the Shellcracker

FLORIDA CHAPTER OF THE AMERICAN FISHERIES SOCIETY

http://www.sdafs.org/flafs

January, 2016

President's Message:

Dear all,

Happy 2016 everyone! I hope the New Year finds you and your fish very well.

First thing on our horizon is **abstract and registration deadline coming up (Friday, January 22, 2016)** for our **2016 Florida Chapter meeting**! A reminder that this year's meeting is at a new location, the **Florida FFA Leadership Training Center in Haines City**, and the dates are also a bit later, March 2-4, 2016. It should be a great meeting! We are thrilled about the new location and we hope you, your colleagues and students will be there.

I wanted to highlight the fantastic symposium that President Elect Andy Strickland is organizing for the 2016 meeting. The topic this year is **'Improving Florida's Fisheries: Actions Today That Benefit Tomorrow'** and it's a great topic. All you have to do if you want to be part of it is indicate that you're interested when submitting your abstract!

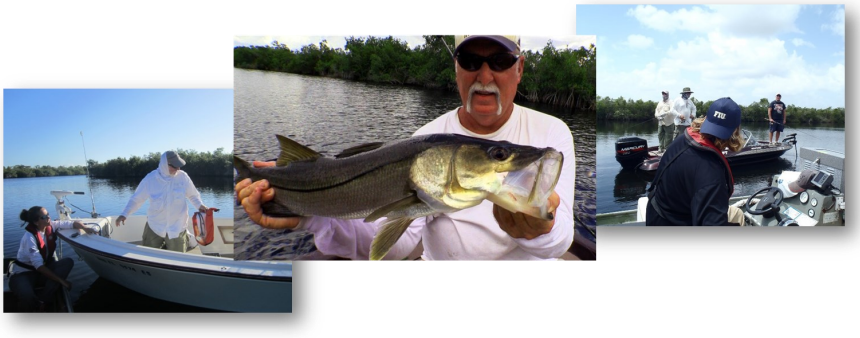
The end of 2015 and the beginning of 2016, and Andy's symposium brought me to a thought worth sharing. And that is how grateful we are in my research group for the partnerships we have made with anglers and for what we have learned from them (below are photos some of the anglers we have been working with in the past few years in the Everglades). We have learned so much and we are so grateful for the perspective they have brought to our research. They have enriched our research and our lives!

Last, I wanted to express my appreciation for the opportunity to serve as your chapter president. We have a great community of fish people in Florida, and I am proud to be part of it. And I don't take the word 'community' lightly. This is truly a wonderful group of colleagues and friends we have built in our Florida Chapter. Finally, thank you executive committee for all your help and guidance over the past year!

Have a wonderful 2016 and we look forward to seeing you in March at the meeting!

Sincerely, Jennifer Rehage

Florida Chapter President



Getting in Touch

American Fisheries Society
Florida Chapter
Officers

President
Jennifer Rehage
Florida International University
11200 SW 8th Street, ECS 337
Miami, FL 33199
Phone: (305) 348-3804
Email: rehagej@fiu.edu

President-Elect
Andy Strickland
FWC/FWRI
5300 High Bridge Road
Quincy, FL 32351
Phone: (850) 717-8740
Email: andy.strickland@myfwc.com

Secretary/Treasurer
Kevin Johnson
FWC/FWRI
601 W. Woodward Avenue
Eustis, FL 32726
Phone: (352) 415-6960
Email: kevin.johnson@myfwc.com

Newsletter Editor
Chris Wiley
FWC/DFFM
3911 Highway 2321,
Panama City, FL 32409
Phone: (850) 277-0913
Email: chris.wiley@myfwc.com

Past President
Chris Bradshaw
FWC/FWRI
100 8th Avenue SE
St. Petersburg, FL 33701
Phone: (727) 502-4717
Email: chris.bradshaw@MyFWC.com

American Fisheries Society
Florida Chapter
Student Sub-Unit
Officers

President
Chelsey Crandall
University of Florida
7922 NW 71st Street
Gainesville, FL 32653
Phone: (352) 392-9981
Email: kicksea@ufl.edu

Vice President
Greg Hill
Florida International University
15421 SW 113 Avenue
Miami, FL 33157
ghill007@fiu.edu

Treasurer
John Hargrove
University of Florida
7922 NW 71st Street
Gainesville, FL 32653
Email: tractor@ufl.edu

University Liason
Carrie Schuman
170 NW 6th Street
Gainesville, FL 32609
carrie.schuman@ufl.edu

Upcoming Event
AFS Annual Meeting — Tampa, FL August 20-24, 2017

Interested in contributing something to the Shellcracker? Email Chris Wiley at *chris.wiley@myfwc,com* with any articles or information that you would like to be included in the next issue. The deadline for the next issue is March 15th, 2016 so start fishing...

January 2016 planning updates for the AFS Annual Meeting in Tampa

Meeting planning is underway for the 147th Annual Meeting of the American Fisheries Society that the Florida chapter is hosting in Tampa from August 20-24, 2017. From now until the meeting date, we will be updating you with progress and where we need assistance. First of all, check out our awesome meeting logo!!

In June 2015, Doug Austen (AFS Executive Director), Shawn Johnston (AFS Administrative Coordinator), and Joe Margraf (AFS President in 2017) visited Tampa and met with several Florida chapter members and potential meeting partners. We toured the convention center, hotels, and possible social venues, and Doug even tried his hand at removing otoliths from some Florida fish while touring FWC's Fish and Wildlife Research Institute in St. Petersburg. Kathy Guindon gave everyone a tour of the Florida Youth Conservation Centers Network facility in Apollo Beach, and we dodged a thunderstorm while enjoying their kayak trails. So far, we have been able to secure a contract with the Marriott host hotel for a Welcome Networking Event, the Tampa Convention Center for the Trade Show and Poster Networking Event, and the Florida Aquarium for the Grand Networking Event. Meanwhile, the student chapter has been researching venues for the student social. In November 2015, Dan Cassidy (AFS Deputy Executive Director) met with Kerry Flaherty-Walia, Travis Tuten, and Kevin Johnson to go over specific budgetary and meeting action items. We also toured the Tampa Bay History Center for consideration for the Goodbye Networking Event. In early January 2016, our first conference call to divide tasks was completed, and we will have these quarterly conference calls until the Kansas City, MO meeting in August 2016.

Looking forward, we are going to need to put together promotional materials and a draft budget for the Kansas City meeting in addition to solidifying contracts and getting more sponsors. We will have more information on how YOU can help at the chapter meeting!

See you in March!

Kerry Flaherty-Walia and Travis Tuten
General co-chairs of the AFS 2017 meeting

Feature Article

Observations of size-specific nursery habitat use by Red Drum, *Sciaenops ocellatus,* in the Apalachicola Bay estuary using fisheries-independent data

David A. Gandy and Robert Gorecki

Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Apalachicola Bay Fisheries-Independent Monitoring Field Lab, Eastpoint, FL.

INTRODUCTION

Gulf of Mexico (GoM) estuaries are extremely productive ecosystems providing critical habitats for feeding, spawning and nurseries for an array of estuarine-dependent sport fishes (USEPA 1999, Barbier et al. 2011). From a fisheries perspective, high estuarine productivity may be largely influenced by the diverse and complex shallow estuarine habitats (e.g., seagrass beds, tidal creeks, marshes, etc.) that serve as essential fish habitat, especially for young-of-year (YOY) and juvenile life stages. Young fishes rely heavily on these environments to provide critical foraging grounds, refuge from predators, and abiotic conditions (e.g., water quality) that optimize growth and survival to adulthood (Weinstein 1979, Boesch and Turner 1984, Sogard 1992, Baltz et al. 1998, Stunz et al. 2002).

