

**Southwest Region Observer Program
Training Manual
January 2007**



**Southwest Region
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
United States Department of Commerce**



Preface

This manual is intended to provide the SWR Observers with the required knowledge needed to fulfill their duties while at sea. This manual is not intended for distribution outside of the training environment or classroom. This training manual is the property of the National Marine Fisheries Service, Southwest Region.

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Chapter One



Introduction

The Southwest Region would like to welcome you to our 2007 observer training course. You have been chosen for your potential to pass training, successfully perform the assigned duties, and become a responsible and respectful shipmate. During the next two weeks we will prepare you to work safely at sea as a competent observer, while expressing professionalism and upholding your integrity. The assessment of your abilities, knowledge, and personal characteristics begins today and will continue throughout training. These assessments include; your interactions with fellow classmates, your ability to comprehend test material, how well you can follow directions and complete assignments provided by the National Marine Fisheries Service staff.



Cetacean dissection training in La Jolla. *Photo credit: Kynan Shantz*

For over three decades, NOAA has been placing observers on fishing vessels to record critical data, used by management in making decisions about the fishery being observed. The Southwest Regional Observer Program has been in operation since the late 1970's. This program was created through the enactment of the Marine Mammal Protection Act, the Endangered Species Act, and the Magnuson-Stevens Fisheries Conservation and Management Act and is now supported by the Highly Migratory Fisheries Management Plan and the Coastal Pelagic Fisheries Management Plan. In our region the program has grown from observing international and domestic tuna purse seine vessels to the local fleets that fish with gillnets, longline, hook and line and coastal pelagic purse seine vessels. The program monitors all fishing in pelagic zones up and down the west coast. We have also most recently been placing observer aboard commercial passenger fishing vessels (or party boats) and we have also collected data on Albacore Troll vessels.

In the past, observers have played critical roles in the management process by providing the management team with better, more accurate data when compared to other data collection methods. We expect this trend to continue and we will strive hard to train you so that you may achieve your full potential. This training manual will be a good tool to help you pass this your course. In this book you will learn how to use a field guide, develop species identification skills, understand the different fisheries you will be working in, learn marine safety skills, understand how to cope with conflict resolution, and we will provide you with trip tips aimed at supplying you with the best tools possible. You will also be given a field manual, which contains all the data forms and corresponding instruction sheets. You should always take notes in your field manual, as this will be the most important manual during your duties in the field.

What to expect

If you haven't already looked at the weekly schedule, found at the beginning of this manual, please do so now. You will see that the next two weeks are going to be busy. You will have plenty of test and quizzes, and not to mention, homework assignments which should keep you stimulated and interested. We also have in class drills that every one must participate in. Class attendance and participation is mandatory and it would be extremely difficult to pass this

course with any absences. Competency during training is determined by an 85% average overall test score, which will include fish identification, both from memory and by using a dichotomous key, marine mammal identification, any safety exams that may be presented and any exams regarding observer issues as presented in class or homework assignments. Trainee's must demonstrate their ability and proficiency at donning immersion suits in the water, righting a life raft, pass the various safety drills and exercises, and have a clear understanding of the role of safety, as presented in class. At this time, their swimming skills and competency are assessed by NMFS staff.

NMFS staff will also assess the trainee's potential to collect pertinent, accurate field data, record accurate marine mammal sighting information, maintain organized, clear, legible data which are relatively free of errors and with accurate measurements of specimens exercise astuteness and reaction to unfamiliar situations at sea in a professional manner, and be a good shipmate who is loyal to observer duties.



Photo credit: Kynan Shantz

Cruise and Post-Cruise Performance

Sea assignment readiness is determined by training examinations and NMFS staff assessments. Once an observer has passed all the required training elements, he/she is ready for their final evaluation. Observer cruises are an extension of training and with this in mind your first two or three cruises are most important. Although we hope that your in class training has prepared you, we understand that you still may need a few more guidance and therefore we require post cruise debriefings at the NMFS office.

After each of the first two trips, observers will debrief with NMFS data editors to ensure that instructions provided during training are being followed and that data are being collected according to the established guidelines and procedures in the observer field manual. Quality data is the goal and we want you to strive to provide us with the highest quality data you can record. We understand that you can't always capture everything we request so remember that no data is better than bad data. During this visit we would also like to check in with you to see the effectiveness of our training. We are always open to suggestions from the observers, as their opinions and ideas can help keep our program more up to speed with what is currently going on in the fishing industry.

After an observer completes their third trip, they will debrief with their employer Frank Orth and Associates (F.O.A.). If the contractor's data editor is confident that the data collected by the observer are at an acceptable level, then the data editor shall recommend to NMFS, Southwest Region, that the observer be allowed to make back-to-back trips. If NMFS data editors are in agreement, then the contractor may proceed with making back-to-back placements. Ideally, observers would debrief after each vessel assignment.

Prior observers who have completed a one week briefing session



Photo credit: Kynan Shantz

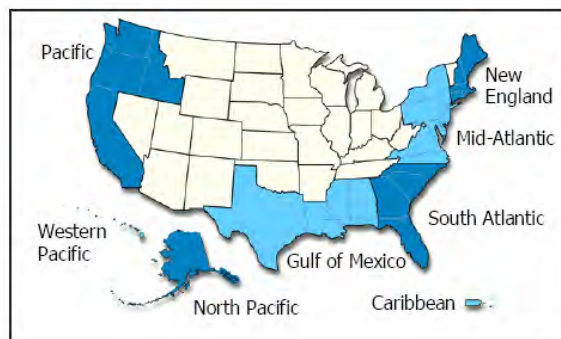
will post cruise with NMFS data editors after their first trip. If the contractor and NMFS data editors agree that the data collected are of acceptable quality, then the contractor may proceed with placing that observer on back-to-back trips.

Contract employees will not be recognized as bona fide SWR Fisheries observers by NMFS, until after they have successfully completed at least three vessel assignments. An observer trained for the southwest regional program may retain their status as a bona fide observer, if they successfully complete at least three trips each season. Observers who do not satisfactorily complete three trips in one season will be required to complete another two week training session the following season before being eligible for deployment. Ideally, observers working in the SWR Observer Program will work an entire season.

Authority

The west coast fisheries are managed and ran under different fisheries management plans established by the Pacific Fisheries Management Council (PFMC) which receives its authority from the Magnusson-Stevens Fisheries Conservation and Management Act (MSFCA). According to the MSFCMA the following definition defines the Pacific Council:

“PACIFIC COUNCIL.--The Pacific Fishery Management Council shall consist of the States of California, Oregon, Washington, and Idaho and shall have authority over the fisheries in the Pacific Ocean seaward of such States. The Pacific Council shall have 14 voting members, including 8 appointed by the Secretary in accordance with subsection (b)(2) (at least one of whom shall be appointed from each such State), and including one appointed from an Indian tribe with Federally recognized fishing rights from California, Oregon, Washington, or Idaho in accordance with subsection (b)(5).” *MSFCMA SEC. 302. REGIONAL FISHERY MANAGEMENT COUNCILS 16 U.S.C. 1852*



Map taken from the Pacific Fisheries Management Council's website

Magnusson-Stevens Fishery Conservation and Management Act and the Fisheries Management Plans

Background

With the passing of the MSFCMA in 1976 and then its reauthorization in 1996, the United States declared its Exclusive Economic Zone (EEZ) to be any area within 200 nautical

miles from the shore. The states have jurisdiction over the waters that are within 3 miles from shore, so federal waters are those that exist from 3 nautical miles to 200 nautical miles from shore.

The main purpose of this act is to conserve and manage the fishery resources found off the coast of the United States, the Continental Shelf Fishery and the anadromous species, such as salmon. This act aims at preventing over fishing while obtaining optimum yield, an amount that provides the greatest overall benefit to the nation, while protecting the marine ecosystems. As previously mentioned, our fisheries are managed by Fishery Management Plans (FMPs). The purpose of fishery management plans has been established by the Magnusson-Stevens Fishery Conservation and Management Act (MSA; 16 U.S.C. 1801 *et seq*). The Southwest Region currently supports two FMPs:

1. **Coastal Pelagic Species FMP**, which includes the following species: Anchovy, Mackerel, Sardine and Squid.
2. **Highly Migratory Species FMP**, which includes the following species: Albacore tuna, Bigeye tuna, Bluefin Tuna, Skipjack tuna, Yellowfin, Swordfish, Marlin, Dorado, Thresher shark, Shortfin Mako.

Both of these FMPs have regulatory guidelines which strengthen the authority of NMFS to place observers aboard fishing vessels that interact with any species that fall under the FMP. More importantly the Magnusson Act provides the most authority for the placement of observers. (Title IV SEC. 403. OBSERVERS 16 U.S.C. 1881b).

Marine Mammal Protection Act of 1972

Background

The Marine Mammal Protection Act of 1972 (MMPA) was most recently reauthorized in 1994. In passing the MMPA in 1972, Congress found that:

- certain species and population stocks of marine mammals are, or may be, in danger of extinction or depletion as a result of man's activities;
- such species and population stocks should not be permitted to diminish beyond the point at which they cease to be a significant functioning element in the ecosystem of which they are a part, and, consistent with this major objective, they should not be permitted to diminish below their optimum sustainable population level;
- measures should be taken immediately to replenish any species or population stock which has diminished below its optimum sustainable level;
- there is inadequate knowledge of the ecology and population dynamics of such marine mammals and of the factors which bear upon their ability to reproduce themselves successfully; and
- marine mammals have proven themselves to be resources of great international significance, aesthetic and recreational as well as economic.

The MMPA places a moratorium, with certain exceptions, on the taking and importation of marine mammals and marine mammal products. Exceptions include permits for (1) scientific research, (2) public display, (3) enhancing the survival or recovery of a species or stock, and (4) commercial fishing operations. If marine mammals are taken for subsistence, the Act does not apply to Native American Aleut or Eskimos living in Alaska. The Act charges the secretaries of Commerce and Interior with enforcement, and gives them authority to promulgate regulations.

As a NMFS certified observer you are authorized, under provision **50 CFR 229.7** of the Federal Code of Regulations, to sample and collect marine mammal specimens that are incidentally caught on a commercial fishing vessel. The only specimen samples you should ever have in your possession are pinniped snouts or skulls and/or tissue samples from cetaceans. ***Do not collect other bones, or parts as specimens.*** They are not needed and will be discarded. Walrus and sea otters are under the jurisdiction of the U. S. Fish and Wildlife Service and you are not allowed to possess any specimen material from them. Possession of any part of a walrus or sea otter is a federal offense.

Commercial Fisheries

The Marine Mammal Protection Act recognized that incidental taking in commercial fisheries could seriously impact marine mammal species and population stocks. The Act also recognized that totally prohibiting incidental taking could seriously impact certain commercial fisheries.

The Act establishes an immediate goal that "the incidental kill or incidental serious injury of marine mammals permitted in the course of commercial fishing operations be reduced to insignificant levels approaching a zero mortality and serious injury rate...".

General Permits

The Marine Mammal Protection Act provides a permitting process to allow the incidental take in fisheries of non-depleted stocks of marine mammals. A General Permit has been issued to the American Tunaboat Association to allow the incidental take of dolphins in the eastern tropical Pacific yellowfin tuna fishery. Individuals and vessels are included under the General Permit when issued a Certificate of Inclusion.

Authorization Certificates

The purpose of the Marine Mammal Authorization Program (MMAP) is to provide an exception for commercial fishers from the general taking prohibitions of the MMPA. Authorization Certificates are issued to commercial fishermen throughout the U.S. Fishermen involved in fisheries that have been identified by the National Marine Fisheries Service as having a likelihood of incidental marine mammal take, must have the Authorization Certificate to operate legally.

Endangered Species Act

Goal

The Endangered Species Act (ESA) is a federal law protecting species of plants and animals listed as threatened or endangered. An "endangered" species is in danger of extinction; a "threatened" species is likely to become endangered.



Restrictions

The ESA makes it unlawful for anyone (federal and state agencies, private citizens) to take, import, or export any species or product made from such species which is officially listed as "endangered." It also prohibits any federal action that could jeopardize a threatened or endangered species or destroy or adversely modify its habitat.

Authorities

The Secretary of Commerce, acting through the National Marine Fisheries Service, has the authority to list marine fish and mammals as threatened or endangered. The Secretary of the Interior, through the Fish and Wildlife Service, is authorized to list all others. A species may be considered for listing at the initiative of the Secretary or through a petition by an interested person. The Secretary has one year to review the status of a petitioned species and to propose listing the species. A final rule listing the species as threatened or endangered must be published within one year after a proposed listing.

