The Cost of Parasitism: Life History Trade-offs in Galápagos Mockingbird Nestlings

Maya Castle*, Isabella Weiler, Allyson Placko, Isabela Vargas, Gabriela Mena, Sabrina McNew
DEPARTMENT OF ECOLOGY AND EVOLUTIONARY BIOLOGY, UNIVERSITY OF ARIZONA

INTRODUCTION

Introduced parasites can drive life history trade-offs in host species, forcing hosts to reallocate limited energy away from growth or reproduction and towards immune defense.

Tolerating parasitism is costly, shifting energy away from key traits such as reproduction and growth [1,2].

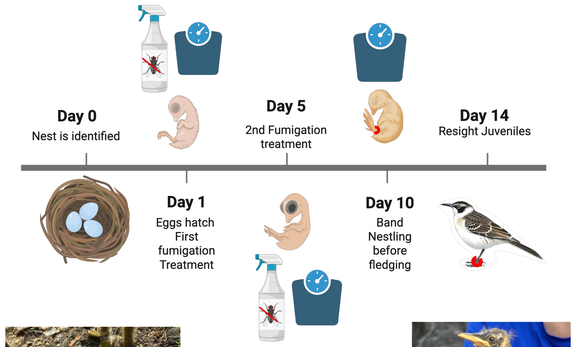
Avian Vampire Fly (*Philornis downsi*) is an introduced nest parasite of the Galápagos Mockingbird (*Mimus parvulus*) — larvae feed on nestling blood and tissue[3].

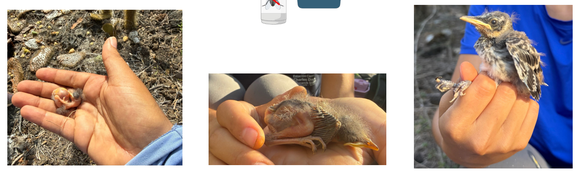
Hypothesis: Parasitism will reduce mass and size of nestlings as energy is diverted away from growth toward parasite tolerance.

1. Parasitized nestlings will have lower body mass than fumigated controls
2. Mass will predict fledging success in both treatment groups
3. The cost of parasitism will decrease over time as tolerance develops in the population

METHODS

1 **Experimental design:** Nests fumigated with insecticide (parasites removed) or parasitized which are sham-fumigated with water (natural infestation).





RESULTS

Nestling Mass by Treatment

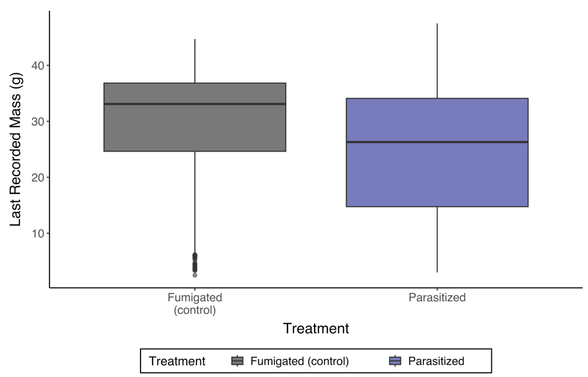


Figure 1. Parasitized *Mimus parvulus* nestlings had significantly lower body mass than fumigated controls across all study years, suggesting that *Philornis downsi* parasitism reduces nestling condition (Welch's two-sample t-test: $p = 7.28 \times 10^{-6}$; fumigated n = 223, parasitized n = 229)

Mean Nestling Mass Over 10 Years

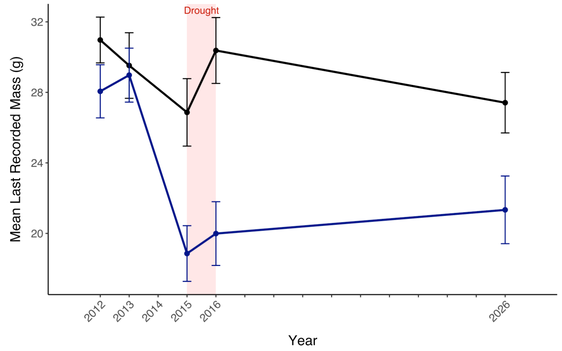


Figure 2. Mean last recorded nestling mass declined sharply in parasitized nestlings during the 2015–2016 drought before partially recovering, while fumigated controls remained higher across all years, indicating that the costs of parasitism on nestling condition fluctuate with annual environmental variation (linear model: p = 0.004; 2012–2016 data from McNew et al. 2019 and Knutie et al. 2016)