Red Drum, Sciaenops ocellatus, is an estuarine-dependent Sciaenid common to coastal waters of the southeastern U.S. and the GoM. Historical assessments in the mid-1980s showed Red Drum stocks to be overfished in Florida waters, primarily because of an intense commercial fishery (Swingle et al. 1984, Goodyear 1987, Beckman et al. 1988, Murphy and Taylor 1990, Murphy and Munyandorero 2008). Since that time however, a complete closure of the commercial fishery, followed by state-mandated slot and bag limits for recreational anglers beginning in the late-1980s lead to recovery of Red Drum stocks which now supports a vast recreational fishery (Muller and Murphy 1994, Murphy and Munyandorero 2008).

Maintaining a productive and sustainable recreational fishery for Red Drum may depend on the availability and proper conservation of habitat used for spawning and nurseries. During spawning, adult Red Drum congregate near bay mouths, inlets, and over nearshore continental shelf waters from mid-August through late November (Peters and McMichael 1987, Comyns et al. 1991, Murphy and Taylor 1990). Eggs and larvae are then carried by tides and currents into nearby shallow coastal waters of bays and estuaries including Apalachicola Bay, FL. Numerous studies have documented the importance of seagrass beds and submerged aquatic vegetation as important estuarine nursery habitats for Red Drum in other systems (Holt et al. 1983, Rooker et al. 1998, Heck et al. 1997, Stunz et al. 2002). In central estuarine Florida waters however, Peters and McMichael (1987) found that Tampa Bay YOY Red Drum appeared to prefer lower salinity backwater areas which accounted for nearly 90% of their catch. Unfortunately, little is known about Red Drum nursery habitat use in the Apalachicola Bay estuary including the relative importance of these nursery habitats in supporting northern GoM Red Drum stocks and the site-specific factors that may influence nursery quality within the estuary.

In this article, we offer a preliminary examination of the Red Drum population utilizing the Apalachicola Bay estuary by analyzing sixteen years (1999 – 2014) of seine data collected by the Florida Fish and Wildlife Research Institute, Fisheries-Independent Monitoring Program (FWRI-FIM). Our objectives were to: 1) examine temporal patterns of size structure to determine months of peak YOY recruitment, 2) use a spatially explicit approach to determine regions within the bay that serve as nursery ground hot spots, and 3) examine the relationship between YOY abundance indices and habitat conditions (e.g., sand vs. mud bottom, submerged aquatic vegetation [SAV] cover, salinity, etc.) to infer how variations in site-specific environmental conditions may affect nursery quality. We hope that the preliminary results shown here will provide useful baseline data needed for quantifying the value of shallow estuarine environments in Apalachicola Bay as essential Red Drum nursery habitat for future management and conservation needs.

METHODS

Study Area.—Apalachicola Bay is a semi-enclosed, shallow estuary along Florida's northwestern coast (Figure 1). A series of barrier islands including St. Vincent, Little St. George, St. George and Dog Island enclose much of the estuary with connection to the GoM through four passes (Indian Pass, West Pass, Sikes Cut, and East Pass). To the east of Dog Island, St. George Sound is completely open to the Gulf. The Apalachicola River is the primary source of freshwater inflow, followed by the Carrabelle River to a much lesser extent (Livingston 1983). Marsh grasses make up much of the shoreline vegetation and characterization of bottom substrate is predominantly sand or mud with oyster beds scattered throughout the Bay (Ingle and Dawson 1953).

Field collections.—From 1999 to 2014, we collected long-term fisheries-independent seine data from Apalachicola Bay and tidal portions of the Apalachicola, St. Marks, Little St. Marks, and East

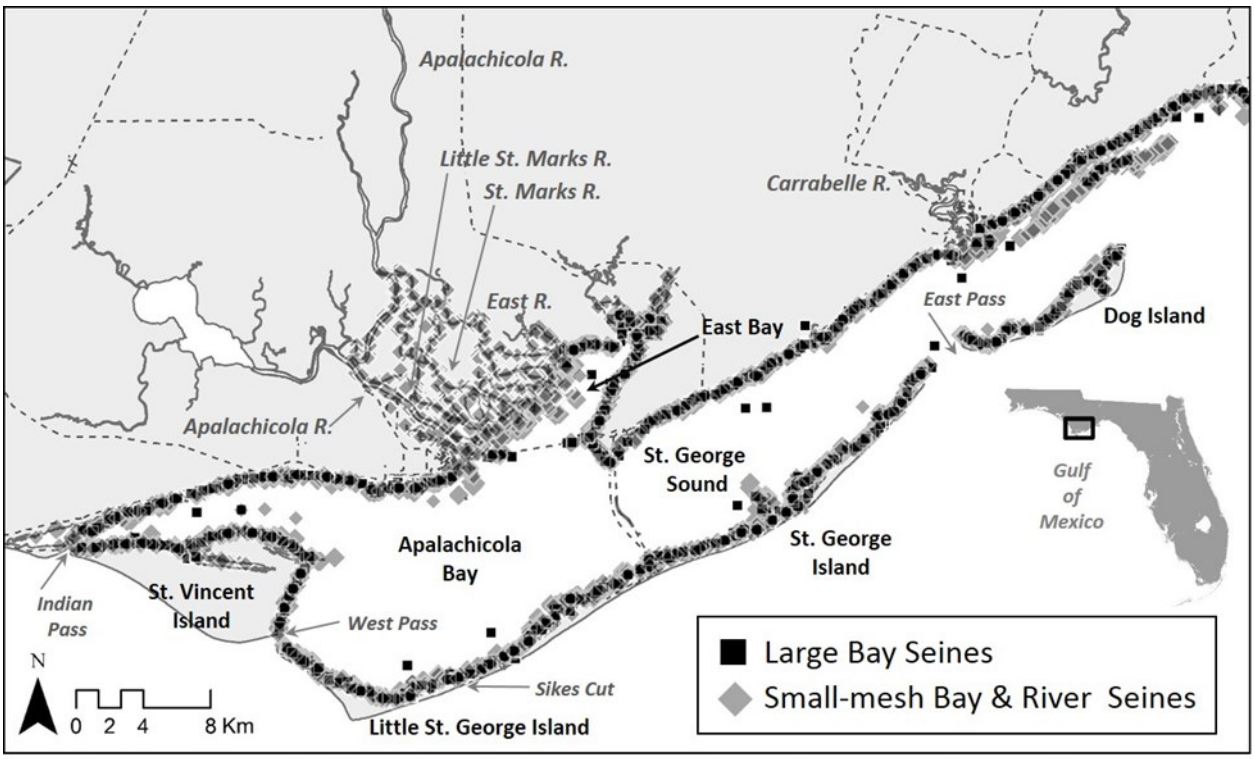


Figure 1. Map of sampling locations within the Apalachicola Bay estuary. The sampling extent spans from Indian Pass to the west to approximately 11.5 km north-east of Dog Island. Tidal rivers sampled include the lower portion of the Apalachicola River as well as the St. Marks, Little St. Marks and East Rivers and adjacent tidal creeks. Large 183-m bay seines were only used in the bay and are shown as black squares. Small 21.3-m bay and river seines are shown as semi-transparent grey diamonds.

Rivers to investigate size-specific nursery habitat use of Red Drum. Red Drum were collected during monthly standardized long-term monitoring conducted by FWRI-FIM (initiated in Apalachicola Bay in 1998) using a multi-gear spatially stratified random sampling design (Winner et al. 2010, Flaherty et al. 2014). Gear types used included a 21.3 x 1.8-m (3.2-mm knotless mesh) center bag seine (hereafter small-mesh bay and river seines) to target fish ≤ 100 mm Standard length (SL), and a 183 x 2.5-m center bag haul seine (hereafter large bay seine) to target larger bodied juveniles >100 mm SL. All samples were collected during daylight hours one hour after and before sunrise and sunset following methods described in Purtlebaugh and Rogers (2007), Winner et al. (2010), and Flaherty et al. (2014).