The Secretary, to the extent prudent and practical, will also designate the species' critical habitat. There are areas with physical or biological features that are essential to conservation of the species or that may need special protection. The Secretary is required to develop recovery plans for listed species, with recommendations for actions necessary to achieve recovery of the species and estimates of the time and money to achieve that goal. All federal agencies must consider recovery plan directives.

Cautions

Certain species of whales and sea turtles are endangered. Possession of products that have been made from sea turtles include combs, polished shells, jewelry, leather goods, meat, oil, cosmetics and preserved animals is illegal.

Conduct

Position of Public Trust

The observer must avoid any behavior which could adversely affect the confidence of the public in the integrity of the observer program or of the government. Observers are thus expected to conduct themselves in a manner which will reflect favorably upon the observer program by maintaining high standards of honesty, integrity, impartiality, and conduct in all situations. Specific guidelines follow:



- (1) Observers must diligently perform their assigned duties.
- (2) Observers must accurately record their sampling data, write complete reports, and report honestly any observed or suspected violations of fisheries, natural resource conservation, or environmental laws or regulations. Falsification of observer data is grounds for dismissal.
- (3) Observers and their employer must protect the confidentiality of all collected data and observations made on board vessels. Observers shall not use any data collected under this contract for purposes other than the performance of this contract nor shall observers release, reproduce, distribute, or publish any of the data.
- (4) Observers must refrain from engaging in any illegal actions or any other activities that would reflect negatively on their image as professional scientists, on other observers, or on the observer program as a whole. This would include, but is not limited to:
 - a) engaging in excessive drinking of alcoholic beverages.
 - b) engaging in the use or distribution of illegal drugs;
 - c) becoming physically or emotionally involved with vessel personnel;
 - d) engaging in criminal, infamous, dishonest, immoral, or notoriously disgraceful conduct which may be perceived as prejudicial to the Government;

Gifts, Entertainment and Favors

- e) soliciting or accepting, directly or indirectly, any gratuity, gift, favor, entertainment, load, or anything of monetary value from anyone who conducts activities that are regulated by NMFS, or who has interests that may be substantially affected by the performance or nonperformance of the observers' official duties;

If the vessel maintains a stricter policy for its employees, then the observer must comply with said policy.

- (5) Observers are prohibited from conducting personal research or from retaining specimens of any kind for any reason not specified in the specific fishery field manual provided to them. Also, observers may not keep personal diaries in any form during a cruise assignment or take aboard any recording device, computer, or personal camera.
- (6) Observers may not have a direct financial interest in any West Coast fishery vessels or shoreside facilities involved in the catching or processing of the product of the fishery, concerns selling supplies or services to these vessels or shoreside facilities, or concerns purchasing raw or processed products from these vessels or shoreside facilities.

Prohibitions

Outside Employment

Observers are prohibited from:

1. engaging in activities that may be perceived as in conflict of interest with their employment;
2. outside employment that impairs their physical or mental capacity to perform their duties and responsibilities; or
3. receiving any additional compensation from a private source for their services to the government.
4. Requests for outside employment with or without compensation should be submitted for determination of conflict of interest.
5. Gambling, betting and lotteries are prohibited.

Use of Government Property



It is your duty to protect and conserve government property entrusted to you. Government equipment is for official use only. This property includes your gear, the computers you use and any equipment used while in training.

Behavior which is contrary to these standards or to the intent of these standards is considered to be grounds for disqualifying the offending observer.

Chapter 2 - Fishery Operations



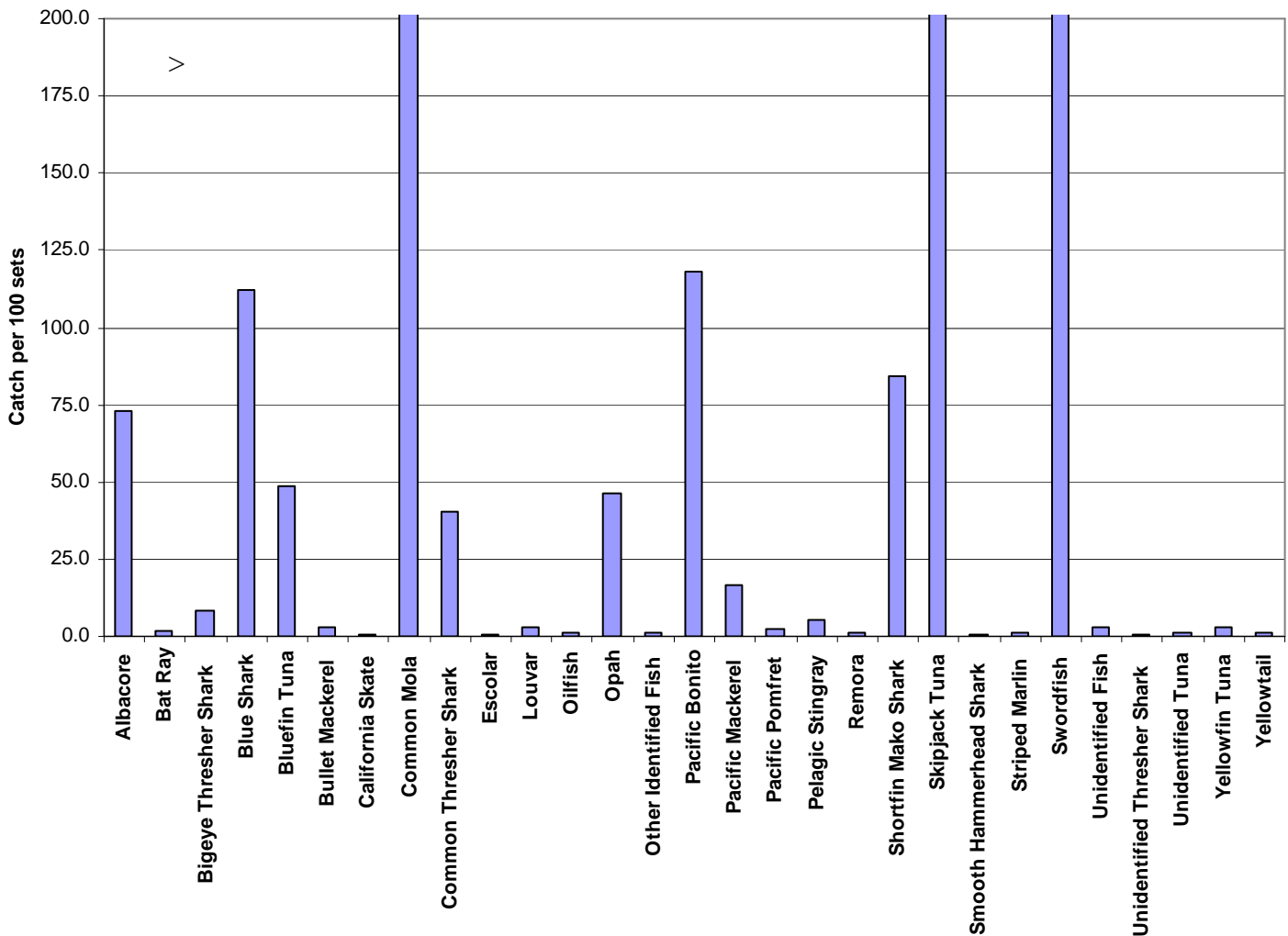
Gillnet Fishery

Gillnets have been used to catch fish for centuries. The word net is a derivative of nettle, the original fiber used for making nets. Archaeological investigations date the use of gill nets in South America back 7,800 years and there are extensive records of net fishing by native Americans of the Pacific Northwest. The following illustration is an example of a older, but effective gill net. The wooden floats have now been replaced with plastic

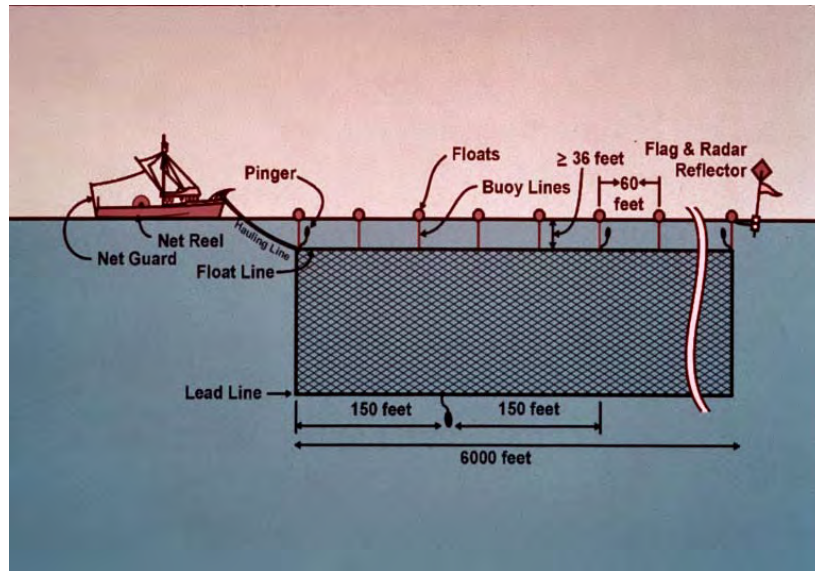


Drift gillnets are suspended from the surface with a series of floats attached to the float line by droppers. The length of the droppers determines how deep the net will be in the water column. The net is a single panel of webbing. In the swordfish and thresher shark driftnet fishery, the net is composed of multifilament twine with a mesh size greater than 14 inches, with a mesh of 18 - 21 inches most commonly used. Other driftnet fisheries use a variety of net material and mesh sizes depending on the target species. The net is held open by a leadline attached to the bottom edge of the panel. When the net is deployed, one end remains attached to the vessel so that the gear drifts along with the vessel. The distance the vessel and net drift together (during the night for swordfish and thresher shark) is dependent on current and wind speed.

Species Caught in Drift Gillnet (2004-2005)



The above chart is just an example of the fish that may be caught in the California/Oregon drift gillnet fishery. This does not represent all the possible fish that may be observed. Protected species have been removed from this chart and for a complete list of species observed in this fishery, please see appendix A at the back of the manual. The target species for the drift gillnet fleet are swordfish and thresher shark.



An illustration of typical drift gillnet gear

In general, fishing activity occurs primarily off of San Diego in August. These trips tend to be shorter in length and less frequent since catch rates are usually low at this time of the year. Beginning in September, some vessels begin moving up the coast and by the middle to end of the month, vessels that were fishing albacore tuna in the northern Pacific Ocean begin returning to port and switching over to driftnet gear, substantially increasing fishing activity. These vessels return to ports such as Moss Landing, San Francisco, Bodega Bay, Fort Bragg, Crescent City, Newport, Oregon, and even Washington ports. During the peak months of October and November, most fishing activity occurs off of central and northern California. However, by December, fishing effort begins to decrease and vessels begin moving South again towards San Diego.

Set gillnets are anchored on the sea floor and there are three basic types. The simplest is a single panel of webbing with no accessories. The other two types are referred to as trammel nets. The simplest form of trammel net is a single panel net which has lines called suspenders connecting the float and lead lines. The suspenders cause the net to sag and thus enhance entanglement. The most sophisticated set net is the multi-panel trammel net. This type of net has two outer panels of larger mesh with a panel of smaller mesh between them. The smaller mesh is hung very loosely so that fish caught in the smaller mesh push through the larger forming a pocket. The set gillnet fleet targets halibut, white sea bass,



soufín shark and yellowtail.

POINTS TO REMEMBER

. Know the different types of nets (drift, set, float, single, and multi-panel trammel) and the characteristics of each.

. Know the basic parts of a gillnet, especially those parts which are measured or described for the data form (hanging line, suspenders, meshes, etc.).

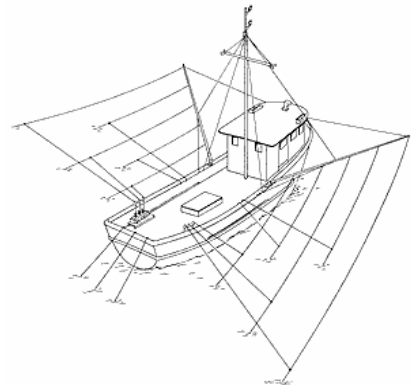
. Hanging length is measured along the cork line and is the distance between the knots that attach the hanging line to the cork line.

. The mesh size of a gillnet is measured as the straight line distance between opposite corners of a stretched mesh, or twice the length of one side.

. Know the usual operating procedures for net deployment and retrieval as well as how to fit observer duties within those procedures.

