Florida LAKEWATCH

Dedicated to Sharing Information About Water Management and the Florida LAKEWATCH Program Volume 49 (2010)

New Technology for Florida LAKEWATCH

Recently you received an email from LAKEWATCH with a link to a webcast about "Establishing Numeric Nutrient Standards" presented by Dr. Canfield. This is a new technology that is available to LAKEWATCH and we want to use this technology to help inform/educate volunteers about important lake management issues. Please take a look at the webcast presentation and give us your feed back on whether you would like to see more of these. The following is the link and below information on what your computer needs to be able to view the webcast.

http://mediasite.video.ufl.edu/mediasite/Viewer/?peid=2ed5e9940453426e86a37a8bad58d595

Software requirements for viewing a Mediasite Presentation

PC Computers with Windows:

- Microsoft Windows XP, Windows Server 2003, or Windows Vista.
- Microsoft Internet Explorer 6.0 SP1? or later, Firefox 2.0 or later, or Google Chrome 1.0 (Chrome is only supported on Mediasite version 5.0.3 and later).
- Windows Media Player 9 or later.
- For Firefox and Chrome playback, Silverlight 1.0 or later (viewers are prompted to install this when attempting to view a presentation).

http://mediasite.video.ufl.edu/mediasite/Viewer/?peid=2ed5e9940453426e86a37a8bad58d595

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- Broadband Internet connection (256 Kbps or more)
- Note: Variable speed playback is not currently supported in Silverlight.

Macintosh Computers:

- Mac OS X 10.4.8 or later
- Safari 2.0.4 or later or Firefox 2.0 or later.
- Silverlight 1.0 or later (viewers are prompted to install this when attempting to view a presentation).
- Broadband Internet connection (256 Kbps or more)
- Note: Variable speed playback is not currently supported in Silverlight.

Linux Computers:

- As of Mediasite version 5.0.3, playback on Linux platforms is supported.
- Playback of Mediasite presentations on Linux is accomplished via the Moonlight Project, an open source implementation of Microsoft Silverlight. For more installation on the installation and configuration of Moonlight, please visit their page here. The compatible operating systems and browsers are listed on this page.
- Microsoft Media Pack for Moonlight
- Broadband Internet connection (256 Kbps or more)

Some folks are having no problem viewing the webcast but there are a few that we have heard from, that are still having difficulty. We are working on these problems and trying to figure out how best to make sure everyone that wants to, can view these information clips. So this will continue to be a work in progress. As we move forward the following are some of the webcast topics that we are considering:

1) Toxic algae?

2) What about muck!

3) Basic water chemistry.

What information would you like, that would help with managing your lake? Let us know.

Calling All LAKEWATCH Volunteers!

The 17th Annual Secchi Dip-In Begins June 26 and Ends July 19

To celebrate the 30th anniversary of the Clean Water Act, the U.S. Environmental Protection Agency (EPA) launched a yearlong series of events in 2003, each month focusing on a different aspect of the Clean Water Act. July 2003 was designated as Lakes Awareness Month. In addition, the North American Lakes Management Society (NALMS) sponsors Lakes Appreciation Month each July. One way the EPA and NALMS help support Lake Appreciation month is by supporting the Secchi Dip-In.

A LAKEWATCH volunteer measuring Secchi disk visibility in the Florida Keys

This is your invitation to participate in this year's Secchi Dip-In, which runs from June 26 to July 19. This is the 17th year of the Dip-In, and the three week event in June and July demonstrates that volunteers such as you can collect quality data for an international research program. The Dip-In is a **network of volunteer programs and volunteers,** that together gather and provide continent-wide (and world-wide) information on water quality.
LAKEWATCH has been an active participant in the Dip-In since 1995.

Florida volunteers have provided information on on 616 Florida waterbodies. At least 69 Florida waterbodies have more than 5 years of data submitted. Five years or more of submissions is critical because it takes a minimum of 5 years of data in order to make reliable statements about trends.
North American volunteers have submitted 5 or more years of data on over 1,800 waterbodies. Of those waterbodies, 202 exhibit significant levels of transparency change, both positive and negative. Are changes in 11% of North America's volunteer-monitored waters significant? It might depend on whether it is "your" lake or stream that is changing and in what direction that change is occurring.

