

The Southwest Fisheries Science Center's

1996 Billfish Newsletter



Results of Cooperative Programs

- Trends in 1994 Billfish angler catch rates
- 1995 Billfish tagging and recoveries

Results of Recent Investigations into Migration Patterns

- Blue Marlin
- Broadbill Swordfish



INTRODUCTION

The *Billfish Newsletter* is an annual publication produced by the Southwest Fisheries Science Center (SWFSC) of the National Marine Fisheries Service (NMFS). The emphasis is on billfish angling and conservation of billfish resources in the Pacific and Indian oceans and is provided as a service to the international angling community. The results and activities of both the *International Billfish Angling Survey* for 1994 and the *Cooperative Billfish Tagging Program* for 1995 are presented in this newsletter. The data presented are the result of cooperating billfish anglers, sport fishing clubs and agencies affiliated with the SWFSC. Summaries of swordfish and blue marlin movements as indicated by our tag and recovery data are also included.

This year NMFS is celebrating its 125th Anniversary as the oldest conservation and environmental federal agency in the U.S. Created by Congress in 1871 as the U.S. Commission of Fish and Fisheries its mission was the protection, management and restoration of fish stocks. NMFS remains active in the role of resource conservation, management and environmental protection of the Nation's domestic and international fishery interests.

1995 was an interesting year with excellent *Survey* responses and increases in the number of billfish tags released and recovered. We have also joined the modern age of cyberspace. Yes, we are on the Internet. You can find the *Billfish Newsletter* along with our quarterly issue of the *Tuna Newsletter* on the Southwest Fishery Science Center's home page at <http://swfsc.ucsd.edu>.

RESULTS OF THE 1994 BILLFISH ANGLER SURVEY

The *Billfish Angler Survey* was begun in 1969 to provide an index of trends in billfish angling effort and catch for the recreational fishing community. Trends in recreational billfish angling throughout the Pacific and Indian oceans are important information to resource managers. Sudden changes in long-term trends can be used to identify emerging problems in localized areas as was seen off northern Mexico in the mid-1980s. Results of the survey cards sent out with last years *1995 Billfish Newsletter*, and returned in 1995, are reported here.

Billfish anglers responding to the *Billfish Angler Survey* for the 1994 fishing year reported catching 2,671 billfish during 6,589 days of angling in the Pacific and Indian oceans. The overall success rate was 0.41 billfish per angler-day or 2.47 days fishing to catch a billfish. Catches included 587 Pacific blue marlin, 136 black marlin, 895 striped marlin, 874 sailfish, 171 spearfish and 8 swordfish.

The results of the *Billfish Angler Survey* for the 1994 fishing year as reported by anglers, by landing location for the Pacific and Indian oceans, are presented in Table 1.

Table 1. Results of 1994 *Billfish Angler Survey*. Data in parentheses are values recorded in 1993. Species codes are striped marlin (SM), blue marlin (BLM), black marlin (BKM), and sailfish (SF).

LOCATION	ANGLER FISHING DAYS	BILLFISH PER FISHING DAY (CPUE)	MAJOR SPECIES
PACIFIC OCEAN			
Hawaii	2,570 (3,259)	0.26 (0.33)	BLM
So. California	1,600 (1,456)	0.09 (0.10)	SM
Baja California, Mexico	1,103 (1,278)	0.77 (0.60)	SM
Guaymas, Mexico	34 (24)	0.56 (0.29)	SF
Mazatlan, Manzanillo, Mexico	85 (101)	0.67 (0.56)	SF
Puerto Vallarta, Mexico	46 (41)	1.33 (0.46)	SF
Acapulco, Ixtapa, Zihuatanejo, Mexico	103 (72)	2.01 (1.54)	SF
Guatemala	10 (101)	2.90 (2.89)	SF
Costa Rica	92 (117)	2.17 (1.80)	SF
Panama	67 (120)	2.93 (1.78)	SF
Colombia	64 (-)	0.13 (-)	SF
Japan	3 (826)	0.00 (0.05)	BLM
Guam, U.S.A.	7 (253)	0.14 (0.18)	BLM
Saipan, U.S.A.	250 (-)	0.12 (-)	BLM
Fiji	32 (13)	0.16 (0.23)	SF
Tahiti, French Polynesia	52 (34)	0.42 (0.38)	BLM
New Caledonia, Solomon Islands	12 (-)	0.17 (-)	BLM
Australia	164 (156)	0.56 (0.53)	BKM
New Zealand	32 (135)	0.19 (0.27)	BLM
Papua New Guinea	40 (46)	0.08 (0.22)	BLM
Malaysia	16 (-)	0 (-)	BLM
Hong Kong	28 (16)	0.14 (0.12)	BLM
INDIAN OCEAN			
Kenya	62 (141)	0.40 (0.67)	SF
Mauritius	32 (225)	0.22 (0.22)	BLM
Mozambique	10 (-)	0.10 (-)	SF

**INFORMATION FOR RECEIVING THIS
NEWSLETTER AND ANGLER SURVEY FORM**

The *Billfish Newsletter* is sent to individuals who have within the past year tagged and released billfish, or have submitted the *Billfish Angler Survey* form to the Southwest Fishery Science Center during the past year. U.S. Government regulations require us to purge our mailing list each year. If you did not fish for billfish in 1995, but would like to continue to receive the *Billfish Newsletter*, indicate your name and address on the bottom portion of the *Billfish Angler Survey* form and indicate "NO FISHING" and return the form. Your name will be retained on the mailing list. Your cooperation in the annual *Billfish Angler Survey* and the *Cooperative Marine Game Fish Tagging Program* is appreciated.

The total number of angler-days reported for 1994 (6,589 days) decreased 23% from 1993. The overall catch per unit of effort (CPUE) for 1994 was 0.41 billfish caught per angler-day. This is similar to the four year average (1990 to 1993) of 0.43 billfish per angler-day, but lower than the preceding four-year period (1986 to 1989) of 0.54. The lowest catch rates occurred in the mid-1970s, averaging about 0.38 billfish per angler-day.

