

Current Lake Management Issues of Concern



Mary Lettlier

Volunteers at the Regional Meeting in Orange County.

As most of you know, each year Florida LAKEWATCH staff organize almost 20 regional meetings at various locations throughout Florida. The objectives of these meetings are three fold:

1) LAKEWATCH thanks the volunteers for their participation in the program and for being good stew-

ards of Florida's valuable natural resource.

2) Staff present to the volunteers the data that they have collected and answer any questions that might arise.

3) LAKEWATCH attempts to answer any questions/concerns regarding

the lake that each volunteer is sampling or any general questions about aquatic resource quest. If staff does not know the answer we attempt to find someone that does.

LAKEWATCH staff record all of these questions to keep abreast of any emerging issues that may need to be researched in the future. Table 1 is a

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summary of all the questions that have been asked at Regional Meetings over the last five years (2009 – 2014). Of the 532 questions asked over this five-year period, it is clear that aquatic plant issues are some of the largest concerns totaling 35% of all the questions. Most of these aquatic plant questions are concerned with controlling plants that are impacting some form of lake use (for example, access issues, navigation, and ability to view a lake).



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The second most asked group of questions concern fish and wildlife issues. Anglers are always concerned about the health of the sportfish populations as are aquatic bird enthusiasts are about the health of aquatic bird populations. A continually increasing concern is the ever-increasing observations of exotic species like the sailfin catfish (*Pterygoplichthys multiradiatus*) and exotic apple snails (*Pomacea sp.*).

Throughout most of central Florida there has been almost a decade of

below average rainfall so it is not surprising that water level in lakes was also an important issue of concern with 21% of the questions. Multiple questions regarding water quality issues and lakes uses round out the major issues of concern with 18% and 3% of the questions, respectively.

During the life of Florida LAKEWATCH (started in 1986) we have addressed many of these issues by providing information circulars on many of

individual issues. The circulars are provided on the Florida LAKEWATCH web site:

(<http://lakewatch.ifas.ufl.edu/LWcircular.html>)

and are free for you to download. Hopefully these will aid in answering lake management questions you have but if not feel free to call LAKEWATCH and we will try to find an answer.

Table 1. Summary of topics from questions asked at Florida LAKEWATCH Regional Meetings held from 2009-2014. The numbers of questions asked about each specific topic are listed in parentheses after the topic.

Aquatic Plants	Fish and Wildlife	Water Level/Access	Water Quality	Lake Uses
Plants (121)	Exotic Species (55)	Lake Water Level (95)	Water Clarity (31)	Swimming Areas (6)
Grass Carp (41)	Sportfish Fish (40)	Sediments (13)	Algae (16)	Jet Skis/Boats (5)
Herbicides (19)	Aquatic Birds (28)	Hurricanes (3)	Color (12)	Trash (4)
Tussocks (4)			Storm Water (9)	Irrigation (2)
	TOTAL 123 (23%)	TOTAL 111 (21%)	Waste Water (9)	
TOTAL 185 (35%)			Bacteria (6)	TOTAL 17 (3%)
			Fertilizers (5)	
			Heavy Metals (3)	
			Oxygen (3)	
			Trends (1)	
			Pesticides (1)	
			TOTAL 96 (18%)	

LAKEWATCH Volunteers Help Evaluate New Technology

By Dawn Davis

Over a one-year period, six citizen scientists from Florida LAKEWATCH collected water samples like traditional LAKEWATCH sampling and additionally algal samples twice a month, open water (0.5 m), at three locations in their lakes. Three lakes from each trophic category (i.e., oligotrophic, mesotrophic, eutrophic, and hypereutrophic) were sampled. Bimonthly sampling was selected to ensure capture of an algal bloom. With the help of Gerry Jaillet and Sharlee Hollingsworth (Lake Ola, Orange County and Lake Jem, Lake County), Nancy Dunn (Lake Bear, Seminole County), Patricia and Buster Mann (Lake Bay, Lake County), Jim Peacock (Lake Florence, Lake County), Dr. Rick Copeland and Ron Rice (Lake Talquin, Gadsden County) and Bob Davis (Lake Boca Cove, Polk County) sample collection of water and algal would not have been possible in the lakes of different trophic status throughout Florida in the timeframe needed.