We already have evidence that waterbodies showing decreasing transparency are sometimes close to ones that may be improving in transparency; there is little evidence of whole regions changing simultaneously. This adds to our knowledge about whether urbanization or disturbance is changing the transparency of our lakes, but also emphasizes our ignorance of mechanisms of change. It emphasizes that, yes, more data is necessary on more waterbodies for more years.

There are 41 LAKEWATCH sites that have only 4 years of data; another year of participation on those sites will almost double the number of lakes in Florida in our analysis. If you have missed several years of the Dip-In, you can enter data for previous years to "catch up" with our database.

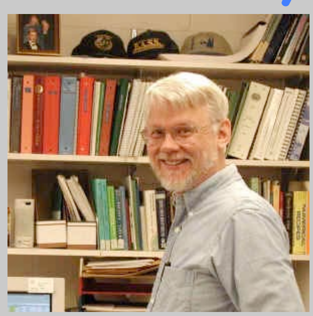
All of the data are available on our newly-refurbished website (http://dipin.kent.edu/). You can retrieve data by state, by county, or by waterbody. It is now possible for you to edit any data that you have previously submitted or to add more data, even for previous years. You now also have the ability to add pictures of you and/or your lake and to check your sampling location on a satellite map.

Why should you contribute to the Secchi Dip-In if you send your data to LAKEWATCH, and why don't we just ask LAKEWATCH for the data? There probably are a number of reasons, but let me cite just two. National priorities for funding of protection and restoration are set on the basis of available national data. You may have heard recently of the quality of our Nation's lakes, based on a random sampling of 1000 lakes across the US. It will not be done again for 5 years. The Dip-In provides the opportunity to contribute to a set of data that can provide annual assessments across North America.

The second reason to provide data to the Dip-In is that we ask some questions that LAKEWATCH does not ask and only you can answer about the quality of your lake. A major component of lake management is understanding of user attitudes about water quality. What we have found out so far is that volunteer's perception of what is meant by a quality lake varies radically from one region of the country to another.

Your participation in the Dip-In is easy, since we require no effort more than what you normally do when you sample for LAKEWATCH. We also encourage the involvement of volunteers that sample rivers and streams, estuaries, and marine environments. It isn't just lakes that are changing and need monitoring.

For more details, Contact



Bob Carlson
2010 Secchi Dip-In
1091 Munroe Falls Road, Kent, OH 44242
Phone 330.673.9459
E-mail: rcarlson@kent.edu

Or your LAKEWATCH Coordinator

Fish Kills in Florida Freshwater Systems

Buford Nature

The most common natural cause of fish kills is due to dissolved oxygen depletion in lake water like this kill shown here.

Freshwater fishing is one of the most popular forms of outdoor recreation in Florida. Each year resident and non-resident anglers take to the water to land trophy fish or just to enjoy the sport of fishing. Some waterfront citizens don't like to fish but enjoy feeding fish and watching fish from their docks. Still other people simply enjoy knowing that fish are living in a lake acting as a biological indicator of ecosystem health. The assumption is that when large numbers of fish are dying then something is wrong with the lake. Therefore, when a fish kill occurs on a waterbody the general public becomes alerted and concerned that humans have somehow caused the kill. Humans have caused fish kills with chemical spills and other types of activities and these fish kills are usually highly visible because newspapers, radio and television report big stories about the problem. Unfortunately, these high profile fish kills make everyone suspect the worst when they see fish dying, even though the majority of fish kills in Florida are natural events dictated by natural environmental factors.

Natural causes for a fish kill can be related to physical processes, water chemistry changes and/or they can be biological in nature. The weather is the primary physical process that causes dramatic environmental changes that can lead to fish kills. Cold fronts can change water temperature quicker than fish can acclimate causing stress and eventual death as many of you may have witnessed this past winter. Wind can destroy habitat and mix deep water with shallow water causing changes in water chemistry quicker than fish can acclimate also causing stress and eventually death. Abundant rain can bring low oxygenated water into a canal, stream, pond or lake causing fish kills.

