

New study sheds light on Galápagos hawk evolutionary history

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Scientists at the University of Missouri-St. Louis used DNA sequences from feather lice to study how island populations of their host, the Galápagos Hawk might have colonized the Galápagos islands, home to the endangered and declining raptor.

The study, recently published online in the journal *Molecular Ecology*, focuses on genes from three parasite species restricted to the Galápagos Hawk. The scientists also sequenced the same genes in the hawk to compare levels of genetic variation across these distantly related species. They traced the family tree of each species across the eight-island range, which were each colonized by the hawks and its parasites.

Because the parasite's mitochondrial DNA was more variable than the host's, the parasite's family tree revealed how four of the hawk's eight populations were related to one another -- the stepping-stone manner in which, over time, the hawks colonized first one island, then another and another, carrying their lice as they went. These relationships were previously obscured due to the hawk's low genetic variation.

The scientists also suggested that their results demonstrate how symbionts of larger and more charismatic species, like hawk lice, can tell scientists a great deal about the history of life.

"The parasites are evolutionary heirlooms that were brought to the islands during the colonization of the hawk, but have continued to evolve along with their hawk hosts," said Noah Whiteman, who conducted this

study as part of his dissertation at UMSL and is now a postdoctoral fellow at Harvard University in Cambridge, Mass. “We had a great deal of trouble understanding how the island populations of the hawk were related to one another because of low genetic variation in the hawk’s DNA. The rapidly evolving lice that live their entire lives on these birds have helped illuminate their host’s evolutionary history.”

The Galápagos National Park and Charles Darwin Research Station are working to save Darwin’s archipelago from the fate of similar island systems. As part of this effort Patricia Parker, the E. Desmond Lee Professor of Zoological Studies at UMSL, forged a close working relationship with the two organizations to better understand the threats facing the island’s endangered birds. Parker initiated this collaboration by examining the basic biology and conservation genetics of the Galápagos Hawk and a few other species that she and her collaborators had studied previously.

A permanent resident found only in the Galápagos island, the Galápagos hawk has intrigued biologists for decades because of its unusual mating system, (cooperative polyandry) within some, but not all, island populations.

In this type of mating system, a single female hawk and up to eight male hawks, who are not close relatives, live in a stable territorial group and cooperate to rear chicks. This type of mating system is rare among birds, and understanding the sequence in which islands were colonized may reveal the point at which it first occurred, and thereby help us understand the evolution of cooperative behavior.

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