Why are algae important?

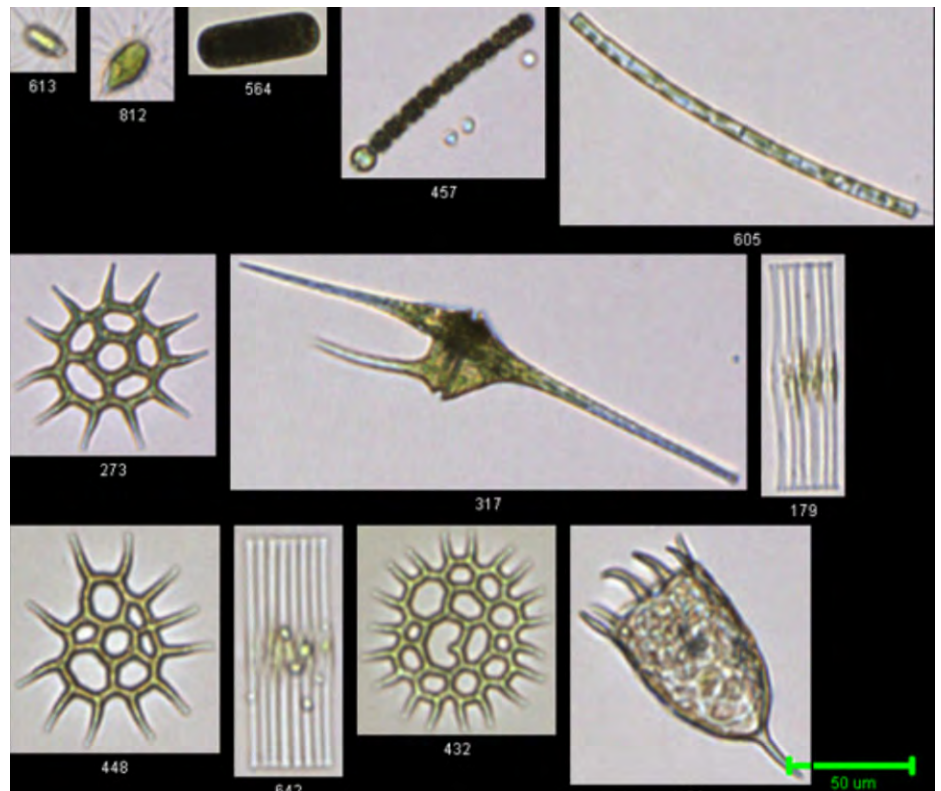
Algae are a vital part of the food web, providing food and oxygen to support most aquatic animal life. Certain types of algae can change with increased nutrient concentrations and influences water clarity in the water body. Therefore, determining the algal type and biomass of algae is useful in assessing the biological productivity. Algal biomass can be calculated with chlorophyll concentrations or counting and measuring individual algae by use of an inverted microscope. Measure-

ment of chlorophyll concentrations is what is largely used in water quality studies due to the ease of measurements (LAKEWATCH procedures) and this increases the ability to analyze a large number of water samples. However, Visual identification is often necessary to identify individual problem algae species (e.g. those that cause toxicity in the water). Counting algae using an inverted microscope allows identification of individual algae to the genus and species taxonomic level, and then the bio-volume of the cell. Consequently, this methodology is tedious and time consuming, allowing too few water samples analyzed for the time and money, especially when looking for statewide patterns.

With intent to fill the gaps in phytoplankton research, Fluid-imaging technology was developed at the Bigelow Laboratory in 1999. The FlowCAM[®] was originally developed to allow oceanographers to count large number of algal sample in real-time and reduce the need for tedious and expensive microscopic counts. The usability of the FlowCAM[®] was quickly established for marine water but use in phytoplankton-rich freshwaters, like those in Florida, has not been widely tested.

What is the FlowCAM?

