

Sounding Line

News of the Florida Keys National Marine Sanctuary

Spring/Summer 2003

New Games of Tag Played in Nearshore Waters

Doug Kelly, Bonefish & Tarpon Unlimited Executive Director

Satellite technology is enabling scientists to learn more about the lifestyles of bonefish and tarpon.

When a beefy bonefish chomped the shrimp on the end of my line, I took up the slack and gave a stiff jab that would make a heavyweight champ proud. The bonefish reacted in its signature manner: a blurring burn through the skinny water, causing my trailing line to spew a mini rooster tail. However, the 20-pound test and heavy spin outfit were no match for the tiring bone. I pumped and wound it to the boat in minutes.

Why the seemingly low regard for sportsmanship? Because this wasn't an ordinary bonefish outing. The game plan was to catch bonefish as quickly as possible to minimize trauma and attach a tag to each. But not your ordinary 'spaghetti' tag – this new device involved acoustic telemetry (AT), a state-of-the-art tagging system whereby the tag transmits a signal that's picked up by underwater listening stations.



A tarpon is revived until strong enough to swim away on its own power after being implanted with a PAT tag. (Photo: Doug Kelly)

Tarpon research is similarly being carried out on a cutting-edge plane. Pop-off archival transmitting (PAT) tags used to track the habits of billfish are now being used on silver kings. At stake is the opportunity to learn more about two species that, compared to fish with greater food value, receive precious little research attention. The new research may soon provide answers to such basic questions as where tarpon and bonefish spawn, as well as migration habits. For example, if tagging data shows that tarpon being netted off the Caribbean coasts of Central America are the same fish found off the U.S. Gulf and Atlantic coastlines, it will be far easier for U.S. lawmakers to work with foreign governments on the protection of these shared game fish species.

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One of the leaders in this new-age tagging research is the Key Largo-based Bonefish & Tarpon Unlimited (BTU), a non-profit organization dedicated to securing research that will inevitably help those species flourish. Funds are being funneled to the University of Miami's Rosenstiel School of Atmospheric and Marine Science (RSMAS) to apply conventional tagging techniques with AT and PAT technology.

Acoustic Telemetry

Each bonefish is implanted with an ultrasonic tag that enables researchers to follow its movements from a boat via a receiver on the same frequency called a hydrophone. However, RSMAS researchers are now using new acoustic telemetry (AT) tags that give each bonefish a unique transmitting signature. By positioning listening stations around certain flats, more than 250 bonefish can be tracked at the same time. This offers unprecedented data on movements of schools as well as individual fish, revealing preferred tides, moon phases, water temperatures and other factors – thus eliminating human error.

see *Bonefish and Tarpon Research*, p.6

Message from the Superintendent

Florida Keys National Marine Sanctuary

Billy D. Causey
Superintendent

Kacky Andrews
State Co-trustee

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Bruce Popham
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Shell/Scale

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Environment

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Conservation and
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Martin Moe
Education/Outreach

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Research and Monitoring

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Submerged Cultural
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Anita Schwessinger
Tourism-Lower Keys

Wayne Blevins
Tourism-Upper Keys

Vacant
Citizen at Large-Upper Keys

Vacant
Charter Fishing/Sport Fishing

Vacant
Recreational Fisher



Sanctuary Superintendent Billy Causey listens attentively to a local captain during a recent field trip to the Tortugas with the alpha students from Marathon Middle and High Schools. (Photo: George Garrett)

Dear Readers,

The dedication and hard work of the talented volunteers, staff and partners in the Florida Keys National Marine Sanctuary truly makes the difference in the success of our management programs and initiatives. Annually, in the Spring, The Nature Conservancy and the Sanctuary host a Volunteer Appreciation Luncheon. At this time, we thank our volunteers for their tremendous contributions for the year and recognize the outstanding work of some individuals. The luncheon always reminds me of the importance of the contributions of individuals and how each person makes a difference in helping us meet our conservation and protection goals. For this, we remain forever grateful. I want to take this opportunity to thank each and everyone of our Sanctuary volunteers for their tremendous contributions over the past year. A special congratulations goes to Loretta Lawrence who was named a NOAA Environmental Hero for 2003.

We also recognize two of our Sanctuary staff for their contributions in this **Sounding Line**. They are Karla Mendez, Administrative Assistant, who was presented the Sanctuary Team Member of the Year Award at the April 8, 2003, Sanctuary Advisory Council meeting and John Halas, Resource Manager, who received the Department of Commerce's Bronze Medal for his national and international contributions for the invention of the mooring buoy system currently used in the Sanctuary. I want to congratulate Karla and John for truly making a difference in the management of the Sanctuary.

