent effective malaria development in mosquitoes. We report here that prevalence of malaria in Hawaiian forest birds at 1900 m on the island of Hawai'i has more than doubled over a decade. This increase was associated with breeding of mosquitoes and warmer summertime air temperatures. We also report direct evidence of tolerance to malaria, and a possible cost of tolerance, in wild native birds. Tolerance is adding to a reservoir of malaria at upper elevations even while vectors are rare and air temperatures are too low for complete development of the parasite in the vector. The data provide a glimpse of how malaria is becoming an emergent infectious disease at upper elevations.

Key Words: avian malaria, climate warming, cost of tolerance, Hawaiian honeycreepers, mosquito vector, tolerance.