Bonefish & Tarpon Journal

A publication of Bonefish & Tarpon Trust

Stewardship Through Science

2011 Edition

WHAT'S INSIDE:

Bonefish & Tarpon Journal
24 Dockside Lane, PMB 83
Key Largo, FL 33037


FRIDAYS IN 2011, FISHING'S
BIGGEST NAMES
ARE ONBOARD WITH OUTDOOR CHANNEL
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FISHING
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SILVERADO
SATURDAYS
7AM - 11AM ET
Outdoor Channel is home to angling's greatest shows like Spanish Fly, Trev Gowdy's Monster Fish and Ultimate Match Fishing. In 2011, we've reeled in even more hit series to our lineup like Buccaneers & Bones (starring TOM BROKAW and MICHAEL KEATON), Zona's Awesome Fishing Show (MARK ZONA), The Fish Fishburne Show, and Saltwater Series. When America's weekend starts, fishing's biggest names go to work on Outdoor Channel.
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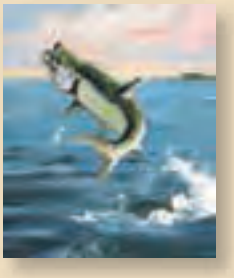
BTT is proud to feature 2011 Artist of the Year:

Luke Frazier

Read more on page 35



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www.tarbone.org

FEATURES

ARTICLES

BTT'S MISSION

To support research to help understand, nurture, and enhance healthy bonefish, tarpon, and permit populations by: supporting research on bonefish, tarpon, and permit biology and fisheries; providing educational material to the public and fishermen, and working with government agencies to ensure healthy fish populations.

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Setting the Hook

MAXIMIZING THE MOMENTUM

A Note from the Chairman and President

Tom Davidson
Chairman

Matt Connolly
President

When we started BTT (then BTU) in 1998, I don't think any of us imagined we would be where we are today. In 1998, we knew almost nothing about the biology of bonefish, tarpon and permit. We have come a long way, but still have a long way to go. What began as a small group of concerned anglers and guides has become the world's number one organization acting on behalf of bonefish, tarpon and permit.

One of the benefits of BTT's persistence is that we are making progress on both the research and conservation fronts. The Florida Permit Initiative, Costa's Project Permit, and our work with the Florida Fish and Wildlife Conservation Commission should improve knowledge of permit populations in the near future. This work is a great example of how conservation and research can go hand in hand.

There is similar progress in The Bahamas with The Bahamas Initiative—a research, conservation and education collaborative approach with guides, other non-profits and the government to improve the long-term outlook for the bonefish fishery in The Bahamas. Progress in Belize is continuing along similar lines.

The BP oil spill threw all of us for a loop in 2010, and BTT is working hard to determine how this might impact tarpon. BTT will remain on top of this.

We benefitted greatly from last year's ESPN2 series *Pirates of the Flats*, produced by Orion Multimedia, which greatly increased BTT's exposure to anglers throughout the world. No doubt some of you reading the *Journal* for the first time came to know of us through that series. We are pleased that the Outdoor Channel has picked up the series (now called *Buccaneers and Bones*)—Orion Multimedia once again did a fantastic job producing the shows. And in 2011 BTT will be featured on some episodes of the *Ford Fishing Frontier* TV series.

In 2011 we hope to once again benefit from corporate donations of lodge fishing trips, gear for membership incentives, for web-store merchandise, online auctions and raffles. And as we thank Hell's Bay Boatworks for the great success of the 2010 Sweepstakes, we look forward to another membership sweepstakes in 2011.

All of this has been made possible by the donations of members, donors and corporate partners, whether financial, in-kind or sweat equity. We are grateful to all who have helped us and look forward to more collaboration in the future.

If you are a member, thank you. If you are not yet a member, take this *Journal* with you, check out our web site to learn more about us, and please join. Between the important work that we do and the incentives we're offering to become a member, how can you refuse?

Tom Davidson is a Founding Member and Chairman, and Matt Connolly is President of Bonefish & Tarpon Trust

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BTT Reflecting On The Past Decade

AARON ADAMS
Director of Operations for Bonefish & Tarpon Trust and a Senior Scientist at Mote Marine Laboratory

Photos by Aaron Adams

There's something about decades that causes a person to sit back and reflect. In the grand scheme of things, groups of 10 years really don't have any meaning, but when the year ends in a zero—as it does now as I write this in the year 2010—there comes with it a desire to look back and add up the accomplishments that have accrued. So I've been looking back on what BTT has accomplished since 2000, and I think the long list of achievements is impressive.

Space is too limited to list all that BTT has done over the past decade, but suffice it to say that it is a significant list of achievements. Highlights are listed below for each species and for projects that address more general topics. You can see a more complete list at www.tarbone.org. If you are a BTT member, you should be proud for being part of all we have done. If you are not yet a member, I hope this inspires you to join.

Bonefish

- BTT funded research that determined bonefish spawning habitats and seasons. This information is now being used to identify spawning locations so they can be protected.
- BTT worked with scientific colleagues to determine that there are three species of bonefish that occur on the flats of the Caribbean, and the extent that each is in the fishery. The results so far: *Albula vulpes* (Common bonefish) is 95% of the fishery; *Albula garcia* (Bigeye bonefish) is approximately 4% of the fishery; and *Albula* sp (not yet named, just discovered) is <1% of the fishery.
- Previous work that determined that bonefish in the Florida Keys grow two to three times faster than in the Caribbean is being confirmed by new, ongoing research being conducted on a bigger scale. Knowing growth rates and ages of fish is an essential component for good management.
- Tag-recapture projects supported by BTT have revealed that although most bonefish remain in relatively small areas (recaptures are typically within a few miles of where the fish were tagged), some bonefish have moved over 100 miles between tagging and recapture. Tagging is ongoing in The Bahamas, Belize, Cuba, and Florida.
- BTT funded research that revealed that the recreational bonefish fishery in The Bahamas is worth >$141 million per year.

Tarpon

- BTT's support of the tarpon satellite tagging program of the University of Miami has helped to highlight the long-distance migrations of tarpon, and the connectivity of fisheries from Virginia through the Caribbean. We now know that "our" fish are also "their" fish, and these data provide leverage for cooperative conservation.
- BTT scientists are closer than ever to identifying key spawning locations, information needed to protecting these critical areas.
- Ongoing work is identifying critical juvenile habitats in Florida, information that will be used to improve habitat protections and focus habitat restoration.

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Permit

- BTT-funded research determined that sandy, windward beaches are the only nursery habitat for juvenile permit, providing more impetus to beach conservation efforts.
- The ongoing Florida-wide Project Permit, sponsored by Costa, is the first-ever tagging program for permit in the world. This program will provide information on permit movements and help to guide research and management.

Photo by Tom Rosenbauer

General

- BTT's study of the economic value of saltwater recreational fishing in the Everglades revealed that value to be more than $991 million per year, providing more ammunition to push for better habitat protection of critical fish habitats.
- BTT has sponsored and hosted three international science symposia on bonefish, tarpon and permit research, conservation and fishing—the only such gathering in the world. This has helped to increase the interest of scientists and managers in these species, resulting in more information and attention to management issues.
- BTT's collaborations with lodges and guides is improving conservation throughout the Caribbean, Gulf of Mexico and southeastern US.

These achievements are even more impressive given that BTT is a private, non-profit, membership-based organization. To my knowledge, BTT is the only organization that does what we do—a private, non-profit, science-based, fisheries conservation organization that uses a scientific framework to structure and fund research and conservation, that applies the information directly to conservation needs, and accomplishes these research and conservation goals through collaborations with guides, anglers, lodges and others involved and invested in the fisheries. The results of the past decade and the momentum BTT now has make me confident that the next 10 years will be even more successful.

Photo by Aaron Adams

A Tagging We Will Go

How many times have you wondered, as you watch a just-released bonefish swim away, where that fish has been, where it will go and whether you'll encounter it again? The ethic of catch and release is an integral part of the bonefishing experience, and with proper angler techniques we know that most of these bonefish survive to potentially challenge an angler another day. But we can also take advantage of this catch-and-release ethos to learn more about bonefish.

The Caribbean Bonefish Research Program is designed to take advantage of our love of catch and release of bonefish to contribute to science. By tagging bonefish, we can learn about their movements, information that can contribute to things like what geographical area should be used for management strategies, and to what extent do different populations mix. Just the brief moment it takes to collect a fin clip will greatly help us finally figure out which species are in the fishery and to what extent different populations mix.

To participate in the tagging effort, travel to a lodge or fish with a guide who is participating in the program (you can find a list of participants under the Tagging Programs tab at www.tarbone.org), request a fin clip kit at www.tarbone.org and take it wherever you are fishing.


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Aaron Adams, from Bonefish & Tarpon Trust, prepares for the hunt. IAIL ATKINSON
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BONEFISH & TARPON TRUST

Buccaneers & Bones to Premiere on Outdoor Channel

NEW NAME but same epic series will castaway to Belize with crew of luminary anglers

This season we join our celebrated band of angling brothers on the flats of Belize as *Pirates of the Flats* morphs to become *Buccaneers & Bones* and moves from ESPN2 to Outdoor Channel in an encore performance of the most anticipated angling production since *A River Runs Through It*.

The reason for the advance hype stems from the luminary cast consisting of legendary NBC News anchor Tom Brokaw, film star Michael Keaton, award-winning author Thomas McGuane, visionary Patagonia founder Yvon Chouinard, actor Zach Gilford, and BTT board member Bill Klyn. The intrepid team is connected by friendship, a love of the flats, a passion for angling, and a desire to amplify BTT's vital message of flats conservation. Each of these anglers has a history of championing conservation causes and their volunteer dedication to this series last year helped BTT realize its largest member and fundraising success ever in its more than decade-long history.

The mix of thoughtful dialogue from seasoned anglers with life experience worth listening to and plenty of close encounters with the finned gifts of Belize promises to make season two even more memorable. The addition of epic tarpon and snook battles, Zach Gilford's saltwater angling debut (he's the star of the recent film adaptation from the celebrated novel *River Why*) and the addition of Lori-Ann Murphy, the accomplished angling ambassador of Belize's El Pescador Lodge, take the series farther down the path of the saltwater angler's life.

Produced by Denver-based Orion Multimedia, America's leading creator of outdoor adventure programming, the series debut last season prompted unprecedented media coverage including the *Los Angeles Times, New York Post, Baltimore Sun, USA Today*, and countless angling magazines, websites, and social media. The Emmy-nominated series lived up to its billing and is back by popular demand. That's good news for viewers, anglers, and saltwater conservationists everywhere.

The series debuted December 26, 2010 on Outdoor Channel and is airing three times per week—anchoring the network's new weekend saltwater fishing block. Visit tarbone.org to get a complete series schedule and episode guide.

1 The Buccaneers toast to good friends, good food and great fishing. 2 Tight loops as McGuane pitches his fly toward the mangroves while Keaton watches with anticipation. 3 Bill Klyn releases a tagged bonefish. 4 Novice fly angler Gilford gets a personal lesson from lady Buc Lori-Ann Murphy. 5 Yvon Chouinard approaches fly fishing with a do-it-yourself attitude. 6 The Buccaneers plan their strategic fishing routes from El Pescador lodge. 7 Keaton battles the acrobatic Silver King. 8 Even with technology present, the comraderie between the anglers radiates. 9 The spirit of Lefty is still with them as McGuane and Brokaw practice their fly swatting swing. 10 The Buccaneers set off on an adventure, eager for what lies ahead. 11 Chouinard exercises proper release techniques. 12 With a quick release and photo op, this duel proves to be a Win-Win.

