Billfish Research and Management News for the Mid-Atlantic $500,000

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Greetings!

Welcome to the 2007 Mid-Atlantic $500,000. A lot has happened in the world of billfish research and management during the past 12 months. Roundscale spearfish and "hatchet marlin" have received considerable attention in the media. Over the past few years, several hatchet marlin have been weighed in at the Mid-Atlantic $500,000, and there's a good chance we'll see more this year. There has been a lot of talk about the conservation value of circle hooks lately. We recently finished a study using pop-up satellite archival tags to compare the fates of white marlin caught on various models of circle hooks, and only one of sixty fish died following release! Circle hooks have also received a lot of attention from the National Marine Fisheries Service (NMFS), with the implementation and then postponement of a rule requiring the use of non-offset circle hooks on natural baits in billfish tournaments. NMFS is also reviewing the status of white marlin with regard to a possible listing under the Endangered Species Act. And on the international scene, the International Commission for the Conservation of Atlantic Tunas (ICCAT) agreed to continue a management measure requiring the release of all live white marlin and blue marlin from pelagic longline gear— a measure that seems to have stopped and maybe even reversed the downward trend of these species.

Inside this newsletter I've included a few articles on billfish research and management, as well as an update on the fishing statistics for the Mid-Atlantic $500,000. If you would like to know more about billfish 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. My colleague and former Master's student Andrij Horodysky will be at the Ocean City weigh station. Andrij will be more than happy to talk about billfish research, fly tying, or his doctoral studies on the sensory physiology of coastal marine fishes.

Tight lines,

Which Circle Hook is the Most Fish Friendly?

There is a wide range of circle hooks available on the market for rigging ballyhoo. These hooks differ not only in size, but in their overall shape and the degree to which the point is offset from the shank. We know from a previous study on sailfish that large offsets (15º or more) result in a high proportion of deep hooking; in other words, a strongly offset circle hook behaves more like a J hook. But what about slightly offset circle hooks and those of different shapes?

Only slight differences in hooking location, bleeding, and post-release survival were found among three models of circle hooks tested— all had huge conservation benefits relative to J hooks.

Over the last two years I have worked with VIMS graduate student Andrij Horodysky to evaluate post-release survival of white marlin caught on three models of circle hooks that are commonly used: 1) non-offset Eagle Claw Circle Sea (model L2004EL) which has moderately elongated circular bend; 2) non-offset Owner SSW In-Line Circle Hook (model 5379-161), which has a bend region shaped more like a "J" hook; and 3) 5º offset Mustad Demon Fine Wire (model C39952BL) which has a circular bend (See Figure 1). Numerous rigging techniques were used to attach the circle hooks to the ballyhoo bait (wire harness attached to a barrel swivel, plain wire harness, rigging floss harness), but all methods left the circle exposed on the top of the head of the bait (See Figure 2). Ballyhoo were dropped back for 4–10 seconds