Albacore Troll

Trolling for North Pacific Albacore, commercially, has been going on for about the past 100 years. It is considered a fairly clean fishery with very limited bycatch. The Albacore is a highly migratory species (HMS) with a cosmopolitan distribution and is globally found in subtropical and temperate waters. The species found in the north pacific spend their early life (ages 3-5) traveling from the eastern to the western pacific and back again. As the fish age, they tend to settle down to either side of the Pacific Ocean, traveling north or south, depending on the time of year and the temperature of the water. Trolling targets fish that are living near the surface, which are younger (ages 3-5) and richer in Omega-3 fatty acids.



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“Trolling” means to catch fish by towing a lure or baited hook behind a slow-moving boat. In the albacore fishery, trollers attach ten to twenty fishing lines to the vessel's outriggers. These fishing lines are of different lengths and are also spread out along each outrigger to help prevent them from getting tangled up with each other. The trolling line has a jig attached to it. A jig is a rubbery lure with a hook on it. Jigs are generally shaped like squid and they come in different colors. As the boat moves, the jigs are trailed in the water, attracting the fish, which will eventually get hooked. The hooked fish will get immediately pulled from the water and prepared for freezing. This operation can occur quite quickly and many fish may be pulled onto the boat at the same time. It is important to stay focused while keeping track of the fish you measured.

Trolling boats also will occasionally pull out their fishing rods and throw chum in the water to attract the fish closer to the surface. They will then use the “pole and line” method to catch the fish.

Bycatch Observerd in the Albacore Fishery from January 2005 through May 2006 (individuals)

Blue Shark	1
Dolphin Fish	1
Skipjack	3
Yellowtail	1

Points to Remember

Know what a jig and hook looks like and how it is used (most are squid shaped pieces of rubber that surround the hook)

Make sure to always find out the best place to stand while observing (to ensure you are not in the way of the crew).

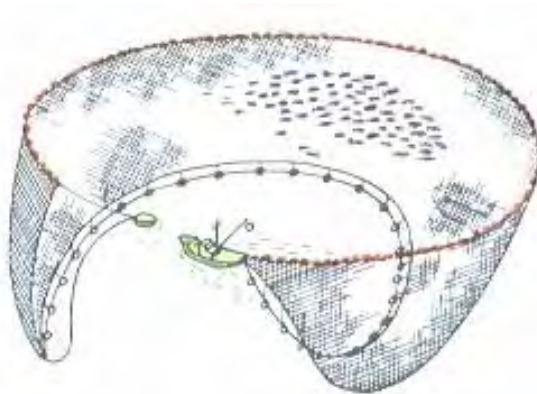
Know how to properly take the measurements down of the tuna caught (done by the forklength)

Coastal Pelagic and Tuna Purse Seine Operations



Purse seines are used to catch entire schools of fish. The top of the net is made of floats that connect to the webbing. The bottom of the net has weighted rings, which allow of the net to traverse the water column. Through these rings runs a wire cable that is used to tighten the net when the fish have been encircled.

To begin with, a skiff, or a small boat, is deployed from the main vessel. The skiff will drag the net into the water and circle the spotted school of fish. Fish are found through bird congregation, sonar, or plane spotters. Once the school has been circled the metal cable is tightened so that the fish can not escape through the bottom of the net. After this, other lines are pulled in, which closes the net, traps the fish and pulls the net closer to the main vessel. A large pump is then used to extract the fish from to the large vessel. When docked purse seine vessels are recognized by the small skiff on top of the stern of the boat.



Purse Seine Vessel in Action

Image taken from- www.ijnet.or.jp/nittoseimo/img/maki4.jpg

The vessels using this fishing method in this region are targeting anchovies, mackerel, sardines, squid and some tuna. The squid are caught while they gather together to spawn. There is generally a high rate of bycatch that occurs in this fishery. Non-targeted species caught include sharks and rays, flatfish, croakers, cetaceans, sea otters, rockfish, and a variety of other fish.

Purse seine operations occur out of several ports and are observed along the California Coastline. The following ports are utilized and observers will be leaving and arriving from these ports; Channel Islands Harbor, Dan Point, Los Angeles, Monterey, Morro Bay, Moss Landing, Newport Beach, San Diego and Ventura. The fishing season is open all year round.

For a list of the species caught in this fisheries please see Appendix A in the back of this manual.

Points to Remember

Know the basic parts of a purse seine (floats, rings, cables, net, pump).

Be sure to find out the net length, the depth the net is placed, and the size of the mesh

Fish are measured by weight and the captain (or knowledgeable crew member) should be contacted about gathering weight information.

Know the usual operating procedures for net deployment and retrieval as well as how to fit observer duties within those procedures.



Observer recording any bycatch that might be associated with the target species, on a purse seine vessel. **Photo credit Brad Davies**

Driftnet Typical Day at Sea

This exercise is designed to walk you through the data collection process while providing an example of what a typical day at sea is like. Your experiences at sea will vary according to the fishery you observing. As a general rule, if you can work through a gillnet (drift and set) typical day at sea, then the rest of the fisheries forms should be manageable.

Complete the appropriate data forms and the Trip Data Summary Form., which can be found in Appendix B. Consider species with no stated disposition as discarded alive and undamaged.

Your observer codes are RAD and 646; your next specimen number is 0078. After you board the ship and have gone through your safety checklist, you ask the skipper if you can dissect marine mammals on board the boat, if he were to catch any. The skipper tells you that you may dissect whatever you want aboard the boat, but he will not allow whole carcasses to be brought back. During this cruise, you completely process all specimens.

You depart the Long Beach office at 8:30 on Thursday, August 30, 2005. You arrive at the dock in San Diego and meet Gary Powell of the *Freudian Sloop* at 11:00. The vessel is 42 feet long, has a working rail height of 36 inches and there is no functioning head. The skipper asks if you are “ok” without a head and you say “I’m fine”. You record the vessel's CDF&G plate number (34567).

The vessel departs San Diego Harbor at 13:27. The weather is a little rough, with a six foot swell and winds at 10 knots. The Captain says the storm had passed and it should be a nicer trip in the coming days. The target species is swordfish. The net is 950 fathoms long, constructed of # 6 nylon multifilament twine and is 135 meshes deep. The hanging line is made of polypropylene and the hanging length is 28 inches with two meshes hanging. The mesh size is 20 inches, and this gang includes 6 fathom extenders.

The fisherman sets his net at 17:04. The LORAN converted position is 35° 35.0' N, 122° 35.6' W. The water depth is 790 fathoms; there is no kelp in the vicinity. Setting the net ends and the new LORAN position is 35° 36.0' N, 122° 35.3' W. The water temperature is 68° Fahrenheit. While setting the net, the crew must place pingers on both the leadline and the floatline. You notice that there were 6 pingers were placed on the floatline and 5 pingers were placed on the lead line. The pingers hanging three feet from both lines and they were Dukane pingers.

Friday, August 31, 2005

Net retrieval commences at 6:26 a.m. The wind is from the south at 6-8 knots, the swells are 4-6 ft and the sky is clear. The LORAN converted position is 35° 36.1'N, 122° 35.1'W. and the water depth is 810 fathoms and you quickly check the water temperature, which is now 66° Fahr-

enheit. You are a bit tired because the main generator was on all night and it kept you up.

A live blue shark (149 cm) is entangled a few fathoms from the starting end of the net near the cork line. Immediately following are five common molas caught near the lead line. Two hundred fathoms farther along are two Pacific mackerel (discarded,dead), a bonito (32 cm, kept) and a mako shark (kept):

♀ 215 cm FL, 236 cm TL, 78 cm D1-D2, developing eggs in the ovary

The mackerel and bonito are midway between cork and leadlines, the mako is too badly tangled to determine vertical position.

In the middle of the net is a dead Common Dolphin:

♀ Length 185 cm, girth 63 cm, no fetus.

At 700 fathoms there is a swordfish:

205 cm EL, 241 cm FL, 199 cm CL.

Along with the swordfish are three dead blue sharks.

♀ 130 cm TL, 123 cm FL, 43 cm D1-D2, four pups in the uteri

♂ 191 cm TL, 185 cm FL, 22 cm D1-D2, claspers 7 cm, calcified, rotation

♂ 165 cm TL, 158 cm FL, 13 cm D1-D2, claspers 5 cm, not calcified, no rotation

The swordfish is near the leadline, while the blue sharks are at the upper third of the net. The net is aboard at 11:23; LORAN converted position is 35° 37.2' N, 122° 35.3' W and all the pingers seem to be working. While the vessel travels, you process the dolphin, the swordfish, and the blue sharks. You finish your work at 12:13. The fisherman sets his net at 1737 in 800 fathoms of water; the LORAN converted position 35° 38.3' N, 122° 36.0' W.

Saturday, September 1, 2005

Net retrieval begins at 4:28 a.m. The water depth is 785 fathoms and the position is 35° 38.5' N, 122° 36.4' W. Two swordfish are in the middle of the net.

110 cm EL, 160 cm FL, 103 cm CL

186 cm EL, 201 cm FL, 180 cm CL

About halfway along the net, two dead blue sharks come up together too entangled to determine a location.

♂ 145 cm TL, 135 cm FL, 45 cm D1-D2, claspers 6 cm, calcified, rotation

. ♀ 117 cm TL, 110 cm FL, 30 cm D1-D2, enlarged uterus with no pups present

About 2/3 along the net, a section of the lead line is missing along with substantial portions of mesh. Only a few meshes are holding the net together. The fisherman estimates 20 fathoms of net was lost and attributes this to interaction with a whale. The final third of the net yields four common molas, two opahs (kept) and three bonitos (35 cm, 42 cm, 29 cm all kept), all in the lower third of the net. There is one more, unknown species in the net and you put it aside to key it out with your Miller and Lea book (*use the picture and your ID book to identify this fish.*) The unknown shark has the following measurements:

♂ 100cm TL, 110 cm FL, claspers 4 cm, noncalcified

Net retrieval ends at 9:52 a.m., and processing specimens takes 45 minutes.

The fisherman steers toward a new position in fog with two foot swells and a wind speed of 8 knots. He sets his net at 16:45. The LORAN converted position is 35° 40.1' N, 122° 38.0' W; water depth is 903 fathoms.

Sunday, September 2, 2005

Net retrieval begins at 4:15. Loran converted position is 35° 41.9' N, 122° 57.6' W and the water depth is 950 fathoms. The weather worsens; wind speed increases to 15 knots with rain and 6-10 ft swells occasionally swamp the stern.

An opah, slightly damaged but kept, is removed from the first third of the net, followed by three mako sharks at the corkline which are kept.

♂ 120 cm TL, 104 cm FL, 42 cm D1-D2, ruptured hymen

. ♀ 188 cm TL, 175 cm FL, 56 cm D1-D2, claspers 10 cm, calcified with rotation

♂ 173 cm TL, 161 cm FL, 47 cm D1-D2, many eggs present in the uteri

Six damaged blue sharks are removed from the net and discarded before you can measure them. A live blue shark is brought up immediately after, but the skipper cuts off the dorsal fin before discarding it over the side.

Just past mid-net is a swordfish entangled half way down from the corkline.

101 cm EL, 130 cm FL, 80 cm CL

A dead blue shark is found entangled with the swordfish.

♂ 251 cm TL, 239 cm FL, 73 cm D1-D2, claspers 15 cm, calcified with rotation

In the net's final third is a large male California sea lion which is cut from the net (it's too heavy to bring aboard). You note the pronounced sagittal crest and estimate the animal's length at one

meter. This last net pull ends at 1133 and you finish sampling at 1217.

During the cruise, you found there was adequate space for net observation and specimen work-ups. Also, there was no malfunction compromising vessel safety. The observer procedures were adequate, data instructions were clear, and sampling instructions workable.

You arrive at the dock in Morro Bay at 1345 and check into a hotel for the night.

Monday, September 3, 2005

After checking out of the hotel, you take a taxi to the airport in San Luis Obispo and return to Long Beach. You arrive at the office at 1315.

Review your data according to your Field Manual instructions.

Unknown shark from September 1st haul



Set Gillnet Typical Day at Sea

Your trip number is SN-MN-0054. The vessel was selected at random after the nets were set. Your observer codes are GRE and 733; your next specimen number is 0078.

You depart your residence at 0345 on Friday, May 12, 2000. You arrive at the dock and meet Charlie Parker, captain of the *Jumping Jack* at 0422. The vessel is 28 feet long and has a rail height of 32 inches. You record the vessel's state plate number (20567), and MMAP number (674512).

The vessel leaves Monterey Harbor at 0512. On the way out, you ask the fisherman about his nets. He tells you that he is fishing two nets; one for soupfin shark and one for halibut. The shark net is 400 fathoms long, constructed of size 18 multifilament webbing with a mesh size of 6 ½". The net is 40 meshes deep with 30% slack. The hanging length is 16" with 6 meshes hanging; the hanging line is nylon. There are no suspenders on the shark net, but he does have them on the halibut net. The halibut net is 30 lb test single strand monofilament with 25% slack. Charlie informs you that the nets have been in the water since 1300 yesterday.



