



Shark Tagging News



A Newsletter of the CDFG Shark Tagging Program

330 Golden Shore, Suite 50

Long Beach, CA 90802

Phone: (310) 590-5169 FAX: (310) 590-5193

Welcome to the second annual California Department of Fish and Game (CDFG) Shark Tagging Program Newsletter. Thanks to all of the new participants who joined us this year and to those of you who continue to support this program.

-Leeanne M. Laughlin, Marine Biologist

We are considering a new logo for the Shark Tagging Program. Below are two logos we have designed. Please vote for either the current logo (last page) or one of the logos below by April 30,

1997. Or if you have a design idea, submit it to Leanne by February 28, 1997.



1996 Tagging Overview

This year, 146 active participants in the program tagged 1,153 sharks, bringing program totals to more than 7,600 sharks tagged, and 130 sharks recaptured (Table 1). During 1996, species tagged included blue sharks (*Prionace glauca*), shortfin mako sharks (*Isurus oxyrinchus*), leopard sharks (*Triakis semifasciata*), salmon sharks (*Lamna ditropis*) and prickly sharks (*Echinorhinus cookei*). Twenty sharks were recaptured in 1996: twelve mako sharks, six blue sharks and two sevengill sharks.

The overall recapture rate for 1996 is 1.7%, slightly lower than the 1995 rate of 2.1%. The difference is due to a lower recapture rate for blue sharks (0.7%,

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down from 1.3% last year). The mako shark recapture rate was comparable to last year at 3.8%. This seems to indicate that while blue sharks appear to be more abundant, they are not as resident in coastal waters of California and Mexico as juvenile mako sharks.

Table 1. Summary of tagged and recaptured sharks, 1983-1996.

Species	No. Tagged/No. Recaptured		
	1983-199	1996	Total
	5		
Blue Shark	4284/35	836/6	5120/41
Shortfin Mako	1879/66	315/12	2194/78
Angel Shark	107/7	-	107/7
Basking Shark	57/0	-	57/0
Thresher Shark	44/1	8/0	52/1
Sevengill Shark	41/1	0/2	41/3
Leopard Shark	20/0	5/0	25/0
Spiny Dogfish	4/0	-	4/0
White Shark	4/0	2/0	6/0
Smoothhound	3/0	-	3/0
Soupfin Shark	2/0	2/0	4/0
Bigeye Thresher	1/0	-	1/0
Prickly Shark	1/0	2/0	3/
Salmon Shark	0/0	3/0	3/0
Smooth Hammerhead	1/0	-	1/0
Total:	6448/110	1173/20	7621/130

Shark Migrations

Mako Sharks

Of the twelve mako sharks recaptured in 1996, nine makos were recaptured in the Southern California Bight, within 80 nautical miles (nm) of where they were tagged. Three others were recaptured off Baja California; one was caught off Point Eugenia after 42 days at large and traveling a minimum of 450 nm, and two were caught off Magdalena Bay (a distance of almost 700 miles from their tagging locations) after a year and nearly two years at liberty.

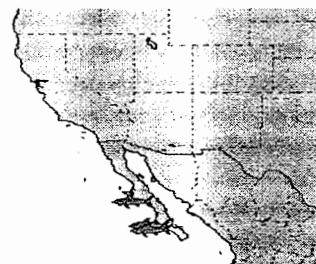


Figure 1. Shortfin mako sharks recaptured in 1996 at distances of 100 nm or more from the tagging site.

Blue Shark

Six blue sharks were also recaptured in 1996. Three were recaptured within 70 nm of their tagging locations. A fourth was caught off Todos Santos Island, near Ensenada, Mexico, about 100 nm from where it was tagged, after 20 days. The fifth was recaptured off Magdalena Bay after almost six months. The sixth was recaptured off Acapulco, Mexico by the crew of a freighter, after eight and a half months. It had traveled a minimum of 1633 nm. This shark has moved farther south than any other recaptured in our program.