FlowCAM[®] is a flow cytometer and digital imaging microscope with the capability to detect, enumerate,



Microscopic imagery of algal cells taken with the FlowCAM[®]. Photo by Dawn Davis.

measure and identify microscopic particles like phytoplankton and detritus in a fluid sample. A high-speed digital imaging system uses pattern recognition algorithms to rapidly characterize particles. Individual images and over 40 measurements characterize size, shape and color are archived. Accompanying software allow data to be sorted and filtered by both measurements and statistical weighting, allowing for semi-automated identification and classification. This function gives the ability to create and store libraries of images.

FlowCAM Study

My first objective was to compare data (taxonomic ID, cell counts, and bio-volumes) measured with the FlowCAM® to those measured with traditional inverted microscope. A total of 32 algal samples preserved with Lugol's solution were analyzed with the inverted microscope and FlowCAM® to assess phytoplankton community composition and biomass. The FlowCAM® increases research productivity by dramatically reducing the time required to analyze samples. For example, an hour and a half spent identifying and counting phytoplankton with a microscope can be replaced with minutes on a FlowCAM®. The FlowCAM® used in this study limited the size range (10-100 µm) of algae looked at and prevented the identification to species and genera taxonomic level, which is preferred for use of microscope. However, at the higher taxonomic algal levels, the phytoplankton bio-volume and cell count estimates obtained from FlowCAM® analyses were not different from those obtained by the microscope.

The next objective was to analyze



Dawn Davis heading out on lake Lochloosa to collect phytoplankton samples. Photo by Christy Horsburg.

the bimonthly water and phytoplankton samples collected by the citizen scientists from the Florida LAKEWATCH program with the FlowCAM®. A total of 189 lake samples were processed with the FlowCAM® in a two-week time frame and various algal community metrics were compared to water quality estimates. The data correctly demonstrated that the blue-green algae dominated in eutrophic Florida lakes. Besides looking at algal community metrics, the FlowCAM® also provided an opportunity to examine detritus bio-volumes in individual lakes over time. These type of data provide the ability to examine additional relationships including chlorophyll-phosphorus ratios in Florida lakes of different trophic states. Understanding the environmental factors resulting in different expressions of the chlorophyll-phosphorus

ratio will advance nutrient/phytoplankton management of lakes.

The inverted microscope and FlowCAM® are two different tools with advantages and disadvantages. The ability of the FlowCAM® to process large numbers of Lugol's preserved algal samples offers the scientific community an opportunity to process samples from large number of aquatic systems when working with citizen scientists and can detect changes in phytoplankton community composition. Furthermore analyses of the FlowCAM® provides more resolution than chlorophyll concentrations and this is an issue of great importance in lake management and detection of algae blooms and potential toxic algae problems.

Search for Rare Native Florida Fishes

By Travis Tuten, Florida Fish and Wildlife Conservation Commission

The Blackbanded Sunfish (*Enneacanthus chaetodon*) is one of the smallest members of the family Centrarchidae, a family that also includes the black basses, crappies, and other sunfish. It attains a maximum length of 3 to 3 ½", has a deep and compressed body, and has a rounded caudal fin. The Blackbanded Sunfish is easily identified by the six bold black bars on its side, the first of which goes through the eye and the last being located near the caudal fin. Another identifying trait is that the first two or three dorsal spines appear black or gray, while the pelvic fins are red and black (Figure 1).

Blackbanded Sunfish are found from Central Florida to New Jersey, but are fragmented throughout their distribution and are considered rare and at risk throughout much of the range. They are often found in slow moving streams or lakes, and are associated with low pH systems that have high vegetation coverage, particularly submerged plants. The first collection of Blackbanded Sunfish in Florida was made in 1936 at Mill Dam Lake in Marion County. They have since been found at 10 additional systems in Marion and Lake Counties in Central Florida, at two more southern locations in Pasco and Polk Counties, and at four systems in Jefferson, Madison, and Baker Counties in Northern Florida. However, most of the Florida collections were made between 40 and 70 years ago and more recent sampling trips to these sites where biologists specifically targeted Blackbanded Sunfish produced zero individuals. Currently, there are only two locations in Florida where Blackbanded



Figure 1. Photo of a Blackbanded Sunfish captured in an Ocala National Forest lake on March 4, 2015. This was the first known collection of a Blackbanded Sunfish in this part of Florida for over 30 years.

