NOAA FISHERIES
Southwest Fisheries Science Center

THE SOUTHWEST FISHERIES SCIENCE CENTER'S

2017 BILLFISH NEWSLETTER

RESEARCH · NEWS · TAGGING · PHOTOS

- **Results and top-tagging captains & anglers of 2016 and 2017**
- ***Tagging Spotlight***
- **Parasites in striped marlin in Baja California, Mexico**
- **Tuna, shark, and opah research**

SWFSC Cooperative Billfish Tagging Program

https://swfsc.noaa.gov/BillfishTagging/

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Congratulations to Xavier Autrey for winning the 2017 Cover Photo Contest!
Xavier captured the cover photo sailfish (or *pez vela* in Spanish) in action while down in Baja California, Mexico and he also contributed the background image on the current page.
Submit your best billfish photos to liana.heberer@noaa.gov for a chance to be featured in our next issue!

Prologue

The annual Billfish Newsletter has been communicating the results of cooperative efforts between fishery scientists and billfish anglers for 55 years. The Newsletter presents the results of the Cooperative Billfish Tagging Program, which began in 1963 and has successfully promoted ethical angling while tracking the migration and movement of large gamefish. Additionally, the Newsletter disseminates the results of the International Billfish Angler Survey, in which cooperative anglers have participated since 1969. The combined efforts of recreational anglers and the scientific community have helped to expand our understanding of assessing changes in billfish distributions and changes in recreational fisheries. In the last four years, we have witnessed unusual ocean conditions with the "warm blob" and El Niño/La Niña cycles altering ocean temperatures from Washington to Baja California. Understanding the effects of such events on our fisheries resources is enhanced through our work with billfish anglers like you. The Southwest Fisheries Science Center looks forward to our sustained collaboration ensuring our goals are met and thanks you for your support.

Kristen Koch

Director
Southwest Fisheries Science Center

Gerard DiNardo

Fisheries Resources Division Director
Southwest Fisheries Science Center

Introduction

Welcome to the 2017 SWFSC Billfish Newsletter! You asked and we delivered—we are happy to announce that this issue covers both the 2016 and 2017 calendar years, unlike our standard newsletter which traditionally covers just the prior calendar year. We appreciate the feedback and thank you for continuously seeking out the yearly results in the SWFSC Billfish Newsletter.

In this issue, we will be presenting more than just billfish news and research—we highlight all the highly migratory species research (p.17) we conduct at the Southwest Fisheries Science Center. Our researchers focus on the life history, distribution and migration, and population dynamics for more than 15 large pelagic species of sharks, tuna, and billfish in the Eastern Pacific Ocean. In step with this research, we provide a quick guide on tag types, uses, and species in a Tagging Spotlight (p. 20), which also describes the rewards associated with each tag. Our avid anglers have created one of the world's longest time series of regional estimates of relative abundance, migrations, growth, and distribution for billfish species from Baja to New Zealand. It has always been our pleasure to present the Top-Tagging Captains and Anglers (p. 12) as our nod to the amazing effort they put into ethical catch-tag-release practices. We also continue our guest research column Science in Action (p. 15), this issue featuring Dr. Sofia Ortega-Garcia of the Instituto Politécnico Nacional (IPN) in Mexico. Dr. Ortega-Garcia is a seasoned fisheries oceanographer focusing on large pelagic species in the California Current and she recently documented a parasite in striped marlin off Baja California, Mexico. We really appreciate your continued participation in the program and your enthusiasm to tag and preserve these important and charismatic billfish species for the next generation. Here's to another 55 years!

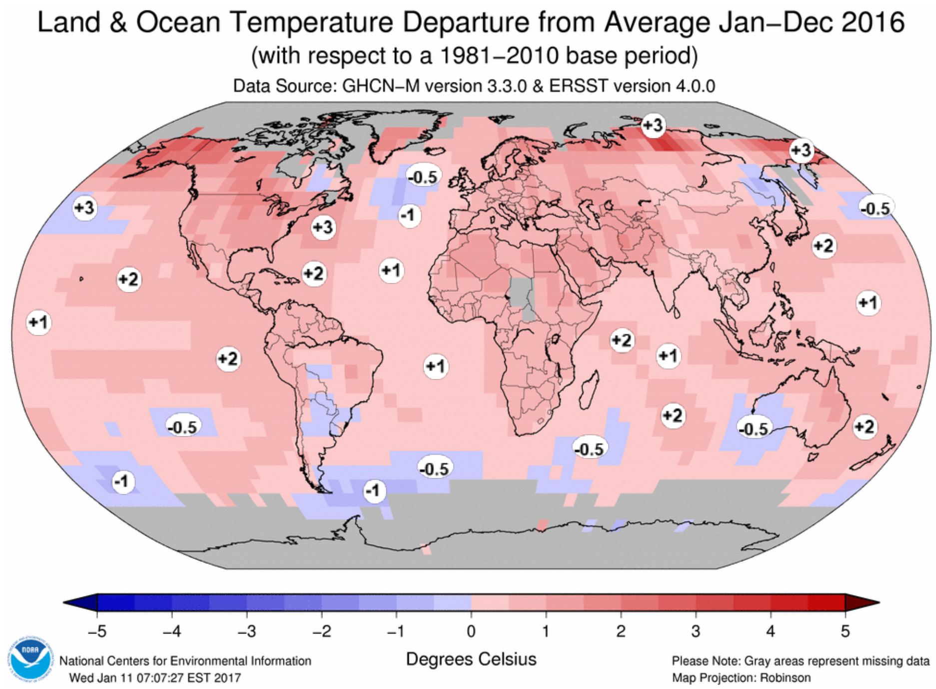


Figure 1. Year 2016 land and ocean temperature departures from a 29-year average (1981-2010).

The 2016 year was one for the record books. Not only were Earth's 2016 surface temperatures the warmest since modern recordkeeping began in 1880, but sea surface temperatures (SST) were affected by the most recent El Niño event. The 2016 season brought the end of the 2015 extreme El Niño event, one that started out as a weak El Niño in 2014 but gradually heightened to extremely warm and anomalous conditions persisting longer than those of the 1997 El Niño. The eastern Pacific endured SST as much as 3°C above a 29-year average (**Figure 1**), affecting regional oceanographic fishing conditions, species distribution, and local rainfall and weather. As anglers out on the water, we are acutely aware of our environment and the changing ocean conditions that occur daily, seasonally, and yearly. If you were out on the water these past three years (2014-2016), we hope you stayed safe, witnessed the majesty and power of the ocean, and were able to participate in the incredible fishing that accompanied these anomalous conditions.

For more information on climate, weather, and fisheries research, visit the following websites:
Climate: http://www.noaa.gov/climate
Weather: http://www.noaa.gov/weather
Fisheries: https://www.fisheries.noaa.gov/

SWFSC and The Billfish Foundation Collaboration

Peter Chaibongsai, the Director of Conservation Programs at The Billfish Foundation, visited with SWFSC Cooperative Billfish Tagging Program staff in May 2017 to discuss future cooperative research (*right*). Both the SWFSC and The Billfish Foundation share the ultimate goal of promoting sustainable recreational fisheries by means of responsible catch-and-release of billfish and science-driven billfish management. Thank you Peter and The Billfish Foundation for your longstanding leadership in the billfish tagging community! Visit The Billfish Foundation at www.billfish.org to find out their great work around the world!


Image credit Peter Chaibongsai.

Juvenile swordfish washes up on La Jolla Shores Beach


Image credit Owyn Snodgrass

On Jul 19, 2016, a juvenile swordfish (*Xiphias gladius*) washed up dead on La Jolla Shores Beach, a local surfing and kayaking beach in La Jolla, CA *(left*). Not only was this the first time a billfish had been seen in the area (at least in shore), but upon dissection by SWFSC staff, the swordfish was found to have either two anal vents or a healed wound (*right*).

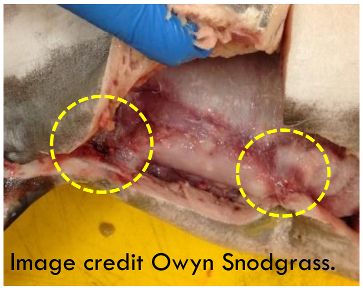


Image credit Owyn Snodgrass.

Do you remember your first fish?

