

MID-ATLANTIC
\$500,000

Billfish Research and Management News



Summer 2012

Photo by Ken Neill

For the past 20 years my colleagues and I have been taking advantage of the fish brought to the weigh stations at the Mid-Atlantic \$500,000 to collect samples for our research projects. As in years past, I'd like to take this opportunity to provide you with an overview of some of our research, an update on international management of billfish, and a summary of the Mid-Atlantic \$500,000 Tournament statistics. In this year's newsletter I've included a description of a study that Emily Loose, a graduate student in my lab, and I are doing to investigate possible ecological differences between roundscale spearfish and white marlin. Back in the lab at the Virginia Institute of Marine Science (VIMS) other ongoing projects include a genetic investigation of the population structure of roundscale spearfish, comparing robust sample collections from the U.S. mid-Atlantic and equatorial waters off Brazil. We are also using genetic techniques, as well as the analysis of organochlorine pollutants, to investigate the

population structure and movements of Atlantic bluefin tuna. Other projects include the use of pop-up satellite archival tags to estimate post-release survival of school size bluefin tuna caught in the recreational troll fishery, the role of physiological stress in the post-release mortality of billfish, the population structure of the cownose ray, feeding habits of mesopelagic fishes along the Mid-Atlantic Ridge, and the efficiency of fish bycatch reduction devices in the shrimp trawl fishery.

If you would like to know more about any of our research projects, domestic or international management of billfish, or graduate education in marine science, please drop by to talk. I'll be down at the Canyon Club weigh station in the early evenings and under the tent after that and my colleague Dr. Jan McDowell will be at the Ocean City weigh station. We'd love to meet you.

Tight lines!

A handwritten signature in black ink, appearing to read "John", is written in a cursive style.

John Graves
Professor of Marine Science
Virginia Institute of Marine Science
College of William & Mary
Gloucester Point, Virginia 23062
email: graves@vims.edu
(804) 684-7352



VIMS | **WILLIAM
& MARY**
VIRGINIA INSTITUTE OF MARINE SCIENCE

www.vims.edu

Roundscale Spearfish and White Marlin

Burying the Hatchet (Marlin). When I came to the first Mid-Atlantic \$500,000 in 1992 to collect tissue samples of white marlin and blue marlin at the weigh station for genetic studies, a few anglers asked me about the hatchet marlin: “Is it a separate species, a morphological variant of the white marlin, or a hybrid of a white marlin and spearfish?” I didn’t have an answer—having recently moved from the west coast I had never heard of a hatchet marlin. Returning to my lab, I read Nakamura’s 1985 review of the billfishes in which he recognized blue marlin, white marlin, longbill spearfish, Mediterranean spearfish, and sailfish in the Atlantic. He also included the roundscale spearfish, a billfish that is morphologically very similar to white marlin, and was reported to occur in the eastern Atlantic. However, Nakamura noted that the taxonomic status of the roundscale spearfish was “still somewhat uncertain” and that “further study is strongly needed to clarify the validity of this species.” In addition, Nakamura discussed the “hatchet marlin,” a fish that looks like a white marlin but has truncated dorsal and anal fins, and was reported from the western Atlantic. It was not known whether the hatchet marlin was a morphological variant of the white marlin or a new species. Nakamura concluded that “a final decision on the status of the hatchet marlin cannot be made at this time and further study on this problem is urgently needed.”

Trying to unravel the identities of the roundscale spearfish and hatchet marlin has not been an easy task. For starters, the roundscale spearfish was originally described by Lowe in 1840 from a single specimen collected off the Island of Madeira in the eastern Atlantic, but that specimen no longer exists. And many of Lowe’s manuscripts were lost in the 1874 shipwreck that also claimed his life. The existence of the roundscale spearfish was questioned by various authors over the years, and the validity of the species was only confirmed in 2006 with genetic techniques. The hatchet marlin has never been formally described and genetic analyses of fish landed at the Mid-Atlantic \$500,000 demonstrated that some hatchet marlin were roundscale spearfish and others were white marlin. So the hatchet marlin is not a separate species. The truncated fins are simply a morphological variation that can occur in roundscale spearfish and white marlin.

