2015 Billfish Newsletter

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PROLOGUE

The annual Billfish Newsletter has been communicating the results of the cooperative efforts between fishery scientists and billfish anglers for over 50 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 movements of large gamefish. Additionally, the Newsletter disseminates the results of the International Billfish Angler Survey, in which cooperative anglers have participated since 1969, creating one of the longest time-series of trends in angler-based relative abundance for several key species. The combined efforts of recreational anglers and the scientific community are essential to maintaining and assessing the health of billfish stocks. In the last two years we have witnessed unusual oceanic conditions with the "warm blob" and the El Niño. Understanding the effects of such events on our fisheries resources (see final section in this Newsletter) is helped through our work alongside billfish anglers. The Southwest Fisheries Science Center (SWFSC) looks forward to our sustained collaboration ensuring our goals are met.

Dr. Francisco Werner
Director, Southwest Fisheries Science Center

INTRODUCTION

The 2015 Billfish Newsletter describes ongoing billfish research projects conducted at the National Oceanic and Atmospheric Administration (NOAA) SWFSC including the results of the 2014 International Billfish Angler Survey and 2014 Cooperative Billfish Tagging Program. The data presented are the product of cooperation with recreational anglers, sportfishing clubs, commercial fishers, and agencies affiliated with the SWFSC. We express our sincere gratitude to those who completed the Angler Survey form and also those who contributed to our tag and release program.

INTERNATIONAL BILLFISH ANGLER SURVEY

We encourage billfish anglers to submit a complete and accurate annual Angler Survey. The Survey form is mailed at the beginning of each year to anglers who have submitted a completed Angler Survey or Billfish Tagging card in the last three years. Each additional Survey submission improves the reliability of the catch and effort statistics. If you or someone you know does not currently receive the Angler Survey, or if you would like to receive additional forms, please contact us. Alternatively, the Angler Survey form can be downloaded from the SWFSC website: http://swfsc.noaa.gov/FRD-Billfish/. Completed forms can be returned by postal mail or email.

The results from the 2014 calendar year were collected during 2015 and are presented in this year's edition. Over 400 anglers submitted their 2014 billfish fishing results from destinations in the Pacific, Atlantic, and Indian Oceans, as summarized in **Table 1**. Some reports were omitted from the analysis because information was missing; please remember to completely fill out the Angler Survey. When effort (fishing days) was not reported, catch data were not used to determine the nominal catch per unit of effort (nCPUE; number of fish per day) metrics.

Table 1. 2014 International Billfish Angler Survey results. Major species were those caught in greatest numbers per area: black marlin (BK), blue marlin (BM), sailfish (SF), striped marlin (SM), swordfish (SW), and white marlin (WM).

LOCATION	ANGLER FISHING DAYS	NUMBER OF BILLFISH	BILLFISH PER FISHING DAY (nCPUE)	MAJOR SPECIES
Pacific Ocean				
Hawaii	898	379	0.42	BM
Southern California	670	141	0.21	SM
Baja California	247	222	0.90	SM
Acapulco/Ixtapa/Zihuatanejo, Guerrero	115	202	1.76	SF
Australia	75	42	0.56	BK
Panama	68	48	0.71	SF
Costa Rica	62	164	2.65	SF
Tahiti	52	15	0.29	BM
New Zealand	48	10	0.21	SM
Manzanillo, Colima	27	11	0.41	SF
New Guinea	20	5	0.25	BM
Mazatlan, Sinaloa	20	14	0.70	SF
Guatemala	13	91	7.00	SF
Puerto Vallarta, Jalisco	10	8	0.80	SF
Samoa	10	2	0.20	BM
Galapagos Islands	5	2	0.40	SM
Fiji	4	0	0.00	-
Huatulco, Oaxaca	4	1	0.25	SF
Kiribati	1	0	0.00	-
Indian Ocean				
Maldives Islands	7	0	0.00	-
Atlantic Ocean				
Dominican Republic	16	12	0.75	WM
Bermuda	10	18	1.80	BM
Cape Verde Island	5	1	0.20	BM
Florida	3	3	1.00	SW
Florida Keys	1	1	1.00	BM
Cayman Islands	1	0	0.00	-
TOTAL	**2,392**	**1,392**	**0.58**	**SF**

The majority of fishing effort was reported off Hawaii, Southern California, and Baja California, Mexico. The Baja California results include reports off the states of Baja California and Baja California Sur. Overall, the billfish fishing results from these three locations were good. The nCPUEs reported off Southern California and Baja showed improvement from the previous year, while Hawaii remained nearly unchanged. Reports of effort were also high for communities along the western Mexico coast between Mazatlan and Huatulco.

Hawaii had the greatest number of fishing days, which was consistent with what has been reported in recent years. In comparison to the results from 2013, both the reported effort and catch off Hawaii increased in 2014. As a result of proportionally similar increases in both these values, the overall nCPUE, in billfish caught per fishing day (0.42) had minimal change. In fact, the nCPUE for the three most commonly caught species, blue marlin, striped marlin and shortbill spearfish, have been fairly consistent in recent years.

Anglers reported excellent billfish fishing off the coast of Southern California during 2014, which correlated with above average water temperatures during the summer and fall. An anomalously warm water blob in the northeastern Pacific (see http://www.nwfsc.noaa.gov/news/features/food_chain/ for information on the blob) brought what are typically warmer water species farther north. The favorable conditions off the coast of California set the scene and the 2014 nCPUE (0.21) was the third best result on record for this location. The result was greater than both the overall annual average (0.12) and the most recent five-year (2009-2013) average (0.06). Not surprisingly, the average number of days that anglers reported in effort also increased from the previous year's total. While the number of individuals that reported fishing off southern California only increased by one, the total amount of effort in fishing days increased from 370 days in 2013 to 670 days in 2014. This was an increase in the total effort by more than 80 percent.