Photos by Orion Multimedia

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The **Science** of Angling

HOW FISH USE SIGHT & SOUND

AARON ADAMS
Director of Operations for Bonefish & Tarpon Trust and a Senior Scientist at Mote Marine Laboratory

Photo by Aaron Adams

Many anglers make assumptions about what fish see and hear, and many of these assumptions are wrong. I've been told in no uncertain terms, for example, that fish can't see color. This is not true. For every species of fish tested of which I am aware, each one can see colors. But different species of fish often see different portions of the light spectrum, and some fish can see portions of the light spectrum that we cannot, such as ultraviolet wavelengths of light. Therefore, knowing what colors can be seen by your favorite game fish is important for designing and selecting flies and lures.

Similarly, since fish don't have external ears, many people think they can't hear. This is also not true. Sound travels very well in water, so hearing is very important for fishes, both to find prey and to avoid predators. Understanding how fish detect sound, and how sound travels through water can be useful in the creation and selection of flies as well as for strategizing how flies are fished under different conditions.

Although there has been no research on vision and hearing abilities of bonefish, tarpon or permit, we can use what we know about fish vision and hearing to help with how we approach fishing for these rock stars of the flats.

Basics of Light in Water

Visible light (the portion of the light spectrum that we are able to see) is composed of many different colors. The general makeup of these colors is red, orange, yellow, green, blue, indigo and violet, plus all of the small transitions in between. Beyond either end of the visible spectrum are wavelengths of light that we are unable to see—infrared on the outer end of the red end of the light spectrum, and ultraviolet past the violet end of the spectrum. Each of these colors has different wavelengths, which means they interact differently with the material through which they pass. The color with the longest wavelength is red, and wavelengths become shorter toward the violet end of the spectrum.

Wavelength matters because, in general, the longer the wavelength, the faster the light is absorbed in water. But what is in the water also influences the behavior of light.

In clear, open ocean water, and to a lesser extent on tropical flats, the color red is no longer visible deeper than about 20 feet. Orange and yellow are lost soon after. By the time a depth of 30 feet is reached, blue and violet are pretty much the only colors left. In deep water, everything takes on shades of gray and black.

The behavior of light differs, however, in coastal and estuarine waters. Many coastal waters contain a lot of plankton, which absorbs short wavelength light (such as blue), and longer wavelengths become absorbed by the water. This leaves green as the dominant color remaining in coastal waters because it penetrates to the greatest depth. In coastal waters with a lot of suspended particles like estuaries, green is also absorbed and scattered, which leaves red, orange and yellow as dominant remaining light wavelength—at least as far as they can penetrate into the water.

These patterns of color attenuation also occur horizontally. So even if a red fly or lure is within a foot of the surface, where red is still a visible color, a fish that is 20 feet or more away from the fly or lure won't see the color red. This is because light is attenuated when it passes through water whether in a vertical or horizontal direction. A little further away and orange won't show up, and so on. This is a big consideration when choosing colors for flies and lures—how far away will the fish be when you make your presentation?

Light is also lost over distance (attenuated) by scattering and absorption by objects. For example, some light is reflected by particles that are suspended in the water. This reduces the

amount of light that continues to pass through the water, so reduces the intensity of the light at greater depth. Other light is absorbed by objects such as rocks and the light is converted into heat. Light is also absorbed by plankton, which uses it for photosynthesis. And still more light is absorbed by the water, which once again is converted to heat. At one extreme, in murky, plankton-filled coastal waters, light doesn't penetrate very far. At the other extreme, in tropical oceans light penetrates for hundreds of feet.

The scattering of light by particles is an important concept to understand, even when fishing apparently crystal clear waters of a bonefish flat. Often, water that seems to be gin clear from the surface is not so when viewed from below. This is because the light that enters the water reflects off suspended particles, scattering light in all directions. This results in decreased horizontal visibility. So although you might be able to see a fish clearly from above, the fish might not have as good a view of your fly as you think.

The scattering of light presents even more of a challenge in murky or muddy water. There are so many particles in the water that light is reflected in all directions, making visibility very difficult. To get a better grasp of this, think about driving through a fog bank at night. You can see more with your low beam headlights on because less light is being scattered through the fog than when you have the high beams on.

Dark objects tend to show up best in murky water conditions because they provide the maximum contrast against the otherwise murky, backlit background against which a light-colored object won't stand out. This is a major reason that black flies and lures are productive in murky water.

As light hits the water surface, some is reflected back into the air and some enters the water. The amount of light that enters the water tends to be greater on days with waves than days that are flat calm. This may seem counterintuitive – after all, days with waves or chop can produce a lot of glare that is tough for an angler to see through. But the glare the angler experiences has more to do with the angle at which the light hits the water in relation to the angler than it does with how much light is entering the water.

When light enters the water, it is refracted (in a sense, it is bent). This is because air and water are different densities, so light travels faster in air than in water. When the angle of the water surface changes in relation to incoming light, such as on a wavy water surface, the relative angles that the light are refracted change, which creates the undulating motion of light and shadow underwater.

The amount of light play underwater can have an influence on how well objects, such as flies and lures, are seen by fish. In general, I think that on days with wave action it is harder for fish to see small objects—they can become lost in the mix of light and shadow that results from the refraction of light through the multiple angles of the water surface. So on days with wave action, try using larger flies or lures. In contrast, on calm days when there is less underwater light play because the light is being refracted at mostly the same angle, smaller flies and lures may be more appropriate.

Basics of Sound in Water

Sound is more important in water than most anglers realize. The densities of water and air are too different for most sound to travel from one to the other, so anglers on a boat or wading are oblivious to most of the noise that exists below the water surface. Similarly, fish are generally unaware of sound traveling through the air above them.

A sound wave is a pressure wave that displaces particles as it travels through air, water or other medium. Sound in water travels about 4.5 times faster (and also travels farther) than in air. Low-frequency sounds tend to travel farther than high-frequency sounds. This means that the noise made by dropping a reel on the deck of the boat is detected almost immediately by fish within a significant radius of the boat – the boat hull acts as an amplifier, and since it is in the water, the sound of banging against its hull is transmitted through the water.

Pressure waves are also generated by objects moving through the water, whether a swimming fish, a scurrying prey, a moving boat or a wading angler. These waves travel through the water in the same fashion as sound waves. This is why stealthy anglers are more successful than those who move quickly across the flat, pushing a wave of water as they move. This also explains why a fish reacts to a fly or lure that plops loudly into the water.

When sound travels through water, its intensity diminishes with distance. This is because it is weakened by scattering and absorption. Scattering is the reflection of the sound wave in directions other than its original direction of movement. This is caused by structures such as rocks, and by the bottom or water surface, all of which are different densities than water. This is especially true in shallow water, where the bottom and water surface are close to one another, which greatly limits the distance that a sound wave can travel in these shallow habitats. In deeper waters the bottom and water surface aren't as influential, and sound can travel farther. Absorption is the conversion of the sound energy to other forms of energy, and doesn't differ between shallow and deeper water.

Fish Hearing

The propagation of sound and other pressure waves in water means that detection of these waves is an essential characteristic possessed by game fish, their prey and their predators. Fish have two means for detecting these sound and pressure waves—an inner ear and a lateral line.

A fish's inner ear is composed of a series of fluid filled canals

and chambers. The inner walls of the chambers are lined by cells with cilia—hair-like extensions that protrude into the chamber. In these chambers are small bones called otoliths. As an otolith moves around in a chamber, the cilia detect the movements and send a signal to the brain.

As a sound wave travels from the water to the otolith, it is moving between substances that have different densities (water and bone). This causes the sound wave to change shape, and causes the otoliths to vibrate. The vibration of the otoliths stimulates the cilia, which sends a message to the brain. The sound waves traveling through the fluid within the inner ear can also be detected. The brain then has to determine whether the sound is of consequence, and whether it is from a prey or predator.

Many fish are also able to use their air-filled swim bladders to increase their hearing ability. The air within the swim bladder is compressed by the sound waves, so is more sensitive than the inner ear. In many fish the swim bladder is connected to the inner ear, which allows the air bladder to act as an amplifier of sound. Even in many fish without a direct connection between the swim bladder and inner ear, an extension of the swim bladder is close enough to the inner ear to at least partially amplify sound. The inner ear system of fish is good at detecting sounds at both close range (30 feet or so) as well as from distant sources (a mile or more in the open ocean).

A great complement to the inner ear system is the lateral line system. The lateral line is a series of pores through which specialized cells extend. The lateral line extends along the length of the fish, from just behind the head to the base of the tail. Sticking through the pores are specialized cells called neuromasts that contain sensory cells embedded in a jelly-filled casing called a capula, which extends into the pore. As pressure waves pass over the fish, the capula is moved, which in turn moves the sensory hairs within it, which sends a signal to the brain. The lateral line is good at detecting pressure waves from near sources, 30 feet or less.

A better understanding of how light and sound behave in water, and how fish are able to see and hear, should already have you thinking about new and better approaches to presenting flies and lures and how to approach fish in different conditions. When we're out on the water we are in the fishes' realm, so the more we know about what makes them tick the better anglers we will become.

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LOOKING FOR BONEFISH: A Beginner's Guide

Photo by Aaron Adams

CHICO FERNANDEZ
founding member and current board member of BTT, author of *Fly Fishing for Bonefish*, and continues to explore the flats at every opportunity

Bonefish live and feed in a constantly changing world. A flat that has a foot of water now may be totally dry in a few hours. And an area with plenty of bonefish tailing on an outgoing tide may only have a few minutes of fishing left. Bonefish are constantly moving, stopping a few seconds here and there to feed and then keep moving through the flats, so you have limited time to find and fish for them.

This can be quite overwhelming to a new bonefish angler, there are so many moving parts to finding the right place at the right time, seeing the fish, and finally catching the fish. Although just a primer, this short article should get you started on chasing bonefish on the flats.

Spotting Bonefish

Once you are on a flat, scan the area slowly, not only looking for tails or fish you see in the water, but also for wakes or any small disturbances that go against the normal flow of waves caused by wind and current—also known as "nervous water."

Set yourself in a location or path of travel that gives you're the best visibility into the water. Glare is always a problem, even with polarizing lenses, but if you orient yourself in the proper direction relative to the sun and waves, you should have a good window of visibility into the water. It is in this window that you'll probably see most bonefish during the day.

Don't be frustrated at the beginning if you can't see fish. With time, you get better and better at it. Only time on the water will teach you this. However, I do have a trick that will help accelerate the learning process: It occurs when someone catches a bonefish.

When a fishing friend is about to release the fish (be sure you're wearing polarized glasses to cut the glare and a hat to shade your eyes), stand next to him or her (if you are on a boat get as high a perch as you can), lock your eyes on the released fish as it swims away until you can't see it anymore.

You will find yourself being able to see the fish at up to 70 feet or more, and will have taken the first step toward teaching your brain what the image of a swimming bonefish looks like. In other words, your eyesight hasn't improved, you just have a better idea of what to look for. Do this every time a fish is landed on the flats and soon you'll be able to see bonefish, occasionally even before more experienced anglers do.

This leads me to another piece of advice—try to fish with an experienced bonefish angler if you can. You will learn from watching him or her fish and catch fish, and will likely get some good advice as well. Plus, you will have a chance to see more fish swim away, and speed up the process of being able to see free-swimming bonefish on your own.

The Learning Curve

To become an expert on a particular flat, arrive at dead low tide. With the flat fully exposed, you can walk the area and learn every depression, drop-off, which part has more turtle grass or sand, and other important characteristics.

Soon the water will start to trickle onto the flat. As it rises just a few inches, the first bonefish may start to appear at the edge of the flat, trying to be the first to come into the supermarket to feed. First watch the deeper portions of the flats, like troughs, because the bonefish will know about them too and use them to access the flat.

