

Population Dynamics of Introduced Sunfish Species (*Lepomis spp.*) to Tropical Reservoirs

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Introduction

Three species of sunfish (redeer, redbreast, and bluegill) were introduced in Puerto Rico's reservoirs decades ago to expand anglers' opportunities and as forage for predator species.



Redbreast Sunfish
Lepomis auritus



Redear Sunfish
Lepomis microlophus



Bluegill Sunfish
Lepomis macrochirus

Methods

Since 2006, we have been monitoring these fish via boat mounted electrofishing.



Fish were measured (TL) and weighed, and data analyzed to obtain relative abundance and Catch Per Unit Effort (CPUE).

For many years, all sunfish species had shown "stable" populations. However, in recent years a rapid decline, particularly in redear sunfish, which previously was extremely abundant, was detected.

In some reservoirs, the redear sunfish CPUE decreased from 27 fish/hour (2006) to 10 fish/hour (2012) while in others, they have disappeared, declining from 20 fish/hour (2006) to 0 fish/hour (2013). The same trend has been observed with the two other sunfish species that have disappeared from the majority of the monitored reservoirs.



Map of Puerto Rico identifying the following reservoirs: 1-Guayo (118 ha), 2-Dos Bocas (254 ha), 3-Caonillas (280 ha), 4-Guayabal (131 ha), 5-Toa Vaca (342 ha), 6-Loiza (388 ha), 7-Cidra (171 ha), 8-Carite (133 ha), 9-Patillas (137 ha)

Hypotheses

1) Predation on sunfish eggs and juveniles and competition for food by the invasive Red Devil cichlid (*Amphilophus labiatus* and *Amphilophus citrinellus*).



Redear Sunfish – mollusks (snails) and benthic aquatic insect larvae
Bluegill Sunfish - insects, crustaceans and some vegetation
Redbreast Sunfish – crustaceans, insects and small fishes

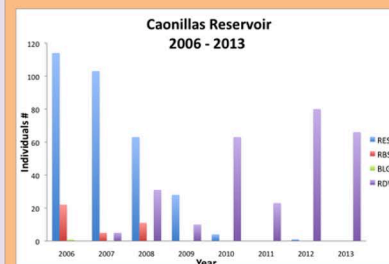
Red Devil – snails, small fishes, insect larvae, worms, other bottom-dwelling organisms and aufwuchs (periphyton)

2) Natural variations in sunfish populations over time.

Results

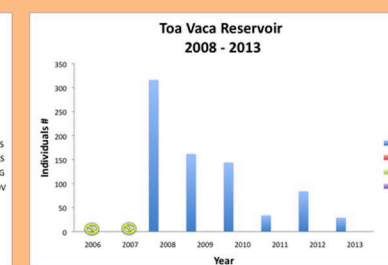
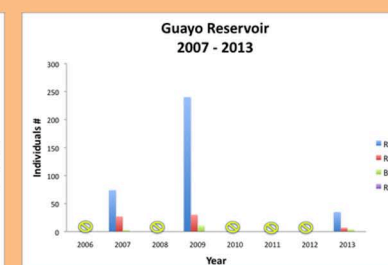
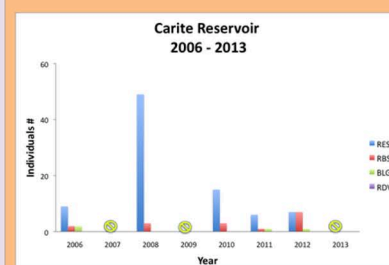
Correlation Between Sunfish and Red Devil

No sampling was performed

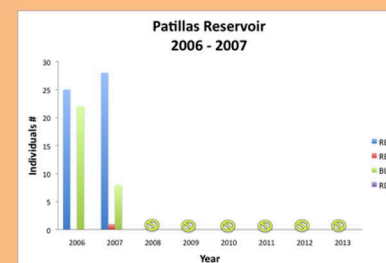


In Caonillas reservoir, Sunfish were present at the beginning of the sampling period at high relative abundance. As the Red Devil was detected, the Sunfish abundance was decreasing. In 2013 no Sunfish were detected in the electrofishing sampling. An inverse correlation between Sunfish and Red Devil is evident.