Upon collection, all Red Drum were enumerated and a subsample measured to the nearest millimeter SL. For each sampling event, temperature and salinity were collected using a YSI sonde, and habitat complexity was assessed. For habitat complexity parameters, bottom sediment was classified based on the presence of sediment types (e.g., mud, sand, oyster/rock/shell hash or any combination of the three). Shore types were classified into four main groups: emergent vegetation (i.e., marsh grasses), terrestrial vegetation (i.e., trees or shrubs), structured shorelines (i.e., sea walls, docks, and rock walls), non-vegetated non-structured shorelines, and combinations of these groups.

Focal size class determination and temporal patterns of young Red Drum.—We divided early and late recruits (<200 mm) of Red Drum into two size classes to account for ontogenetic shifts in diet and/or habitat (Peters and McMichael 1987). The first size class, hereafter referred to as 'early YOY recruits', were classified as being ≤50 mm SL to account for post larval settlement into the Apalachicola Bay estuary within the first couple months after spawning occurs. The second size class, hereafter referred to as 'late stage YOY recruits' was defined to reflect a higher contribution of fish and crabs to their diet which possibly indicates an ontogenetic shift in habitat use and prey availability (Peters and McMichael 1987).

We then examined length-frequency data of Red Drum catch across seine type and year to ensure our multi-gear sampling approach adequately sampled our two focal size classes defined above. We also generated length-frequency histograms by month across all years to determine the timing of peak recruitment for each defined size class. Once peak recruitment months were determined, we removed non-peak months from statistical analyses to reduce inflation of zero catch values. We then generated a catch per unit effort (CPUE) separately for each size class, gear type, and region sampled (i.e., bay vs. river) as the number of fish per sample to investigate peak recruitment habitat use for each defined size class.

Nursery habitat use.—We used a spatially explicit analysis approach to identify size-specific nursery ground hot spots, as well as areas within our study system that may be poor nurseries (i.e., cold spots). We used the Hot Spot Getis-Ord GI* spatial statistics tool in ArcGIS (ArcView vers. 10.3, ESRI, Redlands, CA) to determine the spatial grouping of high and low catch data to elucidate primary nursery grounds within the Apalachicola Bay estuary. The hot spot analysis tool calculates a Getis-Ord GI* statistic of incidence data (in this case, our peak months CPUE for each defined size class). The hot Spot analysis tool analyzes each catch incident point and compares it to other neighboring points. The resulting model generates a Z-score and p-value that determines whether there is a significant spatial grouping of high and low CPUE values. Thus, to be a significant hot spot, a high value CPUE will be surrounded by more high CPUE values (and vice versa). Essentially the model output identifies groups of points that have higher, or lower, catches than is expected by chance. We conducted hot spot analysis separately for each gear type and region (e.g., bay vs. river) and generated hot spots (and cold spots) based on fixed, Euclidean distance for 99%, 95% and 90% confidence interval bands. A map of the model output was then created to show the spatial grouping of hot (i.e., primary nursery habitat) and cold (i.e., low quality nursery habitat) spots for each respective confidence interval band.

Site-specific factors influencing nursery quality.—Generalized linear modeling (GLM) was used to explore variations in CPUEs of Red Drum and the effects of several abiotic and habitat complexity factors during peak recruitment months for the three

different seine techniques: small-mesh river seines (early YOY recruits only due to small number of late stage YOY recruits), small-mesh bay seines, and large bay seines (late stage YOY recruits only due to a lack early YOY recruits collected). Additionally, GLMs based on Gaussian distribution with a Log10(x+1) transformation, negative binomial, and Poisson distributions were applied to the data and goodness-of-fit statistics and residual diagnostics were examined to determine the most appropriate model. The Poisson model showed the best fit for the small-mesh river seine samples, and the negative binomial model was the most appropriate when examining late stage YOY small-mesh bay seine data. The Gaussian model was the best fit for early YOY recruits from small-mesh bay seine data and late stage YOY large bay seine data. Year, shore type, and bottom type were analyzed as categorical explanatory variables for all three seine techniques, with salinity, temperature, and sampling depth analyzed as covariates (un-transformed). The percentage of SAV cover was included as a covariate for small-mesh bay seines and large bay seines, while the presence or absence of SAV was used as a categorical explanatory variable for small-mesh river seines due to the high turbidity and steep drop-offs that make assessing the percentage of SAV cover problematic on the river. Shoreline vs. offshore sampling comparisons were also included as a categorical variable for only the bay sets, and models were run for shoreline bay sets only to assess the effects of various shore types on Red Drum CPUE. With the exception of year, all variables identified as nonsignificant ($\alpha = 0.05$) that did not improve model fit based on the Akaike's information criterion (AIC) values were removed, and the analysis repeated until only significant variables remained in the model. All analyses were fit using the GLIMMIX procedure in SAS (SAS Institute 2006).

RESULTS

Temporal patterns of young Red Drum.— Over sixteen years, between 1999 and 2014, the FWRI-FIM deployed 9,400 seine nets (3,600 large bay seines, 3,551 small-mesh bay seines and 2,249 small-mesh river seines) that collected 12,448 Red Drum in the Apalachicola Bay estuary. Across all gear types and years, length-frequency data for Red Drum showed a tri-modal distribution (Figure 2A) with one mode at ≤50 mm SL (early YOY recruits size class), a second between ~100-200 mm SL (late stage YOY recruits size class), and a third between ~300-650 mm SL (~age-1 to age-3 fish). Gear-specific, length-frequency distributions indicated small-mesh bay and river seines more efficiently collected early YOY recruits and late stage YOY recruits between 51-100 mm SL, while large bay seines selected for late stage YOY recruits greater than 100 mm SL (Figure 2A). Inter-annual comparisons indicated no clear trend in the size distribution for Red Drum collected from large bay seines. Inter-annual variation in size ranges for small bay and river seines were observed, possibly indicating years with varying recruitment strength or inter-annual variation in habitat use that is not adequately quantified by our current stratification design (Figure 2B).

Monthly length-frequency distributions showed that early YOY recruits (≤50 mm SL) first show up in the Apalachicola Bay estuary as early as September, but with peak recruitment months occurring between October and December. The late stage YOY recruits size class (51-200 mm SL) begin to become available to our sampling gears between November and February with peak abundance occurring between March and July (Figure 3).

Nursery habitat use.—For early YOY recruits (Figure 4A), spatial modeling identified three key regions where grouping of high catch samples occurred during peak recruitment months (October – December). In Apalachicola and East Bays, hot spots revealed primary nursery grounds along the northwestern, north, and entire eastern boundary of East Bay. East Bay is a unique portion of the estuary with lower salinities than those typically seen in most regions of the Apalachicola Bay estuary, due to the influx of freshwater from several small tidal creeks and the outflow of three distributaries of the Apalachicola River. Additionally in Apalachicola Bay, a large hot spot was observed on St. George Island directly east and west of the St. George Island Bridge. In the Apalachicola River system, hot spots for early YOY recruits were observed in the lower tidal reaches of the Apalachicola River as well as smaller tidal creeks of the St. Marks and Little St. Marks Rivers, and in a small reach of the East