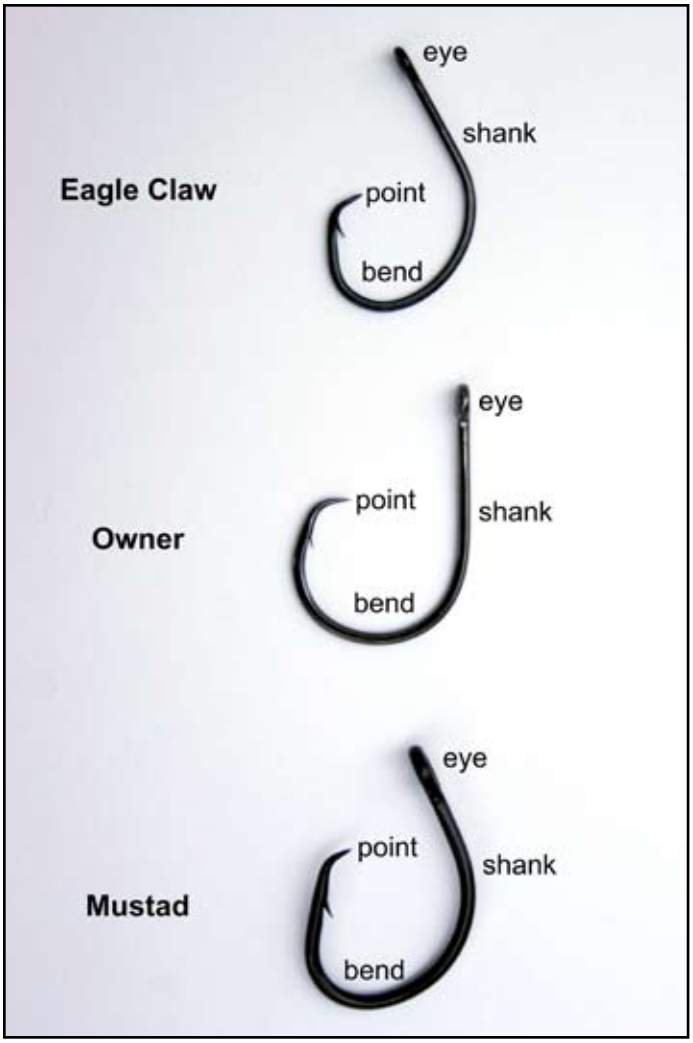


Figure 1. *Three models of circle hooks used our study white marlin post-release survival: Eagle Claw (model L2004EL); Owner (model 5379-161); and Mustad (model C39952BL).*

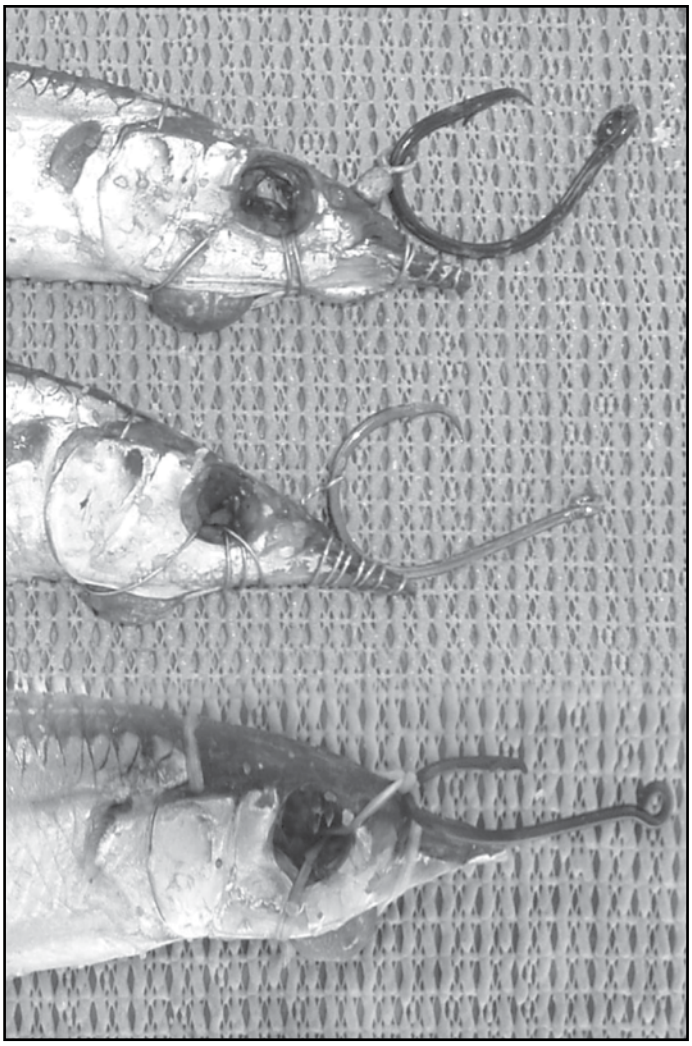


Figure 2. *Three common methods of rigging used to attach circle hooks to ballyhoo: (top) wire harness with a barrel swivel; (middle) plain wire harness; and (bottom) a rigging floss harness.*

Figure 3. *White marlin with a pop-up satellite archival tag. The fish was caught off Virginia Beach, VA last year on a Mustad circle hook that lodged in the corner of the jaw. The fish survived and moved 50 miles to the northeast during the 10-day tagging period. (Photo: Dr. Ken Neill)*

before coming tight and the white marlin were caught on 20 – 30 lb gear with fight times averaging a little over 10 minutes. Twenty pop-up satellite archival tags (PSATs) set to collect temperature, depth and light level data every two minutes were attached to the first 20 fish caught on each hook type (See Figure 3). The tags were programmed to release from the fish after 10 days.

