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EVIDENCE FOR THE IMMIGRATION HYPOTHESIS
IN THE ENDEMIC CICHLID FAUNA OF LAKE
TANGANYIKA

sities could have been generated by intralacustrine radiation from single lineages within each lake.

We have examined representatives of eight genera from Lake Tanganyika and ten genera from Lake Malawi for 13 isozyme loci by starch gel electrophoresis. Cladistic analysis of the electrophoretic data were performed with tilapines as outgroups using Distance Wagner (5,6) and PAUP (7) routines.

Only slight genetic differences exist among Malawi endemics, including representatives of the genera *Cyrtocara*, *Rhamphochromis*, *Docimodus* and *Hemitilapia*, as well as Mbuna genera (see 8). There is no indication that the Malawi cichlid fauna is polyphyletic. In contrast, relatively low similarities characterize several Tanganyikan taxa ($I_N = 0.429 - 0.786$). Cladistic analyses demonstrate that at least one Tanganyikan species, *Cyphotilapia frontosa*, is more closely related to members of the Malawi species flock than it is to the other studied genera from Lake Tanganyika. These results unambiguously indicate that the Tanganyikan cichlid fauna is polyphyletic and suggest that the origin of at least part of this fauna is consistent with the immigration hypothesis. However, between lake comparisons of morphologically similar taxon-pairs, specifically postulated to reflect interlake affinities, indicates that similarity is due to convergence. More comprehensive comparisons among all the major African cichlid flocks will be necessary to evaluate the general importance of the immigration hypothesis to cichlid radiation.

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The origin of the cichlid species flocks of the African great lakes is a major evolutionary problem. One idea for the development of these extremely speciose faunas is the hypothesis that a number of independent cichlid lineages originally contributed to any one species flock, the immigration hypothesis (1). Because of the marked differences among endemic genera in Lake Tanganyika, it has been generally believed that its cichlid fauna includes representatives of such independent lineages (2). If true, this might explain some of the striking similarities exhibited between species from Lakes Tanganyika and Malawi (3,4). Alternatively, endemic cichlid diver-