As I reviewed "New Games of Tag Played in Nearshore Waters," written by Doug Kelly, Executive Director of Bonefish and Tarpon Unlimited (BTU), I was reminded once again, how individuals routinely make a difference in conserving and protecting our marine environment. I remembered how Tom Davidson, past Sanctuary Advisory Council member and current board member of the Sanctuary Friends of the Florida Keys, invited me to attend an organizational meeting of Bonefish & Tarpon Unlimited and become a charter member. At this first meeting, I was surrounded by fishing legends and felt privileged to be a part of this momentous organizational event. These individuals were responsible for countless world records and for creating the "catch and release" fishing ethic. Now, they are combining their years of experience and knowledge to create a vision and goals for Bonefish & Tarpon Unlimited. Once again, individuals like Tom Davidson, Doug Kelly, Dr. Jerry Ault and many others are making a difference.

BTU is using research and education to enhance the conservation and protection of the gray ghosts and silver kings. Through its own initiative and using its own resources, BTU is funding state-of-the-art research aimed at understanding the ecology of these important fish. If some of the secrets about the bonefish and tarpon migration, spawning activities, and other life history questions are revealed, perhaps we will gain a better understanding of how to successfully manage these important species. Undoubtedly, BTU's research will enhance our overall understanding of the role of both the estuarine and marine environments in the bonefish and tarpon life histories and will heighten our awareness of the need to conserve and protect their critical habitats.

Please join me in thanking all of our Sanctuary volunteers for their enormous contributions and congratulating all of those recognized in this edition of **Sounding Line** for their individual and joint contributions to the Sanctuary.

Sincerely,



People Who Make a Difference Everyday



Alex Score has been appointed as the Education and Outreach Coordinator for the newly created South Florida Ecosystem Program. The program, which focuses on potential changes to coastal systems arising from South Florida Ecosystem Restoration, is administered and supported by Florida Sea Grant, National Sea Grant College Program, and NOAA's Atlantic Oceanic and Meteorological Laboratory, Florida Key National Marine Sanctuary, and Southeast Fisheries Science Center. Along with Ms. Score, representatives from these agencies form a committee that oversees the program.



At The Nature Conservancy's annual volunteer luncheon, LCDR Dave Score, Upper Region Manager and Submerged Cultural Resource Coordinator (*above right*), presented the Submerged Cultural Resource Volunteer of the Year Award to Casey Bates (*above left*).

Other recipients of the Volunteer of the Year Award for 2002 for Sanctuary programs include: Jan Blackmon for Team OCEAN and Julio Martinez for Coral Reef Classroom.



Karla Mendez received the Sanctuary Team Member of the Year Award at the April Sanctuary Advisory Council Meeting. The Award was presented by Superintendent Billy Causey (*left*), Council Chair George Neugent (*center right*), and Lower Region Sanctuary Manager Fritz Wettstein (*right*). Karla has been an administrative assistant for the Lower Region office since 1999.



Sanctuary Resource Manager John Halas was awarded the Department of Commerce's Bronze Medal for developing a mooring device designed to protect coral reefs from anchor damage. Halas' invention is being used throughout the Florida Keys National Marine Sanctuary and marine protected areas worldwide.



Biologists and Birds Team Up to Restore Injured Seagrass

Cheva Heck, FKNMS Public Affairs Officer

Biologists from the National Oceanic and Atmospheric Administration (NOAA) Damage Assessment Center are calling on their feathered friends to help restore injured seagrass beds in the Florida Keys National Marine Sanctuary. As part of the restoration process, NOAA biologists recently installed a series of bird stakes, vertical PVC pipes topped by wooden blocks, on several seagrass beds damaged by boat groundings in locations from Key West to Key Largo.

The use of bird stakes is one of several methods NOAA biologists are using to restore seagrass beds injured by vessel groundings. Biologists line injured areas

are happy that recently developed seagrass restoration techniques give us an alternative to watching these sites undergo a painfully slow recovery, or worse, continue to degrade.”

The National Marine Sanctuaries Act authorizes NOAA to seek damages from the responsible party in a grounding to cover response costs, injury assessment costs, costs to restore or replace the injured habitat or acquire equivalent habitat, and costs to compensate the public for the value of the injured resources until they fully recover.

