WaterWorks

University of Florida Department of Fisheries & Aquatic Sciences IFAS

Newsletter of the UF/IFAS Department of Fisheries and Aquatic Sciences *November 2006*

LAKEWATCH
The Legacy

by: Daniel E. Canfield, Jr.

Florida LAKEWATCH had its 20th anniversary in August 2006! In 1986, Dr. Daniel E. Canfield, Jr. founded Florida LAKEWATCH when the first water samples were collected by LAKEWATCHERS at Lake Santa Fe (Alachua County) and Lake Broward (Putnam County). Since 1986, LAKEWATCHERS have sampled more than 1000 Florida lakes and numerous near-shore coastal waters in 50 counties. Today, about 1,800 volunteers help monitor more than 600 lakes and 150 coastal sites.

The Florida Legislature recognized the importance of Florida LAKEWATCH to Florida in 1991 when it officially established LAKEWATCH within what then was the Department of Fisheries and Aquaculture at UF/IFAS (Chapter 91-69; s. 240.5329, F.S.; now F.S. 1004.49). Section 1004.49 of the Florida Statutes states:

"The Florida LAKEWATCH Program is hereby created within the Department of Fisheries and Aquaculture of the Institute of Food and Agricultural Sciences at the University of Florida. The purpose of the program is to provide public education and training with respect to the water quality of Florida's lakes. The Department of Fisheries and Aquaculture may, in implementing the LAKEWATCH program: (1) Train, supervise, and coordinate volunteers to collect water quality data from Florida's lakes. (2) Compile the data collected by volunteers. (3) Disseminate information to the public about the LAKEWATCH program. (4) Provide or loan equipment to volunteers in the program. (5) Perform other functions as may be necessary or beneficial in coordinating the LAKEWATCH program. Data collected and compiled shall be used to establish trends and general background information and shall in no instance be used in a regulatory proceeding."

Since 1991, LAKEWATCHERS have made the LAKEWATCH program Florida's and the nation's premier citizen volunteer monitoring program. The efforts of the LAKEWATCH volunteers are at the core of a steady stream of data routinely tapped by state, regional and local water resource managers, lake homeowners associations, educational institutions, consultants, and the general public seeking to better understand and protect local lakes. Over time, the volunteers' efforts have resulted in a massive aquatic (lakes, rivers, streams and nearshore coastal) database maintained at LAKEWATCH's headquarters in UF's Department of Fisheries and Aquatic Sciences.

Data are provided to all requesters. LAKEWATCH, however, is more than just a water-quality monitoring program. It is a comprehensive aquatic education program. LAKEWATCHERS monitor bacteria, aquatic plants, fish and aquatic birds. Academic scholars have produced more than 30 major scientific publications related to Florida's aquatic systems. LAKEWATCH has produced a book "Living at the Lake", nine informational circulars for beginners interested in the aquatic sciences and numerous other lay-publications to assist citizens with their understanding of how lakes function. LAKEWATCH has helped citizens at Lake Tsala Apopka (Citrus County), Lake Wales (Polk County), and the Forest Hills lakes (Hillsborough County) develop comprehensive lake management plans for their waters. LAKEWATCH is also now working very closely with the Florida Fish and Wildlife Conservation Commission to develop a long-term fisheries monitoring program of Florida's major fisheries lakes.

So what does the future hold for Florida LAKEWATCH? Calls for assistance from citizens and governmental agencies come to LAKEWATCH everyday from throughout Florida. To meet the demands, LAKEWATCH plans to expand the number of lakes and near-shore coastal areas it samples. Current funding and facilities, however, limit expansion. With this in mind, Dr. Dan Canfield, the LAKEWATCH staff, students and highly motivated LAKEWATCH volunteers are attempting to expand the program and make it more stable to make sure LAKEWATCH can help the citizens of Florida long into the future.

For more details about Florida LAKEWATCH, including how to become a volunteer, maps showing locations of sampling sites, program circulars, and information about the program expansion and fund raising, visit this webpage: http://lakewatch.ifas.ufl.edu.