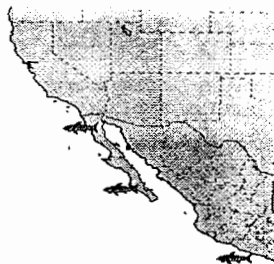


Figure 2. Blue shark recaptured in 1996 at distances of over 100 nm or more from the tagging site.

Other Sharks

Two sevengill sharks were recaptured in San Francisco Bay, after about a year of liberty. Both were captured across the bay from where they were tagged.

1996 Top Shark Taggers

Tagger	No. Sharks Tagged
Joseph Singer	104
Keith Poe	58
Guy Irwin	55
Robert Zalud	23
Bruce Morgan	10
Don Bragg	9
David Brackmann	8
Brad Stiles	6
Andy Dolich	5

Program Activities

Two shark research cruises occurred in 1996. The first took place on the National Marine Fisheries Research vessel R/V DAVID STARR JORDAN in August. The second was on the CDFG research vessel R/V MAKO. On both cruises, longline gear was used to capture sharks. A total of 202 mako sharks and 672 blue sharks was tagged and released,

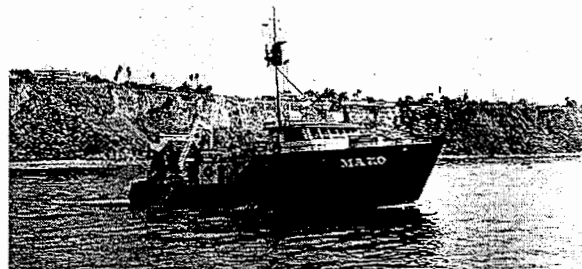


Figure 3. The CDFG's research vessel, the R/V MAKO.

and catch per unit effort data was collected. This data will be used as part of an ongoing shark abundance assessment.

Of the six tournaments that took place in southern California this summer, we had an opportunity to attend two: the Oceanside Invitational Mako Tournament and the Dana Point Mako Tournament in July. At these tournaments, 38 new taggers joined the program. We measured 38 sharks landed during the tournaments as well.

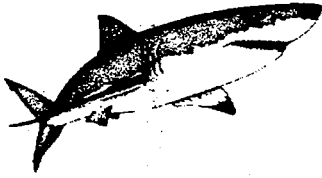
We also were invited to speak at a Big Game Fishing Seminar organized by Gary Jioras of Kong's Tackle in Oceanside. Participants learned about tackle and techniques for shark and marlin fishing and were encouraged to practice catch and release fishing. Ten new taggers signed up at this event and many more took home applications.

Recent Shark Legislation

Within the last few years, new regulations have been enacted to conserve shark resources. Here are the important changes.

White Sharks

As of January 1995, the white shark (*Carcharodon carcharias*) is a protected species in California and



take is prohibited. Take is defined in the Fish and Game Code and Title 14 as "to hunt, pursue, catch, capture or kill," or attempt to do

these things, and includes tagging and releasing. Since the commercial and recreational take of white sharks is prohibited, this means that tagging them is also prohibited. If you catch one accidentally, you must release it without a tag, unless you have a scientific collecting permit. These permits are issued only to researchers who have an ongoing need to capture and collect specimens for their studies. While we will not be tagging white sharks, a number of California researchers will continue to study this magnificent and important predator.

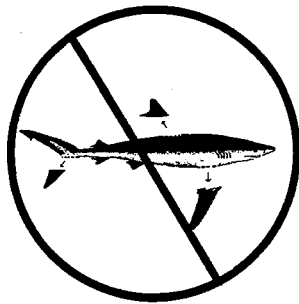
Finning Prohibition

Finning is the wasteful practice of removing a shark's fins for the lucrative shark fin trade, and dumping the body. To our knowledge, this was not a widespread

practice on the West Coast. However to prevent it from becoming a problem, a new regulation went into effect on January 1, 1996, prohibiting the landing of shark fins detached from the carcass.

Leopard Sharks

Leopard sharks now have a size limit of 36 inches total length and a daily bag limit of three. They must be released **without** tagging if undersized.