The “rediscovery” of the roundscale spearfish, and the realization that it occurs throughout the Atlantic has been exciting, but it has created a few problems and generated lots of questions. How good are historical catch records? How many of the “white marlin” landings are actually roundscale spearfish? Are roundscale spearfish misidentified as other species? Does the relative abundance of white marlin and roundscale spearfish vary by geographic area,



White marlin.



Roundscale spearfish.

Photos by Ken Neill

season, year? Recognizing this uncertainty, when the International Commission for the Conservation of Atlantic Tunas (ICCAT) assessed “white marlin” in May of this year, they combined reported landings of white marlin, roundscale spearfish, longbill spearfish, and Mediterranean spearfish into a single group, and assessed the entire complex.

Clearly, white marlin and roundscale spearfish are morphologically similar. Are they ecologically similar as well? Inasmuch as we didn’t know there were two species out there until recently, there are very few studies on roundscale spearfish, and many of the studies conducted on white marlin in the past may have included roundscale spearfish. To help clarify the situation, Emily Loose, a graduate student in my program at VIMS, is investigating differences in the movements and habitat utilization of white marlin and roundscale spearfish in the mid-Atlantic for her thesis research.

Differential movements of white marlin and roundscale spearfish. Recent studies of pelagic longline fishery observer data have shown that the relative abundance of roundscale spearfish and white marlin varies over space and time in the western North Atlantic. For example, U.S. pelagic longline observer data indicate that in the Sargasso Sea, roundscale spearfish are much more prevalent

than white marlin during the winter months, but the opposite is true during the summer. Similarly, Venezuelan observer data show a change in the relative abundance of the two species in the northern Caribbean between winter and summer.

On a more local level, genetic analysis of 20 years of tissue samples from “white marlin” landed at the Mid-Atlantic \$500,000 indicates an increase in relative abundance of roundscale spearfish from the 1990s to the 2000s, as well as large annual variations over the last decade. For the 1992-2000 tournaments, only 2.1% of the “white marlin” brought to the weigh station were roundscale spearfish. From 2002-2011, the frequency of roundscale spearfish increased to 33% (see Table 1). It is important to remember that only the largest 5% of “white marlin” are landed at the Mid-Atlantic \$500,000, and these fish are taken in a limited geographic area during a single week each year, so it is a very limited and potentially biased sample. Still, these data, together with the pelagic longline studies, suggest differential seasonal and geographical distributions and movements of roundscale spearfish and white marlin in the western North Atlantic.

Pop-Up Satellite Tagging. To better understand the dynamics of the movements of roundscale spearfish and white marlin in

the mid-Atlantic region, and to get data on habitat utilization, Emily planned to put out six long-term pop-up satellite tags on roundscale spearfish and six on white marlin. To ensure that the tags were collecting information over the same time period, she wanted to alternate species, tagging a white marlin, then a

Table 1. Mid-Atlantic \$500,000 Tournament White Marlin/Roundscale Spearfish Catches.

Year	WHM	SPG	% SPG	Year	WHM	SPG	% SPG
1992	13	0	0	2004	12	2	14.3
1993	18	2	10.0	2005	4	10	71.4
1994	21	0	0	2006	11	3	21.4
1995	10	0	0	2007	16	7	30.4
1996	18	0	0	2008	29	2	6.5
1998	11	0	0	2009	24	4	14.3
2000	3	0	0	2010	13	17	56.7
2002	6	3	33.3	2011	10	6	37.5
2003	9	3	25				

WHM = white marlin
SPG= roundscale spearfish

1992 - 2000 *2.1%*
2002 - 2011 *33.0%*
1992 - 2011 *22.6%*

Continued on page 6

Mid-Atlantic \$500,000

Winning Fish (weight in lbs.)