Highest catch rate for striped marlin was 0.49 at the southern tip of Baja California, Sur. High catch rates were reported for blue marlin in Hawaii (0.13), Costa Rica (0.16), Mauritius (0.22), Tahiti (0.38), Guam (0.14). Australia (0.45) and Panama (0.43) reported the highest catch rates for black marlin. Excellent fishing for sailfish was reported from Guaymas, Mexico, south through southern Mexico, Guatemala, Costa Rica and Panama.

The trends in CPUE recorded during the *Billfish Angler Survey* are shown graphically by location for striped marlin (Figure 1A), blue marlin (Figure 1B), black marlin (Figure 1C), and sailfish (Figure 1D), see page 4.

It is important to understand these catch rates are annual means calculated over the entire 1994 reporting year. They are not indicative of seasonal highs or lows encountered in any particular region. Also, regions reporting fewer than 100 angler-days (i.e., small sample size), may have a somewhat greater statistical error than regions reporting more than 100 angler-days. The principal value of these data is in the trends observed over a long period of time. These trends can be compared with other events affecting catch rates including meteorological patterns such as El Niño events, regional commercial fisheries or local economies.

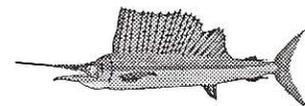
**COOPERATIVE MARINE GAME
FISH TAGGING PROGRAM**

TAGGING RESULTS FOR 1995

The *Billfish Tagging Report* cards received in 1995 indicate a total of 1,206 billfish were tagged and released by 738 anglers and 266 fishing captains, 54% more tags released than in 1994 (Table 2). Increased tagging of blue marlin, striped marlin and shortbill spearfish was noted from Hawaii. There was also increased tagging of striped marlin in Mexico and of blue marlin and sailfish in Fiji

Table 2. Summary of billfish tagged in 1995.

AREA	SPECIES	TOTAL
PACIFIC OCEAN		
Southern California, U.S.A.	Striped Marlin	87
	Short-billed Spearfish	1
	Broadbill Swordfish	2
Hawaii, U.S.A.	Blue Marlin	267
	Striped Marlin	365
	Sailfish	3
	Short-Billed Spearfish	119
	Broadbill Swordfish	66
Baja California, Mexico	Marlin	4
	Blue Marlin	30
	Black Marlin	3
	Striped Marlin	163
	Sailfish	60
Manzanillo/Acapulco, Mexico	Marlin	1
Colombia	Sailfish	2
Guam, U.S.A.	Sailfish	1
	Blue Marlin	11
Fiji	Sailfish	1
	Blue Marlin	2
	Striped Marlin	2
Tahiti	Sailfish	4
Tahiti	Blue Marlin	4
Marshall Islands	Blue Marlin	1
Kiribati	Blue Marlin	1
Tonga	Blue Marlin	1
ATLANTIC OCEAN		
Gulf of Mexico	Broadbill Swordfish	5
	White Marlin	2
	Blue Marlin	1
	Long-billed Spearfish	1
TOTAL		1,210



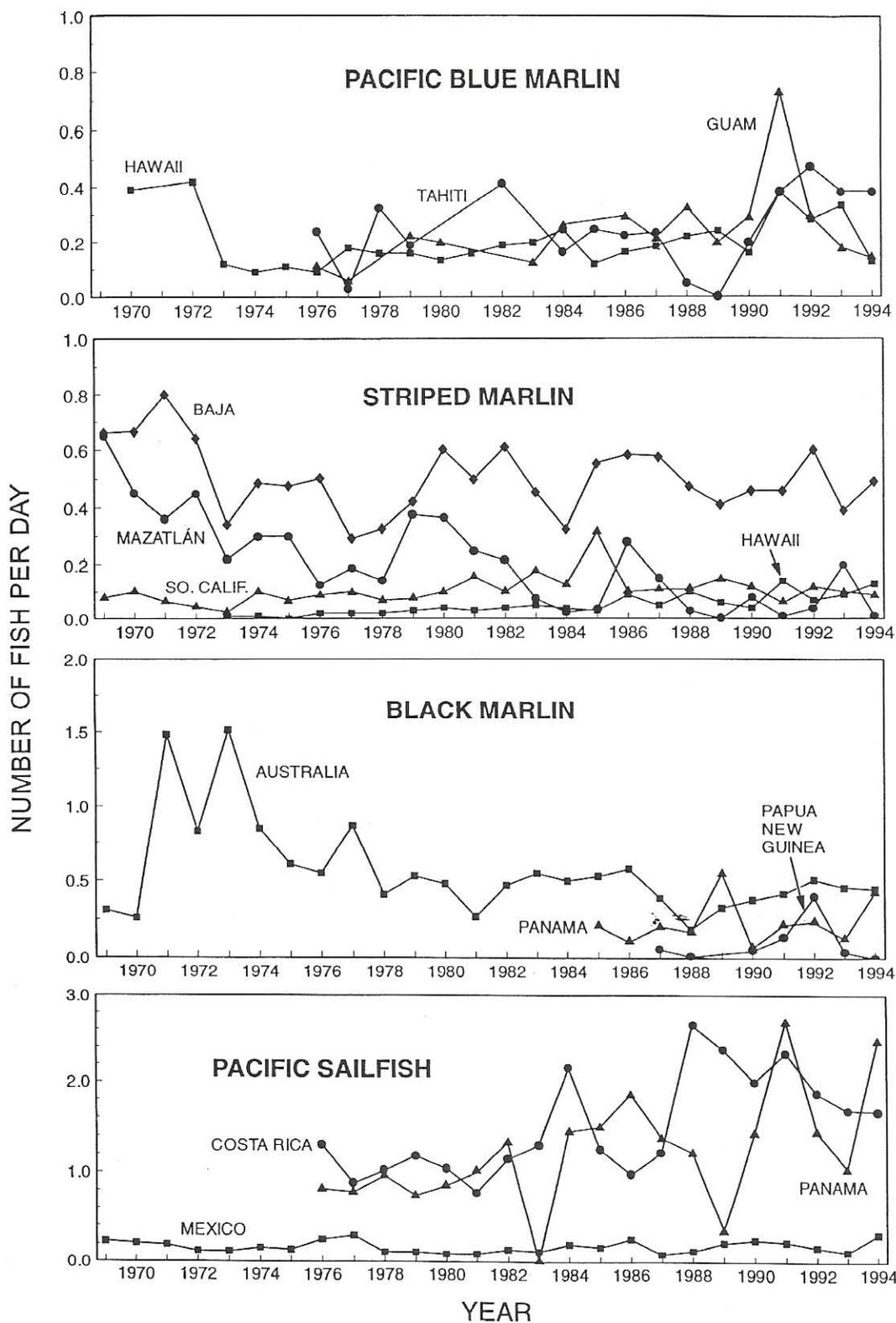


Figure 1. CPUE (number of fish/angler day) for A) striped marlin, B) blue marlin, C) black marlin, and D) sailfish reported by region, 1969-1994.

