

196 miles), but over all western North Atlantic locations the average movement was quite similar (143 vs. 162 miles, respectively). Note that the larger mid-Atlantic movements may have had an "assist" from the Gulf Stream.

The PSAT data clearly show that both blue marlin and white marlin spent most of their time in the warmest surface waters. In fact, both species spent 67% of their time in the upper 10 meters (33 feet) in the mid-Atlantic region. In more southern locations blue marlin and white marlin spent a little less time in the uppermost waters, and overall, blue marlin spent a little more time in the top 10 meters than white marlin (62% vs. 56%, respectively).

Interestingly, both blue marlin and white marlin show secondary peaks of depth utilization below the surface. As you can see in Figure 1, this occurs at a depth of about 40 meters (131 feet) for blue marlin in the mid-Atlantic region, and around 20 meters (66 feet) for local white marlin. These depths likely represent areas where the marlins spend time searching for or encountering prey.

While both blue marlin and white marlin spend most of their time at the surface, they are capable of deep dives. Over all locations, the deepest blue marlin dove below 500 meters (1640 feet), and there were dives in excess of 300 meters (984 feet) at all locations. The deepest white marlin dive was to 280 meters (919 feet). Of course, most of the dives were much more limited in depth: 97.0% of blue marlin dives and 99.8% of white marlin dives were shallower than 200 meters (656 feet).

Although there was considerable variation in diving behavior among individual blue marlin and white marlin, there were some interesting differences between the two species. In general, blue marlin were much more active divers during daylight hours than in the dark. During the evening and into the night, blue marlin spent a lot of time near the surface. This difference in day/night behavior was very pronounced in almost a third of the blue

marlin over all locations, but was only seen in one white marlin.

These habitat utilization data will be useful for adjusting catch rates used in stock assessments of blue marlin and white marlin, as well as for developing meaningful strategies to minimize the bycatch of these species by commercial fishing gears.

And what have you been eating?

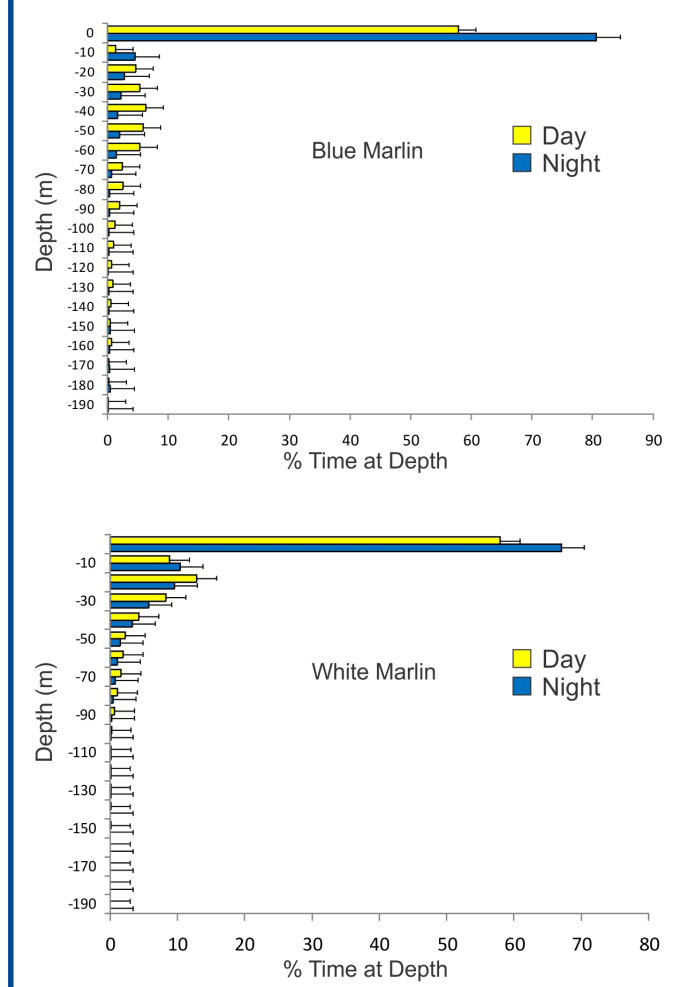
Last year you may have noticed Dr. Michelle Staudinger of the University of North Carolina Wilmington carefully measuring the volume and sorting the contents of billfish