If the flat is too soft to wade, pole on the lowest stage your boat will float, zigzagging to cover different parts of the flat. Don't expect to learn a flat the first day, but to learn more with each visit. Soon you'll understand which bottoms are hard or soft, which areas have more current, where the potholes are located, if there is a ridge in the flat, and the best spots to intercept bonefish.

Photo by R. Valentine Atkinson

Time and Place

The best stage of the tide for bonefish varies with each flat. But on any tide, I am always looking for two important signs: a good flow of water and life on the flat. I generally stay away from a flat that is at a dead low or a late flooding tidal stage.

Look for flats where water is moving, but even when that's not happening note the amount of life you see while poling or wading. This could be small sharks looking for food, mudding rays feeding on the bottom, baitfish and small snapper around small structures and potholes, the occasional small schools of inch-long fry spooking away from you as you cover ground, crabs crawling on the flat, and worms and shrimp holes. The moving animals usually indicate a flat that is in a very active cycle of the tidal stage, and the holes reveal a flat full of food. If at first you don't see something, be patient and Mr. Bonefish might pop up.

Bonefish and Currents

A bonefish will often come in with the first few inches of water of an incoming tide. In this situation, the bonefish will be moving with the tide, getting into shallow water to be first to feed. The reverse happens on the late outgoing tide, when bonefish will ride the last breath of water off the flat. In these situations, you have a real advantage because you know exactly which direction the bonefish is heading and you can plan the perfect cast.

When there is more water on the flat, which direction a bonefish is heading can be a more difficult thing to determine. In general, it's a good practice to first guess that the fish will be feeding into the tide. This probably allows the bonefish to better smell potential prey that are upcurrent, and to take advantage of any prey that are dislodged from the bottom by the tide.

Another reason for moving into the tide is that when a bonefish feeds by digging the bottom, blowing away sand and debris to uncover shrimp or crabs, the water becomes cloudy. By moving into the current, the muddy water is swept behind the bonefish as it feeds and moves, so it maintains good vision of the flat. You can take advantage of this by using these muds to zero-in on feeding bonefish, and predicting their direction of movement to intercept them.

Guide Communication

I can't stress enough how important it is that you have great lines of communication with your guide. The great bonefish tournaments are usually won, year after year, not by a great angler, but by a great team. A guide and angler who have fished together for many years are very hard to beat. They usually communicate well with each other and anticipate what the other is going to do when a fish is seen. They know each other's strong and weak areas. And together they are more than the sum of their respective abilities. Even if you are not in a tournament, knowing how to communicate with your guide will make all the difference between an average and great day of bonefish fishing.

No matter how good you get at seeing fish on the flats, when you fish with a guide he or she is usually going to see it first. The guide's job is to quickly communicate the bonefish's location to you, and the best, most universally used system is called the clock method.

Simply visualize the boat at the center of a clock, where the bow is pointing to 12 o'clock. While looking straight off the bow, 90 degrees to your left is 9 o'clock, 90 degrees to your right is 3 o'clock, and straight off the stern is 6 o'clock. You can fill in the rest of the clock times.

So let's say the guide spots a fish and you can't see it. He will tell you three bits of information: the o'clock angle, the distance the fish is from you, and the direction it's moving or facing. For example, "Bonefish at 11 o'clock, 70 feet and moving slowly to the right." If you don't see the fish, use your rod as a pointing stick—point where you think the fish is, the guide will tell you to move your rod left or right until you are pointing at the fish. If you are fly fishing, sometimes the guide will tell you to start casting and then tell you to cast more right or left as your fly line is in the air as he or she guides your cast toward the fish.

Once you spot the fish, don't lose sight of it even for one second. While your eyes lock on it, you and the guide can calculate the distance, direction and timing of the cast.

Author Chico Fernandez

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A Healthy Tarpon Fishery = $ in the Bank

TONY FEDLER, PH.D.
A Fisheries Economist with experience studying fisheries far and wide. This is his third project for BTT.

Photo by Aaron Adams

Photo by Robert Stearns

For years the press has extolled the economic benefits that saltwater fishing in Florida brings to shoreline communities. Yet we do not know the specific value of tarpon in south Florida. In fact, a call to the Chamber of Commerce, Department of Tourism, or Natural Resources office of any county in Florida with the question "what is the economic value of recreational fisheries in your area?" always results in the same answer "I don't know.". Realizing that the economic value of a fishery can provide leverage for good fisheries conservation, BTT partnered with the Everglades Foundation to determine the value of the recreational tarpon fishery in southwest Florida.

This project focused on estimating the economic impact of tarpon fishing on the Caloosahatchee River and Charlotte Harbor area of southwest Florida. The Caloosahatchee River is the primary waterway flowing from Lake Okeechobee westward to the Gulf of Mexico. Since Lake Okeechobee is used as part of the south Florida water management strategy, it often receives excessive amounts of freshwater from the Lake. The ecological damage of these freshwater releases has been documented, but what about the economic impacts?

The river and its adjacent coastal waters are host to resident tarpon as well as large schools of migratory tarpon that provide the spectacular fishery in famed Boca Grande Pass. How are these fish, and the fishery they support, impacted by the water flows? Since the outflows from the lake impact the southwest Florida region, they also impact the fisheries. This study is the first to document the economic value of the tarpon fishery in this region, thus providing a look at the potential economic impact of the lake releases.

Due to logistical issues with tracking down anglers who travel from outside of Florida to fish for tarpon, we made the focus of this study Florida anglers purchasing a saltwater fishing license that was valid for fishing during the 2009-2010 year, and who resided in five-county regions surrounding the Caloosahatchee River and Charlotte Harbor. In other words, we asked the question—what is the local economic value of the tarpon fishery in the Caloosahatchee and Charlotte Harbor area? In future work we plan to estimate the economic value of anglers traveling to this region to fish for tarpon.

There were 72,648 licensed saltwater anglers in the five-county study identified from the Florida Fish and Wildlife Conservation Commission's saltwater fishing license data file. A random sample of 4,000 were selected to receive an invitation to participate in an Internet-based survey designed to collect fishing and economic data. Survey responses of the 43% of respondents were used to estimate angler fishing days and expenditures.

Of the active anglers in the region, 26,899 spent at least one day targeting tarpon in the study area. Overall, tarpon anglers spent 268,405 of their fishing days targeting tarpon. About 37,500 of these days were spent targeting tarpon in the Caloosahatchee River. Tarpon anglers were much more active than non-tarpon anglers, fishing 15 more days each year.

Tarpon anglers spend an estimated $2,362 for tarpon fishing in the study area. The annual expenditure for fishing by tarpon anglers is over $1,000 more per year than non-tarpon anglers in the study area. Extrapolating these expenditures to all tarpon anglers in the study area results in an estimated $63.5 million in direct expenditures made in the local economy for tarpon fishing with $9.6 million attributable to tarpon fishing in the Caloosahatchee River.

Taking into account the multiplier effects of these direct expenditures results in total economic output of $108.6 million for tarpon fishing in the study area, $16.5 million for the Caloosahatchee River alone. These expenditures translate into 1,094 full-time equivalent jobs in the region and $14.6 million in tax revenues being paid to local, state and federal governments.

Clearly, tarpon fishing is an important component of local economies in Southwest Florida. The magnitude of expenditures by local anglers for tarpon fishing provide ample justification for maintaining and protecting tarpon habitat and water quality in the region. If the tarpon habitats are treated well, the economic value of the fishery will continue. It is time that management agencies understand the importance of this and other recreational fisheries and manage resources accordingly.

In a similar study, Dr. Fedler conducted research on the economic value of the recreational bonefish fishery in The Bahamas. Despite conducting the research during the recession, he found that The Bahamas recreational bonefish fishery was worth more than $140 million dollars per year. More importantly, the fishery contributed a major portion of the economies of the Out Islands. This information has helped to spur Bahamas bonefish guides to work toward better conservation strategies for bonefish and their habitats. Read the full report at www.tarbone.org.

FEATURED BOARD MEMBER:

Sandy Moret

SANDY MORET is a Board Member of Bonefish & Tarpon Trust and can be found at Florida Keys Outfitters when he is not out fishing.

Sandy lives in Islamorada where he and his wife Sue operate Florida Keys Outfitters. His fly-fishing background is extensive. He is the founder and an instructor of the Florida Keys Fly Fishing School, where among his co-instructors are Flip Pallot and Chico Fernandez. Sandy has been Grand Champion in eight of the Keys' most prestigious fly-fishing tournaments and was often seen as a guest angler with Flip Pallot on the Walker's Cay Chronicles, The Reel Guys and Andy Mill's Sportsman's Adventures. He has fished and explored extensively throughout the Bahamas, Central America, the Seychelles, Christmas Island and Palau. He also helped pioneer Russian Atlantic salmon fishing on the Kola Peninsula.

Sandy has served on many elected and appointed positions for Everglades restoration. He was president of the Everglades Protection Association (EPA), which led to the elimination of commercial net harvest in Everglades National Park. The EPA subsequently merged and launched the Florida Conservation Association, which was a leader of the successful 1994 Florida constitutional amendment that banned gill nets in Florida waters. Sandy also served at the appointment of Governor Bob Graham on the East Everglades/Everglades National Park Development Committee.

Continuing his support of conservation, Sandy was a member of the ad hoc committee Alternative E, Everglades for the Educated. This committee has been a leader in developing consensus among park users for the ongoing Everglades National Park's 20 Year Management Plan. Sandy is past chairman of the Don Hawley Foundation, which provides assistance to fishing guides of the Florida Keys in times of hardship. He is currently on the Rules Committee for the International Game Fish Association.

BTT is fortunate that Sandy was a Founding Member (at that time BTU), and that he stays involved in BTT's work by serving as an advisory board member. Sandy admits that he initially had mixed feelings about BTT's initiation of research programs to study the movement of bonefish and tarpon. As have many others, Sandy perceived this type of information as deep secrets that were learned and earned over years of time on the water poling a flats skiff. But as he thought about it, he came to realize there were really few if any "secret spots," and it was up to the anglers and guides who share a common love of our resources and wonderful game fish to get involved in conservation.

With many fisheries globally in decline, Sandy knew that we needed more information and baseline data to protect these treasures. He realized that BTT provided the best course to follow, and they have proven their approach to be valid.

"Back then I was amazed at how little we knew about tarpon and bonefish, and although we have learned a lot we still need to press on," he says.

Sandy thinks that BTT has raised the level of awareness about the social and economic value of these species to new heights. As the information base grows, he sees that the challenge for the future is using that information to preserve, restore and protect the water quality and habitat these creatures live in as best we can.

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Tarpon Talk

ANDY MILL

Steve Huff, Rick Ruoff and Harry Spear.

A Passion for Tarpon, the stunning new Bible of the sport by Andy Mill, as anticipated, is filled with page after page of the author's systematic and celebrated approach to coaxing the great game fish into eating your fly. But the book also features a surprising series of compelling conversations with a legion of hard-boiled tarpon chasers. Here is a choice excerpt:

TALKING TARPON STEVE HUFF

I would much rather have a guy that has real fish sense than a great caster anytime because he reads the shot and knows what is going on out there. There is a current flowing or there is no current. Or the fish is high in the water or the fish is down deep. Where to put the fly, how to lead the fish so it puts the fly in front of the fish; when to strip it and how much to strip it. You watch the body language of the fish. He is lying still. You see the tail kick. You know he is coming, but if you strip too fast you will take it away from him so let him pick up a little speed and strip it. You know this stuff, Andy. It's all about reading the whole scene. There are a lot of people that can heave it out there, but then they do not know what to do with it or how to manipulate it once it gets there. So all that stuff to me that is what I call fishing. I mean there is casting and all this stuff, but fishing is feeding fish—talking to the fish with a fly and making it think it is getting away *but maybe I can still catch it.* You know, you are trying to communicate "this bait is escaping—see if you can catch it." Because I do not think tarpon waste a lot of energy chasing stuff they can't catch. You do not see tarpon chasing minnows in the middle of the day. Because they cannot catch them. They are good at night under a bridge where they can eat it all the time. That is why I think a fly is so successful, why it is such a great bait to catch tarpon with.