Mia (10 years old) and Makira Wright (12 years old) caught their first marlins with Captain Jason Holtz aboard the *Pursuit* out of Kona in August 2017. Congratulations to the lucky lady anglers! Although they are some of our youngest contributors, the absolute youngest angler reported to us was 4 year-old Tommy, who caught his first ever marlin with Captain Vincente Cosio Cota aboard the *Dottie B II* off Cabo San Lucas in 2014. Cheers to our young anglers bringing in a new generation of billfish catch-and-release!

Interested in having a guest scientific speaker at your angling club?

The SWFSC Large Pelagics Lab has a longstanding relationship with and appreciation for local Southern California angling clubs. We always welcome questions and visits to the Center and are more than happy to visit yours to discuss research, our science, and general billfish, shark, or tuna biology. Contact owyn.snodgrass@noaa.gov or gerard.dinardo@noaa.gov if you would like to set up a local visit.

NOAA HIGHLY MIGRATORY SPECIES PROGRAM SWFSC · LA JOLLA, CA

SWFSC researchers have been working alongside the billfish angling community for 55 years to promote ethical angling and further our understanding of various aspects of billfish biology and ecology. Billfish research conducted over the years as a result of this collaboration has included recreational fishery monitoring, biological research into the life history and ecology of specific billfish species, and determining the economic importance of billfish resources. Current ongoing efforts include two major components—the International Billfish Angler Survey initiated in 1969 and the Billfish Tagging Program initiated in 1963. The 2016 results of these programs were collected during 2017 and the 2017 results were collected during 2018 and are summarized below.

The International Billfish Angler Survey

The survey results from the 2016 and 2017 calendar years are summarized in **Table 1** and include fishing area, angler days, and species caught. More than 180 anglers submitted surveys in 2016 to report 1,893 fishing days and more than 1,360 billfish caught from destinations in the Pacific, Atlantic, and Indian Oceans. Less billfish were caught in 2016 than in 2015, however total effort was also down resulting in similar regional recreational nominal catch per unit efforts (nCPUE; number of billfish per day) between the two years. Due to program changes, the 2017 surveys were sent via email only and resulted in lower participation compared to 2016. A total of 55 surveys were completed for 2017, reporting 387 billfish caught in 324 fishing days. However, the overall nCPUE for all locations but Acapulco/Ixtapa/Zihua./Guerrero and Guatemala increased from 2016 to 2017 despite the low reporting.

We anticipate the survey to be sent via email from now on, so we hope for more digital participation from our constituents. Please be sure to check your email for the surveys or go to our website to fill out the angler survey!

BILLFISH ANGLER SURVEY cards for fishing during the 2017 calendar year were emailed in early 2018. If you have not already completed the Survey, please fill it out and return the post-paid form as soon as possible. Additional 2017 Angler Survey forms are available to all billfish anglers by contacting Liana Heberer (liana.heberer@noaa.gov), downloading it from our website (http://swfsc.noaa.gov/FRD-Billfish/), or by clicking or scanning the provided QR code (*left).*

As usual, the majority of fishing effort was reported off Hawaii, Southern California, and Baja California, Mexico during both 2016 and 2017 survey years. Anglers from Hawaii have consistently reported the greatest number of fishing days for the past five years and they accounted for nearly 67% of the total reported fishing days in 2016 and 38% in 2017. In their 1,263 combined fishing days in 2016, Hawaiian anglers caught 773 billfish (the most billfish in 2016) with Pacific blue marlin (*Makaira nigricans*) remaining the most-caught species followed by shortbill spearfish (*Tetrapturus angustirostris*) and striped marlin (*Kajikia audax*). Just as impressive, a total of 92 billfish were caught in 125 fishing days in 2017, resulting in an nCPUE of 0.73.

The regional nCPUE off Southern California was down to 0.18 in 2016 from 0.24 reported from 2015. Southern California showed a general decrease in effort and catch with striped marlin remaining the most-caught species for the region with a total of 42 caught. Interestingly, no billfish were reported caught in the

48 combined fishing days from Southern California in the 2017 survey, resulting in an nCPUE of 0.00 for the first time ever in the history of the program (**Table 1**).

In contrast to Southern California's total lack of billfish, the 2016 (1.43) and the 2017 nCPUE (1.55) values for Baja are the two highest for the region for more than 5 years! Baja is historically extremely productive for billfish fishing and although striped marlin was the major species caught, blue marlin and sailfish were also caught and reported.

Of note, New Zealand reported a catch of one swordfish in 2017, caught by Troy Dando (*left*).

Table 1. Results of the 2016 and 2017 Billfish Angler Survey including fishing days, number of billfish by location, nominal catch-per-unit-effort (nCPUE), and major species caught by area: black marlin (BK), blue marlin (BM), sailfish (SF), and striped marlin (SM), and swordfish (SWO).

	2016				2017			
Location	**Angler fishing days**	**Total billfish**	**nCPUE**	**Major species**	**Angler fishing days**	**Total billfish**	**nCPUE**	**Major species**
Hawaii	1263	773	0.61	BM	125	92	0.73	BM
Southern California	230	42	0.18	SM	48	0	0.00	--
Baja California	123	176	1.43	SM	52	81	1.55	SM
Panama	50	45	0.90	SF	12	20	1.66	SF
Acapulco/Ixtapa/ Zihua./Guerrero	47	64	1.36	SF	20	18	0.90	SF
Costa Rica	46	99	2.15	SF	9	21	2.33	SF
Tahiti	32	4	0.13	BM	1	1	1.00	BK
Australia	32	15	0.47	BK	19	16	0.84	BK
Bermuda	21	7	0.33	BM	1	3	3.00	BM
Mazatlan/Sinaloa	14	5	0.36	BM/SF/SM	--	--	--	--
Malaysia	12	43	3.58	SF	20	89	4.45	SF
Guatemala	5	79	15.80	SF	3	40	13.33	SF
Japan	5	2	0.40	BM	7	3	0.42	BM
New Zealand	4	1	0.25	SM	2	1	0.50	SWO
Puerto Vallarta	4	5	1.25	BM	--	--	--	--
Florida	2	0	0.00	--	--	--	--	--
Manzanillo/Colima	1	2	2.00	SF	--	--	--	--
Bahamas	1	0	0.00	--	--	--	--	--
Colombia	1	0	0.00	--	--	--	--	--
Totals	**1893**	**1362**	**0.719**	**BM**	**324**	**387**	**1.19**	**SF**

The nCPUE time-series were examined for Pacific blue marlin, striped marlin, Indo-Pacific sailfish (*Istiophorus platypterus*), and black marlin (*Istiompax indica*) in the main fishing areas of Hawaii, Baja California, Mexico, Southern California, Costa Rica, Panama, and Australia (**Figure 2**).

Pacific Blue Marlin *(Makaira nigricans)*

The 2016 Hawaii blue marlin nCPUE was 0.35, which is lower than the 2015 nCPUE of 0.47 but higher than the recent 10-year average of 0.30. In contrast, Baja's blue marlin nCPUE increased to 0.11 in 2016 from the 0.04 reported for 2015. *This is the highest blue marlin nCPUE for the region since 1999!* Despite the low reporting, the 2017 Hawaii blue marlin nCPUE was 0.40, showing a general uptick in catch. However, the 2017 Baja blue marlin nCPUE decreased significantly from 0.11 to 0.01, which may also shine some light on the lack of blue marlin catch in Southern California for the 2017 calendar year.

Striped Marlin *(Kajikia audax)*

Since 2011, the Southern California striped marlin nCPUE has been steadily increasing, but the 2016 value sharply declined to 0.18 from the high 0.45 reported in 2015 and then bottomed out at 0.00 in 2017. Again, this may be a result of the lack of reporting in 2017. This 2016 value is similar to the results seen between 2004 and 2013, where the average nCPUE was 0.11. Like the blue marlin effort, the striped marlin fishing for the Baja California region was the highest it has been since 2008, with nCPUE values of 1.21 in 2016 and then 1.48 in 2017. In fact, in order to reflect the high, double-digit nCPUE values for Baja, we added a second axis on the graph (**Figure 2B**). Hawaii experienced a plateau in striped marlin catches with an nCPUE of 0.05, similar to the 0.04- 0.08 value occurring since 2005. Only in 2017 did we see an uptick in activity with an nCPUE of 0.16 reported for the areas.

