

Fish Sampling of the Constructed Wetland on the Natomas Basin Conservancy's BKS Tract

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EXECUTIVE SUMMARY

We took advantage of an opportunity to sample populations of non-native predatory fish in one of the marshes created and managed by the Natomas Basin Conservancy when the marsh was drained for routine maintenance purposes. Both largemouth bass and green sunfish were present in the marsh. Green sunfish appear to be too small to pose a significant risk of predation to giant garter snakes, although they may compete with giant garter snakes for prey. Largemouth bass pose a greater risk to giant garter snakes and management actions to control their populations may become necessary in the future.

INTRODUCTION

Concern has been raised over the potential negative effects of populations of large, non-native fish on the federally threatened giant garter snake. To begin to assess this potential threat, the Conservancy took advantage of an opportunity to sample these fish populations in one of their marsh cells in the Central Basin Reserve when the cell was drained for routine maintenance purposes.

METHODS

On November 18, 2008, Donna Maniscalco and Marin Greenwood of ICF Jones & Stokes conducted fish sampling in the constructed wetland immediately northeast of water control structure K on the Kismat tract. The objective was to determine the species composition and size distribution of fish present in the marsh. When the sampling began, the wetland had been drained to the maximum extent possible. Less than 2 feet of water remained in the open water channels of the marsh in several connected small ponds. Sampling was conducted in two separate areas. The margins of the ponds had a layer of soft mud about 6 inches deep, whereas the substrate in the ponds was muddy but firm. The dominant vegetation surrounding the ponds was tule. Portions of each pond had submerged algae. The water was

very turbid, particularly in regions where common carp were disturbed during sampling.

Sampling was accomplished by hauling a 50-foot center-bag seine (1/8 inch mesh) perpendicular to shore for a distance of about 50–65 feet in each pond. Fish were collected by bringing the wings of the seine together at the shoreline. At each location, the species of each fish was identified and either all individuals or a subsample were measured. Fork Length (FL, measured from the tip of the nose to the center of the tail in fish with forked tails) was measured on carp, bass and sunfish, and (SL) standard length (tip of the nose to the base of the tail) was measured on mosquitofish.

It was noted at the time sampling was conducted that there were large numbers of Great blue herons, Great Egrets, and Snowy egrets present in the area surrounding the drained marsh. It was clear that many of the fish had escaped as the water was drained, and that many of the stranded fish had been consumed by the numerous predatory birds in the area.

TABLE 1. Size and Relative Abundance of Fish Sampled in the BKS Ponds

SPECIES	NUMBER CAUGHT	NUMBER MEASURED	MEAN LENGTH (INCHES)	LENGTH RANGE (INCHES)
Common Carp	152	29	10.5"	5.9–21.9"
Largemouth Bass	12	9	7.9"	6.4–8.1"
Green Sunfish	20	20	3.0"	1.5–4.6"
Western Mosquitofish ¹	7	7	0.8"	0.5–0.9"
¹ more individuals were observed but escaped through the net’s mesh				

RESULTS

The total number of individual fish captured by species and their average size are presented in Table 1. Common carp (*Cyprinus carpio*), Largemouth bass (*Micropterus salmoides*), Green sunfish (*Lepomis cyanellus*), and Western mosquitofish (*Gambusia affinis*) were the only fish species observed, although the catch in both ponds also included numerous bullfrog tadpoles (*Rana catesbeiana*).

Sampling results indicate that green sunfish are resident in the marsh sampled and may reproduce in the area (suggested by the presence of small juveniles). The size distribution of green sunfish indicate that they are probably not a significant threat to giant garter snakes from direct predation; nevertheless, they may compete with giant garter snake for western mosquitofish, a primary prey item for both species. Most populations of green sunfish in California appear to be stunted: they remain relatively small in size throughout their life cycle, especially in the presence of largemouth bass (Moyle 2002).

The size distribution of largemouth bass observed indicate that they are all approximately of the same age-class and may not have reproduced in the marsh examined. No evidence of reproduction, i.e. nests created by males, was observed. The individuals observed were at the lower end of the reproductive size range (7.1”–8.3” TL [total length] in males and 7.9’–9.8’ in females), and thus may have been capable of spawning next spring. However, growth rates in largemouth bass are highly variable depending on the specific environment in which they occur (Moyle 2002). At the sizes observed these individuals would subsist primarily on fish (Moyle 2002) and so may

be competitive with giant garter snakes in addition to potentially being predatory upon them.

It should be noted that large numbers of smaller-size fish may not have been included in this sample either because of escape, passing through the seine, or predation by the large numbers of egrets and herons foraging in the area as the water line receded. It is also likely that some larger fish left the marsh as water levels declined.

Based on observations of the size and number of fish observed, active management to control fish populations in the marsh sampled does not appear to be warranted at this time. However, in other marshes with deeper open water channels – a habitat element that is beneficial for the production of largemouth bass – results from the sampling conducted at this marsh may not apply.

Complete draining of individual marshes during the winter when giant garter snakes are dormant in their upland retreats may be an economically and biologically feasible method to control predatory fish populations should it become necessary; placing screens on the culverts where water enters the marsh to keep fish out may also prove to be effective. Draining the marsh could also reduce the amount of prey available for the giant garter snake the following spring, but this effect would probably be relatively minor. The linear water conveyance features used extensively by giant garter snakes are typically drained during the winter in most years but appear to provide

adequate prey. The frequency of draining necessary to control predatory fish populations depends on a number of factors, including the length of time it takes to colonize a newly flooded marsh, the size of the fish colonizing the marsh, the size of the marsh, and prey populations in the marsh. Largemouth bass generally take 2 to 3 years to become large enough to reproduce. The need for such control measures is potentially reduced by maintaining appropriately structured and distributed patches of emergent vegetation to provide refugia for both giant garter snakes and their prey.

Currently, there is no information to suggest that giant garter snakes are being adversely impacted by populations of non-native predatory fish. However, modifications in the design of the marshes intended to increase habitat values for giant garter snakes, reduce the need for marsh maintenance, and provide other benefits may also result in better habitat for non-native predatory fish. Therefore, monitoring of giant garter snake populations and fish populations should continue.

BIOGRAPHY

Doug Leslie is a wildlife biologist with over 20 years of experience in wildlife biology, management, and research. Doug is the project manager for the NBC biological monitoring team and has been overseeing monitoring efforts in the Natomas Basin since 2004.

Marin Greenwood is an aquatic ecologist with ICF Jones & Stokes.

REFERENCES

Moyle, P.B. 2002. *Inland Fishes of California*. University of California Press, Berkeley.

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