

Attachment 4

PPBEP COMMUNITY GRANT FINAL RESEARCH REPORT FORM

Agreement No.:	FY2425-03		
Grantee Name:	Northwest Florida State College		
Grantee Address:	100 College Blvd E, Niceville, FL 32578		
Grantee's Representative:	Geoffrey Smith	Telephone No.:	850-729-5242
Project Title:	A Comparison of Fish and Decapod Communities in Natural vs. Impacted Tidal Creeks of Santa Rosa Sound		
Please submit any high-resolution photos related to the project (include photo credit for possible use by PPBEP for use in our e-newsletter, annual report, social media, or website) with your report as image files to mbwalkinshaw@ppbep.org .			

ABSTRACT: Limit to 250 words. The abstract should include background and a statement of the problem or issue, followed by a description of the research method(s) and design, the major findings, and the conclusions reached.

Tidal tributaries, including small tidal creeks and tidal ponds, serve as critical habitats to numerous marine fish and invertebrate species. This includes many important forage species and the juveniles of many commercially and recreationally important species such as Red Drum, Spotted Seatrout, Blue Crab, and penaeid shrimps. There is a general lack of either short term or long term assessment and monitoring of juvenile fish and decapod species in the Pensacola Bay system including Santa Rosa Sound. Initial sampling of a subset of tidal creeks draining into Santa Rosa Sound over the past year demonstrated that many of these creeks support large fish populations that included juveniles of both recreational sportfish and commercially targeted decapods. That study focused mainly on relatively intact and minimally impacted creeks. However, many of the creeks/canals along the sound have been highly impacted (seawall shorelines, little/no emergent vegetation, dredged/channelized, etc.). Previous studies have noted that highly impacted tidal tributaries often have lower fish abundances and/or fish communities that are different (more pelagic schooling species, more large/adult sportfish, fewer marsh residents, fewer juvenile sportfish) than more natural creeks. The current study demonstrated that community composition varied significantly between natural and impacted creeks, with major drivers of these differences being Spot, Bay Anchovy, Grass Shrimp, and Sailfin Molly. Abundances of commercial and recreational important species such as juvenile sportfish, penaeid shrimp, mullet, and Blue Crab did not contribute significantly to overall community differences but varied between sites with some impacted and natural creeks having relatively large abundances.

INTRODUCTION: Provide necessary background information, describe the purpose of the project, and state the key objectives.

Tidal tributaries serve as critical habitats to numerous marine fish and invertebrate species. This includes many important forage species and the juveniles of many commercially and recreationally important species such as Red Drum, Spotted Seatrout, Blue Crab, and penaeid shrimp. There is a general lack of either short term or long term assessment and monitoring of juvenile fish and decapod species in the Pensacola Bay system including Santa Rosa Sound. Initial sampling of a subset of tidal creeks draining into Santa Rosa Sound over the past year demonstrated that many of these creeks support large fish and decapod populations that included juveniles of both recreational sportfish and commercially targeted decapods. That study focused mainly on relatively intact and minimally impacted creeks. However, many of the creeks along the sound have been highly impacted. Previous studies have noted that highly impacted tidal tributaries often have lower fish abundances and/or fish communities that are quite different than more natural creeks. The goal of this study is to compare a set of four relatively natural creeks (emergent marsh vegetation shorelines, minimal to no dredging/channelization) to a set of four highly impacted creeks (little to no emergent vegetation, seawall shorelines, dredging/channelization) (see attached map for proposed sampling locations). This study will also expand upon the datasets for some of creeks sampled in the previous study. The data from this study will allow for a direct comparison of the fish communities, as well as water parameters, in natural vs. impacted creeks. In particular, comparisons of recreationally and commercially important species, such as juvenile sportfish, penaeid shrimp, Blue Crab, and mullet were made. If notable differences are discerned, they can be cited as further justification for the preservation and restoration of tidal creek systems in the Santa Rosa Sound system (and possibly for the wider Pensacola Bay system). Such preservation and restoration efforts would aid in the overall maintenance and possible improvement of the health of the Santa Rosa Sound system.

METHODS: Provide sufficient detail for how the project was conducted and data were collected, including specific materials and methodologies/protocols.