The 2014 billfish nCPUE reported from Baja California was 0.90, which was the fourth highest value reported from the area in Survey history. This result was greater than the average from the most recent five years (0.77), but less than the average from the most recent 10 years (2004 – 2013; 0.97 nCPUE). The recent 10-year average included the three best years on record, 2007, 2008, and 2013, when the nCPUE was 1.90, 1.57 and 1.11, respectively. Irrespective, the 2014 nCPUE was a favorable result relative to the historical data. The annual average nCPUE off Baja for the lifetime of the Survey is 0.80. Three species made up the catch composition reported off Baja during 2014. Striped marlin made up 78 percent of the billfish caught by Survey anglers; the remaining catch was distributed amongst sailfish (18%) and blue marlin (4%). Respondents did not report any black marlin, which was unusual as this species has been a component of the Baja catch in all but two years.

Blue Marlin (*Makaira nigricans*):

Photo credit Frank Magnano.[1]

Blue marlin are tropically and subtropically distributed in the Atlantic, Pacific, and Indian Oceans. They generally prefer blue water and are typically found as scattered individuals rather than in schools. This gamefish primarily feeds during the day, mainly on fishes, but is also known to consume cephalopods (squid and octopus). It is the most common species encountered by billfish anglers off Hawaii and other central and western Pacific island nations. Historically, Atlantic and Indo-Pacific blue marlin were believed to be different species, but based on genetic evidence blue marlin are now believed to comprise a single species worldwide.

To examine long-term trends of blue marlin nCPUE in the Pacific Ocean, we highlighted nCPUEs from Hawaii and Baja California, Mexico (**Figure 1A**) where Survey anglers have historically reported the greatest blue marlin catch and effort. In 2014, anglers reported an nCPUE of 0.27 off the coast of Hawaii. This result was similar to that reported in 2013 (0.28). Since the 1970s, nCPUE has been increasing off the coast of Hawaii.

In contrast, blue marlin nCPUE has been decreasing off Baja California. Blue marlin nCPUE was 0.04 in 2014. The average annual nCPUE over the most recent 20 years was 0.07, compared to 0.05 over the most recent 10 years, and 0.04 over the most recent five years. The low nCPUEs reported in recent years were more common during the 1970s when the nCPUE did not get above 0.04.

Blue marlin catch was also reported off several other Pacific locations including central and southern Mexico, Guatemala, Costa Rica, Panama, Tahiti, Samoa, New Guinea, Australia and New Zealand. Anglers reported the highest blue marlin nCPUE off Bermuda, where in 10 fishing days a total of 15 blue marlin were caught for an nCPUE of 1.50. Blue marlin catch was reported from other Atlantic locations as well including Florida, the Dominican Republic and Cape Verde Islands.

Striped Marlin (*Kajikia audax*):

Striped Marlin is an oceanic species found in tropical, subtropical and temperate waters of the Pacific and Indian Oceans. It generally inhabits cooler water than both black and blue marlin and feeds on fishes, crustaceans and squids. It is the most common billfish species encountered by anglers off Southern California, the Baja Peninsula, and New Zealand.

[1] Travis Magnano holding blue marlin that was caught off Mission Bay, California.