Andy Mill: Is a fly equal to bait?

Huff: It is the best bait. It is better than a live mullet. It really is. You can see the fish, because if you tweak it and it is still there and it has life, but it is not running away so he thinks *I can get that thing!* and he starts up for it and you move it away but not so fast that he cannot catch it, and you let him do his thing and let him eat it and you blow his fins off [laughter]. That is what makes a fly so great. Recognizing all this stuff is what I think separates the guy who goes out and fishes for one week a year and catches a few tarpon on a fly from the guy who fishes often enough to see all of what is going on: actually watching the mouth of the fish sip a fly in or being able to see a little gill pump or just a little movement.

One time Sandy Moret and I were in Homosassa. He had on a grizzly fly with a red palmer. He was stripping this fly and this tarpon came up behind it and, you know, kind of sipping around but did not take the fly right away. And it was right on the end of his nose. You could see it. It was early in the morning so the fish was really close—like 20 feet away. He is not stripping it so fast. He is trying to feed this fish. The fish comes up and he takes the tail of the fly. He bites the tail. Sandy does not move it. He then comes up and he bites the center of the fly. We are watching this. And all you can see is the red palmer on his lips, and then he eats the rest in three bites. He took the fly in three bites.

Mill: Unbelievable.

Huff: And Sandy patiently left the fly there until the fish took the third bite. It was not a real big fish, I think 100 pounds. It was a nice fish, but it wasn't jumping through the fly. Sandy goes, "Did you see what I saw?"

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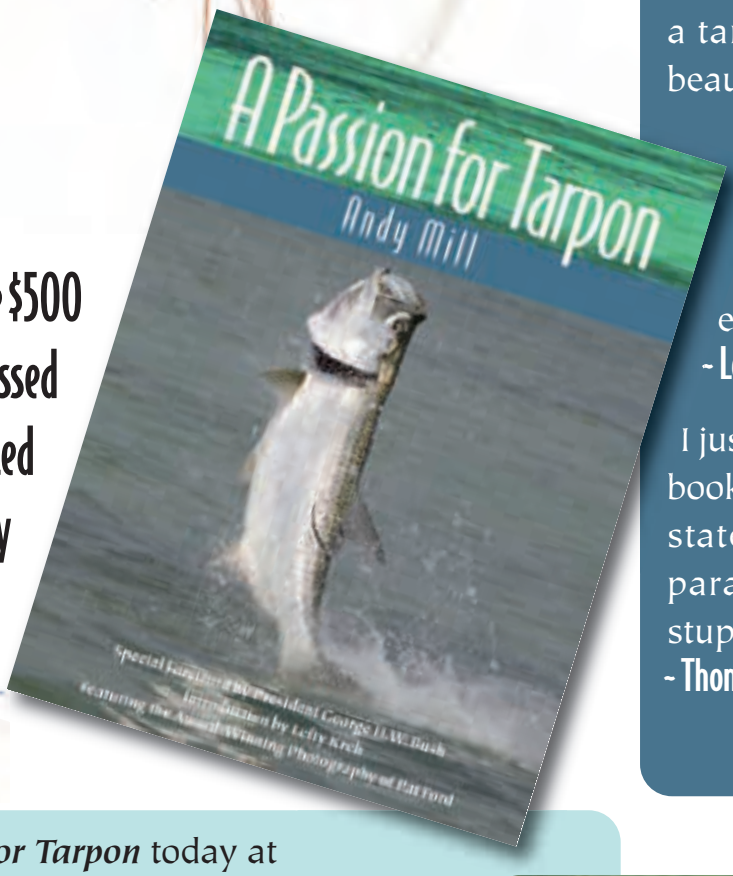

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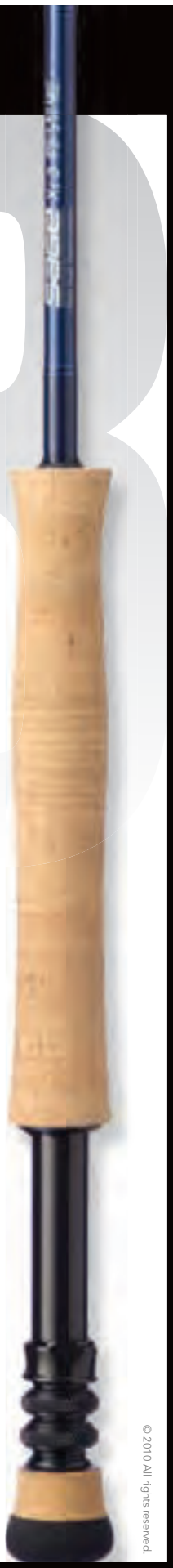
Didn't see the fish until it was right *here*. 30 knot headwind. Tarpon fever. The antenna got in my way. Just couldn't pole any closer. The baitball's *beyond* the breakers. I was standing on my line. Didn't you always want a pierced ear anyway?



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It's Full Moon, High Tide:

Do You Know Where Your Tarpon Are?

RICK HIRSCH Board member of Bonefish & Tarpon Trust and the lead on the Boca Grande Tarpon Conservation Project

Photos by Jerald Ault

The steaks were on the grill, beer cooling, salad mixed, strawberry shortcake in the fridge and palm fronds glittering above the lit swimming pool. I was there with six invited Boca Grande flats boat guides to talk about ways to learn more about the tarpon that formed the backbone to the Boca Grande fisheries, and how we could work together to improve the outlook for the future. We didn't solve the world's problems that evening, but we sowed the seeds for future work.

The following summer of 2009, we held our second BBQ and this time 20 guides, anglers and local businessmen attended. The group quickly honed in on the need to know where tarpon spawn and where they go in the winter—not so we can follow them to catch more tarpon, but so we can work together to get those locations protected.

This time we developed a plan: to raise $60,000 to buy 10 PSAT (satellite) tags in 2010. We hoped to place five tags on tarpon in May, with the goal of identifying spawning grounds. The remaining five tags would be placed in the fall to identify the winter migration routes of Boca Grande's tarpon.

We immediately set about organizing the fundraising venture and decided on a two-pronged approach. First, we worked with some of the guides from the planning meeting and together approached some of their client anglers with proposals for donations to sponsor tagging. Second, we organized a fundraising event for February 2010 at the Gasparilla Inn.

> Our goal is to raise sufficient funds to satellite tag 10 tarpon per year for five years.

We worked tirelessly with the guides to approach their clients about making donations toward the tagging program. Jason Lynn, with the support of his employer Boca Grande Outfitters, organized the fundraising event, including collecting gear, artwork, guided trips and other goodies for auction and raffle. Gasparilla Inn generously acted as event host, Patagonia provided a grant to help cover costs and contribute to tarpon tagging. The effort reached our goal of $60,000.

As you read this we will be in the middle of yet another fundraising push to equal or better our results from 2010. Our goal is to raise sufficient funds to satellite tag 10 tarpon per year for five years. This will give us a much better idea of what we need to do to protect our tarpon fishery for the future.

One of the great things about this multi-year, combined fundraising and scientific effort is that we are able to share our results from the previous year at the next year's fundraiser. We hope that our fundraising model continues to be successful in Boca Grande and can be applied elsewhere.


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Remove the hook or cut the line? The answer to an age-old question.

CORY SUSKI, JEFFREY STEIN, AARON SHULTZ, STEVEN COOKE & ANDY DANYLCHUK

Photos by Cory Suski

What happens to a bonefish that has the line break and swims away with a hook in its mouth? Will the hook come out on its own? Is this a time when you should start thinking about using only barbless hooks to make things better for the fish? If a fish has swallowed the hook, should the line be cut and the fish released with the hook in? Does this represent a problem for the fish? Will this hook work its way out? These are questions often asked by anglers, and recently asked during a BTT-funded study of hook retention in bonefish.

To address these issues, our research group conducted a BTT-funded project to quantify the impacts of hook location and hook retention on the survival and feeding of bonefish. In addition to looking at whether bonefish can shed hooks on their own, we were interested in potential impacts to feeding and survival and if outcomes were impacted by barbed vs. barbless hooks.

The study was carried out at the Cape Eleuthera Institute (CEI) on the island of Eleuthera, The Bahamas. Experiments consisted of first hooking bonefish in either the lip or esophagus with a barbed or a barbless hook, and then releasing hooked fish into a holding tank that also held control fish that had no hook. In addition, two sizes of hooks were used: a #4 hook representative of fly angling and a 1/0 hook representative of bait fishing. All hooks had a color-coded piece of line attached to them so that we could identify which fish had which type of hook and hook placement, and all fish were also outfitted with a uniquely numbered external tag to identify individuals. We observed fish in the tank daily for two weeks after hooking to monitor the rate of hook shedding and behavioral abnormalities (erratic swimming, fungal infections). We fed the bonefish once each day. After two weeks all fish were removed from the tank and weighed; live fish were returned to the wild.

Results from the study showed that hook retention in bonefish had little effect from physical or behavioral impairment, despite hook location and type. All bonefish survived the two-week observation period in the lab regardless of hook size (#4 vs. 1/0), hook location (lip vs. esophagus) or hook type (barbed vs. barbless) and were released back into the ocean.

Almost half of all hooked bonefish (47%) lost their hook within five days after hooking. Almost three-quarters of fish hooked in the lip lost their hook during holding. Hooks located in the lip were more likely to be ejected by the end of the experiment compared to hooks located in the esophagus. There was no difference in shedding rates between barbed and barbless hooks.

We were surprised that there was no difference in hook retention times between barbed and barbless hooks—both were shed in roughly equal proportions after 14 days in the lab regardless of hook location. However, since barbless hooks require less handling time to remove from the fish, and previous research showed that handling time is extremely important for increasing bonefish survival after release, we recommend the use of barbless hooks.

There were no differences in weight loss associated with hook type, hook location or hook size. In addition, several of the fish used in this study were re-captured months after their release into the wild and identified due to their external tag, indicating the probability of long-term survival despite retaining the hook.

Our findings have several important implications for anglers. Bonefish that have been deeply hooked in the esophagus should be quickly released after cutting the line close to the hook rather than extensive handling of the fish to remove the hook. The presence of a hook in the esophagus does not result in mortality within two weeks, and the presence of a hook does not appear

to impact feeding ability. In contrast, increased handling time decreases chances of survival for the bonefish. In addition, we recommend that if you see a hooked bonefish is being tracked by a shark or other predator, intentionally break the line so the fish is released with sufficient energy to avoid the predator. We now know that the bonefish should be okay and will lose the hook in time, but a long fight followed by handling prior to release can make that bonefish more susceptible to being eaten by a predator after you release it.

When considered in the context of impacts such as handling, potential damage to gills and prolonged air exposure, cutting the line and releasing a deeply hooked fish is something that should be considered an acceptable practice by bonefish anglers. While this won't help you from feeling glum when your fish breaks off and swims away before it is landed, it might make you feel a bit better knowing that it will likely survive to be caught again.

Cory Suski is an Assistant Professor in the Department of Natural Resources and Environmental Sciences at the University of Illinois.
Aaron Shultz Research Manager at the Cape Eleuthera Institute, Eleuthera, The Bahamas.
Jeffrey Stein is Research Scientist at the Illinois Natural History Survey.
Steven Cooke is Associate Professor in the Department of Biology at Carleton University, Canada.
Andy Danylchuk is Assistant Professor in the Department of Environmental Conservation at the University of Massachusetts.
All authors are scientists at the Flats Ecology and Conservation Program, Cape Eleuthera Institute.