Medium sized bag seines (21.3 m in length, 1.8 m in depth, 3.2 mm mesh) was used to sample a subset of tidal creeks/canals draining into Santa Rosa Sound. Four relatively natural (emergent marsh vegetation shorelines, minimal to no dredging/channelization) and four highly impacted creeks/canals (little to no emergent vegetation, seawall shorelines, dredging/channelization) will be sampled bi-monthly (October through May). The sampling of natural vs impacted creeks will be distributed through a whole bi-monthly period (i.e., some of each classification will be sampled each month so all of a particular category are not sampled at either the beginning or end of each bi-monthly period). These creeks/canals are located between Gulf Breeze and Navarre on the north shore of Santa Rosa Sound (see attached map). Most of these creeks/canals did not appear to have designated names, so names were assigned based on surrounding attributes, such as park, community, or street names. Creeks were restricted to this area because of the close proximity of both natural and impacted creeks allowing for removal of potential differences based on distribution within the sound (e.g., the far eastern portion of the sound has a number of moderately to highly impacted creeks but few natural creeks while the middle portion has several relatively natural creeks but few highly impacted creeks in close proximity to the natural creeks). Natural creeks included Soundside Preserve Creek (SPC), Lands End Creek (LEC), Lighthouse Point Creek (LPC), and East Tiger Point Creek (ETPC) (see attached map). Impacted creeks included Laguna Lane Canal/Creek (LLC), Magnolia Lane Creek/Canal (MLC), Brickyard Bayou Canal/Creek (BBC), and Soule Place Canal/Creek

(SoPC). Brickyard Bayou Canal/Creek was named after an adjacent road, it was later discovered that this body of water is actually named Brickyard Bayou. Soule Place Canal/Creek was also named after an adjoining road, it was later discovered that this water body of water is named Chinquapin Bayou. Based on the size of the creek 2-4 bag seines were hauled in each system during 4 bimonthly periods (Nov/Dec, Jan/Feb, Mar/Apr, May/Jun). A total of 12 (4, 3, 3, and 2 per individual creek/canal) seines were pulled during each bimonthly sampling period in both natural and impacted systems. All fish and decapod crustaceans were identified and enumerated on site prior to their release. Some individuals were retained as part of a reference collection and for identification purposes. Commercially and recreationally important species including sportfish (Red Drum, Spotted Seatrout, etc.), mullet, Blue Crab, and penaeid shrimp were measured (total length or carapace length in mm) prior to their release. The approximate length and width of each seine haul was measured with a transect tape to estimate area sampled for calculations of species abundances. Ambient water conditions (salinity, dissolved oxygen, temperature, pH, turbidity) were measured at each sampling site with a YSI multi-meter probe, and water samples were collected at the farthest upstream and downstream sampling sites within each creek during each sampling period. These samples were analyzed for total suspended solids, nutrients (total nitrogen, total phosphorus, dissolved inorganic phosphorus, ammonium, and nitrite+nitrate), chlorophyll-a and color. These parameters were analyzed utilizing the standardized operating procedures noted in the attached file. Information on water depth, tidal cycle, shoreline composition (vegetation, seawall, etc.), and bottom type (mud, sand, presence of submerged aquatic vegetation) was recorded at each sampling site. Community composition was compared based on individual species as well as with species grouped by similar characteristics. Species groups included caridian shrimps (essentially all shrimp other than penaeid shrimp, primary Grass Shrimps but also several other rarely encountered species), hermit crabs, penaeid shrimps (Brown and White Shrimp, Rimapenaeus spp., and unidentified juveniles), Blue Crab (both juveniles <100 mm CL and adults >100 mm CL), other crabs (a few rarely encountered crab species), Croaker/Spot (Atlantic Croaker, Spot, and Silver Perch), sting rays, Anchovies/Clupeids (schooling pelagics, mainly Bay Anchovy and menhaden species), silversides, other flatfish (soles, tonguefishes, and flounder species not targeted by recreational/commercial fisheries), bass and sunfish (freshwater sportfish/Centrachids), pipefishes and seahorses, gobies and sleepers, blennies, mojarras, pinfish and pigfish, other benthic fish that were rarely encountered (such as Leopard Searobin, Inshore Lizardfish, etc.), other pelagic fish (such as needlefishes, Ladyfish, Crevalle Jack, etc.), sportfish (small juveniles <200 mm TL and larger juveniles/adults >200 mm SL) and mullets (juveniles <200 mm TL and adults >200 mm TL). The mvabund package in R was used to compare communities compositions between impacted and un-impacted (natural) sites. Pairwise comparison for individuals species or species groups were also compared with comparisons being adjusted for multiple comparisons. Boxplots were created to illustrate the differences in species/species groups contributing significantly to the overall community composition, as well as for the commercially/recreationally important species mentioned above. Water parameters were plotted for the farthest upstream and downstream sites by the sampling period.