The Florida Keys National Marine Sanctuary averages more than 600 reported vessel groundings each year. In 2002, 128 reports resulted in warnings or citations for the vessel owner or operator. Of these, 122 involved injury to seagrass, while six occurred in coral.

Seagrass meadows provide both nursery and feeding grounds for recreationally and commercially important fish and other marine life. Seagrass also filters and stabilizes sediments, helping to create the clear waters for which the Florida Keys are known.

Boaters should use proper navigational skills to avoid running aground. If contact with the bottom does occur, the boater’s course of action should be to stop the engines, trim them up and wait for high tide to drift free, or walk the boat to deeper water. Most injury to seagrass and coral occurs when boaters attempt to use their engines to break free of the bottom (known as “powering off”), or due to inappropriate salvage attempts.



Areas undergoing restoration using the bird stake method are closed to motorized traffic. In the background of this photograph, frigate birds are using the stakes as resting posts.

with the stakes, which provide attractive roosting areas for cormorants and other seabirds. The bird droppings provide a jolt of fertilizer to the area below, helping to speed the growth of shoal grass (*Halodule wrightii*). Shoal grass is a first colonizer of barren areas, preparing the way for other species, such as turtle grass (*Thalassia testudinum*) and manatee grass (*Syringodium filiforme*), to grow once again.

Sean Meehan and Kevin Kirsch are the lead NOAA biologists in this seagrass restoration project. “We think it’s fitting that the first in a series of seagrass restoration projects coincided with Seagrass Awareness Month in March,” said Meehan. “While we prefer to prevent boat groundings in the first place, we



Boat propellers that cut through a seagrass flat often destroy the rhizomes of the plants, the underground stems from which the roots and shoots sprout. Destruction of the rhizomes along with removal of the sediment makes it difficult, if not impossible, for the seagrass to regrow in that location.

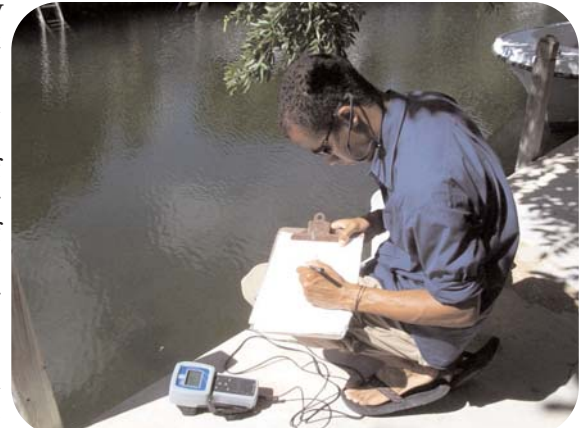


TNC's Florida Keys Watch Tests Canal Waters

Jill Austin, Media Relations Officer, The Nature Conservancy

The Nature Conservancy has been testing canal water once every two weeks at 17 sites throughout the Florida Keys since August 2002. The testing program, known as **Florida Keys Watch**, calls for canal water to be measured for dissolved oxygen, salinity and temperature. Samples are then collected and analyzed for enterococcus bacteria. Enterococcus bacteria live in the intestines of warm-blooded mammals, including humans, and occur naturally at low levels in water and soil. However, high levels of this bacteria indicate the presence of disease-causing agents known to cause swimming-related gastroenteritis and other illnesses in humans.

As a protective measure, the U.S. Environmental Protection Agency (EPA) has set a recommended guideline for enterococcus levels in marine waters. Anything above the EPA guideline of 104 colony forming units (CFU) of enterococci per 100 milliliters of water is considered to be unsafe for swimming.



TNC intern Justin Campbell records data collected from a canal as part of the Keys Watch Program. (Photo: Jenny Conner)

In the first three months of samples taken during last winter's dry season, The Nature Conservancy found approximately 18 percent of the 17 sites averaged more than 104 CFU. Samples collected after a week of heavy rains in December 2002 showed 59 percent were above that level, some registering CFU in the thousands. "It is not surprising to see elevated bacterial levels after heavy rains, but the magnitude of contamination observed following the rain fall was startling," said Brad Rosov, Marine Conservation Program Manager for The Nature Conservancy.

Florida Keys Watch is a two-part water quality testing program to determine the levels of bacteria in Keys canals and then locate the source of the contamination through sophisticated viral pathogen screening. "People have asked legitimate questions about whether humans were part of the water quality problem in the Keys. **Florida Keys Watch** was started to answer those questions," said Jody Thomas, Director of the Conservancy's South Florida and the Florida Keys Program.