Biological causes for fish kills include toxic algae, viruses, bacteria, fungal agents and parasites. These agents are common to every lake in Florida and generally become lethal only after the fish is weakened by stress. Stress is usually caused by a number of factors including the physical processes and changes in water chemistry mentioned above as well as day-to-day factors of living in the aquatic environment (i.e. avoiding becoming some other fishes dinner).

NATURAL CAUSES OF FISH KILLS

One type of natural fish kill that is common in Florida waterbodies is due to cold temperatures. This type of fish kill is generally specific to tropical species that have little tolerance for cold temperature. For example, the fish species blue tilapia, which is an exotic fish from the Nile River, was accidentally introduced into Florida. Blue tilapias now have successful reproducing populations in 18 counties. The distribution of blue tilapia is limited by their sensitivity to low temperature so they are rarely found in lakes north of Central Florida (i.e. Gainesville Florida). Blue tilapia stop feeding when the water temperature gets down to about 60°F and they die when it reaches 45°F. Thus, when severe cold fronts, like the ones Florida saw this past winter, drops water temperatures in southern Florida it can cause fish kills of blue tilapia. This type of fish kill is easily identified because it generally happens after extended cold weather and all of the dead fish will be cold intolerant fishes such as blue tilapia.

Another type of fish kill that is natural and common in Florida waterbodies occurs to fish after they spawn. Some fish will spawn year round in Florida but generally there is a peak from January through April. When fish spawn they use a tremendous amount of energy in courtship behavior, building nests, releasing eggs and milt, and in some cases defending the young. After this period the fish are weak and any change in the environment may stress and kill the fish. A fish kill due to spawning stress will generally be composed of one or two species of fish that are adults, possible with red soars on the body. This type of fish kill is most common in the springtime and early summer when the majority of the fish are spawning.

The most common natural cause of fish kills is due to dissolved oxygen depletion in lake water. Dissolved oxygen refers to oxygen gas that is dissolved in the water. Fish "breathe" oxygen just as you and I do. However, fish are able to absorb oxygen directly from the water into their blood stream using gills, whereas you and I use lungs to absorb oxygen from the atmosphere.

Oxygen is dissolved into the water from two sources--the atmosphere and photosynthesis. Oxygen naturally dissolves slowly from the atmosphere into water; however, wind and wave action can help accelerate the diffusion process. Photosynthesis also adds oxygen to the water column. Photosynthesis is a process where oxygen is produced by algae and aquatic plants when they use carbon dioxide, water and sunlight to make food.

Dissolved oxygen is removed from lakes by natural biological activity in the water column. Algae, fish, insects, zooplankton, bacteria and aquatic plants use oxygen from the lake water for respiration. For this reason dissolved oxygen increases during daylight hours (when the algae and aquatic plants are producing more oxygen than is being used by the natural biological activity of the lake) and declines throughout the night until just before daybreak (when no oxygen is being produced).

The temperature of the water will affect how much dissolved oxygen the water can hold at a given time. Cool water can hold more oxygen gas in solution (dissolved oxygen) than warm water. Not only does warmer water hold less oxygen than cooler water, but also warmer water increases the metabolic rate of fish increasing their oxygen demand to just complete their normal physiological functions. Both the physical phenomenon of warmer water being able to hold less dissolved oxygen than cooler water and the fact that fish in warmer water need more oxygen than fish in cooler water puts the fish in double jeopardy when the temperature of the water increases.

Buford Nature

A dead chain pickerel on Orange Lake in Alachua County following a fish kill.

The most common natural cause of fish kills is due to dissolved oxygen depletion in lake water.

Although oxygen depletions can occur at anytime, they are most common and likely to cause fish kills during warm summer months (when warmer waters hold less oxygen), cloudy weather (which decreases the amount of light available for algae and aquatic plants to produce oxygen through photosynthesis), and during algae and aquatic plants die-off (algae and aquatic plants are the most important producers of oxygen in a lake).