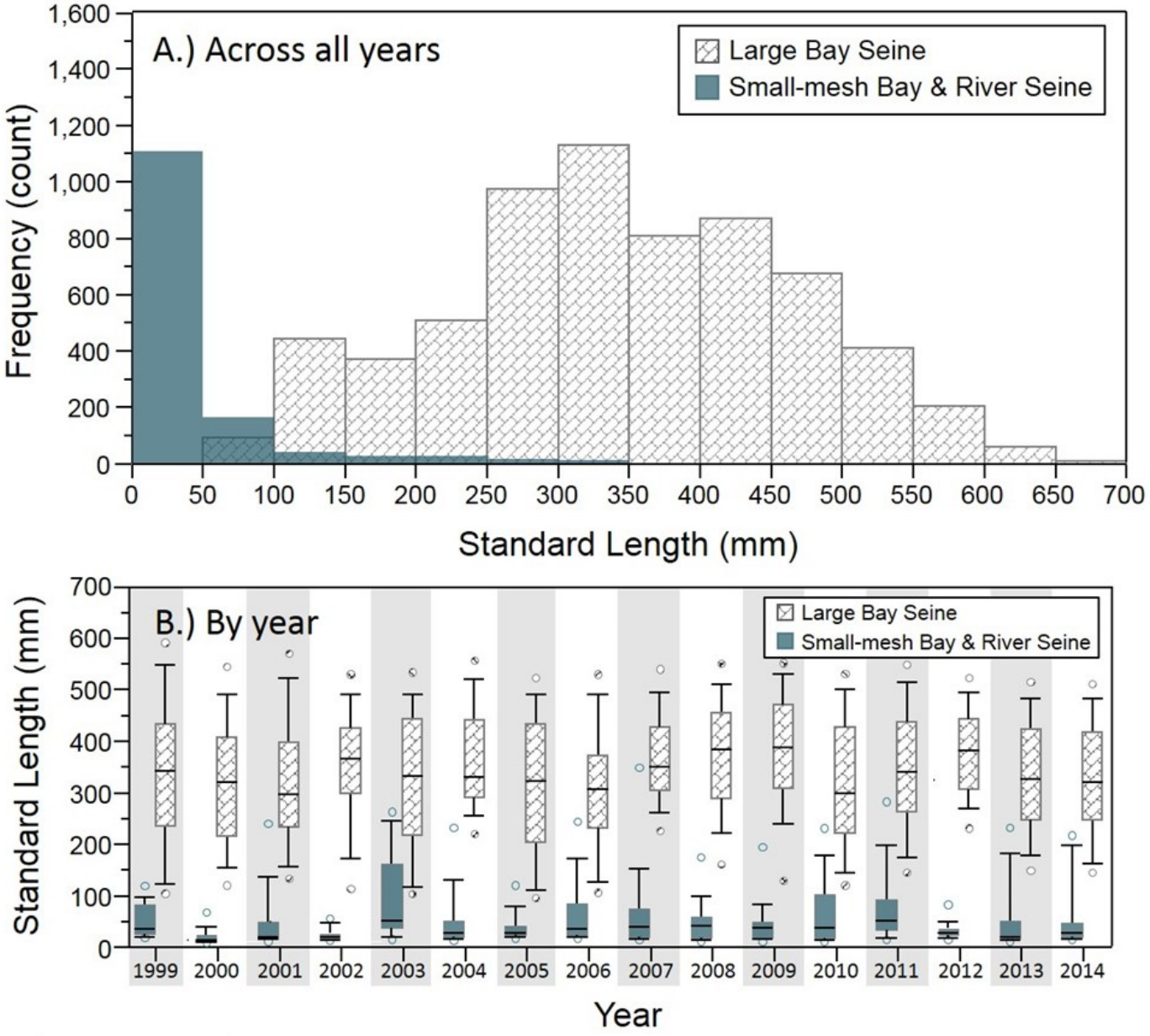


Figure 2. Length-frequency histogram across all years showing the size structure (A.), and box plots of SL by year showing the variation in size across years (B.) of Red Drum seine data collected from FWRI's Fisheries-Independent Monitoring Program from 1999 – 2014 in the Apalachicola Bay estuary and adjacent tidal rivers. Data presented in both figures were partitioned by gear type which include large bay seines shown in the light-colored patterned bars, and small-mesh bay and river seines shown in turquoise bars, respectively.

River (Figure 4A). Marsh grass-lined banks and numerous small secondary and tertiary tidal creeks in these locations may offer ideal habitat for food and refuge from predators.

The location of hot spots for late stage YOY Red Drum remain in East Bay but are present in new areas of Apalachicola Bay and St. George Sound. (Figure 4B). Large expanses of East Bay still remain to be a key nursery ground for the larger size class. Along St. George Island, we observed a shift in nursery ground use along the outer eastern and western portions of St. George Island and along portions of Little St. George Island. This may represent a shift in habitat use, but may also be a result of our stratification design and gear biases. If indeed a shift in use along the island is occurring as Red

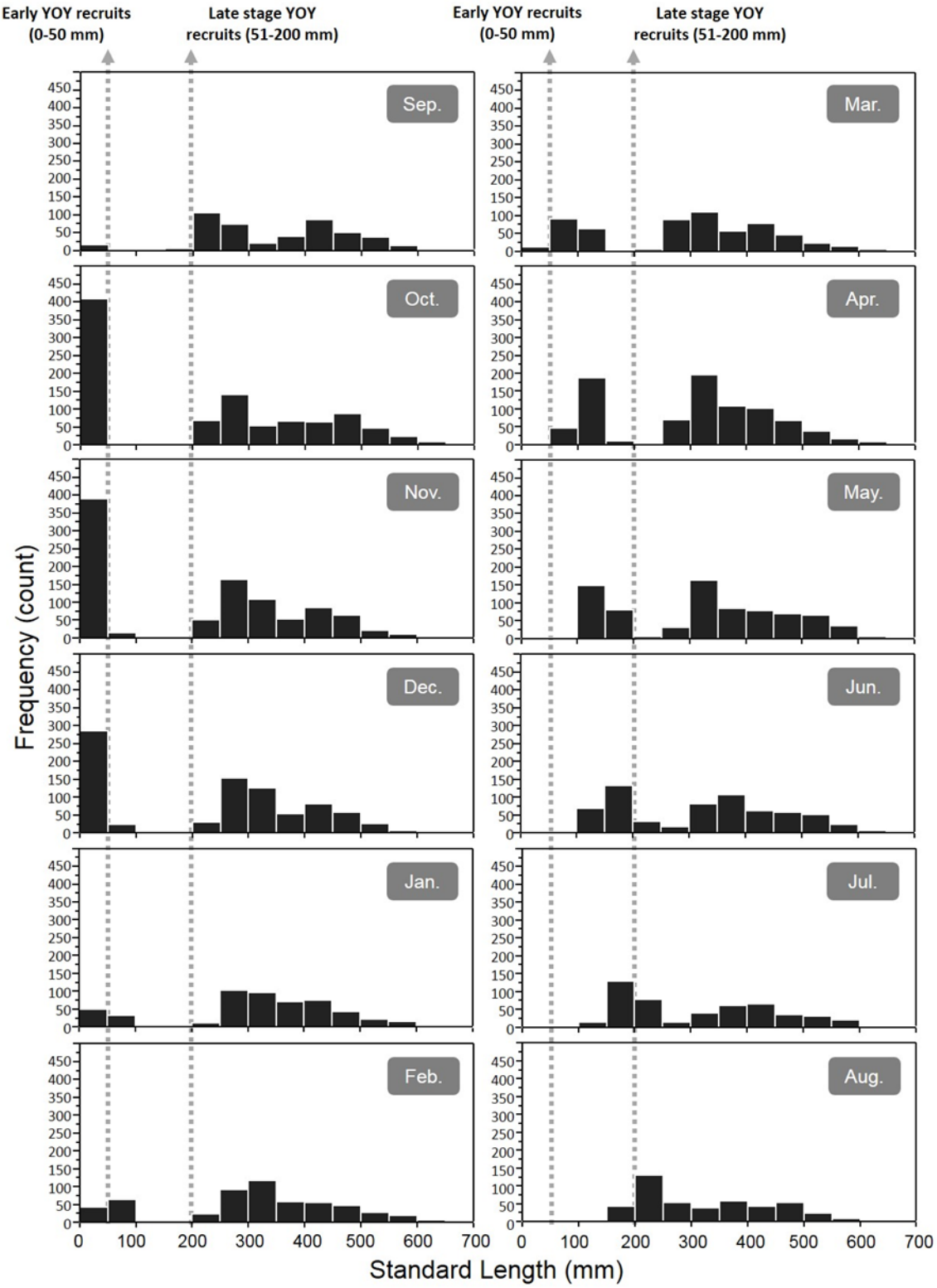


Figure 3. Monthly length-frequency histograms across all years showing timing of peak recruitment for early YOY recruits (October - December), and late stage YOY recruits (March – July) size classes. Red Drum seine data was collected from FWRI's Fisheries-Independent Monitoring Program from 1999 – 2014 in the Apalachicola Bay estuary and adjacent tidal rivers.