		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
White Marlin	1st	86	69	69	69	77	89	74	78	68	69	75	91	75	77
	2nd	83	68	65	68	69	76	71	67	61	63	61	79	74	61
	3rd	76	61	65	64	66	72	68	63	---	63	60	79	71	61
Blue Marlin	1st	466	615	586	746	455	748	534	522	566	578	558	433	518	690
	2nd	384	488	542	660	410	493	468	480	476	421	---	---	---	520
	3rd	359	435	522	519	407	448	412	464	---	---	---	---	---	410
Tuna	1st	109	254	242	205	153	120	221	204	172	114	147	82	182	190
	2nd	102	218	213	166	142	103	181	185	153	114	136	72	150	70
	3rd	95	200	139	108	126	99	105	185	141	112	81	61	132	60
Dolphin	1st	36	42	53	33	34	33	33	43	39	29	34	43	44	40
Wahoo	1st	44	67	73	47	79	69	38	72	86	76	75	95	58.5	70

Billfish Releases

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
White Marlin														
Boated	15	20	23	16	18	13	10	14	3	10	10	13	14	1
Released	84	136	174	177	153	124	231	432	58	220	182	144	313	24
% Released	85%	87%	88%	92%	89%	91%	96%	97%	95%	96%	95%	92%	96%	95%
Blue Marlin														
Boated	9	7	11	14	7	15	8	10	2	3	3	4	3	
Released	3	8	13	16	11	26	17	29	32	10	18	15	22	2
% Released	25%	53%	54%	53%	61%	63%	68%	74%	94%	77%	86%	79%	88%	84%

Catch Per Unit Effort (CPUE)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
White Marlin														
# Fish Caught	99	156	197	193	171	137	241	446	62	203	192	157	327	25
# Boats x # Days	393	408	426	417	435	381	393	411	399	378	393	384	429	50
CPUE (fish/boat-day)	0.25	0.38	0.46	0.46	0.39	0.34	0.61	1.09	0.15	0.61	0.49	0.41	0.76	0.5
Blue Marlin														
# Fish Caught	12	15	24	30	18	41	25	39	34	13	21	19	25	3
# Boats x # Days	393	408	426	417	435	381	393	411	399	378	393	384	429	50
CPUE (fish/boat-day)	0.03	0.04	0.06	0.07	0.04	0.11	0.06	0.09	0.09	0.03	0.05	0.05	0.06	0.0
Marlin/Boat-Day	0.28	0.42	0.52	0.53	0.43	0.45	0.67	1.18	0.24	0.64	0.54	0.46	0.82	0.5