Severe oxygen depletion can also occur after heavy thunderstorms during hot weather warm waters hold less dissolved oxygen than cooler water and extended dry periods can lead to a buildup of organic matter that can runoff into the waterbodies increasing the amount of decomposition occurring in the water. This increased decomposition uses up more oxygen and can lead to oxygen depletion in the water resulting in fish kills.

Additionally in the summer months, surface waters warm more rapidly than deeper water. This temperature difference causes a temporary "barrier" to develop between warm water at the top (which is full of oxygen due to photosynthesis and atmospheric exchange) and cool water at the bottom (which is devoid of oxygen due to no photosynthesis or atmospheric exchange). A heavy wind or cold rain, which occur commonly during the summer thunderstorms in Florida, can break the barrier and cause mixing between the two layers. The oxygen-rich surface water mix with the oxygen-deficient bottom waters. If the oxygen demand of the bottom waters is sufficient, most dissolved oxygen present will be rapidly removed from the water column, resulting in a fish kill.

A dissolved oxygen concentration above 5 mg/L (or 5 parts per million) is generally recommended for optimum fish health. Fish become stressed severely at dissolved oxygen concentration below 2 mg/L and begin to die when concentration levels fall below 1 mg/L. Oxygen depletion severe enough to result in significant fish mortality is more likely to occur in water with heavy populations of aquatic plants and/or algae. When a fish kill is caused by oxygen depletion fish of every species die approximately at the same time. Usually large fish are affected before small fish that are often seen "gulping" or "gasping" at the surface of the lake. The weather immediately prior to the fish kill may have been hot, still, and overcast or stormy.

Tampa Tribune

Phosphate mining caused a fish kill in the Alafia River in 1997.

The final type of natural fish kill is due to fish diseases and parasites. Fish contract parasites and diseases just as humans do. Fish parasites and diseases that occur naturally in Florida lakes include viruses, bacteria, fungi, protozoans, crustaceans, flukes and tapeworms. A healthy strong fish is usually able to defend itself against most fish diseases and parasites. A stressed fish, however, may be successfully attacked by fish parasites and diseases resulting in fish mortality.

Fish infected with parasites and/or diseases may have physical clues on their bodies or may display abnormal fish behavior. Some physical clues can be very obvious, such as open sores on the body, missing scales and/or lack of slime and strange growths on the body, head or fins. Abnormal behavior of infected fish are swimming weakly, lazily, erratically, or in spirals; scratching or rubbing against objects in the water; twitching, darting, or having convulsions; failure to flee when exposed to fright stimuli; gasping at the water surface or floating head, tail, or belly up. When physical problems or abnormal behavior is observed it is necessary to capture some of the suspect fish for closer examination. It is important to look at live fish when examining a health problem. Dead fish decompose quickly, obscuring the physical clues of the cause of death.

NON-NATURAL CAUSES OF FISH KILLS:

The possible causes of non-natural fish kills are numerous. Many chemicals and other substances that are dumped, spilt or leaked into a lake can cause fish kills. The amount of "contaminates" entering a lake, though, would have to be large because the large volume of water in the lake would dilute the toxicity of the "contaminates". There are often noticeable signs of a "contaminate" entering the lake, such as a film present on the water surface or the color or clarity of the water has changed, strange odors, and drums or containers of unfamiliar substances near shore. Usually with non-natural causes of fish kills, investigation of the local area and observations recording any changes noticed in the water quality can direct investigators to the possible contamination source responsible for the fish kill.

Fish kills are a fact of life and many things can cause them! The important thing to remember is that the majority of fish kills in Florida are due to natural causes and that if a human induced source is involved then it will usually be evident.

FUNDING UPDATE

The Florida Legislature has passed the budget for fiscal year 2010-2011 and Florida LAKEWATCH has remained in the budget at $275,000, the same amount as the previous fiscal year. As a result, we ask all of our volunteers to continue sampling at the frequency that you sampled last year.

A special thanks to all of our volunteers who contacted their legislators to let them know how important LAKEWATCH is to Florida. You helped make a difference and we are very thankful!