We got usable data from 59 of the 60 tags (one tag released after only one day and that wasn't long enough to evaluate post-release survival). Based on temperature and depth data as well as total movement information, 58 of those 59 fish survived the 10-day tagging period (See Figure 4). The lone mortality was a white marlin caught on an Owner circle hook that was lodged in the center of the fish's lower jaw. The fish had a fight time of 14 minutes and was considered to be in excellent condition at the time of release, but four days later the fish died and sank to the bottom at 1160 m.

We found no statistically significant differences in the incidence of deep hooking, hook induced trauma (bleeding), or post-release survival among three types of circle hooks – all appeared "fish friendly" relative to the results we found for J hooks in a previous study. In fact, "J" hooks were 39 times more likely to hook fish deeply, 32 times more likely to induce trauma, and 22 times more likely to cause mortality than circle hooks. The post-release mortality of white marlin caught on the three models of circle hooks was less than 2%, while 35% of white marlin caught on J hooks died after release. Considering that between 4,000 and 8,000 white marlin are caught in the U.S. each year (mostly on J hooks), the use of circle hooks could decrease post-release mortality by as many as 1,332 to 2,664 white marlin annually in the U.S. recreational fishery alone. Imagine what could be accomplished on an Atlantic-wide scale. Billfish anglers have shown a strong conservation ethic, releasing 99% of the white marlin they catch-- it's time now to ensure that released white marlin have the highest chance of survival. ***Use Circle Hooks!***

Hook Type	Hook Location	Bleeding	Fate	
Eagle Claw 20	Jaw/ext. visible 20 (100%)	No 19 (95%)	Live	19
			Dead	0
		Yes 1 (5%)	Live	1
			Dead	0
	Deep/ not ext. visible 0	No n/a	Live	n/a
			Dead	n/a
		Yes n/a	Live	n/a
			Dead	n/a
Mustad 19	Jaw/ext. visible 19 (100%)	No 19 (100%)	Live	19
			Dead	0
		Yes 0	Live	n/a
			Dead	n/a
	Deep/ not ext. visible 0	No n/a	Live	n/a
			Dead	n/a
		Yes n/a	Live	n/a
			Dead	n/a
Owner 20	Jaw/ext. visible 19 (95%)	No 19 (100%)	Live	18
			Dead	1
		Yes 0	Live	n/a
			Dead	n/a
	Deep/ not ext. visible 1 (5%)	No 1 (5%)	Live	1
			Dead	0
		Yes 0	Live	n/a
			Dead	n/a

Figure 4. *Effects of the three models of circle hooks on hooking location, bleeding, and fate of white marlin caught on three models of circle hooks. "n/a" refers to "not applicable."*

Winning Fish (weight in lbs.)

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

Billfish Releases

White Marlin	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Boated	15	20	23	16	18	13	10	14	3	10	10	13
Released	84	136	174	177	153	124	231	432	58	220	182	144
% Released	85%	87%	88%	92%	89%	91%	96%	97%	95%	96%	95%	92%

Blue Marlin	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Boated	9	7	11	14	7	15	8	10	2	3	3	4
Released	3	8	13	16	11	26	17	29	32	10	18	15
% Released	25%	53%	54%	53%	61%	63%	68%	74%	94%	77%	86%	79%

Catch Per Unit Effort (CPUE)

White Marlin	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
# Fish Caught	99	156	197	193	171	137	241	446	62	203	192	157
# Boats x # Days	393	408	426	417	435	381	393	411	399	378	393	384
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

Blue Marlin	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
# Fish Caught	12	15	24	30	18	41	25	39	34	13	21	19
# Boats x # Days	393	408	426	417	435	381	393	411	399	378	393	384
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
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**

oo – Facts & Figures

2004	2005	2006
75	**75**	**88**
74	68	79
71	67	77
518	**699**	**722**
---	525	641
---	418	469
182	**193**	**184**
150	78	123
132	60	118
44	**47**	**44**
58.5	**74**	**93**

