Research group suggests Madagascar's unique animals arrived on rafts

March 20 2012, by Bob Yirka

Image: Wikipedia.

(PhysOrg.com) -- Ever since the island of Madagascar was first visited by people, some two thousand years ago, there has been speculation about the unique plants and animals that live on the world's fourth largest island; one where roughly ninety percent of the wildlife is found nowhere else. For many years, it was believed they came to be there during the time when the island was still physically connected to Africa, but that reasoning has fallen by the wayside as it has been shown that the island separated some 88 million years ago, while most of the animals that live there didn't arrive till just 60 million years ago, forcing evolutionary scientists to search for other explanations. Now new evidence by an international group of researchers is proposing that the animals got there by floating on rafts during a time when prevailing

currents would have made the journey more plausible. They have published a paper on their ideas in the *Proceedings of the National Academy of Sciences*.

Today, the distance between Madagascar and Africa is about 250 miles (400 kilometers), far enough to make the journey by raft virtually impossible due to a lack of fresh water to drink, not to mention overheating and sunburn. But, say the researchers, some 60 million years ago, things were different. During that time, the island was in a slightly different position. In particular, its northernmost edge hadn't started creeping into the southern equatorial current, which means ocean currents would have been able to flow from west to east, which would have helped tremendously. If the animals were to ride over, they would have done so accidentally due to finding themselves marooned on a raft made of natural vegetation torn from the ground during a cyclone, examples of which have been seen often enough in modern times to prove that it can happen. If such a situation did occur, it's possible the small raft could have been blown far out to sea by a storm that also deposited enough water on the raft to allow any animals aboard to survive the trip from Africa, or even Asia.

The researchers came to these conclusions after building a database of all the animals on the island and then working backwards using genetic evidence to pinpoint almost precisely the time frame that they diverged from their African cousins. Once they had that, they studied research findings regarding conditions on the Earth in that area and found that it was likely that the ocean currents could have been flowing east to west due to tectonic shifting.

The research team suggests that the animals would also have had time on their side. Over a span of millions of years, a rare event such as animals floating over could have occurred often enough to account for the animals that did make it over and who eventually began reproducing.

The team also points out that once the island shifted enough to change ocean currents, the numbers of animals reaching Madagascar diminished greatly, which explains why those that did make the trip lived in almost complete isolation, giving rise to the evolution of such exotic species.

More information: Spatial and temporal arrival patterns of Madagascar's vertebrate fauna explained by distance, ocean currents, and ancestor type, *PNAS*, Published online before print March 19, 2012, doi: 10.1073/pnas.1113993109

Abstract

How, when, and from where Madagascar's vertebrates arrived on the island is poorly known, and a comprehensive explanation for the distribution of its organisms has yet to emerge. We begin to break that impasse by analyzing vertebrate arrival patterns implied by currently existing taxa. For each of 81 clades, we compiled arrival date, source, and ancestor type (obligate freshwater, terrestrial, facultative swimmer, or volant). We analyzed changes in arrival rates, with and without adjusting for clade extinction. Probability of successful transoceanic dispersal is negatively correlated with distance traveled and influenced by ocean currents and ancestor type. Obligate rafters show a decrease in probability of successful transoceanic dispersal from the Paleocene onward, reaching the lowest levels after the mid-Miocene. This finding is consistent with a paleoceanographic model [Ali JR, Huber M (2010) *Nature* 463:653–656] that predicts Early Cenozoic surface currents periodically conducive to rafting or swimming from Africa, followed by a reconfiguration to present-day flow 15–20 million years ago that significantly diminished the ability for transoceanic dispersal to Madagascar from the adjacent mainland.