Update Your Information

We are updating our records. If you are not a primary sampler but would like to remain on our mail list, please call 1-800-525-3928 so that we can update your information. We are purging our mail list and will remove any non-primary samplers from the mail list unless we hear from you.

Thank you,

The LAKEWATCH crew

Life History of Bay Scallops (*Argopecten irradians*) in Florida Waters

An article by the Florida Fish and Wildlife Conservation Commission

BACKGROUND

In Florida, bay scallop populations that comprise the Argopecten irradians metapopulation (a population composed of smaller, isolated local populations) have historically occupied bays and near shore waters from Palm Beach to the Chandeleur Islands in Louisiana. In recent decades that range, and the abundance of individuals comprising the populations occupying that range, has contracted considerably. Scallops are now rare or non-existent in southeast Florida and in areas west of St. Joseph Bay in the Florida panhandle. Moreover, areas such as Pine Island Sound, Sarasota Bay, Tampa Bay, and Pensacola, which once harbored very dense scallop populations, now support few if any individuals. Essentially, until 1999 only Steinhatchee and St. Joseph Bay harbored healthy scallop populations.

LIFE HISTORY

Bay scallops occur in discrete "local" populations that are isolated from neighboring populations by areas of inhospitable habitat (e.g., salinity < 20 psu, no seagrass). Most members of each population only live for 12–18 months; although, a small proportion of each year class may survive for 24 months or more. Thus, each population must replace itself, or receive offspring from neighboring populations sufficient to replace itself, each year. Because individual scallops only live for about one year, population fluctuations are extreme and the collapse of local populations is a natural feature of bay scallops in Florida. As a result, the stability of scallop populations in Florida is realized at the metapopulation level, not the local level. That stability derives from the existence during any year of multiple local populations throughout the state; although, the location of those individual populations may change from year to year. It is reasonable to assume that increasing the number of healthy local populations extant during any year increases the stability of the metapopulation.

In Florida waters, bay scallops appear to spawn only once, generally during fall; although, recruitment monitoring by FMRI staff indicates settlement of larvae beginning in August of each year and extending through May of the following year. Larval scallops are pelagic (living in the water column rather than on the bottom) for 10–14 days. During that time they may be dispersed a considerable distance from the source population. The pelagic dispersal phase connects local populations and is the critical link in maintaining the metapopulation. Any local population that becomes disconnected from this linkage will eventually become extinct unless that linkage is reestablished.

FWC

The Bay scallop (*Argopecten irradians*).

POPULATION MONITORING

To assess the status of bay scallops in Florida waters, we conduct adult population surveys during June of each year at various sites along the Florida west coast. Survey sites include Pine Island Sound in Charlotte Harbor (PIS), Anclote Anchorage near Tarpon Springs (ANC), the coastal waters of Pasco and Hernando Counties (HER), coastal waters in the vicinity of the Homosassa and Crystal Rivers (HOM), the Steinhatchee area (STN), St. Joseph Bay (SJB), and the Crooked Island Sound/St. Andrew Bay estuarine complex (SAB). At each site, we conduct transect surveys at 20 randomly located stations. Each transect survey consists of paired scuba divers swimming either side of a 300-m transect line and counting all scallops within 1 m on each side of the line. Thus, we count scallops within a 600-m2 area at each station, and we sample a 12,000-m2 area at each site. Surveys have been conducted since 1994 at most sites; although, we did not begin sampling the Hernando area until 1997 (Figure 1).

Using the results of our transect surveys, we apply the following criteria to determine the health of a local scallop population:

1) Abundance: In a healthy scallop population, mean population density generally exceeds 25 scallops per 600 m2 transect. Mean population density below 5 scallops per transect generally suggests a collapsed population. Mean density between 5 and 25 scallops per transect suggests a transitional population.

2) Distribution: Scallops should be widely distributed throughout the sample area. We sample 20 stations at each study site, and we expect to recover scallops from a minimum of 10 of those stations in a healthy population.

