The Shellcracker

FLORIDA CHAPTER OF THE AMERICAN FISHERIES SOCIETY

http://www.sdafs.org/flafs

July, 2013

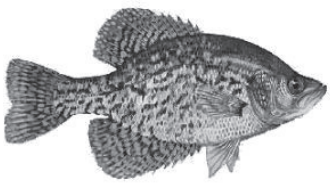
President's Message:

Greetings from Gainesville! It's more than halfway through the summer break for those of you that teach, are in school, or have kids that go to school. This town pretty much empties out at this time of year and now is about the time that you start to hear lots of chatter filling the air about what the next college football season is going to be like. There's also a lot of other excitement, whether its family vacations, scalloping trips, or news that you got picked for a great quota hunt in the fall. Whatever the case, a lot of us are doing those things with family and friends. You're born, married, and adopted into family, but you make friends and strengthen friendship through experiences – both positive and negative. Ever since I've been in this field at every single place I've worked, I've seen my colleagues work together throughout the week, and play together after work and on the weekends. It may just happen that way because they have the same interests, and that's why they got into this line of work in the first place, but the point I'm making is it's a bunch of friends that are working together. In fact, it's a lot of close friends and in many cases; it is like a family. We're all blessed to have the opportunities to work on what we're passionate about, and even more so with great company.

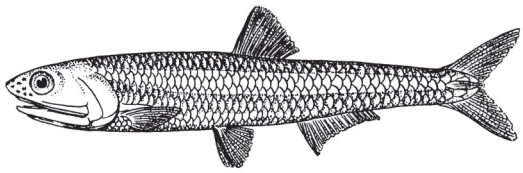
Summer is also the time of year that many of us are working in the office on grants, annual reports, and data entry. Kerry Flaherty, Linda Lombardi, and myself, have been working with Tammy Lamm, a sales manager with Visit Tampa Bay, to get letters of support and put together a great bid package for our Chapter to host the 2017 AFS Meeting in Tampa. It's now complete and has been submitted to Gus Rassam and the Time and Place Committee. The next step is to orally present our bid at the 143rd Annual Meeting in Little Rock, Arkansas on September 8. Based on the quality of package and from what I hear, the lack of competition, we're most likely going to win this bid, which means a lot of future preparation to host a great meeting. We have over 30 Chapter members that have signed up to chair or work on most of the committees, but there are still other opportunities to sign up and the door will be open right up through the meeting. If you are interested in getting involved and haven't yet thrown your name in, contact Kerry **Kerry.Flaherty@myfwc.com** or myself **Travis.Tuten@myfwc.com** and we'll get you set up. While this meeting will take a great deal of work and dedication, it's also going to be extremely rewarding. There will be a lot of memories and experiences that come with this opportunity, which will build relationships and strengthen friendships. Let's take advantage of what lies in front of us and have some fun with it.

Next year's Florida Chapter Meeting has been scheduled for February 18th – 20th, 2014. Our President-elect, Chris Bradshaw, is working on putting a symposium together that will look at the interactions between research and management. The first call for papers and more information about the meeting will be in the October issue of the Shellcracker, but feel free to contact Chris **Chris.Bradshaw@myfwc.com** or myself if you have any questions. Enjoy the rest of your summer!

Travis Tuten
Florida Chapter AFS President



Getting in Touch



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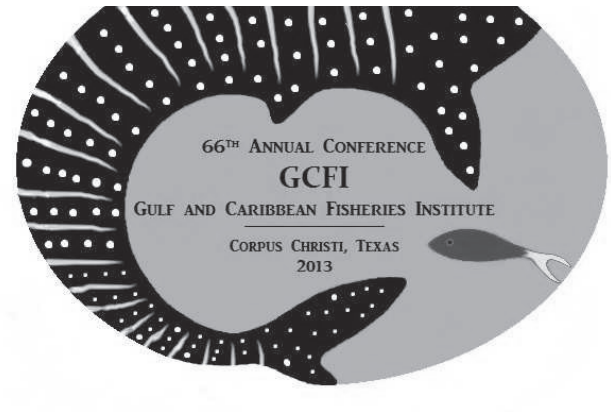
Upcoming Events

2013 Annual Meeting of the American Fisheries Society. Little Rock, Arkansas. Sept. 8-12.

67th Annual Conference of the Southeastern Association of Fish and Wildlife Agencies. Oklahoma City, Oklahoma, October 13-16, 2013.