Indo-Pacific Sailfish *(Istiophorus platypterus)*

The Costa Rica sailfish nCPUE has remained the highest for the three main locations since 2003, and anglers there reported a nCPUE of 2.0 for the 2016 season and 1.44 for the 2017 season. Although neighbors, both the 2016 (0.48) and 2017 (1.00) sailfish nCPUE in Panama was largely below that of Costa Rica and has been since 2003. This 2016 season marked an increase in nCPUE for Panama after two consecutive years of downward trends in nCPUE. The Mexico sailfish nCPUE value is based on fishing effort reported from locations across the entire country's west coast, including the mainland and the Baja Peninsula. The 2016 sailfish nCPUE (0.38) was identical to last year's value but then dropped in 2017 to 0.27, although both values remain higher than the 5- and 10-year averages (0.38 and 0.23, respectively) and the region's overall nCPUE (0.23). Unlike Costa Rica and Panama, the sailfish nCPUEs of Mexico have not exceeded 1.0 in the history of the program. This may be in part due to the expansive and diverse coastline of the country which includes temperate waters as opposed to the strictly tropical waters off Costa Rica and Panama which sailfish tend to prefer.

Black Marlin (*Istiompax indica*)

The 2016 black marlin nCPUE for Australia, 0.47, shows a slight drop from the 2015 value (0.48) although it increased considerably to a value of 0.78 in 2017, the highest it has been since 2005 (1.38). Black marlin fishing has stayed fairly consistent in the last 5 years and has remained between 0.38 and 0.48 since 2011. The runner-up for black marlin nCPUE is Panama, which reported an nCPUE of 0.14 for 2016 and 0.08 in 2017. These are both decreases from the previous year (0.17), but only 2016 was above the 5-year average for the region (0.13). Papua New Guinea, Malaysia, Guatemala, and Thailand have all reported black marlin catches in the past, however, the consistent standouts for the species have been Panama and Australia since the early 1970s.

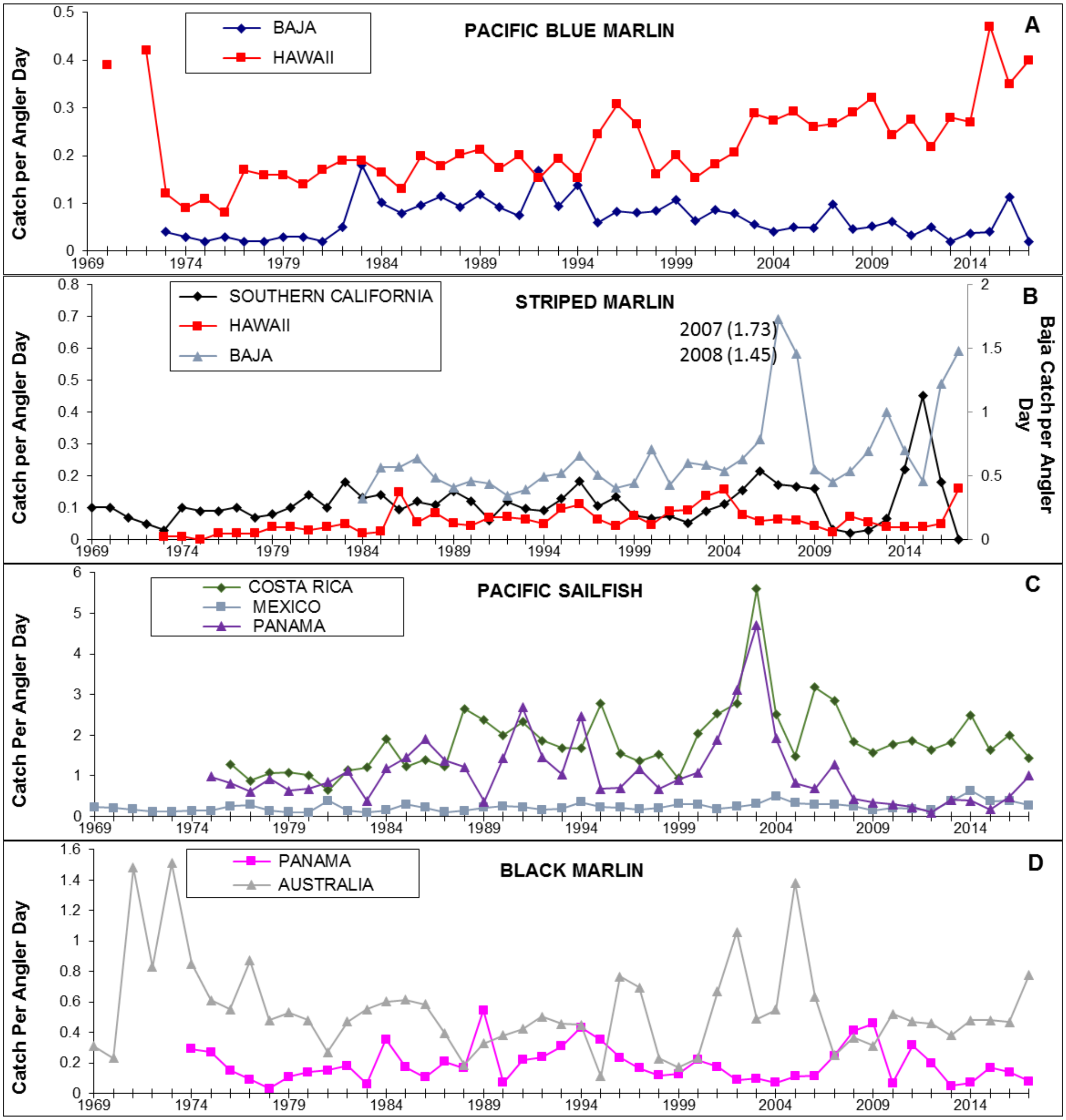


Figure 2. CPUE as catch-per-angler-day is shown from 1969 through 2017 for Pacific blue marlin, striped marlin, Pacific sailfish, and black marlin. Notice the addition of a secondary vertical axis in B in order to accurately reflect the high, double-digit nCPUE values for Baja's striped marlin catch.

The Billfish Tagging Program

The SWFSC's angler-based Billfish Tagging Program has provided tagging supplies to billfish anglers since 1963. Tag release and recapture data are used to examine movement and migration patterns, species distribution, and age and growth. This volunteer tagging program depends on the participation and cooperation of recreational captains and anglers, sportfishing organizations, and commercial fishers. In collaboration with the CDFW, over 80,000 tuna, sharks, and billfish have been tagged and released since the start of the program, 60,010 of those on just billfish.

Anglers released 984 tags on billfish in 2016 and 662 on billfish in 2017 (**Table 2**). The Hawaiians tagged the greatest number of billfish for both years—a total of 739 tags in 2016 and 447 tags in 2017 (**Table 3**), which is very typical for the program, as Hawaii generally carries more than 75% of the tagging effort. Hawaii's tagging effort was followed by Acapulco/Ixtapa-Zihuatanejo with 112 tags in 2016 and 152 tags in 2017, the majority released on sailfish. The total lack of tags released from Mazatlan/Sinaloa, Guatemala, New Zealand, and Tahiti in 2017 may be indicative of changing ocean conditions or changing effort in the area.

Table 2. Billfish tagging and return rates for 2016, 2017, and the history of the program (1963-2017).

Species Name	Releases 2016	Releases 2017	Release Totals (1963-2017)	Return Totals (1963-2017)	Return Rate (%)
Pacific blue marlin	605	396	14,468	110	0.76
Sailfish	131	122	10,268	51	0.49
Striped marlin	113	76	23,775	344	1.44
Shortbill spearfish	133	66	2,759	6	0.21
Black marlin	2	1	3,392	70	2.06
Broadbill swordfish	--	--	524	17	3.24
Unidentified billfish	--	1	4,382	5	0.11
Shortfin mako shark	3	6	3,667	93	2.53
Blue shark	1	--	5,886	14	0.23
Tuna	2 (Bluefin)	5 (Yellowfin)	739	39	5.27
All Others	--	5	3,506	35	0.99
Total	**993**	**678**	**73,366**	**784**	**1.06**

Table 3. Summary of billfish tagged during 2016 and 2017, by region.