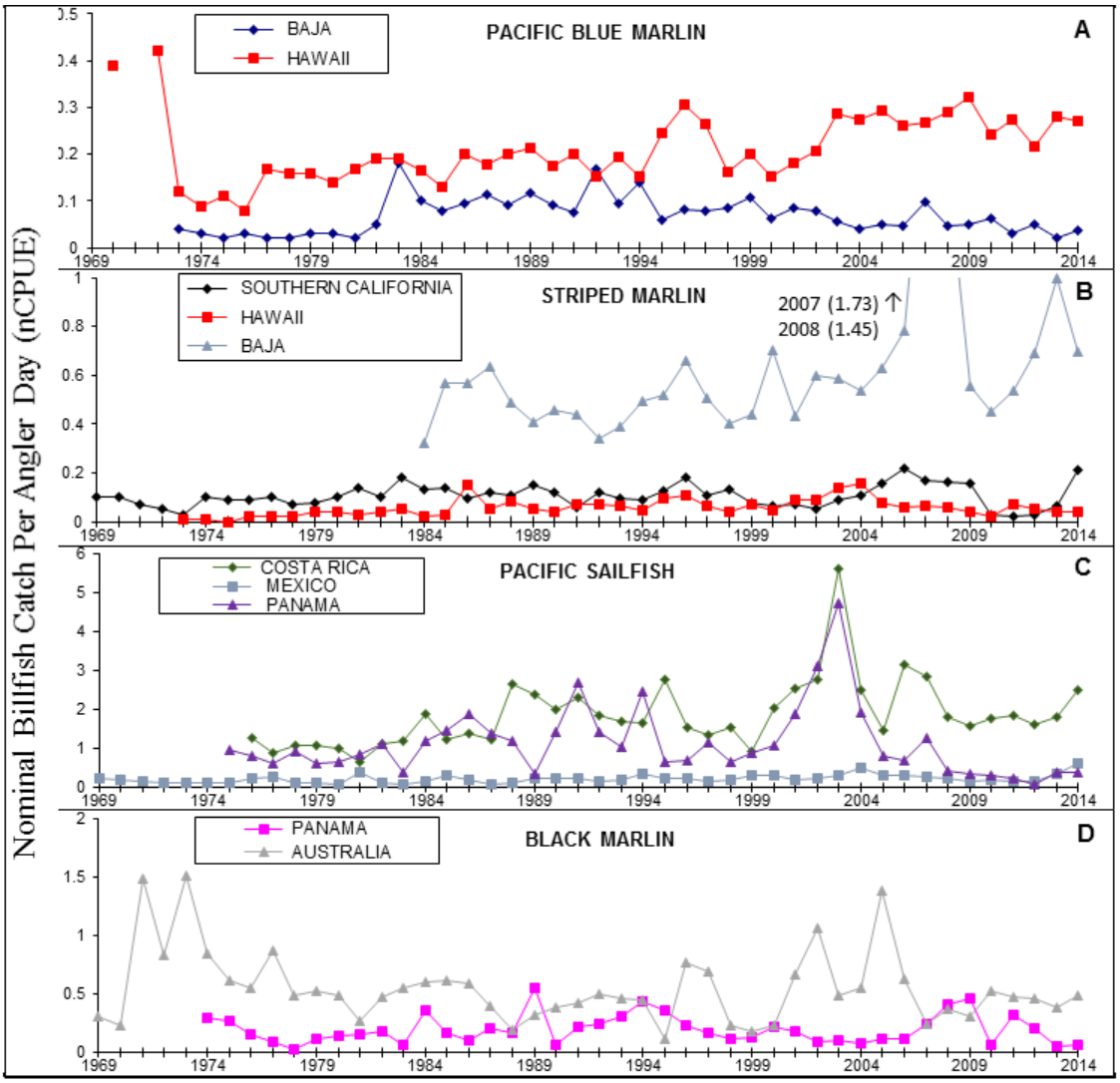


Figure 1. Nominal catch-per-unit-effort (nCPUE) in number of fish per angler fishing day reported by region from 1969 - 2014 for Pacific blue marlin (A), striped marlin (B), Pacific sailfish (C), and black marlin (D).

Striped marlin nCPUEs from Southern California, Baja California and Hawaii (**Figure 1B**) were examined. These three locations accounted for nearly 95% of the striped marlin catch. The results were mixed as anglers reported good fishing in the northeastern Pacific, but not off Hawaii. Arguably, the most notable difference in 2014 was the increase in striped marlin nCPUE off the coast of Southern California. As previously mentioned, the warm water blob that occurred off Southern California during the summer and fall of 2014 presented favorable conditions. Anglers reported an nCPUE of 0.21 striped marlin per day, which was the second highest striped marlin nCPUE on record. The highest striped marlin nCPUE off Southern California was 0.22 in 2006. To put this in perspective, the most commonly captured billfish species off Hawaii is blue marlin and during 2014 the Southern California striped marlin nCPUE and the Hawaii blue marlin nCPUE were nearly identical.

Across locations, the highest striped marlin nCPUEs are often reported from off Baja California and 2014 was not an exception. The nCPUE was 0.70 in 2014, which was less than the value during 2013 (1.00). However, the 2014 striped marlin nCPUE was a relatively high number. The 2014 result was above the recent five years average (0.65) and above the overall annual average (0.60).

Off Hawaii, striped marlin nCPUEs have ranged between 0.01 and 0.16. The 2014 nCPUE value was 0.04, which was below the annual average (0.06). The highest nCPUE value off Hawaii (0.16) was reported in 2004. However, the success was short lived. The average nCPUE from 2005 through 2014 is 0.05.

Pacific-wide, the 2014 striped marlin nCPUE (0.16) was similar to results from recent years. The value was equal to the average of the most recent five years and slightly below the average of all Survey years (0.19) despite a relatively good year in the northeast Pacific. In addition to the areas highlighted above, striped marlin catch was reported from locations off Mexico, Costa Rica, Panama, Ecuador, Tahiti, and New Zealand.

Pacific Sailfish (*Istiophorus platypterus*):

Sailfish prefer tropical habitat and are abundant in eastern Pacific coastal and offshore waters from Mexico to Ecuador as well as in tropical waters of the western Pacific and Indian Ocean. Sailfish can be found in schools, often with others of similar size. They feed on fishes, crustaceans, and cephalopods.

Anglers in Mexico had great success catching sailfish in 2014. It was their best season in Survey history (**Figure 1C**). Anglers reported a sailfish nCPUE of 0.63, which was nearly three times greater than both the recent five-year average (0.21) and the overall average (0.23). The Mexico sailfish nCPUE is based on fishing efforts reported from locations across the entire country. Baja California had the lowest sailfish nCPUE, which is not surprising as historical data shows that sailfish are more common in the warmer waters south of the Baja Peninsula. The 2014 sailfish nCPUE from locations south of Baja was 1.38, which compared to previous years, was the third best result on record.

In Central America, we examined the Survey results from neighboring Costa Rica and Panama. Prior to 2004, the annual sailfish nCPUEs reported from these two countries were often close in value, although over the past 10 years the sailfish nCPUE off Panama has consistently been below the values reported from Costa Rica. During 2014, the number of respondents and the amount of effort reported from these countries were similar, but there was a large discrepancy between the nCPUEs. The sailfish nCPUE off Costa Rica was 2.50, which was an improvement from 2013 and ranked in the top 10 annual results for this location. Conversely, the sailfish nCPUE

off Panama (0.38) dipped slightly from the previous year and was well below the overall annual average nCPUE (1.13). The good news for Panama was that the 2014 result was better than the average from the most recent five years (0.27).

In addition to locations highlighted above, sailfish catch was also reported from Guatemala, Hawaii, Tahiti, Papua New Guinea, Florida, Malaysia, and the Dominican Republic.

Black Marlin (*Istiompax indica*):

Black marlin are typically found in the tropical, subtropical and occasionally temperate waters of the Pacific and Indian Oceans. These fish are often caught near land masses and coral reefs and feed on fishes, cephalopods, crustaceans, and small tunas when abundant.

Black marlin were caught by Survey respondents at several locations during 2014 including Australia, New Zealand, Hawaii, Tahiti, Mexico, Guatemala, Panama, and Costa Rica. Similar to results from previous years, Australia was the only location where this species was caught in greater numbers than other billfish (**Table 1**). Australia had the highest black marlin nCPUE across all locations. The nCPUE was 0.48, which was similar to results reported in recent years. Prior to 2007, black marlin nCPUE off Australia was extremely variable with some years greater than one fish per day (**Figure 1D**). The 2014 result was slightly less than the annual average (0.55).

