

Saving Darwin's finches from extinction on the Galapagos Islands

(Knowledge Transfer)

Project leads

Univ.-Prof. Sonia Kleindorfer (sonia.kleindorfer@univie.ac.at)

Abstract

The Galapagos Islands are a world heritage tourism destination, yet the endemic flora and fauna are threatened by a suite of introduced species. My research team, in partnership with a network of research scientists established in 2012, is studying the impacts of the accidentally introduced parasite *Philornis downsi* for the survival of all Galapagos landbirds. I supervise teams of scientists and students to conduct field work to test the impact of the parasite for Darwin's finch survival and measure evolutionary dynamics. In addition to conducting fundamental research, we experimentally trial control measures. The results of our research are presented and shared in annual reports, meetings and peer-reviewed manuscripts.

Keywords

Galapagos, introduced parasite, *Philornis downsi*, biodiversity crisis, extinction

Aims of the Third Mission activity

1. To promote awareness about the population status of Darwin's finches and Galapagos landbirds.
 2. To identify and monitor threats for the survival of Darwin's finches.
 3. To involve local researchers and community in addressing threats to Darwin's finches.
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Cooperation partners outside the university sector

Institutions including Charles Darwin Foundation, Galapagos National Park

Cooperation partners from the scientific/research field

- External partners: network of 20+ researchers from 12 universities; we are members of the *Philornis downsi* Action Group; Kleindorfer was founding member in 2012
 - Internal partner at University of Vienna: Dr. Sabine Tebbich
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Faculty

Faculty of Life Sciences, core facility Konrad Lorenz Research Center for Behaviour and Cognition, Grunau im Almtal

Timeframe

2018 - offen

Funding

Third-party research funds (FWF)

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| Research basis | I have 55+ peer-reviewed publications on this system and was senior author on the first paper to discover and describe the life cycle of the novel parasite <i>Philornis downsi</i> . |
| Social/economic relevance | The outcomes of the research will have impact on biodiversity, animal welfare, and nature tourism economic viability. My team advises the Charles Darwin Foundation and Galapagos National Park about management options to control the invasive parasite informed by scientific on-ground research. If avian biodiversity collapses on the Galapagos islands as the result of an accidentally introduced parasite brought in via human activity, the negative financial impacts to tourism will be high including expected shifts in agriculture and ecosystem services when avian biodiversity changes. |
| Integration into academic teaching/the curriculum | I use this research as case study examples in 300013 VO Einführung in die Verhaltensbiologie, 300039 VO Einführung in die Ethologie and 300188 UE Ethologischen Übungen Grünau. |

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| Impact | We discovered a two-stage life cycle for the parasite <i>Philornis downsi</i> that was accidentally introduced to the Galapagos and developed novel methods of parasite removal using a plant-based insecticide that kills the parasitic larvae but does not harm the endemic birds. By targeting the treatment to particular life stages, we have identified the window of highest impact. Trials are currently underway to deliver permethrin-soaked materials in the field so that endemic Galapagos land birds can collect the material and self-fumigate their nests. |
| Transfer aspect of the activity | Knowledge transfer about all research insights are given annually and ad hoc to the Galapagos National Park and Charles Darwin Foundation for their approval and implementation of management tools that we have experimentally tested in the field. |

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| Future orientation & sustainability | The current biodiversity crisis is long-term by nature, and our research efforts are broadly applicable to introduced pathogens and disease in other parts of the world. For example, the methods we developed have been implemented to conserve birds in other island systems including Tasmania, Australia (forty-spotted pardalote). We are investing in students and graduates with skills in data analysis and experimental field tests to conserve flora and fauna. |
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| Achievement of objectives | The research activities by my team are reviewed annually by the Charles Darwin Foundation and the Galapagos National Park where they are listed as part of the Annual Plan. |
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Measures to sustain this activity over the long term/expand it

I submitted an FWF application in December 2020; I remain active within the interdisciplinary *Philornis downsi* network and am visiting and collaborating scientist with the Charles Darwin Foundation.

Visibility

Via websites and peer-reviewed publications

Links/Publications

- <https://www.darwinfoundation.org/en/datazone/checklist?species=10067>
 - <https://www.darwinfoundation.org/en/publications/identification-guides/field-guide-resident-landbirds-of-galapagos>
 - <https://rdcu.be/cdx75>
 - Kleindorfer, S., Dudaniec, R.Y. Host-parasite ecology, behavior and genetics: a review of the introduced fly parasite *Philornis downsi* and its Darwin's finch hosts. *BMC Zool* 1, 1 (2016). <https://doi.org/10.1186/s40850-016-0003-9>
 - Common, L.K., O'Connor, J.A., Dudaniec, R.Y., Peters, K.J. and Kleindorfer, S., 2020. Evidence for rapid downward fecundity selection in an ectoparasite (*Philornis downsi*) with earlier host mortality in Darwin's finches. *Journal of evolutionary biology*, 33(4), pp.524-533. <https://doi.org/10.1111/jeb.13588>
 - Fessl B, Sinclair, B & Kleindorfer S (2006). The life-cycle of *Philornis downsi* (Diptera: Muscidae) parasitizing Darwin's finches and its impacts on nestling survival. *Parasitology* 133(6): 739-747.
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