The fisherman begins retrieving the shark net at 0625. You cannot see any kelp or the shoreline. Your GPS position is 36 40.6 N, 121 51.7 W, and the water depth is 33 fathoms. Weather is foggy with no wind, the seas are flat. You check the water temperature with your alcohol-filled thermometer and record it as 55.3 degrees Fahrenheit. You use your compass to determine that the net is set along a 220° heading.

A few fathoms from the start end, near the lead line, a sand sole and a starfish are tangled. Next are two Pacific mackerel (kept) and a soupfin shark which you set aside for processing.

A halibut (66 cm, kept) is removed from the net. Now there's another soupfin shark and a male spiny dogfish, both near the middle of the net. You place the soupfin next to the other one.

A dead harbor porpoise is entangled in the net about 50 fathoms into the haul and in the top third of the mesh. There are six Pacific mackerel heads entangled nearby. The fisherman maneuvers the animal on board and discards the fish heads. You place the porpoise with the sharks.

The center third of the net is coming aboard; there are a halibut (60 cm), which has been chewed on (discarded dead), and a dungeness crab (14 cm). Next are a California skate near the leadline, and a bat ray right above it. A female spiny dogfish and leopard shark (kept - female, 110cm TL, 95cm FL, 24cm D1-D2) are near the center of the net.

About mid-net is a dead, unidentifiable flatfish with two rock crabs chewing on it. Closely following these are two soupfin sharks which are set aside with the others.

The last third of the net is coming aboard now. Next is a spotted ratfish, caught near the lead-

line; above it is a halibut (66 cm, kept) near the corkline. In the last few fathoms of net, a lingcod (71 cm, kept) and another soupfin shark are near the leadline

The net haul ends at 0804 and the water depth is 32 fathoms.

Harbor porpoise:

♀, 188 cm TL, girth 60 cm, no lactation. Biopsy and carcass collected.

Soupfin sharks:

♀, 145 cm TL, 131 cm FL, 33 cm D1-D2, with 6 pups in her uteri;

♀, 144 cm TL, 120 cm FL, 42 cm D1-D2, eggs developing in the ovaries but no uterus enlargement;

♂, 127 cm TL, 111 cm FL, 28 cm D1-D2, 6 cm claspers, neither calcified nor rotatable; no sperm present.

♂, 124 cm TL, 112 cm FL, 31 cm D1-D2, 7.5 cm claspers, calcified but not rotatable; no sperm present.

♂, 140 cm TL, 121 cm FL, 36 cm D1-D2, 8 cm claspers, calcified and rotatable; sperm present.

The fisherman motors to the next net at five knots. There are now two foot swells and the wind speed is eight knots.



At 820 the fisherman starts hauling the halibut net. This net is 300 fathoms long, 8 ½" mesh, 25 meshes deep and has 8 foot suspenders every 10 fathoms. The hanging length is 12" with 4 meshes hanging, and the hanging line is nylon. It's set in 30 fathoms of water, at 36 39.0 N, 121 51.8 W. There is no kelp nearby, and water temperature is 55.6 F.

The first two fish are halibut (66 cm, 72 cm); the first one is a little chewed up but they are both kept. Next are three Pacific mackerel and a rock crab; the mackerel are retained.

Another halibut (86 cm, kept), and a California skate are pulled from the net. Then, two more halibut (56 & 53 cm, kept) are brought aboard with a male spiny dogfish (85 cm TL), and a ratfish. After those, in the middle of the net, are two bonito (67 & 75 cm FL, kept).

Just past mid-net is small soupfin shark which is kept. At the end of the net, five dead Pacific sardines (discarded) and a drowned Common Murre are near the corkline.

Net haul ends at 1133; water depth 30 fathoms. The fisherman pilots the vessel to where he plans to reset the nets.

Soupin shark:

♂ 101 cm TL, 83 cm FL, 21 cm D1-D2, with 4 cm claspers, neither calcified nor rotatable; no sperm present.

You debark the vessel at Monterey harbor at 1303.

Review your data according to the instructions in your field manual.

Chapter 3- Species Identification



INTRODUCTION TO CETACEAN IDENTIFICATION

The objectives of this presentation are to present the general characteristics of cetaceans, to inculcate the use of these characteristics in building a positive identification, to provide new observers with a list of the cetaceans they must recognize on sight, and to present an overview of the Order Cetacea.

PRIM ARY CHARACTERISTICS

The primary characteristics are those features of a cetacean which will clearly distinguish it from any other. If the observer has the opportunity to see all of the primary characteristics, there should be no problem making a conclusive identification. Some cetaceans have primary characteristics which are unique and therefore identifiable solely by that feature. The six primary characteristics are:

1. Presence/absence, size, shape and location of the dorsal fin.
2. Body length
3. Color pattern
4. Size and shape of the melon
5. Presence/absence, size and shape of the snout
6. Body shape

SEC ONDARY CHARACTERISTICS

These are characteristics which may be observable, but are infrequently useful in building a positive identification. On rare occasions, the observation of secondary features may permit a valid identification. The secondary characteristics are:

1. Size and shape of the pectoral flipper
2. Shape of the flukes
3. Size, shape, and direction of the spout
4. Scarring
5. Behavior

COLOR PATTERN AND COLORATION

The color pattern of a cetacean is a distinctive array of contrasting pigmentation which all members of the species display. Coloration is the range of possible hues an individual animal could exhibit. Light conditions, sea state, and water quality have considerable effects on apparent coloration.

The following descriptive characters should help you in your ability to correctly identify a cetacean, especially if you are observing one in the water. These descriptions in this list are not the only way to characterize the animals. If there are other terms you find easier to use, then do so. We will go over and draw these character states in class. Feel free to try and draw out these characters on your own before we go over them in class. This should help you when you are at sea and you are filling out a sighting record.

DORSAL FIN SHAPES

POINTED AND STRONGLY FALCATE

ROUNDED AND STRONGLY FALCATE

POINTED AND WEAKLY FALCATE

ROUNDED AND WEAKLY FALCATE

SUBTRIANGULAR

UPRIGHT TRIANGULAR

TRIANGULAR FORWARD CANTED

TALL TRIANGULAR

DORSAL FIN LOCATION

MIDBODY

TWO THIRDS BACK

THREE FOURTHS BACK

CAPE

STRAIGHT

"V"

NARROW AND WAVY

UPSWEPT

HEAD OR MELON SHAPES

ROUND AND
DEMARCATED

ROUND NOT
DEMARCATED

SLOPING WITH
A FLAT MELON

SLOPING WITH
A BULGING MELON

BULBOUS

SQUARE

SHARKLIKE

SNOUTS

LONG MODERATE

LONG SLENDER

SHORT ROBUST

CONICAL

INDISTINCT POINTED

CONICAL WITH
ARCHED MANDIBLE

STRIPES

FLIPPER TO CHIN

FLIPPER TO EYE

FLIPPER TO MOUTH

NARROW EYE TO ANUS

BROAD EYE TO ANUS

NARROW FLIPPER TO ANUS

SUSPENDER

PECTORAL FINS

TYPICAL

ELONGATE ROUNDED

ELONGATE POINTED

PADDLE SHAPE

KNOBBED

BANDED

FLUKES

TYPICAL

SINUATE MARGIN

TRIANGULAR

Flukes (cont.)

UNNOTCHED

SMOOTH

RAGGED

SPECIES YOU MUST KNOW

There are 80 recognized species of cetaceans world wide. Of these, approximately one half frequent the California area. There are 16 species that are the most common and special attention should be paid to names listed below. The remainder are either rare or extremely difficult to identify. You will be shown more than what is listed below and you may be tested on all the species in this manual.

Cetaceans

Delphinidae Striped Dolphin *Stenella coeruleoalba*
Common Dolphin *Delphinus delphis*
Pacific Whitesided Dolphin *Lagenorhynchus obliquidens*
Bottlenose Dolphin *Tursiops truncatus*
Risso's Dolphin *Grampus griseus*
Northern Right Whale Dolphin *Lissodelphis borealis*
Short Finned Pilot Whale *Globicephala macrorhynchus*
Killer Whale *Orcinus orca*

Phocoenidae Dall's Porpoise *Phocoenoides dalli*
Harbor Porpoise *Phocoena phocoena*

Physeteridae Sperm Whale *Physeter macrocephalus*

Eschrichtidae Gray Whale *Eschrichtius robustus*

Balaenopteridae Blue Whale *Balaenoptera musculus*
Minke Whale *Balaenoptera acutorostrata*
Humpback Whale *Megaptera novaeangliae*

Ziphiidae Cuvier's Beaked Whale *Ziphius cavirostris*

Pinnipeds

Phocidae Northern Elephant Seal *Mirounga anugstirostris*
Harbor Seal *Phoca vitulina*

Otariidae California Sea Lion *Zalophus californianus*

Turtles All listed in this manual

IDENTIFICATION TESTING

Identification testing is more than an examination. It is a training technique to school new observers in what to look for when trying to identify cetaceans, to enhance observational skills and develop confidence in their use, and to properly document sighting information. Cetacean identification is a difficult art to practice, and especially so in the commercial fishing venue. Testing roughly imitates real conditions and is progressively more difficult.

Test Structure

Trainees will be drilled in marine mammal identification with spot quizzes at random times during the day. Usually, five to seven slides will be shown for a limited time or trainees will be asked to draw cetaceans from memory in a limited amount of time. The final exam is composed of twenty-five questions which are worth four points each. Depending on the question, some answers may receive partial credit. Color transparencies (slides) with full views of cetaceans are used in the beginning. Then, views of the animals in natural surroundings which are gradually more difficult to identify will be used. Pinnipeds and marine turtles will be included after their introduction in the curriculum. Trainees will view a slide for a limited time, the screen will then go dark with sufficient time to select an answer before the next slide is shown. The viewing time of each slide is reduced with each subsequent test and slides will only be shown once.

Taking the Test

Trainees should mentally relax and remember that the eye will see the entire slide and the information will be transmitted to the brain. Concentrate on viewing the whole slide and noting those characteristics which you will use to make a positive identification. Continue to view the slide and mentally sort the information until the screen goes dark. After the slide is gone, select the correct answer and mark the score sheet; not the test paper.

BIBLIOGRAPHY

- Au, D. W. K., W. L. Perryman, and W. F. Perrin. 1979. Dolphin distribution and the relationship to environmental features in the eastern tropical Pacific. Southwest Fisheries Center, Admin. Rep. LJ-79-43, 59 pp.
- Ellis, R. 1982. A sea guide to marine mammals. Whalewatcher, J. Am. Cetacean So., 26 pp.
- Leatherwood, S., R. R. Reeves, W. F. Perrin, and W. E. Evans. 1982. Whales, dolphins, and porpoises of the eastern north Pacific and adjacent Arctic waters. A guide to their identification. NOAA Technical Report NMFS Circular 444. 245 pp.
- Perrin, W. F. 1969. Color pattern of the eastern Pacific spotted porpoise, *Stenella graffmani* Lonnberg (Cetae, Delphinidae). Zoologica, 54(4):135-152.
- Perrin, W. F. 1972. Color patterns of the spinner porpoise *Stenella cf. S. longirostris* of the eastern Pacific and Hawaii with comments on delphinid pigmentation. Fish. Bull. 70(3):983-1003.
- Perrin, W. F. 1975. Distribution and differentiation of populations of dolphins of the genus *Stenella* in the eastern tropical Pacific. J. Fish. Res. Bd. Can. 32(7):1059-1067.
- Perrin, W. F., P. A. Sloan, and J. R. Henderson. 1978. Taxonomic status of the "Southwestern" stocks of spinner dolphin, *Stenella longirostris*, and spotted dolphin, *S. attenuata*. Southwest Fisheries Center Admin. Rep. LJ-78-6, 35 pp.
- Schnell, G. D., M. E. Douglas, and D. J. Hough. 1982. Geographic variation in morphology of spotted and spinner dolphins (*Stenella attenuata* and *S. longirostris*) from the eastern tropical Pacific. Southwest Fisheries Center Admin Rep. LJ-82-15c, 213 pp.
- Smith, T. D. (ed.). 1979. Report of the status of porpoise stocks workshop (August 27-31, 1979, La Jolla, CA). Southwest Fisheries Center Admin. Rep. LJ-79-41.