3) Resilience: Even healthy scallop populations fluctuate in abundance from year to year, but a healthy population should recover from a low point within one or two years. Good examples of resilient populations include Anclote and Steinhatchee, but the resilience of the St. Joseph Bay population is currently unknown.

MANAGEMENT

Prior to 1985 there were no statewide regulations regarding the harvest of bay scallops in Florida waters; although, local rules applied in Bay, Gulf, and Pinellas Counties. In 1985, the Florida Marine Fisheries Commission instituted statewide regulations (Rule 46-18), governing the harvest of scallops and simultaneously repealed all local rules. Those statewide regulations included a closure of the fishery between April 1 and June 30 of each year and a recreational bag limit of five gallons of whole scallops, or 1/2 gallon of meat per person per day. Limits were also placed on the size and number of drags that could be used by vessels harvesting scallops for commercial purposes, and restrictions were placed on commercial harvest in the south end of St. Joseph Bay. In 1994, there was an emergency closure of the bay scallop fishery in response to the perceived collapse of bay scallop populations in many areas of Florida. All state waters were closed to commercial harvest, and the recreational fishery was closed south of the Suwannee River. Additionally, the length of the recreational harvest season was reduced to three months (July–September). A formal modification of bay scallop harvest regulations, which continued both the commercial and recreational closure south of the Suwannee River, was instituted in 1995. The 1995 regulations also included a more included a closure of the fishery between April 1 and June 30 of each restrictive individual bag limit (two gallons of whole scallops or one pint of meat per person per day), a boat limit of 10 gallons of whole scallops or 1/2 gallon of meat per boat per day, and a further reduction of the season to July and August of each year. In 1997, the season was lengthened by 10 days (July 1–September 10); otherwise, the 1995 regulations remain in effect.

RESTORATION

The goal of the 1994 bay scallop management modifications is restoration of local populations in an effort to further stabilize the metapopulation. To achieve this objective, between 1997 and June of 2002, FMRI scientists conducted a federally funded program to restore bay scallop populations in Florida waters. FMRI's initial efforts targeted the most recently collapsed scallop populations, those between Anclote and Crystal River, because those populations were in close proximity to the relatively healthy Steinhatchee population.

A resurgence of scallop populations has been observed in the area from the Weeki Wachee River north to Crystal River. From 1993 through 1996, the Homosassa scallop population averaged less than eight scallops per 600 m2 transect during June of each year and density decreased during each successive year (Figure 1). A slight, 15 scallops per transect, resurgence in scallop abundance was recorded in 1997. Numbers again fell during 1998, probably as a symptom of degraded coastal water quality during that year. Scallop abundance increased substantially during 1999 (29/transect), 2000 (243/transect), and 2001 (299/transect). Genetic evidence and the initial increase in abundance observed during 1997, prior to any restoration activities, suggest that management rather than restoration may have fundamentally influenced this resurgence. Regardless, there are substantially more scallops in the area between Weeki Wachee and Crystal River than were observed during the 1990s.