Program News

Integrative Fisheries Science will be the focus of a new program area in the Department of Fisheries and Aquatic Sciences. Currently, the program is in a planning stage with participation by colleagues from state and federal resource management agencies. The purpose is to harness the broad expertise that exists in the Department and across UF to address present and emerging issues regarding sustainable management of marine and freshwater fish and the ecosystems in which they occur.

Faculty in this program will work closely with agencies to address critical information needs related to allocation of harvest, fishing effort in time and space, components of fish mortality, essential fish habitat, and fish community dynamics. They also will explicitly address human impacts including increasing fishing pressure, development, introduction of non-native species, reduced freshwater flow, stochastic events including hurricanes and drought, and other human dimensions of fisheries science. The program will be a catalyst for interdisciplinary teams of university and agency scientists to provide innovative solutions for fisheries management problems.

The program will advance the field through cutting edge science and technology devlopment, will serve fisheries managment agencies through continuing education workshops, collaborative research, and quantitative consulting and expertise. It will address the critical shortage of individuals trained in quantitative methods of fish stock assessment and modeling with a specialized curriculum in Integrative Fisheries Science, recognizing the need for scientists who can perform single-species and multi-species stock assessments and also assist their agencies in moving towards ecosystem management.

This iniative began with development of a comprehensive Action Plan, written by the faculty and students, and with active participation by our colleagues from state and federal agencies including the National Marine Fisheries Service, the Florida Fish and Wildlife Conservation Commission, the US Fish and Wildlife Service, USGS and Water Management Districts.

The plan is being revised in response to agency input, and then will be advanced with action items to achieve the specific goals and objectives. To fully accomplish the program goals, the Department will pursue additional faculty positions in fisheries modeling, spatial statistics,

Faculty and students in one of the break-out groups at the September 2006 retreat to develop a draft action plan for the Integrative Fisheries Science Program.

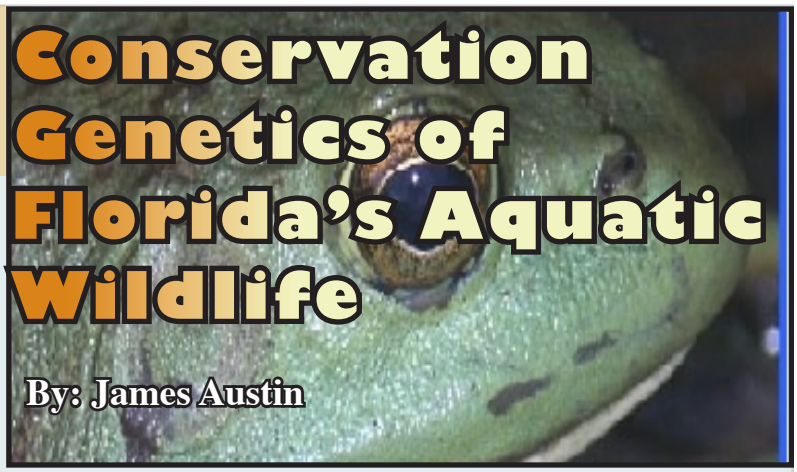
and human dimensions -- as well as funding for infrastructure upgrades including state-of-the-art GIS and core research laboratories and field equipment. We envision this program supporting visiting scholars, post-doctoral research associates, and a substantial number of graduate students. Major outputs from this program will include -

- Graduates with the quantitative statistical and modeling skills that are essential to being highly competent fisheries scientists or managers
- Research in sustainable fisheries science that is of regional, national and global significance
- Extensive collaboration with state and federal agencies to advance the tools available for sustainable fisheries management
- Innovative and effective continuing education opportunities for emplopyees of state and federal fisheries management agencies

Overarching principles of this new initiatve include supporting the Land Grant Mission, ensuring data legacy, and working in a manner that is complementary to the programs of our state and federal agency partners and supportive of their mandates. The Department intends for this program to be a model of highly effective agency-academic partnership.