Sunfish are known to inhabit.

The Florida Fish and Wildlife Conservation Commission (FWC) is the state agency in charge of managing Florida's fish and wildlife resources for their long-term well-being and the benefit of people. FWC is currently working on a number of projects that involve some of Florida's rare species, including some of the state's rare freshwater fish species. For one of these projects, FWC is trying to identify additional systems that Blackbanded Sunfish currently inhabit. Many of the locations that Blackbanded Sunfish might occupy may not be sites that FWC biologists typically sample for freshwater fish collections, which could be a big reason this species is currently only known to occur at two locations in Florida. The most recent collection was made at a new location in the Ocala National Forest in Marion County. While FWC plans to branch out and sample additional systems in search of Blackbanded Sunfish, we also ask that you keep an eye out for this fish. The Blackbanded Sunfish

typically feeds on aquatic insect larvae and other small invertebrates and is not a species that you will catch on hook and line. However, there is a chance that they could be seen from the shoreline or dock, while swimming or snorkeling, or might be caught in a cast net. If you think you have observed or collected an individual, please try to take a picture of it and contact FWC biologist Travis Tuten at travis.tuten@myfwc.com. Thank you for your help!



Travis Tuten is a Fisheries Biologist with the Florida Fish and Wildlife Conservation Commission office in Gainesville. Photo: FWC media.

Participate in the 2015 SecchiDip-In!

(It's the whole month of July!)



2015 marks the 22nd anniversary of the Dip-In and the 150th anniversary of the very first Secchi dip by Father Pietro Angelo Secchi. Each summer Dip-In participants add their water transparency measurements to a unique effort and thus demonstrate that they are an invaluable part of the effort to monitor lakes around the world. We invite you to participate in this year's effort.

Changes at Dip-In HQ

Dr. Robert Carlson, eminent limnologist and founder of the Secchi Dip-In program, has transferred its management to the North American Lake Management Society (NALMS). Over the years, NALMS has been a stalwart supporter of the Dip-In.

It was important to Dr. Carlson that the Dip-In endure after he retired from Kent State University, the long-time home of the Dip-In. NALMS was a natural choice to carry on that legacy given our long history together and how well the Dip-In fits with the mission of NALMS, "to forge part-

nerships among citizens, scientists, and professionals to foster the management and protection of lakes and reservoirs for today and tomorrow."

Now you may be wondering what will change with the Dip-In itself. Actually, you won't notice much as the Dip-In will still focus on working with volunteer monitoring programs to collect lake data. Here are the few changes you may notice:

- You'll find some major updates to the Dip-In website at www.secchidipin.org;
- You may interact with the new intern we will hire soon to manage the Dip-In day-to-day;
- And in 2016 you can expect improvements to the Secchi Dip-In database and how you enter your data. Along with these changes, we also plan to launch a Dip-In mobile app.

Dip-In Basics

The Secchi Dip-In monitors water transparency, which provides so much information. Transparency is sensitive to changes in nutrient levels and to changes in the temperature structure of the lake. Transparency and turbidity can be measured by a variety of instruments in most every aquatic habitat. (The Dip-In also welcomes measurements of water temperature.)

- Participants take a Secchi measurement on one day during the month of July.
- Participants monitor lakes, reservoirs, estuaries, rivers, or streams, however they must already have the equipment and training to do so (see secchidipin.org, monitoring and methods section). Most Dip-In participants are members of an established volunteer or professional monitoring program. The Dip-In encourages monitoring programs to use this event to high-

light their local efforts.

- When 5 or more years of data have been gathered on a site, it is used to determine trends in transparency. The Dip-In currently tracks over 2,000 waterbodies for trends in transparency.

Why Volunteer Monitoring?

Budget cuts at all levels of government have hampered the ability of resource agencies to effectively monitor the conditions of lakes and reservoirs. Through the efforts of volunteers like you, and volunteer monitoring programs, the Secchi Dip-In is able to contribute to an understanding of the status and trends of water quality in North America. These contributions have become even more important as we witness more and more changes in our environment due to climate change. **You can make a difference, both for local efforts and for the world.**

Common Questions

What are the dates of the Dip-In?