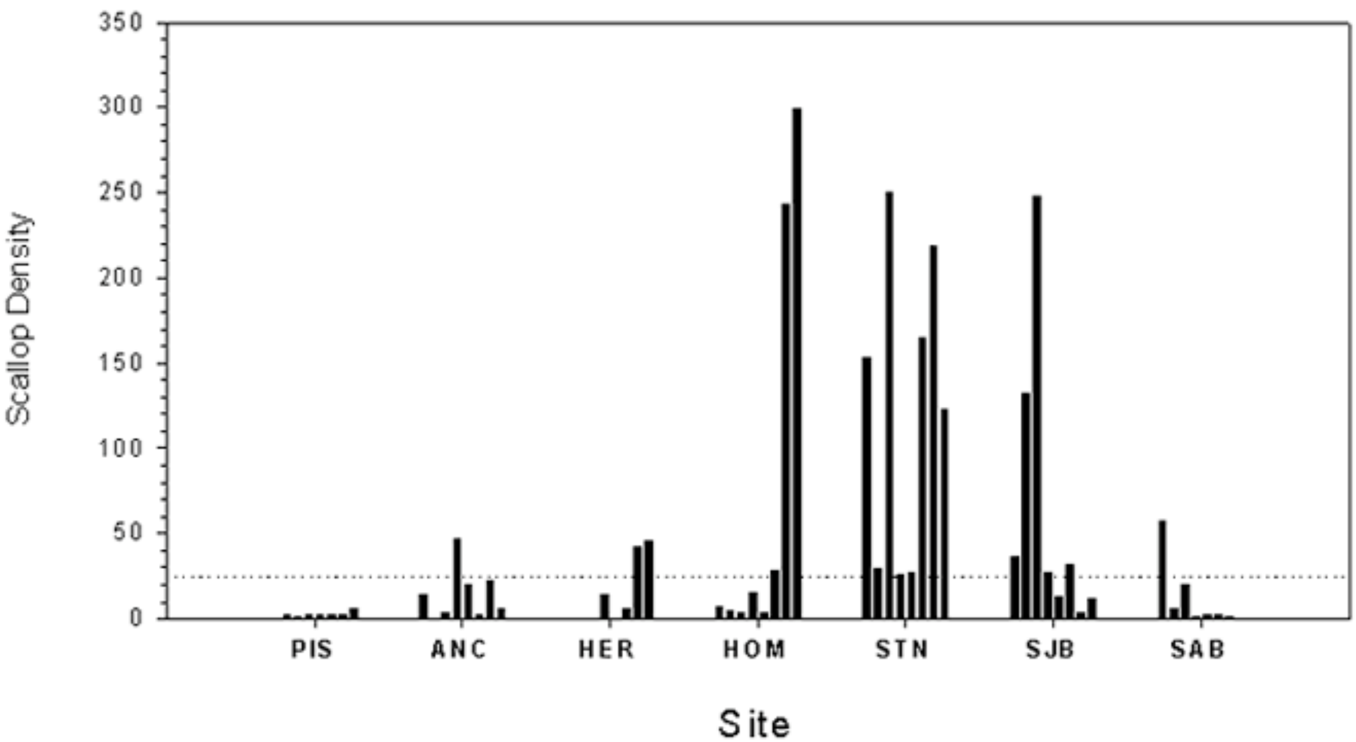
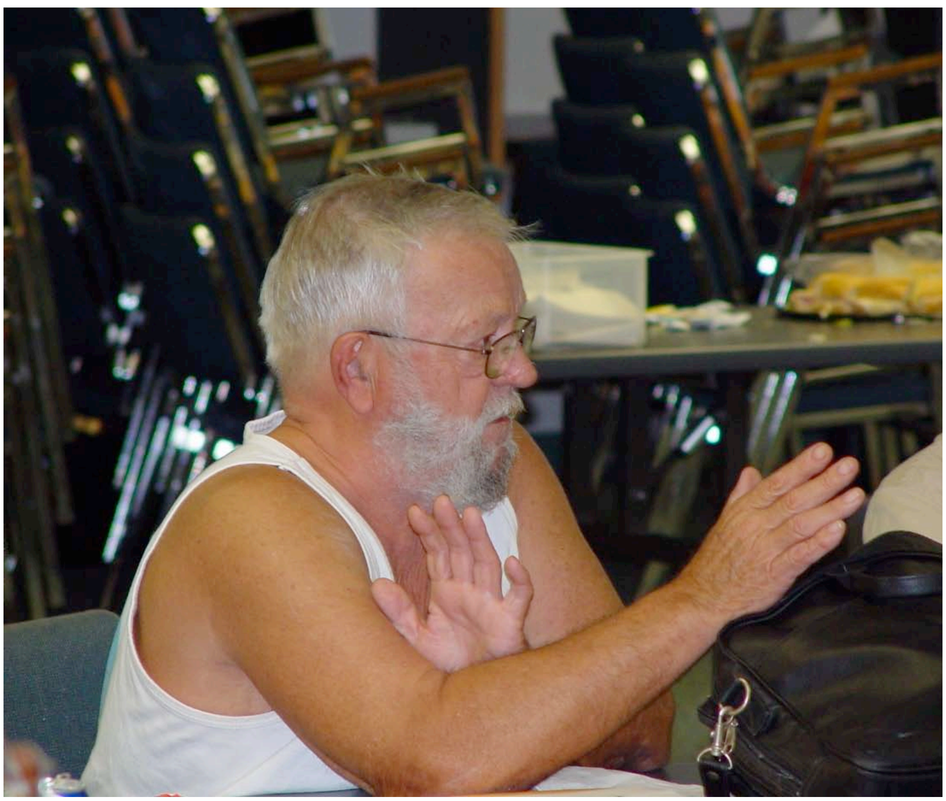