Tracking Tarpon Travels: Scientists Go High-Tech With **D N A**

KATHY GUINDON, MIKE TRINGALI & CAROLE NEIDIG

Photo by Aaron Adams

Imagine the year is 2006 and you and a friend have just set out on a clear autumn morning for tarpon fishing. The sun is breaching the horizon and the sky is on fire with streaks of pink and yellow cutting through a serene purple glow.

You maneuver your boat quietly, stalking through the still, backcountry waters scanning for small fish rolling at the surface. You are seeking an acrobatic fun fight today; not a giant one to break your back. A few moments later there is a slight stir, a surge of excitement and a young tarpon tightens the line, then presents itself against the morning sky. Minutes after the adrenaline rush for you and the fish, the tarpon is boat side. You reach down, take a DNA sample from the outer jaw of the 12-pounder, snap a quick photo and release it for another day.

Fast-forward nine years to summer 2015. Your extended family visits for a week of fishing for giant silver kings with local guides. On the first day, your brother experiences 30 minutes of forearm-screaming chaos, with the reward of a magnificent 135-pounder at the side of the boat. He takes a quick DNA sample from the outer jaw and continues fishing. That winter you receive a letter that your brother caught and scraped the same tarpon you sampled as a sub-adult in 2006.

What an amazing story to share with friends and family. Plus, DNA samples collected during your family's visit contributed to determining that Florida's tarpon nursery habitats harbor juvenile and sub-adult fish that grow up to provide adult tarpon to the recreational fishery. Do we know this yet for certain? No, but using DNA to track tarpon of all sizes in Florida can lead us to those answers.

Using the unique DNA fingerprint of an individual tarpon is a technologically advanced yet very simple way for anglers anywhere to genetically "tag" and track any tarpon. DNA will not fall out or rub off the fish, and it will not get covered in algae making it hard to see. It cannot be permanently removed from the fish by another angler and it never needs to be repaired. The most difficult part is remembering to return the tarpon DNA sample for processing after it is taken.

The study is growing, gaining recognition among anglers. In its pilot year (2005), 32 anglers and FWRI staff participated in the study and returned 176 samples to test the concept. Geneticists at FWRI successfully isolated 15 tarpon microsatellites (specific locations on the DNA) and discovered there was enough genetic variation in Atlantic tarpon for the project to work (that is, individual tarpon can be identified by their DNA).

To obtain the most useful data, we need samples from around the state of Florida and from the southeast United States. In 2006, the study spread statewide and angler participation and samples more than doubled. In 2007, Mote Marine Laboratory joined as partners. As a result, sample numbers and angler participation more than doubled again. For the first time, more than 1,000 DNA samples were collected in 2008, so we knew we were on the right track. As of October 31, 2009, 2,251 samples were returned, with 2,013 of them taken from fish caught in Florida. A goal of 3,000 samples was set for 2010, with anticipation of 1,200 coming from the Florida Keys. By June 1, 2010, project goals were

Photo by Aaron Adams

approximately halfway there with 800 samples returned from the Florida Keys alone.

In a few short years, biologists and anglers participating as citizen scientists can be tracking more than 10,000 tarpon from Florida waters. As of June 2010, the Tarpon Genetics Recapture Study has logged 37 recaptured tarpon in the database with a calculated recapture rate of 0.8%. This means that about one out of 100 genetically "tagged" tarpon is recaptured. As the number of tagged tarpon increases, data involving recaptured fish will come in at a faster rate.

Using the unique DNA fingerprint of an individual tarpon is a technologically advanced yet very simple way for anglers anywhere to genetically "tag" and track any tarpon.

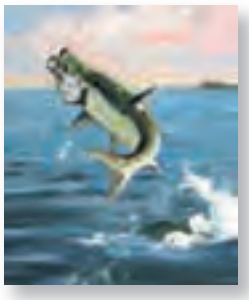
Early results indicate the study will provide information on adult ranges, seasonal and long-term movements, and will allow scientists to determine if tarpon show season-specific fidelity to locations from one year to the next. With long-term sampling, data may also reveal critical linkages between juvenile nursery grounds and adults in major Florida fishing grounds. In other words, if a DNA sampled juvenile matures and is recaptured as an adult, it will show us whether or not juvenile tarpon in Florida are the same fish supplying the recreational fishery for adults.

Coverage of the study is statewide, with more than 180 collection centers (bait and tackle shops and stores) that can be visited to obtain a free DNA sampling kit and to drop off tarpon samples at no cost to the angler. Each kit contains materials for sampling three tarpon and instructions on how to do it. Tarpon Team members from MML contact the shops monthly to pick up samples and resupply the DNA sampling kits. Anglers may also choose to mail samples directly to FWRI.

You can get more details, request a sampling kit, and find study links under the Angler Participation—Tarpon Genetics tab at www.tarbone.org.

Kathy Guindon is an Assistant Research Scientist
Mike Tringali is a Research Scientist with FWC
Carole Neidig is a Senior Biologist with Mote Marine Laboratory

ARTIST OF THE YEAR
Luke Frazier



Luke Frazier grew up hunting and fishing in the mountains of northern Utah. These early forays into nature instilled a kinship with the wildlife, and a passion for the outdoors. Later, his formal art training occurred at Utah State University, where he earned a Bachelor of Fine Arts degree in painting and a Master of Fine Arts degree in illustration.

His love of fly fishing and hunting is apparent in his work. Influenced by the art of Winslow Homer, Edgar Payne, Bruno Liljefors, Wilhelm Kuhnert, Carl Rungius, and Bob Kuhn, Frazier appreciates the strength of drawing, color and emotion put into their art work.

Frazier's work has often been compared to that of Carl Rungius and Bob Kuhn, noted masters of wildlife art. Recent praise has come from Bill Kerr, cofounder of the National Museum of Wildlife Art, and John Geraghty, a board member of the National Cowboy Hall of Fame in Oklahoma City, both Frazier collectors.

Frazier's work has been included in the book Leading the West. In 2007 Frazier was included in the new book The Fine Art of Angling, and his work "The Tillamook Creel" adorned the cover. Frazier was chosen to be featured artist at the Jackson Hole Fall Arts Festival in 2007 and Southeastern Wildlife Exposition, in Charleston South Carolina in 2010. He has been profiled in Art of the West, Wildlife Art, Big Sky Journal and Southwest Art. His paintings frequently appear in Field & Stream, Gray's Sporting Journal, Sporting Classics and Alaska.

He received the Founders Favorite Award at the Art for the Parks competition in 2002 and the Wildlife Art Award in 1994, 1996, and 1997, and has been recognized on the National Parks stamp.

Bonefish Transportation: If You Have To Do It, Here's How

CORY SUSKI, AARON SHULTZ, KAREN MURCHIE, CHRISTINE GRIFFITH, STEVEN COOKE, ANDY DANYLCHUK & TONY GOLDBERG

Photos by Cory Suski

Oxygen is something that is critical for life, but is typically not something that we think about as we go about our day. As you stand on the flats on a calm morning and take a deep breath prior to fishing, you probably think more about fresh air, open spaces and fish than oxygen. But just like humans, bonefish have specific oxygen requirements that need to be met to keep them happy, healthy and vigorous.

When we interact with bonefish through angling, we have the potential to impact their access to oxygen, which is something that frequently goes unnoticed. This article summarizes recent BTT-supported research that examined the effect of adding supplemental oxygen to livewells on bonefish prior to release.

Previous research has shown that angling is essentially exercise for fish and can result in changes to their physiology – their heart rate goes up, they consume a great deal of energy, and they also produce wastes such as lactate, similar to what we would produce if we were exercising. Recovery from this exercise can take anywhere from two to four hours depending on the amount of exercise that is done, and is a process that consumes energy. More importantly, the extent of these physiological changes can impact the likelihood that fish are captured by a predator after being released, with tired fish less capable of avoiding predator attacks.

To minimize the likelihood of predator attacks on fish after release, anglers may choose to hold fish in livewells for short durations so the fish can recover and/or to allow the angler to move to a better location (fewer predators) before releasing the fish. Similarly, bonefish caught during live-release angling tournaments can be held in livewells prior to the weigh-in, and this holding period can last for several hours.

During any situation where live fish are held in tanks or confined spaces, oxygen concentration in the water is something that should be considered, especially since fish take up oxygen from the water as they breathe. Since treatment of bonefish prior to release is an important component of a successful catch-and-release fishery, with BTT funding we set out to answer the questions: What dissolved oxygen concentration do bonefish need? Can bonefish have too much oxygen? What happens if oxygen concentrations fall?

Our research aimed to quantify the physiological and behavioral impacts of dissolved oxygen, which is the amount of oxygen in the water available to fish and other organisms. We performed two separate experiments: one held bonefish in water at different oxygen concentrations to identify upper and lower limits and the other exercised fish to replicate angling, then recovered them in water with different oxygen concentrations and sampled blood to measure how their rate of recovery was influenced by oxygen concentration. The goal of this research was to identify oxygen concentrations that should be maintained in livewells that will allow bonefish to recover from angling in the least amount of time with the fewest sub-lethal effects, allowing them the greatest probability of post-release survival.

The behavioral portion of the study was conducted at the Cape Eleuthera Institute (CEI) on the island of Eleuthera, The Bahamas, and consisted of placing fish into individual containers that replicated livewells. These containers were supplied with normal seawater, water that had low oxygen, and water that had been over-oxygenated. The low-oxygen environment replicated real-life angling situations where bonefish had been placed in a livewell without flow-through, so that the bonefish had consumed most of the oxygen in the container. The over-oxygenated environment replicated situations that may arise through the unregulated use of oxygen-infusion systems that supply dissolved oxygen to livewells. The normal seawater treatment served as a control, and replicated a situation where bonefish were held in a livewell with a flow-through system that was left running constantly to provide a continuous stream of fresh seawater.

When fish were held in these different oxygen concentrations, the frequency of gill ventilations was counted—this essentially is a measure of breathing rate for the fish and indicates how hard they are working to obtain oxygen.

After 30 minutes of exposure to the livewell with no flow-

through, there was a two-fold increase in the rate of opercular beats for bonefish relative to fish held in the livewell with a flow-through system. This suggests that the fish likely were becoming oxygen deprived in the low-oxygen situation, and needed to work harder and pass more water over their gills to obtain oxygen.

In contrast, bonefish exposed to water that was over-oxygenated (livewell with an oxygen system) showed a significant drop in ventilation rates relative to fish held in seawater. Although at first blush this might seem a good thing, it turns out it is not. For fish, one of the cues that stimulate them to pass water over their gills is an absence of oxygen in the water. Therefore, holding fish in over-oxygenated water likely reduced this stimulus for them to ventilate their gills, causing a reduction in ventilation rates. While this wouldn't seem to be a large negative consequence, gill ventilation helps remove wastes such as carbon dioxide. Therefore, the reduced ventilation rate of bonefish in the over-oxygenated water caused an accumulation of waste products that can impair recovery.

The blood physiology portion of the study was also conducted in the Bahamas and involved exercising bonefish for four minutes to replicate angling, and then allowing them to recover for either two or six hours in the same containers as the behavior study. This design allowed us to quantify how different concentrations of oxygen either facilitated or impaired recovery.

Results showed that recovery from exercise was slowed by low oxygen conditions compared to regular seawater. Similar results were observed for fish recovered in water with high oxygen compared to normal seawater, with over-oxygenated water causing physiological disturbances that persisted for several hours.

The blood experiment results complement the behavioral study results, and show that flow-through livewells are better for holding bonefish than are non-flow-through livewells and livewells with supplemental oxygen. Any time that fish are held for extended periods of time in closed containers of water, it is imperative that oxygen concentration of the water be considered.

For those who are able or desire to measure these things, this means that recommended dissolved oxygen concentrations during holding remain between 4 mg/L and 8 mg/L (normal seawater dissolved oxygen concentrations are typically around 6 mg/L). Continuous use of livewell flush pumps and/or the continuous addition of fresh seawater to holding tanks should be sufficient to maintain this oxygen concentration.

