



**Program in Fisheries and Aquatic Sciences**

**School of Forest Resources and  
Conservation**

**12<sup>th</sup> Annual Graduate Student Symposium  
6<sup>th</sup>-7<sup>th</sup> April 2009**

**Program and Abstracts**

**GRADUATE STUDENT SYMPOSIUM  
ORGANIZING COMMITTEE**

**Abstracts & Program:**

Dana Bigham, Nikki Dix, John Hargrove, Jenney Lazzarino, Kimberly Thurman,  
Paula Viveros

**Audiovisual:** Felipe Carvalho, Andrew Barbour

**Food:** Alecia Adamson, Zy Biesinger

**Facilities:** Matt Lauretta, Jake Tetzlaff, Nate Johnson, Meredith Montgomery,  
Geoff Smith

**Faculty Coordinators**

Dr. Debra Murie and Dr. Shirley Baker

**MONDAY, APRIL 6th 2009**

9:00 - 9:15 **OPENING ADDRESS** by Tom Frazer, School of Forest Resources and Conservation, Associate Director

**SESSION I MODERATOR: DANA BIGHAM**

9:15 - 9:30 **EFFECTS OF NUTRIENT ENRICHMENT IN A HIGHLY FLUSHED ESTUARY**

Nicole Dix [Edward Phlips]

9:30 - 9:45 **JUVENILE GAG FINE-SCALE SPACE-USE PATTERNS**

Zy Biesinger [William Lindberg/Benjamin Bolker]

9:45 - 10:00 **MEASUREMENTS OF PRIMARY PRODUCTION IN THE CALOOSAHATCHEE RIVER / SAN CARLOS BAY ECOSYSTEM**

Loren Mathews [Edward J. Phlips]

10:00 - 10:15 **UNDERSTANDING ANIMAL MOVEMENT USING STOCHASTIC MODELS: MODELING TRANSITIONAL STATES ACROSS A RANGE OF SPECIES AND SCALES**

Jakob C. Tetzlaff [William E. Pine III]

10:15 -10:30 **DESIGN AND IMPLEMENTATION OF A PARTICIPATORY MAPPING FRAMEWORK TO PLAN FOR RECREATIONAL OPPORTUNITIES: USING TAYLOR COUNTY, FLORIDA AS A CASE STUDY**

Garin Davidson [Robert Swett]

10:30 - 10:45 **COFFEE BREAK**

**SESSION II MODERATOR: JOHN HARGROVE**

10:45 - 11:00 **PAST, PRESENT, AND FUTURE LONG-TERM WATER QUALITY TRENDS**

Dana Bigham [Daniel Canfield, Jr.]

- 11:00 - 11:15 **PHYTOPLANKTON COMPOSITION AND ABUNDANCE IN RELATION TO SALINITY, NUTRIENTS AND LIGHT GRADIENTS IN A BARRIER ISLAND SUBTROPICAL ESTUARY: APALACHICOLA BAY**  
Paula Viveros [Edward J. Philips]
- 11:15 - 11:30 **POTENTIAL IMPACTS OF NON-NATIVE FISH IN NORTH MESOAMERICAN LAKES**  
Christian Barrientos [Jeff Hill]
- 11:30 - 11:45 **FISH COMPENSATORY RESPONSES FOLLOWING WHOLE-LAKE EXPERIMENTAL DENSITY REDUCTION**  
Matthew J. Catalano [Micheal S. Allen]
- 11:45 - 12:00 **WATER COLOR AND ITS RELATIONSHIP WITH DISSOLVED ORGANIC CARBON AND RAINFALL**  
Ivelisse Ruiz-Bernard [Dr. Daniel E. Canfield/Dr. Matthew Cohen]
- 12:00 - 13:00 **LUNCH BUFFET**
- 13:00 - 13:15 **PRESENTATION: GRADUATE STUDENTS OF THE YEAR**

**SESSION III MODERATOR: GEOFF SMITH**

- 13:15 - 13:30 **PHYLOGEOGRAPHY OF THE ROUND PEARLSHELL, *GLEBULA ROTUNDATA* (LAMARCK, 1819) (BIVALVIA: UNIONIDAE)**  
Nathan A. Johnson [James D. Austin]
- 13:30 - 13:45 **PHYTOPLANKTON AND MESOZOOPLANKTON INTERRELATIONSHIPS DURING ALGAL BLOOMS PERIODS IN LAKE GEORGE, FL AND IN MESOCOSM-BASED EXPERIMENTS**  
Akeapot Srifa [Edward J. Philips]
- 13:45 - 14:00 **A COMPARATIVE ANALYSIS OF DETRACTORS AND NEEDS PERCEIVED BY BOATERS IN THREE FLORIDA BOATING REGIONS**  
Nancy Montes [Robert Swett/Thomas Frazer/Charles Sidman]
- 14:00 - 14:15 **VISUAL AND MOLECULAR ANALYSIS OF REEF FISH FOOD HABITS**  
John Hargrove [Daryl Parkyn/James Austin]

14:15 - 14:30 **EVALUATION OF LARVAL FLORIDA POMPANO  
*TRACHINOTUS CAROLINUS* FED THE CALANOID COPEPOD  
*PSEUDODIAPTOMUS PELAGICUS***  
Eric J. Cassiano [Cortney L. Ohs/B. Denise Petty]

14:30 - 14:45 **MACROPHYTE DECLINES IN FLORIDA'S SPRING-FED  
RIVERS: IMPLICATIONS FOR FAUNAL ORGANISMS**  
Edward Camp [Bill Pine/Tom Frazer]

14:45 - 15:00 **COFFEE BREAK**

**SESSION IV MODERATOR: ANDREW BARBOUR**

15:00 - 15:15 **CATCH TRENDS, DISTRIBUTION, AND LENGTH FREQUENCY  
COMPOSITION OF BLUE SHARKS CAUGHT BY THE  
BRAZILIAN TUNA LONGLINE FLEET IN THE SOUTHWEST  
ATLANTIC OCEAN: 1978 - 2007**  
Felipe Carvalho [Debra Murie]