The Dip-In is now the whole month of July. We'll also continue to accept data from outside of the "official" Dip-In dates as we always have. Since the Dip-In was originally conceived as taking place during the US Fourth of July and Canada Day, over the years the "official" dates of the Dip-In have moved around a bit over the years depending on which days of the week Canada Day (July 1) and Independence Day fell. As a result, the length of the Dip-In changed from year-to-year.



Joe Richard

A LAKEWATCH volunteer taking a Secchi reading on Clear lake in Gainesville.

Why not get transparency data directly from volunteer monitoring programs?

The Dip-In requests transparency data from volunteers rather than from monitoring programs for many reasons, including the lack of staff capacity to request data every year from hundreds of programs, check the data and enter it in the Dip-In database format. There are unique ID codes for volunteer, lake, and program that must be added for each record and each record is checked so that the proper lake is correctly associated (e.g., there are 5 Trout lakes in Itasca County, Minnesota alone). It is a time-consuming effort to enter a single program's data into our database.

Perhaps even more important is that

the Dip-In also asks for information that most programs do not, such as participants' opinion about what they perceive to be current problems in their lake and perceptions of water quality change. Transparency is not the only object of interest.

Do you have more questions?

We've added a Help / FAQ page to the Dip-In website

www.secchidipin.org

which covers many common questions.

Contact Us

Drop us a line by email at secchidipin@nalms.org with any question not answered on the website.

FWC conservation measures in place for unique American eels

The Florida Fish and Wildlife Conservation Commission (FWC), in support of the Atlantic States Marine Fisheries Commission, has new conservation measures for American eels.

Staff from the FWC proposed the changes at the September 2014 Commission meeting, which the commissioners subsequently approved for implementation.

“This amendment brings Florida into compliance with the interstate Fisheries Management Plan and ensures the future of Florida’s eel fishery,” said Jim Estes, deputy director of the FWC’s Division of Marine Fisheries management and the FWC representative to the Atlantic States Marine Fisheries Commission.

A 9-inch minimum size limit for American eels harvested in Florida (commercially or recreationally) and a recreational bag limit of 25 eels per angler per day is now in effect. A wholesale/retail purchase exemption is provided for recreational anglers purchasing American eels for bait. Anglers must retain proof of purchase to claim the exemption. American eel permit application and reporting forms have been updated. These measures will help conserve this unique species of fish. Eels spend most of their lives in fresh water, but must return to the Sargasso Sea to spawn. The eggs hatch into a leaf-shaped larval form that

floats with the currents until they come near shore, when they morph into nearly transparent glass eels. Then as they swim farther upriver, they develop a brownish coloration and grow into what biologists refer to as pencil eels, due to their size. As maturation continues, they enter the more typically encountered yellow-eel phase, which is when they are most commonly harvested for food or use as bait. After 8 to 24 years, the mature eels return to the Sargasso Sea to spawn, changing yet again into blind silver eels. After spawning, silver eels die, never returning to fresh water.

Harvest of eels peaked around 1980, with commercial fishermen harvesting well over 3.5 million pounds along the Atlantic seaboard. In recent years, harvest declined to less than 1 million pounds but was valued at nearly \$2 million.

This complex life history and the

harvest pressure from commercial and recreational anglers who use eels as bait, necessitated creation of the “Interstate Fishery Management Plan for American Eel” in the mid-1990s. The Atlantic States Marine Fisheries Commission has repeatedly amended the plan to keep pace with population and harvest trends, as well as new research.

Florida’s new eel rules will help ensure compliance and the future of this valuable and novel fishery.

For [more information](#) on the American eel, go to

MyFWC.com/WildlifeHabitats

and select “Species Profiles” and then “Freshwater Fish.” For the updated commercial permit and reporting forms go to MyFWC.com/License/ and choose “Freshwater” then “Commercial Fish, Eels & Frogs.”