RESULTS: Present and describe key results from your research project. This section should accurately describe all data collected, including data summaries, significant observations, and trends (if applicable). Please attach a separate file with map(s), tables, and figures.

Please see attached files including an excel file containing all mvabund results tables and a word document with the text summary of the results and all associated figures (boxplots and graphs).

DISCUSSION AND CONCLUSION: Present, interpret, and discuss the results, project outcomes, future research needs, and how this research connects back to the CCMP.

Interpretation of the water parameter data is contained with the summary of results for each parameter presented in the attached results word document.

Generally community composition differed significantly between un-impacted and impacted systems, but this was typically driven by a few commonly captured species. Spot, a relatively small Sciaenidae, recruit widely throughout estuaries and are somewhat pelagic when they first recruit. They are often found in large abundance along open shorelines. The wider, more consistent entrances and deeper water may be why this species was generally more abundant in the impacted creeks and canals. Bay Anchovy and clupeids, primarily menhaden species, were also more abundant in impacted systems, again likely to the wider entrances and greater abundance of open water. Conversely, Grass Shrimp and Cyprinodontiformes (Poeciliidae - livebearers, Fundulidae – topminnows and killifish, and Cyprinodontidae – pupfishes), were much more abundant in the relatively un-impacted systems. These species are often most abundant in areas with large amount of submerged aquatic vegetation and/or emergent shoreline vegetation. The latter being present along most of the shoreline of the un-impacted systems and almost non-existent in the impacted systems. Although, juvenile sportfish, juvenile mullet, penaeid shrimp, and Blue Crab did not contribute significantly to the overall community differences between impacted and un-impacted system, there were some noticeable differences in abundances (some of these differences would likely be significant if further statistical tests were performed). Overall, juvenile sportfish abundances were slightly higher in impacted systems. Many of the small juvenile sportfish captured during the sampling are more habitat generalist than specialists. For example Spotted Seatrout will recruit to nearshore seagrass beds, tidal creeks, etc. Juvenile flounder typically recruit to sandier bottoms which were more common in the dredged, impacted creeks/canals than the relatively un-impacted creeks, which often had muddier bottoms. Sheepshead and Gray Snapper widely recruit to structured areas (woody debris, emergent vegetation, seagrass, rocks, seawalls, etc.) in estuaries, and although nearly all of the juveniles of these species were captured in un-impacted creeks, it is likely more were present around the dock pilings of the impacted canals that could not be sampled. Red Drum, are a bit more specialized in the habitat for recruitment, typically recruiting to salt marshes, which is where they were most commonly encountered in this study. The areas where juvenile sportfish were most commonly encountered in impacted systems was also more similar to un-impacted systems than the rest of the canal. They were generally found in dead ends with shallower water,