TAGGING PRIORITIES

Our current tagging emphasis, by location is:

Southern California	Striped Marlin Broadbill Swordfish
Hawaii	Blue Marlin Striped Marlin Black Marlin Broadbill Swordfish
Mexico	Blue Marlin Black Marlin
Central America	All billfish
Indian Ocean	All billfish

and Guam. Total fish tagged by billfish anglers in 1995 are shown in Table 3.

Table 3. Summary of all fish tagged in 1995.

Striped Marlin	617
Blue Marlin	318
Short-billed Spearfish	120
Broadbill Swordfish	73
Sailfish	71
Yellowfin Tuna	8
Marlin	5
Whitetip Shark	5
Bigeye Tuna	5
Shortfin Mako Shark	3
Black Marlin	3
White Marlin	2
Dorado	2
Yellowtail	2
Long-billed Spearfish	1
Albacore Tuna	1
Hammerhead Shark	1
TOTAL RELEASES	1,237

SURVEY RESPONSE

Your response to the *Billfish Angler Survey* is needed to better determine the trend of angler catch rates which provides an index on the health of the billfish stocks important to recreational fisheries.

Enclosed you will find three copies of the *Billfish Angler Survey* card for fishing in the 1995 calendar year; one for your individual use and extras for family members or other anglers not familiar with the *Survey*. Additional 1995 *Survey* cards are available to billfish anglers through this office.

Over 250 individual captains of charter and private boats tagged billfish in 1995. Due to space constraints, we list only those captains who tagged significant numbers of billfish in their region (Table 4, see page 6). Their continued interest and cooperation have greatly enhanced the Tagging Program and their efforts are appreciated. In the past we listed the name of each angler who tagged and released a billfish; however with over 700 individual taggers there just too many to recognize. This year we list all anglers who reported tagging two or more billfish in 1995 (Table 5, see page 7). We do recognize and appreciate the efforts of all billfish taggers and regret not being able to list them by name in this year's *Newsletter*. The captains of cooperating commercial fishing vessels are recognized in Table 6 (see page 7). Through their efforts in tagging small North Pacific swordfish and marlin, we are gaining valuable information concerning the movements of these migratory billfishes. Finally we acknowledge the efforts of the sportfishing clubs, fishing resorts, affiliated organizations and others involved in this truly cooperative *Billfish Tagging Program*.

TAG RECOVERIES - 1995

Twenty billfish tags were returned in 1995. Twelve were from striped marlin, five from blue marlin, and one each from swordfish, bigeye tuna, and shortfin mako shark (Table 7, see page 8). Of the five blue marlin, four were tagged and released off Kailua-Kona and the other off Maui, Hawaii. Days at liberty for these blue marlin ranged from 11 to 559 days. Four of them were recovered within the waters around Hawaii while one traveled 597 nm (894 km) southwest. Movements of all blue marlin recoveries to date are shown in Figures 2 and 3 (page 9).

Of the twelve striped marlin recovered during the year eight were tagged and recovered in the waters surrounding Hawaii. They varied in time at liberty from 9 to 265 days. Three other striped marlin were released off Southern California. Two of these moved westerly toward Hawaii over distances of 1,506 and 2,737 nm (2,786 and 5,063 km) and had been at liberty 129 and 205 days, respectively. One other striped marlin tagged near Santa Catalina Island, California, moved 635 miles (1,175 km) southeast to Thetis Bank, Mexico, in 309 days. A striped marlin tagged at the East Cape area of Baja California, Sur, Mexico, moved across the mouth of the Gulf of California to near Mazatlan, Mexico, in 14 days.

The only swordfish recovery of the year was tagged northeast of Hawaii and moved east-north-east 1,852 nm (3,426 km) and was recaptured near San Clemente Island, California. Another swordfish recaptured last year was tagged in that same area and also moved eastward toward the U.S. West Coast. All swordfish recoveries reported to date are shown in Figure 5 (page 11). The bigeye tuna

Table 4. Names of captains tagging substantial numbers of billfish, and the number of billfish tagged and released. From Billfish Tagging Report cards received for 1995 calendar year releases.