4 November 2013 - 8 November 2013

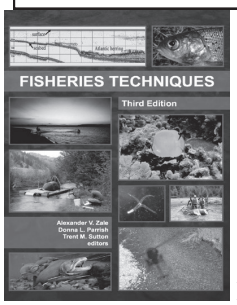
2014 Florida Chapter American Fisheries Society Meeting. Altoona, FL. February 18 – 20, 2014.

2014 Ecological and Evolutionary Ethology of Fishes. Corvallis Oregon, June 22-26, 2014

Check out our Parent Society's calendar at http://www.fisheries.org/afs/calendar.html for other events not listed here!

Answers from page 9. Lane Snapper B. Jolthead Porgy

New Titles from AFS

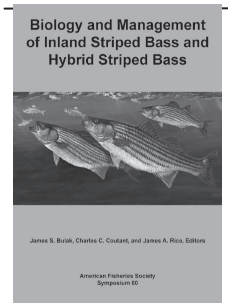


Fisheries Techniques, Third Edition

Alexander V. Zale, Donna L. Parrish, and Trent M. Sutton, editors . Published by the American Fisheries Society. 2012

ISBN: 78-1-934874-29-5

A comprehensive instructional and reference volume on fisheries sampling and analysis methodologies. This new edition has a greater emphasis on quantitative techniques and estuarine and marine systems than previous editions. Several Chatpers are authored by Florida Chapter members, including Debra Murie, Mike Allen, Bill Pine, and Daryl Parkyn. The book is intended for practicing fisheries professionals, researchers, professors, and advanced under-

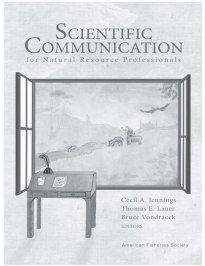


Biology and Management of Inland Striped Bass and Hybrid Striped Bass

James S. Bulak, Charles C. Coutant, and James A. Rice, editors.588 pages, hardcover, index. Symposium 80Published by the American Fisheries Society, May 2013.

ISBN: 978-1-934874-36-3

The book provides coverage of the biology and management of striped bass and hybrid striped bass in the inland waters of the United States. The book's 34 chapters are divided into nine major sections: History, Habitat, Growth and Condition, Population and Harvest Evaluation, Stocking Evaluations, Natural Reproduction, Harvest Regulations, Conflicts, and Economics. A concluding chapter discusses challenges and opportunities currently facing these fisheries. This compendium will serve as a single source reference for those who manage or are interested in inland striped bass or hybrid striped bass fisheries.



Scientific Communication for Natural Resource Professionals

Cecil A. Jennings, Thomas E. Lauer, and Bruce Vondracek, editors. 180 pages

Published by the American Fisheries Society

This how to guide to most forms of modern scientific communication, contains practical advice on improving communications and publishing success. Chapters include preparing and submitting manuscripts talks and posters, determining authorship, searching for information, integrating statistics and results into your writing, designing tables and figures, converting your thesis or dissertation to a journal manuscript, deciding where to submit your manuscript, responding to peer review.