15:15 - 15:30 **ACOUSTIC ROLES AND EFFECTS IN PREY CAPTURE  
BEHAVIOR OF LINED SEAHORSES (*HIPPOCAMPUS ERECTUS*)  
IN AQUARIA.**  
Paul Anderson [William J. Lindberg]

15:30 - 15:45 **CAPTURE OF STORMWATER HYDROCARBON DISCHARGES**  
Jiexuan Luo [Robert Swett/Daniel E. Canfield Jr./Charles E. Cichra]

15:45 - 16:00 **DO SANCTUARY PRESERVATION AREAS IN THE FLORIDA  
KEYS NATIONAL MARINE SANCTUARY OFFER HOGFISH,  
*LACHNOLAIMUS MAXIMUS*, SIGNIFICANT PROTECTION  
AGAINST EXPLOITATION?**  
Alecia Adamson [Don Behringer]

16:00 - 16:15 **AN EXAMINATION OF THE LAKE VEGETATION INDEX**  
Eric Flynt Thomas [Daniel E. Canfield Jr.]

16:00 - 16:15 **USING STABLE ISOTOPES TO CHARACTERIZE  
AQUACULTURE POND TROPHIC DYNAMICS AND EVALUATE  
POND MANAGEMENT PRACTICES FOR COMMERCIAL  
ORNAMENTAL FISH PRODUCTION**  
Jon Kao [Cichra/Yanong]

16:15 - 16:30 **REMARKS FOR THE DAY**

**TUESDAY, APRIL 7<sup>th</sup> 2009**

**SESSION V MODERATOR: JENNEY LAZZARINO**

- 9:00 – 9:15    **RECOMMENDATIONS FOR MONITORING FISHES IN COASTAL RIVERS**  
Matthew V. Laretta [Thomas K. Frazer/William E. Pine]
- 9:15 – 9:30    **STREAM VELOCITY AND PERIPHYTON ABUNDANCE: A META-ANALYSIS**  
Jess Beasley [Tom Frazer/Craig Osenberg]
- 9:30 – 9:45    **EFFECTS OF STOCKING WILD ADULT LARGEMOUTH BASS ON LAKE GRIFFIN'S BASS FISHERY**  
Darren J. Pecora [Daniel E. Canfield Jr.]
- 9:45 – 10:00   **MATURITY OF GREATER AMBERJACK USING NON-LETHAL EXAMINATION AND CATHETERIZATION OF THE UROGENITAL PORE**  
Geoffrey Smith [Debra Murie]
- 10:00 – 10:15   **DEVELOPING A FISHING FOR SUCCESS CURRICULUM FOR 3-5<sup>TH</sup> GRADE STUDENTS: USING LITERATURE TO TEACH SCIENCE**  
Kimberly O. Thurman [Charles E. Cichra/Daniel E. Canfield, Jr.]
- 10:15 – 10:30   **ASSESSING THE QUALITY OF ALTERNATIVE HABITATS USED BY THE GRASS SHRIMP *PALAEMONETES PUGIO***  
Meredith Montgomery [Tom Frazer]
- 10:30 – 10:45   **COFFEE BREAK**

**SESSION VI MODERATOR: MATTHEW LAURETTA**

- 10:45 – 11:00   **UTILIZING REMOTE SENSING TECHNIQUES TO ESTIMATE SEAGRASS ACREAGE ON CHOCTAWHATCHEE BAY**  
Jenney K Lazzarino [Daniel E. Canfield Jr.]

11:00 – 11:15 **A PREDICTIVE LARGEMOUTH BASS POPULATION MODEL TO EXPLORE POLICY OPTIONS AT THE KISSIMMEE CHAIN OF LAKES, FLORIDA**

Patrick O'Rourke [Micheal Allen]

11:15 – 11:30 **LIFE HISTORY, POPULATION DYNAMICS, AND FISHERY MANAGEMENT OF THE GOLDEN TILEFISH, *LOPHOLATILUS CHAMAELEONTICEPS*, FROM THE SOUTHEAST ATLANTIC AND GULF OF MEXICO**

Linda Lombardi [Mike Allen/Bill Pine]

11:30 – 11:45 **AUTONOMOUS PIT TAG ANTENNAE IN AN ESTUARINE CREEK: SURVIVAL ESTIMATES AS AN INDICATOR OF NURSERY HABITAT QUALITY**

Andrew B. Barbour [Aaron J. Adams/Donald C. Behringer]

11:45 – 12:00 **DETERMINING WHAT CONSTITUTES AN EXCELLENT NONFORMAL ENVIRONMENTAL EDUCATION EXPERIENCE**

Corina Guevara [Robert Swett]

12:00 CLOSING REMARKS

## **DO SANCTUARY PRESERVATION AREAS IN THE FLORIDA KEYS NATIONAL MARINE SANCTUARY OFFER HOGFISH, *LACHNOLAIMUS MAXIMUS*, SIGNIFICANT PROTECTION AGAINST EXPLOITATION?**

Alecia Adamson [Don Behringer]

Marine Protected Areas (MPAs) are designated areas with varying levels of use restrictions aimed at reducing anthropogenic impacts. One of the primary goals of MPAs is to sustain or increase the biomass of economically important fisheries. The FL Keys National Marine Sanctuary (FKNMS) is an MPA encompassing 9500 km<sup>2</sup>, however, fishing is permitted throughout much of this area. In 1997, 18 non-extractive use Sanctuary Preservation Areas (SPAs), each covering an area of approximately one km<sup>2</sup>, were established along the reef tract in the FKNMS to protect prime coral reef habitats and their associated organisms. Large resident fish, such as the hogfish, *Lachnolaimus maximus*, may have a home range that extends past the boundaries of these SPAs, subjecting them to fishing pressure. Hogfish are a favorite target for spearfisherman and prior studies have shown evidence that hogfish are undergoing growth overfishing in the Florida Keys and annual fecundity is much lower than hogfish populations in North Florida. It is my goal to determine whether SPAs protect hogfish, using tagging and visual surveys, to measure abundance, mean size, spawning harem size, sex ratio, and site fidelity relative to unprotected areas outside the SPAs.