Frequently Asked Questions

Q: Why are most of the sharks I catch the same sex and of a similar size in certain areas and times of year?

A: Shark populations generally tend to segregate by size and sex. Each segment of the population may have a different migration pattern. Size segregation is thought to be an adaptation to prevent small sharks from being preyed on by their larger relatives. It may also prevent mortalities from adult males attempting to mate with subadult females. The courtship of male sharks involves biting the female, which could result in serious injury or death for a juvenile female who has not yet developed the thick skin of an adult female. Also, scientists

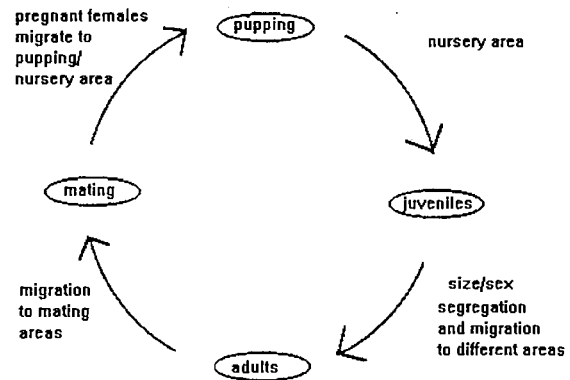


Figure 4. Shark life history.

believe that juveniles congregate in nursery grounds, which adults seldom frequent (except pregnant females). Nursery areas have the added advantage of a large amount of prey for young growing sharks. Adults may have different temperature or prey preferences, meaning they will be found in different areas.

Q: Why is it so important to monitor shark fisheries? What's the big deal?

A: One reason to monitor shark populations is because their unique life history. Sharks, like humans are long lived, take a long time to reach reproductive maturity (5 to 6 years old) and produce only a few well-developed offspring at a time. This life history strategy requires large investments of time and energy unlike the strategy of sardines and mackerel, which spawn thousands of eggs at a time. This means that shark pups come into the world well prepared to fend for themselves.

Sharks have several methods of giving birth to their pups. Some, usually bottom dwellers, lay egg cases, from which the pup hatches. Other sharks are viviparous, meaning they bear live young. In some species, eggs are retained in the female's paired uterus and hatch before birth. In others, like the mako and thresher shark, young sharks hatch within the female's body well before birth and feed on undeveloped, yolky eggs that are also present within the uterus. This is called **oophagy**.

A more extreme version of this mode of reproduction is found in the sandtiger shark, an East Coast species. In sandtiger sharks, the first embryo to hatch within the uterus consumes all of its younger siblings as well as the undeveloped eggs. This is known as **intrauterine cannibalism** or **embryophagy**. Sandtiger pups are always born in litters of two, one from each uterus.

The final method is called **placental viviparity**. The embryos start with a yolk, which then develops into a placenta and attaches to the uterine wall. The shark embryo is then nourished by the mother's bloodstream, in a way similar to that of mammals. Blue sharks and hammerheads reproduce using this method.

In all these examples, three things remain the same:

late maturity, high maternal investment, and large, well-developed young. This is true of many top predators (such as humans!). These modes of reproduction evolved in sharks because they allowed for better pup survival. However these strategies evolved before humans became predators, with efficient fishing techniques. High maternal investments in offspring make it possible for sharks to replace losses due to natural mortality, but makes it difficult to keep pace with human predation, also known as fishing mortality.

Proper Tagging Procedures

Affix the tag to the tagging pole by fitting the leading edge of the hole in the metal tag dart into the slot on your tagging pole tip. Loosely anchor the trailing end of the tag to your pole with a rubber band. If the tag bounces off the shark on your first try, the rubber band will keep the tag from being lost.

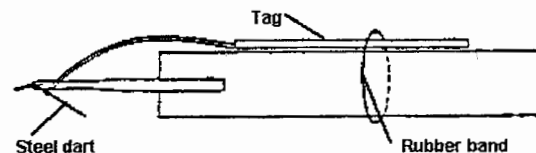


Figure 5. Tagging pole with shark tag inserted.

