

UNIVERSITY OF CALIFORNIA

Los Angeles

Colonization and diversification on oceanic islands:
forest *Tarphius* and cave-dwelling *Trechus* beetles of the Azores.

A dissertation submitted in partial satisfaction of the
requirements for the degree Doctor of Philosophy
in Biology

by

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2005

ABSTRACT OF THE DISSERTATION

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Isolation and high levels of endemism make the Azorean archipelago an elegant system to study colonization and evolution on oceanic islands. Beetles (Coleoptera) are among the most diverse inhabitants of the Azores. Using molecular tools and the speciose genera *Tarphius* and *Trechus*, I test hypotheses regarding the origin and patterns of island colonization, as well as diversification within this archipelago. Field surveys revealed that some *Tarphius* and *Trechus* species are more wide spread than previously thought, and biospeleological expeditions led to the discovery of several new species of cave arthropods.

Based on the molecular data I collected, colonization of the Azores has been a rare event, and Madeira Island, the closest landmass, is the most likely source of colonists for both *Tarphius* and *Trechus* beetles. Once colonists arrived to the archipelago, inter-island dispersal played an important role in speciation and in the establishment of the phylogeographic patterns observed in both genera of beetles.

Many of the *Trechus* species found in the Azores are troglobites. This provides an opportunity to investigate speciation associated with the colonization of cave habitats. Molecular phylogenetic analyses revealed that dispersal of troglobites within an island is a function of distance, and that all troglobites are more closely related to each other than they are to surface species in the same genus. The most parsimonious explanation for the monophyly of cave species is that troglomorphy evolved only once in the Azores, which implies controversial over-sea dispersal of cave adapted forms.

Caves in which *Trechus* beetles were collected vary in levels of radon. This observation was used to test whether high levels of radiation caused acceleration of DNA mutation rate in the organisms living in those environments. The molecular markers used in this study failed to identify significant differences in mutation rates correlated to radiation exposure.

Finally, the data I present suggests that a taxonomic revision of *Tarphius* and *Trechus* beetles endemic to the Azores should be considered. My data also highlights the urgency of establishing a more comprehensive network of protected areas in the archipelago, in order to arrest the trend of insular extinctions and biodiversity erosion.

How to cite:

Amorim, I.R. (2005) Colonization and diversification on oceanic islands: forest *Tarphius* and cave-dwelling *Trechus* beetles of the Azores. Ph.D. dissertation, Department of Ecology and Evolutionary Biology, University of California, Los Angeles, 282 pp.