



New Games of Tag 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.

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.

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.

Bonefish and Tarpon Research

“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.”

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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 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



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

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 PC 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 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

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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**.



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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 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.

*Note: This article appeared in the Spring/Summer 2003 issue of the newsletter of the Florida Keys National Marine Sanctuary, **Sounding Line**. For more information, visit: floridakeys.noaa.gov. Doug Kelly, a resident of Tampa, Florida and former editor of Sport Fishing magazine, is a freelance writer and also serves part time as Executive Director of Bonefish & Tarpon Unlimited.*

Bonefish Life Cycle



Stage I Larvae
leptocephalus (early)



Stage I Larvae
leptocephalus (late)



Stage II Larvae
leptocephalus (late)



Juvenile Bonefish



Adult 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 leptocephali 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.