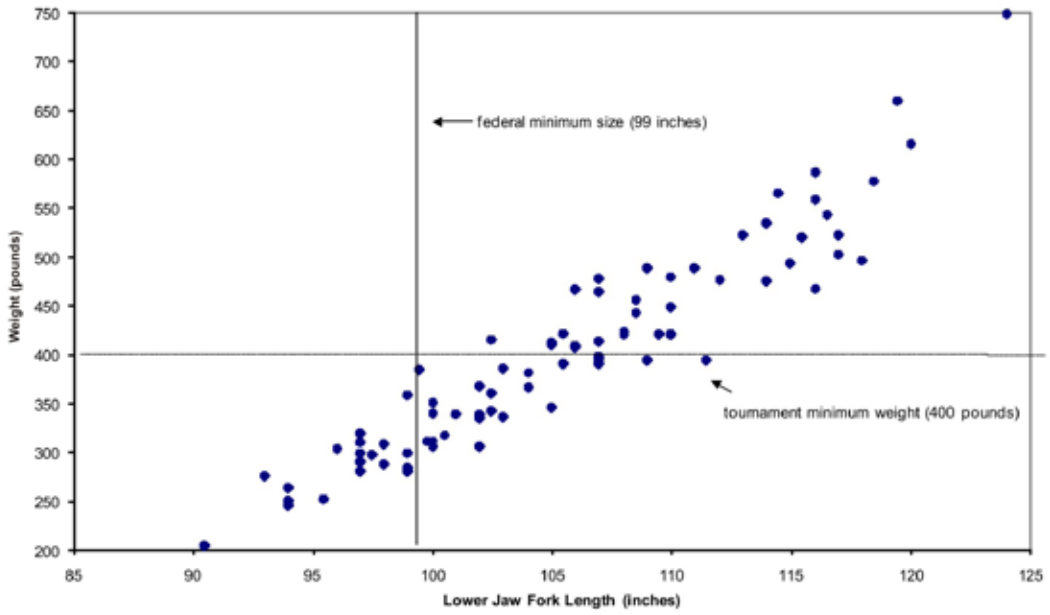
2004	2005	2006
14	14	18
313	244	444
96%	95%	96%

2004	2005	2006
3	5	6
22	25	19
88%	84%	76%

2004	2005	2006
327	258	462
429	507	528
0.76	0.51	0.87

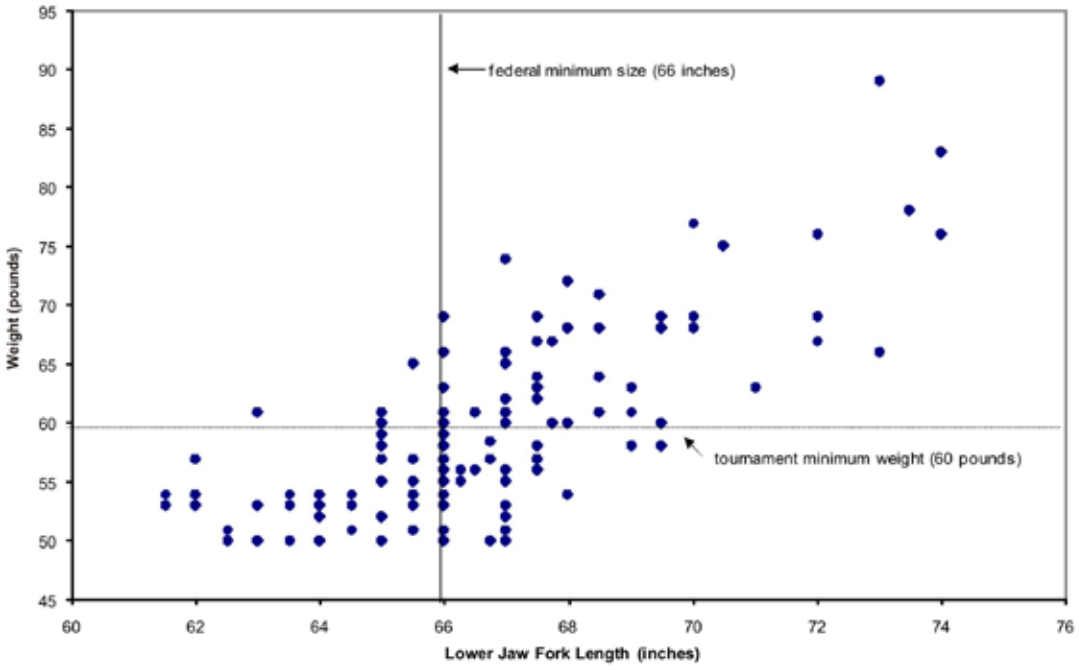
2004	2005	2006
25	31	25
429	507	528
0.06	0.06	0.05
0.82	**0.57**	**0.92**