CAPTAIN NAME	TOTAL	CAPTAIN NAME	TOTAL
HAWAII, U.S.A.		BAJA CALIFORNIA, MEXICO CONTINUED	
Capt. Mark Shultz	86	Capt. Antonio Lucero	10
Capt. Mike Derego	36	Capt. Dennis L. Gagnon	8
Capt. Kelley Everette	27	Capt. Cami Garnier	7
Capt. F. McGrew Rice	26	Capt. Billy Miyagawa	6
Capt. Tom Siebler	26	Capt. Juan	5
Capt. Dennis Harris	22	Capt. Jerry Lewis	5
Capt. John Jordan	21	Capt. Brad Titcomb	5
Capt. Randy O. Orkisch	21	Capt. Jesus Araiza	4
Capt. Chuck Hauptert	20	Capt. Arturo Cota	4
Capt. James G. Ward	20	Capt. Jesus	4
Capt. Tad Luckey	18	Capt. Martin Lucero	4
Capt. Freeman Roberts	15	Capt. Terry Bersuch	3
Capt. Robert McGuckin	14	SOUTHERN CALIFORNIA, U.S.A.	
Capt. Dudley Worthy	12	Capt. Stan Ecklund	7
Capt. Jeff Honings	11	Capt. Ken Brookins	6
Capt. Fran Miller	11	Capt. Karl Kogler	4
Capt. Marty Sands	11	Capt. Michael S. Callan	3
Capt. Joseph Yu	10	Capt. Michele B. Kogler	3
Capt. Jerry Allen	9	Capt. Tom Patierno	3
Capt. Kevin M. Hogan	9	Capt. Dick Sieminski	3
Capt. Norm Isaacs	9	FIJI	
Capt. Robert D. McCowan	9	Capt. Darren Lane	3
Capt. Glen H. Paxman	9	Capt. Craig Hughan	2
Capt. Lee Severs	9	Capt. Max Lane	2
Capt. Bill Casey	8	GUAM, U.S.A.	
Capt. Tim Putnam	8	Capt. Russell Blythe	6
Capt. Bob Sterling	8	Capt. Jeb Bechtel	3
Capt. Randy Parker	7	TAHITI, FRENCH POLYNESIA	
Capt. Darryl Chow	6	Capt. Chris Lilley	3
Capt. Chuck Frumin	6		
Capt. Peter Hoogs	6		
Capt. Steven D. Kaiser	6		
Capt. Gary Oliver	6		
Capt. Roy Tutsahara	6		
Capt. Gene Vander Hoek	6		
Capt. Paul Abatie	5		
Capt. Mike Hennessy	5		
Capt. Darrin Isaacs	5		
Capt. Jerome Judd	5		
Capt. Chris Lightfoot	5		
Capt. Marlin Parker	5		
BAJA CALIFORNIA, MEXICO			
Capt. Mike Libby	27		
Capt. Jesus Agundez	24		
Capt. Paulino Martinez	18		
Capt. James A. Clarke	15		
Capt. Martin Verdugo Collins	15		
Capt. Eric A. Wahrenbrock	15		
Capt. Arturo	12		
Capt. Tom Naylor	11		

TAGGING SUPPLIES are available to billfish anglers through this office and the following locations:

- Southern California
 - San Diego Marlin Club, San Diego, California
 - Balboa Angling Club, Newport beach, California
 - Catalina Seafood, end of Avalon Pier, Catalina Island
- Hawaii
 - Pacific Ocean Research Foundation (PORF), Kailua-Kona
 - SWFSC, Honolulu Laboratory
 - Lahaina Yacht Club, Maui, HI
- Baja California, Mexico
 - Rancho Buena Vista, East Cape
 - Rancho Leonero, East Cape
- Panama
 - Tropic Star Lodge
- Tahiti
 - Haura Fishing Club

Table 5. Names of anglers tagging substantial numbers of billfish, and the number of billfish tagged and released. From Billfish Tagging Report cards received for 1995 calendar year releases.

ANGLER NAME	BILLFISH TAGGED	ANGLER NAME	BILLFISH TAGGED
SOUTHERN CALIFORNIA		HAWAII	
Hamilton Barnard	2	Robert Anthony	2
Chad Brookins	2	Kenny Blake	2
James Cecconi	2	Joe Bridges	2
John Durns	2	Brad Brim	2
Stan Ecklund	5	Michael Carter	2
Dennis L. Gagnon	2	Kenneth R. Corday	4
Eric Grennan	2	John Creswick	2
Kathy Henderson	2	Geza Csige	2
Gary Jasper	2	Richard M. Devine	2
Karl Kogler	3	John Drouilhet	2
Bill Lescher	3	Senichi Eguchi	2
Gerald Lester	2	Ron Freitas	9
Charles Robertson	2	Angelo Gentile	2
Don Schumacher	2	Taylor Gomes	2
Jeffrey Wells	2	Ralph P. Guttman	6
		Jerry Haynie	2
		David Heeney	2
		Bart Hoey	2
		Bill Hoey	2
		Keith J. Hollingworth	2
		Bill Holt	3
		Carol Holt	3
		Norm Isaacs	5
		Dayna James	2
		Jeff Kahl	6
		M. Karageorgis	2
		Jak Kingsbury	3
		Randy Kinores	3
		Seth Kizel	2
		Gilbert U. Kraemer	2
		James Lee	2
		Carlos Lewis	2
		Rebecca Long	2
		Bobby Luuwai	4
		Mike McElroy	2
		James McKee	2
		Charles M. Melhuish	2
		Tracy Melton	2
		Jeff Meyer	3
		Max Miller	3
		Bob Morgan	2
		D. Brent Nelson	2
		Hugh Pattinson	3
		Paula Pattinson	2
		Albert Pleus	2
		Alex Powers	2
		Angelo J. Rossi	3
		Beau Saunders	2
		Steve Schumacher	2
		John Scularri	2
		Scott Seo	2
		Jeff Stark	2
		Sue Stolzman	2
		Andrea Stovall	2
		Mort Thatcher	2
		Larry Van Sickle	3
		Stephen Wallace	2
		Thomas W. Watkins	2
		Duane Weiss	2
		Aimee Weller	2
		Matthew Weller	2
		Adrienne West	3
		Steve Williams	2
		Jef Wong	2
BAJA CALIFORNIA, MEXICO			
Don Anderson	20		
Donald V. T. Bear	12		
Russel V. Bear	5		
Mike Boyce	2		
James A. Clarke	7		
Reed Dewey	2		
Bonnie Egerer	2		
Randy Egerer	3		
Gordon Fawsett Jr.	2		
John Fabian	3		
Mary Fedorka	2		
Thomas J. Fisher	2		
Arlan Flaum	2		
Dennis I. Gagnon	8		
Scott Gillin	3		
Casey Hoch	6		
Gary L. Hunt	2		
Stephen Jansen	2		
Sawyer Jones	2		
Brad Karr	2		
Ron Kovach	4		
Jack Kursinski	3		
Cissy Lewis	3		
Jerry Lewis	5		
R.S. Madding	3		
William Maxwell	3		
Greg Metzgus	3		
Richard Mitten	5		
Tom Naylor	3		
Gary Norton	2		
Paxson H. Offield	10		
Al Panico	3		
Gary Primm	3		
Blair Proulx	8		
Ed Rice	3		
John Rose	4		
Steve Sheldon	2		
Lisa Shue	4		
Fred Slaten	3		
Sue Stolzman	2		
John Talsky	4		
Jan Van Liempe	2		
Fabian Von Posern	2		
Mark Wahrenbrock	2		
SharonWallis	2		
Joe Wimberly	3		

Table 6. We wish to thank the captains of commercial fishing vessels tagging billfish in 1995.