connection to freshwater inputs, and in some rare cases small amounts of emergent vegetation. Another possibly explanation for the lower abundance of juvenile sportfish in at least some of the un-impacted systems is that even though they have relatively intact shorelines, their upper watersheds have been highly modified and in some cases have caused significant sedimentation. This has caused the systems to become much shallower, even in deeper creek bends where the juvenile sportfish would often reside, especially during low tides. In this manner, sedimentation may have improved the habitat in some of the impacted creeks/canals while detracting from it in some of the un-impacted creeks. Juvenile mullet were considerably more abundant in un-impacted systems, possibly as a result of predator refuge (intact emergent shoreline, generally shallow depth, restricted entrances). Penaeid shrimp and Blue Crab abundances tended to differ less between impacted and un-impacted systems. Soundside Preserve Creek and Lighthouse Point Creek have highly restricted entrances and East Tiger Point Creek has significant freshwater inputs from a number of nearby golf course ponds, which likely explains the lower numbers of penaeid shrimp, Blue Crab, and some juvenile sportfish species in these creeks. Some of the results noted should be treated with caution, as sampling was conducted during an atypical year in terms of weather. Between the end of the November/December sampling period and the start of the January/February sampling period, there was a record breaking snow event for our area. This resulted in the death of many individuals of several fish species, due to the unusually cold water. It appears that all of the juvenile Atlantic Tarpon observed in East Tiger Point Creek died (personal observations during January/February sampling and reports from homeowners). It is likely that most if not all of the juvenile Common Snook in these system died (several were captured or observed in December but none were captured or seen during the rest of the sampling). Some dead White Mullet were observed (not anywhere near the extent reported in other areas locally), but this species was still caught in large numbers after the snow event. Mojarra, which were one of the most abundant species captured in November/December, were caught in very low numbers after the snow event, indicating a likely large cold water related mortality event. Only a few dead mojarra were observed, but it is likely that these small-bodied fish were quickly consumed by larger predatory fish, wading birds, raccoons, etc. The impacts to mojarra appeared to be much greater in impacted creeks as there were almost none caught (and only small juvenile) in these systems during January through April and abundances only appeared to start rebounding in May/June due to a pulse of new recruits. In the un-impacted systems, mojarra abundances dropped substantially after the snow event, but both small and large individuals were caught more frequently than they were in impacted systems. The generally shallower water, muddier bottoms, and restricted entrances of some of the un-impacted systems likely allowed them to stay warmer compared to the impacted systems with sandier bottoms (less heat retention than mud due to color differences) and wide/deep entrances (unrestricted flow of colder sound water into the system). A relatively large number of small juvenile Spotted Seatrout were captured in most of the impacted creeks prior to the January snow event, and almost none were collected in the impacted sites the rest of the sampling period. It is possible some they could have died due to the cold water, became disoriented/lethargic enough to be consumed by large Spotted Seatrout, which were observed both before and after the snow event, or they may have simply moved to the nearby seagrass beds in the sound as part of an ontogenetic habitat shift.

Overall, this sampling shows that these systems may play an important role in the fish and decapod communities of Santa Rosa Sound. Three (Brickyard Bayou Canal, Soule Place Canal/Chinquapin Bayou, and Magnolia Lane Creek/Canal) of the 4 impacted systems that were

sampled have areas that at least partially mimic an un-impacted system (freshwater inputs, shallow waters with adjacent deep holes for refuge during low tide, mix of mud and sand bottom, woody debris, and minimal shoreline vegetation) and often produced larger catches of juvenile sportfish, juvenile mullet, penaeids, and Blue Crabs). Even though all 4 of the un-impacted systems had nearly continuous shoreline vegetation often consisting of salt marsh, they had other impacts. East Tiger Point Creek appears to have elevated freshwater inputs and sedimentation due to the surrounding neighborhoods and golf course ponds. The lowered salinity is less desirable for some juvenile sportfish, such as flounders, Red Drum, and Spotted Seatrout (can all tolerate low salinity but are often more common in moderate to high salinity). However, this may be beneficial if certain juvenile sportfish species, such as Atlantic Tarpon and Common Snook, that often prefer lower salinity systems, continue to become more abundant in this region of the state. Much of the middle portion of East Tiger Point Creek appears to have suffered from significant sedimentation at some point, with even most of the bends being relatively shallower than would typically be expected. Soundside Preserve Creeks similarly has some elevated freshwater inputs due to the altered upper water shed, but not to the same extent as East Tiger Point Creek. This system overall is relatively small and has a very narrow, shallow entrance that likely limits recruitment several juvenile sportfish species, penaeids, and Blue Crabs. However, previous observations have indicated that this system may be important for juvenile Atlantic Tarpon. For its size (relatively small system), Lighthouse Point Creek appears to be providing good habitat for some juvenile sportfish including Red Drum, Spotted Seatrout, and Sheepshead. The restricted entrance of this creeks may prevent recruitment of some species. Overall, of the all the creeks/Canals sampled, Lands End Creek produced some of the highest abundances of juvenile sportfish, juvenile mullet, penaeids, and Blue Crabs. This system has a relatively extensive intact salt marsh shoreline and a moderately sized entrance. However, the upper portions of this system appear to have a high degree of sedimentation, which is likely restricting several species to the middle and lower portions of the creek. These systems have not been sampled thoroughly in the past and there is little sampling data from Santa Rosa Sound in general. There is some data available from FWC fisheries-independent sampling of the area in 1997 (FWC 1997). The data is from sampling conducted in Santa Rosa Sound and Chowtawahatchee Bay from January through April and utilized the same sampling gear as the current study. However, this a data set that is over 20 years old so the following comparisons may not reflect current conditions in the wider Santa Rosa Sound system. Based on this data combined sportfish abundances averaged 0.001 individuals/m², penaeid abundances averaged 0.003 individuals/m², Blue Crab abundances averaged 0.011-0.013 individuals/m², and mullet abundances averaged 0.068-0.127 individuals/m². The average abundance of juvenile sportfish (<200 mm TL) is higher than this for all systems but East Tiger Point Creek. Lands End Creek, Brickyard Bayou Canal, and Soule Place Creek/Chinquapin Bayou are all at least an order of magnitude greater than this, indicating that they are likely important nursery areas for juvenile sportfish. The average abundance of penaeid shrimps was greater than this for all systems sampled, and was at least an order of magnitude greater for all but East Tiger Point Creek, Lighthouse Point Creek, and Soundside Preserve Creek, with Brickyard Bayou Canal, Lands End Creeks, and Laguna Lane Canal being multiple orders of magnitude greater, indicating that these systems may be important recruitment areas. Blue Crab average abundance was higher than this in all systems, except for Soundside Preserve Creek (0.010 individuals/m²). Magnolia Lane Creek/Canal was approximately an order of magnitude greater (0.110 individuals/m²). Brickyard Bayou Canal fell within the range listed above for mullet, while Lands End Creek and