For more information or to obtain a copy of the Action Plan mentioned in this article, contact Dr. Havens at khavens@ufl.edu or by phone at 352-392-9617 ext 232.

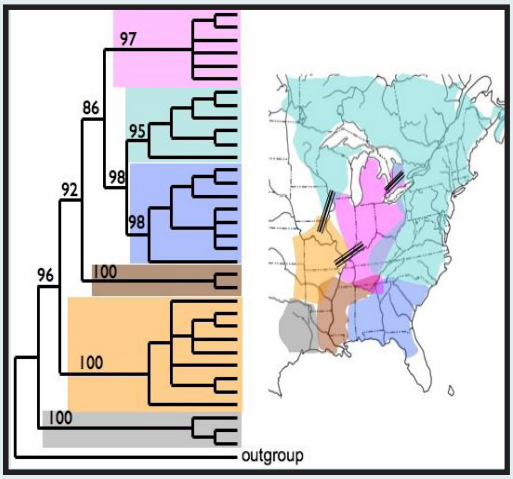
Faculty Focus



Conservation Genetics of Florida's Aquatic Wildlife

By: James Austin

The use of genetic information to identify conservation priorities plays an important role in fisheries and wildlife management. There are a number of powerful tools in the genetics toolbox that complement traditional biological data. For example, genetic information can provide support for, or highlight deficiencies in, various management plans. In many cases, such as when species are difficult to observe, genetic tools provide the best (or only) means of understanding a species' ecology.



Genetic information is used here to identify the geographic distribution of ecotypes within a particular aquatic species.

Conservation genetics draws from numerous subdisciplines of evolutionary biology and ecology, including population genetics and behavioral ecology, and is increasingly inter-disciplinary. An example is the young field of landscape genetics, that combines genetics with landscape (or seascape) information to understand the role geography plays in structuring populations and stocks. Conservation genetics will play an increasingly crucial role in the management and conservation of Florida's wildlife and fisheries as human population growth and the associated pressure on natural resources and habitats in Florida continues.

Dr. Jim Austin's research program focuses on understanding consequences of habitat heterogeneity, fragmentation, and alteration on population genetic diversity and ultimately the persistence of populations of Florida's wildlife.

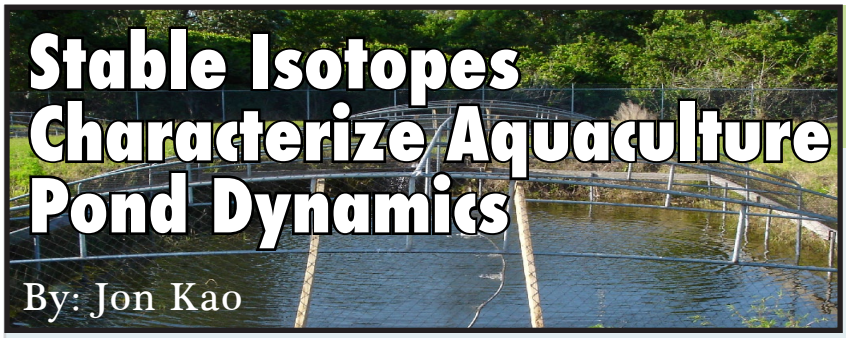
Jim Austin joined the Institute for Food and Agricultural Sciences (IFAS) in January 2006, coming from a postdoctoral position at Cornell University in New York. Jim Austin is cross-appointed between the Departments of Fisheries & Aquatic Sciences and Wildlife Ecology & Conservation, and his research includes a broad array of species and ecosystems. Jim Austin's research background is in population genetics and phylogeography (the study of the natural processes that shape the distribution of lineages) of aquatic amphibians – important ecological components of freshwater ecosystems. However, his research interests span a variety of ecological systems, from desert mammals to Florida's stream fishes.