Location	Species	2016 Tag totals	2017 Tag Totals
Southern California	Striped Marlin	36	8
	Pacific Blue Marlin	2	2
	Shortbill Spearfish	--	1
Gulf of Mexico	Sailfish	1	--
	Pacific Blue Marlin	--	3
Hawaii	Pacific Blue Marlin	565	379
	Shortbill Spearfish	130	58
	Striped Marlin	41	9
	Black Marlin	2	--
	Sailfish	1	--
	Unidentified Billfish	--	1
Baja California/La Paz	Sailfish	2	--
	Striped Marlin	16	34
	Pacific Blue Marlin	2	--
Mazatlan/Sinaloa	Striped Marlin	10	--
	Sailfish	2	--
	Pacific Blue Marlin	2	--
Manzanillo/Colima	Sailfish	2	--
	Pacific Blue Marlin	--	1
Acapulco/Ixtapa/ Zihuatanejo/Guerrero	Sailfish	90	118
	Pacific Blue Marlin	15	2
	Striped Marlin	7	25
	Shortbill Spearfish	--	7
Costa Rica	Sailfish	2	1
	Striped Marlin	1	--
	Pacific Blue Marlin	--	9
	Black Marlin	--	1
Guatemala	Sailfish	20	--
	Striped Marlin	2	--
	Pacific Blue Marlin	1	--
New Zealand	Sailfish	1	--
Tahiti	Pacific Blue Marlin	1	--
Fiji	Sailfish	--	2
Samoa	Pacific Blue Marlin	17	--
	Sailfish	10	1
	Shortbill Spearfish	3	--
Totals		**984**	**662**

Tag recoveries (recaptures) provide data to assess growth and migration patterns. Ten tags were recovered in 2016 for six Pacific blue marlin, one striped marlin, two shortbill spearfish, and one unknown species (identified as a Pacific blue marlin at release and a black marlin at recovery). For the nine fish where tag release information was available (**Table 4**), the fish were at liberty for a collective average of 215 days (range 21-438 days). The most impressive recovery this year was for the Pacific blue marlin tagged in Hawaii and recovered 730.74 nautical miles away in Kiribati just 63 days later.

Only two tags on Pacific blue marlin were recovered in 2017, both by commercial fishing operations near or out of Hawaii. You'll notice the tag release information was never submitted, so please make sure you turn in your release cards and report any recoveries!

Table 4. Billfish tag recoveries for 2016 and 2017. PBM= Pacific blue marlin, SPR= Spearfish, STR= striped marlin.

Species	Tagger / Captain	Release Date	Release Location	Recovery Date	Recoverer	Recovery Location	Days At Liberty	Net Nautical Miles Traveled
PBM	Czabayski Jr./ Terwilliger	08/14/2015	Hawaii (19.19N,156.56W)	01/10/2016	Aaron Guptill	Hawaii (13.38N, 167.51W)	154	728.19
SPR	Herren/ Herren	05/06/2015	Hawaii (19.34N, 156.3W)	04/23/2016	Jose Vasquez	Hawaii (16.21N, 155.44W)	343	188.92
PBM	Isherwood/ Epstein	08/14/2015	Hawaii (19.37N, 156.4W)	07/18/2016	Ian Keinach	Hawaii (19.30N, 156W)	339	0.48
PBM	--	--	--	07/27/2016	Daniel Stokes	Hawaii (19.30N, 156W)	--	--
PBM	Burtner/ Stutheit	02/04/2016	Hawaii (19N, 156W)	03/30/2016	Jim Ives	Hawaii (19.30N, 156W)	55	1.80
PBM	Schultz/ Fay	08/09/2016	Hawaii (19N, 156W)	08/30/2016	Unknown	Hawaii (19.30N, 156W)	21	1.80
SPR	Hoshino/ Nakamaru	08/14/2015	Hawaii (19N, 156W)	10/25/2016	Dave Lewis	Hawaii (23N, 147W)	438	558.15
PBM	Giglio/ Kahl	07/27/2016	Hawaii (20.33N, 156.45W)	09/28/2016	Nelson Aberilla	Kiribati (8.38N, 158.39W)	63	730.74
PBM or STR	Okasinkski/ Schumaker	03/01/2016	Hawaii (19.50N, 156.4W)	12/28/2016	Edmar Aquino	South Pacific (12.12N, 166.19W)	302	716.19
STR	--	--	--	06/19/2016	Brian Bogan	Hawaii (27.36N, 149W)	--	--
PBM	--	--	--	07/18/2017	Commercial Fisherman	Hawaii (16.11N, 155.60W	--	--
PBM	--	--	--	04/01/2017	Terence	Hawaii (no coordinates)	--	--

Top-Tagging Captains and Anglers Acknowledgements

It is truly the hard work of dedicated anglers and captains who make the SWFSC Cooperative Billfish Tagging Program successful. Whether a veteran or first time tagger, we appreciate all of our anglers and captains who tag and release billfish and we would like to acknowledge those who tagged more than 3 billfish these past two years (**Table 5** and **Table 6**). Carol Herren dominated the angler charts for both the 2016 and 2017 years, with 76 billfish tagged in 2016 and 46 in 2017. Fantastic effort, Carol!

She was followed in both years by Craig Linder with an average of 15 tags released over the two years, which was complemented closely by Craig Lindner, Jr. in 2016 with 12 tags and Xavier Autrey in 2017 with 12 tags. We want to congratulate all our anglers on a job well done!

Captain Bruce Herren also dominated the captain charts in 2016 with 82 tags released from the *Raptor*. Herren was followed closely by Rich Hamilton and Kenny Fogarty, trailing by only 18 and 21 tags, respectively. Mexican Captain Santiago Valdovinos of the *Gitana* reigned supreme in 2017 with a total of 92 tags released, knocking Captain Bruce Herren into a deadlock for second place with Steve Bridges, as each released 47 tags during the 2017 calendar year. Congratulations to our top-tagging anglers and captains alike, and good luck in 2018!

Table 5. Anglers tagging more than four billfish in 2016 and 2017.

2016		2017	
Angler Name	**Billfish Tagged**	**Angler**	**Billfish Tagged**
Carol Herren	76	Carol Herren	46
Craig Lindner	14	Craig Lindner	16
Craig Lindner, Jr	12	Xavier Autrey	12
John Hayes	12	Ann Thompson	12
Peter Libkind	11	Tim Hawkins	12
Steve Spina	11	Dan Muslin	9
Rudy Baldoni	11	Carl Taylor	8
Larry Peardon	8	Matt Hoff	8
Chris Kiser	8	Charles Stirling	7
Darryl Longabardi	8	Sherry Polk	7
John Cole	8	Jan Halberg Madsen	6
David Brady	7	Dan Gaffney	6
David Malmberg	7	Walter Heim	6
Norman Cook	7	Rick Shedore	5
Larry Peabody	6	Candace Stewart	5
Kathy Ecklund	6	Flemming Andersen	4
Paul Fruchbom	6	Jacob Strarup	4
Jan Halberg Madsen	6	Gary Carruthers	4
Matt Hoff	6	Raymond Keating	4
Jeff Doescher	5		
Tim Wurster	5		
Pemerika Gillet	5		
Xavier Autrey	5		
John A. Dragos	5		
Paul Dolinoy	5		
Sean Weaver	5		
Grady Mulbery	5		
Doug Brownell	5		
Mark Thompson	4		
Reece Anderson	4		
Christa Morrissey	4		
Alex Keith	4		
Eric Schneider	4		


Image credit Bob Woodard.


Image credit Steve Turza.

Table 6. Captains tagging more than four billfish in 2016 and 2017.