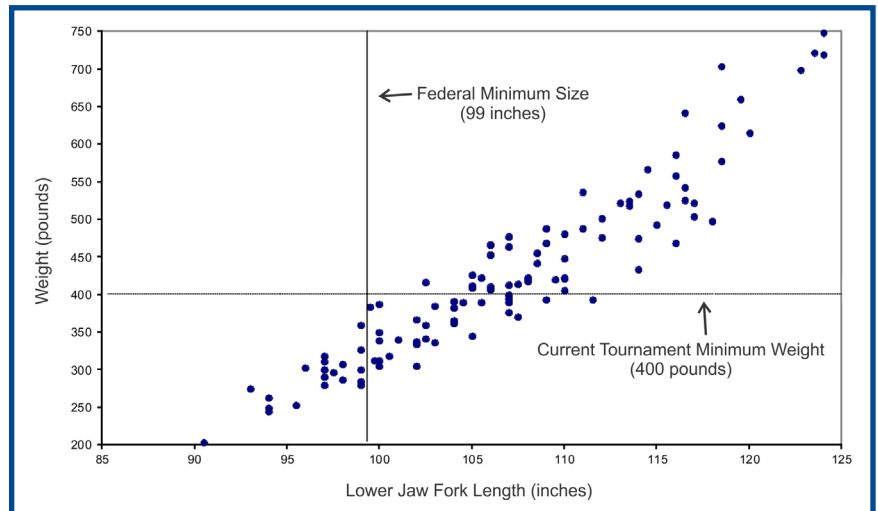
00 — Facts & Figures

	2006	2007	2008	2009	2010	2011
5	88	92	92	95	88	82
8	79	77	88	78	88	76
7	77	69	79	78	82	75
9	722	536	719	453	---	565
5	641	524	625	---	---	498
8	469	414	501	---	---	494
3	184	212	80	69	177	148
8	123	172	78	69	105	71
0	118	168	77	67	84	63
7	44	39	43	37	56	53
4	93	77	74	97	49	50

	2006	2007	2008	2009	2010	2011
4	18	23	31	28	31	21
4	444	274	423	322	526	442
%	96%	92%	93%	92%	94%	95%
	2006	2007	2008	2009	2010	2011
5	6	3	3	2	2	5
5	19	23	11	14	11	17
%	76%	88%	79%	88%	85%	77%

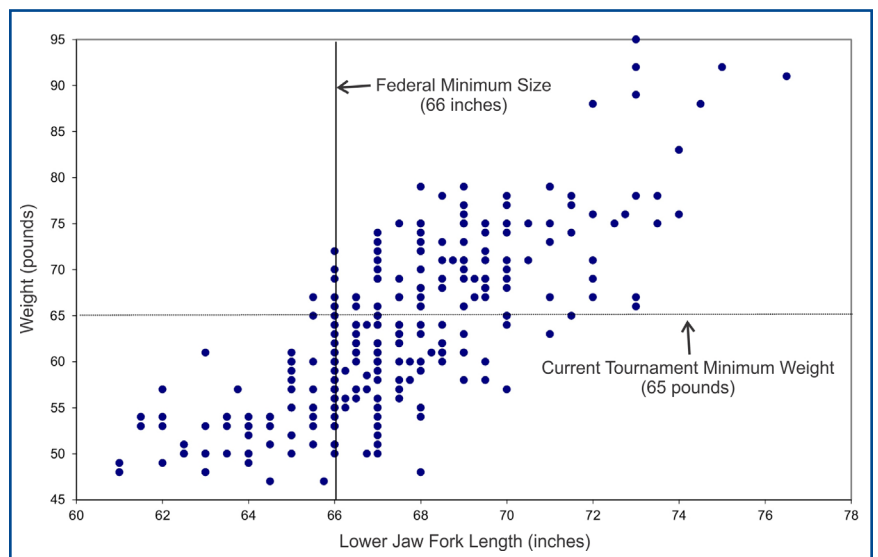
	2006	2007	2008	2009	2010	2011
8	462	297	454	350	557	463
7	528	462	423	408	402	287
1	0.87	0.64	1.07	0.86	1.39	1.61
	2006	2007	2008	2009	2010	2011
1	25	26	14	16	13	22
7	528	462	423	408	402	287
6	0.05	0.06	0.03	0.04	0.03	0.08
7	0.92	0.70	1.10	0.90	1.42	1.69

Blue Marlin Length-Weight Relationships (1992-2011)



There is a good relationship between length and weight for blue marlin. Fish need to be about 5 inches over the federal minimum size of 99 inches lower jaw fork length (LJFL) in order to meet the tournament minimum weight of 400 pounds. It's a different story for white marlin. The federal minimum size is 66 inches LJFL, but white marlin landed at the Mid-Atlantic \$500,000 with a LJFL of 67 inches have weighed anywhere from 51 to 74 pounds! The best way to tell if a legal white marlin will make the tournament minimum weight is to see if it "carries the weight" all the way to the tail. *Long, thin fish won't make weight!*

White Marlin Length-Weight Relationships (1992-2011)



continued from page 3

roundscale spearfish, etc. In addition, Emily recruited recreational vessels to keep track of the number of white marlin and roundscale spearfish they caught, to get an idea of how the relative abundance of the two species varies over space and time in the mid-Atlantic. It was a good plan, but like many good plans, it did not escape Murphy's Law.