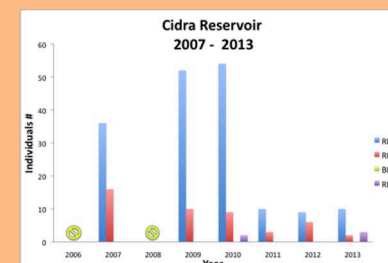
At Carite, Guayo and Toa Vaca reservoirs, the Red Devil is not present and the Sunfish population (the three species in Carite and Guayo) was present during the sample period. However, a decrease in Sunfish population is detected.



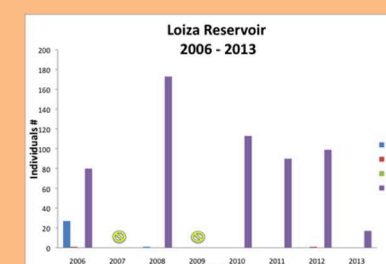
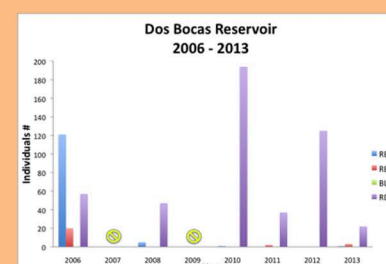
Patillas and Guayabal reservoir were the least sampled reservoirs during the sampling period. Both reservoirs presented high relative abundance of Sunfish. In Patillas reservoir, the three Sunfish species were present. The Red Devil was not present during the years that they were monitored but at the present we don't know if it has established there.



In Cidra reservoir, the presence of the Red Devil was first detected in 2010. Although the Sunfish population remains present, a decrease in the abundance is evident.



In these two reservoirs, the Red Devil was present from the beginning of the sampling period. The Sunfish abundance decreased considerably and in some years Sunfish were not detected in the electrofishing sampling.



Discussion

The Red Devil was first registered in Puerto Rico reservoirs in 2000. Since then, it has established in the majority of the island reservoirs and could be affecting the Sunfish populations. Other impacts are likely, but have not been observed yet.

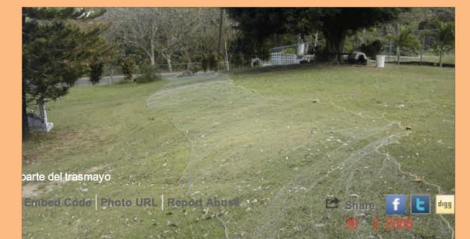
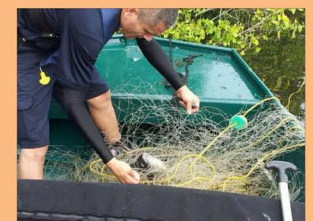
Predation on sunfish eggs and juveniles and competition for food by the invasive Red Devil cichlid.

- All species exhibit diet overlap based on literature references.

Natural variations in sunfish populations over time.

- Little data exists on natural variations in sunfish populations in PR reservoirs. However, in the absence of red devils, extirpation of sunfish has not been observed to occur.

Many reservoirs in Puerto Rico are subject to severe poaching by gillnets, and this may also influence sunfish abundance. In PR fishing regulations, there is no daily quota for sunfish, or red devils, but reservoir commercial fishing is prohibited.



We recognize that attributing sunfish decline to the introduction of invasive red devil cichlids is speculative at this time and the only evidence is circumstantial. However, red devil cichlids are known to be extremely aggressive predators and there is little doubt that their presence complicates reservoir fisheries management in Puerto Rico and likely contribute to the decline and disappearance of sunfish species. It is recommended that more detailed studies of the impact of this species be promoted.

Preliminary indications suggest that the introduction of Red Devil cichlids in tropical reservoirs outside their natural range could have serious impacts on sportfish species.

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