Blue Marlin Length-Weight Relationships (1992-2006)



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 (1992-2006)



Just What is a "Hatchet Marlin"?

A "hatchet marlin" can be a white marlin or a roundscale spearfish—take a look at the position of the vent to know which one you've caught.

Most white marlin have nicely rounded dorsal and anal fins, but every now and then one is landed that has dorsal and anal fin tips that are so straight that they look like they were sheared off with a knife (See Figure 5). These fish, called hatchet marlin, were considered by most to be a morphological variant of the white marlin. Over the past several years we've had several hatchet marlin brought to the weigh station at the Mid-Atlantic $500,000 and I've taken tissue samples from each fish.

A few years ago I was studying the genetic relationships of all the billfishes with my colleagues Dr. Bruce Collette at the National Museum of Natural History and Dr. Jan McDowell at VIMS, and we decided to include a few of the hatchet marlin samples to see if they grouped with white marlin. Surprisingly, the results indicated that the hatchet marlin is a distinct species, more closely related to the spearfishes than to the white or striped marlin. While we were undertaking our study, Dr. Mahmood Shivji of Nova Southeastern University in Florida was able to get samples of what were believed to be roundscale spearfish, a rare species of billfish described from the eastern Atlantic. His genetic analyses indicated that the roundscale spearfish is a valid species of billfish, distinct from the other spearfishes. Both of our studies were presented in the same session at the Fourth International Billfish Symposium held on Catalina Island, California at the end of 2005. When Mahmood showed a picture of a roundscale spearfish in his presentation, it looked just like a hatchet marlin to me. Could it be that we were both describing the same species? After exchanging samples and running them in our labs, it became clear that hatchet marlin and roundscale spearfish are one and the same. As the roundscale spearfish had already been formally recognized, that's the appropriate common name to use.

Last year at the Mid-Atlantic $500,000 several white marlin and roundscale spearfish were landed, affording us an opportunity for detailed morphological and genetic studies of the two species. We found that the shape of the dorsal and anal fins alone do not discriminate between the two species. *Both white marlin and roundscale spearfish can have truncated fins.* In other words, a "hatchet marlin" can be either a white marlin or a roundscale spearfish. The best way to tell the two species apart is to go bottoms up and look at the location of the vent: in a white marlin the vent is about two inches forward of the start of the anal fin, while in roundscale spearfish the vent is five or six inches forward of the anal fin (Figure 6). The shapes of the scales of white marlin and roundscale spearfish are also quite different. While the side of a white marlin has an even sheen due to the closely packed scales, the side of roundscale spearfish appears stippled as the scales have a bit of space around them (see Figure 7).

Figure 5. *A hatchet marlin photographed by Dr. Guy Harvey off the Azores. Note the truncated dorsal and anal fins.*

