'Great speciators' explained: It's intrinsic

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The Splendid White-eye (Zosterops splendidus) is found only on the tiny island of Ranongga is one of seven species endemic to islands of the New Georgia Group, Solomon Islands. This species was among the original 'great speciators' described by Mayr and Diamond in PNAS over 30 years ago. Credit: C. Filardi/CBC-AMNH

New molecular research shows that birds within the family *Zosteropidae*—named white eyes for the feathers that frame their eyes—form new species at a faster rate than any other known bird. Remarkably, unlike other rapid diversifications, which are generally confined in their geography, white eyes have managed to diversify across multiple continents and far-flung islands spanning much of the eastern hemisphere. The research was published this week in *Proceedings of the National Academy of Sciences*.

White eyes have long been dubbed "Great Speciators" for their apparent ability to rapidly form new species across geographies where other birds

show little or no diversification. The idea has been gestating for nearly 80 years, since Ernst Mayr and Jared Diamond coined the term after encountering white eyes in the Solomon Islands. Each island they visited had distinct white eye species, whereas most other birds varied little from island to island. Thirty years ago, Mayr and Diamond could only guess at an answer, but both thought that some intrinsic trait was driving the extreme patterns observed among the white eyes.

"Their idea was spot on," says Christopher Filardi, Biodiversity Scientist for the Pacific Programs at the Center for Biodiversity and Conservation at the American Museum of Natural History. "There's something special about these birds. White eyes quickly diverge into new species across water gaps as narrow as a couple of kilometers—gaps that other birds easily bridge to maintain gene flow."

The new research paper demonstrates just how quickly white eyes can diversify. For a glimpse into key aspects of the white eye's evolutionary history, Filardi collaborated with Rob Moyle (University of Kansas), Catherine Smith (Missoula, Montana), and hypothesis originator Jared Diamond (currently at the University of California at Los Angeles). Looking at both nuclear and mitochondrial DNA, the team found that most of the 100-plus species in the *Zosteropidae* evolved very recently, even though the group is spread from Asia to Africa and into Oceania. The family emerged as a group between 4.46 and 5.57 million years ago, and the *Zosterops* genus (with about 80 species) exploded into a large number of species within the last 2 million years. The team calculated a rate of diversification in *Zosterops* and found that this genus has the fastest known rate among birds: between 2.24 and 3.16 species per million years.

"As we started to compile the data, we were shocked," says Moyle, Assistant Professor and Assistant Curator at the University of Kansas. "White eye species from across the family's range had strikingly similar

genetics, indicating a recent origin and incredibly rapid diversification."

To put these results in perspective, only a few vertebrates in the world, such as the cichlid fishes found in lakes of the African Rift Valley, exceed this rate of diversification. But while cichlid diversification can be explained by climate shifts and geological changes within their narrow geographic range, rapid speciation among white eyes cannot be linked to environmental factors because of their recent hemispheric spread. In their paper, the team supports the classical "Great

Speciator" hypothesis and suggests that intrinsic traits of white eyes drive the system. These traits include sociability, the ability to survive in a variety of habitats, and a short time between generations relative to other birds. Some species may also have become more sedentary over the course of evolution, similar to historically dispersive human populations that "settled down," minimizing further dispersal and gene flow. The team concludes that the new genetic data sheds light on the paradoxical ability of some organisms to rapidly form new species while simultaneously dispersing over large geographic distances.

"I am delighted to see this molecular evidence supporting ideas that I had only been able to guess at over the last several decades," says Diamond, a professor of the Geography Department at UCLA. "I know that Ernst Mayr, if he had still been alive, would have been delighted at this confirmation 78 years after he visited the Solomons."

Filardi adds, "This leaves the question: are the white eyes really special, or have we simply caught them at a special time in their evolution? That we don't know, but our results indicate that high rates of diversification may have as much to do with a species' 'personality' as they have to do with more classical geographic or geological drivers of speciation."

Source: American Museum of Natural History