Robert Mitchell Jr.	Swordfish	12
	Striped Marlin	7
David Ghigliotty	Swordfish	18
Michael Traynham	Swordfish	9
Joseph M. Swann	Swordfish	7
	Striped Marlin	1
Jim Anderson	Swordfish	2
	Striped Marlin	4
	Blue Marlin	1
Gene Makus	Swordfish	7
	Striped Marlin	1
Greg Natali	Swordfish	5
Robert Vacchetta	Swordfish	4
Michael McDaniel	Striped Marlin	3
Steven Ho	Swordfish	2
TOTALS	Swordfish	66
	Striped Marlin	16
	Blue Marlin	1

was tagged on the French Seamount by our research associates onboard the *Townsend Cromwell* based in Honolulu. It traveled west only 330 nm (610 km) in 617 days. One recovery of a shortfin mako shark tagged near Santa Barbara Island, California, was recovered at Cortes Bank, 92 nm (170 km) to the south. It had been at liberty 808 days.

MOVEMENTS OF BLUE MARLIN IN THE PACIFIC OCEAN

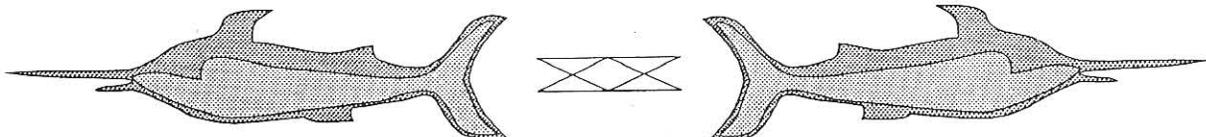
Background

Pacific blue marlin (*Makaira nigricans*) are distributed throughout the world's tropical and warm temperate oceans. In the Pacific, blue marlin make seasonal north-south migrations. Generally they are concentrated in the western and central South Pacific from December to March. During spring and summer (May to October) they move north to the western and central North Pacific. They inhabit waters off Hawaii all year but are more abundant June through October. Seasonal abundance off the west coast of Mexico is also highest during summer. Occasionally they move into the waters off Southern California but usually only during periods of anomalously warm ocean water.

Blue marlin concentrate in areas of high productivity principally in areas of equatorial upwelling which accumulate quantities of their prey. Their bill is used for stunning or killing their food which, in most areas, consists of squid, skipjack and yellowfin tuna. The primary

Table 7. Tag recovery information.

TAGGER CAPTAIN	RELEASE DATE	RELEASE LOCATION	RECOVERY DATE	RECOVERY LOCATION	DAYS FREE	MILES/ DIRECTION TRAVELED
STRIPED MARLIN						
Larry Benjamin Ken Brunst	01/16/95	21°18' N 157°52' W Kewalo Basin, Oahu, HI	01/25/95	16°53' N 156°14' W S. of Hawaii	.9	283 - S
Andrea Stovall -	01/22/95	21°38' N 158°04' W Oahu, HI	02/03/95	20°57' N 157°44' W S. of Oahu, HI	12	66 - S
David Brackman -	10/02/94	32°39' N 117°58' W San Clemente Is., CA	04/25/95	18°31' N 161°20' W S. of Oahu, HI	205	2737 - SW
Marty Sands -	03/15/95	21°15' N 157°00' W Molokai, HI	05/11/95	25°34' N 162°32' W NW of Kauai, HI	57	421 - NW
- Jeff Honings	02/25/94	20°42' N 156°55' W Lanai, HI	06/12/95	24°41' N 160°32' W NW of Kauai, HI	107	323 - NNW
Karl Kogler Michele Kogler	10/02/94	32°50' N 118°21' W San Clemente Is., CA	02/08/95	30°48' N 143°22' W NE of Hawaii	129	1506 - WSW
Stan Ecklund Kathy Henderson	09/18/94	33°30' N 118°50' W Santa Catalina Is., CA	07/24/95	24°44' N 112°54' W Thetis Bank, Baja MX	309	635 - SSE
James Clarke Gary Primm	06/09/95	23°23' N 109°25' W Los Frailes, MX	06/23/95	23°17' N 107°16' W Mazatlan, MX	14	129 - ESE
Kevin McLaughlin Mark Shultz	10/20/95	21°14' N 156°40' W Molokai, HI	10/30/95	21°38' N 156°35' W Molokai, HI	10	25 - NNE
Tom Lezcano Glen Paxman	10/21/95	21°15' N 158°02' W Oahu, HI	11/02/95	22°31' N 157°01' W NE of Oahu, HI	12	97 - NNE
- Mark Shultz	03/08/95	21°12' N 156°42' W Molokai, HI	11/28/95	22°52' N 150°45' W NE of Hawaii	265	371 - ENE
Debra Combs Chris Sheeder	11/15/95	21°18' N 157°49' W Honolulu, HI	12/23/95	19°31' N 155°56' W Kailua-Kona, HI	38	156 - ESE
BLUE MARLIN						
Art Sullivan Gene Vander Hoek	10/22/93	19°44' N 156°03' W Kailua-Kona, HI	05/04/95	13°38' N 163°55' W SW of Hawaii	559	597 - WSW
Marty Sands -	07/13/95	20°46' N 156°40' W Maui, HI	07/30/95	20°03' N 155°52' W Kawaihae Bay, HI	17	64 - ESE
Arthur Symes Kenny Llanes	08/23/93	19°27' N 155°58' W Kailua-Kona, HI	08/02/95	19°50' N 159°25' W W. of Hawaii	709	208 - WNW
David Levine Dennis Harris	10/25/95	19°30' N 156°00' W Kailua-Kona, HI	11/30/95	19°47' N 156°06' W Kailua-Kona, HI	36	18 - NNW
Robert Masson Kelly Everette	11/29/95	19°43' N 155°59' W Kailua-Kona, HI	12/10/95	22°50' N 156°55' W N. of Molokai, HI	11	195 - NNW
SWORDFISH						
David Ghigliotty -	05/01/93	28°20' N 149°08' W NE of Hawaii	01/01/95	32°03' N 118°29' W San Clemente Is., CA	610	1852 - ENE
BIGEYETUNA						
NMFS Research -	08/18/93	17°24' N 157°37' W French Seamount	04/27/95	14°31' N 162°18' W S. of Hawaii	617	330 - SW
SHORTFIN MAKO SHARK						
Don Riechel -	08/24/93	33°45' N 119°09' W Santa Barbara Is., CA	11/10/95	32°33' N 120°06' W Cortes Bank, CA	808	92 - SSW



factors that affect blue marlin movements, on both local and larger oceanic scale, are major oceanographic events that change water temperature and productivity patterns.