Student Sub-Unit News

This year, 2013 has been a great year for the Florida AFS student subunit. We have broken new ground on exciting social media projects and built on the works of the previous student board. In April, we launched the student run fisheries science blog (floridafisheriesscience.blogspot.com). The blog highlights the latest and innovative student fisheries research in Florida. The bloggers include our own Crystal Hartman, Kyle Wilson, Joy Young, Chelsey Crandall, and Ross Boucek. Since its establishment, the bloggers have written 10 posts, and these stories have reached just under 2,000 viewers. One video blog post, (Otolith shape and fish movement) was featured in a Long Term Ecological Research - "Communicating Science Workshop" in June,as an effective example of communicating research to the public. Please support your FL AFS student subunit and read (or watch) some of the exciting stories on the blog!

In addition to launching the blog, the student group has undertaken a collaborative research project. The goal of this research aims at understanding the influence of high temperature on freshwater fish fitness across the state of Florida. More specifically, we will test whether high temperatures have more severe impacts on freshwater fish fitness in nutrient rich or nutrient poor water bodies. A total of 9 Students from three different universities are working together to answer this question, as well as 3 different state and federal agencies have contributed data. The final project will be submitted as a publication to an AFS journal, and will be presented by a student at the next Southern division and Florida AFS chapter meetings. We are very grateful to FWC for contributing the majority of the data and providing support of through the early stages of the project.

Interested in contributing something to the Shellcracker? Email Daryl Parkyn dparkyn@ufl.edu with articles or information that you would like to be included upcoming issues. The deadline for the next issue is Sept 28, 2013, so start writing.

Feature Article

Acoustic Telemetry Mark-resighting to Inform Assessment and Management of Gulf Sturgeon

Merrill B. Rudd. Fisheries and Aquatic Sciences, School of Forest Resources and Conservation, University of Florida. 7922 NW 71st street, Gainesville, Fl, 32653.

The Threatened Gulf of Mexico Sturgeon

The Gulf Sturgeon (*Acipenser oxyrinchus desotoi*) is a charismatic, anadromous species distributed across the northern Gulf of Mexico. They are both famous as living fossils and infamous for their high-flying acrobatics on the Suwannee River, most recently a serious injury on Choctawhatchee Bay. Gulf sturgeon forage in the marine environment during winter months and annually migrate into riverine environments for spawning and possibly thermal refuge in the summer. Nine rivers adjacent the Gulf of Mexico are known to support Gulf sturgeon populations, including the Pearl, Pascagoula, Escambia, Blackwater, Yellow, Choctawhatchee, Apalachicola, Ochlockonee, and Suwannee Rivers (Fig. 1). They are believed to return to their natal rivers annually, however they are also known to emigrate into other river drainages after population mixing in shared overwintering areas (Wooley and Crateau 1985;

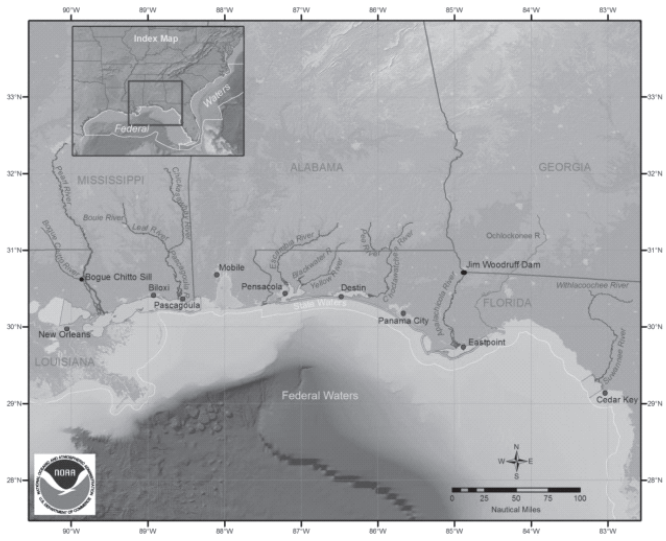


Figure 1. Gulf of Mexico and Southeastern rivers supporting Gulf Sturgeon (*Acipenser oxyrinchus* populations).