Fledging Success vs. Nestling Mass

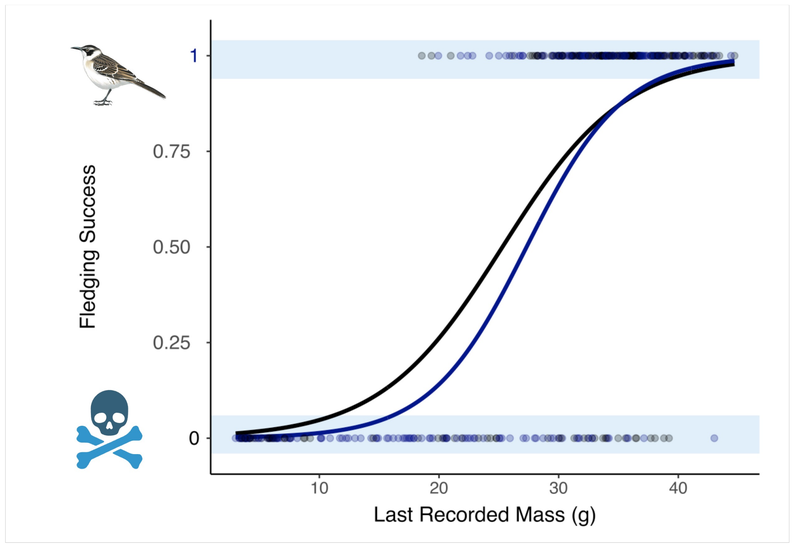


Figure 3. Last recorded mass was a significant predictor of fledging success in parasitized nestlings but not in fumigated controls, indicating that parasite pressure makes body condition more critical for survival (binomial logistic regression: parasitized p = 0.034, fumigated p = 0.111).

CONCLUSIONS

HYPOTHESIS SUPPORTED

Parasitized nestlings were consistently smaller than controls across all study years, confirming a measurable cost to nestling condition.

MASS & SURVIVAL

Mockingbirds show tolerance to *Philornis downsi*, yet nestling mass only predicted fledging success in parasitized birds, suggesting that parasite pressure creates a survival threshold absent in fumigated controls, with ongoing implications for long-term population health and Galápagos landbird conservation.

TEMPORAL VARIABILITY

The cost of parasitism is not fixed: yearly variation in parasite pressure, amplified by events like the 2015-2016 drought, drove significant fluctuations in nestling condition and survival.

2026 PRELIMINARY DATA

Mockingbirds show tolerance to *Philornis downsi* but parasitized nestlings have significantly lower body mass and reduced fledging success, with ongoing implications for long-term population health and Galápagos landbird conservation.

ACKNOWLEDGEMENTS

1. Knutie, S.A., Owen, J.P., McNew, S.M., Bartlow, A.W., Arriero, E., Herman, J.M., DiBlasi, E., Thompson, M., Koop, J.A.H. and Clayton, D.H. (2016), Galápagos mockingbirds tolerate introduced parasites that affect Darwin's finches. Ecology, 97: 940-950.
2. McNew, S.M., Goodman, G.B., Yépez, J.R. et al. (2020), Parasitism by an invasive nest fly reduces future reproduction in Galápagos mockingbirds. Oecologia 192, 363–374
3.McNew, S.M, Knutie S.A., Goodman G.B, Theodosopoulos, A., Saulsberry A., Yépez, J.R, Bush S.E., Clayton D.H. (2019) Annual environmental variation influences host tolerance to parasites. Proc Biol Sci 1 February 2019; 286 : 20190049.

Thanks to :
Goberth Cabrera
Birgit Fessl
Jessica Estrada