## **ACOUSTIC ROLES AND EFFECTS IN PREY CAPTURE BEHAVIOR OF LINED SEAHORSES (*HIPPOCAMPUS ERECTUS*) IN AQUARIA.**

Paul Anderson [William J. Lindberg]

Foraging activity and success were measured in muted and control lined seahorses (*Hippocampus erectus*) in loud and quiet tank environments to test two hypotheses: (1) that loud ambient noise inhibits feeding activity, and/or (2) that loud ambient noise masks a putative acoustic mechanism for prey capture. Nine surgically muted animals and 8 control animals were individually acclimated in both loud ( $125.7 \pm 0.9$  (Mean  $\pm$  SE) dB SPL re: 1  $\mu$ Pa at mid-water column,  $143.1 \pm 1.3$  dB at tank bottom) and quiet ( $118.7 \pm 0.5$  dB at mid-water column,  $124.5 \pm 0.6$  dB at tank bottom) tanks for one hour. Total strikes and percentage of successful strikes were measured in a 10 minute period after the introduction of 100 live mysids (*Mysidopsis bahia*). Control animals made  $35 \pm 8$  (Mean  $\pm$  SE) strikes with a  $94 \pm 3\%$  success rate in loud tanks and  $26 \pm 5$  strikes with a  $98 \pm 1\%$  success rate in quiet tanks. Muted animals made  $36 \pm 4$  strikes with a  $96 \pm 1\%$  success rate in loud tanks and  $34 \pm 5$  strikes with a  $95 \pm 2\%$  success rate in quiet tanks. A repeated measures ANOVA revealed no effects of muting, tank noise, or any interaction on either response variable ( $p > 0.05$ ). Results suggest that (1) loud ambient noise does not inhibit feeding behavior, and (2) prey capture in the lined seahorse is not dependent upon an acoustic mechanism, voiding the masking hypothesis.

## **AUTONOMOUS PIT TAG ANTENNAE IN AN ESTUARINE CREEK: SURVIVAL ESTIMATES AS AN INDICATOR OF NURSERY HABITAT QUALITY**

Andrew B. Barbour [Aaron J. Adams/Donald C. Behringer]

An important component of fisheries management is protection of essential fish habitat. However, many marine fish undergo a multiphase life-cycle which complicates habitat-based fishery management. Common snook, *Centropomous undecimalis*, juveniles are primarily found in mangrove creeks whereas adults utilize numerous coastal habitats. Due to accelerating coastal development, mangrove creek habitat have been destroyed or severely degraded. It is unknown whether this degradation affects nursery habitat quality for juvenile snook. We are generating survival estimates using mark-recapture techniques to define nursery habitat quality, testing the hypothesis that less-degraded creeks have higher juvenile survival rates. To quantify survival, an array of autonomous PIT tag antennae has been constructed in mangrove creeks of high (n=2) and low (n=2) levels of degradation. Initial data has confirmed the recapture of 60% of fish tagged in the past year (n=1,000) a level rarely seen in mark-recapture studies. Consequently, we expect these antennae to enable us to reliably estimate juvenile survival. This information will support management aimed at protecting habitats with high juvenile survival rates.

## **POTENTIAL IMPACTS OF NON-NATIVE FISH IN NORTH MESOAMERICAN LAKES**

Christian Barrientos [Jeff Hill]

Mesoamerica is a sub-tropical region that contains important natural resources shared among countries in the area. For example, Guatemala's geographic attributes includes many inland water systems, including three major lakes with areas over 100 squares kilometers, which provide freshwater supply, transportation, tourism and fisheries. Despite the fact that these water bodies are under management, the natural resources such as fisheries have declined and still are under several threats, including overfishing, habitat destruction, pollution and the introduction of non-native species. The impact of non-native species on the native ichthyofauna has not been quantified, although qualitative reports describe species richness and abundance of native fish declining in those lakes.

To predict the state of a native fish community after the introduction of non-native species, we propose to: (1) identify establishment status of introduced species, (2) compare fish-community composition in Mesoamerican lakes, (3) identify importance of non-native species in fisheries, (4) compare reproduction of native and non-native species in different seasons, (5) compare food resource use and overlap of natives versus non-native species.

## **STREAM VELOCITY AND PERIPHYTON ABUNDANCE: A META-ANALYSIS**

Jess Beasley [Tom Frazer/Craig Osenberg]

Flowing water has profound effects on all members of lotic communities. Periphyton (the complex assemblage of algae, cyanobacteria, and other microbes that adheres to submerged substrata) is affected by the movement of water through multiple pathways: limitation of the exchange of nutrients and waste products; the application of drag forces which can lead to shearing of the periphyton from its substrate; scouring of the periphyton by sediment particles suspended in the flowing water; and indirectly by altering the behavior of grazers, which may increase or reduce grazing pressure. However, few studies have investigated how current velocity affects periphyton-grazer interactions, and, of these studies, the majority used only two (or three) current velocity treatments. I conducted a meta-analysis of published studies reporting periphyton abundances. This aggregation of data allows for better resolution of the effects that moving water has on periphyton. I also examine the effects of other parameters, such as nutrient levels or light availability, on the velocity-periphyton relationship.

## **JUVENILE GAG FINE-SCALE SPACE-USE PATTERNS**

Zy Biesinger [William Lindberg/Benjamin Bolker]

Fisheries models often treat demographic parameters as constant across large spatial scales. However, spatial variation in density- and habitat-dependent processes may be important to population dynamics, especially with spatially structured life histories. One reason for assuming process spatial homogeneity has been the logistic and technological challenges of gathering landscape and movement data at appropriate scales. We are testing new technology to record reef fish movements with exceptional spatial and temporal sampling resolution, e.g. 3-D position estimates to sub-meter performance every 6 seconds over 39 days for grouper ranging >200 meters. Movements are analyzed relative to habitat features mapped using 600 kHz side-scan sonar. Positions of acoustically tagged fish are derived using an array of autonomous, fully submerged hydrophone data loggers. Understanding individual movements relative to landscape features at such fine resolutions will improve models that incorporate spatial variation in demographic parameters.

## **PAST, PRESENT, AND FUTURE LONG-TERM WATER QUALITY TRENDS**

Dana Bigham [Daniel Canfield, Jr.]