In the eastern Pacific, anglers fishing off Panama typically have the greatest success catching black marlin each year, but in 2014 Guatemala had the highest nCPUE (0.08) in the region. This result was the highest black marlin nCPUE reported from this location in Survey history yet reflects only a single black marlin caught during 13 days of reported effort. Over the past thirty years, a total of 1,887 fishing days have been reported by Survey respondents fishing off Guatemala's coast, resulting in only 10 black marlin captures. In southern Central America, anglers reported catching 5 black marlin off Panama with an nCPUE of 0.07. This was a slight improvement from the previous year (0.05) although the 2014 result was equal to the fourth lowest nCPUE for this location and was well below the annual average (0.19). The black marlin nCPUE off Costa Rica was 0.02, which was also below this location's annual average (0.04).

In addition to locations highlighted above, black marlin catch was also reported from off the Mexican state of Guerrero, Hawaii, Malaysia, New Zealand, and Tahiti.

Shortbill Spearfish (*Tetrapturus angustirostris*):

The shortbill spearfish is an oceanic species with a distribution across tropical, subtropical and temperate Pacific Ocean waters with limited abundance near Hawaii, Central America, Mexico, and the West Coast of the United States. Shortbills have been occasionally reported in the Atlantic Ocean, but it is thought that the primary populations and spawning grounds are within the Pacific and Indian Oceans. They feed on fishes, cephalopods, and crustaceans.

Historically, most spearfish catch has been reported off the coast of Hawaii. The Hawaii annual average shortbill nCPUE was 0.10, which was equivalent to the most recent five-year average and slightly above the overall average (0.08). The only other location where a shortbill spearfish was reported was Tahiti, where the nCPUE was 0.02.

Broadbill Swordfish (*Xiphias gladius*):

Broadbill swordfish are a commercially important fish but historically have not been taken in high numbers by recreational anglers in the Pacific. The fishing method typically used for targeting swordfish differs from other billfish because recreational anglers typically target these fish at night. Reports of swordfish catch among the billfish angling community are usually minimal. Recreational anglers reported catching swordfish at four locations in 2014 including California, Hawaii, Florida, and New Zealand.

BILLFISH ANGLER SURVEY cards for fishing during the **2015** calendar year were emailed or mailed in early 2016. If you have not already completed the Survey, please fill it out and return the post-paid form as soon as possible. Additional 2015 Angler Survey forms are available to all billfish anglers by contacting this office or they can be downloaded from our website. See http://swfsc.noaa.gov/FRD-Billfish/. We update our mailing list each year, so if you wish to continue to receive the *Billfish Newsletter* but did not fish, please indicate "**NO FISHING**" on the Billfish Angler Survey form and return it to the SWFSC and your name will be retained on our mailing list. Your continued response to the Billfish Angler Survey is appreciated and is critical to monitoring changes in abundance of billfish stocks important to recreational and commercial fisheries.

THE BILLFISH TAGGING PROGRAM

The SWFSC's angler-based Billfish Tagging Program began in 1963 and has provided tagging supplies to billfish anglers for over 50 continuous years. Tag release and recapture data are used to determine movement and migration patterns, species distribution, and growth. This volunteer tagging program depends on the participation and cooperation of recreational captains and anglers, sportfishing organizations, and commercial fishers. Over the course of this volunteer tagging program, over 55,000 billfish have been tagged and released! In addition, we report on other tagging efforts managed at the SWFSC. In collaboration with California Department of Fish and Wildlife and the recreational fishing community, over 80,000 fish have been tagged and released (**Table 2**).

Table 2. Summary of all fish tagged during 2014 with releases and recoveries for the period 1963 through 2014. The pelagic sharks and albacore were tagged during NOAA SWFSC research operations.

SPECIES NAME	RELEASE 2014	RELEASE TOTAL	RETURN TOTAL	RETURN RATE (%)
Pacific Blue Marlin	494	12,584	99	0.79
Sailfish	325	9,850	51	0.52
Striped Marlin	158	23,513	350	1.49
Shortbill Spearfish	75	2,439	4	0.16
Broadbill Swordfish	1	524	17	3.24
Black Marlin	0	3,392	69	2.03
Billfish, Unidentified	1	4,387	6	0.14
Common Thresher Shark	135	2,533	110	4.34
Shortfin Mako Shark	108	6,096	378	6.20
Blue Shark	38	9,941	202	2.03
Leopard Shark	4	235	12	5.11
Albacore Tuna	42	1,049	35	3.34
All Others	4	3,928	179	4.56
TOTAL	**1,385**	**80,471**	**1,512**	**1.88**

We are pleased to report that a total of 1,054 tags were released on billfish during 2014 (**Table 3**). This was the first time in nearly a decade that our billfish tagging program eclipsed 1,000 tag releases during the calendar year. It was a great achievement as tags were spread across several species from numerous locations across the Pacific Ocean. The majority of tag releases were on Pacific blue marlin and over 90 percent of those occurred off the coast of Hawaii. Anglers and Captains in Hawaii are stalwarts of our tagging program, in large part due to the cooperation of operations out of Kona including the Kona Charter Desk and Jody Bright for the Hawaii Marlin Tournament Series (http://konatournaments.com). Hundreds of tags each year are sent to these operations and end up on billfish through charters and tournaments. Equally important, the release information comes back to us and we are able to share the results with you.

Sailfish was the second most tagged species; a total of 325 sailfish were tagged. Over 300 of these sailfish were tagged off the coast of the Mexican state of Guerrero. In particular, captains and anglers fishing from the port of Zihuatanejo made a huge contribution to the tagging effort in this area. The Zihuatanejo sailfish tagging effort ramped up a few years ago as the result of some dedicated anglers and charter captains.

Table 3. Summary of billfish tagged during 2014, by region.