Blue marlin are sexually dimorphic in that females grow to be two to three times larger than males. During the Hawaiian summers males out-number females by several times. They are primarily a solitary fish which, at times, do form small schools. Anglers often report observing a large female surrounded by several smaller, presumably male, blue marlin. Spawning occurs over a wide area in the western and central Pacific. During the non-reproductive months (winter) the ratio of males to females tends to equalize and larger fish are often present. The current International Game Fish Association (IGFA) All Tackle Record was caught off Kailua-Kona in 1982 and weighed 1,376 pounds (624 kg).

Results

Anglers cooperating with the *Billfish Tagging Program* have tagged 3,943 blue marlin in the Pacific Ocean since 1964. Releases in Hawaiian waters account for 50% while releases off Mexico account for 35%. The remainder were released from the central and western South Pacific. Cooperating billfish anglers are currently releasing 350 to 400 tagged Pacific blue marlin annually.

Through 1995 we have received 34 blue marlin recoveries yielding a 0.86% return rate. Of these, release information for five (5) has not been returned. Two other recoveries were released as "striped marlin" and one additional tag was reportedly released on a "shark" and recovered from a "blue marlin". This leaves a total of 26 legitimate blue marlin recaptures. Twenty-one (21) of these were released in Hawaiian waters (Figure 2). Of those, 15 were recaptured in and around the Hawaiian Islands and indicate considerable inter-island movement ranging from 1 to 678 days at liberty (1.9 years) and a net movement of 3 to 195 nm (5 to 361 km). Five tagged off

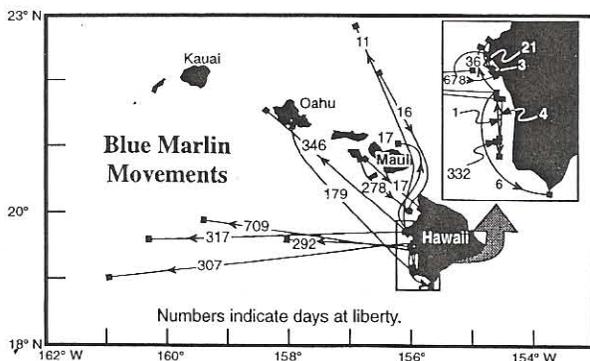


Figure 2. Blue marlin movements around Hawaii.

Kailua-Kona, Hawaii, moved westerly and off-shore from 122 to 597 nm (226 to 1,104 km) during 292 to 709 days at liberty. One additional blue marlin traveled south from Kailua-Kona to the Marquesas Islands in the South Pacific 2,357 nm (4,360 km) in 102 days. (Figure 3).

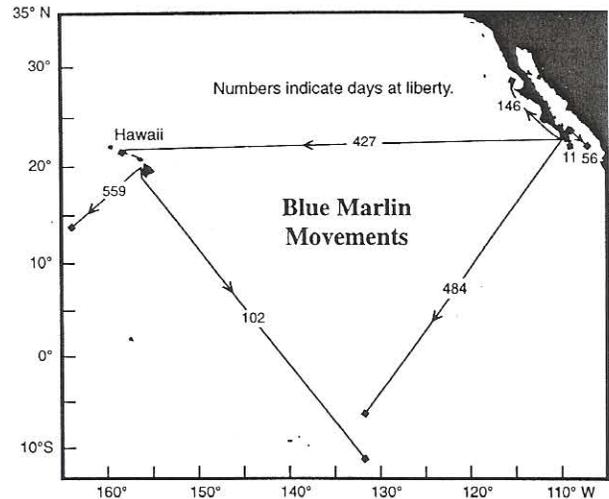


Figure 3. Long distance movements of blue marlin.

Five blue marlin were tagged along the East Cape area of Baja California Sur, Mexico (Figure 3). Three of these were tagged in front of Rancho Buena Vista and were at liberty from 11 to 146 days and traveled 110 to 465 nm (204 to 860 km). Two others traveled much greater distances: one to Oahu, Hawaii, 2,929 nm (5,419 km) west in 427 days and the other to the Marquesas Islands in the south Pacific, 2,228 nm (4,122 km) in 484 days.

Blue marlin are only occasional visitors to Southern California where there are only 12 reported tag releases and there are no confirmed recaptures. Two striped marlin tagged and released off Southern California were reportedly recaptured as blue marlin off the coast of southern Baja California Sur. Because species identification was not confirmed these data cannot be used in any analysis.

It is clear from the movements of individual blue marlin that their migration pattern is complex and more tag-release and recapture data are needed. Their movements throughout the Pacific places them at risk from many commercial fisheries operating in international waters. The Food and Agriculture Organization of the United Nations reports the annual commercial harvest of blue marlin in the Pacific is approximately 20,800 metric tons and 3,000 metric tons from the Indian Ocean.

It is generally agreed that commercial catches of blue marlin first exceeded sustainable fishing pressure in the early 1960s. The Pacific stock appeared to recover somewhat in the mid-1970s. These determinations are, however, based on fishery data only through 1986. Subsequent data necessary to determine the current status of blue marlin stocks in the Pacific are not available. Commercial catch in the Pacific continues to exceed the estimated sustainable harvest level although blue marlin stocks do not appear to be in decline.