Long-term water quality data will be gathered from various data sources and compiled to examine water quality trends over time. These long-term water quality data will be analyzed to address the hypothesis that an increasing human population increases nonpoint source pollution, as measured by water quality parameters total phosphorus, total nitrogen, chlorophyll concentration, and Secchi depth. Examination of long-term water quality trends will be completed for lake-based data sets for the State of Florida and other US states. Along with the possible influence of human population growth, the contribution of urban and agricultural development to nonpoint pollution will be attempted to be quantified.

## **MACROPHYTE DECLINES IN FLORIDA'S SPRING-FED RIVERS: IMPLICATIONS FOR FAUNAL ORGANISMS**

Edward Camp [Bill Pine/Tom Frazer]

Marked alterations of aquatic habitats may profoundly impact the abundances and distributional patterns of faunal organisms using these habitats. We assessed linkages between specific aquatic habitat types (submerged aquatic vegetation, SAV) and small bodied fish and macroinvertebrates (SFI) in the Homosassa and Chassahowitzka rivers; spring-fed rivers along the west coast of Florida. Long term research indicates a shift in the SAV communities of these systems, with decreases in rooted macrophytes (e.g. *Vallisneria*) and concomitant increases in the relative abundance of filamentous macroalgae. To assess SFI and SAV relationships, we sampled SFI associated with five SAV habitat types. Our results suggest both SFI density and species composition were significantly related to SAV habitat type. SFI densities were generally highest in filamentous macroalgae. However, Shannon's diversity index values for SFI were lowest in filamentous macroalgae and higher in native rooted macrophytes. Combining these findings with documented trends in SAV habitat types provide insight into how shifts in SAV may affect the structure and function of Florida's spring fed rivers and other aquatic ecosystems. This information is valuable for investigating the ecology of habitat-animal relationships and as a decision support tool for managers.

## **CATCH TRENDS, DISTRIBUTION, AND LENGTH FREQUENCY COMPOSITION OF BLUE SHARKS CAUGHT BY THE BRAZILIAN TUNA LONGLINE FLEET IN THE SOUTHWEST ATLANTIC OCEAN: 1978 - 2007**

Felipe Carvalho [Debra Murie]

Catch-per-unit-effort (CPUE) and size of blue sharks (*Prionace glauca*) caught by the Brazilian tuna longline fleet (national and chartered; 60,645 sets), which operates in the southwestern Atlantic Ocean, were analyzed from 1978 to 2007 (30 years). CPUE, as a measure of relative abundance, was standardized by a general linear model (GLM) using three different approaches: i) a negative binomial error structure (log link); ii) the traditional delta-lognormal model, assuming a binomial error distribution for the proportion of positive sets, and a Gaussian error distribution for the positive blue shark catches; and iii) the Tweedie distribution, recently proposed to adjust models with a high proportion of zeros. Blue shark standardized CPUE showed a relatively stable trend from 1978 to 1995. From 1995 on, however, there was an increasing trend in standardized CPUE, with a sharp rise between 2000 and 2002, reaching a maximum in 2007. A cluster analysis was used to identify target species and was incorporated as a factor into the GLM. The overall spatial distribution of blue sharks based on size showed a general tendency of large adults (fork length > 209 cm) to concentrate in lower latitudes (<10°S) whereas juveniles (fork length < 129 cm) were restricted to higher latitudes (>41°S), which might be explained by the different oceanographic characteristics in these areas.

## **EVALUATION OF LARVAL FLORIDA POMPANO *TRACHINOTUS CAROLINUS* FED THE CALANOID COPEPOD *PSEUDODIAPTOMUS PELAGICUS***

Eric J. Cassiano [Cortney L. Ohs/B. Denise Petty]

One of the major bottlenecks to Florida pompano production has been low survival during the larval phase. Recently, the use of copepods as a primary or supplemental live feed has been evaluated with success for many marine species. By instituting copepod nauplii as a food source during this first feeding phase; the survival, growth, and subsequent condition of Florida pompano larvae is improved.

Two 7-day rearing trials were conducted to evaluate 3 feeding regimes in 13 L tanks. The feeding of rotifers (*Brachionus* sp.), copepod nauplii for one day, and copepod nauplii for three days were evaluated. In each trial, six replicate tanks were used for each treatment. Fish larvae were stocked at a rate of 50/L for each replicate. Rotifers were fed four times daily at a rate of 2.5 individuals/mL/feeding from day 2 to day 7 post hatch. Nauplii feeding rate varied between trial and duration. Water quality parameters and culture conditions were monitored daily. Percent survival, growth, and stress resistance were compared for all treatments. Survival was assessed at 7 days post hatch and morphometric data was calculated from samples taken at 0, 3, and 6 days post hatch using image analysis software.

## **FISH COMPENSATORY RESPONSES FOLLOWING WHOLE-LAKE EXPERIMENTAL DENSITY REDUCTION**

Matthew J. Catalano [Micheal S. Allen]

Understanding compensation in fish populations is central to determining sustainable harvest strategies, yet few studies have evaluated fish compensation using whole-lake experiments. I evaluated compensatory responses of gizzard shad (*Dorosoma cepedianum*) following whole-lake density reduction at the Harris Chain of Lakes, Florida. Shad density was reduced at Lake Dora in spring of 2005 and 2006 via a commercial gillnet fishery that selectively harvested fish greater than 300 mm. I evaluated changes in growth, maturity, fecundity, and pre-recruit survival before and after harvest at Lake Dora and two unharvested control lakes (Lakes Eustis and Harris). Gizzard shad recruitment remained at pre-removal levels despite a 50-60% reduction adult density. Growth, maturity, and fecundity did not differ after removal but pre-recruit survival likely doubled. Changes in pre-recruit survival were large enough to sustain historical recruitment rates in the face of the density reduction.