The Cetaceans





Short-Beaked Common Dolphin *Delphinus delphis*



Long-Beaked Common Dolphin *Delphinus capensis*



Pacific White-sided Dolphin *Lagenorhynchus obliquidens*

THE DOLPHINS

Common Dolphin *Delphinus delphis* and *Delphinus capensis*

Diagnostic Features

- * Dark dorsal "V" shaped cape
- * Dark chin to flipper stripe
- * Long dark snout and a rounded demarcated melon



The common dolphin or whitebelly, is widely distributed from 36°N to below the equator and abundant throughout its range especially near major ocean bottom features. There are some large gaps in this distribution and definite seasonal movements. Although common dolphins exhibit a unique color pattern, the hue of the anterior lateral field may be cream, tan, blue or green, depending on the stock. These dolphins can reach a length of 2.3 meters and they have a moderately robust body. They have variable accessory stripes and a pointed, weakly falcate dorsal fin. What are the differences between the two species?

School size may exceed a thousand. There are two variations on this dolphin; the Short-Beaked Form and the Long-Beaked Form.



Delphinus delphis



Delphinus capensis †

Pacific White-sided Dolphin *Lagenorhynchus obliquidens*

Diagnostic Features

- * Rounded melon with a short blunt beak
- * Dark dorsal cape divided by white stripe
- * Dark mouth to flipper to anus stripe



The Pacific whitesided dolphin, or hook fin porpoise, frequently approach vessels and ride the bow wave. This behavioral trait and a striking color pattern make identification easy. They can grow up to 2.3 meters, they have a medium robust body that is white ventrally with light grey sides. The dark dorsal capped is divided by a white stripe and they have a dark mouth to flipper anus stripe. Their melon is rounded with a short blunt beak and they have a strongly falcate dorsal fin dorsal fin that is white in color and positioned 2/3 posterior.

Pacific white-sided dolphins range from the Gulf of Alaska to the tip of Baja California and offshore to the continental shelf. School size to several thousand.

† Photo Credit: Michelle Berman



Bottlenose Dolphin *Tursiops truncatus*



Risso's Dolphin *Grampus griseus*



Striped Dolphin *Stenella coeruleoalba*

Bottlenose Dolphin *Tursiops truncatus*

Diagnostic Features

- * **Dark grey to light black overall color**
- * **Stubby beak with a well demarcated melon**
- * **Robust body**



The bottlenose dolphin, commonly known as flipper, or black porpoise can be found by drifting objects, near offshore banks, and around offshore islands. They have a robust body, a length up to 4 meters with an indistinct cape and a falcate, pointed dorsal fin. They will often ride the bow wave and perform aerial acrobatics in the stern wake. They may also associate with whales and schools of porpoise. Tursiops range from Point Conception, California, to at least as far south as Ecuador and offshore to 500 miles. School size to several hundred.

Risso's Dolphin *Grampus griseus*

Diagnostic Features

- * **White head with a shallow “V” shaped crease**
- * **Body is grayish with many scars and scratches**
- * **Tall, falcate dorsal fin, slightly rounded or pointed**



Referred to as grey grampus or simply grampus, Risso's dolphins, are cosmopolitan in temperate and tropical oceans. Grampus are born light grey in color, change to dark brown or black as sub-adults, then return to light grey as adults. They have a robust body with a slender tail stock. They do not have a distinctive snout and their head is white with a “V” Shaped crease. They can reach up to 4 meters in length. They may occur in mixed schools with other cetaceans. School size may be several hundred.

Striped Dolphin *Stenella coeruleoalba*

Diagnostic Features

- * **Dark cape with a light shoulder blaze**
- * **Flipper to eye stripe**
- * **Moderately long dark snout with a rounded demarcated melon**
- * **Variable narrow eye to anus stripe**



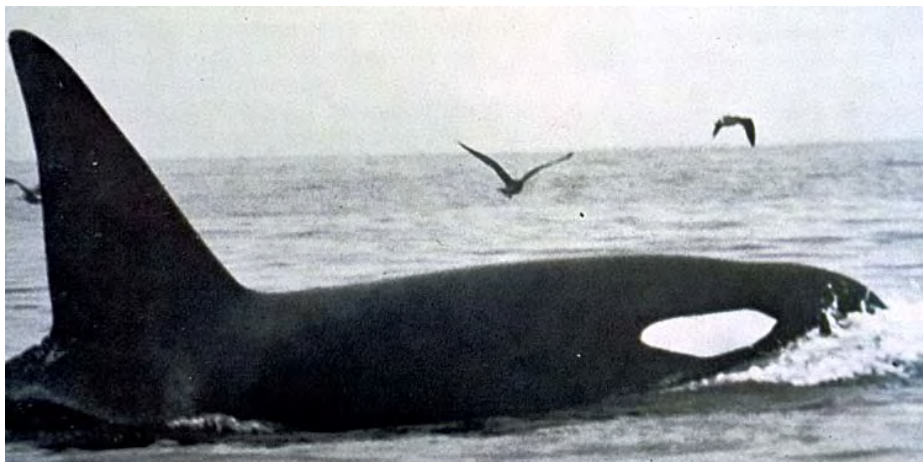
Striped dolphins have been found stranded in British Columbia, Washington, Oregon and Southern California. They can reach up to 2.3 meters in length, they have a robust body with a moderately falcate dorsal fin. They are gray laterally, white ventrally with a variable accessory stripe a flipper to eye stripe and a variable narrow eye to anus stripe. They are capable of high leaps (6-7 m) and are sometimes given to amazing aerobatics. School size to a thousand, but streakers are usually seen in groups of 250 or less. Their diet is variable feeding on various mesopelagic fishes, squids, and crustaceans.



Northern Right Whale Dolphin *Lissodelphis borealis*



Short Finned Pilot Whale *Globicephala macrorhynchus*



The Killer Whale *Orcinus orca*

Northern Right Whale Dolphin *Lissodelphis borealis*



Diagnostic Features

- * No dorsal fin
- * Slender black (dorsal) and white (ventral) body

Northern right whale dolphins inhabit temperate waters seaward of the continental shelf between 30°-50° north latitude. They can reach lengths up to 3 meters, have a short indistinct beak with no dorsal fin. Their body is black dorsally and white ventrally, a trait also observed on their flukes. Because they are gregarious, they may be seen in herds of 100 or more. They commonly associate with Pacific white sided dolphins and when they do, they may ride the bow waves of vessels. These dolphins also ride the pressure waves of fin and gray whales. When disturbed, they will flee in tightly packed groups first by swimming low in the water, rapidly then in long graceful leaps. These cetaceans are occasionally captured in gillnets and occasionally get close enough to shore to strand. Their subsistence is squid and mesopelagic fish. Juveniles are gray or creamy white for the first year.

Short Finned Pilot Whale *Globicephala macrorhynchus*

Diagnostic Features

- * Large bulbous melon
- * Black body with light grey saddle patch behind dorsal fin
- * Anchor patch between pelvic fins
- * Long Sickle shaped pelvic fins



Pilot whales are commonly called blackfish or potheads by fishermen. They are often found in association with bottlenose dolphin. They can grow up to 7 meters and they have a robust body with a slender tail stock. The rounded falcate dorsal fin is broad based and they have long sickle-shaped flippers with an “anchor” shaped patch inbetween.

Data from a subsistence fishery in the North Atlantic reveal that females are sexually mature at age 8, while males do not mature until 15-20 years of age. Females calve at 3-4 year intervals. The diet consists principally of squid. Pilot whales are believed to live up to 45 years. *G. macrorhynchus*, the Short Finned Pilot Whale, closely resembles *G. melana*, the Long Finned Pilot Whale. There have been a few reported sightings of *G. melana* in the Pacific Ocean. Pilot whales are cosmopolitan between 60° North Latitude and 60° South Latitude. Herd size from a few to 1000.

The Killer Whale *Orcinus orca*

Diagnostic Features

- * Oval white patch behind each eye
- * Black dorsally and laterally; white ventrally
- * Tall, erect, triangular dorsal fin (♂) Smaller falcate dorsal fin (♀) & juveniles





Dall's Porpoise *Phocoenoides dalli*



Harbor Porpoise *Phocoena phocoena*

(Killer Whale Cont.)

Killer whales, derive their common name from their propensity to dine on other cetaceans and pinnipeds and their ability to hunt in packs. They have a robust body and can reach length of up to 9 mters. Their snouth is blunt and indistinct. They have a light grey saddle patch behind the dorsal fin. The dorsal fin is tall and erect in males and smaller and falcate in females and juveniles. Killer whales are known to live 20 years in captivity and may survive to 50-60 years in the wild. Killer whales are found throughout the Pacific Ocean. Herd size may be up to 150, but is usually from a few to 25 animals.

Dall's Porpoise *Phocoenoides dalli*

Diagnostic Features

- * **Black with large oval white patch on sides**
- * **Triangular dorsal fin, top half white**
- * **Sloping melon with an indistinct beak**



This porpoise has a boust body and can reach up to 2.2. meters. It is Black with large oval white patch on sides and has a sloping melon with an indistinct beak. The range of this porpoise is from the Pribilof Islands of Alaska and the Bering Strait to Baja California. Normally found in the cooler waters, they migrate southward between October and May. They are fast and powerful swimmers and readily ride the bow waves of ships. When they swim at high speed, the may throw a rooster tail of water so large that they can't be seen. They dine on fish and squid and are frequently entangled in drift gillnets.

Harbor Porpoise *Phocoena phocoena*

Diagnostic Features

- * **Dark brown/gray dorsally and light gray/white ventrally**
- * **Sloping melon with no beak**
- * **Variable dark mouth to flipper stripe**



Shy and unspectacular, the harbor porpoise or "puffing pig", ranges from the Pribilof Islands of Alaska to Point Conception, California. It has a pudgy body with a variable triangular dorsal fin. They can grow up to 2 meters and they are Dark bown/gray dorsally and light gray/white ventrally. However, strandings have occurred as far south as Los Angeles. Herd size is usually ten or less, although feeding aggregations exceeding 50 have been reported. Their diet is variable but they seem to prefer schooling non spiny fish. They frequently interact with fish traps and set gillnets.



Sperm Whale *Physeter macrocephalus*



Pygmy Sperm Whale *Kogia breviceps*



Dwarf Sperm Whale *Kogia simus*

THE WHALES

Sperm Whale *Physeter macrocephalus*

Diagnostic Features

- * Skin Wrinkled posterior to head
- * Blowhole forward and positioned off to the left
- * Rounded dorsal hump back on body



Sperm Whales are readily recognized by their distinctive angled blow and body shape. They reach lengths of up to 17 meters, they are dark brown or black color and they have crenulations on their tail stock. They can also be described by their skin being wrinkled posterior to their flattened head and their short paddle-shaped flippers. Sperm whales dine principally on giant squid. They are known to dive to depths of 1500 meters and may remain submerged for 90 minutes. Sperm Whales are found world wide between 60° N and 70° S. Herd size is a few to 50 individuals.

Pygmy Sperm Whale *Kogia breviceps*

Diagnostic Features

- * Blowhole is on top of head and to the left
- * Dorsal fin is small and falcate
- * Teeth only found in lower jaw



The Pygmy Sperm Whale is usually found offshore in temperate and tropical waters. Stranding records reflect larger populations in the Atlantic Ocean, but members of the genus *Kogia* are occasionally seen floating quietly at the surface. This species has a boxy shark-like head followed by a crescentic white mark behind the eye. The underslung lower jaw has the only teeth. The blowhole is on top of head and left of mid-line. The body is a blue-gray color and the dorsal fin is located about mid-body. The body length is up to 3.4 M; herd size is ten or less.

Dwarf Sperm Whale *Kogia simus*

Diagnostic Features

- * Dorsal fin tall and falcate
- * Upper jaw has rudimentary teeth



This cetacean is similar to the Pygmy Sperm Whale except that it is smaller, the dorsal fin is generally tall and falcate, and the upper jaw may have rudimentary teeth. The dorsal fin may be the only characteristic that can distinguish it from the Pygmy Sperm Whale. The distribution of this species is closer to shore and over continental shelves. It is rare to see this species. Body size is up to 2.7 meters, smallest of all whales and even some dolphins.



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Gray Whale *Eschrichtius robustus*



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The Blue Whale *Balaenoptera musculus*



The Minke Whale *Balaenoptera acutorostrata*

[†]Guide to Marine Mammals of the World;
Chanticleer Press 2002

Gray Whale *Eschrichtius robustus*

Diagnostic Features

- * No head ridge
- * Mottled gray color
- * Nubbin dorsal fin with crenulations on tail stock



Sometimes referred to as the California gray whale, this species may be seen occasionally off the coast of California and Baja California, Mexico. They grow up to 14 meters, have two throat creases with a long a slightly arched mouth line. The Baleen is white or light brown and they do not have a head ridge. They are characterized by their mottled gray color. Extensive barnacle and isopod colonies (*Cyamus* and *Cryptolepas spp.*) located over the whole body make the black skin of these whales appear gray.