Many aquatic and terrestrial species have become endangered because of the elimination and fragmentation of their habitat, human alteration of the environment, and pressures brought on by introduced species. New applications and insights from genetic studies of both endangered and common species are being used to formulate management plans to prevent extinction of endangered taxa. Genetic data offer insight into the history of populations through the comparison of 'ancient' DNA with modern samples, or through powerful analytical techniques that can reconstruct a population's history from contemporary DNA sequences. For example, genetic data can be used to infer the change in size of a population over time, rates of inter-specific hybridization, and levels of inbreeding in small populations. Exciting developments in analytical methods also allow the use of genetic data in a forward-planning, predictive manner, such as estimating the impacts of man-made barriers in streams or the effect of additional artificial reefs.

Jim Austin is also working with the Florida Fish and Wildlife Conservation Commission to evaluate the genetic implications of Florida's bass hatchery practices. The potential for poor survival and recruitment in released hatchery bass is high, and emphasizes the need for consideration of the genetic composition of stocked bass alongside the need to maintain production.

For additional information about Dr. Austin's program in conservation genetics, please contact him by email at austinj@ufl.edu or by phone at 352-392-9617 ext. 280.

Student Spotlight



Stable Isotopes Characterize Aquaculture Pond Dynamics

By: Jon Kao

Jon Kao is a PhD student working at the Tropical Aquaculture Laboratory (TAL). His major advisor is Dr. Chuck Cichra.

Florida's ornamental fish industry is located primarily in Southern and Central Florida (Miami area, Hillborough and Polk counties) where winter temperatures are usually mild. Fish are raised in small earthen ponds (ca 0.1-0.25 hectares) located in areas where they are filled by ground water usually located a meter or less beneath grade. Fish production in pond aquaculture systems is often variable among individual ponds and these differences can persist through time, regardless of similarities in soil type, water quality, and physical environments. Florida's ornamental fish industry accounts for nearly half of all aquaculture revenues in Florida, generating tax revenue for state and local governments as well as providing employment opportunities. However, profit margins for fish farmers are typically small due to operational expenses and competition from low-cost overseas imports. Of these operational expenses, feed and fertilizer expenses are second only to labor costs.

To remain competitive with foreign producers and remain profitable under the pressure of rising land prices, domestic producers will need to maintain high levels of production throughout their culture facilities, and will be increasingly intolerant of low production ponds. Due to these economic pressures, 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 stable isotope tracers to characterize the fate of nutrients from fish feeds and fertilizers in aquaculture ponds.

One of the current research projects being carried out at the University of Florida's Tropical Aquaculture Laboratory in Ruskin, Florida is to raise six 'common' tropical ornamental freshwater species in 24 research ponds. Six ponds are assigned to each of four different treatments: processed 'cooked' feed, unprocessed feed, inorganic fertilizer and cottonseed meal organic fertilizer. We have assumed that fish that are in the feed treatments are eating the feeds directly while supplementing their diet with live foods, and that fish in the fertilizer treatments are obtaining their nutrition exclusively from live food production stimulated by fertilizer addition.

My research project consists of tracing the flow of nutrients from these formulated feeds and fertilizer inputs to the target species (swordtails; Family Poeciliidae) using stable isotopes of nitrogen and carbon. Stable (non-radioactive) isotopes of common elements occur naturally and biological materials typically differ isotopically depending upon geographic location, trophic position and the nature of the food web base in the ecosystem of origin. Differences in the isotopic composition of biological materials typically occurs due to differences in the thermodynamic properties (e.g., rates of diffusion, enzyme kinetics of substrates) of atoms and molecules that have differing amounts of these stable isotopes; a carbon dioxide molecule that has a carbon of the more common isotope (molecular weight of 12) will move more quickly than a carbon dioxide molecule that has a heavier carbon isotope (m.w. of 13). Because of these physical differences, heavier isotopes tend to accumulate within an organism over time.

By tracing these nutrients through the various organisms within these ponds it will allow us to understand the internal nutrient cycling occurring within aquaculture pond food webs, and may allow us to consistently produce high pond production rates. By maximizing the nutrient transfer from feeds or fertilizer inputs through the fewest trophic levels, efficiency of nutrient transfer can be increased.