Drum grow and age, it is possible that dietary shifts with ontogeny may be influencing their movement. Of notable importance, we also observed the addition of several new regions in the bay serving as key late stage YOY nurseries that were not evident in the hot spot analysis conducted for the smaller early YOY recruits size class. These areas include western portions of St. Vincent Island and north central regions of Apalachicola Bay west of the Apalachicola River confluence. These additional regions are near shallow backwater creeks and marshes that are not accessible using our current sampling methodol-

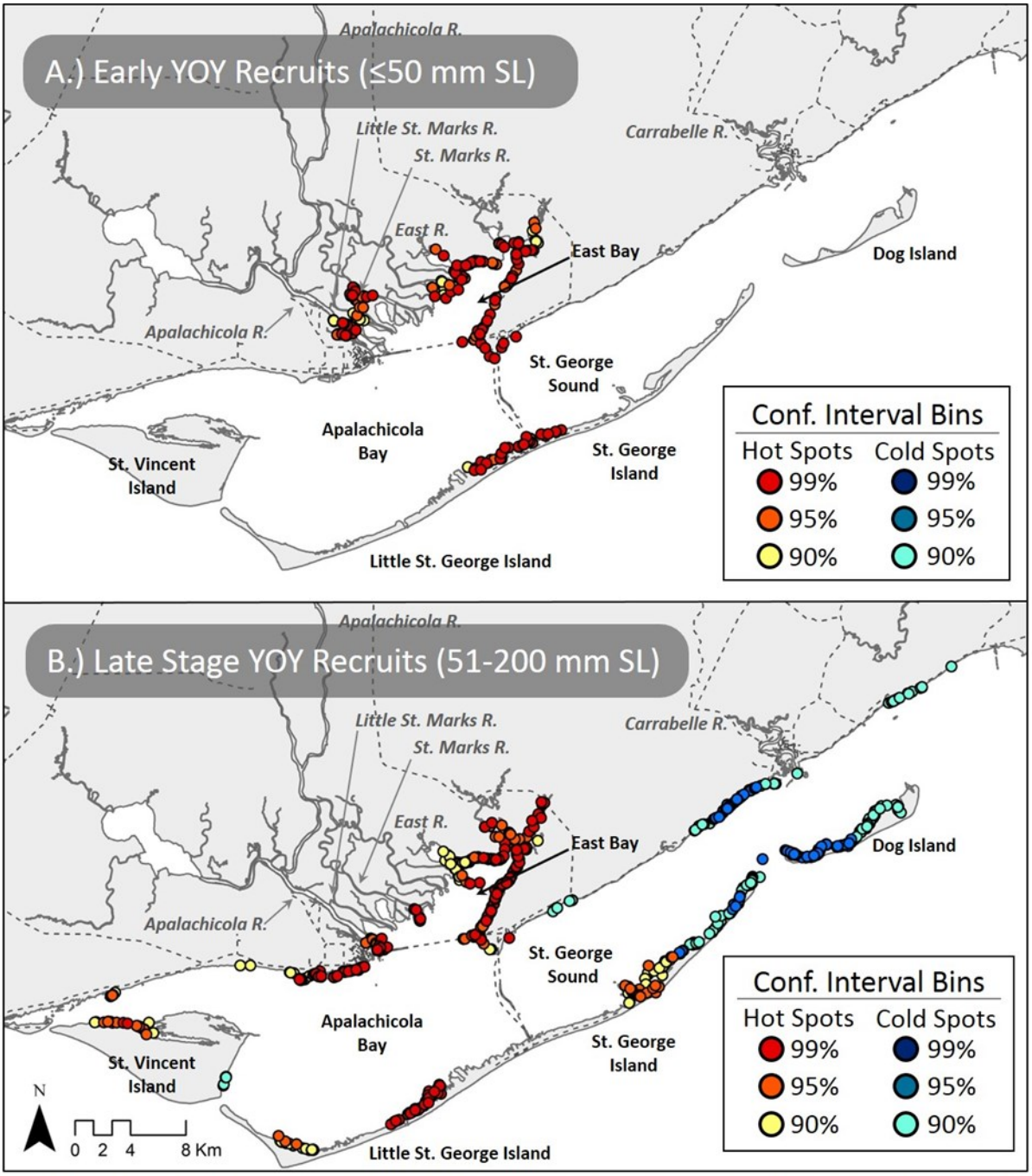


Figure 4. Map of the Hot Spot analysis model outputs showing significant spatial groupings of high (i.e., Hot Spots) and low (i.e., Cold Spots) CPUE data for (A) early YOY recruits (≤50 mm SL), and (B) late stage YOY recruits (51-200 mm SL) Red Drum in the Apalachicola Bay estuary. Hot spots in red to yellow shaded circles indicate primary nursery grounds whereas cold spots in blue shaded circles represent areas that are poor quality nursery grounds.

Model variable for early YOY recruits (≤50 mm)	Small bay seine (ddf=865)			Small river seine (ddf=548)			*Shoreline only Small bay seine (ddf=381)		
	ndf	*F*	*P*	ndf	*F*	*P*	ndf	*F*	*P*
Year	15	2.8	<0.001	14	NS	NS	15	2.3	<0.001
Temperature	1	NS	NS	1	9.9	0.002	1	NS	NS
Salinity	1	24.3	<0.001	1	20.4	<0.001	1	22.7	<0.001
Shoreline vs Offshore	1	37.5	<0.001	.	.	.	.	.	.
Bottom type	6	NS	NS	3	NS	NS	6	NS	NS
SAV cover (%)	1	23.1	<0.001	.	.	.	1	16.5	<0.001
SAV cover (P/A)	.	.	.	1	NS	NS	.	.	.
Sampling depth	1	4	0.0487	1	18.3	<0.001	1	NS	NS
Shore type	.	.	.	8	NS	NS	9	NS	NS

Table 1. Results of generalized linear modeling analyses indicating the effects of year and several abiotic and habitat complexity variables on Log10 transformed CPUE (# fish/set) for early YOY Red Drum (≤50 mm SL) from FWRI's Fisheries-independent Monitoring seine data in the Apalachicola Bay estuary. Note ndf = numerator degrees of freedom, ddf = denominator degrees of freedom, NS = not significant, dots = non-applicable due to small sample size.