Initial overfishing in the early 1900s (Fig. 2), combined with subsequent habitat degradation led to Gulf sturgeon threatened listing across their geographic range under the Endangered Species Act (ESA) in 1991. Despite relatively high numbers in some riverine systems such as the Suwannee River, they are currently managed as a single population, and therefore are likely not recovering at a rate to be delisted by the goal year of 2023.

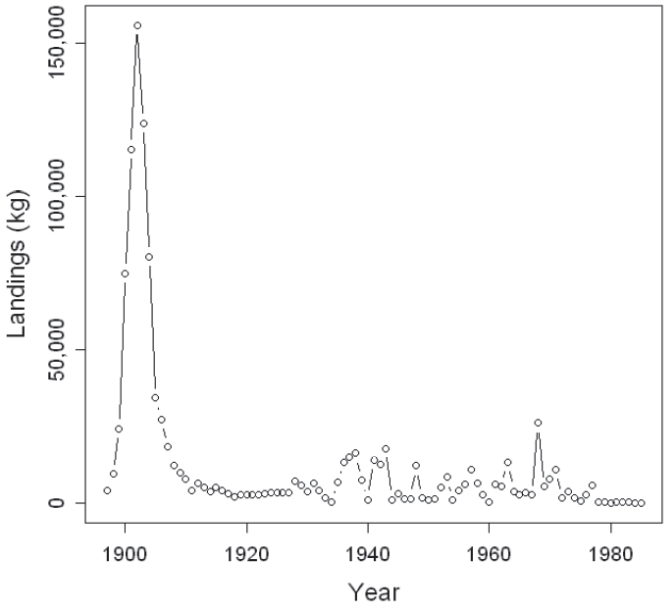


Figure 2. Reported annual Gulf sturgeon commercial fisheries landings from Florida. 1880-1984.

Uncertainties in these estimates likely stem from low capture probability associated with PIT tag programs relying on physical recaptures, which ranged from 0.10 – 0.15 (Pine and Martell 2009, and difficulty differentiating between mortality and emigration due to non-cohesive tagging programs between river drainages. To resolve these uncertainties, NMFS initiated a five-year standardized acoustic telemetry tagging program in 2010.

Standardized acoustic telemetry tagging program

Acoustic receivers (VEMCO VR2Ws) were deployed at the river mouths of the nine river drainages across the Gulf of Mexico with known Gulf sturgeon populations (Fig. 1). Acoustic transmitters were surgically implanted in the body cavity of Gulf sturgeon (Fig. 3) assumed to be adults (≥1350 mm) caught in gill nets during the fall outmigration during the first three years of the tagging program (2010 – 2013), to be monitored over a five year period (2010 – 2015). The sample size of Gulf sturgeon acoustically tagged varied by river drainage based on variable catch rate (between 12 and 105 individuals over the first two years). The lowest sample sizes occurred in the western Gulf riverine populations.

My research objectives

(1) Develop and evaluate a modeling framework to estimate area-specific parameters using the acoustic telemetry sampling design.

(2) Using the framework from objective (1), fit Gulf sturgeon acoustic telemetry data to estimate movement and mortality rates.

Multi-state modeling framework

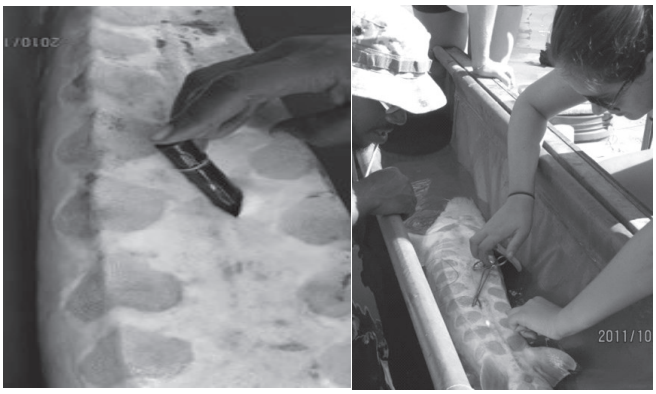


Figure 3. Surgically implanting an acoustic transmitter, (A) insertion and (B) suturing.