Pacific Ocean		
Southern California	Striped Marlin	33
	Marlin, unidentified	1
	Pacific Blue Marlin	1
Baja California	Striped Marlin	41
	Sailfish	7
	Pacific Blue Marlin	3
Puerto Vallarta, Jalisco	Sailfish	1
Manzanillo, Colima	Sailfish	4
Acapulco/Ixtapa/ Zihuatanejo, Guerrero	Sailfish	304
	Striped Marlin	1
Panama	Pacific Blue Marlin	1
Hawaii	Pacific Blue Marlin	463
	Striped Marlin	81
	Shortbill Spearfish	72
	Sailfish	2
	Broadbill Swordfish	1
Tahiti	Pacific Blue Marlin	3
Fiji	Shortbill Spearfish	1
Samoa	Pacific Blue Marlin	18
	Sailfish	6
New Zealand	Pacific Blue Marlin	3
	Striped Marlin	1
Unknown Location	Pacific Blue Marlin	2
	Sailfish	1
	Striped Marlin	1
	Shortbill Spearfish	2
TOTAL		**1,054**

Photo credit Eric Hermann.[2]

The 2014 billfish tagging total off Southern California was the best result in five years and the fourth best result overall. The majority of tag releases were on striped marlin. Corresponding with an increase in the Southern California striped marlin nCPUE over the past few years, there has also been an increase in tags released. The striped marlin tag total (33) during 2014 was the third best result on record; a total of 52 stripers were tagged in 2006 and 33 were tagged in 2008. Indeed, the warm water conditions of 2014 attributed to the warm blob benefited Southern California anglers.

Also worth noting was the tagging effort from the western Pacific. A total of 24 tags were released off Samoa, which was the best result from this location. This was mainly the result of cooperative anglers involved in the Pago Pago Game Fish Association and their annual Game Fish Tournament. In addition, anglers released billfish from other Pacific locations including Panama, Tahiti, Fiji, and New Zealand.

[2]Submitted by Bob Woodard.

TOP ANGLERS AND CAPTAINS ACKNOWLEDGMENTS

Recreational Anglers

We appreciate the cooperation of anglers and captains who tag and release billfish. The tagging effort during 2014 was the result of contributions from many people; over 650 individual anglers released a billfish tag. This was a very encouraging result as the number of taggers during the two previous years did not exceed 500. Thanks to all anglers who tagged or attempted to tag a billfish and promoted conservation and ethical angling during 2014! Individual recognition of the 63 anglers who reported three or more billfish tag releases is presented in **Table 4**.

Carol Herren deployed the most billfish tags amongst the recreational anglers (not including captains). Carol released a total of 57 tags off Hawaii on a combination of three different species including blue marlin, shortbill spearfish, and striped marlin. 2014 marks the fourth consecutive year that Carol topped the list of angler tag releases. Steve Spina, who has held the top angler award in previous years, was runner up to Carol in Hawaii for the second consecutive year.

Table 4. Names of anglers tagging three or more billfish during 2014, by area.

ANGLER NAME	BILLFISH TAGGED
California	
KATHY ECKLUND	12
Baja California / Baja California Sur	
LARRY PEABODY	5
REX BUTLER	5
THOMAS NEIKIRK	4
XAVIER AUTREY	4
COLBY HYATT	3
RICHARD HAMILTON	3
BARRY SMITH	3
Manzanillo, Colima	
JOHN ANDERSON	3
Acapulco/ Ixtapa/ Zihuatanejo, Guerrero	
XAVIER AUTREY	18
DAN GAFFNEY	12
GREG PROKOPETZ	9
CARL TAYLOR	7
PETER CROWE-	7
VICTOR STOLTZ	7
FRED CASHMORE	6
TIM PINELLI	5
PETER VEITNER	5
DON NEUFELD	5

ANGLER NAME	BILLFISH TAGGED
Acapulco/ Ixtapa/ Zihuatanejo, Guerrero (Cont.)	
DAVID SPARKS	5
WALTER SPARKS	5
CAMILLA THILLBERG	5
THOMAS C. WILKOSKI	5
JEFF WITT	5
MARK KORDUS	4
JOHN WILKINSON	4
GARY L YOUNG	4
DON SPARKS	4
DEBBIE KORDUS	4
ISIDRO BARRAGAN	3
JIM HEIKKINEN	3
JOAL BARBEHENN	3
GARRY TAYLOR	3
FRANK VANDEN BROCK	3
RANDY KOLLODGE	3
ROBYN VANDEN BROCK	3
SHARON POKOLM	3
DEAN MYHRE	3
DAVID JOHNSON	3
JILL ARMITAGE	3
WILLIAM A MIDDAGH	3

ANGLER NAME	BILLFISH TAGGED
Hawaii	
CAROL HERREN	57
STEVE SPINA	9
ROBERT MILSTEIN	7
CRAIG LINDNER	7
ED MUELLER	6
NICHOLAS	5
CHRIS HOWAT	5
MIKE JACOBSEN	5
DENEEN WARGO	4
BRENDA BAGWELL	4
LONA O. KNIGHT	4
CHRIS KISER	4
SULTAN LINJAWL	3
TIM WURSTER	3
RICK CHAPONOT	3
JOHN BOWERS	3
JANET B. MARTIC	3
BARRY ALTY	3
JIM ROBINSON	3
Samoa	
ANDY WEARING	4
ALFRED	3
JERRY MOORE	3

Taggers fishing off the Mexico state of Guerrero were very active during 2014. Guerrero locations had the greatest number of anglers that tagged three or more billfish. Only four anglers tagged more than 10 fish at one location during 2014 and two of them did this off Guerrero. Xavier Autrey tagged 18 billfish and Dan Gaffney tagged 12. Both of these anglers tagged exclusively sailfish at this location. However, Xavier Autrey's 2014 tagging efforts extended into other locations. Xavier tagged four billfish off Baja California including three sailfish and one striped marlin, in addition to tagging one sailfish off Puerto Vallarta for a total of 23 billfish. Another notable tagging effort off Guerrero was put in by the Sparks family who collectively tagged 17 sailfish during four days.

The warmer water put billfish anglers of Southern California back in action. In 2014 Kathy Ecklund was the top tagger in that area releasing 12 striped marlin.