Of course, the presence of a new (old) species of billfish has raised some interesting questions. Foremost among these is the impact of misidentification of roundscale spearfish as white marlin on the white marlin stock assessment. The preliminary answer is "not much." We have been archiving white marlin tissue samples from areas

throughout the Atlantic for the past 15 years, and a genetic survey of a subset of those samples indicates that only a few percent were misidentified as roundscale spearfish. However, roundscale spearfish can be locally abundant at times. Genetically screening the samples we have collected at the Mid-Atlantic $500,000 over the years, we found that while in most years only white marlin were brought to the weigh station, in 2003 and 2005 there were more roundscale spearfish than white marlin (see Table 1). Overall, roundscale spearfish account for 18% of the "white marlin" weighed in at the Mid-Atlantic $500,000. Of course, it is difficult to make any broad inferences from this observation as the tournament only samples a very small part of the Atlantic Ocean, and just a few percent of the "white marlin" caught in the tournament (the largest fish) are brought to the weigh station. Clearly more research is needed here, and with grant support from the National Marine Fisheries Service we will be looking at the relative abundance of white marlin and roundscale spearfish throughout the Atlantic over the next few years. We'll keep you posted.

As for the tournament rules, the Mid-Atlantic $500,000 has always considered hatchet marlin in the white marlin category. That some hatchet marlin are roundscale spearfish doesn't change that interpretation. Both white marlin and roundscale spearfish remain eligible for the white marlin prize money, providing they meet or exceed the federal minimum size for white marlin (66 inches LJFL) and the tournament minimum weight (60 lbs.).

Year	White Marlin	Roundscale Spearfish
1992	13	0
1993	18	2
1994	21	0
1995	10	0
1996	18	0
1998	11	0
2000	3	0
2002	6	3
2003	3	9
2004	12	2
2005	4	10
2006	11	3

Table 1. *Numbers of white marlin and roundscale spearfish weighed in at the Mid-Atlantic $500,000. Over all years for which we have samples, roundscale spearfish comprise 18% of the landed "white marlin."*

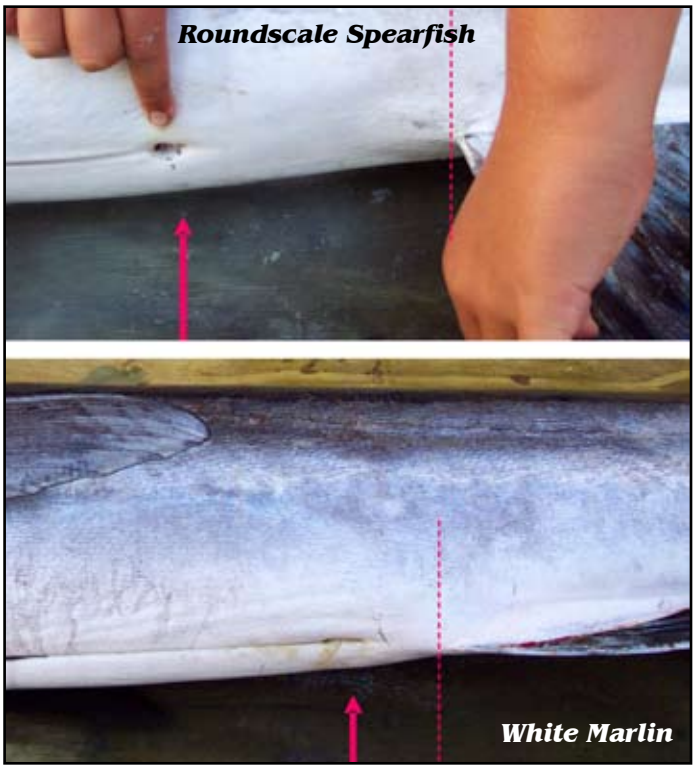


Figure 6. *Roundscale spearfish can be distinguished from white marlin by the location of the vent (arrow). In the spearfish (top) the vent is 5-6 inches forward of the start of the anal fin (dotted line), while in white marlin (bottom) the vent is less than 2 inches forward of the fin.*