I chose to analyze the data in a multi-state modeling framework, because of this techniques ability to estimate area-specific parameters (Fig. 4). The multi-state model is similar to the classic Cormack-Jolly-Seber (CJS) models, estimating survival and capture probability, but with an additional transition parameter estimating movement between "states". In this case, states are geographic (i.e. what river drainage does a fish enter each year?).

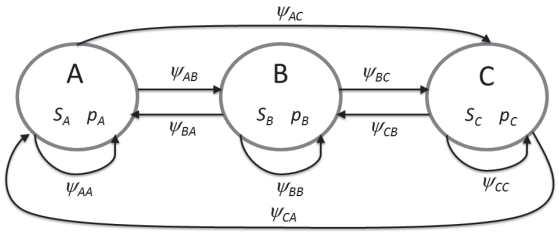


Figure 4. Diagram of the multi-state model, *S* = survival rate, *p* = capture probability, and y = transition parameter between "states" (A, B, and C).

Collapsing continuous data into discrete time intervals

Due to the continuous nature of acoustic telemetry data, I needed to make assumptions about Gulf sturgeon movement to temporally collapse the data into discrete time intervals for the mark-recapture model. I temporally collapsed the data into two seasons per year: the in-migration (March – August) and the out-migration (September – February). All individuals detected during the out-migration were assigned the marine state, assuming 100% of individuals are migrating out of the rivers during the fall months, entering the marine environment, and subject to marine mortality rates. Individuals detected during in-migration were assigned their respective riverine state. Assuming each individual's tagging location was its natal river, each capture history was associated with the individual's respective natal river. This method allowed me to estimate non-random movement rates (i.e. the probability of a fish from the Suwannee River returning to the Suwannee River was estimated separately from the probability of a fish from the Apalachicola River moving into the Suwannee River). Furthermore, this method allowed me the flexibility to estimate marine and riverine survival rates separately.

Need for simulation: Is the model biased?

Because of a limited sample size of acoustically tagged Gulf sturgeon and a relatively short monitoring time, I conducted a simulation test to ensure the multi-state model could estimate unbiased parameters. Using assumed values of survival, detection, fidelity, and emigration rates, I generated data over a 2 and 5 year period to account for the data currently available (2 years) and what is expected at the end of the monitoring program (5 years). I conducted 1,000 iterations of generated data and respective model runs, looking to see if the model could spit out, on average, the values I used to generate data. And it could! Median mean parameter estimates were equal to the true values used in data generation, while precision of mean parameter estimates increased with higher sample size of tagged Gulf sturgeon and longer monitoring time (Fig. 5).

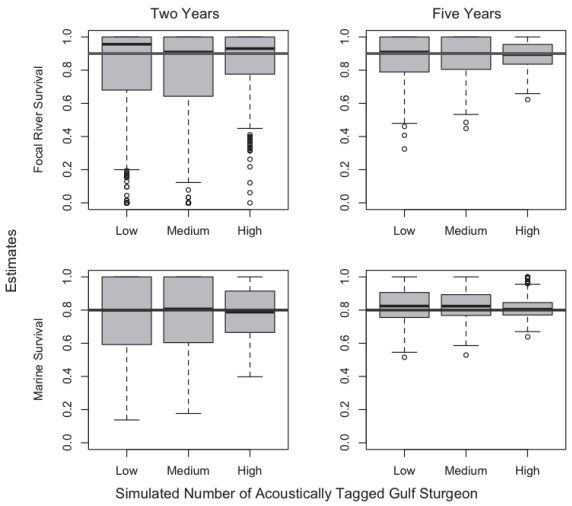


Figure 5. Distribution of mean parameter estimates from 1,000 iterations of generated data and model runs confirm the multi-state model is unbiased, with increased precision after 5 years and higher sample size of tagged individuals.