## **DESIGN AND IMPLEMENTATION OF A PARTICIPATORY MAPPING FRAMEWORK TO PLAN FOR RECREATIONAL OPPORTUNITIES: USING TAYLOR COUNTY, FLORIDA AS A CASE STUDY**

Garin Davidson [Robert Swett]

Taylor County, Florida has identified a need to provide an increasing influx of residents and tourists with sustainable recreational opportunities within its upland and coastal areas. The purpose of my project is to design and implement a participatory mapping framework to identify, characterize, and evaluate the suitability of coastal resources to accommodate existing and potential recreational opportunities within Taylor County. The proposed framework will integrate participatory mapping techniques with the *Water Recreation Opportunity Spectrum* (WROS) method developed by the Department of Interior Bureau of Reclamation. This project will result in a rating-system that classifies coastal areas' ability to accommodate various recreational pursuits according to an evaluation of environmental, developmental, jurisdictional, and social factors/constraints. An assessment of the participatory mapping framework will be conducted to evaluate its effectiveness and to suggest improvements. This project will result in a strategy to help communities throughout Florida vision and plan for the provision of responsible coastal access and recreation.

## **EFFECTS OF NUTRIENT ENRICHMENT IN A HIGHLY FLUSHED ESTUARY**

Nicole Dix [Edward Philips]

Predicting the consequences of eutrophication in coastal ecosystems has become a major priority for marine research. It is now well-understood that stratified or semi-enclosed estuaries are susceptible to hypoxic conditions; however, the effects of nutrient enrichment on well-mixed estuaries are less understood. The lagoonal habitats of the Guana Tolomato Matanzas National Estuarine Research Reserve (GTMNERR), FL present an excellent opportunity to investigate how highly flushed estuaries respond to a variety of nutrient load scenarios. The goal of this research is to characterize spatial and temporal nutrient variability within the GTMNERR and determine differences in the response of the biological community. The St. Augustine and Ft. Matanzas regions of the lagoon represent areas with similar hydrology but distinct watershed input characteristics. From 2002-2008, the more urbanized St. Augustine region experienced higher nutrient concentrations than the less-developed Ft. Matanzas region. During the winter and summer of 2008, sampled oyster populations near St. Augustine were denser with larger, meatier individuals than those in the Ft. Matanzas region. These patterns suggest secondary production of benthic, sessile invertebrates can be used to model the effects of nutrient enrichment in highly flushed estuaries.

## **DETERMINING WHAT CONSTITUTES AN EXCELLENT NONFORMAL ENVIRONMENTAL EDUCATION EXPERIENCE**

Corina Guevara [Robert Swett]

Nonformal education consists of activities that are conducted outside the traditional formal system (e.g., K-12). Such activities are designed to provide people with specific knowledge and/or skills and they are relatively short in duration. Each year UF/IFAS extension faculty and staff offer a broad variety of nonformal environmental educational opportunities as part of their programmatic activities. Two examples include (1) three-day workshops on GIS basics for natural resources applications and (2) off-site programs provided by the PFAS *Fishing For Success Program*. Faculty and staff who provide nonformal environmental education usually are experts in the subject matter that they wish to communicate. However, many are not trained in, or intimately familiar with, the education-related (pedagogical) processes, skills, and methods that contribute to high-quality educational experiences. The goal of this project is (1) to determine what processes, skills, and methods are important in the design and implementation of nonformal educational activities, such as workshops, and (2) to evaluate the availability of appropriate pedagogical materials for extension faculty. Project results will help trainers in aquatic resources and other areas to design effective nonformal opportunities to fulfill the extension mandate of a land grant university.

## **VISUAL AND MOLECULAR ANALYSIS OF REEF FISH FOOD HABITS**

John Hargrove [Daryl Parkyn/James Austin]

Diet studies examining stomach contents of fish are commonly used to establish relationships between individual organisms and their environments. Despite the utility of these studies, there are many instances where intrinsic limitations make reliable identification of consumed prey impossible. For example, many fish have pharyngeal teeth, which can macerate prey items beyond recognition and identification of soft-bodied prey is often limited when stomach contents are visually inspected. As a supplemental approach to visual analysis of stomach contents, we are using polymerase chain reaction (PCR) to amplify mitochondrial DNA fragments of the Cytochrome oxidase subunit 1 (CO1) gene region from prey tissue recovered from stomachs. Subsequent sequencing of the PCR products reactions is being used to identify prey to the species level. Additionally, fecal samples will be screened for the presence or absence of key prey groups using PCR primers that target DNA from a range of organisms (e.g. polychaetes). In this study, PCR and sequencing reactions are being applied to stomachs and fecal contents of French grunt (*Haemulon flavolineatum*) which possess pharyngeal teeth and forage on soft-bodied prey items, such as polychaete and sipunculids worms.

## **PHYLOGEOGRAPHY OF THE ROUND PEARLSHELL, *GLEBULA ROTUNDATA* (LAMARCK, 1819) (BIVALVIA:UNIONIDAE)**

Nathan A. Johnson [James D. Austin]

The genus *Glebula* (Conrad, 1853) is monotypic, restricted to Gulf Coast drainages, and known to occur from the Ocklockonee River in Florida west to the Guadalupe River in eastern Texas. We are investigating the phylogeographic structure of *Glebula rotundata* throughout its range using mitochondrial DNA sequences of two protein-coding genes (*COI* and *NDI*). Thus far, forty-three individuals from seven major river basins east of the Mississippi River have been sequenced. Maximum sequence divergence of *COI* and *NDI* haplotypes are 0.72% and 0.89%, respectively. Sequence analyses reveal congruent patterns between individuals for both genes and haplotype sharing between adjacent drainage basins east of the Mississippi. Results will be presented in light of geologic history of the region and several biological features of *G. rotundata*, both of which make it particularly likely that recent gene flow has been important in its evolution.

## **USING STABLE ISOTOPES TO CHARACTERIZE AQUACULTURE POND TROPHIC DYNAMICS AND EVALUATE POND MANAGEMENT PRACTICES FOR COMMERCIAL ORNAMENTAL FISH PRODUCTION**

Jon Kao [Cichra/Yanong]

The ornamental fish industry in Florida accounts for nearly half of all aquaculture revenue in Florida. Feeds and fertilizers are a major expense for fish farmers in Florida, second only to labor costs. A frequently asked question is whether fish primarily obtain their nutrition from expensive commercial feeds, from live organisms resulting from primary and secondary production (best supported by relatively cheap fertilizers), or a combination of the two. We will answer this question by using nitrogen and carbon isotope tracers to characterize the fate of nutrients from fish feeds and fertilizers in aquaculture ponds via the isotopic analysis of fish, zooplankton and phytoplankton. Success of this research has both a potentially large economic impact by increasing the efficiency and profitability of fish production as well as a scientific contribution by increasing our understanding of aquaculture pond food webs.