Eels spend most of their lives in fresh water, but must return to the Sargasso Sea to spawn. Photo credit: Kim Bonvechio, FWC

Volunteer Bulletin Board

In Remembrance of Bob Forbes

Recently we got a notice from LAKEWATCH volunteers Dave and Ruth Taisch that long-time LAKEWATCH volunteer Bob Forbes past away. Bob was the sampler on Lake Carlton for many years and an avid boating enthusiast. We salute Bob for his many years of service and would like for all of the LAKEWATCH friends and supporters to know that Bob will be truly missed!

From Dave and Ruth Taisch

"Dear Sailing Enthusiast and Friends of Bob Forbes, It is with a heavy heart that I have to inform you that Bob died last night. His daughter, Robin, said that he went peacefully with no pain, and his cat "Kitty" curled up with him. Bob was 97, and a long time boating and sailing enthusiast. He will be missed by those

who knew him, especially those of us who got knot tying and other lessons from him.

This afternoon I went for a sail in remembrance of Bob and other sail club members who left us before him. They must have appreciated it, because they arranged a pretty afternoon with blue sky, puffy white clouds, and a good breeze requiring a reef. Bob or one or more of the others still have a sense of humor because I had several unexpected, surprise splashes of cool water to the face from water coming over the bow."

The following is a message sent by Bob's son Jeff, apparently on Bob's instructions: Message from Bob....
"When I come to the end of the road, and the sun has set for me, I want no rites in a gloom-filled room. Why cry for a soul set free? Miss me a little, but not too long, and not with your

head bowed low. Remember the love that we once shared, miss me, but let me go. For this is a journey we all must take, and each must go alone. It's all part of the Master's plan, a step on the road to home. When you are lonely and sick of heart, go to the friends we know, Bury your sorrows in doing good deeds, miss me, but let me go."

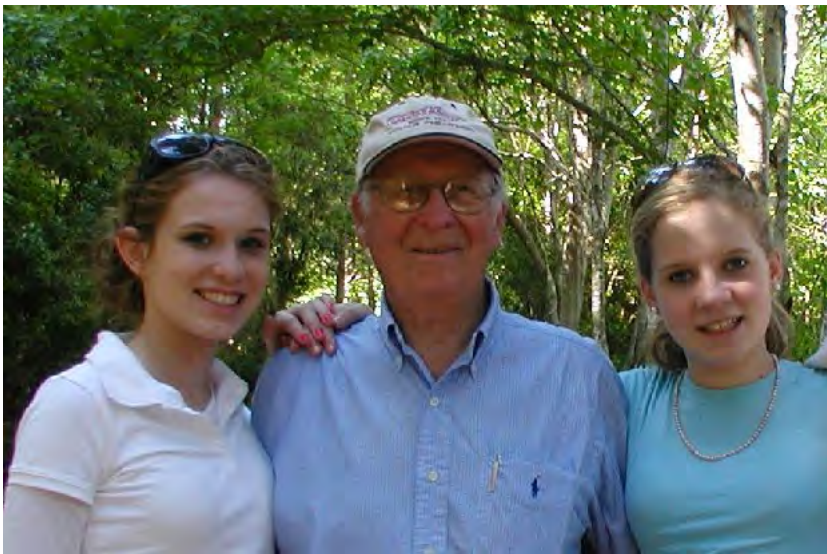
"Enjoy this day, chat with a stranger, and pet a tailwagger for Bob."

THANK YOU!

Once again I would like to share with you how much we sincerely appreciate everyone's support of the Florida LAKEWATCH program! It is only with the dedication of our volunteers, friends, faculty and staff that Florida LAKEWATCH continues to serve Florida. This program started as a dream 28 years ago, and thanks to you this dream is a real part of Florida's efforts to protect our water resources. We hope you will continue making a positive impact on Florida's future.

Mark Hoyer

Florida LAKEWATCH Director



Bob Forbes with his granddaughters Molly and Allison. Photo provided by the Forbes family.