Captains

Charter and private boat captains who support billfish tag and release (and catch and release) play an important role by supporting ethical angling and conservation stewardship of the marine environment. Further, they set an example by demonstrating skillful release of their billfish catch. A total of 133 captains reported tag and release of billfish with their anglers and clients. We gratefully acknowledge those 62 captains who assisted with tagging three or more billfish in specific regions (**Table 5**).

Santiago Valdovinos skippered during 135 tag releases! After breaking the triple digit barrier in 2013 with 105 tag releases, Santiago bettered the effort in 2014 and delivered the second best result by a captain over the past 50 years! Santiago takes clients out of Zihuatanejo aboard *Gitana* where Adan Valdovinos Olea aboard *Gitana II* also made a huge contribution. Adan skippered his charter while clients tagged 74 billfish. This was the second best result of all captains. With the combined efforts of these captains, it's easy to understand how Zihuatanejo was the location in 2014 with the most anglers that released three or more billfish tags.

Richard Hamilton skippered while anglers released 28 billfish tags off the coast of Baja California, Mexico. Captain Hamilton has been the leading captain off Baja in previous years and has almost 30 years of experience tagging for this program off locations including Baja, Hawaii, and California. During 2014, Richard helped anglers tag and release a combination of striped marlin, blue marlin and sailfish.

There were 17 captains that skippered during a billfish tag release off the California coast and three of those captains were involved with more than two releases. Stan Ecklund Sr. continued his efforts by leading all captains from Southern California for the second consecutive year. Stan was captain during 12 billfish tag releases, which was

over one third the total number of tags released from this location!

Off the coast of Hawaii, it's difficult to be the top tagging captain with such a high standard of competition. Thirteen captains tagged over 20 billfish during 2014. These captains are at the top of the bunch, year after year, and do an excellent job continually supporting the effort. Bruce Herren unseated Ken Fogarty as the top tagging captain after Ken held the title for three consecutive years. Bruce skippered for a total of 68 billfish tag releases which included 60 blue marlin, six shortbill spearfish, and two striped marlin. Ken and Marlin Parker tied for the second spot with 37 releases each.

We also want to thank the captains that flew the tagging flag in the western Pacific, far from the home location of this program in La Jolla, California. In particular, Andy Wearing and Joel Allain were the top captains out of Samoa and Tahiti, respectively.

Table 5. Names of captains tagging three or more billfish during 2014, by area.

CAPTAIN	BILLFISH TAGGED
Hawaii	
BRUCE HERREN	68
MARLIN PARKER	37
KEN FOGARTY	37
JOHN BAGWELL	31
CHUCK WILSON	28
GUY TERWILLIGER	26
STEVE EPSTEIN	26
ROBERT C. SYLVA JR.	25
MCGREW RICE	25
CHRIS WONG	24
TEDDY HOOGS	23
JEFFREY FAY	22
KEVIN HIBBARD	21
JAMES DEAN	18
DAVID CRAWFORD	14
MIKE TAPPERO	12
KERWIN MASUNAGA	11
STEVE CARROLL	9
TIM HICKS	9
BRIAN WARGO	9
MICHAEL O'TOOLE	7
DAVID BERTULEIT	6
KEVIN M. HOGAN	6
KENT MONGREIG	6

CAPTAIN	BILLFISH TAGGED
Hawaii (Cont.)	
JOHN JORDAN	6
NEAL PRESTON	6
PAUL CANTOR	6
TIM PUTNAM	5
BRETT FAY	5
GABE HEFLIN	5
CHRIS BAYS	5
RANDY LLANES	4
BRIAN (CHIP) VAN MOLS	4
ROB ELLYN	4
MIKE DEREGO	4
CHUCK E. HAUPERT	4
DON STUTHEIT	3
JOHN R. WILSON	3
LANCE GELMAN	3
JASON HOLTZ	3
SAM CHOY JR.	3
ROBERT MCGUCKIN	3
California	
STAN ECKLUND SR.	12
KYLE DICKERSON	3
NATE SHILL	3

CAPTAIN	BILLFISH TAGGED
Baja California / Baja California Sur	
RICHARD HAMILTON	28
VINCENTE COSIO	9
LUIS ABAROA FLORES	6
EODIN MARTINEZ	4
HAROLD SCHRAM	3
Manzanillo, Colima	
HOWARD BOND	3
Acapulco/ Ixtapa/ Zihuatanejo, Guerrero	
SANTIAGO VALDOVINOS	135
ADAN VALDOVINOS	74
ISIDRO BARRAGAN	53
EODIN MARTINEZ	26
ARMANDO ARCINIEGA	11
JESUS OSORIO RUIZ	5
Tahiti	
JOEL ALLAIN	3
Samoa	
ANDY WEARING	11
ROSS DAVIS	3
MICHAEL RANDRUP	3
ALFRED SCHWALGE	3

TAG RECOVERIES

Tag recoveries are a vital part of the Tagging Program because they allow us to track movements of highly migratory billfish species and monitor growth. We appreciate the anglers who report recaptures of tagged fish. In past years, as many as 27 recoveries have been recorded in a single year. Twice, during the 1990s, over 20 tags were recovered and reported during a single year. However, in recent years those numbers have significantly dropped and the average annual number of recoveries over the last 10 years is fewer than six. We encourage all anglers to report tag recoveries, including those that are re-released with or without new tags.

Table 6. Tag recovery information for 2014.