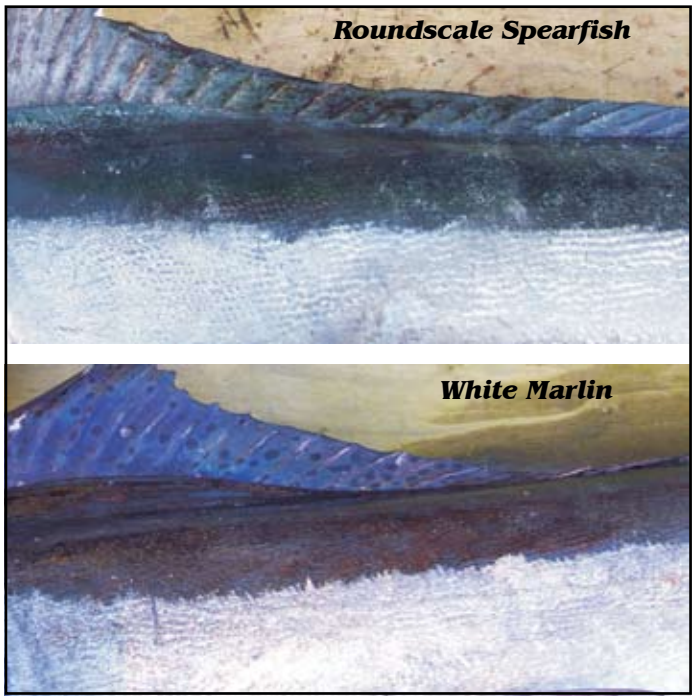


Figure 7. *Roundscale spearfish can also be distinguished from white marlin by the nature of the scales. The sides of a roundscale spearfish scales appear stippled while the sides of a white marlin are more uniform in coloration.*

Billfish Management

On Again, Off Again: NMFS Rule Requiring the Use of Circle Hooks in Billfish Tournaments

On January 1, 2007 NMFS implemented a rule requiring the use of non-offset circle hooks in natural baits for those fishing in registered billfish tournaments in the United States. The rationale behind the rule was pretty straight-forward: post-release survival is much higher for billfish caught on circle hooks, and requiring their use in tournaments would save a lot of fish. Furthermore, there would likely be additional conservation benefits as most crews that fish tournaments would probably use circle hooks outside of tournaments to improve their fishing techniques. However, NMFS continued to receive comments opposing the circle rule after it was implemented, especially from anglers in North Carolina who wanted to fish Ilander/ballyhoo combinations with J hooks. In May, NMFS decided to suspend the implementation of the rule until January 1, 2008, citing that the delay would "improve long-term compliance." What is needed is some data on the fate of blue marlin and white marlin caught on Ilander/ballyhoo rigs with J hooks. We'll be looking at that this year. Stay tuned.

White Marlin Endangered Species Act Status Review

In 2001 NMFS received a petition to consider listing white marlin as threatened or endangered under the Endangered Species Act. During 2002, NMFS assembled a Status Review Team that considered the status of white marlin, the likelihood of extinction, and the efficacy of existing management measures. Based on the Status Review Team's report, NMFS concluded that there was not sufficient evidence to list white marlin at that time, but indicated that the agency would reconsider the status of the species in 2007. That review is winding up now and a decision should be announced shortly. A "wild card" in this year's review is the presence of the roundscale spearfish, a species that can be misidentified as white marlin. However, based on genetic screening of a subset of archived samples of "white marlin," it appears that misidentified roundscale spearfish account for only a few percent of white marlin landings throughout the Atlantic—it's not a major problem. Also on a positive note, the recent ICCAT assessment for white marlin indicated that the stock's status may have increased over the last few years, suggesting that ICCAT's management measure requiring the release of all live white marlin from longline gear is having an impact. While white marlin are still seriously overfished, the outlook seems to be getting brighter.

ICCAT Management Measure for Blue Marlin and White Marlin

ICCAT's management measure requiring the release of all live blue marlin and white marlin from pelagic longline gear was due to expire at the end of 2006. Going into the ICCAT meeting in Dubrovnik, Croatia last November, the United States was worried that a new billfish measure might not be approved by ICCAT, as support for billfish could be negotiated by other countries to gain access to U.S. swordfish and/or western bluefin tuna quota, or for U.S. support for a total allowable catch of eastern bluefin tuna that exceeded the scientists' recommendation. Fortunately, Brazil took the lead drafting and submitting the new billfish management measure and the commission agreed to extend the existing live release requirements through 2010 (the next scheduled assessment). The new measure also provides for limited observer coverage (5% by vessel, not by longline set), requires monitoring and reporting of artisinal fisheries (small scale fisheries for local consumption), and limits artisinal catches at 2006 levels. Well done.

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