Florida's Ornamental Aquaculture

By Matt DiMaggio, PhD, Assistant Professor, Fisheries and Aquatic Sciences Program

Hello Lakewatch! My name is Matthew DiMaggio and I have been hired as an Assistant Professor in the School of Forest Resources and Conservation's Program in Fisheries and Aquatic Sciences at the University of Florida. My research programs fall under the umbrella of ornamental aquaculture, with specific foci in the areas of fish reproduction, larval nutrition, production optimization, and physiology. I am currently located at the Tropical Aquaculture Laboratory (TAL) in Ruskin, situated among the greatest concentration of fish farms in Florida.

Florida's ornamental fish industry represents the most valuable segment of aquaculture within the state, with over 140 producers culturing hundreds of species of freshwater and marine ornamental fishes. The success of this industry is directly influenced by two factors which provide growers in this state with an advantage over other domestic producers; climate and water. Florida's subtropical/tropical climate allows for an extended growing season not afforded to other producers within the United States. Furthermore, these prolonged periods of warm weather make it possible to grow a multitude of ornamental species in outdoor ponds. These ponds are generally shallow (4 – 6 ft) "water table" ponds that can result from natural seepage or be further supplemented by freshwater wells. As the Lakewatch community is well aware, the quality and composition of water resources within the state

can vary dramatically, however, this variation may provide producers with an opportunity to raise species that may only thrive in specific conditions. For example, water quality parameters such as pH, hardness, and alkalinity are critical to rearing ornamental species and these water

parameters must be carefully monitored to ensure proper reproduction, growth, and survival. Indeed, Florida's water resources are a great asset that has allowed Florida to become the top producer of ornamental fishes in the country. At the TAL our research mainly fo-



Figure 1. [Top] Adult bichir (*Polypterus senegalus*) [Bottom] Juvenile bichir. Photos provided by Matthew DiMaggio

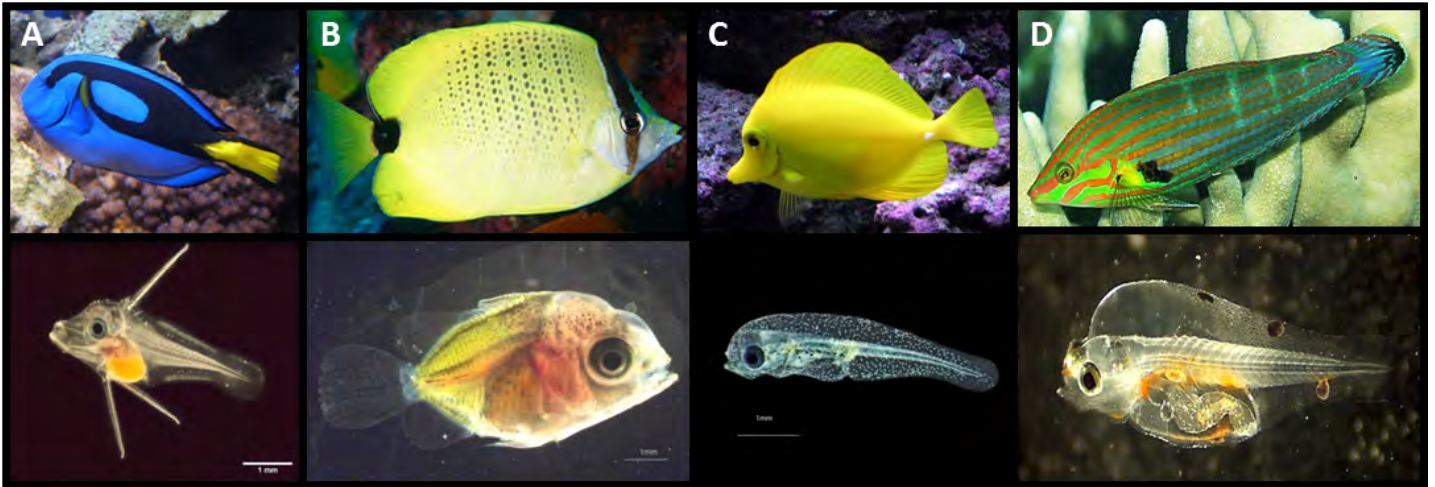


Figure 2. A) Pacific Blue Tang *Paracanthurus hepatus* B) Milletseed Butterflyfish *Chaetodon miliaris*, C) Yellow Tang *Zebrasoma flavescens*, D) Melanurus wrasse *Halichoeres melanurus*. Larval stages are pictured below photographs of mature adults. Photos provided by Matthew DiMaggio.

