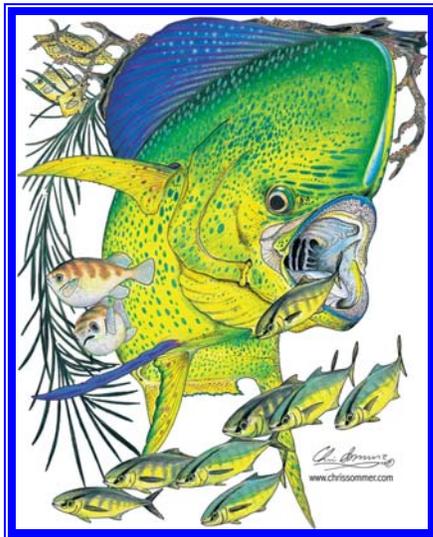


Cooperative Science Services, LLC Dolphin Tagging Research Project

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fish until July 2nd. The tag was only fifty miles from the fish's release site when it first contacted the satellite at a point just north of the Middle Isaac Bank in the Northwest Providence Channel in the Bahamas. The tag had drifted at the surface for only 5.3 hours before making contact with the satellite.

These smart-tags monitored the two fish for a total of 33.3 days, generating more than 9,000 time-sensitive observations that were transmitted via Argos back to the office for analysis. These time-specific observations paint a detailed picture of the fish's vertical movements in the water column (see figure that follows) and the temperatures that they traveled through. The subsequent tracks are the first hard data showing dolphin use more of the water column than previously suspected.

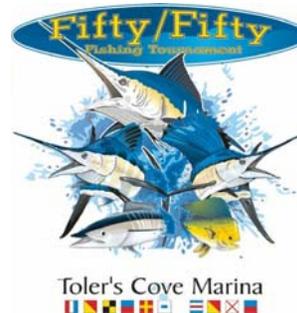
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Tracking Florida Bulls

This is the first of three articles reporting on the findings from the pop-off archival satellite tags that have been deployed on dolphin off the Eastern Seaboard. Readers should keep in mind that the results presented are from just a few fish that represent some of the largest and oldest members of the population whose behavior may differ from other size or age classes.

Thanks to the efforts of Capt. Richard DeLizza and the crew aboard his boat, *Rock Boat* out of Weston, Florida, science has its first hard data on dolphin behavior off South Florida. These fishermen were willing to give up the thrill of boating two 35-pound bull dolphins to aid science. They attached the new, hi-tech pop-off satellite archival tags to these fish before releasing them in the Straits of Florida. These instruments would record the surrounding water pressure and temperature every three to four minutes while attached to the fish. The miniature computers are programmed to release from the fish, float to the surface and relay the archived data via the Argos satellite system back to home base.

Capt. DeLizza's crew deployed the first tag May 10th, 2006, off Islamorada with the device staying with the fish for 10 days. After drifting for four days at the surface, the tag contacted the satellite at a point 330 miles north of the fish's release site on the eastern side of the Gulf Stream off Daytona. The second tracking device was placed on a bull just west of Bimini, Bahamas, on June 9th, 2006, with this instrument remaining with the



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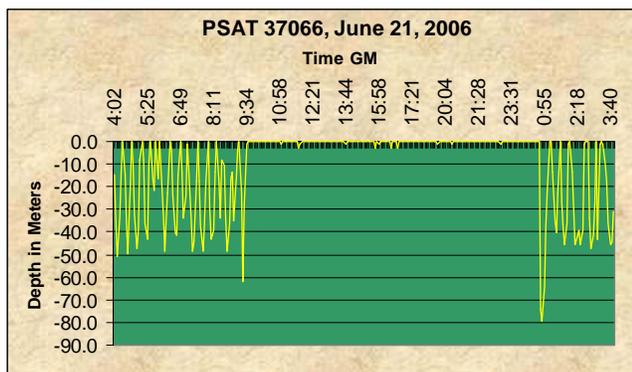
HH Reef Foundation/Dolphin Study

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Looking at the vertical movements, you are first struck by the great depths to which the fish would dive and then the stark difference in their diving behavior between day and night. The bull dolphin off Bimini dived to a maximum depth of 260 feet while the Islamorada bull descended even farther, reaching a depth of 309 feet below the surface. Surprisingly, both of these dives were made at night. As it turns out, dolphins make the majority of their deep dives during the night but always return to the surface at daybreak.