The six sites that showed the highest levels of bacteria are being screened further for the presence of viral pathogens. By documenting the presence of viral pathogens, scientists can determine whether human waste is the source of the bacteria contamination. This study is a follow-up to a 1999 University of South Florida study by Dale Griffen *et. al.* that found viral pathogens in Keys canals were linked to humans. For more information about **Florida Keys Watch**, contact: Brad Rosov at: (305) 745-8402 or brosov@tnc.org.

Coral Reef Task Force Passes Water Quality Resolution

On February 27, 2003, the U.S. Coral Reef Task Force passed the "Wider Caribbean Water Quality Resolution," which addresses how water quality affects coral reefs in Florida, Puerto Rico, and the U.S. Virgin Islands. The resolution specifically refers to the cesspits, septic tanks, and shallow water injection wells that exist in the Florida Keys, noting that they are responsible for "inadequately treated, nutrient-rich wastewater entry into the nearshore coral reef system, the vitality of which is based on maintaining nutrient-poor waters." The resolution adds that "the coral reef ecosystem of the Keys receives water from the South Florida watershed, and that the implementation of the Comprehensive Everglades Restoration Plan (CERP) is needed to improve the quality, quantity, and timing of water flow to these areas." "This helps highlight the many problems facing the Keys reefs," said Katherine "Kacky" Andrews, Sanctuary Co-trustee for the State of Florida, who led the effort to get the resolution passed.

The resolution, drafted by NOAA, the State of Florida, Puerto Rico, and the Virgin Islands, calls for resources to be applied to solve wastewater problems and for CERP to be implemented to benefit the coral reefs of the Keys. For more information, visit the U.S. Coral Reef Task Force home page: www.coralreef.gov.



Bonefish and Tarpon Research

(by Doug Kelly, continued from p.1)

“This set-up represents the latest in acoustic telemetry technology, and early results have been very exciting,” says Dr. Jerry Ault, a professor of marine biology at RSMAS and lead scientist for the BTU tagging projects. “Instead of trying to follow fish around in a boat – which tends to spook them and alter behavior – the use of listening stations means I can be sleeping and we’re still tracking numerous bonefish movements and habits.”

To cover all the bases and take advantage of both techniques, each bonefish implanted with an AT tag also receives a conventional tag. In this way, if a fish swims out of the listening station area, it can still offer data and also let researchers know that it’s alive. Over 1,300 conventional tags have been implanted thus far by a good number of fishing guides in Miami and the Florida Keys, as well as researchers.

I recently went on a tagging trip with Michael Larkin, a RSMAS research assistant under Ault. According to Larkin, the AT data revealed that one particular bonefish returned to the same flat 40 consecutive days. Even four months later, the fish was caught on the same flat, exhibiting what’s known as site fidelity. However, other bonefish tagged in Biscayne Bay have ended up 50 or more miles south in the Florida Keys. These differences indicate that bonefish site fidelity



The wanton killing of bonefish still occurs in some areas of the world -- a malady Bonefish Tarpon Unlimited aims to stop. (Photo: Ian Manforth)

may be related to their size or the time of year, and there is a greater degree of stock mixing than previously thought. But further research should unlock these and other mysteries.

A listening station for AT tags entails a hydrophone chained to a 5-gallon bucket of cement with a small buoy attached. The length of rope is adjusted so the buoy is kept below the surface, keeping it out of view to most passers-by while enabling researchers familiar with its general position to visually pinpoint its location. Sites for listening stations are chosen in areas deeper than the surrounding flats to lessen discovery or prop damage, and to maximize the receipt of acoustic signals at the receivers.

The listening station is periodically raised, a probe inserted between a computer and a port in the hydrophone, then all the information is downloaded. The result is a complete record of which tagged fish came to that flat and at what specific times. The next step at RSMAS is to overlay the corresponding conditions at those times concerning tide, temperature, turbidity, moon phase and other factors. At that point, a clearer picture emerges about individual and schooling patterns of behavior.

Pop-Off Archival Transmitters

PAT tags for tarpon are even more esoteric. Tags have a timing device and they pop off at whatever interval desired, such as six months or a year. The tags then float to the surface and transmit all the stored data to a satellite.

The benefits over traditional tagging are huge. Previously you would only know where a fish was first

Lend a Helping Hand

Tagging projects are gaining momentum and already beginning to fill in the knowledge gaps. But more PAT and AT tags must be implanted in order to obtain a rich flow of data to analyze.