Figure 1. Bay scallop (Argopecten irradians) adult density estimated for various sites along the Florida west coast between Pine Island Sound and St. Andrews Bay during June every year. The density estimate for each year at each site is calculated as the average number of scallops counted along twenty randomly allocated 300-m transect lines. At each transect station, SCUBA divers swim either side of the 300-m transect line and count all scallops within 1 m of the line. Thus, total area sampled at each transect station is 600 m^2, and total area sampled at each site each year is 12,000 m^2. PIS=Pine Island Sound, ANC=Anclote, HER=Hernando, HOM=Homosassa, STN=Steinhatchee, SJB-St. Joseph Bay, SAB=St. Andrew Bay/Sound. Horizontal dotted line depicts mean density of 25 scallops per transect.

Outstanding LAKEWATCH Volunteer

John Clark shared his time between Ramrod Key, Florida and Ocean Shores, Washington. He has been a LAKEWATCH volunteer and wrangler for the Ramrod Key sampling group for 9 years. John and the other Ramrod samplers were trained in 2001 and they have taken samples on 10 sites for approximately 108 months.



John Clark makes his point at the Monroe County LAKEWATCH Regional meeting in December 2002.

John was born in Seattle Washington and grew up on the edge of Shilshole Bay where he developed a love of the sea and all the nature surrounding it. John was in the Navy until 1945. He immediately enrolled in the University of Washington and studied fisheries sciences after leaving the Navy where he graduated in 1949.

After graduation he worked at Woods Hole until, in the 1960's, he became the assistant director of the Sandy Hook Marine Laboratory in New Jersey. In 1970 he became the director of the Narragansett Marine Laboratory in Rhode Island. From Rhode Island John moved to Washington, D.C. when he became a senior associate with the Conservation Foundation, where his involvement with coastal zone conservation policy was influential in the Federal Coastal Zone Management and Clean Water programs. In the 1980's he returned to a government job in the International Affairs Office of the National Park service. There he dealt with research, planning and training projects in coastal zone management in many developing countries. He retired in 1987, but still worked as a consultant on coastal zone management, working in more than 30 countries.

He had the title " Honorary Conch" conferred on him by Monroe County Commissioner George Neugent, for his civic activities. He has written more than 130 papers and authored or co-authored 27 books, the most notable of which are "Coastal Ecosystem Management" (1977), "Coastal Zone Management Handbook" (1996), and "Coastal Seas, the Conservation Challenge" (1998).

He has been the president of the Breezeswept Beach Civic Association twice. He worked on having additional culverts installed on Ramrod Key to increase circulation in the canal systems and formed a water quality assessment program for the waters around Ramrod Key, working with the University of Florida's LAKEWATCH program.

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Florida LAKEWATCH

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All unsolicited articles, photographs, artwork or other written material must include contributor's name, address and phone number. Opinions expressed are solely those of the individual contributor and do not necessarily reflect the opinion or policy of the Florida LAKEWATCH program.

John (closest in the picture) observing has data at the 2002 Key's Regional meeting.

John passed away April 5, 2010 at the age of 83. He is survived by his wife Catherine " Catie" and his 4 children, 8 grand children and 1 great-grandchild. Everyone who knew John loved and appreciated him. He was a unique person. He will be greatly missed by his family and all the people that knew him. We want to acknowledge John's time and effort he gave to the Florida Keys, the LAKEWATCH program and the ENVIRONMENT.