stomachs at the Canyon Club weigh station, part of her study quantifying the food habits of large pelagic fishes in the western North Atlantic. The two blue marlin landed last year had empty stomachs, but prey were present in the 18 white marlin/roundscale spearfish that she examined. Fish were the dominant prey item (74% by mass) and cephalopods were also quite important (24% by mass). Major prey items included small tunas, butterfish, cusk eels, and shortfin squid. Dr. Staudinger will be back at the weigh station this year to collect more billfish stomachs if you'd like to talk to her about this exciting research, or you can email her at staudingerm@uncw.edu.

Guy Harvey Ocean Foundation

This year's raffle at the Mid-Atlantic \$500,000 will benefit the Guy Harvey Ocean Foundation (GHOF). The GHOF's mission is to fund inspired scientific research and innovative educational programs to encourage conservation and best management practices for sustainable marine environments. The proceeds of the raffle will be used to directly support research on mid-Atlantic tunas and billfishes. As you probably know, these incredible fishes face significant challenges and there is a very real need for solid science to support meaningful management and conservation measures at the local and international levels. Thanks for your support.

Figure 1. Time-at-depth histogram for blue marlin and white marlin tagged off the U.S. Mid-Atlantic, separated into nighttime (blue bars) and daytime (yellow bars). Only depth bins that contained > 1% of total time are shown.



Billfish Research and Management News

Summer 2010

Greetings!

For the past 19 years we've been studying the fish brought to the dock at the Mid-Atlantic \$500,000 and, as in years past, I'd like to take this opportunity to provide you with a summary of the tournament statistics and to share some of our research results. This year's newsletter focuses on how local blue marlin and white marlin spend their time in the water column. In our lab at the Virginia Institute of Marine Science we are also investigating the distribution and population structure of roundscale spearfish, genetic differentiation of Atlantic and Indo-Pacific blue marlin, population structure of Atlantic bluefin tuna, stock structures of various deepsea sharks, and post-release survival and habitat utilization of large red drum.

If you would like to know more about our research, the 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,

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Under the Sea

We all know that blue marlin and white marlin spend some time up near the surface because that's where we catch them. But how much time do these species spend at various depths, and when are they there? Over the past several years we have deployed about 150 short-term pop-up archival satellite tags (PSATs) to study the fate of blue marlin and white marlin caught in the recreational fishery throughout the western North Atlantic. The PSATs collected depth, temperature and light level data every 90 seconds for 10 days before they released from the fish, popped up to the surface, and transmitted the archived data to passing satellites. Those data not only let us know whether or not a fish survived, but they also provided high resolution pictures of how surviving fish used the water column. Dan Dutton, a graduate student in my lab who just completed his M.S. degree, analyzed these data for his thesis research, and some of the highlights for the U.S. mid-Atlantic region are presented below.

In terms of dispersal, the average minimum straight line movement over the 10-day tagging period (point of release to point of tag pop-up) of mid-Atlantic blue marlin was greater than local white marlin (455 vs.