Model variable for late stage YOY recruits (51-200 mm)	Small bay seine (ddf=1446)			Large bay seine (ddf=909)			*Shoreline only Small bay seine (ddf=381)		
	ndf	*F*	*P*	ndf	*F*	*P*	ndf	*F*	*P*
Year	15	NS	NS	15	3.3	<0.001	15	NS	NS
Temperature	1	NS	NS	1	10.9	0.001	1	NS	NS
Salinity	1	31.3	<0.001	1	66.9	<0.001	1	15.3	<0.001
Shoreline vs Offshore	1	20.3	<0.001	.	.	.	.	.	.
Bottom type	6	2.8	0.010	6	4.4	<0.001	6	NS	NS
SAV cover (%)	1	NS	NS	1	6.6	0.011	1	NS	NS
SAV cover (P/A)	.	.	.	.	.	.	.	.	.
Bag depth	1	NS	NS	1	10.1	0.002	1	NS	NS
Shore type	.	.	.	8	NS	NS	9	NS	NS

Table 2. Results of generalized linear modeling analyses indicating the effects of year and several abiotic and habitat complexity variables on Log10 transformed CPUE (# fish/set) for late stage YOY Red Drum (51 - 200 mm SL) from FWRI's Fisheries-independent Monitoring seine data in the Apalachicola Bay estuary. Note ndf = numerator degrees of freedom, ddf = denominator degrees of freedom, NS = not significant, dots = non-applicable due to small sample size. Comparisons for all small river seines were non-significant and therefore excluded.

ogies and may represent important recruitment habitats for early YOY recruits. Lastly, for late stage YOY recruits, we observed four distinct cold spots. Cold spots include areas of sandy flats with lush homogenous seagrass beds that tend to have higher salinities on average than the hot spots.

Site-specific factors influencing nursery quality—For water quality parameters, generalized linear modeling indicated that salinity significantly affected the abundance of Red Drum in both size classes and for all gear types, while temperature only affected early YOY recruits in small-mesh river seines, and late stage YOY Red Drum in large bay seines (Table 1). Sampling depth was a significant factor for early YOY recruits collected in small-mesh bay and large bay seines, but not in the shore-

line only small-mesh bay seine analysis. SAV cover significantly affected abundance of early YOY recruits in small-mesh bay seines and late stage YOY recruits in large bay seines. By and large, the majority of hot spots for both size classes tended to be in regions that are typically thought of as lower salinity backwater areas rather than large expanses of SAV. Both early and late stage YOY Red Drum showed a preference for shoreline as opposed to shallow (<1.5 m deep) offshore habitats in bay seines. However, there was no significant difference between shoreline types in the shoreline bay seine only analysis. This suggests a preference for shoreline habitats in general, but no specific preference between the shore type classifications tested.

CONCLUDING REMARKS

Although the data presented are preliminary, we highlight the efficiency and importance of long-term fisheries-independent monitoring in providing critical life history and abundance data for Red Drum. Overall, we noted key recruitment windows for early YOY recruits and late stage YOY Red Drum, and identified regions of the Apalachicola Bay estuary that are important nursery habitats. Results appear to suggest salinity as one of the key drivers of nursery use as groupings of hot spots were predominantly located in shallow, lower salinity backwater regions of the estuary. However, further research is warranted to completely understand all site-specific conditions that influence nursery quality.

REFERENCES

Baltz, D. M., Fleeger, J. W., Rakocinski, C. F., and McCall, J. N. 1998. Food, density, and microhabitat: factors affecting growth and recruitment potential of juvenile saltmarsh fishes. Environmental Biology of Fishes 53:89-103.

Barbier, E. B., Hacker, S. D., Kennedy, C., Koch, E. W., Stier, A. C., and Silliman, B. R. .2011. The value of estuarine and coastal ecosystem services. Ecological Monographs 81:169-193.

Beckman, D. W., C. A. Wilson, and A. L. Stanley. 1988. Age and growth of Red Drum, Sciaenops ocellatus, from offshore waters of the northern Gulf of Mexico. U.S. National Marine Fisheries Service Fishery Bulletin 87:17–28.

Boesch, D. F., and Turner, R. E. 1984. Dependence of fishery species on salt marshes: the role of food and refuge. Estuaries 7:460-468.

Comyns, B. H., Nieland, D. L., and Wilson, C. A. 1991. Reproduction of red drum, Sciaenops ocellatus, in the north central Gulf of Mexico: Seasonality and spawner biomass. NOAA Technical Report NMFS 95:17-26.

Flaherty, K. E., T. S. Switzer, B. L. Winner, and S. F. Keenan. 2014. Regional correspondence in habitat occupancy by Gray Snapper (Lutjanus griseus) in estuaries of the southeastern United States. Estuaries and Coasts 37:206–228.

Goodyear, C.P. 1987. Status of the Red Drum stocks in the Gulf of Mexico. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center, Contribution CRD 86/87-34, Miami.

Heck, K. L., Nadeau, D. A., and Thomas, R. 1997. The nursery role of seagrass beds. Gulf of Mexico Science 15:50-54.

Holt, S. A., Kitting, C. L., and Arnold, C. R. 1983. Distribution of young red drums among different sea-grass meadows. Transactions of the American Fisheries Society 112:267-271.

Ingle, R. M., and Dawson, C. E. 1953. A survey of Apalachicola Bay. State Board of Florida, Board of Conservation, Technical Series 10.

Livingston, R. J. 1983. Resource atlas of the Apalachicola estuary (No. 55). Florida Sea Grant College Program.

Muller, R., M. D. Murphy. 1994. Stock Assessment of Red Drum, Sciaenops ocellatus, in Florida. Florida Marine Research Institute Report to Florida Marine Fisheries Commission. St. Petersburg.

Murphy, M. D., and R. G. Taylor. 1990. Reproduction, growth, and mortality of Red Drum Sciaenops ocellatus in Florida waters. U.S. National Marine Fisheries Service Fishery Bulletin 88:531 –542.

Murphy, M. D., and J. Munyandorero. 2008. An assessment of the status of Red Drum in Florida waters through 2007. Report to the Florida Fish and Wildlife Conservation Commission from the Florida Fish and Wildlife Research Institute,

Fish and Wildlife Research Institute in-house report 2008-008, St. Petersburg.
Peters, K. M., and McMichael, R. H. 1987. Early life history of the red drum, Sciaenops ocellatus (Pisces: Sciaenidae), in Tampa Bay, Florida. Estuaries 10:92-107.
Purtlebaugh, C. H., and K. R. Rogers. 2007. Recruitment and essential habitat of juvenile Sand Seatrout (Cynoscion arenarius) in four estuaries along the west coast of Florida. Gulf of Mexico Science 2007:15–32.
Rooker, J. R., Holt, S. A., Soto, M. A., and Holt, G. J. 1998. Post settlement patterns of habitat use by sciaenid fishes in subtropical seagrass meadows. Estuaries 21:318-327.
Sogard, S. M. 1992. Variability in growth rates of juvenile fishes in different estuarine habitats. Marine ecology progress series 85:35-53.
Stunz, G. W., Minello, T. J., and Levin, P. S. 2002. Growth of newly settled red drum Sciaenops ocellatus in different estuarine habitat types. Marine Ecology Progress Series 238:227-236.
Swingle, W., T. Leary, C. Davis, V. Blomo, W. Tatum, M. Murphy, R. Taylor, G. Adkins, T. McIlwain, and G. Matlock. 1984. Fishery profile of Red Drum. Gulf of Mexico Fishery Management Council, Tampa, Florida, and Gulf States Marine Fisheries Commission, Biloxi, Mississippi.
USEPA, 1999, Ecological condition of estuaries in the Gulf of Mexico. Report of US Environmental Protection Agency, RD, National Health and Environmental Effects Research Laboratory, Gulf Ecology Division. Gulf Breeze, FL.
Weinstein, M. P. 1979. Shallow marsh habitats as primary nurseries for fishes and shellfish, Cape Fear River, North Carolina. U.S. National Marine Fisheries Service Fishery Bulletin 77:339-357.
Winner, B. L., D. A. Blewett, R. H. McMichael Jr., and C. B. Guenther. 2010. Relative abundance and Distribution of Common Snook along shoreline habitats of Florida estuaries. Transactions of the American Fisheries Society 139:62–79.

