Raft or bridge: How did iguanas reach tiny Pacific islands?

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Scientists have long puzzled over how iguanas, a group of lizards mostly found in the Americas, came to inhabit the isolated Pacific islands of Fiji and Tonga. For years, the leading explanation has been that progenitors of the island species must have rafted there, riding across the Pacific on a mat of vegetation or floating debris. But new research in the January issue of *The American Naturalist* suggests a more grounded explanation.

Using the latest genetic, geological and fossil data, biologists Brice Noonan of the University of Mississippi and Jack Sites of Brigham Young University have found that iguanas may have simply walked to Fiji and Tonga when the islands were still a part of an ancient southern supercontinent.

The two islands, located about 2000 miles east of Australia, are home to several iguana species, and their presence there is "one of the most perplexing scenarios in island biogeography," Noonan says. The other islands in the region, and closest continental landmass, Australia, have no iguanid species at all. In fact the closest iguanids are found about 5,000 miles away in the Americas. So how did these species get to these remote islands?

Some scientists have hypothesized that they must have rafted there—a journey of around 5,000 miles from South America to the islands. There is some precedent for rafting iguanas. There are documented cases of iguanas reaching remote Caribbean islands and the Galapagos Islands on

floating logs. But crossing the Pacific is another matter entirely. Noonan and Sites estimate the trip would take six months or more—a long time for an iguana to survive on a log or vegetation mat.

So Noonan and Sites tested the possibility that iguanas simply walked to the islands millions of years ago, before the islands broke off from Gondwana—the ancient supercontinent made up of present-day Africa, Australia, Antarctica and parts of Asia. If that's the case, the island species would need to be old—very old. Using "molecular clock" analysis of living iguana DNA, Noonan and Sites found that, sure enough, the island lineages have been around for more than 60 million years—easily old enough to have been in the area when the islands were still connected via land bridges to Asia or Australia.

Fossil evidence backs the finding. Fossils uncovered in Mongolia suggest that iguanid ancestors did once live in Asia. Though there's currently no fossil evidence of iguanas in Australia, that doesn't necessarily mean they were never there. "[T]he fossil record of this continent is surprisingly poor and cannot be taken as evidence of true absence," the authors write.

So if the iguanas simply migrated to Fiji and Tonga from Asia or possibly Australia, why are they not also found on the rest of the Pacific islands? Noonan and Sites say fossil evidence suggests that iguana species did once inhabit other islands, but went extinct right around the time humans colonized those island. That's an indication that iguanas were on the menu for the early islanders. But Fiji and Tonga have a much shorter history of human presence, which may have helped the iguanas living there to escape extinction.

The molecular clock analysis combined with the fossil evidence suggests a "connection via drifting Australasian continental fragments that may have introduced [iguanas] to Fiji and Tonga," Noonan says. "The 'raft'

they used may have been the land."

The researchers say that their study can't completely rule out the rafting hypothesis, but it does make the land bridge scenario "far more plausible than previously thought."

More information: Brice P. Noonan and Jack W. Sites Jr., "Tracing the Origins of Iguanid Lizards and Boine Snakes of the Pacific." The American Naturalist 175:1 (January 2010).

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