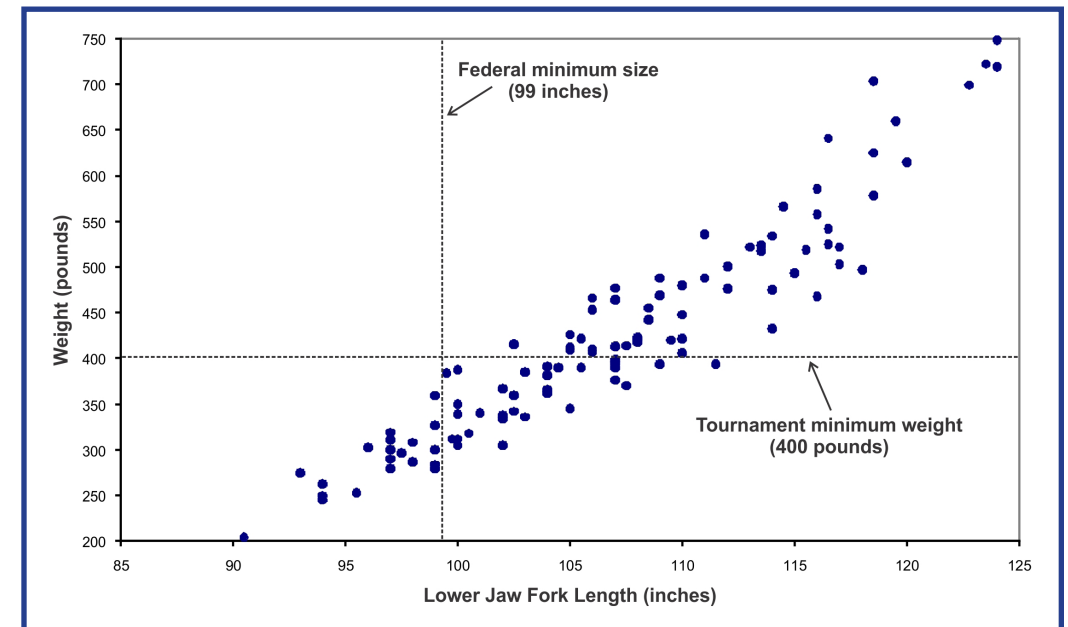
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Mid-Atlantic \$500,000 — Facts & Figures

Winning Fish (weight in lbs.)

		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
White Marlin	1st	86	69	69	69	77	89	74	78	68	69	75	91	75	75	88	92	92	95
	2nd	83	68	65	68	69	76	71	67	61	63	61	79	74	68	79	77	88	78
	3rd	76	61	65	64	66	72	68	63	---	63	60	79	71	67	77	69	79	78
Blue Marlin	1st	466	615	586	746	455	748	534	522	566	578	558	433	518	699	722	536	719	453
	2nd	384	488	542	660	410	493	468	480	476	421	---	---	---	525	641	524	625	---
	3rd	359	435	522	519	407	448	412	464	---	---	---	---	---	418	469	414	501	---
Tuna	1st	109	254	242	205	153	120	221	204	172	114	147	82	182	193	184	212	80	69
	2nd	102	218	213	166	142	103	181	185	153	114	136	72	150	78	123	172	78	69
	3rd	95	200	139	108	126	99	105	185	141	112	81	61	132	60	118	168	77	67
Dolphin	1st	36	42	53	33	34	33	33	43	39	29	34	43	44	47	44	39	43	37
Wahoo	1st	44	67	73	47	79	69	38	72	86	76	75	95	58.5	74	93	77	74	97

Blue Marlin Length-Weight Relationships (1992-2009)



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!

Billfish Releases

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
White Marlin																		
Boated	15	20	23	16	18	13	10	14	3	10	10	13	14	14	18	23	31	28
Released	84	136	174	177	153	124	231	432	58	220	182	144	313	244	444	274	423	322
% Released	85%	87%	88%	92%	89%	91%	96%	97%	95%	96%	95%	92%	96%	95%	96%	92%	93%	92%
Blue Marlin																		
Boated	9	7	11	14	7	15	8	10	2	3	3	4	3	5	6	3	3	2
Released	3	8	13	16	11	26	17	29	32	10	18	15	22	25	19	23	11	14
% Released	25%	53%	54%	53%	61%	63%	68%	74%	94%	77%	86%	79%	88%	84%	76%	88%	79%	88%

Catch Per Unit Effort (CPUE)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
White Marlin																		
# Fish Caught	99	156	197	193	171	137	241	446	62	203	192	157	327	258	462	297	454	350
# Boats x # Days	393	408	426	417	435	381	393	411	399	378	393	384	429	507	528	462	423	408
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	0.51	0.87	0.64	1.07	0.86
Blue Marlin																		
# Fish Caught	12	15	24	30	18	41	25	39	34	13	21	19	25	31	25	26	14	16
# Boats x # Days	393	408	426	417	435	381	393	411	399	378	393	384	429	507	528	462	423	408
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	0.06	0.05	0.06	0.03	0.04
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	0.57	0.92	0.70	1.10	0.90

White Marlin Length-Weight Relationships (1992-2009)