BTU’s membership boasts renowned personalities such as Stu Apte, Billy Pate, Chico Fernandez, Lefty Kreh, Curt Gowdy, Guy Harvey, Johnny Morris, Mina Hemingway, Norman Schwarzkopf, Joan Wulff, Mark Sosin, Gary Ellis, Jeff Cardenas, and Christie Whitman.

To learn more about BTU and how to join the effort, call 813-546-8241 or visit: www.tarbone.org. To obtain a brochure and future newsletters, email the author at dkelly@tarbone.org.




tagged and then where caught, with little information and lots of guesswork in between. But PAT tags don't require a tagged fish to be re-captured or even the tag retrieved. Meanwhile, an entire minute-by-minute chronology of the tarpon's habits is being recorded, providing valuable insights about preferred habitats and visitation frequencies at various tides, lunar phases, temperatures, times of day and conditions.

Ault believes the day is drawing closer when we'll have answers to questions about spawning, migration, feeding habits and other important data that's missing with bonefish and tarpon. Plans are on the drawing boards to expand the studies to the Caribbean, Central America and Pacific regions that harbor bonefish populations. Recently, a new tagging program got underway in conjunction with BTU at the Mangrove Cay Club on Andros Island in the Bahamas. And efforts in the U.S. are being stepped up as well, with 20 PAT tags planned for use this year alone. All the tagging work seeks to engender a deeper understanding of what makes tarpon and bonefish tick, so decision-makers will be more

inclined to take the correct steps to protect them.


BTU also co-sponsored the Tarpon-Bonefish Symposium in January in partnership with the International Game Fish Association, RSMAS, the Florida Fish & Wildlife Conservation Commission, Tarpon Tomorrow and others. The symposium was a huge success, with double the expected attendance and experts from around the world sharing their experiences and expertise. Plans are already in the works for a second symposium in 2005.

Even so, the tagging studies using PAT and AT tags present challenges: Costs for tags and research work are high; and the coordination necessary to get the tags into fish can be complicated. But this new technology has moved tagging efforts out of the silent-movie era to the point that a new door has been opened to a data stream that is destined to revolutionize our knowledge of silver kings and gray ghosts. And that all points to healthier and greater resources for those species in the Florida Keys and elsewhere.




Stage I Larvae
leptocephalus (early)


Bonefish Life Cycle




Adult Bonefish




Stage I Larvae
leptocephalus (late)



Stage II Larvae
leptocephalus (late)



Juvenile Bonefish



Spawning in bonefish takes place from November through June. Exactly where spawning occurs is not known, but is believed to be offshore or somewhere where the currents will carry the eggs offshore. During spawning, females produce up to 1.7 million eggs. Eggs hatch into transparent larvae known as leptocephali. Bonefish leptocephalis are similar to those of tarpon, except that bonefish leptocephali reach a larger size. However, as adults, tarpon will far surpass bonefish in size. During the larval phase of development, which lasts from 41 to 71 days, the larvae drift in the ocean currents. After transforming into a juvenile, the fish takes up residence in nearshore habitats where it grows into a mature adult, in about 3 to 4 years. (Adapted from *Bonefish Sea Stats* from Florida Marine Research Institute; illustrations by D. Peebles, B. Eldred (1967), Alexander (1961).) For more information, visit: www.floridamarine.org



NOAA Names Environmental Hero for 2003



Environmental Hero Loretta Lawrence is happiest when she is out on the water in her boat or underwater as a diver assisting scientists in the collection of data. Loretta also loves educating young people about the marine environment.

Keys resident Loretta Lawrence has been named a NOAA Environmental Hero for 2003. Since arriving in the Keys in 1996, Loretta has put her strong environmental ethic into action by committing her time, equipment and funds to a variety of environmental and research projects in the Florida Keys.

As a volunteer for The Nature Conservancy, Loretta worked with the Florida Marine Research Institute on the Florida Bay Watch and Queen Conch Programs. As the Florida Keys only RECON (reef monitoring) instructor for The Ocean Conservancy, she has trained many RECON volunteers, including students from the Marine Science Studies Program at Coral Shores High School. Recently, Loretta become involved in Reef Medics, the Sanctuary's newest volunteer program designed to restore grounding sites.

Loretta is truly an Environmental Hero for the Florida Keys and for the nation.

The Florida Keys National Marine Sanctuary thanks those who contributed their articles, photographs, and editing expertise to Sounding Line newsletter. Sounding Line is produced on a quarterly basis by the Florida Keys National Marine Sanctuary. For more information or to be placed on the mailing list, email the editor at Nancy.Diersing@noaa.gov.



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