An experimental aquaculture pond used in the research

Student & Faculty News

Dr. Daryl Parkyn, Dr. Bill Lindberg, and Mr. Paul Anderson *received a Fellowship Training Grant from the Morris Animal Foundation in support of Mr. Anderson's PhD research project dealing with sound, stress, sex and seahorses.*

Dr. Deb Murie *was installed as President of the Marine Fisheries Section of the American Fisheries Society at the annual meeting in September in Lake Placid, NY.*

Mark Rogers *received a John Skinner Memorial Fund Award, from the Southern Division of the American Fisheries Society.*

Emily Mitchem *won the Best Paper Award from the University Scholars Program for a presentation on her undergraduate research project dealing with green mussels (mentor Dr. Shirley Baker). Emily now is a Masters student in the Department working with Dr. Tom Frazer.*

Alumni Alert

Kim Bonvechio (MS, 2001) is a Scientist with the Florida Fish and Wildlife Conservation Commission. She is a former graduate student of Dr. Mike Allen. The following text is excerpted from an interview posted online at http://research.myfwc.com/education/interviews.

What are you working on now?

I was hired to establish standardized protocols for sampling freshwater fishes in inland waters of the state. In the past, each field and regional office conducted fish surveys independent of each other. Because of this, data were collected in different ways with multiple gear types or configurations, and at various times of the year. In order to streamline data collection and entry procedures and improve our science-based management practices, a standardized sampling manual and freshwater fisheries database were created. My current work mostly revolves around the maintenance and continual improvement of these products.

Was fisheries work your original career interest?

No, not at all. In fact when I was growing up, my three brothers wouldn't even let me go fishing with them. "You're a girl! Girls don't fish!" they always told me. So initially, I was geared towards marine biology with a particular interest in marine mammals. However during my undergraduate career, I was introduced to many different facets of fisheries, including working with otoliths of spotted sea trout and barramundi, conducting stream fish surveys with backpack electrofishing, and participating on a National Marine Fisheries Service (NMFS) research cruise for a larval cod predation study. I started thinking that fish were pretty cool. When I moved to Florida and met Dr. Mike Allen, the biggest fishing fanatic I have ever met (next to my husband), I dove head first into fishing and fisheries management. I haven't looked back since.

What do you like most about your career?

Mostly, the flexibility and job diversity. I have been able to keep a flexible work schedule. Because of that, I feel confident that when I have a family, I will be able to attend most of my children's activities such as school plays and sports events. Family is very important to me so my job's flexibility is a big plus. Additionally, no two days are alike with my job. There is always something different to do: a new question to answer or a new problem to solve. This keeps me motivated by challenging me to learn new things and improve myself professionally.

What advice would you give to someone interested in pursuing a career in your field?

I'll try to summarize the main tidbits of advice I would like to pass along to our future scientists:

- While in college, get involved with professional organizations and clubs and volunteer or work in as many different areas related to your field as possible. In addition to gaining valuable work experience, you will also gain important skills that will help you professionally such as leadership and time management skills.

- When choosing your college classes, take a look at job boards to find out what skills are being most sought after. Then, take courses to coincide with those. Additional skills will make you more marketable when applying for jobs.

- In the beginning of your career, it is easy to be unsure of yourself and your abilities. You will constantly question yourself, "Can I really do this?" Yes, you can and yes, it is completely normal to feel that way. Will you make mistakes? Yes. Will you learn some hard lessons? Sure. But so has everyone else.

- Be flexible and open-minded in your learning. By that I mean don't be afraid to learn and try new things because you never know what you might be missing.

- Always strive to improve yourself professionally and personally. Even when you are finished with school, learning never ends. There are so many lessons in life to learn so embrace learning throughout your life.

- No matter how talented you are or how much you accomplish in life, always retain your humility. Every person, no matter what their degree or profession, has something to offer to you and the world. There is a great saying by Reverend. Jesse Jackson, "Never look down on a man, unless you are helping him up"

Florida Ecosystems in the Spotlight

Is an increase in nitrate compromising the ecological health and integrity of Florida's spring-fed coastal rivers?