The blue marlin catch per angler-day, reported in this *Newsletter*, may indicate a short term decline in angler success rate in both Hawaii and Guam (Figure 1A). However, this is not below the 10-year mean for those areas, and the catch rate for Tahiti remains high.

MOVEMENTS OF BROADBILL SWORDFISH IN THE PACIFIC

The broadbill swordfish, *Xiphias gladius*, in the North Pacific is harvested commercially in both coastal and high-seas fisheries by numerous nations. Longline vessels of Japan, Taiwan and Korea have fished in the North Pacific since the mid-1950s targeting swordfish, marlins and tuna. In California, harpoon fishing began in the early 1900s and remained the primary fishery for swordfish until 1980 when it was largely displaced by the drift gill net fishery for pelagic sharks and swordfish. The longline fishery for swordfish in Hawaii was fairly small until 1990 when it expanded rapidly due to an influx of vessels from the U.S. East Coast and Gulf states. Landings in Hawaii quickly surpassed those along the U.S. west coast.

Recreational anglers consider swordfish one of the finest of all trophy game fishes because of their size and strength. However, swordfish are rarely tempted to strike even the finest of baits or lures. Swordfish typically feed at night in the surface waters on small pelagic fishes, hake and squid. They are also known to feed at depths of at least 300 meters.

Most angling is done during the daytime from private boats targeting striped marlin. When a basking or finning swordfish is sighted, the angler may spend hours trying to encourage the seemingly aloof swordfish to take the bait. Drifting at night with chemical light-sticks and squid bait has been done in recent years but has been more popular on the East Coast.

The California recreational fishery for swordfish and striped marlin developed about the turn of the century. Recreational catch records of swordfish are kept by the various sportfishing clubs in California. The Balboa An-

gling Club, San Diego Marlin Club and the Tuna Club (Avalon) are three of the major clubs where anglers have their swordfish catches recorded and weighed. The number of swordfish weighed in at these clubs averaged 3 to 4 fish per year. During the period between 1969 to 1980, an average of 30.5 fish per year were caught, with a peak in 1978 of 127 swordfish reported (Figure 4). The increased catches during that period correspond to a similar increase in commercial landings. A generally higher abundance of their prey was also reported during the same period. There is some evidence that swordfish abundance may increase in the years following El Niño events.

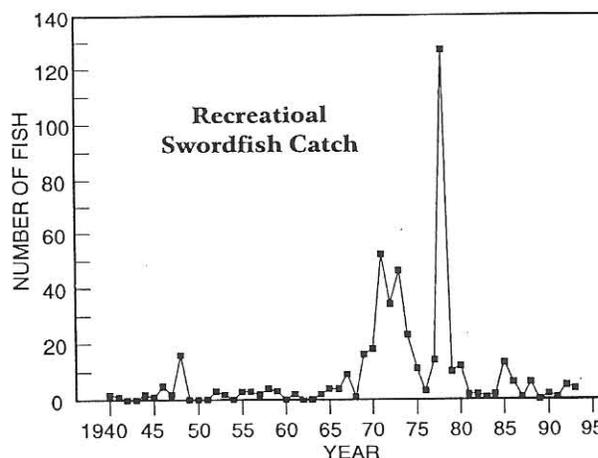


Figure 4. Southern California recreational swordfish catch.

Swordfish weighed at major California sport fishing clubs between 1981 and 1992 averaged 107.5 kg and ranged between 58.5 kg and 177 kg. The IGFA, All Tackle Record, was a 536 kg swordfish taken off Chile in 1953.

Since the beginning of the *Billfish Tagging Program* a total of 453 broadbill swordfish have been tagged and released. There are 9 legitimate recoveries. This 1.99% return rate is greater than the 0.79 to 1.95% obtained for the marlins. The SWFSC, along with cooperating anglers, tagged 17 swordfish in 1978 in an effort to identify movement patterns in the Southern California Bight. Six (6) of these have been recaptured; all were at liberty fewer than 35 days and had apparently not left the Southern California Bight (Figure 5, inset).

Since 1991, cooperating U.S. longline fishermen based in Hawaii have tagged and released small swordfish. Three swordfish tagged and released north of Hawaii moved northeast (Figure 5). The first was recaptured a year later 321 nm (594 km) to the east. The two other

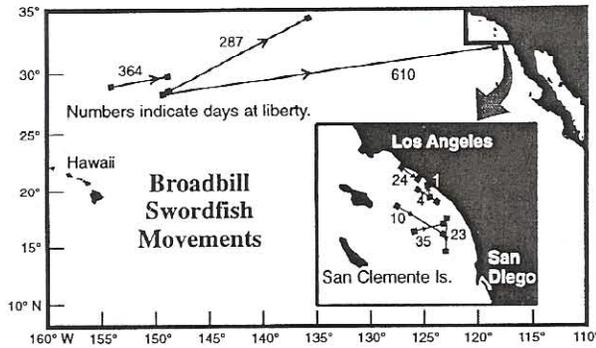


Figure 5. Broadbill Swordfish movements.

recoveries moved north and eastward from the central Pacific area toward the west coast of North America. One moved from northeast of Hawaii to near San Clemente Island, California, a total of 1,852 nm (3,426 km) in 610 days. This fish had grown 117 cm when recaptured by a

U.S. drift net vessel fishing for swordfish and pelagic sharks. The other moved eastward from the central Pacific to the Erben Tablemount, a distance of 889 nm (1,645 km) in 287 days at liberty. It had grown 59 cm when recovered by a Japanese longline vessel fishing in international waters.

Two immediate and important facts are apparent from these data. Swordfish in the central and eastern North Pacific move long distances and may have established, but as yet undefined, migratory patterns. Swordfish tagged in the Hawaii longline fisheries are being recaptured in the eastern North Pacific by vessels operating both in the coastal and international waters.

The swordfish resource is considered over-fished in the Atlantic Ocean and the Mediterranean Sea. In the Pacific, the resource is considered healthy and stable. Global markets for swordfish remain strong and the reduced supply from the Atlantic has caused increased demand for Pacific swordfish.

HOW TO TAG YOUR BILLFISH

First, have your tag loosely affixed to the applicator tip with a rubber band before you catch your fish.