2016 AFS Florida Chapter Annual Meeting

We invite you to submit abstracts for the 2016 annual meeting of the Florida Chapter of the American Fisheries Society meeting. The meeting will take place March 2-4, 2016 at the Florida FFA Leadership Training Center in Haines City. We hope you can join us!

The meeting will consist of both invited and contributed oral presentations and posters. The 2016 symposium on March 3 is titled **'Improving Florida's Fisheries: Actions Today That Benefit Tomorrow'**

The **2016 symposium** will focus on the three primary avenues to improve our fisheries: fish stocking, fishing regulations, and habitat enhancement. What do we do as researchers, scientists, or managers to improve fishing or fishing opportunities throughout the Sunshine State?

We strongly encourage submissions for the symposium. Please note if you would like your presentation to be part of the symposium, indicate it in your abstract submission.

Deadline for abstracts submission & early registration: **Friday, January 22, 2016**

Abstract format
Abstract *word limit is 300 words* and should include the following information:

Presenter: Williams, Brian
Email: BrianWilliams@FloridaFish.net
Author(s): Williams, B.[1], K. Rowley[1], and P. George[2]
[1]Affiliation with address.
[2]Affiliation with address.

Title: Recommendations for New Limits on Some of Florida's Most Targeted Fish Species

Abstract: 300 word maximum

Student Presentation: No or Yes (work presented was completed while a student)

Presentation type: Oral or Poster

Would you like to be considered for the symposium? Yes or No

Are you willing to be a moderator? Yes or No

Are you willing to be a judge? Yes or No If so, oral presentation or poster?

Abstract submission
Please submit your abstract as a MS Word document to andy.strickland@myfwc.com. Please follow these instructions for submission:

- In the email subject line, please enter FLAFS2016: followed by the author names in your abstract (e.g., FLAFS2016 SmithTaylorRosen)
- Use the same name for the abstract file, e.g. FLAFS2016 SmithTaylorRosen.doc
- Please include the associated information requested above with the abstract

Presentation details
Speakers will be given 20 minutes for talks (15 minutes for presentations and 5 minutes for questions and/ or discussion). We will have PowerPoint 2007 on a laptop capable of accepting your presentation on a flashdrive.

All posters will be presented on *Wednesday evening, March 2,* and can be left up for the entire meeting. Posters should be no larger than 150 X 100 cm (60" X 40"), but they can be set up either as portrait or landscape format on an easel. If you require other options for projection or poster formats, please contact the annual meeting's Program Chair, Andy Strickland, andy.strickland@myfwc.com.

Meeting details
The 2016 meeting will be held at the Florida FFA Leadership Training Center, 5000 Firetower Road, Haines City. Maps and directions will be available in the next issue of the Shellcracker or can be found on the Florida FFA Leadership Training Website at www.flaltc.org.

The meeting's schedule of events will be similar to past meetings with exception of serving lunch on the first day to help cut costs. We will begin in the afternoon on Wednesday, March 2nd with the presentation

of contributed papers. The poster session will take place following dinner on Wednesday evening. The **'Improving Florida's Fisheries: Actions Today That Benefit Tomorrow'** symposium will start on Thursday morning. The business meeting and raffle will follow dinner on Thursday night. We will hear more contributed papers on Friday morning, followed by lunch and the presentation of awards immediately following lunch.

Registration, Lodging and Meals

Early registration deadline is **Friday, January 22, 2016.** The cost for early registration is $40.00. The cost for registration after January 22, 2016 is $60.00. **We strongly encourage folks to register early because the venue needs estimates for meals and rooms several weeks in advance.** If you are staying at the FFA Leadership Training Center for this year's meeting, the cost for full meals and lodging is $209.00. Costs of meals and lodging are higher for this year's meeting than they were in past years because the amenities offered at the FFA Leadership Training Center will be much better and gratuity is built into the cost. The full cost of meals and lodging is still cheap compared to most meetings. Linens will be provided including pillows, towels, and sheets.

We have Columbia long-sleeved fishing shirts with the chapter logo for the meeting this year! The cost for the shirts are $15.00 for those that register by the early registration deadline. The cost for additional shirts of those that register late is $30.00.

For your convenience, we will have registration available online via our website: Florida Chapter AFS. Once you fill out the online form, you can either pay online through PayPal or print the completed form and mail it in with your check, cash, or money order. A hard copy of the registration form can also be found on the Chapter's website: http://sdafs.org/flafs/.

If you can't attend the meeting, we will have a new link on the chapter's website where you can pay your $10 annual dues electronically, or you can still mail a check for $10 to the Secretary/Treasurer made payable to Florida Chapter AFS.

Opportunities for student support

As in previous years, student travel awards will be available for the annual meeting. Master's and doctoral students are also eligible for the Roger Rottmann Memorial Scholarship, for which the recipient(s) will be announced at the annual meeting. More information and the application materials are available at FLAFS Awards and Scholarships.

We look forward to seeing everyone in Haines City for our 2016 annual meeting!

2016 Student Raffle

Our next raffle is less than two months away. We need your help to make next year's raffle better than ever and expand our donator list for the upcoming national meeting in 2017. If you are interested in helping out please email Andy Strickland (Andy.Strickland@MyFWC.com) or Alan Collins (lac96@bellsouth.net). Remember all proceeds fund our student travel grants for next year's meeting. Please contact us to get involved!

Thanks,
Andy Strickland and Alan Collins

Annual Meeting of the Florida Chapter of the American Fisheries Society

March 2-4, 2016
FFA Leadership Training Center, Haines City, Florida

Wednesday, March 2nd

11:00am – 6:00pm	Registration
1:00pm – 5:00pm	Contributed Papers
5:00pm – 7:00pm	Poster Setup
6:00pm – 7:00pm	Dinner
7:00pm – 8:00pm	**Formal Poster Session**…Followed by Bonfire Social

Thursday, March 3rd

7:30am – 8:30am	Breakfast
7:30am – 6:00pm	Registration
8:30am – 12:00pm	**Symposium: Improving Florida's Fisheries**
12:00pm – 1:00pm	Lunch
1:00pm – 2:30pm	**Symposium: Improving Florida's Fisheries**
2:45pm – 5:00pm	Contributed Papers
5:00pm – 6:00pm	Student Subunit Meeting
6:00pm – 7:00pm	Dinner
7:00pm – 8:00pm	**Chapter Business Meeting and Award Presentations** Student Awards: Travel and Roger Rottman Scholarship Professional Awards: Rich Cailteux Award Followed by the Raffle, Auction, and Bonfire Social

Friday, March 4th

7:30am – 8:30am	Breakfast
7:30am – 9:00am	Registration
8:30am – 8:40am	Announcements
8:40am – 12:00pm	Contributed Papers
12:00pm – 1-00pm	**Lunch and Awards Presentation** Best Papers/Best Posters Power Tie Lampshade Award

Driving Directions to the FFA Leadership Training Center

From the North:

Take I-4 to Highway 27 South. Travel south approximately 12 miles to Highway 544, turn left (east). Continue east to Route 17 (1st stop light), turn right (south), go 3 miles. Turn left (east) on Highway 542 - Lake Hatchineha Rd. (look for a green "FFA Training Center" sign) go 8 miles. Watch for the next green sign on the right on Highway 542 - Lake Hatchineha Rd., turn right on Firetower Rd. Travel 4.5 miles to FFA Leadership Training Center.