The daily track of a bull dolphin through the vertical water column off Bimini, Bahamas. The graph follows the fish from midnight to midnight on June 21st.

The picture that emerged from the data was that the fish spent 97% of the daylight hours within the top 10m of the surface but only 56% of the night time in the surface layer. These bulls spent far greater portion of the night time, 19%, at or below 30m. Only 5% of the daylight hours were spent at or below 30m. Deep dives were made on 28 of the 34 nights monitored but on only 9 of the 35 daylight periods in the study. A difference was also noted in the depth to which they dove with the average maximum depth being 148 feet during daylight and 184 feet at night. The fish averaged making 11 dives per night that averaged five minutes in length on the nights when they made deep descents. It was common for the fish to return to the same depth on consecutive dives and during the same night.

The two fish were observed to enter waters ranging from 71.6 to 87.6°F. As expected the warmest waters were encountered at the surface while the coldest waters were associated with the deeper dives. The range of temperatures utilized did vary between the two fish. The fish off Islamorada moved through waters of 71.6 to 84.4°F while the fish off Bimini stayed in waters of 75.6 to 87.6°F. Some of this difference could be from the normal seasonal warming of the water. Neither fish would linger in waters at or below 77°F.

Knowing that dolphins spend the majority of their lies at or near the surface, and that this is where fishermen

pursue them, makes their surface temperature selections very important from the angler's perspective. Surface water temperatures occupied by the two fish did vary, but some of the change could be the result of the normal increase in ocean surface temperatures during the interval between the monitoring events. With a May 10th deployment, the bull off Islamorada utilized surface waters from 76.6 to 84.4°F preferring waters around 81.1°F. The second bull released on June 9th off Bimini preferred waters of 83.8°F but traveled through surface waters ranging from 79.7 to 87.6°F.

This segment of the study confirmed that dolphinfish off Florida are principally surface-fish, spending more than 80% of their time in the surface layer. These two fish have shown that dolphins use a much larger portion of the water column than science suspected, at least down to 300 feet deep. Surprisingly, dolphins were found to frequent the deeper layers mostly during the night. While these bulls would travel through waters with temperatures of 71.6 to 87.6°F, they spent the most time in surface waters that were 81 to 84°F.



Sargassum and Dolphin: Is there a link?

Offshore fishermen as well as fishery managers have recognized for many years the important role the floating seaweed, sargassum, plays in the life of many game fish, sea turtles and other marine life. This floating, golden-brown alga is a product of the Sargasso Sea which makes up the central portion of the North Atlantic Ocean. The algae provides important habitat throughout the Caribbean Sea, Gulf of Mexico and western North Atlantic Ocean. The vast mats and lines formed in the Gulf Stream and other offshore waters provide important shelter for small animals to hide from predators as well as a productive site to hunt for food. In most cases, it is the only shelter regularly available to marine life in the vast expanses of open water in the North Atlantic.

Those people who have dip-netted a clump of sargassum have seen the myriad of shrimp, crabs, filefish, jacks, seahorses and other sea life that call it home. A fish common to this mix is the dolphin. This species has been associated with the sargassum community more than any other game fish. Fishermen and fishery managers alike hold the presence of

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sargassum synonymous with the occurrence of dolphin. Yet little scientific data exist that document the actual relationship between this prolific ocean algae and the occurrence of dolphinfish.

The 2006 Dolphin Tagging Study initiated an effort to collect information on the presence of sargassum for each dolphin tagged. As a result, participating anglers provided information on the presence/absence of sargassum for 93% of the dolphinfish tagged. Data from the 1,385 tagged-fish reported on, have begun to reveal the importance of this drifting habitat for the species. However, the relationship between the two may not be as clear as generally perceived. After all, how is the bias from the increased catch by fishermen who stop to fish a school found around sargassum filtered to give an accurate comparison?

If you consider the catch of a dolphin to be a "successful encounter," then 76% of the successful encounters occurred in the presence of sargassum when all areas were combined. However, the proportion of fish caught in association with the algae did vary with geographic region. When just those fish tagged along the East Coast are considered, then 79% of the successful encounters with dolphin were in areas where sargassum was present. An even higher incidence of fish caught around sargassum was observed off the Florida East Coast where 82% of the successful encounters were near the floating alga. However, the importance of sargassum was not nearly as great off the remainder of the US East Coast where 56% of the successful encounters were in the proximity of the golden habitat.

