

Sunshine Bass in the St. Johns:

The St. Johns River (SJR) was historically home to the southern-most native population of Atlantic strain Striped Bass (*Morone saxatilis*). Natural reproduction of this stock however, was likely low compared to northern rivers and was thought to have ceased completely by the 1970's due to degradation of habitat and water quality. In efforts to supplement this fishery, both Striped Bass and their hybrids with White Bass (*M. chrysops*), known as Sunshine Bass (*M. chrysops* x *M. saxatilis*) are stocked by USFWS and FWC, respectively. Stocking rates vary drastically dependent on brood fish availability, hatchery success, and hatchery/management priorities although in recent years, stockings and angler catches have been dominated by Sunshine Bass.

Thermal Refuge:

Sunshine Bass can be found throughout the SJR system in winter, but in the summer, warm river water forces the fish into thermal refuge. Fish look for cooler water temperatures (<25°C) which can be found in the SJR's many freshwater springs or upper, canopy-shaded sections of tributaries. While restricted to thermal refuge, fish have little available food, and fish health can decline rapidly during this time.

The Middle St. Johns River has a multitude of habitats suitable to Sunshine Bass throughout the year from deep-water structure to various spring systems. In particular, the use of Silver Glen Springs (SGS) as thermal refuge has been extensively studied by FWC biologists, with large (>1,000) aggregations observed from May-October. In 2018, a pilot telemetry study in SGS showed a surprising amount of Sunshine Bass movement in and out of the SGS system during summer residency. With average river water temperatures well above 29°C, it was presumed that fish were likely utilizing nearby alternative thermal refuge. As a result, a new study was initiated in 2019 with an expanded receiver array to include other potentially suitable habitats.

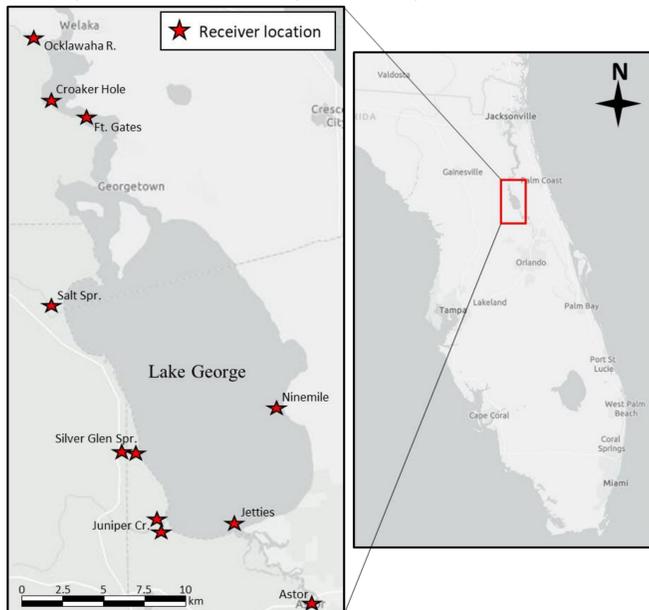
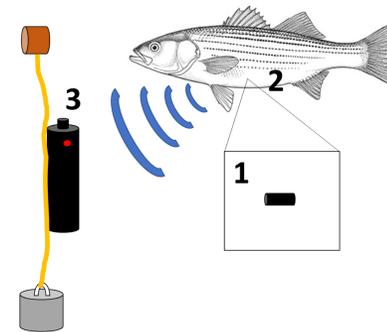


Figure 1. Map of study area and acoustic receiver stations encompassing the St. Johns River from Astor to Welaka, FL.



Objectives:

- Determine the temporal and spatial movements of Sunshine Bass throughout the Middle SJR system.
- Define the relative importance of SGS as a thermal refuge for Middle SJR Sunshine Bass and identify other seasonally-important habitats.



- 1) Sonic transmitter emits a "ping" every 60 seconds
- 2) Transmitter is implanted into a Striped Bass/Sunshine Bass
- 3) Acoustic receiver records these "pings" when a tagged fish swims by

Methods:

Receiver Array:

- Passive array (n=11) was deployed covering a total of 43 river kilometers (rkm) from Astor to Welaka, FL (Figure 1).
- Sites included:
 - Silver Glen Springs (SGS)
 - Salt, Juniper, and Croaker Hole Springs
 - Ocklawaha River
 - Lake George pilings (Ninemile point, Jetties)
- Temperature loggers on receivers to get accurate local temperatures.

Tagged fish:

- Sunshine Bass were captured in Lake George before their migrations to thermal refuge (April 2019).
- A total of 25 fish were internally-tagged with V9 acoustic transmitters.
- Tags had an estimated battery life of 476 days, allowing fish to be tracked until August 2020.

Results:

Seasonal Movement:

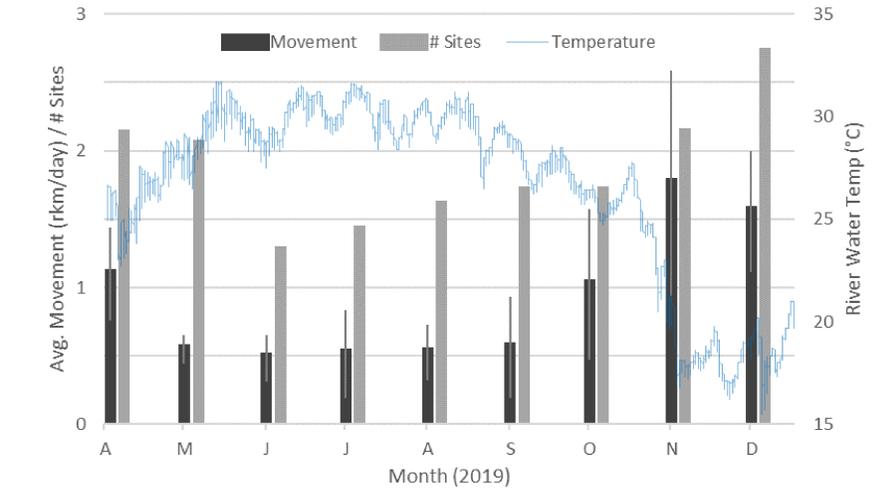


Figure 2. Average rate of movement and sites utilized by Sunshine Bass from April-December 2019. Secondary axis shows river water temperature within the study area.

- Lower rates of movement and # of sites utilized in summer.
- On average, however, fish still utilized >1 site, even in summer.

Habitat Use:

Table 1. Number of tagged Sunshine Bass detected at each site

	Jetties	Ninemile	SGS	Croaker Hole	Juniper Creek	Salt Springs	Ockl. River
April (N=25)	23	13	6	1	0	0	0
May-Sept (N=25)	16	15	15	2	4	1	0
Oct-Dec (N=11)	5	5	10	1	1	1	0
Total	23	19	18	4	4	2	0

- High summer use of Jetties and Ninemile with average temps of 29.5°C and 28.5°C respectively. However, these were mainly for short periods of time between thermal refuge use.
- 72% of tagged fish utilized SGS at some point in the year.
- Documented use of 3 other spring systems.
- Monthly declines in active tag detections (e.g. loss, mortality, emigration from array).

Future Research:

- Continue to download and collect data.
- Look at mortality rates/loss once tags begin to expire.
- Possible expansion of array or new study area (i.e. Lower St. Johns River).

"Way too Early?" Takeaways:

- Importance of SGS, Jetties, and Ninemile throughout the year.
- Propensity of fish to move throughout system, regardless of water temperature. Short-term tolerance of waters >25°C.
- Possibly high mortality? → Efficacy of stocking program?