2016		2017	
Captain	Billfish tagged	Captain	Billfish tagged
Bruce Herren	82	Santiago Valdovinos	92
Richard Hamilton	68	Steve Bridges	47
Kenny Fogarty	61	Bruce Herren	47
Santiago Valdovinos	59	Marlin Parker	35
Steve Bridges	49	Adan Valdovinos Olea	32
Marlin Parker	44	Mcgrew Rice	30
Teddy Hoogs	42	Kenny Fogarty	29
Mcgrew Rice	39	Teddy Hoogs	29
David Crawford	36	Dan Muslin	24
Joe Schumaker	31	David Crawford	24
Adan Valdovinos Olea	28	Jeff Kahl	21
Jeff Kahl	22	Stretch Fogarty	20
John Bagwell	19	John Bagwell	19
Tim Putnam	18	Bob Sylva Jr.	18
Jeffrey Fay	18	Sergio Marin V.	12
Don Stutheit	16	Chuck Wilson	11
Tim Hicks	15	Michael Roberto	10
Rob Ellyn	14	Seth Kizel	10
Bob Sylva Jr.	14	Tim Putnam	10
Kent Mongreig	14	Richard Hamilton	9
Vincente Cosio	12	Scott M. Fuller	9
Scott M. Fuller	10	Kent Mongreig	9
Tom Casey	10	Ann Thompson	9
Steve Carroll	10	Jeffrey Fay	8
Kerwin Masunaga	10	Walter Heim	6
Armando Arciniega	8	Brett Fay	6
Andy Wearing	8	Rob Ellyn	5
Chris Choy	8	Shawn Palmer	4
Chuck Wilson	8	M. Roberto	4
Trevor Child	7	Bryan Toney	4
Kevin M. Hogan	7	John R. Wilson	4
Oskie Rice	6	Jason Holtz	4
James Dean	6	Tony Clark	4
Brett Fay	6	Reuben Rubio	4
John Jordan	5	Jeff Morris	4
Russ Cox	5	Anvar Salas V	4
Bill Mac Corkell	5		
Sergio Marin V.	4		
David Unger	4		
Vaughan Simpson	4		
Rodney Reid	4		
Tony Clark	4		
Guy Terwilliger	4		
Bomboy Llanes	4		
Neal Isaacs	4		
Steven R. Fassbender	4		
Stan Ecklund Sr.	4		


Image credit Mary Mo.


Image credit David Johnson.


Image credit Rudy Morgon.

First record of the parasites *Maccallumtrema xiphiados* and *Philichthys xiphiae* in the striped marlin off Cabo San Lucas, Baja California Sur, Mexico

By Sofia Ortega García
Professor and Researcher- Instituto Politécnico Nacional - CICIMAR

Cabo San Lucas fishing has gained an international reputation that is hard to beat. Located at the southernmost tip of Baja California Sur, it is surrounded by the Pacific Ocean and the Sea of Cortez. With deep waters just a couple of miles from the shore and access to multiple seamounts and banks, Cabo's location makes it an ideal hub for sportfishing. It boasts the Pacific's highest reported striped marlin (*Kajikia audax*) catch-per-unit-effort and has fittingly been called the "Marlin Capital of the World", so is the perfect choice for any angler who likes to catch marlin, dolphinfish, roosterfish, tuna, dolphinfish, and other pelagic species.

The Interdisciplinary Center for Marine Sciences at the National Polytechnic Institute (CICIMAR-IPN) in La Paz, Mexico, runs a Large Pelagic Fish Project and monitors local sport fishing species. The Large Pelagic Fish Project carries out biological sampling during three consecutive days of each month in the main sportfishing landing site for the Cabo San Lucas fleet. During sampling in 2012 and 2013, two striped marlins were found with Didymozoid nematodes (**Figure 3**), one on December 6, 2012, approximately 26 nautical miles west of Cabo San Lucas, Baja California Sur, Mexico (23°02′N; 110°15′W); and the other on March 21, 2013, east of Cabo San Lucas near San Lucas Canyon (22°50′N; 109°50′W).

Figure 3. Didymozoid nematodes found between the muscle and the skin of striped marlin.

The scientific name of this nematode is *Maccallumtrema xiphiados* and it was found between the muscle and the skin of a female striped marlin measuring 155 cm postorbital length and weighing 35.4 kg, as well as from a male striped marlin 122 cm postorbital length and weighing 16 kg. These parasites appeared as a large mass of yellow-orange ovoid capsules distributed throughout the abdominal muscle.

These are permanent parasites of most marine and freshwater fishes and can be found in the gut, stomach, mouth, lungs and other organs. Although the parasite has been reported in swordfish and recorded in hosts living along the U.S. coast and Hawaiian Islands, this is the first time this parasite has been reported in the striped marlin caught in waters of Baja California Sur. Although it has not been proven whether the consumption of marlin meat infected by this parasite can affect the health of the human being, it is visually unpleasant.

In the same host, the poecilostomatoid copepod identified as *Philichthys xiphiae* was found near the interorbital width (**Figure 4**). The parasite was collected from a male measuring 155 cm posorbital length and weighing 36 kg (13 May 2014). This type of copepod is more common to find, although they cannot be seen with the naked eye.

Figure 4. *Philichthys xiphiae* copepod found near the interorbital width of a striped marlin.

For more information on this research, please read:

Ortega-García, S., & Hernández-Trujillo, S. (2017). First record of Maccallumtrema xiphiados and the Philichthys xiphiae in the striped marlin Kajikia audax (Philippi, 1887) off Cabo San Lucas, Baja California Sur, Mexico. Journal of Applied Ichthyology, 33(4), 804-806.

Highly Migratory Species Research

In addition to billfish tagging and research, the Life History Program of SWFCS's Fisheries Resources Division conducts research on highly migratory tuna, sharks, and pelagic fish. Our research focuses on better understanding the reproductive biology, growth and ageing, foraging ecology, and distribution of these species in order to accurately inform sustainable fisheries management.

TUNA

Species we study:

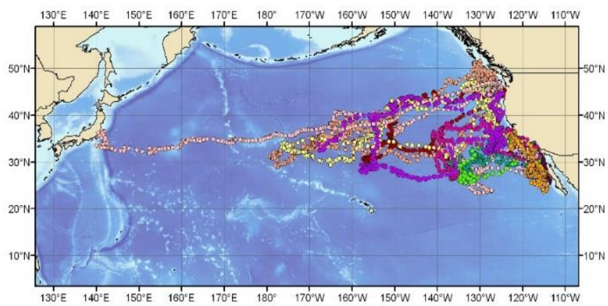
Pacific bluefin tuna (*Thunnus orientalis*)

Yellowfin tuna (*Thunnus albacares*)

Albacore tuna (*Thunnus alalunga)*

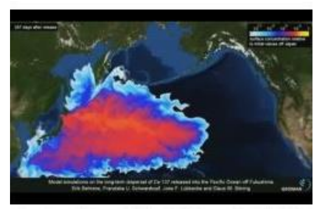
Bigeye tuna (*Thunnus obesus)*

Albacore tuna migrations



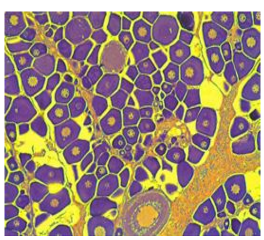
Since the 1970s, the SWFSC has collaborated with the American Fishermen's Research Foundation (AFRF) in tagging studies of North Pacific albacore. Through these studies we have learned that juvenile albacore make trans-Pacific migrations in their younger years between Japan and the West coast of North America. To date over 24,000 albacore have been tagged with conventional dart tags and 1,245 of these have been recovered.

Radioactive material in U.S. West Coast Tuna



Our researchers investigated the levels of radionuclides cesisum ^{134}Cs and ^{137}Cs found in Pacific bluefin tuna and albacore tuna as a result of the Fukushima Daiichi nuclear power plant accident in March 2011. In fifty bluefin tuna sampled off the U.S. West Coast in 2012, the smaller fish (recent migrants from Japan) had ^{134}Cs (0.7 ± 0.2 Becquerels (Bq)/kg) and elevated ^{137}Cs (2.0 ± 0.5 Bq/kg) in their white muscle tissue, while most larger, older fish had no ^{134}Cs and only background levels of ^{137}Cs. These levels of radiation were very low and far below levels that are considered cause for concern. To learn more, visit our website about Fukushima radiation in U.S. West Coast Tuna and read the paper.

Pacific bluefin tuna sampling



Pacific bluefin tuna are opportunistically sampled in recreational fisheries to obtain lengths for stock assessment estimates, otoliths for ageing, fin clips for DNA in genetic analyses, stomach contents for foraging ecology, and gonads for assessing sexual maturity. Although some of the bluefin sampled in the last few years have been larger than 300 pounds and 3-5 years of age, to date all gonads have been immature (*left*).