Grey whales range from the Bering and Okhotsk Seas to offshore of Yavaros, Mexico; they are limited to above 20° N. Between November and May, wintering concentrations of whales are found in waters off Baja California, where the females calve in the lagoons and the males remain offshore. Summer concentrations are found in the Bering Sea. The average herd size is 16.

The Blue Whale *Balaenoptera musculus*

Diagnostic Features

- * Paired, raised blowholes
- * small, falcate dorsal fin
- * Broad, flat “U” shaped rostrum



Blue whales are one of the easiest balaenopteran whales to identify due to their large size (up to 30 meters), mottled bluish color and small dorsal fin. They also have a single median head ridge and paired raised blowholes. This species subsists on krill and attains a weight of 100 tons. The blow is slender, vertical and up to 9 m tall. The north Pacific stock is estimated at 17,000. Blue whales are usually seen singly or in pairs.

The Minke Whale *Balaenoptera acutorostrata*

Diagnostic Features

- * White ventrally & laterally
- * Tall falcate dorsal fin b back on body
- * Most have a white flipper band



Minke whales are the smallest of the baleen whales known to inhabit the Pacific Ocean. They can grow up to 7 meters and they have a single head ridge. They have a tall falcate dorsal fin and are often distinguished by their white flipper band. These whales subsist on krill and small schooling fish and are usually found singly or in pairs. The blow is low, bushy and indistinct. The body is slender; the baleen short and white. Stocks of Minkes are found world wide and are thought to number 500,000.



The Humpback Whale *Megaptera novaeangliae*



The Fin Whale *Balaenoptera physalus*



The Bryde's Whale *Balaenoptera edeni*

The Humpback Whale *Megaptera novaeangliae*

Diagnostic Features

- * Forward edge of flippers scalloped
- * Head and Fluke covered with knobs and Barnacles on chin
- * Dorsal fin 2/3 back on body, variable & on a small hump



Humpback whales are named for their distinctive dorsal fin and are seasonal inhabitants of California waters. They can grow up to 15 meters, have a robust body with paired blow holes. Humpback whales range from the Bering Straits to offshore of Jalisco, Mexico and may be seen as far south as the Revillagigedo Islands during the winter. Humpbacks feed on krill and small schooling fish. They corral schools of small fish with a curtain of air bubbles, then lunge into the concentrated school from below. Their blow is 3 M tall and bushy; their baleen is short and black. Herd size is usually ten or less.

The Fin Whale *Balaenoptera physalus*

Diagnostic Features

- * Prominent falcate dorsal fin back on body
- * Right lower jaw is white, the other is dark



Fin whales were extensively hunted in the last century, yielding 75 barrels of white oil per adult from blubber seven to nine inches thick. They feed on codfish. Their baleen is 2.5 feet long and light gray streaked with black. Their length is 23 meters, have a single median ridge and a narrow V shaped rostrum and head This species is usually solitary or in groups of up to seven. Feeding aggregations of up to 50 have been observed. Their world wide population is estimated to be 4,000.

The Bryde's Whale *Balaenoptera edeni*

Diagnostic Features

- * Three parallel head ridges



Bryde's whale (pronounced "Breedah's"), are sub-tropical to tropical in distribution in areas of high productivity. The distinctive pattern of head ridges makes Bryde's whales easy to identify when relatively close. They have a pointed head and rostrum and grow up to 14 meters. They feed on krill and schooling fish and are usually solitary or in small groups.



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The Sei Whale *Balaenoptera borealis*



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Baird's Beaked Whale *Berardius bairdii*



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Cuvier's Beaked Whale *Ziphius cavirostris*

[†]Guide to Marine Mammals of the World;
Chanticleer Press 2002

The Sei Whale *Balaenoptera borealis*



Diagnostic Features

- * Single head ridge

Sei whales derive their common name from the Norwegian word for pollack, a fish they associate with seasonally in the North Atlantic. They have a slender body with a length up to 18 meters. Their pointed head and rostrum are followed by paired slightly raised blowholes. They are dark gray to bluish-gray on the back and sides. Their diet is similar to other rorquals. They are widely distributed in the North Pacific and migrate seasonally. There are three tentative stocks totaling around 10,000 animals; herd size is usually five.



THE FAMILY ZIPHIIDAE: THE BEAKED WHALES



The beaked whales are small to medium sized with somewhat slender bodies. A small dorsal fin is located 2/3 back on the body. A distinctive beak precedes a rounded or sloping melon. The flukes are concave at the rear margin and not divided by a prominent notch. Older animals exhibit varying degrees of whitening of the melon, head, or anterior dorsum. Adult males display a characteristic pair of teeth in the lower jaw. All have paired throat grooves.

Baird's Beaked Whale *Berardius bairdii*

Diagnostic Features

- * Front Teeth Exposed when mouth is closed
- * Indentation at blowhole



Sometimes called the Giant Bottlenose Whale, Baird's is the largest of the beaked whales, attaining a length of 13 M. The head has a prominent bulging melon which slopes into a long, cylindrical beak. The body is long and rotund with a small triangular dorsal fin 2/3 back on the body. Flippers are small and the flukes are un-notched. Color varies from slate grey to army brown; white scarring may be evident. Herd size is up to 20. These whales range from temperate to arctic in the Pacific Ocean.

Cuvier's Beaked Whale *Ziphius cavirostris*

Diagnostic Features

- * White conical slightly concave head
- * Short beak



Although reported to inhabit all except the coldest waters, Cuvier's whales are rare and known mostly from strandings. Their indistinct blow and unobtrusive nature make them difficult to observe or identify. Mature males have two small conical teeth at the tip of the lower jaw. Body color is highly variable: slate grey, reddish, or tan and the head and anterior body whiten with age. This beaked whale can grow up to 7 meters and has a long and robust body. The variable dorsal fin is positioned 2/3 back on the body. Herd size is usually ten or less.



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Hubbs' Beaked Whale *Mesoplodon carlhubbsi*



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Blainville's Beaked Whale *Mesoplodon densirostris*



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Stejneger's Beaked Whale *Mesoplodon stejnegeri*

Hubbs' Beaked Whale *Mesoplodon carlhubbsi*

Diagnostic Features

- * White cap around blowhole and massive teeth visible (♂ only)
- * Small, falcate dorsal fin



The Hubbs' Beaked Whale can be found along the western coastline ranging from Southern Californian to southern Alaska. Male and female can be distinguished by the **male's white "cap"** located on the dorsal surface of the head. Other gender distinctions are the lack of erupting teeth in the female and the male has a long stocky beak that is usually white. Both genders will normally have scars all over their body. Females are more difficult to identify due to the lack of distinguishable characters.

Blainville's Beaked Whale *Mesoplodon densirostris*

Diagnostic Features

- * Prominent, curved or triangular dorsal fin
- * Light patch on underside



This whale has the widest distribution of any Mesoplodon species, but is primarily found on the Atlantic coast of the United States. Small Schools have been sighted in Hawaii, and some have been spotted of the Pacific coast of the United States. The male is identified by its large teeth that erupt from the arched lower jaw. It has yellow and white spots all over its body and it also has a white or grayish underside, a feature found on both genders. Female's do not have erupting teeth and their lower and upper jaws may appear white.

Stejneger's Beaked Whale *Mesoplodon stejnegeri*

Diagnostic Features

- * Small, nearly triangular or falcate dorsal fin
- * Spindle-shaped body



These whales are not seen vary often and their distribution runs along the Californian coastline across the Aleutian Islands to Japan. In fact few of these animals have been seen alive. The males can be identified by their large two teeth, that are laterally compressed and are found midline of the beak The male body color is dark while the female body color is lighter. Males have a white beaked and are often confused with the Hubbs' Beaked Whale. Both genders have long beaks

PINNIPEDS & THE SEA OTTER





Harbor Seal *Phoca vitulina*



Northern Elephant Seal *Mirounga angustirostris*

INTRODUCTION

Pinnipeds are a family of mammals characterized by external appendages modified into flippers. Of the more than 30 known species, six of these are found along the California coast. Four are eared seals (sea lions or fur seals), and two are earless (the true seals).

One other marine mammal inhabits the California coast, but this one is in the Mustelidae or weasel family. The Sea Otter has elongated rear appendages that appear flipper-like; the front legs have webbed paws and are similar to other carnivores.

FAMILY PHOCIDAE

Phocids are easily distinguished from other pinnipeds by their apparent lack of external ears. Propulsion through the water is accomplished solely through use of the hind flippers. Although skillful swimmers, these animals are relatively helpless ashore because they lack the ability to rotate their hind flippers forward to aid in locomotion. Although the flippers have well developed distal toe nails, overland travel is difficult and restricted to an undulating belly-crawl. Phocids are usually observed suspended vertically in the water with only their heads exposed. When disturbed, they sink backwards below the surface rather than diving forward.

Harbor Seal *Phoca vitulina*

Diagnostic Features

- * Blotches against a contrasting background
- * Multicuspid premolar



The Harbor Seal is a relatively small, robust seal with a blunt squarish muzzle. The body surface is covered with a highly variable pattern of blotches and mottling against a contrasting (darker or lighter) ground color. The presence of multicuspid premolars is diagnostic.

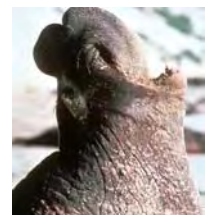
Adult Harbor Seals are usually less than 6 feet in length and weigh up to 300 lbs. Males and females are relatively the same size.

Harbor Seals are found from the Bering Sea to central Baja California. They usually occur inshore in harbors, shallow bays and near river mouths, but are occasionally found near offshore islands. The Harbor Seal commonly interacts with the California gillnet fishery.

Northern Elephant Seal *Mirounga angustirostris*

Diagnostic Features

- * Males have a rostrum
- * Both sexes are uniformly brown in coloration
- * Mature males have a "shield" of cornified, thickened skin on chest and frontal neck area.





Guadalupe Fur Seal *Arctocephalus townsendi*



Northern Fur Seal *Callorhinus ursinus*

(Northern Elephant Seal Cont.)

The rostrum of a large male elephant seal is expanded into an overhanging, wrinkled, inflatable proboscis. Mature males have a "shield" of cornified, thickened skin on chest and frontal neck area. The proboscis is also present, but less pronounced in adult females giving them a characteristic "Roman" nose appearance. Coloration of both sexes is uniform brown or gray, and pups are usually light gray. The premolars are monocuspid in this species.

Adult male elephant seals attain lengths up to 20 feet, and weights up to 7,700 lbs; females weigh up to 1,980 lbs. Males are often grotesque-looking, as they are frequently scarred from dominance contests with other males. Both sexes regularly slough large patches of epidermis.

FAMILY OTARIIDAE

The Otariids, unlike the previous family, possess an obvious external ear pinna. They use their fore-flippers to propel themselves through the water, and their hind flippers rotate forward to facilitate travel on land. The middle three digits of each flipper have toenails, located roughly halfway down the flipper surface. There is marked sexual dimorphism in size in all species. Otariids are commonly observed "rafting", floating on their backs or sides in small groups, often in or near kelp beds. When disturbed, they usually dive forward rapidly and submerge.

Guadalupe Fur Seal *Arctocephalus townsendi*

Diagnostic Features

- * **Narrow pointed muzzles**
- * **Fur on the dorsal surface of fore flipper**



Guadalupe Fur Seals are relatively small, streamlined sea lions whose closest relatives are found in the eastern Pacific region. They are easily distinguished by their narrow pointed muzzles which give the animal's head a "Lassie" profile. Head and neck coloration in both sexes is yellowish gray to reddish brown, with the long silvery guard hairs, especially noticeable on the neck and shoulders of an adult male. Body color is dark brown or gray. The presence of fur on the dorsal surface of the fore flipper is diagnostic.

Male Guadalupe Fur Seals can attain lengths of up to 6 feet, and can weigh up to 350 lbs. Females grow to 4.5 feet and weigh 100 lbs.

Northern Fur Seal *Callorhinus ursinus*

Diagnostic Features

- * **Light patch on the chest**
- * **Fore flippers naked distal to wrist**



The muzzle of the Northern Fur Seal is shorter and less pointed than in the previous species, but the whiskers are longer. The foreshortening of the muzzle pronounced in adult males, giving the profile a convex appearance. The dorsal surface of the fore flipper is naked distal to the wrist. Males are usu



California Sea Lion *Zalophus californianus*

(Northern Fur Seal Cont.)

ally dark brown with gray coloration on the neck and shoulders. Females are usually gray overall, but darker on the face. Both sexes normally have a lighter patch on the chest. Males can be up to 7 feet long and can weigh 600 lbs.; females up to 5 feet and 130 lbs.