Emily received her satellite tags in early August last year and was able to get the first tag out on a white marlin on August 13th, shortly before she came up to the Mid-Atlantic \$500,000. Tagging a roundscale spearfish didn't seem like it would be too much of a challenge as 37.5% of the "white marlin" brought to the weigh station at last year's tournament were roundscale spearfish. However, last year's tournament ended a day early due to Hurricane Irene, and after the blow, roundscale spearfish were not to be found. Following Hurricane Irene, Emily observed 81 white marlin catches and only one roundscale spearfish, which she tagged on September 10th. She tagged a white marlin the next day, and after that, it was only white marlin for the rest of the season. Yes, the two species appear to have differential movements!

The three tags that Emily deployed last summer were programmed to release after 12 months, but it is rare for a satellite tag to stay on a billfish for long durations. Premature releases are the norm. The tag on the roundscale spearfish popped up after 35 days, the first white marlin tag popped up after 325 days, and the tag on the second white marlin is still attached and scheduled to pop up on September 11th. Although a very limited sample size, the two tags do provide some interesting insights into the behavior of these two fish.

The straight line movements of the roundscale spearfish and white marlin are presented in Figure 1 (below). In 35 days, the roundscale spearfish moved almost 800 mi due east at about latitude 40°N, a little more than one-third of the distance to the Azores. In contrast, the white marlin's straight line displacement was also approximately 800 mi, but this was over a period of 325 days. Using light-based geolocation algorithms to look at movement over time, it is apparent that this white marlin remained in the general vicinity in which it was released, around 35° N and between 70° and 78° W, until early May, at which time it moved due east from longitude 78° W to 60° W over a three