## **UTILIZING REMOTE SENSING TECHNIQUES TO ESTIMATE SEAGRASS ACREAGE ON CHOCTAWHATCHEE BAY**

Jenney K Lazzarino [Daniel E. Canfield Jr.]

The abundance of seagrass is often viewed as an indicator of environmental conditions, especially when abundances decline. Long time residents of the Choctawhatchee Bay area report a major decline of seagrasses within the bay and associate the decline with nutrient enrichment. Choctawhatchee Bay, however, receives major freshwater input from the Choctawhatchee River, the fourth largest river by flow in Florida. The bay-wide effects of these freshwater inputs to seagrass meadows are not clear. Fluctuations in freshwater load (drought and floods) to Choctawhatchee Bay over time alter the salinity conditions within the bay. Few on-site surveys of sea-grasses have been completed on this bay. Mapping of seagrass beds utilizing remote sensing technology may be a more cost-effective and less invasive method for quantifying seagrass meadows in this area, due to the high water clarity throughout the bay. I propose to use various techniques on Landsat 5 imagery, combined with ground-truthing, to assess its use as a tool for estimating acreage of submersed aquatic vegetation (predominately Shoal Grass (*Halodule wrightii*) and Widgeon Grass (*Ruppia maritima*)). If successful, past Landsat imagery will then be obtained to examine seagrass changes in Choctawhatchee Bay over time (1984 to present).

## **RECOMMENDATIONS FOR MONITORING FISHES IN COASTAL RIVERS**

Matthew V. Laretta [Thomas K. Frazer/William E. Pine]

A fish-monitoring program was initiated in 2007 at the Homosassa and Chassahowitzka Rivers, Florida as part of a large-scale study aimed at evaluating stream-ecosystem structure and function. The principal goals of the monitoring program were: (1) to obtain estimates of seasonal abundances and biomasses of freshwater and saltwater fishes, and (2) to evaluate the catchability of large-bodied and small-bodied fishes subject to boat-electrofishing and beach-seining. Multiple-pass, mark-recapture electrofishing and block-netted, seine-depletion sampling was conducted during the summer and winter in 2007 and 2008. Catchability estimates of largemouth bass and other species subjected to boat electrofishing were fairly consistent and indicate that relative abundance indices may be used to effectively monitor abundance trends in these systems. Other species demonstrated a high degree of variability in capture probability, and require more intensive sampling effort to obtain accurate estimates of population abundance. Similarly, seine catch rates were shown to be an appropriate abundance metric for many species of small-bodied fishes, but may be less appropriate for monitoring some species, particularly demersal fishes.

## **LIFE HISTORY, POPULATION DYNAMICS, AND FISHERY MANAGEMENT OF THE GOLDEN TILEFISH, *LOPHOLATILUS CHAMAELEONTICEPS*, FROM THE SOUTHEAST ATLANTIC AND GULF OF MEXICO**

Linda Lombardi [Mike Allen/Bill Pine]

Golden tilefish, *Lopholatilus chamaeleonticeps*, are located in depths greater than 100 fathoms throughout the Gulf of Mexico and eastern coast of the United States. Golden tilefish are primarily harvested commercially using long-lines. Much of the basic life history (i.e., growth, mortality) of the golden tilefish is unknown in the Gulf of Mexico. I propose to evaluate life history metrics for golden tilefish and conduct a stock assessment to evaluate optimal harvest policies. Fishery dependent and independent sources will be employed to collect biological samples. Radiometric ageing techniques involving the decay of lead ( $^{210}\text{Pb}$ ) to radium ( $^{226}\text{Ra}$ ) were chosen as the best method to validate the timing of growth increments. Results from this technique are essential for proving the longevity of golden tilefish. Reproductive traits will be examined from monthly sampling of gonad tissue. Histological preparation of gonad tissue will be viewed for the presence of oocytes and/or sperm and staged appropriately. Results from histological analysis will be used to determine the reproductive strategy of golden tilefish. Multiple population models with time series fitting methods will be utilized to find the best possible predicted biomass given observed biomass.

## **CAPTURE OF STORMWATER HYDROCARBON DISCHARGES**

Jiexuan Luo [Robert Swett/Daniel E. Canfield Jr.]

Stormwater is one of the most important sources for water quality impairment. Most discussions of stormwater impacts focus on nutrients, but hydrocarbons (oil) are one of the main contaminants. Oils in stormwater runoff to lakes that are seldom treated unless there is major spill. Among all the methods to remove oil, transportable forms of oil sorbents are considered as most convenient and effective. In this study, SBS (styrene-butadiene-styrene) in meshed socks is explored as a method to remove low levels of oil contamination from stormwater pipe discharges. The initial focus is an examination of the materials ability for absorbing or desorbing oil. With this information, an evaluation SBS sorbents for long-term removal of oil from diffuse stormwater runoff can be made.

## **MEASUREMENTS OF PRIMARY PRODUCTION IN THE CALOOSAHATCHEE RIVER / SAN CARLOS BAY ECOSYSTEM**

Loren Mathews [Edward J. Philips]

Urban and agricultural development in and around the Caloosahatchee River and Estuary has drastically altered the flow, supply, and quality of water in this system for more than two hundred years. Recently occurring algal blooms have brought attention to nutrient issues and processes affecting biomass accumulation there. The major purpose of this project is to measure primary production rates in the Caloosahatchee River and Estuary system in order to create an empirical model that can be used to predict the response to changes in nutrient load. Primary production rates in terms of oxygen evolution are measured at four sites (one each in the upper estuary, middle estuary, lower estuary, and San Carlos Bay) using simulated *in situ* light:dark bottle incubations and in-lab incubations involving a flow-through raceway and photosynthetic chamber, respectively. Key water quality parameters such as temperature, salinity, dissolved oxygen, photosynthetically active radiation (PAR light), and macronutrient levels (nitrogen, phosphorous, and silica) are also determined at each site for their direct and indirect affect on primary production. The structure and abundance of the phytoplankton will be determined to identify shifts in primary producer communities.