Steller Sea Lion *Eumetopias jubatus*

Diagnostic Features

- * **Males have the appearance of a mane**
- * **presence of a gap between premolars and molars**
- * **Light yellowish brown overall when dry, a darker orange brown when wet.**



The Steller Sea Lion is best distinguished by its color and large adult size. Adults of both sexes are a light yellowish brown overall when dry, a darker orange brown when wet. Pups are from dark brown to black. Males can be huge, attaining lengths of up to 11 feet and weighing up to 2200 lbs. Mature males have very thick necks with thick hair giving the appearance of a mane and they lack the sagittal crest of adult male California sea lion. Females average 7.5 feet long and can weigh up to 800 lbs. Adult male Steller Sea Lions have massive canine teeth, and the presence of a gap between the premolars and molars (in both sexes) is diagnostic.

California Sea Lion *Zalophus californianus*

Diagnostic Features

- * **Both sexes brown or black**
- * **Mature males have prominent sagittal crest**



This is the most commonly encountered pinniped in California. Live animals are best distinguished from the preceding species by color. When wet, both sexes appear uniformly dark brown or black. When dry, adult males are dark, females and subadult males are light brown to tan, and pups are dark brown. The presence of a prominent sagittal crest topped with a patch of light fur is diagnostic for mature males. There is no gap between the molar and premolar teeth in the upper jaw. Male California sea lions grow to eight feet long and 700 lbs.; females to six feet and 250 lbs.



Sea Otter *Enhydra lutris*

Sea Otter *Enhydra lutris*

Diagnostic Features

- * Head rounded, with blunt muzzle
- * Body covered with long fur
- * Presence of paws



The sea otter is an elongate mustelid with a long, muscular tail equal to $\frac{1}{4}$ of its body length. The limbs end in broad paws with 5 digits and are not modified into flippers, but they are strongly webbed, especially the elongated hind feet. The head is rounded with a blunt muzzle, and small external ears are present. Coloration varies from dark reddish-brown to nearly black, sprinkled with silvery white guard hairs. The head and neck is frequently paler in color than the rest of the body. Males grow to 6 feet in length and may weigh 90 lbs.; females are up to 4 feet long and 60 lbs.

The former range of sea otters was from the northern islands of Japan across the Bering Sea and southward to southern Baja California. They usually occur within 3 miles of shore and are often associated with kelp beds.

Indigenous peoples of Siberia and North America have hunted this species for food and pelts since ancient times, but trade in sea otter pelts with Europeans began in 1741 when 800 pelts were given to Vitus Bering. This trade eventually involved Russia, Spain, Japan and (after 1785) the United States, France and England.

The stocks were depleted. The Russians limited the sea otter take in Alaskan waters until the U.S. purchase of Alaska in 1867, after which unregulated harvest continued. By 1911 the sea otter was nearly eliminated. In 1913, California and the Alaska territory prohibited the hunting of sea otters. By 1920, the only known population south of Alaska was at Big Sur. The sea otter's current range extends from Santa Cruz California to Avila, San Luis Obispo Co., California and has been expanding at a rate of 2.5 miles per year since 1913. There have been occasional sightings of sea otters from northern California to the Mexican border.

The Sea Turtles





Loggerhead Turtle *Caretta caretta*



Eastern Pacific Green Turtle *Chelonia agassizi*

INTRODUCTION

The known fossil records of marine turtles are 200 million years old. The eight contemporary species have fossil evidence 60 million years old. In general, marine turtles are circum-tropical in pelagic and coastal waters. Historic commercial and subsistence fisheries for some, if not all species, pre-date written history. The market for turtle products varies widely, with the Ridley prized for its leather, the Green of its meat, the Hawksbill for its shell and the leather-back for its oil. A cartilaginous tissues known as *calipee* and *calipash* from the hard shell turtles is the essence of turtle soup. The main predators of these turtles are the larger sharks, fish trawls and man. All are considered threatened or endangered. Marine turtles spend most of their lives at sea, and the few weeks of each year during nesting and hatching seasons are when these creatures are most vulnerable to predation

Loggerhead Turtle *Caretta caretta*

Diagnostic Features

- * Five Pairs of costal scutes that do not overlap
- * Reddish brown or orange color
- * Two pairs of irregularly divided prefrontal scales
- * Three pairs of inframarginal scutes



The loggerhead turtle is cosmopolitan in coastal and subtropical waters, and may drift with the currents or migrate into temperate seas. With a carapace length up to 1.4 meters, they have a shell longer than broad and somewhat tapered and is often heavily fouled. Encrusting organisms are common and include: leeches, crabs, barnacles, and filamentous algae. Their head is large, broad and sub-triangular.

Loggerheads inhabit a variety of estuarine and continental shelf habitats. They may remain dormant during the winter buried in the muddy bottoms of sounds, bays, and estuaries. Major concentrations of juvenile and sub-adults may be observed off of Baja California in spring and summer. While loggerheads are the only species known to nest outside of the tropics, there is no reported nesting in western North America. Loggerhead hatchlings and juveniles are frequently associated with current convergences where floating epipelagic animals and flotsam are gathered. This species is carnivorous most of its life dining on jellyfish, conch, clams, crabs, fish, and octopus.

Eastern Pacific Green Turtle *Chelonia agassizi*

Diagnostic Features

- * One pair prefrontal scales, four post-orbital scales
- * Four pairs non-overlapping costal scutes, and four pairs inframarginal scutes
- * Color slate grey to black with splotching or radial patterns of brown, green and black



The Eastern Pacific green turtle is the most common along the west coast of America. It can grow up to 4 feet, and a good diagnostic is the presence of one pair prefrontal scales, four post-orbital scales. Its color is usually green and it has a smooth carapace with little fouling and no vertebral knobs on the juveniles. It inhabits the coastal waters of the Eastern Tropical Pacific Ocean, and is not usually observed in the open ocean. Migrations occur between the northern and southern extremes of distribu



Hawksbill Turtle *Eretmochelys imbricata*



Olive Ridley Turtle *Lepidochelys olivacea*

(Eastern Pacific Green Turtle Cont.)
tion.

The food of adults consists of a number of species of algae though the diet varies between feeding grounds and may include animal food in minor quantities such as small molluscs, crustaceans, bryozoans, sponges, jellyfish and echinoderms. For a long time this green sea turtles provided an abundant and easily available source of food for the coastal inhabitants of Baja California.

Hawksbill Turtle *Eretmochelys imbricata*

Diagnostic Features

- * **Two pairs prefrontal scales**
- * **Four pairs costal scutes, four pairs inframarginal scutes**
- * **Overlapping scutes**



The hawksbill is the most tropical of all sea turtles, and is distributed throughout the Central Atlantic and Indo-Pacific regions. They live in clear, littoral waters of mainland and island shelves around reef formations and coastal lagoons and bays with sea grass or algal meadows. They grow up to 1 meter and have a beak-like mouth/ The head is small and narrow with a pronounced overbite. Carapace is mottled brown, yellow/orange & black with a "tortoise shell " pattern and there are four overlapping costal scutes. The scutes are most strongly imbricated at maturity, but in older animals the overlapping character is frequently lost.

This is a carnivorous turtle; the diet is principally sponges but corals, tunicates, and algae provide some variety. The narrow and elongated snout and the thick scutes of the carapace are adaptations to cope with waves and to obtain food in crevices between corals and rocky substrates.

Olive Ridley Turtle *Lepidochelys olivacea*

Diagnostic Features

- * **Five or more pairs of costal scutes w/ indistinct boundaries**
- * **Uniform gray/green or olive color**
- * **Two pairs prefrontal scales; often irregularly divided**



This is the most abundant turtle, a pantropical species living primarily in the northern hemisphere with the 20° isotherms as its distributional boundaries. They can grow up to .8 meters and are noted for their uniform gray/green or olive color. Their costal scutes often very narrow and they have four pairs inframarginal scutes with pores.

In continental coastal waters, principally in the Eastern Pacific and Indian Ocean, where major reproductive colonies are found, these turtles are usually seen in large flotillas travelling between breeding and feeding grounds. There have been observations of turtle diving and feeding in 200M deep and also floating in the thousands just in front of their nesting beaches around noon. This turtle usually migrates along the continental shelves and feeds in shallow water.

The olive ridley is a facultative carnivore, which for long periods of time is capable of eating a
(Olive Ridley Turtle Cont.)



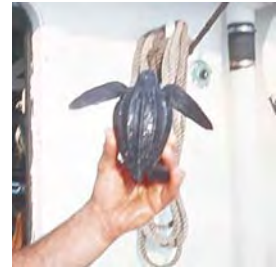
Leatherback Turtle *Dermochelys coriacea*

single kind of food, i.e. red lobsterets. Other foods include fish, salps, crustaceans, molluscs, algae, and fish eggs.

Leatherback Turtle *Dermochelys coriacea*

Diagnostic Features

- * **Prominent longitudinal ridges, often knobby or notched**
- * **No horny scutes**
- * **Black with white spots**



This is one of the largest living reptiles, surpassed in size only by some species of crocodiles. Adults are easily distinguished from all other species of sea turtles by their spindle-shaped huge bodies and their leathery, unscaled keeled carapaces. Adult leatherbacks are adapted to colder water than other sea turtles, a capability that is due to their protective thick and oily dermis. As a result, the leatherback is the most widely distributed with a range around 70°N to 45°S.

They are a highly pelagic species that approaches coastal waters only during the reproductive season. They seldom form large aggregations (flotillas) and apparently wander erratically in search of food which is assumed to be carnivorous throughout its lifecycle feeding primarily on jellyfish, tunicates, and other epipelagic soft-bodied invertebrates. Unlike most other sea turtles which nest during spring and summer, the leatherback usually nests in the autumn and winter forming "arribazones" or nesting beaches.

Adults are caught incidentally by set or drift nets used for pelagic fishing and by longlines used for tuna, sailfish, swordfish and sharks. Generally speaking there are no commercial fisheries for this species.

INTRODUCTION TO FISH IDENTIFICATION

GENERAL

This training should enable the observer to correctly identify on sight most of the species commonly encountered in the California pelagic fisheries. However, familiarity and skill with the field guides is necessary to identify specimens of taxa containing many similar species (eg. rockfish, flatfish), and to identify less common species not presented in training.

Positive identification of fishes can usually be made on the basis of external structural characters. Become familiar with these characters, and the terminology describing them, by studying pages 4-12, including figures 1-10, in *Guide to Coastal Marine Fishes of California*.

DIAGNOSTIC CHARACTERS

Number, location, size and shape of dorsal fin(s); presence or absence of, and number of spinous rays; and the number of soft rays.

Presence or absence of and location, size and shape of pectoral, pelvic and anal fins; presence or absence of and number of spinous rays; and the number of soft rays.

NOTE: Although time consuming, fin spine/ray counts can distinguish between superficially similar species.

Size and shape of caudal peduncle and caudal fin.

Presence or absence of and number of cranial, opercular or preopercular spines.

Presence or absence of barbels, cirri, flaps, papillae etc...

Size and location of orbit relative to mouth line; structure of mouth and chin.

General body shape (fusiform, flattened etc..).

Length, location and configuration of lateral line and the number of lateral line scales.

Presence or absence of, and the structure of maxillary, mandibular, palatine, vomerine and basibranchial teeth.

Number and shape of anterior gill-rakers on first gill arch.

COLOR PLATES

Refer to the color plates in the middle of *Pacific Coast Fishes* and locate an illustration that closely resembles the specimen.

1. Compare general body shape, size; structure of the mouth and snout; fin shape and placement; color and markings.
2. Compare the specific characters highlighted by arrows in the illustration and read the brief description of the species on the facing page.
3. If no discrepancies are apparent between the description/illustration and the specimen, turn to the indicated page in the text and read the species account.
4. Check the specimen for each structural character listed in the species account, paying particular attention to features which are *italicized*, as these are often diagnostic.
5. Read the descriptions of range and habitat to ensure the species normally occurs where the specimen was caught.
6. Check similar species listed in the account to rule out superficially similar or related fishes.
7. If by the above steps a positive identification still cannot be made, key out the specimen using *Guide to Coastal Marine Fishes of California*.

DICHOTOMOUS KEY

Become familiar with the diagnostic features used for identification discussed and illustrated on pages 6 - 12 in *Guide to Coastal Marine Fishes of California*.

