

Made possible by a grant from the Guy Harvey Ocean Foundation August 2017



#### A Fish that Almost Completed the Circle

It was just 14 miles southwest of where the dolphinfish had been released more than eight months earlier that its journey came to an end. Having swum thousands and thousands of miles during its 263-day migration, it came to within just hours of completing a full circle. This is the fourth over-winter recovery of a dolphin tagged in 2016 off the U.S. Atlantic Coast to be recovered and one of very few that came so close to completing the full migration circuit.

This story started on August 6, 2016, off Key Largo, Florida, when Capt. Ed Kattel tagged the fish during a trip aboard the *Cool Cat*. The fish was released 17.5 miles southeast of Key Largo, Florida, at the northern end of the Keys. This fish was one of 14 that the *Cool Cat* crew tagged that day and was one of seven fish tagged in its school. It was estimated to be 19 inches in fork length when tagged.

The fish was recovered by Laura Struve on April 26, 2017, off Islamorada, Florida, during a fishing trip with Bud & Mary's Charters. This fish was reported to be the largest one of the day. The fish was estimated to be 38 inches in length when recovered.

This fish was at liberty for 8.75 months, so the question becomes how far did it swim and where did it travel during that time? We were able to document that another dolphin that we tracked with a satellite tag for six months had swum at least 8,100 in straight-line distance during the monitoring period. The satellite tagged fish averaged traveling 45 straight-line miles each day. While there is no way of knowing where this new fish had traveled, it could easily have covered a distance in excess of the 4,000 miles required to circumnavigate the Sargasso Sea. The estimated sizes for this fish at release and recapture suggest that it had grown 19 inches in length or just over two inches per month. This is well short of the 27 inches of growth suggested for a fish earlier this year out for 7.9 months, but the difference could simply be individual variation or just the difference in growth between the sexes.



Tags need to be deeply embedded in the dorsal musculature of the fish for the tag to remain with the fish for extended periods, increasing the chances of it being recaptured.

## Increase in Tagging Results in Recaptures

A big surge in the number of fish being tagged in the Florida Keys began in early June and immediately resulted in numerous tag recoveries being reported. Up until June, a total of just 84 dolphin had been tagged in 2017. During June the Keys' tagging activity shifted into high gear, resulting in a total 484 dolphin tagged that month. The surge started on June 9, when the crew of Don Gates' boat *Killin Time II* tagged 62 fish. This one day's effort resulted in three of their fish being recaptured the very next day an average of 47 miles north of where they were released. Fish tagged by the crew of the *Killin Time II* would go on to account for 15 tag recoveries.

Following the recovery of the fish just reported on that nearly completed its migratory circle, there have been 23 tagged fish reported recovered. Twenty of these fish were tagged off the Florida Keys, two off south Florida, and one off Cape Hatteras, North Carolina. Of the fish tagged in

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Florida and later recaptured, 19 were recovered before they got out of state. Only three fish were recovered outside of Florida and all were caught off Cape Hatteras, North Carolina. One fish tagged off Cape Hatteras was recovered off Oregon Inlet, North Carolina.

Over the course of this study fish tagged off Florida and recovered before leaving the state have averaged traveling at the rate of 26.8 miles per day. The 2017 Florida instate recoveries averaged traveling north at 44.0 miles per day. This indicates that this year's fish were traveling northward at a speed that was 64 percent faster than they have averaged in the past. This is likely the result of a faster flow rate for the Florida current traveling past Florida's east coast.

Boats responsible for tagging the 23 fish recaptured.

		Their Fish			
Boat	Captain	Recaptured			
Killin Time II	Don Gates	15			
Cool Cat	Ed Kattel	2			
Wam Jam	Dave Wamer	2			
Rock Boat	Richard DeLizza	1			
Will Power	Will Cathey	1			
Grady Daze	Richard Cook	1			
Mi Vida	Michael Stoklosa	1			

Examining the liberty periods for the Florida instate recoveries, we see that 52 percent, 10 fish, were recaptured the next day and eight of the fish were at liberty less than a week. Only one fish recovered off Florida was out for more than a week and it was at liberty for 18 days moving at the surprisingly slow rate of 5.6 miles per day. All of the instate recoveries took place between Marathon and Ft. Pierce. A point that should not be overlooked is the fact that 86 percent of the fish tagged off Florida and later recovered were recaptured before the fish could leave Florida. This is a good indication of the heavy fishing pressure applied to dolphin off the Florida east coast and the importance of the dolphinfish stock to the Florida offshore recreational fishery.