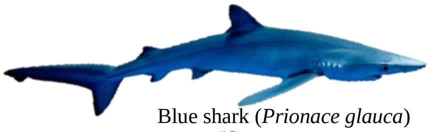
For more information on our tuna research, visit our **Tuna Research webpage**

SHARKS

Species we study:

Shortfin mako shark (*Isurus oxyrinchus*)

Common thresher shark (*Alopias vulpinus*)



Blue shark (*Prionace glauca*)

Basking shark (*Cetorhinus maximus*)

White shark (*Carcharodon carcharias*)

Tagging

The Southern California Bight is an important habitat and pupping ground for various pelagic shark species. The researchers at the SWFSC have tagged thresher sharks, shortfin mako sharks, and blue sharks with satellite tags (*right*) and conventional spaghetti tags to observe their abundance, distribution, movement, and growth. Tagged blue sharks have traveled the farthest offshore to waters south of Hawaii. Movement patterns for mako sharks show distinct differences among years, as movements were much farther offshore in El Niño years and the shift in distribution likely reflects a change in the availability of food near-shore. An examination of daily dive patterns reveals some additional differences among the three species. In comparison to the mako sharks, the blue and thresher sharks show a distinct diurnal pattern. The greatest difference in day and nighttime depth distributions is apparent in thresher sharks, which spends more time at depth during the day than either of the other two species.

Ageing

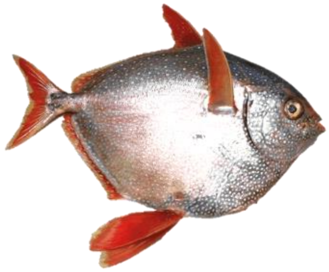
The vertebrae of the tagged sharks are injected with oxytetracycline (OTC), a fluorescent marker that provides a reference point in age and growth studies. Tetracycline deposits where new calcification is occurring at the time of injection and makes a fluorescent time mark in the vertebrae that can be examined in relation to new vertebral growth when a fish is recaptured a year or more after injection and release. Our age and growth research is dependent on the reported recapture of these tagged sharks. If you captured a tagged shark, a reward is offered in exchange for recapture information and shark vertebrae (see Tagging Spotlight, page 20).

Foraging ecology

While sharks are known and feared for their occasional attacks on humans, the majority of species prefer a diet of small fishes and invertebrates. A few (like the adult white shark) appear to prefer larger prey such as marine mammals, large fishes and other species of sharks. The stomach of an 11-ft. (3.4 m), 986-lb female taken near Santa Barbara Island contained remains of a young harbor seal, a small common dolphin, and vertebrae of one or more unidentified small sharks. The stomach of a 9-ft. (2.7 m TL), 402-lb male caught near Santa Monica Bay, CA, was found to contain remains of a billfish, tentatively identified as striped marlin, plus another unidentified teleost. Watch the video: A Mako Shark's Last Meal.

For more information on our shark research, visit our **Shark Research webpage**

OTHER PELAGICS

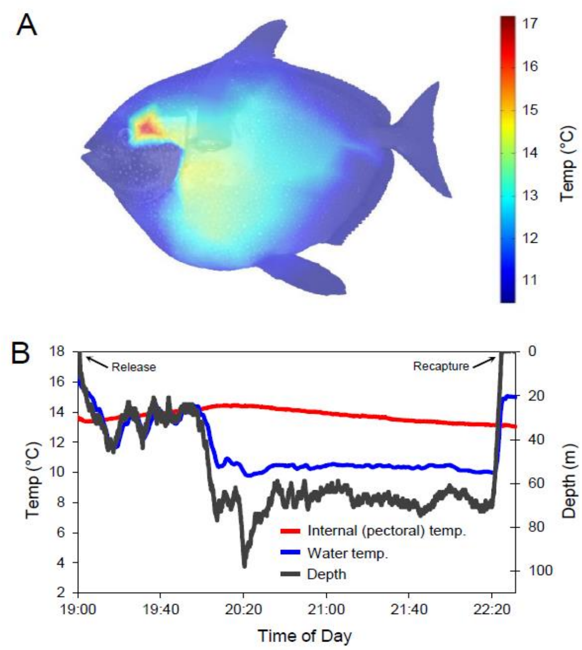


Opah (*Lampris gutattus*)

Yellowtail (*Seriola dorsalis*)

Opah endothermy

SWFSC researchers have reported that the opah is the first fish known to have a whole-body form of endothermy. Unlike tunas and lamnid sharks which are capable of warming specific regions of the body (regional endothermy), the opah is the only vertebrate outside of mammals and birds known to circulate warmed blood throughout the body. The bulk of its heat appears to be generated by its unusually large pectoral muscles which are used in continuous swimming. These muscles are insulated from water by a thick layer of fatty connective tissue. In addition, the opah has a unique series of extensive counter-current heat exchanges inside its gill arches which are used to minimize heat loss at the gills where blood comes in close contact with the water to absorb oxygen and release carbon dioxide during respiration. Thus the entire body core including the swimming musculature, visceral organs, and the heart are warmer than the environment. Although warm blood perfuses the entire body, the cranial region (eye and brain) is warmer than the body core. Read more here about opah on our **[Opah Biology webpage]**.



Yellowtail fitness

The Genetics, Physiology, and Aquaculture (GPA) Program uses physiological tools to provide high-quality data on the health and fitness of California yellowtail, *Seriola dorsalis*, in order to increase the productivity, efficiency, and sustainability of culture and production practices. Specifically, this work includes establishing baseline metrics of yellowtail health and fitness through measures of growth, feed conversion, metabolism, and swimming capacity. The comparison of such metrics between culture-reared yellowtail and their wild-caught counterparts helps define achievable health and fitness standards for aquaculture production and improve husbandry practices.

Interested in learning more? Visit the following links to access all of the research from the FRD Life History Program and the Large Pelagics Research:

https://swfsc.noaa.gov/FRD-LHP/

https://swfsc.noaa.gov/textblock.aspx?Division=FRD&id=20002&ParentMenuId=110

TAGGING SPOTLIGHT

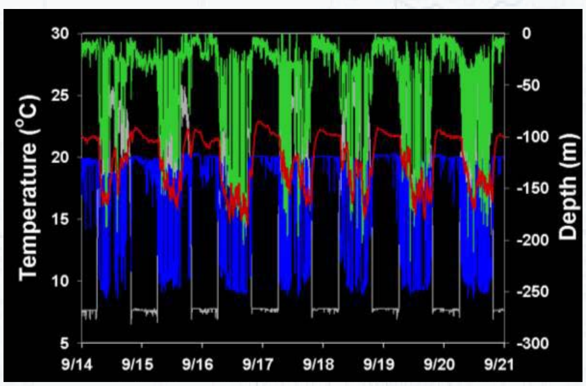
Tag types and uses

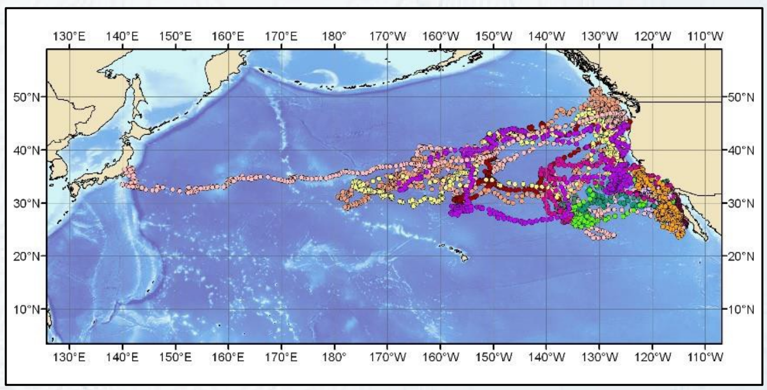
Tagging is no new practice, however, advances in satellite telemetry, geolocation, and computing power has driven the field of tagging research into new depths. The Southwest Fisheries Science Center deploys a variety of tags on many species, often in collaboration with other institutions, universities, and organizations. Here is a quick guide on tag types, their uses, and species the SWFSC deploys tags on.

Archival Tags (albacore tuna)

SWFSC recovery reward: $500

These digital, data-logging tags are surgically implanted into fish and record light level, water temperature, depth (pressure), and internal temperature for a pre-programmed rate over a set period of time. These tags are useful for monitoring thermoregulating species such as tuna and sharks which migrate long distances and maintain internal body temperature above ambient temperature during deep dives. Archival tags need to be physically recovered in order to retrieve and analyze the information stored on the tag. Our team tags albacore in the North Pacific Ocean to observe diving behavior and migration patterns (*below*).