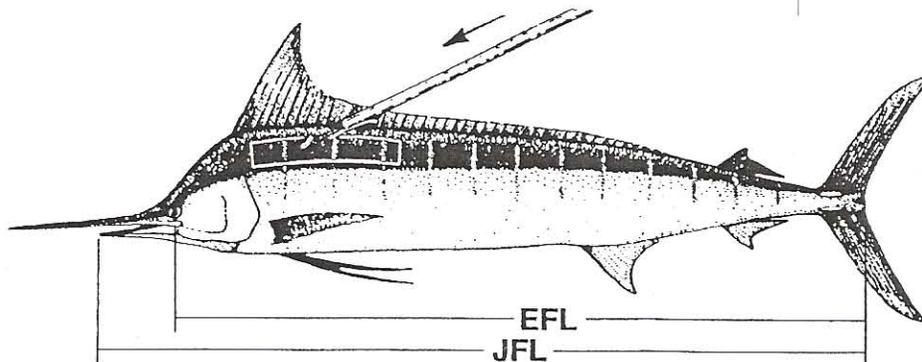
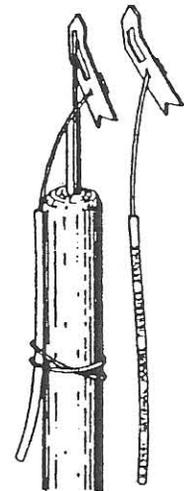
When the fish is brought alongside your boat, allow the fish time to calm down so you can better control it for accurate tag insertion.

The tag is inserted in the dorsal back muscle just below and behind the tallest part of the dorsal fin (pictured below). The tag should be inserted a full two inches into the muscle and at an angle matching the flow of water over the fish's back. Take care to avoid the head and gill areas.

The fish should be tagged without excessive handling or removing it from the water. If the hook cannot be easily removed, the fish can be released by cutting the leader as close to the hook as possible.

A fish that is over-exerted can often be revived by slowly pulling it through the water until it begins to swim on its own. A fish that has thrown its stomach can still be released. Several returns have been received when the *Billfish Tagging Report* card indicated "stomach thrown".

It is equally important to complete and promptly return the *Billfish Tagging Report* cards.



COMPLETING THE BILLFISH TAGGING REPORT CARD

The *Billfish Tagging Report* cards should be filled out completely and as accurately as possible. Use Latitude and Longitude as well as locally known fishing localities when possible. The length of the fish can be estimated as "eye-to-fork" (EFL) or as "tip of lower jaw-to-fork" (JFL).

Include any remarks, your Club name and complete address' of the angler and boat captain. Your name is recorded as angler or captain as indicated on the Billfish Tagging Report card. Number of billfish tagged by individual are summed by angler or captain category. Alternating between angler or captain will reduce the total number billfish listed in your name in each category. We do not double list names indicated in both categories. Please return cards promptly to the Southwest Fishery Science Center. Tagging is of no value unless this *Billfish Tagging Report* card is returned. Postage is paid if mailed in the U.S.A.

NOAA, National Marine Fisheries Service
 BILLFISH TAGGING REPORT
 Please return card
 Otherwise tagging is of no value

PLEASE FILL IN DETAILS AND MAIL TODAY. Tag No: A28762

Position: 33°12'N 118°10'W "SL106" Catalina I

Species: Striped Marlin Date: 8/14/93

Estimate, length or weight: Inches 70" EFL Lbs. 105

Remarks: Good Shape - hook removed

Angler: Marla Martin

Address: 1310 Broadbill Way SD Zip: 92111

Club: Anglers Bay Yacht Club

Captain: Bill Fish

Address: 214 Tagright St. SD Zip: 92111

Response to this form is voluntary.
 OMB 0648-0009, expiration date: 06/31/93
 NOAA 88-162, 4/93

Public reporting burden for this collection of information is estimated to average 0.01 hour 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. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to David B. Holts, Southwest Fisheries Science Center, P.O. Box 271, La Jolla, CA 92038-0271, and to the Office of Management and Budget, Paperwork Project, Washington, DC 20503.

ACKNOWLEDGEMENTS

We wish to thank all the anglers, captains, commercial fishers and cooperating agencies for supporting the *International Billfish Angler Survey* and the *Cooperative Marine Game Fish Tagging Program*. Thanks to Ken Raymond, Roy Allen and Henry Orr for the design and production of this newsletter.

We welcome comments concerning both the *Survey* and *Tagging* programs as well as the contents of this *Newsletter*.

SEND US YOUR PHOTOGRAPHS

The Southwest Fishery Science Center is looking for good photographs of billfish for the cover of next years *Billfish Newsletter*. Color or black-and-white photos of billfish and/or fishing activities are appropriate. We would appreciate your sharing of photos and will give you full credit in the 1996 issue. A billfish baseball cap and plaque will be awarded to the winning photographer.

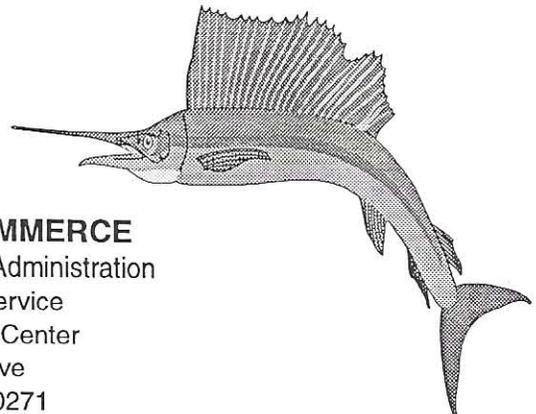
This year we recognize Richard Gibson for providing the 1996 Billfish Newsletter's cover photograph. Richard Gibson is a world class sportfishing photographer whose photographs routinely appear in a variety of sportfishing magazines.

Smooth seas and good fishing,

David B. Holts, Fishery Biologist
 Douglas Prescott, Computer Specialist

Southwest Fisheries Science Center
 P.O. Box 271
 La Jolla, CA 92038-0271
 Phone - (619) 546-7186
 FAX - (619) 546-7003

Fly the Tagging Flag!



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 National Marine Fisheries Service
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