TAGGER / CAPTAIN	RELEASE DATE	RELEASE LOCATION	RECOVERY DATE	RECOVERER	RECOVERY LOCATION	DAYS FREE	NAUTICAL MILES - DIRECTION TRAVELLED
Pacific Blue Marlin							
GARETT CURRY / CHUCK WIGZELL	7/19/2011	Kona, Hawaii	1/4/2014	TEGUH SUPRAPTONO	Eastern Tropical Pacific	900	3,380 - SE
KEIJI MATSUBA / DOUG PATTENGILL	9/19/2009	Kona, Hawaii	8/15/2014	DENEEN WARGO	Kona, Hawaii	1,791	0
Striped Marlin							
BRIAN SCOTT / CHRIS WONG	2/17/2014	Maui, Hawaii	5/24/2014	LOI HANG	Eastern Tropical Pacific	96	915 - E
N/A - Release card not received	N/A	N/A	8/18/2014	VICENTE ESPINOZA	Baja California, MX	N/A	N/A
Shortbill Spearfish							
N/A - Release card not received	N/A	N/A	2/14/2014	KEN FOGERTY	Kona, Hawaii	N/A	N/A

Five recoveries were reported in 2014 including two Pacific blue marlin, two sailfish, and one shortbill spearfish (**Table 6**). The blue marlin recaptures were both very interesting as each exceeded two years at liberty. The first blue marlin recapture of 2014 happened in January aboard a fishing vessel that was working in the eastern tropical Pacific several hundred miles west of Peru. The fish was tagged in 2011 by Garett Curry while fishing with Chuck

Wigzell onboard *Hooked Up*. The fish moved a minimum 3,380 nautical miles, which was a top 10 result in distance travelled. We thank a colleague from Japan who relayed the information to us.

Deneen Wargo recaptured the next blue marlin in August. The marlin had been at liberty for nearly five years, which also was a top 10 result (time at liberty)! Amazingly, the fish was recaptured very close to where it was tagged. The fish was tagged in 2009 by Keiji Matsuba while fishing with Captain Doug Pattengill onboard fishing vessel *Ho'okele*. The recovery was made by Deneen, who is one of the owner operators of Bite Me Sportfishing, while fishing onboard fishing vessel *Bite Me 6*.

In May, Loi Hang recovered a fish that had been tagged earlier in the year by Brian Scott while fishing onboard *Hinatea* with Captain Chris Wong. The fish travelled approximately 915 nautical miles to the east in a relatively short amount of time, 96 days. The second striped marlin was recaptured in August by Vicente Espinoza off the coast of Baja California, Mexico. Unfortunately, the tagging information that describes the release of this fish was never received.

Similarly, we did not receive information regarding the release of the shortbill spearfish that was recaptured by Captain Ken Fogarty. This is truly unfortunate as this is one of only four shortbill recaptures on record and the details of the tagging would have been both useful and interesting. We appreciate the efforts of all who tag and release billfish as part of our program and remind everyone to return the tag and release details promptly so we can fill in the blanks.

Our emphasis continues to focus on the skillful tagging of all billfish in the Pacific Ocean. Other species tagged over the years through various collaborations and independent research efforts are also reported as both general interest and so anglers will know to look out for tags on a number of different species. While we consider tag-and-release vital for conservation, we do not encourage the use of our billfish tags for non-billfish.

The SWFSC's Large Pelagics group has a significant shark research program. Tagged and recaptured sharks in that program are mentioned here as general interest and because we need your support to look for bright yellow and/or white tags on the dorsal fin of shortfin mako, blue and thresher sharks. These specially tagged sharks are part of our age and growth studies. These sharks were injected with oxytetracycline which leaves a growth mark on the shark's vertebrae. We offer a ***US$100.00 reward*** *for the return of the tag with a four inch section of the vertebrae. Please notify this office as soon as possible if you catch one of these tagged sharks.*

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.

CHANGING WATERS, MOVING FISH

In recent years, we've witnessed oceanographic anomalies in the Pacific Ocean. In late 2013, scientists recognized a large mass of warm water off the West Coast of North America. This phenomenon, nicknamed 'the blob' by Nick Bond at the Joint Institute for the Study of the Atmosphere and Ocean at the University of Washington, extended through the summer of 2014 and into 2015. During this time, recreational anglers and scientists alike reported changes in the composition of species that they caught. For example, research surveys off the Gulf of Alaska found species such as ocean sunfish and thresher shark, which are rarely encountered in the ordinarily cooler waters so far to the north. Now, a strong El Niño has developed and water conditions across the Pacific are atypical. We can expect that migratory species affected by these changes will continue to adjust their normal behavior and migration patterns.

Using catch and tagging data from recreational anglers it is possible to examine billfish distribution and habitat in a changing environment. Scientists are using the best available information and analytical tools to try and understand how the observed climate-induced changes in oceanography are potentially leading to shifts in animal distribution. At James Cook University in Townsville, Australia, researcher Nick Hill and his colleagues examined the relationship between oceanographic conditions and black marlin distribution using data from a longstanding tagging program[3]. Spatial habitat modelling software was used to study the distribution of black marlin caught by recreational anglers off the eastern coast of Australia by incorporating a suite of oceanographic variables including sea surface temperature (SST), chlorophyll-*a*, sea surface height anomaly, and the magnitude and direction of predominant currents to investigate how suitable habitat for black marlin varied monthly, seasonally, and annually from 1998 through 2013. Chlorophyll-*a* and sea surface height were found to be the main factors that influenced black marlin habitat and distribution, highlighting the importance of features such as currents and eddies in driving their movements.

The El Niño Southern Oscillation was also found to be a significant factor, with suitable habitat in areas of the southwest Pacific varying annually and shifting as much as 300 kilometers poleward depending upon conditions. The authors describe an overall poleward shift in black marlin habitat that has been occurring at roughly 88 km per decade since 1998. This shift had not been described before and is likely due to an overall increase in the presence

[3] Hill, N. J., Tobin, A. J., Reside, A. E., Pepperell, J. G., & Bridge, T. C. (2015) Dynamic habitat suitability modelling reveals rapid poleward distribution shift in a mobile apex predator. Global Change Biology. http://onlinelibrary.wiley.com/doi/10.1111/gcb.13129/full

of tropical mode water across the southwest Pacific Ocean and the complex way in which local currents react to El Niño events in close proximity to Australia's coastline. The extent of suitable habitat was shown to be expanding at its southern (cooler) edge quicker than it was contracting at its northern edge. Therefore, suitable black marlin habitat may be expanding; however, it is not yet known if black marlin are altering their distribution in response to these shifts. It also raises the question how these changes may affect other species, such as striped marlin, whose suitable habitat may consequently be compressing as warmer water is pushed into their preferred cooler environment.

