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Two Significant Records of Exotic Tropical Freshwater Fishes in Southern Alabama

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Abstract - Incidental observations of aquatic exotic species may represent important early indicators of established populations. Herein we report ecologically significant observations of 2 exotic fish taxa in southern Alabama—*Pterygoplichthys disjunctivus* x *pardalis* (Amazon Sailfin Catfish) and *Oreochromis niloticus* (Nile Tilapia). Our observations establish the presence and confirm reproduction, respectively, of these species in the state.

Aquatic exotic species have become established throughout much of the southeastern United States (Nico and Fuller 1999) and they contribute to the tremendous ecological and economic impacts of nonindigenous introductions in this country (Pimentel et al. 2000, Ricciardi and Rasmussen 1999). For example, exotic species may contribute to the relatively high rates of aquatic species extinctions in the region (Gurevitch and Padilla 2004, Wilcove et al. 1998). The primary means of introduction for exotic fishes in the southeastern US include the pet trade and aquaculture. Early detection of potentially invasive species in a given area is extremely important when designing plans to manage them (Holden et al. 2016), but systematic surveys are rarely completed. Therefore, incidental encounters of exotic species suggest the presence of established populations and might stimulate additional surveys.

In 2014, we conducted a mark–recapture study of turtles in Baldwin and Mobile counties, Alabama. To trap turtles, we used hoop nets with lead lines (trammels) with the intervening trammel-net functioning as a drift fence to intercept and direct turtles into the unbaited hoop nets. Hoop nets were 1.2 m in diameter and double-throated (i.e., with a pair of internal funnels). We focused our trapping efforts in shallow, muddy-bottomed, tidally influenced rivers; the riparian vegetation in the areas where we trapped ranged from broad, open marshes to shrub–tree zones.

During turtle trapping, we recorded 2 exotic fish species as bycatch that represent ecologically significant observations for Alabama (Table 1), including *Pterygoplichthys disjunctivus* Weber x *pardalis* Castelnau (hybrid Sailfin Catfish; Fig. 1) and *Oreochromis niloticus* L. (Nile Tilapia) brooding eggs. Herein we provide information on these captures as well as relevant information previously reported in the nonindigenous aquatic species database maintained by the US Geological Survey (2016).

The nearest previously reported record of *P. disjunctivus* to our capture site was observed in the Pearl River near Jackson, MS, in 1992 (USGS 2016). The nearest *P. pardalis* record to our study site is from 2009 in central Florida, and that specimen was identified as *Pterygoplichthys* based on having >7 branched dorsal-fin rays and no hypertrophied odontodes on the cheek per Armbruster (2004) and via the key in Armbruster and Page (2006). There are numerous additional records of that species from southern Florida (USGS 2016). In 2007, two specimens of *O. niloticus* were reported from the Weeks Bay watershed where we captured our animal (USGS 2016); several other specimens have been collected

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in Mississippi. The significance of our 2014 record is that it confirms that this species is reproducing in Alabama.

P. pardalis Castelnau (Amazon Sailfin Catfish) is native to much of the lowlands of the Amazon River Basin of South America, and *P. disjunctivus* Weber (Vermiculated Sailfin Catfish) replaces it in the Madeira River drainage of the Amazon Basin (Armbruster and

Table 1. Morphological data, sex, and reproductive state associated with 2 records of non-indigenous aquatic species observed in the Mobile Bay Watershed, AL, in 2014.

	Specimen 1	Specimen 2
Species	*Pterygoplicthys disjunctivus* x *pardalis*	*Oreochromis niloticus*
Family	Loricariidae	Cichlidae
Accession number	AUM 63166	AUM 63560
Collection date	30 May 2014	11 July 2014
State	AL	AL
County	Mobile	Baldwin
Watershed	Dog River	Magnolia River
Latitude	30.58735	30.39159
Longitude	-88.12598	-87.79568
Collectors	J.C. Godwin, A.M. Godwin, G.W. Godwin	J.C. Godwin, D.A. Steen
Identified by	J.W. Armbruster	D. Werneke
Sex	female	female
Standard length	233 mm	255 mm
Wet mass (70% ETOH)	215.7 g	610.0 g
Reproductive condition	Eggs inside body cavity (likely released from the ovaries after death as tissue deteriorated)	Eggs in mouth at time of capture and exhibited bright pink breeding coloration on throat and abdomen

Figure 1. Lateral and ventral views of *Pterygoplicthys disjunctivus* x *pardalis* (AUM 63166) collected from Dog River, Mobile County, AL.

Page 2006, Weber 1992). Differences between the 2 species are subtle: lines on the posterior portion of head of *P. pardalis* vs. spots in *P. disjunctivus*, and most of the spots free on the abdomen with only some combining to form vermiculations in *P. pardalis* vs. all spots joined into a network of lines in *P. disjunctivus* (Fig. 1). Using these characters, our specimen is clearly the *P. pardalis* morphotype. Despite Weber's (1992) revision, more work is needed to determine the range of variability of color in *P. pardalis* to determine if *P. disjunctivus* is distinct. Specimens identified as both species are widely established in peninsular Florida and locally established in other southeastern states (USGS 2016); however, it is likely that the introduction was actually a hybrid of the 2 species. Wu et al. (2011) found that *Pterygoplichthys* in Taiwan confidently identified as *P. pardalis* had *P. disjunctivus* mitochondrial DNA and vice versa, and that many specimens had intermediate morphologies. They found evidence for free gene-flow from the *P. pardalis* morphotype and the *P. disjunctivus* morphotype indicating that either *P. disjunctivus* was not valid, or aquarium specimens were the result of an early hybridization event. Based on extensive examination of specimens and photos of introduced specimens from around the world by J.W. Ambruster (unpubl. data) and previous revisionary work on the genus (Armbruster and Page 2006), we recognize that introduced specimens worldwide, as well as specimens from the aquarium trade, range in morphology from *P. pardalis* to *P. disjunctivus* and should, per Wu et al. (2011), be classified as hybrids. Suspected mechanisms of introduction are aquarium releases and escape from fish farms, but we know of no fish farms in southern Alabama that could be a source of the species. Impacts attributed to presence of *Pterygoplichthys* include increased siltation due to riverbank excavation by male fish and potential destabilization of banks and increased erosion. *Pterygoplichthys* species graze on algae, benthic organisms, and detritus, and they may potentially affect indigenous invertebrate communities (USGS 2016). Our specimen was an adult with ripe ovaries, suggesting that *Pterygoplicthys* may be reproducing in Alabama.

Nile Tilapia are native to tropical and sub-tropical Africa and the Middle East and have been widely used in aquaculture, which is the primary route of introduction into North American waters. This species is established in Mississippi, Florida, and likely Georgia (USGS 2016). Our observation suggests that they are also established in Alabama. Nile Tilapia feed on aquatic macrophytes, prey on native fishes and amphibians, and compete with native fishes (US Geological Survey 2016).

Although we were not looking for exotic fishes in southern Alabama, we found 2 species of potential environmental or economic concern. It is likely that studies conducted specifically to detect exotic aquatic species in Alabama would generate new and important information about the presence, distribution, and demography of these animals in the state. In particular, a combination of traditional and eDNA (environmental DNA) sampling in a systematic sampling framework might generate important insights (Lodge et al. 2012).

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