I CAN SEE CLEARLY NOW: INSIGHTS FROM STABLE ISOTOPIC ANALYSES TO ECOLOGICAL AND EVOLUTIONARY DYNAMICS OF HAPLOCHROMINES IN THE AFRICAN GREAT LAKES.

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The Great Lakes of Africa, Victoria, Malawi and Tanganyika, each host endemic species flocks which together account for a disproportionate share of the global diversity of freshwater fish. This diversity is overwhelmingly contained in one family, the Cichlidae, particularly within the subfamily Pseudocrenilabrinae which has several tribes in the African Great Lakes (commonly and collectively referred to as haplochromines). Haplochromines have undergone spectacular evolutionary radiation in each lake. This extensive and apparently rapid diversification has fascinated evolutionary biologists while confounding fisheries management which attempts to maintain this diversity. In each endemic flock, trophic selection pressures have been invoked to explain the evolution of functional morphologies, especially in the cranial and jaw structures, as well as evident differences in behavior allowing utilization of different habitats. Stable isotope analysis of these species-rich communities, provides clear evidence that morphologically distinct species have significantly disparate diets or feed in distinct habitats. Species-rich communities with high population densities are able to maintain isotopic distinction even among closely related species. Despite this distinction, isotopic analysis of pelagic and littoral benthic communities in Lake Tanganyika demonstrate a significant dependence of the littoral communities on pelagic food sources, except among the obligate benthic algal grazers. Cichlids are highly visual and loss of water transparency can obliterate selective feeding and breeding. Closely related sibling species can become distinct or indistinct in their isotopic composition as environmental conditions change. Increasing water transparency along a turbidity gradient in Lake Victoria allowed sibling species to become more selective in prey, feeding habitat and mate selection as waters clarify. Similarly comparison of modern haplochromine species with historic specimens from museum collections from Lake Victoria demonstrate modification of prey selection in

response to changes in turbidity and light penetration as a result of the eutrophication of the lake. Evolution of species-rich haplochromine communities is most explosive and rapid in the littoral where clear water interfaces with habitat complexity to allow these fishes to exploit a broad range of trophic opportunities as well as enabling sexual selection. Maintaining clear waters is the first line of protection for the remarkable diversity of the African Great Lakes and all their trophic and behavioral innovations.