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SHORT COMMUNICATION

FIRST REPORT OF THE MAYAN CICHLID, *CICHLASOMA UROPHTHALMUS* (GÜNTHER 1862) COLLECTED IN THE SOUTHERN LITTORAL ZONE OF LAKE OKEECHOBEE, FLORIDA

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Introduction

The Mayan cichlid, *Cichlasoma urophthalmus* (Günther 1862), is a native freshwater fish of tropical America. Its natural distribution ranges from southern Veracruz in Mexico to Nicaragua, including the entire Yucatan peninsula (Miller 1966, Kullander 2003). Mayan cichlids in their native region have been found in both fresh and brackish waters (Miller 1966). Several studies have documented their ability to thrive in a wide range of salinities (Martinez-Palacios et al. 1990, Chavez-Lopez et al. 2005) and water temperatures (Stauffer and Boltz 1994). Mayan cichlids generally prefer well-oxygenated habitats with deep, transparent water and submerged aquatic vegetation (Chavez-Lopez et al. 2005), but also have been observed to withstand virtual anoxia for more than two hours in the laboratory (Martinez-Palacios and Ross 1986). Their robustness has allowed this species to thrive in many different aquatic habitats in the south Florida region including Florida Bay (Loftus 1987), Naples on the west coast (Faunce et al. 2002), Lake Osbourne in West Palm Beach (Fuller et al. 1999), and as far north as Charlotte Harbor (A. Adams, pers. comm., Mote Marine Laboratory, Sarasota, FL). It remains unclear how this species was initially introduced to Florida, but it is speculated that it was accidentally released from private aquariums. Loftus (1987) and Trexler et al. (2000) note that although initial densities of Mayan cichlids in Florida Bay fluctuated when first introduced, they have since reached higher numbers and have become established in that region.

Here we report the collection of five juvenile Mayan cichlids in Lake Okeechobee, a large, shallow subtropical lake (26°60'N, 80°50'W) (Figure 1). These specimens were collected on 4 and 10 November 2003 in the southern littoral zone of Lake Okeechobee at a site off the southwest tip of Torry Island (26°42'N, 80°44'W). The lake stage of this densely vegetated area is highly variable. Nico (in press) reported a single collection of 16 juvenile Mayan cichlids in 2001 from a backwater area in the rim-canal along the NE portion of Lake Okeechobee (Figure1); an area that is hydrologically isolated from the lake proper, except for several navigation locks and water control structures.

Materials and Methods

Five specimens were collected with a 1 m^2 aluminum throw trap during fish surveys by the South Florida Water Management District (SFWMD). After deployment of the trap, vegetation was harvested using rakes, aquatic weed cutters, and/or manual removal of plants. Fish were collected with a 600 µm mesh "D-shaped" dip net. Net sweeps were repeated until six consecutive sweeps yielded zero fish. Fish were placed in plastic Whirl-Pak™ bags and kept on ice. Standard lengths (SL, mm, ± 0.01) were measured using a digital micrometer and specimens were weighed (wet weight, ± 0.01g). Fish were then fixed in 10% formalin and then transferred to 70% ethanol. One specimen each was submitted to the Florida Museum of Natural History, Gainesville, Florida, and to the Ichthyology Museum at the University of Southern Mississippi. To assess diet, we removed and examined the digestive tracts of two additional specimens. Gut contents and prey items were identified to lowest possible taxonomic category.

Results

Cichlasoma urophthalmus specimens were collected and identified based on the following combination of characteristics: shape of body and snout, dark bands on body side, intense dark blotch at the caudal fin base, dorsal spine count of XV (range from XV–XVII), anal fin spine count of V (range is V–VI), and conical shape of teeth (identification verified by Nico).

The range of fish (n = 5) collected was 18.71 to 34.94 mm ($\bar{x}$ = 25.07 mm SL) and wet weight ranged from 0.16 to 1.17 g ($\bar{x}$ = 0.51 g). Four of the five Mayan cichlids were collected from dense beds of *Hydrilla verticillata*, an exotic submerged aquatic plant (Havens 2003). The remaining individual was captured in a giant bulrush stand (*Scirpus*