In the northeast Pacific Ocean, suitable habitat for striped marlin likely changed with the presence of unusually warm water in recent years. We have yet to understand the larger effects of recent events such as the blob and the ongoing El Niño. The development of billfish habitat models would assist in assessing the impact of these changes. Many anglers believe that recent events have created both temporally- and spatially-favorable conditions and an expansion of suitable habitat for some billfish species that spend time off the coast of California. Although continued monitoring and detailed modeling are necessary, warmer water conditions may translate into an expansion in suitable habitat and may lead to better fishing. Indeed, Southern California billfish anglers reported the second highest striped marlin nCPUE on record and an order of magnitude more striped marlin tag releases during the 2014 warm water year than in previous years. Keep an eye out for next year's Newsletter to see how the El Niño year unfolded.

Photo credit Carol Lynn.[4]

[4] Christine Mire and a large blue marlin caught onboard *Marlin Magic II* with Captain Marlin Parker.

Tagging Best Practices

1. BEFORE YOU CATCH YOUR FISH:

First decide if you plan to tag and release any fish caught. If so, circle hooks are preferred because they reduce deep or foul hooking when bait fishing. We recommend that you do not use double rigged J hooks when releasing your catch.

2. WHILE FISHING:

Never attempt to tag a fish while it is jumping or thrashing about. Bring your fish to leader as quickly as possible but wait until the fish is calm and swimming beside the boat before tagging.

3. TAGGING:

Check for previous tags! Tag the fish as it is being towed alongside the boat by inserting the tag in the back muscle below the tallest part of the dorsal fin. Avoid the gills, head, and belly. Take care not to allow your fish to injure itself on the vessel's transom or hull. Keep the fish's head submerged to allow oxygenated water to continue passing through its mouth and over its gills. Before releasing, measure or estimate the length of the fish from the tip of the lower jaw to the fork in the tail (LJFL; lower jaw-to-fork length) and its weight.

Photo credit Carol Lynn.[5]

4. RELEASING:

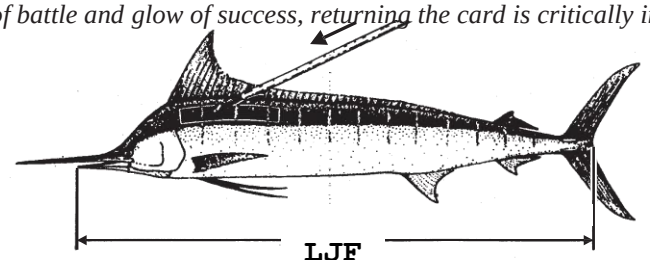
Revive the fish by slowly towing it through the water, allowing water to flow over the gills until its normal color returns and it begins to swim on its own. Remove the hook with a good pair of pliers, or if deeply hooked in the throat or stomach, release it by cutting the leader as close to the hook as possible. It is worth emphasizing the value of releasing healthy fish to increase animal survivorship, and thus chances of subsequent tag recovery. The healthiest fish are those that are handled with care, kept submerged throughout the capture, recovery and release process.

5. COMPLETE THE BILLFISH TAGGING REPORT CARD:

Photo credit Lindsay Skrapke.[6]

Fill out the yellow Billfish Tagging Report card completely and as accurately as possible indicating latitude and longitude, date of release, estimated length (LJFL), and estimated weight of the fish. Include name and mailing addresses of the angler and boat captain and other remarks as appropriate. Return cards promptly to us at the Southwest Fisheries Science Center. As we are move toward electronic Newsletters and Report Cards, please also include your email address.

Make your tagging effort count. *Tag and release your fish skillfully and return the BILLFISH TAGGING INFORMATION promptly. Though easily forgotten in the heat of battle and glow of success, returning the card is critically important and the final step in tagging your fish.*



[5] TJ Rosengarth with a beautiful tag and release onboard *Marlin Magic II*.
[6] Joe Kuschell reporting his 400lb catch after a day with Captain Fay on *Humdinger*.
[7] Back cover photo: Charlie & Steve Turza onboard *Silky* with Captain John Bagwell.

SEND US YOUR PHOTOGRAPHS

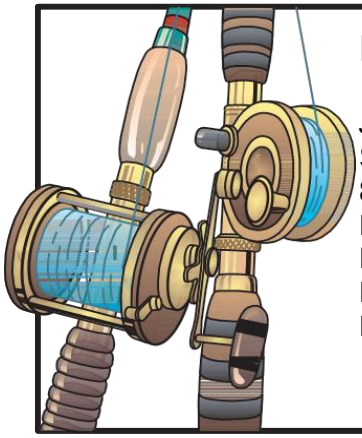
Cover photo: The winning cover photo was submitted by Brent Nelson. Photo credit Mason Farish. The photo is Dan Doehrr in battle with a jumping blue marlin that was tagged and released off the Kona coast.

Thank you everyone who submitted photos. We had a lot of great entries. We are looking for more great photographs for the next Billfish Newsletter. Color and black-and-white photos of billfish and/or fishing activities are appropriate. Digital photos are preferred and can be emailed to us. We would appreciate you sharing your photos and will reward a billfish tagging t-shirt for the winning entry and give full credit in the next issue.

ACKNOWLEDGMENTS

The information here would not be possible without the cooperation of thousands of anglers and volunteers who support these investigations. Their efforts and assistance are greatly appreciated. We thank Nick Hill for contributing to our research update on black marlin habitat. This and past Billfish Newsletters and the 2015 Angler Survey form can also be accessed through the SWFSC's webpage at http://swfsc.noaa.gov/FRD-Billfish/

Photo credit Jaime Turza.[7]



Fine fishing for now and forever!

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