Study catches two bird populations as they split into seperate species

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A new study finds that a change in a single gene has sent two closely related bird populations on their way to becoming two distinct species. The study, published in the August issue of the *American Naturalist*, is one of only a few to investigate the specific genetic changes that drive two populations toward speciation.

Speciation, the process by which different populations of the same species split into separate species, is central to evolution. But it's notoriously hard to observe in action. This study, led by biologist J. Albert Uy of Syracuse University, captures two populations of monarch flycatcher birds just as they arrive at that evolutionary crossroads.

Monarch flycatchers are small, insect-eating birds common in the Solomon Islands, east of Papua New Guinea. Uy and his team looked at two flycatcher populations: one found mostly on the large island of Makira, the other on smaller surrounding islands. Besides where they live, the only discernable difference between the two populations is the color of their feathers. The birds on Makira have all black feathers. Birds on the smaller islands have the same black feathers, but with a chestnut-colored belly.

The question of whether these two populations are on the road to speciation comes down to sex. When two populations stop exchanging genes--that is, stop mating with each other—then they can be considered distinct species. Uy and his team wanted to see if these flycatchers were heading in that direction.

It would be all but impossible to try to catalog every occasion on which an all-black flycatcher mated with a chestnut-bellied. So Uy and his team used another test.

Flycatcher males defend their mating territories. If a potential rival male enters another's territory, fights often ensue. If all-black males react less violently to chestnut-bellied males and vice versa, that's an indication that the two don't recognize each other as reproductive rivals. If they don't see each other as rivals, then one can assume that mating between members of the two populations is rare.

So Uy and his team made all-black and chestnut-bellied taxidermy models. They used the models to invade mating territories in each population. As expected, when all-black birds were presented with all-black models, they attacked. But when all-black birds encountered chestnut-bellied models, they were much less likely to go on the offensive. The same scenario held for the chestnut-bellied birds.

That males from the two populations no longer view the other as a reproductive threat is a good indication that not much mating is taking place between the two groups. Their evolutionary paths are diverging, Uy and his team found—all because of a change in plumage.

The researchers then went a step further. They looked into the birds' genomes to see what genes may have played a role in the different plumage pattern. They found only one: the melanocortin-1 receptor gene (MC1R). The MC1R gene regulates the production of melanin, which gives skin and feathers their color. The all-black and chestnut-bellied birds had different versions of the MC1R gene, which gave rise to the plumage change.

That change appears to have been enough to create a reproductive barrier for flycatchers. Not every species is so picky, so a color change

doesn't always drive speciation. Nonetheless, these results suggest that it can take as little as one gene, in the right spot in the genome, to cause a fork in the evolutionary road.

More information: J. Albert C. Uy, Robert G. Moyle, Christopher E. Filardi, Zachary A. Cheviron, "Difference in Plumage Color Used in Species Recognition between Incipient Species Is Linked to a Single Amino Acid Substitution in the Melanocortin-1 Receptor." *The American Naturalist* August 2009.

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