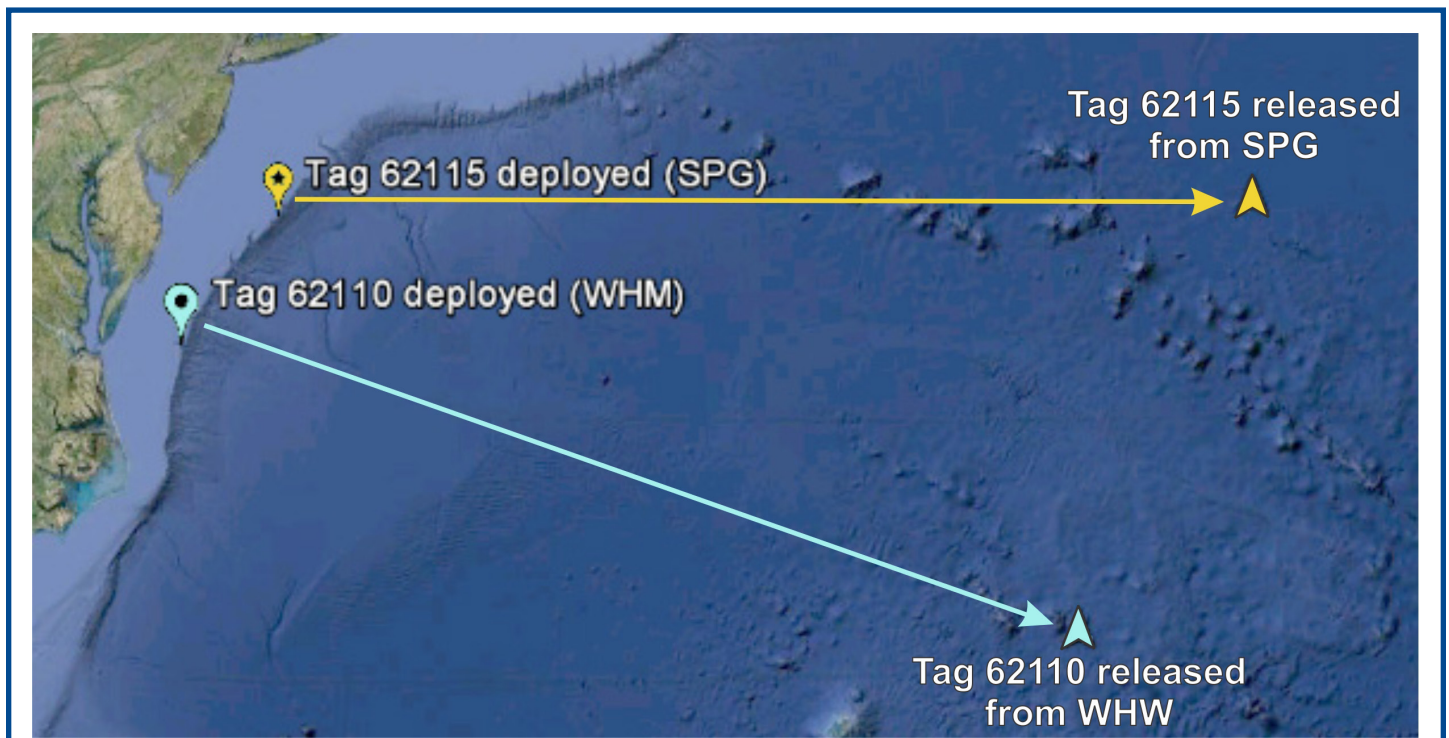


Figure 1: Google Earth map showing the locations of tagging and tag release for the roundscale spearfish (SPG) and white marlin (WHM). Each fish traveled approximately 800 miles in a straight line distance, although the roundscale spearfish tag popped up after only 35 days while the white marlin carried the tag for 325 days.

