Rethinking Classifications

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September 20, 2018
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Thinking about how animals are named, and sorted into species, genus, family, and so on can conjure images of scientists studying preserved specimens in museums, and putting a label on them, deciding where they fit in the tree of life. The study of systematics, however, is a much more dynamic field than many of us will give it credit for.

Systematics is the study of how every living creature has become a distinct species, how life has evolved throughout history, and how all sorts of species are related to each other. Talking about how chimpanzees and bonobos are the closest living relatives to humans, for example, is an issue of systematics; as are the scientific names and classifications given to each plant, animal, and microorganism.

Given the sheer number and variety of every type of organism, categorizing them all is a challenge. Scientists are continuously finding new evidence about how animals are related to each other. And each piece of evidence has the possibility of changing how an animal is classified. This means that as new evidence continues to come to light, systematics—and the tree of life—is constantly changing and evolving, like the species it is trying to classify.

In the past, scientists had to rely on classifying organisms by appearance. Animals that looked like each other were probably closely related. But as technology like genetic analysis continued to develop, scientists were able to take a much closer, and more exact look at how all of these organisms are connected. Because of technological advancements like this, the classifications of animals do not only get more complex, they can change entirely: An animal previously thought to be a member of a certain species can turn out to be a separate one entirely, or it can be a member of a different order or family.

A team of scientists, including Juan Carlos T. Gonzalez, currently affiliated with the University of the Philippines Los Baños, have published work that shows a prime example of how systematics and taxonomy is continuously changing. Their paper—published in the International Journal of Avian Science—looks at the taxonomic classification of the white-chested tinkerbird, which is endemic to Zambia.

A single tinkerbird was discovered. This specimen was unique; different from the common yellow-rumped tinkerbird (*Pogoniulus bilineatus*) because of the coloration of its feathers, as well as a handful of other differences like coloration on the legs and bill. Because of this, the scientists who discovered it decided that this was the first discovered specimen of a separate tinkerbird species, which they named *Pogoniulus makawai*. However, one notable issue with this is that since its discovery, a larger population of white-chested tinkerbirds has not yet been found. The question remains, then: Is the specimen found an individual from a rare species, or simple a rare variant of a more common one?

The original white-chested tinkerbird specimen (bottom) compared to other types of tinkerbird

In this new study, researchers compared the genetics of this single white-chested tinkerbird specimen with other species that it was supposedly closely related to, including its yellow-rumped counterpart. This brings a new angle to the question of its taxonomic lineage, since the scientists who originally discovered the specimen did not have access to this technology, and only had physical characteristics to base their classification off of.

The researchers took DNA samples from the actual original white-chested tinkerbird specimen. By combining the different DNA fragments they were able to extract, they managed to reconstruct the genetic sequences of a few particular genes.

The scientists also extracted DNA from *P. bilineatus*, the yellow-rumped tinkerbird, as well as several other types of tinkerbird, and assembled the same genes that they assembled from the white-chested tinkerbird specimen. By assembling these similar genes, they were able to compare differences in their genetic sequences using specialized computer software.

With the results of their genetic comparison, the scientists concluded that the white-chested tinkerbird was most likely just a variant or subspecies of the more common yellow-rumped tinkerbird, which would explain why a larger population has yet to be found.

However, like with many findings and conclusions in systematics and taxonomy, there is still room for investigation, and many ways this conclusion could change. For example, there is still the question of the several other morphological differences between the white-chested and yellow-rumped birds (the scientists determined that there were 13 of these differences in total). In addition, the yellow-rumped tinkerbirds that DNA was taken from were not from the same area that *P. makawai* was originally found in. Obtaining DNA from birds in those areas could reveal some local genetic variations, which could have lead to the development of a different species.

And maybe, an entirely new technique piece of technology could be developed, which could change the way scientists look at how these birds, as well as millions of other species are classified.

REFERENCE

Kirschel ANG, Nwankwo EC, Gonzalez JCT. Investigation of the status of the enigmatic White-chested Tinkerbird *Pogoniulus makawai* using molecular analysis of the type specimen. Ibis 2018; 160:673-680.

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