

Dr. Roberts' answers to questions

From minute papers:

1. Can the expression of other genes in Cichlids be altered similarly to jaw size through genetic combinations of species?

I think you are asking if hybrids can be used to map genes related to traits other than jaw shape. If so, the answer is yes! There have been great studies using the same strategies to map the genetic basis of pigmentation, vision, sex determination, and body morphology. My lab currently has projects tackling behavior and intestinal phenotypes using mapping in hybrids.

2. When the speaker discussed the colonization of new lakes by cichlids he said that scientists determined that two species colonized these new lakes. How were the scientists able to determine this number of species and do they know which ones they were?

Great question, and still the subject of controversy. For some time it was thought that it was just one species, but a recent study suggests that six may be a better estimate. These studies use genetic information, comparing all of the species in the lake to species that are thought to represent possible ancestors. In the case of the estimate of six ancestors, the estimate was inferred from finding six distinct mtDNA sequences in the lake. So, maybe I should have said "six" instead of "two", but it is still a surprisingly small estimate given the 1,000 or so species in the lake today. Also, all six potential ancestors belong to a single genus, and weren't nearly as phenotypically diverse as the current species.

3. Our speaker mentioned similarities in all the dog breeds and all the cichlids. So my question, based on that is: Why are cichlids considered different species but dogs are not considered different species?

Basically, "gene flow" under natural circumstances (the biological species concept). Dog breeds are maintained by artificial selection, and given the chance, dogs aren't picky about only mating within their own breed. Cichlid species only mate within their own species in the wild, and human intervention is required to get them to hybridize.

4. What is next for the cichlids? Especially as the East African Rift Valley widens and East Africa actually leaves the continent?

If major continental movements open the lakes to the ocean, that would be bad news for cichlids, since they are not adapted to salt water (though if salt concentration rose gradually, perhaps they would have time to adapt). Some species could persist by retreating to the freshwater rivers that flow into the lakes. A more immediate threat to cichlids is man-made, especially in Lake Victoria. Pollution and eutrophication has made the water cloudy, and some of the species that rely on visual cues to distinguish each other are now hybridizing. Additionally, the introduction of non-native fish species has had serious negative impacts on the native cichlids.

5. I'd like to know if the lab that bred hybrid cichlids had advantages/disadvantages. It seems like an intermediate jaw wouldn't work well.

This is an interesting question, and gets to the idea of whether jaw shape differences are actually "adaptive" and provide a fitness benefit. The intermediate fish do just fine in the lab, where they are fed easy-to-eat flake food. It would be interesting to do a competition experiment between parental species and hybrids in a controlled semi-natural environment (like a man-made pond) to see if the parental species fare better.