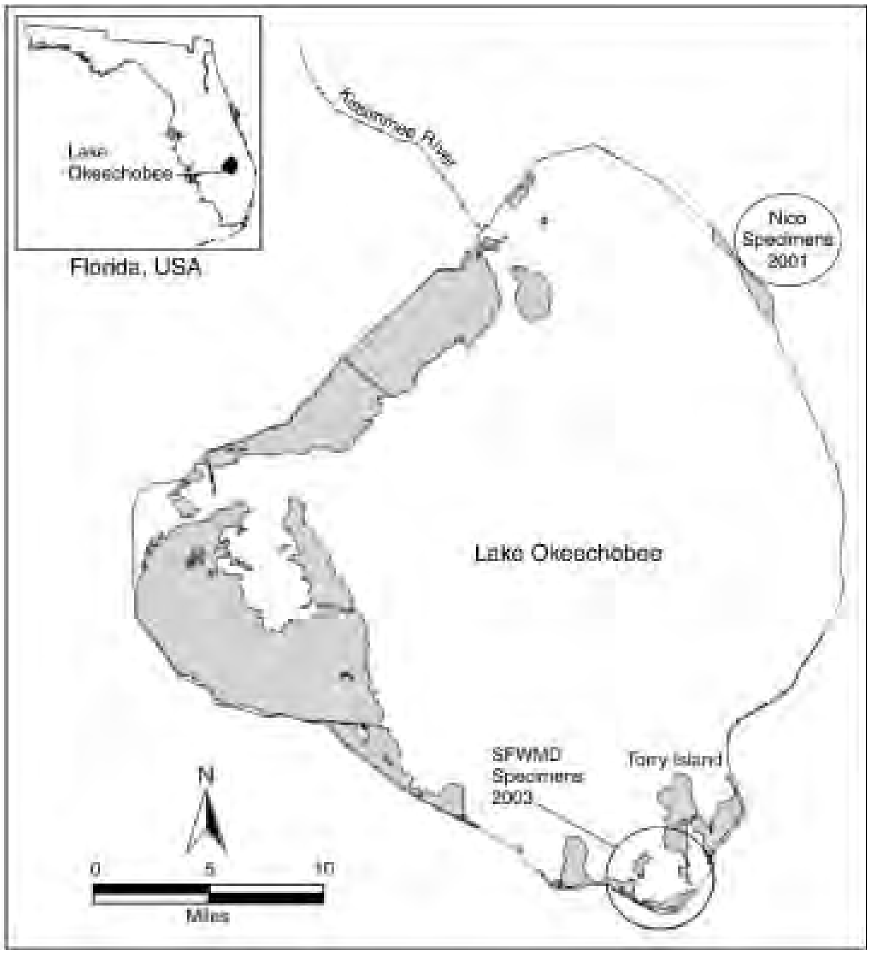

Figure 1: Map of Lake Okeechobee, Florida, noting collection sites of this study and those of Nico 2001.

californicus). Other fish collected included the golden topminnow (*Fundulus chrysotus*), bluefin killifish (*Lucania goodei*), flagfish (*Jordanella floridae*), eastern mosquitofish (*Gambusia holbrooki*), least killifish (*Heterandria formosa*), and sailfin molly (*Poecilia latipinna*).

Digestive tract analysis of two specimens (18.71 and 22.32 mm SL) yielded more than 99% detritus, fish scales the posterior half of an unidentified amphipod, and partially digested remains of a terrestrial insect.

Discussion

Although the mode of introduction of Mayan cichlids in Florida cannot be determined conclusively, it is evident this species is capable of expanding its range. Mayan cichlids were reported in southern Florida for the first time in 1983 from samples collected in Everglades National Park (Loftus 1987). It was determined from that study that Mayan cichlids were restricted to the Taylor Slough drainage basin; however, Shafland (1996) reported that Mayan cichlids had spread and become abundant in several canals and rivers of southern Florida, including the C-111, and the more northern C-7 canal. Faunce et al. (2002) have also reported Mayan cichlids in Naples, on Florida's west coast, and further north and east in West Palm Beach.

Opportunistic feeding behavior and a tolerance to a wide range of salinities are characteristics that may facilitate the success of the Mayan cichlid in new habitats and enhance its spread into new locations in Florida. Arthington and Mitchel (1986) have suggested that this species is a generalist feeder. Bergman and Motta (in press) support this claim with fish collected from Big Cypress National Preserve concluding that the Mayan cichlid demonstrates a generalist diet throughout its ontogeny and primarily consumes detritus, vegetation, gastropods, crustaceans, insects, and fish. Caso-Chavez et al. (1986) and Chavez-Lopez et al. (2005) found that Mayan cichlids ate mostly plant material and supplemented their diet with crustaceans, insects, and mollusks. In contrast, in Mexico, the Mayan cichlid has been classified as a carnivore because it appears to prey primarily on small animals (Martinez-Palacios and Ross 1988).

The distribution and feeding ecology of the Mayan cichlid in Lake Okeechobee is largely unknown, although our limited gastro-intestinal tract analysis would seem to support generalist feeding behavior, at least for juveniles. The systematic collection of juvenile Mayan cichlids in the southern end of Lake Okeechobee, Nico's (in press) collection from the NE rim-canal, and anecdotal accounts of captures by fishermen from widely distributed locations throughout Lake Okeechobee suggest this species is ubiquitous in the system. However, we have yet to observe any recruitment, spawning, or nesting behavior; key factors that define an established community (Loftus 1987). An adult Mayan cichlid was recently captured in the Kissimmee River, a major tributary that flows into the northwestern corner of the lake (L. Glenn, pers. comm., SFWMD, West Palm Beach, FL). To our knowledge, this is the most northern specimen collected in the Lake Okeechobee watershed.

Further research on the potential impact of Mayan cichlids on native fish populations and its role in the trophic structure of Lake Okeechobee is warranted since the species appears to have the potential to become a common member of the littoral zone community. The distribution of invasive fish species such as the Mayan cichlid in south Florida is highly variable and is possibly a function of habitat preference, spatial relationship of sampling area to point of introduction, and ambient temperature changes (Trexler et al. 2000). For Mayan cichlids in the Everglades, Trexler et al. (2000) reported that annual minimum temperature affected species abundance, and that introduced species required time to expand from their point of introduction. Further investigation may provide insight into how and where the Mayan cichlid was introduced to Lake Okeechobee, and how to monitor and regulate its population growth.

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