Three fish tagged off the Keys did make it out-of-state before they were recaptured off Cape Hatteras. Two of the fish were tagged by the crew of the *Killin Time II* and the other by the crew of Richard DeLizza's boat, *Rock Boat*. These fish were at liberty for an average of 24 days and averaged traveling 38 miles northward each day. While fish making this trip in the past have exhibited travel rates as fast 93 miles per day, the average rate has been 26.5 miles per day. This shows that the out-of-state recoveries also exhibited elevated travel speeds that were 43 percent above the average rate. So virtually all of the fish tagged off the east coast of Florida that were later recaptured displayed travel rates well above those normally seen. The last tag recovery during this period is a stark reminder that dolphinfish do not behave the same everywhere they occur. This tag recovery story takes place off North Carolina's Outer Banks. The fish was tagged by Capt. Will Cathey's crew aboard his boat the Will Power off Cape Hatteras in early June. On July 4, 28 days after being tagged, the fish was recaptured off Oregon Inlet, roughly 70 miles away from its release site. This means that this fish had averaged traveling only 2.5 miles to the northeast per day. This fish took longer to move 70 miles, than the three Florida fish to travel 800 to 900 miles. This suggests that while dolphin are in their traveling mode off Florida's east coast and for that matter off Georgia and South Carolina, when they reach the Outer Banks region they could be ready to kick-back and linger a spell. That certainly gives the Tar Heel anglers a big advantage over the rest of the anglers in the South Atlantic Bight.

# Dolphinfish Research Program

## Migration and life stage size progression through dolphin tagging data

One of the single most important pieces of information to collect when tagging and releasing dolphin, besides accurate release coordinates and sex, is a measured fork length. While anglers participating in the Dolphinfish Research Program should always strive to collect accurate release information they should also place an emphasis on collecting precise fork lengths because the information gleaned from that additional effort can be key to describing additional information about this species. Tagging data is increasingly being used to model the growth of many pelagic fish including yellowfin, bigeye, and skipjack tuna, when the size at recapture, release, and days at large are known. When these data points are known, they can be used to estimate growth parameters known as  $L_{\infty}$ (asymptotic length) and K (rate at which  $L\infty$  is approached). These growth parameters can then be used to estimate growth through modifications of the von Bertalanffy growth model (VBGM). In the past, dolphin growth has largely been inferred through analysis of hard parts (i.e., daily otolith checks or scale annuli) or progression in size frequency, and never through analysis of tagging data. We are now using the DRP dataset to model growth and in this article I would like to show you why. Let's take for example a portion of the DRP's dataset from 2002 to 2014 and examine the growth of fish that were recaptured outside U.S. mainland waters in the western and central Atlantic and Caribbean Sea. During this time period there were 17 international recoveries that had either measured or estimated fork lengths for both the tagging and recapture events. These movements and growth rates are shared in a series of tables and figures below.

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## Dolphinfish Movements



## Dolphinfish Growth Rates Obtained through Tagging Data

Days Liberty	Release Size (FL in mm)	Recapture Size (FL in mm)	Growth Rate (mm/d)	Recapture
45	460 m	530 m	1.56	Freeport, BA
159	460 e	900 m	2.77	Bahia de Baracoa, Cuba
192	460 e	710 e	1.30	Puerto Plata, D.R.
223	480 e	1070 e	2.65	N. Exuma Sound, BA
229	530 m	1150 m	2.71	Santa Cruz Del Norte, Cuba
241	640 m	1200 m	2.32	534 miles SW of Azores
252	410 m	1250 m	3.33	Bahia De Gibara, Cuba
309	510 m	1350 m	2.72	Rum Cay, BA
318	430 m	990 m	1.76	Long Island, BA
	e-estimated m-measured	e-estimated m-measured		

Days	Release	Recapture	Growth Rate	Recapture
Liberty	Size (FL in mm)	Size (FL in mm)	(mm/d)	Location
230	560 e	1040 e	2.09	Antigua, West indies
231	480 e	1020 e	2.34	La Parguera, Puerto Rico
246	510 m	1220 m	2.89	La Parguera, Puerto Rico
256	640 e	970 e	1.29	St. Barthelemy - F.W.I.
263	610 e	1270 e	2.51	Choroni, Venezuala
330	610 m	1040 e	1.30	Majahaul, Mexico
341	460 m	1070 m	1.79	Bassaterre, St. Kitts
557	640 e	1250 e	1.10	La Parquera, Puerto Rico
	e-estimated	e-estimated		

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The figures and tables above illustrate mark and recapture movements around the western and central north Atlantic and Caribbean Sea. The measurements between the mark and recapture locations were used to obtain growth rates. These growth rates were then compared to growth rates obtained through analysis of scales, otoliths (fish ear bones), and progression in size frequency data from previous studies covering 50 years of scientific research. This preliminary analysis shows that the