One way to eliminate some of the catch bias is to summarize the data on a date- and site specific basis. In other words, treat all fish captured at a single location on the same day as a single event. Then compare the number of events with two or fewer fish and those with three or more between the two habitat types. This would reduce single-location events where 3 fish or even 70 fish were caught to an equal value. Under this analysis the full data set showed that 1.9 times more one to two fish catch-location events occurred in areas with sargassum. More importantly, 3.5 times more three-plus-fish catch-location events occurred around the bronze algae than in open water. Data for the coast of Florida showed a similar higher ratio, 3.4 times higher, for the three-plus fish catch-locations in the vicinity of sargassum but exhibited a higher occurrence, 2.3 times greater, of one to two fish catch-locations around the algae than in open water.

Another point to be considered in judging an area's productivity is the average number of fish caught per catch-location. When one to two fish catch-locations were compared between open water areas and those with sargassum, no difference was found in the average number of fish caught, 1.2 fish, per catch-location. There

was, however, a marked difference between areas when the catch rates for three-plus fish catch-locations were compared. The average number of fish caught per catch-location in proximity to sargassum, 9.0 fish, was 1.6 times higher than the average for open-water areas, which had an average of 5.7 fish per catch-location.

The results show that three-quarters of the fish in the study were captured near sargassum. Fishermen in the vicinity of floating habitat had almost twice as many successful one or two fish encounters with dolphin as anglers fishing open-water. Anglers fishing around the golden weed were 1.6 times more likely to catch three or more fish per catch-location than fishermen working open water. And finally when anglers did strike a high-multiple catch-location, they caught 1.6 times more fish on average.

These limited data provide the first quantified examination of dolphin capture in relation to the presence of sargassum. Preliminary results provide the beginning of a data base that supports what fishermen have believed all along: you catch more dolphin when there is sargassum. While this is a beginning, it will require several more years of work by offshore fishermen to amass a sufficiently large data base to clearly define the importance of sargassum to the abundance of dolphin.

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Your Financial Support is Needed

The CSS Dolphin Tagging Study is beginning its second year as a private research program. The fledgling program was successful from every perspective during its first year. More than 250 anglers from 22 states participated in the project during 2006. These fishermen utilized 143 vessels from Montauk, New York, to Sugarland, Texas, to support this study. The research program signed up 69 additional offshore boat owners to tag fish in 2006. This makes more than 950 boat owners and anglers who have registered to tag dolphin for the study. Their efforts resulted in 1,510 dolphin being tagged in 2006 and a record number of tag recoveries being reported, 44 tag recaptures, during the year. Even

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financially it was successful, receiving donations totaling \$55,000 from individuals, fishing organizations, businesses and conservation foundations.

The target budget for 2007 is only slightly higher at \$56,600. This budget will provide funding to continue the intense tagging in the South Atlantic Bight and an attempt to expand the tagging in the Gulf of Mexico and Mid-Atlantic Bight. The project will encourage a special tagging effort in to determine the existence of a fall southerly movement in south Florida. Information on the affiliation of dolphin with Sargassum will continue to be collected. It also provides funding needed to carry out the first phase of a project to identify the origins of dolphinfish entering U.S. Territorial Waters. Sponsored in part by an individual and a private foundation, the first phase is a research cruise into the Yucatan Strait. This phase will attempt to tag 200 to 300 dolphinfish during their northward migration in the western Caribbean. The project also plans to conduct a pilot assessment using tagging data to identify East Coast occurrence of dolphinfish, geographic areas of importance to the species and primary recreational fishing grounds for this important game fish. CSS personnel will also be deploying three satellite tags on dolphin off the Carolinas under a separate project with the Hilton Head Reef Foundation and the South Carolina Sea Grant Consortium.

As you can see, the objectives for the 2007 Dolphinfish Research Program are very ambitious. Not only is the program ambitious . . . it is also a cost-effective research effort. No academic institution or government agency could carry out the same level of work for the same actual costs. This program represents a viable alternative that conservation-minded anglers and organizations have at their disposal in addressing important fisheries issues when government cannot or will not respond.

I hope that you will give positive consideration to donating to the CSS Dolphinfish Research Program to ensure this important work continues in 2007. Donations should be made out to the Hilton Head Reef Foundation (HHR Foundation/Dolphin Study) and sent to the address below. The Hilton Head Reef Foundation is a registered 501 (c) 3 organization and all donations are fully tax-deductible.



Photo courtesy of Jim Goller

This research program is working to gather information to help ensure that great fishing days such as shown above will not become just a memory.



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