

Land iguanas under continuing threat on Galapagos archipelago

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The Galápagos Islands, which provided impetus and inspiration for Charles Darwin's seminal work, "On the Origin of Species", are home to unique populations of reptiles. Since the time of man's first visit in the 16th century to this crucial incubator for evolutionary theory, the islands' native plants and animals have faced grave challenges, including severe pressures from introduced species, habitat destruction and predation by man himself.

In some instances, this has led to reduced populations and even extinction. In the 20th century, conservation efforts began, but according to new research published this week in the scientific journal *Molecular Ecology* considerably more must be done to insure the long-term survival of land-dwelling iguanas on the archipelago.

In their new article, "Galapagos Land Iguanas Remnant Populations," an international coalition of scientists, led by Michel Milinkovitch, from the University of Geneva, Switzerland, detail their near-decade-long effort to assess the population genetics of land iguanas on the six islands where the reptiles occur today.

Population genetics is a cornerstone of modern evolutionary synthesis. It employs principles of molecular genetics and sophisticated data analysis to identify populations and characterize the genetic diversity within – and the levels of genetic differentiation among – these evolutionarily significant groups. Changes are influenced by the evolutionary forces of natural selection, genetic drift, mutation and gene flow. Scientists obtain

blood or tissue samples from subjects and examine multiple loci across their genome. In so doing, researchers are able to draw conclusions regarding relationships, genetic diversity and genetic drift among various populations.

Galápagos land iguanas diverged from the famous Galápagos marine iguanas 10 to 20 million years ago, and there are currently two recognized species of terrestrial iguanas; *Conolophus subcristatus* and *C. pallidus*.

Beginning in the 1930s, and continuing through the 1980s, various threatened populations of land iguanas were relocated from one island habitat to another, or were subject to captive breeding and reintroduction programs. Combined with the eradication of invasive species at some locations, this patchwork of dedicated conservation efforts by the Charles Darwin Foundation and the Galápagos National Park Service has undoubtedly preserved some native species from extinction, but unfortunately the records of these activities were not always detailed. As a result, the genetic diversity of captive and reintroduced populations is uncertain.

Given that genetic diversity within – and relationships among – populations are crucial for long-term species survival, the authors investigated genetic variation at nine nuclear microsatellite loci among more than 700 land iguanas from six island habitats. For comparison, the information obtained was compared with similar information gathered from 20 marine iguanas. This represents the first time that extensive and modern molecular genetic analyses have been applied to the study of these unique terrestrial reptiles. Results revealed four distinct "clusters" of iguanas, including two potential new species. Results also revealed that, while some populations enjoy robust genetic diversity, others do not. As such, they are at increased risk from any future changes in environmental pressures.

As noted by the authors, "Molecular data could prove of paramount interest for improving management of [off-site] captive populations and for guiding the development of proper [natural habitat] population survival and habitat management plans for this spectacular reptile."

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