By: Tom Frazer

Nitrate occurs naturally in aquatic systems, including springs that feed rivers along Florida's Gulf coast. Nitrate is assimilated by aquatic plants and algae and is one of several nutrients that contribute to their growth. An increase in the supply of nitrate has the potential to stimulate growth with negative ecological consequences. In fact, excessive nutrient enrichment may favor the development of nuisance plant and algal species and may ultimately lead to the decline of native vegetation. Increased periphyton growth on rooted aquatic plants as a consequence of increased nutrient input can exacerbate the situation. Such a scenario is a commonly observed eutrophication progression scheme in aquatic systems worldwide.

The potential eutrophication of Florida's spring-fed rivers, as a result of increased nitrate delivery, is a primary concern for water resource managers. Recent research carried out by faculty, staff and students in the Department of Fisheries and Aquatic Sciences suggests that several spring-fed river systems along Florida's Gulf coast have indeed been negatively affected by increased nutrient inputs. Highlighted here are some key findings from the Weeki Wachee, Chassahowitzka and Homosassa rivers. Nitrate concentrations have increased significantly in the springs that feed all three of these river systems. Since 1998, nitrate concentrations in the headwaters of the Weeki Wachee River, have increased by approximately 50%. In the Chassahowitzka and Homosassa rivers, nitrate concentrations near the spring complexes, which serve as the origin of flow, have increased by 20% and 6%, respectively. The increases in nitrate concentration coupled with concomitant increases in flow rates in each of the three rivers has resulted in substantially greater nitrate loads. In fact, calculated nitrate loading rates near the headwaters of the Weeki Wachee, Chassahowitzka and Homosassa rivers have increased by 76%, 43% and 56%, respectively, since 1998.

Soluble reactive phosphorus concentrations have also increased significantly in each of the three river systems. This is particular reason for concern given that previous work in these rivers has indicated a strong potential for phosphorus limitation of algal growth. In the upper regions of the Weeki Wachee River, mean soluble reactive phosphorus concentrations increased by as much as 21% since sampling was initiated in 1998. Increases of 19% and 15% were documented in the upper regions of the Chassahowitzka and Homosassa rivers, respectively. Loading rates, calculated from data collected near the headwaters of the Weeki Wachee, Chassahowitzka and Homosassa rivers, increased by 33%, 44% and 46%, respectively.

Coincident with the increased nitrogen and phosphorus concentrations and higher nutrient loading rates, were marked declines in submersed aquatic vegetation in each of the three rivers. The Weeki Wachee River exhibited an approximate 75% reduction in mean SAV biomass. A similar reduction was observed in the Homosassa River, i.e., 67%. An approximate 31% reduction in mean SAV biomass was observed in the Chassahowitzka River. Noteworthy was the observed decline in the frequency of occurrence of native species such as *Vallisneria americana* (tape grass) in the Homosassa River and *Sagittaria kurziana* (strap-leaf sagittaria) in the Chassahowitzka River. The abundance of periphyton associated with rooted macrophytes increased significantly in both the Homosassa and Chassahowitzka. In fact, mean periphyton abundance on the remnant macrophyte population in the Homosassa was nearly twice as high (85% increase) during 2003-2005 than it was in 1998-2000. In the Chassahowitzka River, the increase in mean periphyton abundance on macrophytes was 30% during the same time interval.

The changes noted above are, in combination, legitimate reasons for concern. Increased nutrient delivery, loss of native macrophytes and increased periphyton loads are symptomatic of eutrophication-related phenomena. The potential broader consequences of nutrient over-enrichment on the ecological health and integrity of the Weeki Wachee, Chassahowitzka and Homosassa rivers, however, have yet to be fully investigated. Continued monitoring of these systems is ongoing and essential to evaluate the effectiveness of ongoing nutrient reduction strategies and future remediation efforts aimed at reversing the negative effects of nutrient over-enrichment.

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