It is important to point out that the measurement of oxygen in water is extremely simple and straightforward. Dissolved oxygen meters are relatively inexpensive (many models are available for well below $400) and will reliably inform anglers, managers and tournament organizers what the concentration of oxygen in any holding tank is, thereby removing any speculation or uncertainty regarding water quality, especially during long-term holding.

The next time you are on the flats and take a deep breath after a challenging fight with a bonefish, think about the fact that you are constantly acquiring oxygen and that the fish is doing the same as it swims away.

Cory Suski is Assistant Professor in the Department of Natural Resources and Environmental Sciences at the University of Illinois. Aaron Shultz is Research Manager at the Cape Eleuthera Institute. Karen Murchie is Research Scientist in the Department of Biology at Carleton University, Canada. Christine Griffen is Laboratory technician in the Department of Natural Resources and Environmental Sciences at the University of Illinois. Andy Danylchuk is Assistant Professor in the Department of Environmental Conservation at the University of Massachusetts. Tony Goldberg is Professor in the School of Veterinary Medicine at the University of Wisconsin-Madison. All authors are scientists with the Flats Ecology and Conservation Program, Cape Eleuthera Institute, Eleuthera, The Bahamas.

BODY-DOUBLE: Which Species of Bonefish Was That?

ELIZABETH WALLACE
is a Ph.D. student working on bonefish genetics for her dissertation in the Conservation Biology Graduate Program at the University of Minnesota

Photos by Aaron Adams

The Caribbean Bonefish Research Program is designed to determine which species of bonefish are in the fishery; the movement patterns of bonefish; bonefish growth rates; and to apply the results of this work to conservation, management, and education. The Program is in full swing, and the genetic portion, in particular, has some exciting preliminary results to report.

The genetics program collects samples from fin clip kits that anglers and guides use to cut a small piece of fin tissue from a bonefish (the tissue grows back in a couple weeks). The tissue sample is placed in a vial that contains a preserving solution and sent to BTT. Thanks to the efforts of lodges, guides, anglers and scientists, over 1,200 fin clips have been collected from bonefishes throughout the Caribbean.

These fin clips are screened using genetic testing procedures and the data are analyzed in order to identify the species of each sampled fish, determine if any individuals are hybrids with mixed species ancestry, and establish whether distinct breeding populations exist within each species.

Species Identification

Three of the four bonefish species found in Caribbean waters have been collected through the fin clip program. These consist of *Albula vulpes* as well as *A. sp. B* (aka *A. garcia*) and *A. sp. cf. vulpes*. The latter two species are morphological cryptics, meaning that they are so visibly similar to *A. vulpes* that they cannot be identified without genetic testing. This fact may suggest that they are not different enough to consider separate species. However, the data reveal a very different picture. Other cases of cryptic species have been identified, in fishes as well as other organisms. *Albula vulpes* and the two cryptics (*A. sp. B* and *A. sp. cf. vulpes*) are so genetically distinct that we believe they have been separated for millions of years.

To date, the majority (96%) of the fish sampled have been identified as *A. vulpes*. However, 13 *A. sp. cf. vulpes* and 16 *A. sp. B* have also been collected from the fishery (Florida Keys, Bahamas and Belize) *(Figure 1)*.

The fourth Caribbean species, *A. nemoptera*, has not been identified from any collections to date. This species is reported to have a very restricted range in the southern Caribbean and is apparently only in deep water. Interestingly, *A. nemoptera* is the only Caribbean bonefish that can be identified visually—it has a dorsal threadfin, similar to tarpon, which makes this species quite distinctive.

Hybridization Among Bonefishes

Through our genetic screening, some fish have been identified as hybrids. This means they have a mixed species ancestry. In the majority of cases, the hybrids were identified between *A. vulpes* and *A. sp. B*. To date, 10 *A. vulpes* x *A. sp. B* hybrids have been collected from the Caribbean. These individuals were caught in the Bahamas, Belize and the Florida Keys. Of the 10 hybrids collected to date, five were first generation (F1) hybrids. This refers to fish with parents from two different species (in this case one *A. vulpes* parent and one *A. sp. B* parent). Five are backcrossed individuals. This means they have one hybrid parent and one pure species parent. In each of these cases, one parent was an *A. vulpes* x *A. sp. B* hybrid (F1) and the other parent was a pure *A. sp. B*. This is referred to as an F2 hybrid and implies *A. vulpes* x *A. sp. B* hybrid individuals are able to reproduce. Half of the hybrids identified to date were collected from Florida waters, suggesting this is a mixing zone for these two species. Overall, hybridization appears to occur infrequently in the Caribbean.

Hybridization is common in marine fishes, many of which are broadcast spawners in deep offshore waters. Broadcast spawning refers to groups of males and females that gather to spawn and eject eggs and sperm into the open water, where fertilization occurs as the eggs and sperm drift off in the currents. This spawning behavior tends to allow mixing of eggs and sperm from multiple species.

Population Structure Within Species

Some species consist of one reproductive population. This can be true even across large geographic areas, such as across the Caribbean. In this situation scientists refer to it as one genetic stock, which can usually be managed as a single unit. Other species have multiple breeding populations which are isolated from one another, which usually results in multiple, distinct genetic stocks. Fisheries managers may create different regulations for species with multiple stocks, as they can be more vulnerable to fishing and other pressures.

When multiple stocks exist in a species, individuals from one genetic stock tend to be more similar to each other than they are to fish from the other stocks. This similarity is the result of reproductive isolation between the stocks (i.e., individuals from different locations don't mix). In the case of bonefishes, some surprising results have been found. The data collected to date suggest that *A. sp. B* and *A. sp. cf. vulpes* each consist of one genetic stock that is found throughout the Caribbean.

In contrast, the results for *A. vulpes* suggest that two distinct stocks exist. Interestingly, these two distinct genetic populations appear to be found throughout the Caribbean *(Figure 2)*. The apparent dominance of one genetic stock in Panama, Venezuela and the Virgin Islands is likely an artifact due to small sample sizes in these areas. It appears the northern Caribbean may be an area of higher mixing between the two *A. vulpes* populations, however this is also the area with the highest sampling effort. What is separating these two stocks is not yet clearly understood. Differences in spawning timing, locations or some other mechanisms may be contributing factors.

While these results are still preliminary, the dataset is very large for a study of this kind, so provides a relatively high level of confidence in the current study findings. Data collection and analysis continue, and the results will continue to be updated as new information becomes available.

This study would not be possible without the tissue collection assistance provided by BTT members. This once again underscores how anglers and guides can contribute to research and conservation, and that your participation is essential to the work that BTT does.

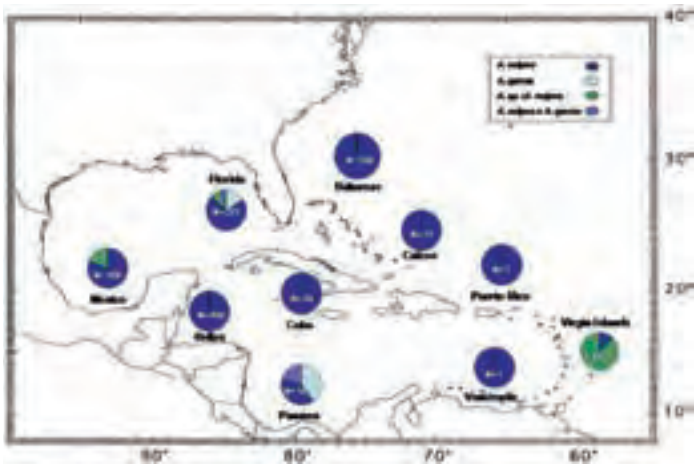


Figure 1. Bonefish species distributions within the Caribbean. The sample sizes listed for each locality are for total collections to date. These numbers include angler fin clip program returns as well as scientific collections.

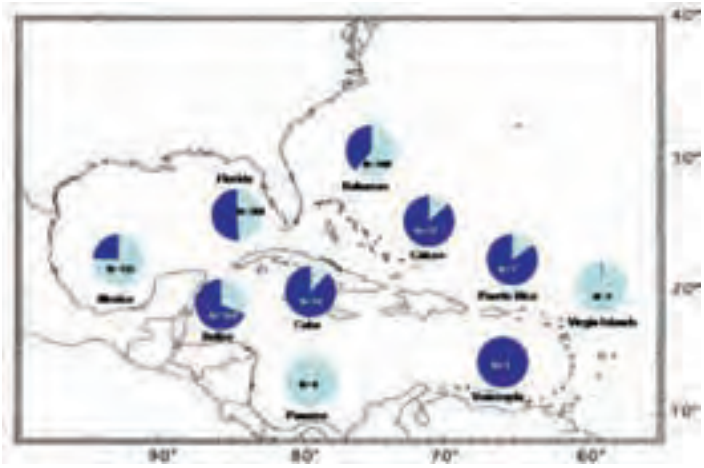


Figure 2. Genetic population assignments for *A. vulpes* individuals collected across the Caribbean. The data suggest that in most locations, both genetic stocks co-exist.

Our Fish Are Your Fish: Tracking Tarpon Long-Distance Travels

JERALD AULT & JIANGANG LUO

Jerald S. Ault is a Professor of Fisheries and Director of the Bonefish & Tarpon Conservation Research Center at the University of Miami. Jiangang Luo is Scientist in the Division of Marine Biology and Fisheries at the University of Miami.

Tarpon sport fishing, perhaps one of the world's most storied fisheries, contributes billions of dollars annually to the Gulf of Mexico and southeastern U.S. economies—providing livelihoods to tens of thousands of Americans from Texas to Florida to Virginia. Despite its regional importance, data to assess and manage this valuable resource are very scarce.

Our novel approach has capitalized on a simple formula: We combine high-tech science with an existing network of guides, sport fishers and others to obtain data necessary for conservation of this species. Over the past decade these integrated networks have greatly enhanced scientific successes and helped us develop a better understanding of tarpon so we can better manage the fishery.

Atlantic tarpon are an ancient fish with remarkable seasonal migration rhythms that mirror water temperature and prey changes. In the spring of each year, south Florida heralds the arrival of migrating schools of silver kings to its waters, where these magnificent fish feed and spawn. After a two- to three-month stay, like the great herds, many push onward to the north to feed.

> While the rate of increased knowledge puts us on the right track, we have a long way to go.

We like to think of them as good friends stopping by, and while on this long journey, they want to share some excitement while they are in town. However, have you long wondered where the biggest of these friends traveled from, and where they go? What proportion of the tarpon traveling through Florida each year was born there? Do populations of the species migrate internationally? And why have tarpon populations declined or increased over years in different regions?

Fortunately, we have begun to employ TSI (Tarpon Science Investigations), facilitated by new computerized tagging technologies. Since 2001, scientists at the University of Miami have been placing satellite-based PAT tags on tarpon. These devices contain micro-sensors that archive data on the fish's depth, light level, temperature and salinity of surrounding water every second for periods up to a year. The preprogrammed tag then detaches from the fish, rises to the surface and transmits the stored data to a network of orbiting ARGOS satellites. Like ET phoning home, the archived data are forwarded by email to us here on Earth for analysis.

Use of these state-of-the-art tags has provided unparalleled knowledge about the tarpon's use of the ocean environment, migration patterns and resource connectivity, greatly changing the way we think about the silver king.

New satellite tracking data have shown that migrating schools enter U.S. waters in Florida and Texas in late spring to spawn, then many travel either to the mouth of the Mississippi River or to Chesapeake Bay to rebuild the gonads and body by feeding on the biological riches found in the northern climes, then they reverse course and depart southward in late fall.