Once the shark is alongside your boat, allow it a few minutes to calm down. Waiting a few minutes makes it easier to accurately insert the tag. The tag should be placed into the muscle tissue directly below the first dorsal fin and above the lateral line.

Do not remove the shark from the water. Compare the shark's length to some known length for an accurate estimate (mark off your tagging pole or the side of your boat with tape every six inches). If the hook cannot be removed, release the shark by

cutting the leader as close to the hook as possible.

Completing the Tagging Card

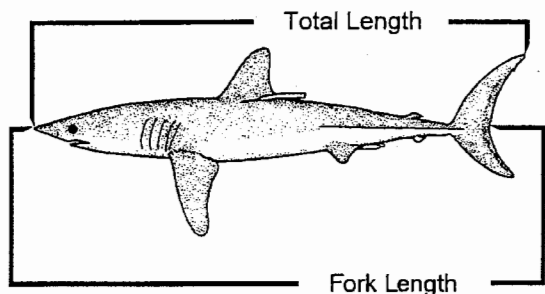


Figure 6. Length measurement of sharks.

Fill out the tagging report card immediately after tagging a shark. Please include latitude and longitude or loran coordinates with a locality when possible. This is especially important for the many new taggers fishing in the San Francisco Bay area and off central California. A well-known landmark, distance from shore and compass heading will also be acceptable. Sharks should be measured in total length (tip of nose to tip of tail) or fork length (tip of nose to fork in tail, Fig. 6). Please indicate which measurement you used.

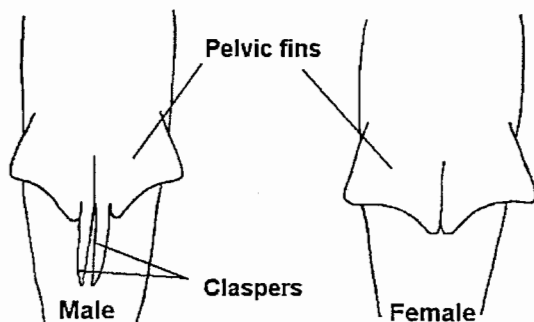


Figure 7. Pelvic fins of male and female sharks.

Any comments can be included in the length section. Put your permit number in the upper left

corner of the card; this will allow us to process them faster once we receive them. Mail the cards as soon as possible; tagging is of no value unless the card is returned.

Reminders

- On your address label, there is a number next to your name (i.e., P:###). This is your permit number. Please include this number when calling or writing us so we can look up your information quickly.
- Please send us an address change if you move. A current phone number would also be helpful in case we need to contact you.
- Remember, these tags are designed for large fish. Please **don't** tag sharks under 3 feet long; the tag may seriously injure or kill them.
- Do not tag white sharks.
- Also, please **don't** tag bottom dwelling sharks such as dogfish and smoothhounds (sand sharks), or bat rays, stingrays and skates. We have limited funding to buy tags. So, make every tag count!
- Please do not use these tags for billfish or large fish other than sharks. If you wish to tag billfish, please contact Dave Holts at the National Marine Fisheries Service, La Jolla, phone (619) 546-7186.
- If you catch a shark that has already been tagged, please collect the same information that you would when tagging a shark. This includes the tag number, species, date and location caught, sex, and length in total length (tip of nose to tip of tail) or fork length (tip of nose to fork in tail). If you keep the shark,

please measure it directly with a tape measure or ruler. Mail the information to the Shark Tagging Program or give LEEANNE a call. You will receive a baseball cap with the CDFG Marine Fish Tagging Program logo as a reward.

- If you are out of tags and would like more, please indicate on the return card, or contact LEEANNE Laughlin at the number on the front page.

How Can You Help?

Donations

As most of you know the Department of Fish and Game, like many other state programs, has suffered budget cutbacks and has been asked to do more with less. We are halfway through the 96/97 fiscal year, but have little left for the tagging program because of needed equipment repairs and purchases. New shark tags cost about \$1 each, and stainless steel tagging tips are \$6 each. We supply these to all shark taggers, free of charge.