Captured Dolphinfish Growth Rates						
Data Source	Growth Rate (mm/d)	No. of Fish	Location	Aging Method		
This study	2.14 FL	17 Transient WCA and Caribbean Sea		Tagging Data		
Beardsley (1967)	1.99 FL	121	Florida Current	Scale annuli		
Rose and Hassler (1968)	1.56 FL	593	North Carolina	Scale annuli		
Oxenford and Hunte (1983)	1.43 SL	25	Barbados	Daily otolith checks		
Oxenford and Hunte (1983)	1.53 SL	1084	Barbados	Daily otolith checks		
Oxenford and Hunte (1983)	4.71 SL	50	Barbados	Daily otolith checks		
Murray (1985)	1.78 FL	2953	St. Lucia	Progression in size frequency		
Bentivoglio (1988)	0.49 SL	19	Gulf of Mexico	Daily otolith checks		
Bentivoglio (1988)	3.88 SL	81	Gulf of Mexico	Daily otolith checks		
Uchiyama et al. (1986)	3.19 SL	11	Hawaii	Daily otolith checks		
Rivera Betancourt (1994)	2.52 FL	121	Puerto Rico	Daily otolith checks		
Rivera and Appeldoorn (2000)	3.31 SL	121	Puerto Rico	Daily otolith checks		
Schwenke and Buckel (2007)	3.78 FL	107	North Carolina	Daily otolith checks		

average growth obtained through our tagging data (2.14 millimeters per day = 0.08 inches per day or 0.56 inches per week) is exactly in the middle of the range of growth rates obtained from previous studies. It is widely known that dolphin grow pretty fast but an average growth rate of more than one half inch per week is amazing! This means that for each month a dolphin is at liberty it is on average going to grow more than two inches. One point to emphasize here that might not be evidently clear is that all of the dolphinfish used in this analysis were released as juveniles along the east coast and recaptured as adults elsewhere. This represents an increase in biomass exchange between mark and recapture locations and highlights a superb opportunity for DRP anglers to go that extra mile to accurately measure their fish before releasing it, which ultimately allows allow our team to further explore using the DRP dataset to model dolphin growth and regional exchange of dolphin biomass. As more growth data are obtained for dolphin through tagging data, we intend to apply this model to these data in order to more properly estimate the age composition of dolphin catch, estimate size specific fishing mortality, and enhance regional biomass exchange estimates. These preliminary results are fascinating and would not have been obtained without the dedicated captains and crews that participate in the Dolphinfish Research Program listed below.

Table 1 A total of 28 vessels and 31 anglers contributed to the collection of data used in this growth analysis.

Vessel Name	Taggers or Captain	Their Fish Recaptured	Reporting Vessel Name(s)	Reporter(s)
Killin' Time II	G. Lasater, D. Gates, D. Williams	3	Reel Excuse; Sea Quest; Fish On	L. Shaughnessy; T. Peets; B. Mackay
Bouncer's Dusky	R. Smith	2	Patsea VII; Gole	A. Sturges; R. Zario
Draggin' Dreams	J. Brown	2	unknown	R. Rodriquez; J Carralero Pineda
Thomas Flyer	R. Thomas	2	Doris; Lucero	L. Jimenez; A. Alonso
Castaway	unknown	1	unknown	J. Mejuto
Farmers Tan	T. Scofield	1	Tauro	R. Vizcaino
Hammerhead 2	B. Stull	1	H20	B. Nunes
Mad Fin	P. Brownell	1	unknown	R. Greaux
Miss Pasco	B. Morrill	1	Sin Prisa	C. Pou
Sea Witch	M. Mitchell	1	unknown	A. Alfonso
Summer Girl	R. Hooker	1	La Ravanca	C. Sauce
No Name	M. Parramore	1	No Vacansea	K. Cote

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### Dolphinfish Research Program to address Caribbean Fishery Management Council

On August 15, the DRP will present 16 years of research to the Caribbean Fishery Management Council as the Council convenes for their 160<sup>th</sup> regular meeting. At this meeting, the Council



will discuss the importance of dolphin to fishery stakeholders in the U.S. Caribbean. I will provide an overview of what was discussed in the next newsletter.

## Dolphinfish Research Program now Supported by the Beyond Our Shores Foundation



With Don Hammond heading into retirement I founded Beyond Our Shores, a 501(c)(3) nonprofit to provide financial, accounting, marketing, and scientific support to the Dolphinfish Research Program. In helping the DRP continue to

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thrive and expand, we ask that you kindly offer your financial support. Fishing clubs, fishing industry representatives or individuals who are interested in supporting the Dolphinfish Research Program should contact wess@beyondourshores.org or mail checks to Beyond Our Shores PO Box 662, Rockville, MD, 20848. You can contact me directly at (787) 436-8300. Through your dedicated efforts and sacrifices, dolphin were tagged from Key West to Nantucket Island, in the Bahamas, throughout the Caribbean Sea, the Gulf of Mexico, and off Southern California and Central America. Now the future of this program is in your hands.

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