Lighthouse Point Creek exceeded this range. The analysis in this study mostly focused on commercially and recreationally important species, however, it should be noted that various species of important forage fish species, ecological indicators, etc. were collected in high abundance with species varying based on creek/canal characteristic. Additionally, even though this study was not designed to assess Diamondback Terrapin (a threatened species in Florida) abundance, one was captured in East Tiger Point Creek, and the largely intact marshes of this creek as well as Lighthouse Point Creek, and Lands End Creek also have a high likelihood of supporting Diamondback Terrapins.

REFERENCES: Please list references cited throughout this report. Additionally, if there are key references that PPBEP needs copies of to fully understand your methods and overall research, please attach references as individual PDFs.

Florida Fish and Wildlife Conservation Commission (FWC). 1997. Fisheries-independent monitoring program
intl.net/F50006A/OPAC/Details/Record.aspx?IndexCode=-
1&TaskCode=1569156&HitCount=464&CollectionCode=2&SortDirection=Descending&CurrentPage=1&Cur

SUCSESSES AND CHALLENGES: Describe the significant successes and challenges the organization experienced related to the funded grant.

Overall this project was a success, after making some adjustments learned from a previous community grant project (applying for sampling permit as soon as notification of award was made, initiating UWF sub-award contract as soon as notice to proceed with project was granted). Our biggest challenge was finding sampling days without inclement weather (exceedingly cold temperatures, excessive rain, lightning, etc.) and also having the best possible tides to increase sampling efficiency.

LESSONS LEARNED: Describe what the organization learned based upon the results, successes, and challenges reported. Address programmatic, evaluative, or organizational changes that will be made based upon these lessons learned.

There were still some delays in setting up the sub-award contracts, but knowledge gained through this process will be incorporated into any future collaborative studies to streamline this process.

As outlined in the discussion, a large amount of information about fish communities in small tidal tributaries in Santa Rosa Sound was gained. This data may be further evaluated in the context of water circulation in the wider Pensacola Bay system. This may provide further insights on the abundances of juvenile sportfish collected in the systems sampled in this study as well as other areas of the bay system that may serve as important juvenile sportfish nursery areas.

This report is submitted in accordance with the reporting requirements of Agreement No. FY2425-03 and accurately reflects the activities associated with the project.

 Recoverable Signature

X Geoffrey Smith

Geoffrey Smith

Instructor

Signed by: Geoffrey Smith

07/11/2025

Signature of Grantee's Representative

Date

Geoffrey Smith, Instructor

Print Name and Title