Several taggers have generously sent us checks in the past. Unfortunately, cash donations must be put into the general fund under State regulations. Thus, the shark tagging program would not benefit from this generosity.

- We would like to thank Mr. Joseph Singer for his loan of a framed 8x10 photo of a 175-lb mako shark about to be tagged. We plan to use this picture at sportfishing events to promote the shark tagging program.

Volunteer Opportunities

Anyone who has a few spare hours a week and would like to take on a slightly different role is

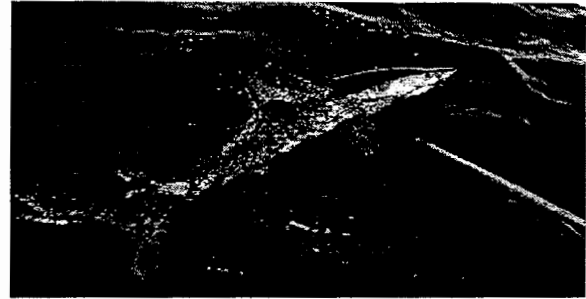


Figure 8. Mako shark about to be tagged. Photo by Joseph Singer.

welcome to join our shark team. We always need help with data entry, staffing research cruises, and building tagging equipment. If you would like to be involved, or know someone who would, please call LEEANNE.

We are grateful to several students who volunteered their time on the R/V MAKO cruise. Julian Herndon, a junior at University of Southern California, participated to gain experience working with sharks; he hopes to study them in graduate school. Laura Wallace, a graduate student at Moss Landing Marine Laboratory, took samples of blood and tissue from mako and blue sharks to study differences in ammonia and urea levels between the two species. David Hyrenbach, a doctoral student at Scripps Institute of Oceanography, used the MAKO's travel time between stations to do seabird transects, and compared the species present with water characteristics. The students helped with the fishing, and worked on their own research projects.

Another valuable volunteer was Bill Miller, a recent graduate of California State University Long Beach. For over a year, Bill volunteered his time between four and eight hours a week and commuted to our Long Beach office from Ontario (eighty miles one



Figure 9. Volunteer Bill Miller measuring a mako at a tournament. Inset, Bill with Exceptional Volunteer Award.

way). Bill entered massive amounts of data, helped on the R/V DAVID STARR JORDAN cruise, went to tournaments, and compiled data from many tag returns. If you got a letter and map saying a shark you tagged was recaptured, Bill most likely put it together. Because of his great attitude and hard work, he received an Exceptional Volunteer Award from the Department. Bill recently moved to greener pastures in Oregon. We will miss him.

CDFG Now on the Internet!

The Department of Fish and Game now has a new site on the World Wide Web. You can check fishing and hunting regulations, check the status of legislation, find information on different regions of the State, download wildlife photography, and even read this newsletter. The page is constantly expanding, and new announcements will be posted. The Department's homepage address is:

<http://www.dfg.ca.gov>

Thanks again to everyone who participated this year. Without your support the program would not work. We depend on your contributions of time and tagging effort. Good luck fishing and tagging in the coming year!

NOTE: PARTICIPATION IN THE SHARK TAGGING PROGRAM IS STRICTLY VOLUNTARY. DEPARTMENT OF FISH AND GAME SHARK TAGS ARE NOT TO BE USED FOR PROFIT. PROFIT INCLUDES CHARGING OTHERS FOR THE USE OF TAGS, USE OF THE TAGGING PROGRAM'S NAME IN ADVERTISING, OR CLAIMING TO REPRESENT THE DEPARTMENT FOR THE BENEFIT OF A BUSINESS. THE ISSUING OF SHARK TAGS DOES NOT CONSTITUTE AN ENDORSEMENT OF ANY BUSINESS THAT MAY TAG SHARKS IN THEIR OPERATIONS. TAGS ISSUED ARE NOT TO BE TRANSFERRED; THEY MUST BE USED BY THE PERMITTEE TO WHOM THEY WERE ISSUED OR ON THE VESSEL UTILIZED BY THAT PERSON.