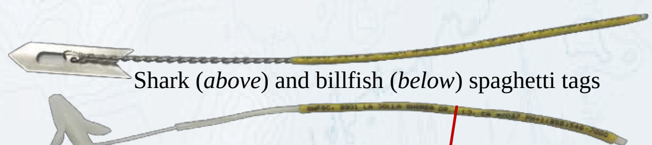




Conventional Tags (sharks and billfish)

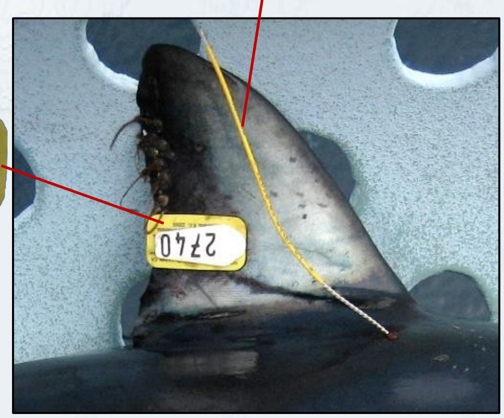
SWFSC spaghetti tag recovery reward: T-shirt
OTC tag recovery reward: $100 when returned with 4-5 verts

These are non-digital tags used to simply mark a fish for opportunistic recapture in movement and growth studies. Researchers record species sex and size, condition, and location at both release and recapture to calculate growth over time at liberty and movements. Conventional tags are cheap, durable, and can withstand wild animal movement for years, making them effective for mass-tagging events year after year such as this very billfish program. OTC tags indicate that sharks have been injected with fluorescent oxytetracylcine used for X-ray imaging of vertebrae for ageing purposes, so sharks with OTC tags also need their vertebrae recovered and examined.



Shark (*above*) and billfish (*below*) spaghetti tags

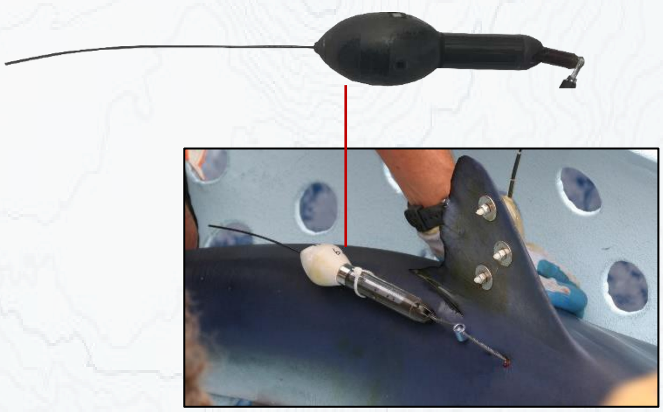
Oxytetracycline (OTC) tag

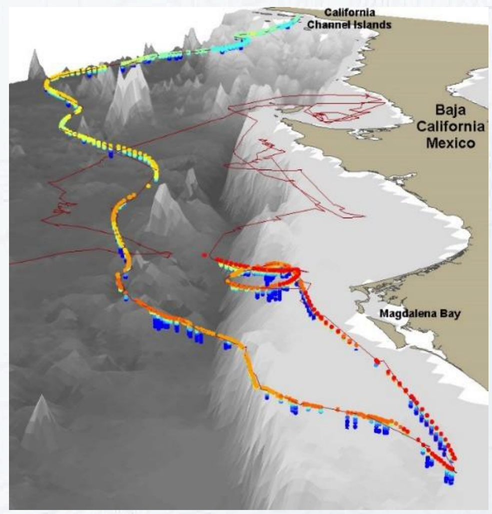


Pop-up satellite archival (PSAS or PAT) tags (Sharks and albacore tuna)

SWFSC recovery reward: 100-$500

PSATs are digital data loggers implanted on the back of submerged species and record location, depth, and temperature for a programmed period, which upon completion, detach from the animal and float to the surface to transmit tag data to a satellite-based system called Argos. The animal's horizontal movements are later calculated by geolocation software using the tag's observations of twilight, sea surface temperature, and dive depth, while vertical movements can be inferred by tag depth and temperature data. PSATs are useful for observing animals that are constantly diving and migrating long distances but that don't surface often, if ever. Although theses tags don't need to be physically recovered in order to access its data, recovering PSAT tags is useful considering they can be re-programmed and reused.

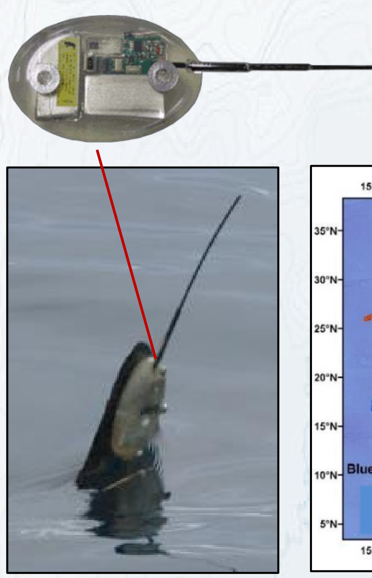


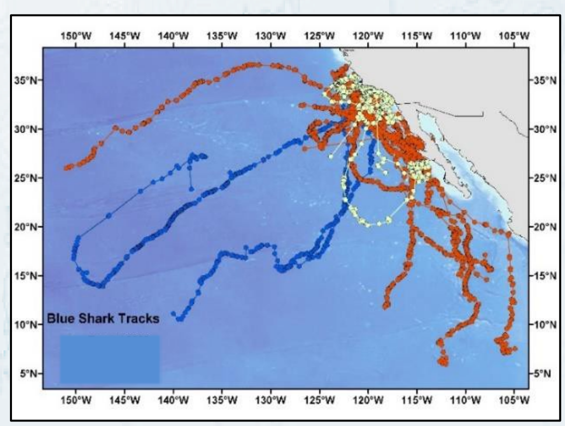


Smart Position and Temperature (SPOT) tags (sharks)

SWFSC recover reward: $50

SPOT tags are digital location trackers affixed to the dorsal fin of animals that spend time at the surface. When the SPOT tag is out of the water at the surface (*right*), it sends out short transmissions to the Argos satellite system that instantaneously calculates the location of the transmitter to produce near real-time, very accurate locations available to view online. SPOT tags also record temperature, however their true appeal is in tracking animals over long distances and in remote areas.



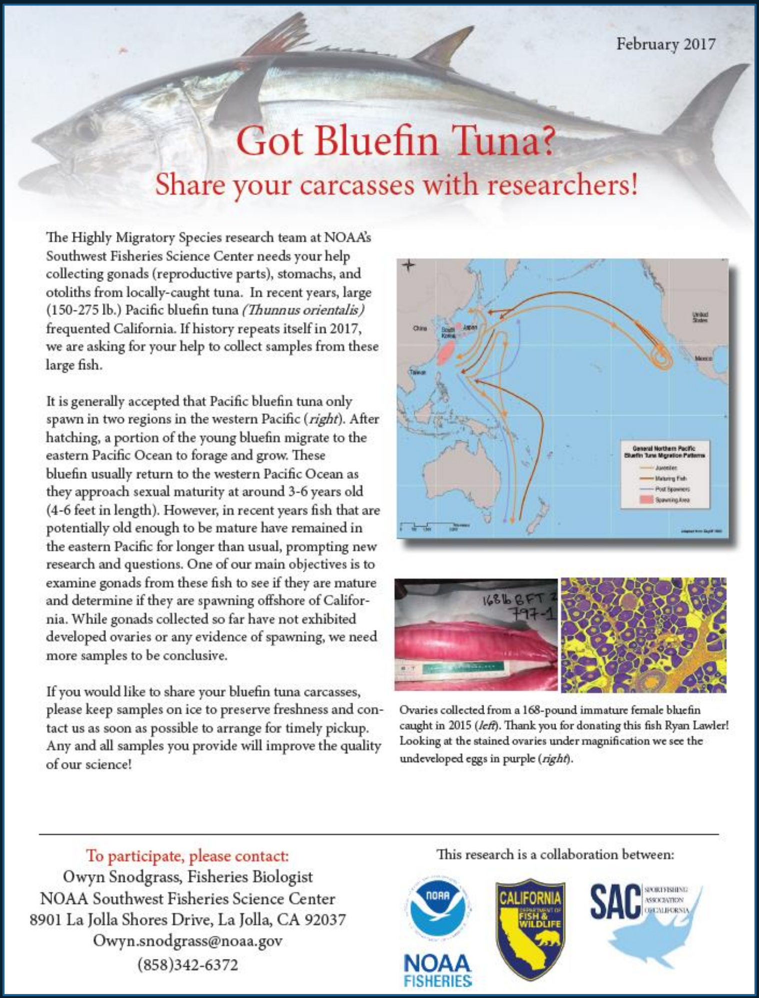


Do you have shark, tuna, or opah carcasses?