In 2010, we celebrated our 160th tarpon PAT tagging since the program's inception. The strength of these research accomplishments lies in the exceptional network of tournament support in Texas (Texas Tarpon Tomorrow Pro-Am, host Scott Alford), Mexico (e.g., Veracruz Yacht Club and host Angel Requejo), and most recently South Carolina (Low Country, host Andrew McClain) that form the backbone of our PAT-tagging efforts. These coordinated events concentrate anglers in specific areas, and they then communicate by cell phone and VHF radio to alert scientists where tarpon are available for tagging.

As a complement to tournament efforts, funding for a special science-angler relationship was initiated in 2010. Spearheaded by Bonefish & Tarpon Trust Board Member Rick Hirsch, this five-year program endeavors to place 50 total PAT tags (10 per year for five years) on tarpon in the Boca Grande, Florida, area to learn more about regional spawning areas and migratory patterns. These efforts have greatly benefited from local expertise from captains Jamie Allen, Greg Hall, Tommy Locke and others.

In 2010, a total of 24 were tagged at locations around the Gulf of Mexico, southeastern U.S. and Caribbean Sea. This would not have been possible without the aforementioned and others such as scientists in Belize with the Green Reef Foundation; guides and anglers from south Florida and the Florida Keys, like Paul and Heidi Nute; and collaborations with forward-thinking partners in Texas including Texas Parks & Wildlife, Coastal Conservation Association, Tarpon Tomorrow, Harte Institute and Oceanic Conservation Organization.

New environmental threats have heightened concerns about tarpon fishery sustainability. For example, last winter's January extended cold wave was particularly lethal to tropical game fish species including snook, bonefish and tarpon, and to their prey. Water

temperatures dipped as low as 44°F for periods of more than 3.5 days, and killed an unknown number of mostly small (and young) tarpon in Biscayne and Florida bays, and the Indian River Lagoon.

Another unforeseen threat was the BP Deepwater Horizon (DWH) oil spill. Our pre-spill satellite-tagging data show that tarpon move into the ground-zero area of the DWH disaster for feeding and spawning during summer, and primarily utilize near surface waters and the water column, where risks have not been evaluated for tarpon or any other species. These risks may be of two types: (i) acute mortality from direct encounters with the toxic oils and dispersants; and, (ii) insidious chronic effects on reproductive population dynamics (spawning, larval survival, juvenile success in nursery areas) and growth and death rates. Focused studies and new data are urgently needed to understand these effects on tarpon, which will require improved communication between the public, scientists and managers; stronger state-federal and public fiscal support for the science; and improved legislation to protect the fishery.

While the rate of increased knowledge puts us on the right track, we have a long way to go. As we move forward there is great need to expand the knowledge base to improve our angling opportunities and success, and to ensure the sustainability of the fishery for this magnificent fish.

Project Permit: if you can catch them, you can tag them

AARON ADAMS

Permit are often referred to as one of the most elusive game fish of the saltwater flats, captivating anglers for years in their quest to catch them. They also contribute to the financial and psychological ruin of many an angler. And yet little is known about this mysterious species.

Thanks to the support of Costa® and funding from additional sources, in early 2010 BTT launched Project Permit, the world's first-ever permit-tagging project. Project Permit's goal is to work with guides and anglers to tag more than 6,000 permit throughout Florida over the next four years, with hopes to eventually expand Caribbean-wide.

Despite their importance as a rock star of the saltwater flats, there are virtually no data on permit—what is the population size, what are their movement patterns, are "your" permit also "their" permit, is the fishery healthy? These are all basic questions that need to be answered to ensure a healthy fishery into the future. For example, it's not currently known whether permit caught in the Florida Keys are from the same or different populations than those caught as far north as Tampa or as far south as Cuba. And if research findings from tarpon and bonefish are any indication, we don't want to assume that permit are homebodies: Tarpon tagging research has shown migrations as far north as the Chesapeake Bay in the Mid Atlantic, and bonefish have been recorded to travel the length of the Florida Keys.

Project Permit began at the 2010 March Merkin permit tournament, and so far permit have been tagged from Stuart and Fort Myers to Key West, from the flats to offshore reefs. Momentum is building.

Photo by Tom Rosenbauer

To help and to learn how to tag a permit, please click on the Tagging Programs tab on our web site at www.tarbone.org.

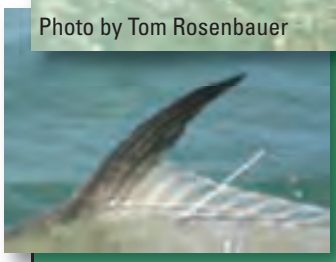


Photo by Capt. Joe Gonzalez

New Belize Permit Tagging Study Under Way

In September 2010, Aaron Adams, Director of Operations for BTT, Jason Schratwieser, Conservation Director for the International Game Fish Association (IGFA), and Celia Mahung, Director of the Toledo Institute for Development and Environment (TIDE), met with recreational fishing guides in Punta Gorda, Belize, to discuss a permit-tagging project. The guide response was overwhelmingly positive, and all present agreed to start the first ever permit-tagging program in Belize.

The Punta Gorda area was chosen because the permit fishing is fantastic, the guides are very conservation oriented, and TIDE has an excellent record as a leader in conservation for the area.

The first permit was tagged in September 2010, and guides were outfitted with new tagging kits in the Fall. In addition to Florida, this now gives permit anglers another fishing destination where they can fish for permit and contribute to conservation at the same time.

Permit Me

DAVE SANDERSON

Summer is permit time for me. During June, July and August, if the tide is right and the weather is reasonable, you'll find me permit fishing. There is nothing sweeter than seeing a few dark shapes float up out of a deep channel in Biscayne Bay and meander their way across one of my favorite banks.

I love the challenge of catching a single permit: the stalk, the eat, the fight and the release. Each permit is different and each serves as a learning experience.

The stalk: I have to sneak up on each fish, they are wary and can see and sense my presence. The presentation: Whether a live crab or a fly, it needs to be spot on. The eat: Sometimes it is subtle, sometimes it is frantic, and each requires a different response from me. The fight: A permit is a powerful and wily fighter that will run off the flat in a blink of an eye and head for the nearest sea fan or coral head. The release: Grabbing the permit by the tail signals the end of the fight, and without a doubt will result in a story to tell.

The sense of accomplishment that comes with catching a permit is intoxicating. I want to make sure that I and others can enjoy that feeling in the future. That is why I felt it was important to get involved with the "Project Permit" tagging initiative. Participating in Project Permit is a simple yet meaningful way for me to personally give back to the fish. In the long run, I hope the tagging efforts of everyone involved in the project help scientists better understand the fishery for future protection. I also can't wait to see where "my" tagged fish end up.

Dave Sanderson is a BTT member who lives in southeast Florida, and has become an expert at tagging permit.

How Many Bonefish Are Out There?

MICHAEL LARKIN AND JERALD AULT

Michael Larkin is a Ph.D. candidate and Jerald S. Ault is a Professor of Fisheries and Director of the Bonefish & Tarpon Conservation Research Center at the University of Miami.

Bonefish are a popular saltwater fishing quarry due to their occurrence in shallow, crystal-clear shallow tropical waters, and for their lighting speeds when hooked. These superb attributes allow them to support many important catch-and-release fisheries around the globe. South Florida hosts the world's most popular recreational bonefish fishery because of the availability of large bonefish. More than 68% of the saltwater fly rod and saltwater line class world records for bonefish listed by the International Game Fish Association were caught in south Florida coastal waters. It has been estimated that this popular fishery contributes approximately $1.0 billion annually, making it a key component of south Florida's regional economy.

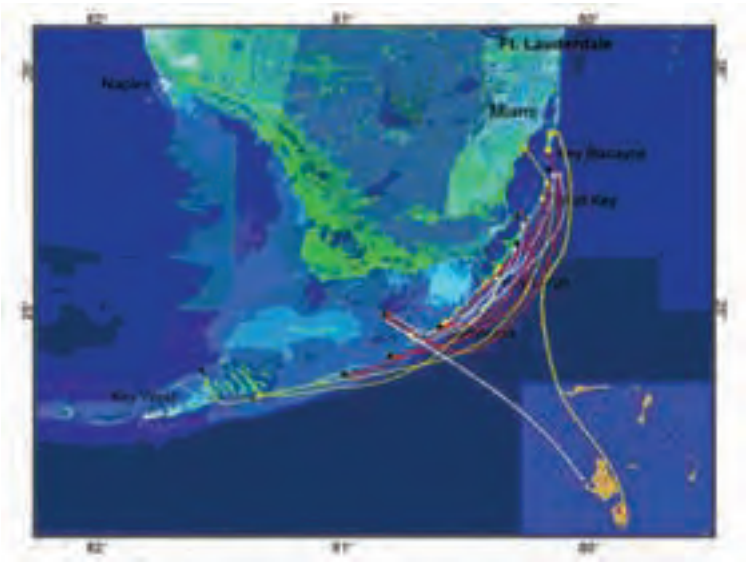
Despite the economic significance of south Florida's bonefish fishery, the stock has never been adequately assessed. The fishery is principally recreational catch-and-release with no commercial harvest allowed, and as a result there are no catch-and effort records as are commonly available for commercial fisheries such as snappers and groupers. So how do you resolve this quagmire?

A key step was for the University of Miami's Bonefish and Tarpon Conservation Research Center to initiate a bonefish-tagging program in 1998 in collaboration with professional guides and BTT. Tagging studies are commonly used to provide information of fish movements and migrations, but they can also provide reliable estimates of survivorship, growth and population size, and reveal key habitats occupied by juveniles and adults. Tagging programs can thus provide valuable information on catch-and-release fisheries to support fishery management that would otherwise be unavailable.

Since its inception in 1998, the anchor-tagging program has tagged over 8,500 bonefish with more than 350 recaptured.

These recaptures have provided a fascinating range of information on bonefish that was previously unknown. Forty-two percent of the recaptures were made at or near the same location where the fish was tagged, and about 70% of the recaptures were caught within five miles of the tag location. However, just because the bonefish were caught in the same location does not necessarily mean that bonefish do not move. Sixteen recaptured bonefish moved more than 50 miles from the location where they were tagged. The longest verified movement for a bonefish within Florida was by a fish tagged in Biscayne Bay by Capt. Joe Gonzalez that was recaptured by Steve Gray some five months later at Sawyer Key in the lower Florida Keys, about 126 miles away from its release location. Amazingly, two bonefish tagged in the Florida Keys were recaptured 150 miles away in Andros Island, Bahamas.

Lifetime growth of bonefish can be modeled from tag data by analyzing the change in lengths of fish during the period at liberty from tagging to recapture. Our results show this to equivalent to growth estimates derived from otoliths (earbones): the advantage of using tag data to estimate growth is that the fish is released alive whereas use of otoliths requires killing the fish to collect the otoliths.



Population survivorship rates can also be estimated from tag-recapture data, but tag recoveries are dependent on four factors: (1) numbers tagged and released; (2) tag reporting rate; (3) rate tags are shed from the fish; and (4) post-tagging survival. The number of animals tagged is diligently recorded in a database. Tag reporting rates of dedicated volunteers are being compared to those for anglers in four regions of the Florida Keys. Tag shed rates are being estimated from tagging experiments at the Miami Seaquarium. The final variable to determine is survivorship.

Further cooperative scientist-fishermen efforts have taken place, such as the Florida Keys bonefish census, having completed its 8th year in 2010. The census estimates population size and provides a robust quantitative baseline to measure environmental impacts on the bonefish population. The one-day census occurs twice (spring and fall) each year. The population has hovered around 330,000 bonefish from 2003-2009, with only slight year-to-year variations. Of great interest, however, is the fact that the spring 2010 census recorded the highest population estimate ever, even after the record cold temperatures of January 2010.