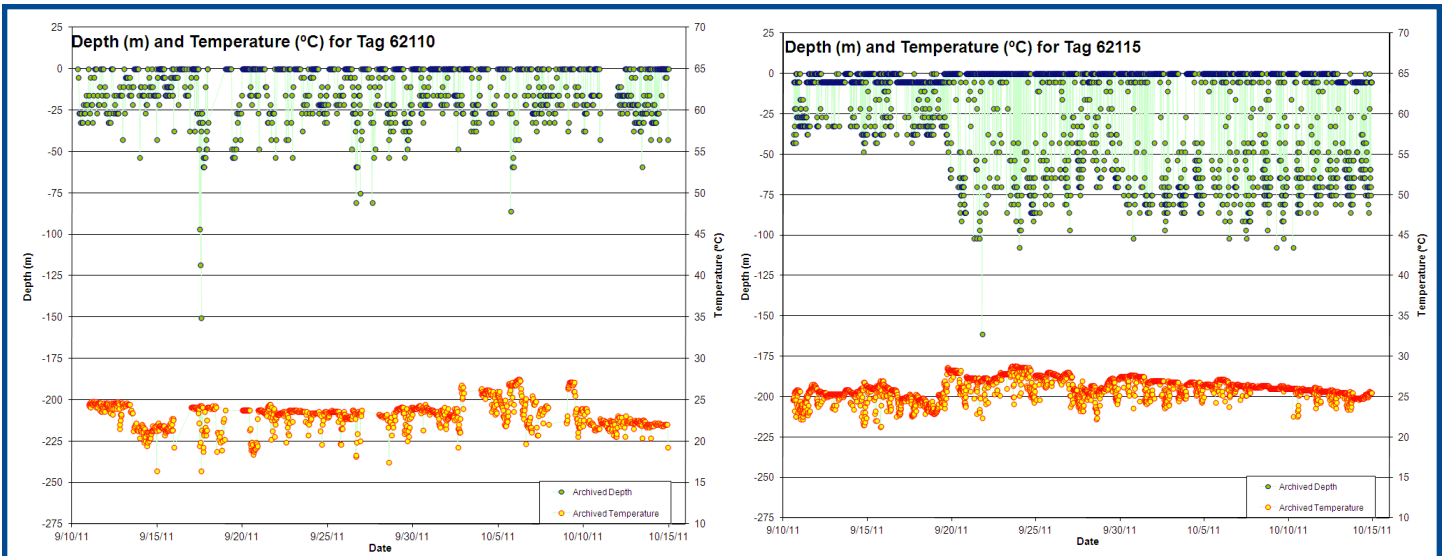


Figure 2: Depth and temperature data collected by satellite tags while attached to the white marlin (tag 62110, left) and roundscale spearfish (tag 62115, right). These graphs show where the two fish spent their time in the water column, as well as their temperature preferences for the time period of September 10 – October 14, 2011.

week period. Interestingly, white marlin are reported to spawn in May and June in the western North Atlantic.

Habitat utilization of the two fish can be compared for the 35 day period for which the tag was attached to the roundscale spearfish, 10 September – 14 October, 2011. The temperature and depth plots for the two fish are presented in Figure 2 (above), and the data are broken down into histograms in Figure 3 (right). During the 35 days of observations, the roundscale spearfish preferred warmer water, spent more time at the surface (top 10 meters), and tended to dive to greater depths on a daily basis. With a sample size of just one fish each, we can't say much more at this time, but the preliminary movement and habitat utilization data suggest there may be ecological differences between these morphologically similar species. We hope to give you a much more detailed analysis in next year's newsletter.