Fitting the model to real data

Once verified as unbiased, I could fit the model to real data collected by Gulf sturgeon research cooperators

across the Gulf. With the first two years of data, a model was fit to estimate natal river-specific survival and detection probability and state- and natal river-dependent movement rates. Detection probability across all regions of the Gulf was greater than the capture probabilities estimated from previous tagging programs (Fig. 6), improving inferences in Gulf sturgeon survival and movement rates.

Survival rate estimates were relatively high (> 0.87), transformed to mortality rates less than 0.14. A major exception is in the Pascagoula River, with survival rate estimates very low compared to other riverine populations (Fig. 7). All fish from the Pearl, Pascagoula, and Suwannee Rivers returned to their respective natal rivers each year (Fig. 8). Gulf sturgeon tagged in the central Gulf (Escambia Bay, Choctawhatchee River, and Apalachicola River) displayed relatively high movement rates to nearby rivers, especially those genetically related (Stabile et al. 1996).

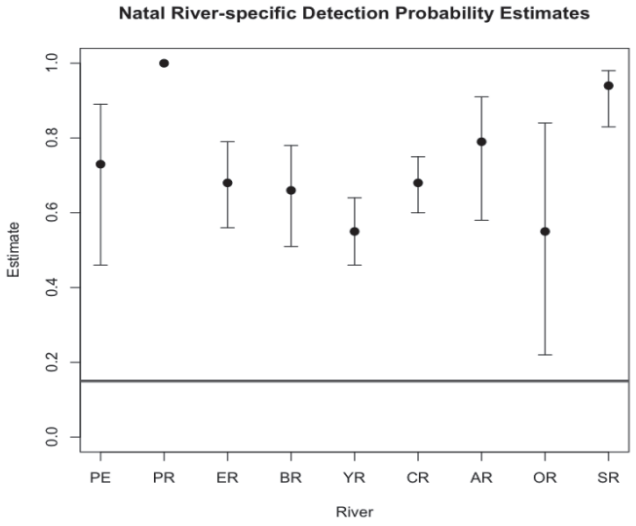


Figure 6. Detection probability estimates for each natal river group from 2 years. Solid line represents the highest capture probability from previous tagging programs.

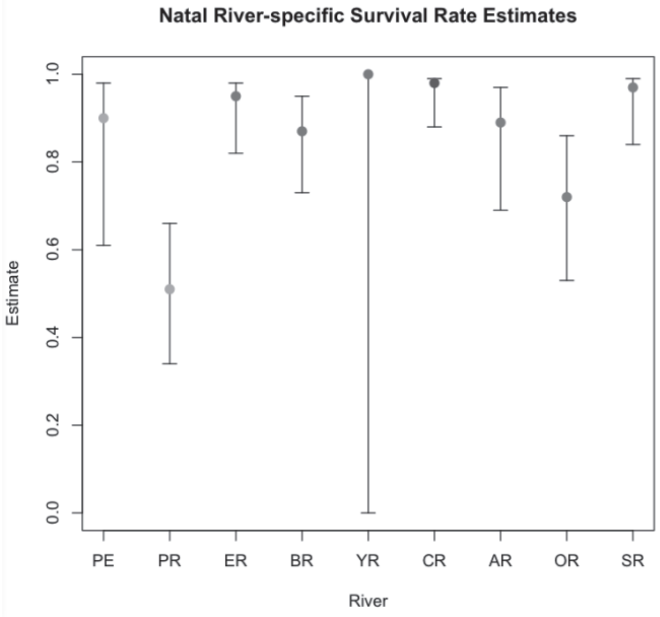


Figure 7. Survival rate estimates for each natal river group from 2 years of acoustic telemetry data are overall higher in the eastern Gulf than the western Gulf.