Donate your samples for research!

NOAA researchers are looking for:

- Pacific bluefin tuna carcasses and heads
- Innards of female common thresher sharks over 4.6 feet (140 cm) in length, preferably pregnant
- Opah carcasses
- Any tag type (conventional, satellite, implanted archival) on sharks, tuna, opah, or billfish



February 2017

Got Bluefin Tuna?

Share your carcasses with researchers!

The Highly Migratory Species research team at NOAA's Southwest Fisheries Science Center needs your help collecting gonads (reproductive parts), stomachs, and otoliths from locally-caught tuna. In recent years, large (150-275 lb.) Pacific bluefin tuna *(Thunnus orientalis)* frequented California. If history repeats itself in 2017, we are asking for your help to collect samples from these large fish.

It is generally accepted that Pacific bluefin tuna only spawn in two regions in the western Pacific (*right*). After hatching, a portion of the young bluefin migrate to the eastern Pacific Ocean to forage and grow. These bluefin usually return to the western Pacific Ocean as they approach sexual maturity at around 3-6 years old (4-6 feet in length). However, in recent years fish that are potentially old enough to be mature have remained in the eastern Pacific for longer than usual, prompting new research and questions. One of our main objectives is to examine gonads from these fish to see if they are mature and determine if they are spawning offshore of California. While gonads collected so far have not exhibited developed ovaries or any evidence of spawning, we need more samples to be conclusive.

If you would like to share your bluefin tuna carcasses, please keep samples on ice to preserve freshness and contact us as soon as possible to arrange for timely pickup. Any and all samples you provide will improve the quality of our science!

General Northern Pacific Bluefin Tuna Migration Patterns

Juveniles

Maturing Fish

Post Spawners

Spawning Area

Ovaries collected from a 168-pound immature female bluefin caught in 2015 (*left*). Thank you for donating this fish Ryan Lawler! Looking at the stained ovaries under magnification we see the undeveloped eggs in purple (*right*).

To participate, please contact:

Owyn Snodgrass, Fisheries Biologist

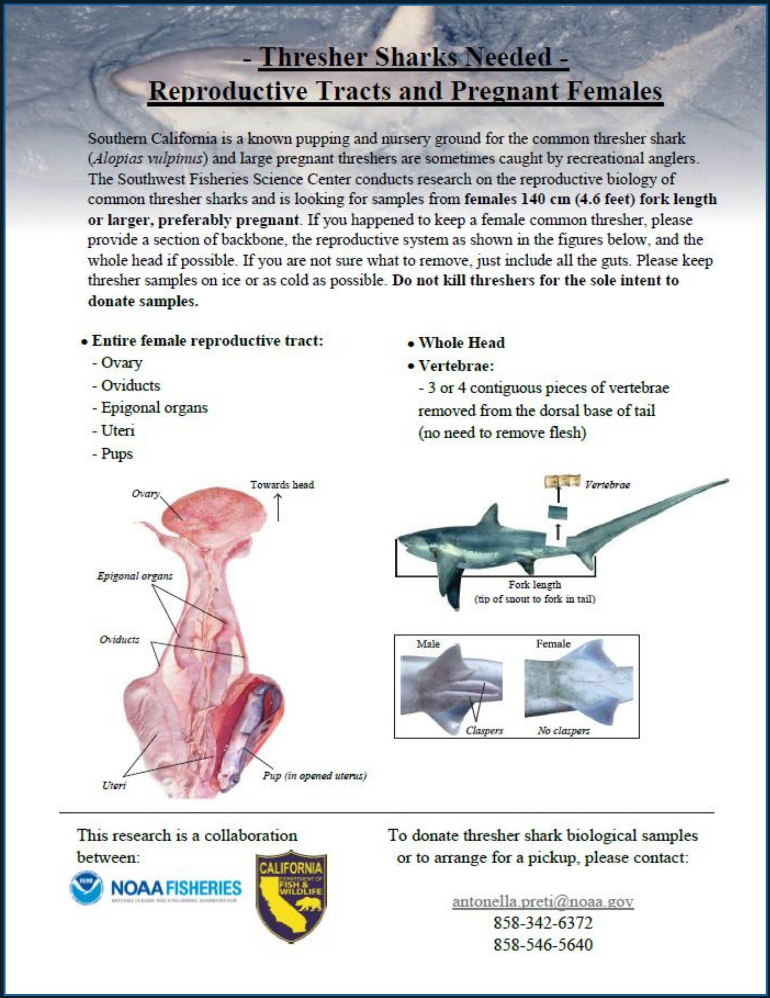
NOAA Southwest Fisheries Science Center

8901 La Jolla Shores Drive, La Jolla, CA 92037

Owyn.snodgrass@noaa.gov

(858)342-6372

This research is a collaboration between:



- Thresher Sharks Needed -

Reproductive Tracts and Pregnant Females

Southern California is a known pupping and nursery ground for the common thresher shark (*Alopias vulpinus*) and large pregnant threshers are sometimes caught by recreational anglers. The Southwest Fisheries Science Center conducts research on the reproductive biology of common thresher sharks and is looking for samples from **females 140 cm (4.6 feet) fork length or larger, preferably pregnant**. If you happened to keep a female common thresher, please provide a section of backbone, the reproductive system as shown in the figures below, and the whole head if possible. If you are not sure what to remove, just include all the guts. Please keep thresher samples on ice or as cold as possible. **Do not kill threshers for the sole intent to donate samples.**

- **Entire female reproductive tract:**
  - Ovary
  - Oviducts
  - Epigonal organs
  - Uteri
  - Pups
- **Whole Head**
- **Vertebrae:**
  - 3 or 4 contiguous pieces of vertebrae removed from the dorsal base of tail (no need to remove flesh)

Ovary

Towards head

Epigonal organs

Oviducts

Uteri

Pup (in opened uterus)

Vertebrae

Fork length

(tip of snout to fork in tail)

Male

Female

Claspers

No claspers

This research is a collaboration between:

To donate thresher shark biological samples or to arrange for a pickup, please contact:

antonella.preti@noaa.gov

858-342-6372

858-546-5640

Visit our Large Pelagics Tag Recapture Reporting webpage for more information and contact Owyn Snodgrass or Liana Heberer to donate your samples:

Owyn.snodgrass@noaa.gov

858-334-2884 or 342-6372

liana.heberer@noaa.gov

858-546-5626

ACKNOWLEDGMENTS

The information here would not be possible without the cooperation of thousands of international anglers and volunteers who support these investigations, which we greatly appreciate. We also thank Dr. Sofia Ortega-Garcia for contributing her research to our Newsletter. Our Billfish Newsletter archive, Angler Surveys, and tag request page can be found online at the SWFSC webpage, https://swfsc.noaa.gov/FRD-Billfish/.

Thank you | Fa'afetai | ありがとうございました | Gracias | Merci beaucoup!

PAPERWORK REDUCTION ACT NOTIFICATION

NOAA Fisheries needs the information reported on Billfish Tagging Cards and the International Billfish Angler Survey for the conservation and management of fishery resources. The information will be used for billfish research. Public reporting time and effort for the Billfish Angler Survey card is estimated to average five minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. You can send comments regarding this burden estimate to the SWFSC, 8901 La Jolla Shores Drive, La Jolla, CA 92037. The information submitted will become public record. Notwithstanding any other provision of the law, no person is required to, nor shall any person be subject to a penalty for failure to comply with collection of information subject to the requirements of the Paperwork Reduction Act.


Image credit Glen Heitman.


Image credit Hugh Himmelreich.


Image credit Dave Itano.

Submit your angling photos to
liana.heberer@noaa.gov
to be featured in next year's
Billfish Newsletter!


Image credit Todd Lenihan.


Image credit Troy Dando.


Image credit Marty Firestein.


Image credit Glen Heitman.