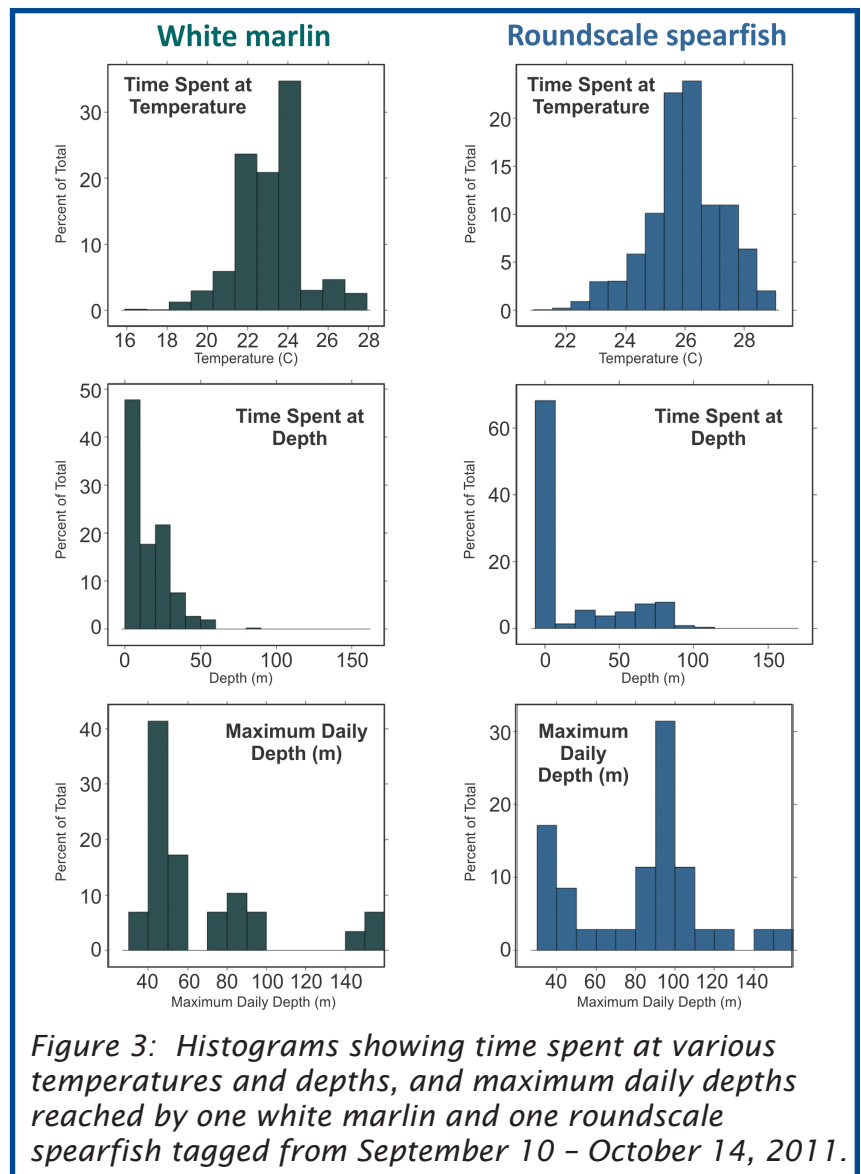


Figure 3: Histograms showing time spent at various temperatures and depths, and maximum daily depths reached by one white marlin and one roundscale spearfish tagged from September 10 – October 14, 2011.

Billfish Management

ICCAT 2012. The focus of this year's meeting of the International Commission for the Conservation of Atlantic Tunas (ICCAT) will be bluefin tuna, marlins, and sharks. During 2012, ICCAT's Standing Committee for Research and Statistics (SCRS) will be conducting stock assessments of white marlin, Atlantic bluefin tuna, and shortfin mako, in addition to performing an ecological risk analysis for other sharks taken in ICCAT fisheries.

In 2000 ICCAT approved a management measure requiring the release of live blue marlin and white marlin caught on pelagic longline gear. The measure also requires each country to reduce landings of blue marlin by 50% and landings of white marlin by 67% from the landings they reported in 1996 or 1999 (whichever was higher). For the past several years, reported overall landings for the two species have reflected the mandated reduction, suggesting compliance with the measure. So it was a bit discouraging last year when the SCRS conducted a full assessment of blue marlin and determined that Atlantic-wide stock of blue marlin remained overfished and that overfishing is still occurring. It may be that the reductions in fishing mortality by live release in the longline fishery were more than offset by increases in catches by small scale artisanal fisheries, many of which do not report landings. Or maybe, compliance with the live release measure is not as good in practice as it is on paper.

At last year's ICCAT meeting, in light of the results of the 2011 blue marlin assessment, the Commission adopted a one year measure designed to end overfishing of blue marlin by further reducing catches from the longline and purse seine fisheries. The measure also charged the SCRS with reviewing existing data collection programs for artisanal fisheries and evaluating possible time/area closures that would significantly reduce billfish

bycatch. The measure will expire at the end of the year and a new measure, incorporating recommendations from the SCRS resulting from this year's assessment of white marlin, will need to be adopted.

The SCRS conducted the white marlin assessment in May and the preliminary report has been released and is available at http://www.iccat.int/Documents/Meetings/Docs/2012_WHM_ASSESS_ENG.pdf. While there are some substantial differences in the trends of the major catch per effort time series used in the assessment, the overall results suggest that the Atlantic-wide stock remains overfished but fishing mortality has decreased to a level where overfishing may not be occurring. The assessment will be finalized and management recommendations developed for the Commission at the annual meeting of the SCRS in early October. I expect that the SCRS will recommend further reductions of white marlin fishing mortality to ensure a rebuilding of the stock, and it is safe to say that the United States will adopt a position consistent with the SCRS advice. We will then work with other nations to draft and adopt a new marlin management measure at the annual ICCAT meeting which will take place November 12 -19 in Agadir, Morocco. Stay tuned!



Roundscale spearfish.

Photo by Brady Lybarger