Direct estimation of natural mortality

For most stock assessments, natural mortality is derived from life history characteristics (e.g. metabolic growth parameter, longevity) or estimated from meta-analysis of potentially outdated data. Gulf sturgeon

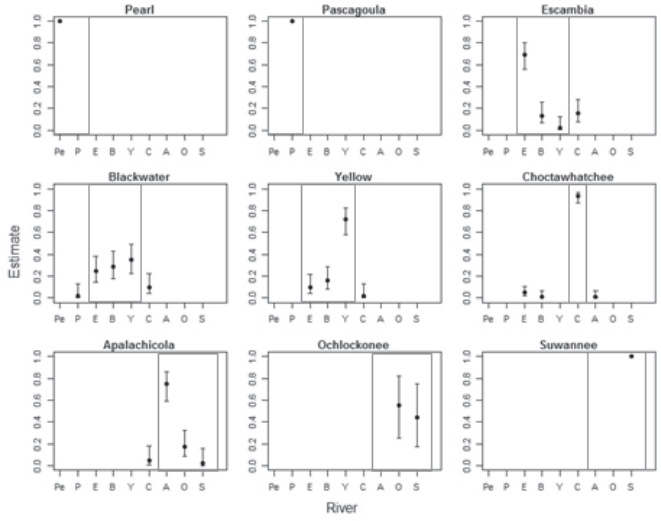


Figure 8. River-specific movement rates with genetically related areas highlighted in boxes.

represent an interesting case study where we have the ability to directly estimate natural mortality, extremely rare for population assessments. Under the assumption of negligible fishing mortality due to the protected status of Gulf sturgeon, estimates of total mortality from using long-term mark-recapture data could be assumed equal to natural mortality for riverine populations with minimal anthropogenic impact (e.g. Suwannee River). Furthermore, no acoustically tagged individuals were recovered dead in the Pearl River after the black liquor spill in August 2011, hinting that the mortality rate estimated in this study could represent natural mortality as well.

Defining management units

Combined with genetic analyses, high fidelity rates to rivers and genetically related areas and potentially divergent patterns in mortality across the Gulf contribute important information for defining appropriate management units. With current estimates of abundance meeting current estimates of carrying capacity, several Gulf riverine populations could be on the road to recovery. Please see my thesis for more information on the Gulf sturgeon stock assessment!

About the Author: Merrill Rudd recently finished her MS in Fisheries and Aquatic Sciences at the University of Florida, with Drs. Rob Ahrens and Bill Pine. She is now moving out west at the end of this summer to continue studying population dynamics and stock assessment in her PhD with Drs. Trevor Branch and Ray Hilborn at the University of Washington, funded by the NSF IGERT Program on Ocean Change.

References

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Stabile, J., J. Waldman, F. Parauka, and I. Wirgin. 1996. Stock structure and homing fidelity in gulf of Mexico sturgeon (Acipenser oxyrinchus desotoi) based on restriction fragment length polymorphism and sequence analyses of mitochondrial DNA. Genetics 144 (2):767-775.

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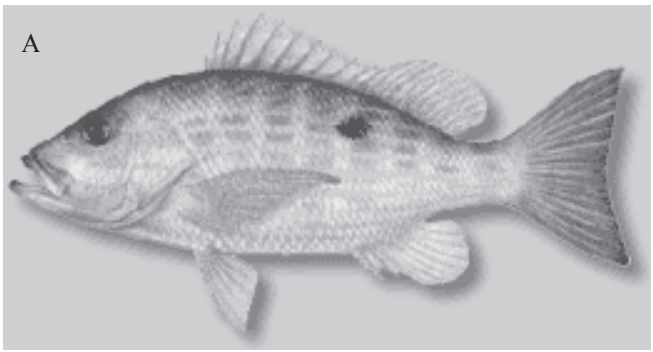
Name these Florida Fishes (answers page 2)



This estuarine, pinkish fish has a pink/red caudal fin, a yellow edge along the dorsal fish and pink and yellow stripes.

This marine fish has a blue line under each eye and the corner of the mouth is orange