## **A COMPARATIVE ANALYSIS OF DETRACTORS AND NEEDS PERCEIVED BY BOATERS IN THREE FLORIDA BOATING REGIONS**

Nancy Montes [Robert Swett/Thomas Frazer/Charles Sidman]

Florida is one of the most important U.S. states for recreational boating. The more than one million boats registered in Florida surpass every other state. This large number of registered boats, along with some 300k transient boats that visit Florida each year, contributes to high use of its navigable waterways. This use results in numerous boating-related needs and problems that local and state managers seek to address. Between 2005 and 2008, Florida Sea Grant and FWC surveyed over 9,000 boaters in distinct regions of Florida. In addition to characterizing boaters and boating patterns, survey respondents listed their perceived detractors (e.g., lack of courtesy, excessive regulation, congestion) and needs (e.g., increased access, infrastructure, and education). The project goal is to compare detractors and needs compiled for three Florida boating regions (Greater Charlotte Harbor, Brevard County, and Bay County). Boaters' responses and demographic characteristics, such as age, boating experience, type of boat, seasonality, completion of boat safety course, water related activities, and typical departure site, will be evaluated. Project results will help to identify target groups to mitigate specific problems (e.g., lack of courtesy), as well as provide recommendations to improve the surveys used for the future recreational boating characterizations.

## **ASSESSING THE QUALITY OF ALTERNATIVE HABITATS USED BY THE GRASS SHRIMP *PALAEMONETES PUGIO***

Meredith Montgomery [Tom Frazer]

Grass shrimp (*Palaemonetes spp.*) are common inhabitants of both freshwater and estuarine waters along Florida's Gulf coast. They are important prey for a large number of fishes. As their common name suggests, grass shrimp are frequently found in close association with submersed aquatic vegetation (SAV). However, the relative value of different SAV habitat types to grass shrimp is not known. Grass shrimp occupancy studies (measuring density) have been often used as proxy measures of habitat quality, but they rarely provide information concerning the survival, health, and fecundity of the species within alternative habitat types. Recent studies of SAV habitats of the Chassahowitzka River have shown these vegetative communities to be under change (augmented epiphytic growth and decreased observed frequency of aquatic plants). I propose, as part of my thesis research, to use proxy measures of *P. pugio*'s biological fitness to assess the quality of different SAV habitat types in the Chassahowitzka River. Measures of instantaneous growth rate, sex ratio, and fecundity will be used as proxies of fitness across habitat types.

## **A PREDICTIVE LARGEMOUTH BASS POPULATION MODEL TO EXPLORE POLICY OPTIONS AT THE KISSIMMEE CHAIN OF LAKES, FLORIDA**

Patrick O'Rourke [Micheal Allen]

Largemouth bass *Micropterus salmoides* support highly important recreational fisheries in Florida and the presence of aquatic macrophytes and fluctuations in water levels can influence their recruitment to the adult population. We examined historical electrofishing, creel survey, plant composition and water quality data at Lakes Tohopekaliga and Kissimmee in the Kissimmee Chain of Lakes (KCOL), Florida, to explore relationships between these factors for the construction of a predictive population model for largemouth bass. We attempted to estimate relative recruitment among years by defining age-1 fish in the electrofishing samples given modal peaks in length-frequency charts for each year. Catchability appeared to vary considerably for electrofishing samples among years due to confounding factors such as hydrilla presence, while angler catch appeared to show less drastic changes. Because of these catchability concerns as well as the limited water level fluctuations in the KCOL during our study period, we plan to use other studies from similar systems to inform our parameters. Our finished model will allow managers to predict how altering flow regimes or changing macrophyte coverages will ultimately impact largemouth bass abundance and catch.

## **EFFECTS OF STOCKING WILD ADULT LARGEMOUTH BASS ON LAKE GRIFFIN'S BASS FISHERY**

Darren J. Pecora [Daniel E. Canfield Jr.]

Lake Griffin was stocked with approximately 14,000 wild adult largemouth bass from 2005 – 2007 in order to stimulate economic activity related to the fishery. Florida Fish and Wildlife Commission conducted a roving creel survey in the main stem of Lake Griffin which reported 10% catch of stocked fish. LAKEWATCH call-in tag return survey data (N=296) indicated that 72% (212) of the tags were reported from waters adjacent from the main lake, while 22% (84) were reported from Lake Griffin proper. I conducted a electrofishing survey to estimate the percentage of tagged fish in the canals compared to the main stem of Lake Griffin. I also examined dispersal distance from the stocking points and persistence of stocked fish. Preliminary results show the fish are dispersing over large distances and move throughout the lake. A significant number of stocked fish were captured in canals. Historical data analyses were conducted to look at biotic and abiotic factors affecting the largemouth bass fishery. Water level and macrophyte abundances seem to be the primary factors influencing largemouth bass abundance. The economic activity generated by the stocking project was estimated to be \$2.7 million annually and stocking through the reproduction of adult fish seems to have increased largemouth bass abundance as estimated by electrofishing catch.

## **WATER COLOR AND ITS RELATIONSHIP WITH DISSOLVED ORGANIC CARBON AND RAINFALL**

Ivelisse Ruiz-Bernard [Dr. Daniel E. Canfield/Dr. Matthew Cohen]

Water color and dissolved organic carbon (DOC) are recognized to be critical properties of aquatic ecosystems. They play a central role in water bodies by influencing light penetration, affecting pH, acting as a buffer in some acidic lakes, and interacting with some dissolved nutrients and metals. They represent a large reservoir of carbon in many aquatic systems and form part of the local and global carbon cycling. Color and DOC originate from decaying organic matter carried in solution by runoff from the watershed. In this study, we are going to determine the relationship of color and DOC and their interaction with rainfall to assess the dynamics of color and DOC in Florida's aquatic systems. Studies of the dynamic of color and DOC export using long-term data can increase our understanding on how large-scale watershed process such as rainfall influence the carbon inputs in form of color in lakes.