cuses on development of culture protocols for new species and optimization of current protocols employed by the industry to increase efficiency. Two freshwater species we are currently working with are the rainbow shiner (*Notropis chromosomus*) and bichir (*Polypterus senegalus*) (Figure 1). The rainbow shiner is a species native to the United States with commercial production occurring overseas. Research efforts at the TAL have been successful at defining cues to trigger spawning behavior in recirculating aquaculture systems. Additionally, we have also developed methods for efficient collection of fertilized eggs and are currently investigating disinfectants for these embryos that will result in better larval survival and health. The bichir is another species that has been identified by the Florida Tropical Fish Farms Association as a potential candidate for production in the state. Native to Africa, this “primitive” species has increased in popularity among the aquarium trade. Unlike most fishes, the bichir is considered to be an obligate air breather and can survive in water bodies with low dissolved oxygen levels. Investigations are currently underway to elucidate spawning

protocols conducive to commercial production of this species. Interestingly, bichir larvae have external gills during their early development and these sensitive structures may influence husbandry procedures. Trials that will evaluate larval nutrition and culture procedures are forthcoming.

Growing interest in marine ornamental species coupled with increased knowledge regarding their captive husbandry requirements has resulted in 700,000 US households which currently maintain marine aquaria and over 2,000,000 home and public marine aquaria globally. Accordingly, research into expansion of production species for the marine ornamental industry is of great interest to domestic aquaculture producers. It is estimated that over 11 million marine fish, representing 1,800 unique species, are sold annually; with the preponderance of specimens resulting from wild capture. Historically, efforts to develop commercial protocols for marine ornamental aquaculture production have primarily focused on species which spawn large demersal eggs, exhibit some degree of parental care, and have large developed larvae capable of consuming cultured

zooplankton such as rotifers and *Artemia*. Culture of species which spawn small pelagic eggs and have underdeveloped prolarval stages has been largely unsuccessful due to bottlenecks mainly associated with captive spawning and larval nutrition. Research at the TAL in conjunction with the SeaWorld and Busch Gardens Rising Tide Conservation Initiative is currently focused on finding solutions to these bottlenecks. Some of the marine ornamental species we are presently working with include the Pacific Blue Tang (*Paracanthurus hepatus*), Yellow Tang (*Zebrasoma flavescens*), Milletseed Butterflyfish (*Chaetodon miliaris*), and Melanurus wrasse (*Halichoeres melanurus*) (Figure 2). Research projects are currently evaluating novel live feeds such as copepods and ciliates, the use of “probiotics” or beneficial bacteria, and environmental variables such as temperature, photoperiod, and water quality.

The diversity of research within the ornamental aquaculture field is quite impressive. Our results will have implications not only for stakeholders in Florida but potentially for conservation of reefs on the oppo-

School of Forest Resources and Conservation
Florida LAKEWATCH
7922 NW 71st Street
Gainesville, FL 32653



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Florida LAKEWATCH
Fisheries and Aquatic Sciences
School of Forest Resources and Conservation
PO Box 110600
Gainesville FL 32611-0600

or call
1-800-LAKEWATCH (800-525-3928),
(352) 392-4817,

E-mail: fl-lakewatch@ufl.edu,

Website: <http://lakewatch.ifas.ufl.edu/>

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site side of the globe. I am excited to work with Florida's ornamental producers and the faculty, staff, and students here in the fisheries and aquatic sciences program at the

SFRC. I would welcome any potential for collaboration with LAKEWATCH and I am grateful for this chance to introduce my research programs to the Florida LAKEWATCH community.



Matthew DiMaggio is an Assistant Professor in the School of Forest Resources and Conservation's Program in Fisheries and Aquatic Sciences at the University of Florida. He can be reached at the contact information below.

Tropical Aquaculture Laboratory
1408 24th Street SE
Ruskin, FL 33570
mdimaggi@ufl.edu
(813) 671.5230 Ext.115