From the Northwest:

Travel south on I-75 to the Florida Turnpike. Exit turnpike at US Highway 27, go south. Travel south approximately 35 miles to Highway 544, turn left (east). Continue east to Route 17 (1st stop light), turn right (south), go 3 miles. Turn left (east) on Highway 542 - Lake Hatchineha Rd. then go 8 miles. After green "FFA Training Center" sign on right on Highway 542 - Lake Hatchineha Rd., go 8 miles and turn right on Firetower Rd. Travel 4.5 miles to FFA Leadership Training Center.

From the Southeast:

Take the Turnpike or I-95 to State Road 60. Travel west on Highway 60 to U.S. Highway 27, turn right (north). Travel north on U.S. Highway 27 to Dundee (Approx. 9 miles). Turn right at the stop light in Dundee onto Highway 542. Travel east to the first stop light, turn left on Route 17. Travel north for 1.25 miles to Lake Hatchineha Rd. (Highway 542), turn right. After green "FFA Training Center" sign on right on Highway 542 - Lake Hatchineha Rd., go 8 miles and turn right on Firetower Rd. Travel 4.5 miles to FFA Leadership Training Center.

From the Southwest:

Take I-75 to State Road 60 East to U.S. Highway 27. Travel east on Highway 60 to U.S. Highway 27, turn left (north). Travel north on U.S. Highway 27 to Dundee (Approx. 9 miles). Turn right at the stop light in Dundee onto Highway 542. Travel east to the first stop light, turn left on Route 17. Travel north for 1.25 miles to Lake Hatchineha Rd. (Highway 542), turn right. After green "FFA Training Center" sign on right on Highway 542 - Lake Hatchineha Rd., go 8 miles and turn right on Firetower Rd. Travel 4.5 miles to FFA Leadership Training Center.

Award Nominations!?!

The Awards Committee is seeking nominations for the Florida Chapter's, Outstanding Achievement and Rich Cailteux Awards. Send nominations to Eric Nagid (eric.nagid@myfwc.com) by January 22, 2016. Applications should be limited to one page, but descriptive enough to convey why the individual is deserving of the award. Nomination letters should outline the accomplishments of the individual that meet the criteria of each award below.

Outstanding Achievement Award

The purpose of the Outstanding Achievement Award is to recognize individuals for singular accomplishments and contributions to fisheries, aquatic sciences, and the Florida Chapter. The award aims to honor individuals for distinct contributions to the fisheries profession and enhancing the visibility of the Chapter. The Outstanding Achievement Award is the highest honor Florida AFS may bestow upon an individual member or collaborating group.

Candidates will be evaluated according to the following criteria:

- Original techniques or research methodology
- Original ideas, viewpoints, or data which contributed to fisheries management or our understanding of aquatic resources
- Important ecological discoveries
- An original fishery research or management program of statewide importance
- Activities in public education and outreach that have statewide impacts

Rich Cailteux Award

The purpose of the Rich Cailteux Award is to recognize individuals who have maintained a long-term commitment to research, management, and/or conservation of Florida fisheries and aquatic resources. This award aims to honor individuals for their career contributions to the fisheries profession and enhancing the visibility of the Florida Chapter.

Candidates will be evaluated according to the following criteria:

- A minimum of 20 years spent in a fisheries related field in Florida
- Substantial career contributions to Florida aquatic resources and the fisheries profession
- An imaginative and successful program in fisheries and aquatic sciences education
- A history of mentoring young fisheries professionals, and involvement and leadership with the Florida Chapter of the American Fisheries Society.

Candidate Biographies for Upcoming Election for Florida Chapter Officers

(further nominations for President-Elect and Secretary/Treasurer will be provided at the 2016 annual meeting)

President-Elect: **Jeff Hill, Ph. D.**

It is an honor to be nominated to run for President of the Florida Chapter of the American Fisheries Society. My BS in Biology came from the University of North Alabama followed by experience as a commercial aquaculture producer in south Florida. My academic background in fisheries began at the University of Florida with MS and PhD degrees and continues today where I am an Associate Professor and Fisheries Extension Specialist at the UF/IFAS Tropical Aquaculture Laboratory in Ruskin. My research, teaching, and extension programs focus on the ecology and management of non-native fishes. This is my 20th year with the Florida Chapter. During this time I have been to nearly every annual meeting to present research, learn from others, and of course socialize at the bonfire. I fondly recall our meetings at the Withlacoochee Forest during my early years and the more recent Camp Ocala meetings. I am sure as we look forward to meeting in a new location that more great memories of friends and colleagues and outstanding presentations will be had by all. Over the years I have served the Chapter as symposium co-organizer, session moderator, paper and poster judge, and presenter. As a student member I was deeply honored to receive the Roger Rottmann Award, in particular due to the institutional knowledge passed down to me about his character and accomplishments. In addition to involvement in the Florida Chapter I have been active since 2005 in the American Fisheries Society, serving 3 years as President of the Introduced Fish Section (IFS) and member of the AFS Governing Board, a combined 7 years on the IFS EXCOM, as a member on the Hatcheries and Management of Aquatic Resources (HAMAR) Steering Committee, and a member of the Resource Policy Committee (2011 to present). I would be proud to serve as President and continue the traditions of the Florida Chapter as a leading voice in fisheries management in the state.

Florida Chapter of the American Fisheries Society
Florida FFA Leadership Training Center
Annual Meeting Registration: March 2-4, 2016

Official Use Only:
Postmarked:_____
Entered:_____
Deposited:_____

First: _____ **Last:** _____ ☐ **Student (please check)**

Affiliation:_____
This address will be used in our mailing list and should be the one where you want to receive materials.

Street Address:_____

City:_____ **State:**_____ **Zip Code:**_____

Work Phone:_____ **Ext:**_____ **Email:**_____

Shirt Size: (Select One) Small Medium Large X-Large XX-Large Not Purchasing a Shirt

Arrival Time: (Select One) Wed Noon Wed PM Thurs AM Thurs Noon Thurs PM Fri AM

Please check the appropriate boxes below.

PRE-REGISTRATION: registration form postmarked by Friday, January 22, 2016
☐$ 30.00 One-day Registration ☐$ 40.00 Full Registration

LATE-REGISTRATION: registration form postmarked after Friday, January 22, 2016
☐$ 40.00 One-day Registration ☐$ 60.00 Full Registration

Meals and Lodging (lodging price based on double occupancy rooms for professionals)

Wednesday, March 2, 2016	Thursday, March 3, 2016	Friday, March 4, 2016
No Lunch This Year	☐ $14.00 Breakfast	☐ $14.00 Breakfast
☐ $24.00 Dinner	☐ $17.00 Lunch	☐ $16.00 Lunch
☐ $50.00 Lodging	☐ $24.00 Dinner	
	☐ $50.00 Lodging	

Full Meals and Lodging ☐ **$209.00**
Linens (provided)

Florida Chapter dues (calendar year 2016) ☐ **$10.00** ☐ FL Chapter dues paid via AFS annual membership.

Total Amount: _____

Total Enclosed: _____ OCash OCheck
(Minimum $10)

Balance Due: _____ OCash OCheck OCredit

Please Make Checks Payable to Florida Chapter, AFS and mail to:
Kevin Johnson
FWC
601 W. Woodward Ave.
Eustis, FL 32726
Phone: (352) 800-5003
Fax: (352) 357-2941
Email: kevin.johnson@myfwc.com
*Checks not payable to 'Florida Chapter AFS' will be returned to sender.
Registration Forms may be sent via fax (attention: Kevin)
or via email: (subject: 2016 AFS FL).
A minimum amount of $10 must be mailed to validate your registration.

Note: This is a buffet-style service and food must be ordered one week in advance.
Since meals are pre-paid, **please** submit your registration form as soon as possible.
Registrations will still be accepted at the meeting, but with a late registration fee.
We can accept VISA, MASTERCARD, cash or check at the meeting.
If you would like to pay your meeting fees with a credit card, then please send a $10 check for your deposit.