## **MATURITY OF GREATER AMBERJACK USING NON-LETHAL EXAMINATION AND CATHETERIZATION OF THE UROGENITAL PORE**

Geoffrey Smith [Debra Murie]

Greater amberjack, *Seriola dumerili*, is a pelagic reef species found along the western Atlantic coast. This species tends to congregate around reefs, rocky outcroppings, wrecks, and man-made structures, such as oil rigs. Amberjack are harvested both recreationally and commercially. Currently this species is managed in the U.S. as two separate stocks, the Gulf and the Atlantic. The most recent stock assessment for the Gulf stock indicated that it is overfished and undergoing overfishing. Information that may improve stock assessments and management of greater amberjack is lacking, including knowledge of potential sex and maturity segregation, proportion of skip spawners, and the potential for multiple spawning peaks. The goal of this part of my thesis is to evaluate whether amberjack can be accurately sexed and staged for maturity using external examination and catheterization of their urogenital pores. Both of these methods are non-lethal and can therefore be used with catch-and-release tagging studies to examine sex-specific distributions based on geographical area and water depth.

## **PHYTOPLANKTON AND MESOZOOPLANKTON INTERRELATIONSHIPS DURING ALGAL BLOOM PERIODS IN LAKE GEORGE, FL AND IN MESOCOSM-BASED EXPERIMENTS**

Akeapot Srifa [Edward J. Philips]

Planktonic communities in the aquatic environment are temporally and spatially dynamic. Periods of exceptionally high phytoplankton biomass, i.e. blooms, are associated with changes in the structure and abundance of higher trophic levels, most directly zooplankton. This research aims to elucidate the relationship between cyanobacterial abundances and the amount of mesozooplankton in Lake George, FL. Water samples will be collected and preserved weekly during March-June 2009 (or thrice a week during the bloom period), and will be analyzed for relevant water chemistry characteristics such as chlorophyll and chemical contents . Phytoplankton and mesozooplankton abundances will be microscopically quantified and calculated for their biomass. Laboratory-scale mesocosm experimental models will be also constructed to observe the effect of toxic cyanobacterial strain blooms on the abundances of mesozooplanktons.

## **UNDERSTANDING ANIMAL MOVEMENT USING STOCHASTIC MODELS: MODELING TRANSITIONAL STATES ACROSS A RANGE OF SPECIES AND SCALES**

Jakob C. Tetzlaff [William E. Pine III]

The ability to predict movements and distributions is fundamental to many basic aspects of animal ecology, ranging from understanding individual behavioral decisions to assessing population dynamics. While the mobility of fish populations has traditionally been ignored in population dynamics models, recent advances in tagging technology, such as acoustic and satellite tags, allow for tracking the movements of individual animals over large spatial and temporal scales. State-space models provide a powerful approach for analyzing such movement data by simultaneously capturing the essential ecological, physiological and environmental factors driving movements. The general purpose of this study is to investigate the role of individual-level movement processes and their interaction with survival in structuring population viability across heterogeneous landscapes using state-space models. These concepts will be tested with a number of fish species that span a broad range of spatial scales from small rivers to open oceans to help inform a variety of management questions associated with animals and their use of space such as marine protected areas, marine fishing zones, and critical habitat designation.

## **AN EXAMINATION OF THE LAKE VEGETATION INDEX**

Eric Flynt Thomas [Daniel E. Canfield Jr.]

The Florida Department of Environmental Protection (FDEP) has recently developed a multi-metric index based on the aquatic macrophyte community of a lake, the Lake Vegetation Index (LVI), designed to indicate the biological integrity of a lake. The purpose of this study is to test the LVI using data collected by Florida LAKEWATCH. LAKEWATCH macrophyte surveys will be used to calculate an LVI, and then compare the calculated LVI to the LVI calculated according to FDEP protocol. Long term water chemistry and fish data available from LAKEWATCH will be used to examine the relationship between LVI and these important lake components that are typically used to assess biological integrity.

## **DEVELOPING A FISHING FOR SUCCESS CURRICULUM FOR 3-5<sup>TH</sup> GRADE STUDENTS: USING LITERATURE TO TEACH SCIENCE**

Kimberly O. Thurman [Charles E. Cichra/Daniel E. Canfield, Jr.]

One of the components of Fishing for Success (FFS) is its partnership with local schools and classroom teachers to provide outdoor learning activities for students. Increasing student knowledge and improving attitude about the aquatic environment and its inhabitants are program objectives. The most successful outdoor programs for children include active outdoor participation, coordinated traditional classroom activities, and at least ten hours of combined contact time. Developing a mini-curriculum that meets teacher and FFS needs can increase the impact of an already invaluable program. A qualitative review of local, state and nationally established curricula was conducted in hopes of using ready-made materials. None of these proved suitable for FFS needs. An ongoing survey and interviews with FFS teachers has revealed that the best place to infiltrate the 3-5<sup>th</sup> grade classroom is through reading. Using literature to teach science presents exciting learning opportunities for the student, but many challenges for the curriculum designer. Finally, when a pedagogically strong curriculum is ready its effectiveness will be tested using a quasi-experimental, non-equivalent group pretest-posttest research design.

**PHYTOPLANKTON COMPOSITION AND ABUNDANCE IN RELATION TO SALINITY, NUTRIENTS AND LIGHT GRADIENTS IN A BARRIER ISLAND SUBTROPICAL ESTUARY: APALACHICOLA BAY**

Paula Viveros [Edward J. Phlips]

The Apalachicola estuary is an example of an ecosystem that has been impacted by human development. The estuary is important both ecologically and commercially; it serves as a nursery and spawning ground for aquatic wildlife, and supports a large shellfish industry which depends on the fresh water dominated estuary. However, the flow of the river has been reduced in recent years, due to both drought conditions and increased upstream anthropogenic water withdrawal, endangering the integrity of the estuary, including the structure and function of the planktonic and benthic communities. The aim of the present study is to determine spatial and temporal patterns of phytoplankton composition and abundance in the estuary and correlate the results with observed gradients in salinity, nutrients concentration and light availability. Phytoplankton composition and abundance will be determined on a monthly basis for two years at a range of sampling sites within the bay. The overall goal of the study is to help define how future changes in flow and nutrient content of the Apalachicola River will impact the structure and function of the phytoplankton community.