The cold snap of January 2010 killed an unknown number of small age one- to three-year-old bonefish, but any loss of this age group of bonefish will not be seen until they are old enough to be part of the fishery (several years). The census runs solely on the effort of volunteers and would not be possible without them. It also proves to be an excellent feedback loop, highly complementary to the tagging program, where the efforts given by the volunteers help monitor the resource that they so passionately pursue.

The goal of both the tagging and other programs of the Bonefish Tarpon Research Center is to generate the vital information critical to determination of the status and sustainability of Florida's bonefish population. This information will not only guide Florida fishery managers in their efforts to build a sustainable fishery, but will also serve as a model for evaluating other bonefish fisheries around the globe.

Diary of an Angler

LORI-ANN MURPHY
Director of Fishing at El Pescador Lodge

As Director of Fishing at El Pescador Lodge on Ambergris Caye in Belize, I get to take part in all kinds of fun adventures. Working with first- and second-generation San Pedrano guides is always entertaining. I love that they bring with them what their forefathers learned generations before them in a commercial fishery and apply that knowledge to something they would never have imagined—fishing for bonefish, permit, tarpon and other game fish with a fly rod. Now these same guides have taken yet another step and are collecting data for Bonefish & Tarpon Trust so we can learn more about fish they have known their entire lives.

Last June presented El Pescador Lodge and me with big news: Buccaneers and Bones was coming town, and with an all-star cast. Not only that, I was going to get to fish with Batman, a.k.a. Michael Keaton. As huge as that is, try names like Tom Brokaw, Yvon Chinnard, Tom McGuane, Zack Gillford, Bill Klyn and BTT's very own Aaron Adams. It became apparent right from the start that this crew was absolutely dedicated to the cause. We have a mission: To learn more about bonefish, permit and tarpon.

On the first evening, I had just finished my fishing orientation to the crew and everyone was sitting around for the first time with cameras rolling. Tom Brokaw had just traveled across the globe from Turkey. He hadn't slept in hours, but there he was, telling us that the oil spill in the Gulf would be a life-changing event. Every hair on my arms rose. Tom has been everywhere on this planet and has met world leaders with each step. And there he was, showing concern about the future of bonefish, permit and tarpon.

Brokaw's long-time friend, Yvon Chinnard, listened attentively as he does so well. They have been friends for 30 years. And after just a second or two of a pause, Keaton and McGuane exploded with outrage about the spill and its impact on the fish and other resources. It was obvious to all that the crew cares.

Fishing was tough, and conditions were anything but optimal. One might think, "Oh too bad for those guys, fishing in Belize with celebrities," but on film shoots the days are full of tight (and often conflicting) film schedules, anglers' personal fishing preferences and the usual changing weather conditions.

But despite this, some incredible things happened in Belize. Tom McGuane battled the biggest tarpon of his life on fly. But then the behemoth finally wore through the leader as it was brought to the boat after nearly an hour and a half of battle.

As an educator in fly fishing, it is always a gift to run into someone who shows up and gives it their all. So it was great that one of the Buccaneers was Zach Gilford, whose excitement for fishing was palpable. Zach and I poled a canoe around a backcountry lagoon system in search of bonefish, and experienced bonefishing like you read about in the magazines.

As the week progressed the tone turned grim because Hurricane Alex was on its way to our shores. Suddenly flights were being changed, and everyone had to head out before the storm. The filming was ending.

There is always someone going the wrong way. A storm was approaching and Aaron went to the lagoon to fish. He came back with stories of great action for tailing bonefish, so as most of the crew was being evacuated, I took a camera guy to the lagoon to see if we can get some more bonefish on film. But we were too late. Conditions had deteriorated as the storm came closer, people were moving their boats to the lagoon, storm warnings were in full effect, white caps dominated the sea.

Some of us then headed to Florida in search of more tarpon. We started at the Ocean Reef Club and fished Key Largo. Chris Peterson, President of Hell's Bay Boatworks, and his son were there to meet us, providing both the fishing and camera boats. The beautiful boats matched the stellar guiding from Darrick Parker, which made for a couple of great days sight fishing for migratory tarpon on the last leg of the season. Aaron and I should have had several fish to the boat but as can be the case in tarpon fishing—it just never happened.

Anglers and crew then packed into the cars and with Key Largo in the rearview headed across the state to Tarpon Lodge, on Pine Island in southwest Florida. There we joined Stu Apte and Jerry Ault. It amazed me as I listened to Stu and Jerry talk about tarpon, and how Stu remembered every fish—from the tackle, the bite, the fight and the place. And the ageless curiosity Jerry showed when he talked about tarpon. Once again, the guides—Jamie Allen and Mark Becton—put us on tarpon.

It was a great experience from start to finish, and made even more rewarding by seeing the commitment of everyone involved—from the celebrity anglers to the camera and production crews—to conservation of these magnificent fish and their amazing habitats in which they live.

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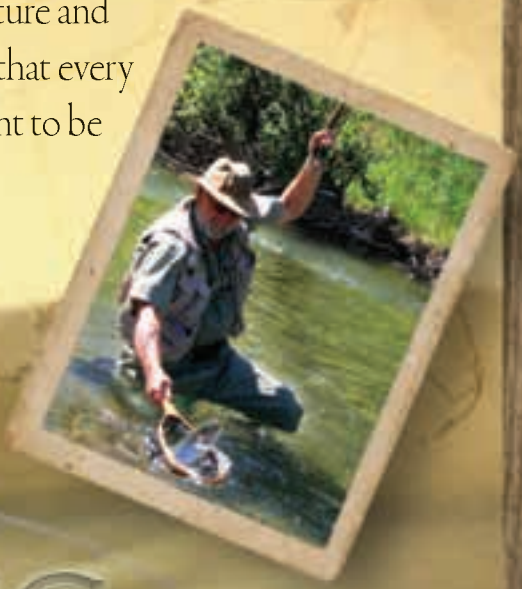

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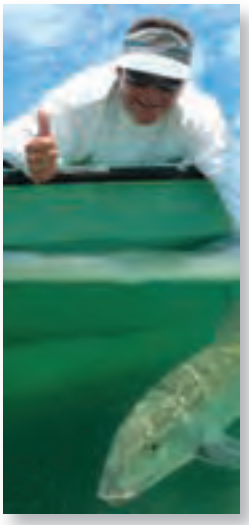

Capt. Joe Gonzalez: A Guide for All (the right) Reasons

SUSAN COCKING & JERALD AULT

One of the most knowledgeable and accomplished light-tackle fishing guides on Biscayne Bay is Capt. Joe Gonzalez. The veteran Miami skiff guide, 50, is widely recognized by his peers and others for knowing what the bonefish are going to do before they do it. His instincts and intimate knowledge of the fish and the flats have made him an invaluable contributor to bonefish research.

Gonzalez works closely with Bonefish & Tarpon Trust (BTT) scientists Dr. Jerry Ault and Mike Larkin at the University of Miami's Rosenstiel School of Marine & Atmospheric Science, providing key assistance with the annual bonefish census, acoustic telemetry studies, and with the long-term anchor-tagging program. Gonzalez has tagged more "bones" than most of us will ever catch—about 1,500 over the past seven years.

"At first, I was skeptical and paranoid about giving the information, but it hasn't hurt me at all," Gonzalez said. "I think it's beneficial to learn about the fish's growth, survivorship and migration."

Gonzalez and the researchers he assists have learned a lot about bonefish over the past decade or so. From sampling otoliths (bony structures in the head used for balance) and counting the rings, much like counting the rings of a tree, they have learned that bonefish live at least 20 years. The oldest fish ever documented was about 21.

More than 8,300 tags inserted in bonefish since 1998 reveal their movements. Ault says the rate of recapture is about five percent—most within two to five miles of where they were tagged originally. But several have been recaptured more than 100 miles from their tagging location, and one of Gonzalez's fish—tagged in Biscayne Bay and at large for about 11 months—was recaptured in the middle bight of Andros Island in the Bahamas.

That particular bonefish excursion got everyone's attention, according to Gonzalez, "Everybody thought that Florida bonefish were only found in Florida and that the Bahamas fish were only in the Bahamas. They thought all these fish were different, separate bodies of fish," he said.

Another tagged by Capt. Ken Knudsen of Islamorada also wound up in Andros' Middle Bight. The next question becomes whether these fish reflect a regular occurrence or are just isolated fish with wanderlust.

The study of bonefish is important because the silver speedsters are a major component of Florida's $5.5 billion sport-fishing industry. Ault estimates each bonefish in Florida is worth about $3,500 per year to the industry or about $75,000 over its lifetime. The species supports everything from fishing tackle to flats boats.

The Florida Keys is renowned worldwide for its flats-fishing opportunities, including bonefish. But Gonzalez says the bonefishery in Biscayne Bay—though not as well known—can be just as productive, with 10 world-record bonefish and permit caught here on the doorstep of a major metropolitan area with three million residents. However, he says, "It's not an easy fishery."

"Many think of calm, slick water and sunny days to be the best conditions. But ask most guides and they would usually prefer some wind and low-light conditions," Gonzalez said. "I myself love fishing in strong winds. The fish drop their guard and eat flies well. They move better and feed hard."

Many guides complain that bonefish are spooked by Biscayne Bay's constant boat traffic. But Gonzalez says boat wakes can sometimes encourage bonefish to feed by flushing shrimp and crabs. "I'll be on the edges of the channels and the boats will come by and create a lot mud, but the fish are in the mud making mud," Gonzalez explained. "It's kind of weird telling my anglers to look for puffs of mud inside fresh mud, but when you find it, it's a gimme."

Guides from Miami to the Keys have expressed worry that they are not seeing as many bones on the flats as in previous years. Last January's extended cold wave was particularly lethal to tropical game fish species including tarpon, snook and bonefish, and to their prey. But Gonzalez still managed to locate bonefish for his customers.

"I fished hard for two weeks after the blast and the fishing was really good," the guide said. "It was somewhat of a relief to me and to others that there are still plenty of fish around. I believe that most of our larger outside fish ran offshore, probably to the Hawks Channel area, or deeper areas to take refuge when water temps dropped below 60 oF. So yes, the fishery is not as strong as it used to be, but we'll always be talking about how it used to be."

Ault and Gonzalez, out for a Biscayne Bay fishing trip Oct. 27 in the central and eastern areas of the bay, counted only 52 bones in five miles of poling. On previous outings, Ault said they counted more than 100 fish in the same area.

Ault says that one of the great challenges researchers face in calculating Florida's bonefish population is the lack of historical data, so data sets being developing by BTT are just the beginning.

Gonzalez's all-around expertise on bonefish recently led to an invitation, through the University of Miami, to fish the flats of Los Roques, Venezuela. He was invited to introduce the concept of tagging to the local guides. It was an eye-opening experience.

"The fishery down there, the different camps and lodges and guides, it isn't a happy place…folks don't get along," Gonzalez said. "As kind of an ambassador, because I speak the fishing lingo and Spanish fluently, I was able to travel there and make some peace between these guys and help everyone get on the same page and realize that by tagging bonefish, it is making the whole business down there a little bit more environmentally friendly. They were very receptive, and with me being a guide they were able to relate to me. It was a really positive good experience. They've started a tagging program and now they are beginning to estimate numbers, get growth rates, and mirror what we've done here."

After the challenges of urban Biscayne Bay, Gonzalez figured the Los Roques fishery would be a piece of cake. It wasn't.

"I'll tell you what, it was hard to get the fish to eat," he said. "When I was on my own … now, I know how to strip, I know how to feed a fish…I'd try it and they'd spook and I'd work with one of the guides and they knew how to read their fish better than I did because they were their fish."

For a veteran guide with more than two decades of experience, it was like starting all over again.

"It was crazy," he said. "It showed me that there are things you know from being on the water that are special and unique to each place."

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