1. Turn to "Key to the Families" (pages 13 - 31, Sections A - I). The key consists of major groupings of fishes subdivided according to one or two easily distinguishable characters (presence or absence of pelvic fins). Starting on page 13, locate the appropriate section (A - I) by process of elimination based on the characteristics listed.
2. Once the appropriate section is located, use that section's key to determine family. Note that use of the key may result in referral to a subsequent section, and the above process must be repeated with that section's key until family identification is established.
3. Once the family has been determined, turn to the appropriate page as directed by the key. If the family or genus contains many species, the Species Presentation will usually be preceded by yet another key for members of that taxon, which should be used for species determination. If not, refer directly to the Species Presentation and accompanying illustrations, and base identification on comparison with characters listed and illustrated for the species.
4. Verify species determination by cross-reference with the species accounts and illustrations in *Pacific Coast Fishes*.

NOTE: Pay particular attention to **Range** and **Habitat** descriptions in the accounts. If you have keyed the specimen to a species not normally encountered in the area, check your work and if possible, take a photograph of the fish.

Billfish





Swordfish *Xiphias gladius*



Striped Marlin *Tetrapturus audax*

BILLFISHES

There are two billfishes commonly caught in the fisheries observed by the southwest region. The swordfish and the striped marlin. The blue marlin has also been recorded, but it is rare. Due to the blue marlin's similarity to the striped marlin, we have included it here. We also have included two other billfish, although their occurrences are also rare.

The swordfish is the targeted species in the driftnet fishery, while the marlins can only be caught with hook and line as a sport fish. Commercial fishermen are required to surrender dead striped marlin to a game warden. As an observer, you should request any dead marlins for scientific purposes. If the entire carcass cannot be retained, perform the requisite dissections.

Xiphiidae

Swordfish *Xiphias gladius*

Diagnostic Features

- * The upper jaw is shaped like a long flattened sword or bill.
- * **There are no pelvic fins.**
- * Pectoral fins are low on the body.



In the young, both parts of the dorsal and anal fins are connected. The midsection is covered by skin when a length of one foot is reached. There is a strong keel on the caudal peduncle. Adults are scaleless. Coloration is black or brownish dorsally, shading to light brown ventrally. They reach 4.6 m and weigh up to 536 kg.

Swordfish are found worldwide in tropical and temperate seas. They are found in shallow to moderately deep offshore waters. Schools of swordfish are not common although they are migratory. They feed on fish, squid and pelagic crustaceans.

Striped Marlin *Tetrapturus audax*

Diagnostic Features

- * The bill of striped marlin is long and round in cross-section.
- * The dorsal fin is very high in front (as high or higher than the body depth), then slopes quickly towards the rear.
- * **Pelvic fins are present.**
- * There are 15-25 light blue bars or vertical rows of spots on the sides.



When surfaced, the dorsal fin is retracted and not showing, making it difficult to distinguish from a swordfish. There are two keels at the base of the caudal fin. Coloration is dark blue dorsally and silvery white ventrally. Striped marlin reach 4.1 m and 314 kg.

Striped marlin are found in the Pacific and Indian oceans. Their range is from Pt. Conception south. They are epipelagic, oceanic and found near the surface. Schools are not formed. They feed on fish, squid, pelagic crabs and shrimp.



Blue Marlin *Makaira mazara*



Shortbill Spearfish *Tetrapturus angustirostis*



Sailfish *Istiophorus platypterus*

Blue Marlin *Makaira mazara*

Diagnostic Features

- * The dorsal fin is not as high as the body depth
- * **Pelvic fins are present** and they fold against the body.
- * Bluish stripes on side of body



The body is moderately short and compressed, the nape is highly elevated and there is an almost invisible lateral line that zig zags along the sides of the body becoming more noticeable with age. The dorsal surface is dark purplish blue, silvery white ventrally; bluish stripes on upper part of body (which fade after the fish die). Fins are cobalt blue often with dark stripes.

This species not commonly recorded or caught, but due to its similarity to the striped marlin, the catch records could be off. The can get rather large, up to 5 meters and way 900 kg.

Shortbill Spearfish *Tetrapturus angustirostis*

Diagnostic Features

- * Very short bill, only slightly longer than the lower jaw
- * Pectoral fins narrow and short
- * First dorsal fin base long, extending from above posterior margin of preopercle to near second dorsal fin origin



The body is elongate and fairly compressed. The anus is well forward of first anal fin, where in the swordfish and the marlin is near the anal fin. The body is dark blue dorsally, blue splattered with brown laterally, and silvery-white ventrally, without spots or stripes. The base of the first and second anal fin tinged with white.

This species is not caught very often in any of the fisheries observed by the southwest region. It is mostly found in longline fisheries that target swordfish. This fish can grow up to 160 cm.

Sailfish *Istiophorus platypterus*

Diagnostic Features

- * Extremely large and high first dorsal fin, highest at the midway point
- * Very long pelvic fins reaching nearly to the anus
- * Long bill, similar to the marlins



The body is fairly compressed and the bill is slender and round in cross section. The body is blue-purple above, shading to a pale yellowish grey below. The dorsal fin is blue and generally bears a series of dusky or black spots. The sailfish is an epipelagic and oceanic species which is usually caught near islands or reefs but sometimes may be found in the open oceans.

Sharks and Rays





Common Thresher *Alopias vulpinus*



© 2002 Adam P. Summers.

Pelagic Thresher *Alopias pelagicus*

SHARKS

CLASS CHONDRICHTHYS, THE CARTILAGINOUS FISHES

Alopiidae

The thresher sharks are easily identified by an extremely long upper caudal lobe, usually as long as the body. Upper and lower precaudal pits are present, but there is no keel on the caudal peduncle. The eye is relatively large, and is round or vertically oval.

Thresher sharks are found worldwide in warm temperate and tropical seas. The common thresher, as its name implies, is most often caught in the eastern pacific fisheries (north of Mexico). Common threshers are epipelagic, and occur from far offshore to waters over continental and insular shelves at depths ranging from at the surface to 200 fathoms. Young specimens can frequently be found in inshore coastal waters. Threshers prey on small schooling fishes, cephalopods and pelagic crustaceans. They are not considered aggressive and have only small teeth, but a tail swipe from a large individual could possibly cause injury. Females are ovoviviparous and produce two to four young per litter.

Common Thresher *Alopias vulpinus*



Diagnostic Features

- * Long Whip-like tail
- * White coloration, from the ventral side, extends past the upper portion of the pectoral fin

Dorsal coloration of the common thresher is brownish, slate gray or bluish-gray, occasionally with a silvery or golden sheen laterally. Ventral coloration is white, and this species is the only member of the genus in which white ventral coloration extends onto the upper surfaces of the pectoral and pelvic fins. The snout is short, conical and pointed, and the dorsal and lateral profiles of the head are convex. The orbits don't expand onto the dorsum of the head. The pectoral fins are falcate and pointed. Maximum length is to 5.5 meters, with females growing the largest.

Pelagic Thresher *Alopias pelagicus*

Diagnostic Features

- * Coloration above the pectoral fin is dark
- * Long Whip-like tail



This fish can often be confused with the common thresher. It is pale grey dorsally and white ventrally. The pectoral fins are nearly straight and broad-tipped. The terminal lobe of the caudal fin is about equal in length to the second dorsal-fin base. The eyes are moderately large but do not extend onto dorsal head surface. . This thresher also lacks labial furrows, which are shallow grooves around the lips. Maximum length is 3.3 meters for the males and 3.8 meters for the females.



Bigeye Thresher *Alopias superciliosus*



© Pablo D. Meneses

Basking Shark *Cetorhinus maximus*

Bigeye Thresher *Alopias superciliosus*



Diagnostic Features

- * **Relatively large eye**
- * **Dorso-lateral groove running from the head to the base of the first dorsal fin**

The bigeye thresher is similar in general shape and structure to the preceding species, but can be distinguished by its relatively larger eyes, with the orbits expanding onto the head's dorsal surface, and by the presence of a dorsolateral groove running from the head to the base of the first dorsal fin. The insertion of the latter is opposite the pelvic fin origin. In other threshers, the first dorsal fin insertion is anterior to the pelvic fin origin. The pectoral fin is falcate with a rounded tip. Dorsal coloration is dark gray, ventral coloration is light gray or cream. The bigeye thresher attains a maximum length of about 4.6 meters.

This species is found in the Atlantic, Indian, and central and western Pacific Oceans. It is epipelagic, and in our area usually occurs far offshore. It feeds on small pelagic fishes and cephalopods, and in California has been gill-netted from near the surface to 100 fathoms.

Cetorhinidae

The basking shark family consists of one species. It is a large spindle-shaped planktivorous shark characterized by extremely long gill slits that extend from the top to the bottom of the head, and that nearly meet in the gular area. The head and snout are conical and the mouth contains extremely small, curved, peg-like teeth. The dorsal fin is broad and triangular, and upper and lower precaudal pits and a strong keel on the caudal peduncle are present. The caudal fin is crescentic.

Basking Shark *Cetorhinus maximus*

Diagnostic Features

- * **Gill slits long, nearly meeting under the throat**
- * **Large mouth, with chitinous gill rakers used for filter feeding**
- * **Conical head and snout**



Photo modified from *Sharks, History and Biology of the Lords of the Sea*. A. Mojetta. 1997. Swan Hill Press.

The basking shark is the second largest fish in the world (only the whale shark, *Rhincodon typus*, grows larger), and attains a length of 14 meters. Basking and whale sharks are unique among chondrichthians in possessing very long, chitinous gill rakers, an adaptation for straining zooplankton. Dorsal coloration is a uniform bluish or slate gray, black, or brown grading to white ventrally.

Basking sharks are found worldwide in cold seas. They apparently migrate into higher latitudes in summer and into lower latitudes in winter, and there are also seasonal migrations into deeper water, but details are poorly understood. This is a pelagic species often seen cruising slowly in coastal waters with its first dorsal fin and upper caudal lobe breaking the surface, and is frequently seen in pairs or in small schools. It feeds by swimming slowly with its mouth open through aggregations of zooplankton, which are carried by the water flowing into the mouth onto the gill rakers where they are trapped.

The basking shark is generally harmless, but it can respond aggressively when molested. Females are ovoviviparous, but reproductive history is poorly known.



White Shark *Carcharodon carcharias*



Shortfin Mako Shark *Isurus oxyrinchus*



Lamnidae



The mackerel sharks are large, robust, spindle-shaped sharks with crescentic, nearly symmetrical caudal fins. There is a strong keel on the caudal peduncle, and upper and lower precaudal pits are present. The gill slits are relatively long but do not extend to the top or bottom of the head.

White Shark *Carcharodon carcharias*

Diagnostic Features

- * Large, flat, triangular teeth with serrated edges
- * Large torpedo shaped body with a conical snout



This is a large, robust shark with an angular, pointed snout and very large, flat, triangular teeth with serrated edges. The first dorsal fin begins over the rear of the pectoral fin. The second dorsal fin is minute compared to the first and is located slightly anterior to the anal fin. The caudal peduncle possesses a long, well-developed keel. Dorsal coloration is blue or slate-gray to nearly black, grading to white ventrally. Most specimens display a black spot at the base of the pectoral fin, and occasionally the ventral surface of the pectoral fin tip is also marked with black. This species attains lengths of up to nine meters.

White sharks occur worldwide in cooler temperate as well as tropical seas, but apparently associate with cool water bodies and currents throughout their range. Details of migration patterns and reproductive history are unknown. White sharks are found in both offshore and coastal waters, and often frequent islands, especially those with established pinniped rookeries. They range from near the surface to 700 fathoms, but only rarely appear in this fishery.

Shortfin Mako Shark *Isurus oxyrinchus*

Diagnostic Features

- * Most spindle shaped shark of mackerel family
- * Long, slender, smooth edged, teeth and always visible



This species is a moderately slender, spindle-shaped shark with a long, pointed snout. Dorsal coloration varies from dark blue to gray. Ventral surfaces, including that of the snout, are white. The pectoral fin is long and broad, and the length of its anterior margin is less than head length. The first dorsal fin is large and falcate with a rounded tip, and is closer to the pectoral fin bases than the pelvics. The second dorsal and anal fins are minute, and the caudal fin is crescentic. The teeth are blade-like and lack serrations or cusplets. In specimens under three meters long the upper jaw teeth are narrow-based and needle-shaped. In specimens longer than three meters, maxillary teeth are broad-based, flattened and triangular in shape, and the tips of anterior teeth are strongly reflexed. Maximum recorded length is four meters.

Shortfin Mako distribution is worldwide in warm temperate and tropical waters. Habitat is epipelagic and offshore littoral zones in water greater than 16°C, from the surface to at least 80 fathoms. The Shortfin Mako is an active, streamlined pelagic piscivore generally regarded as the fastest swimming shark. Prey includes schooling fish, swordfish, blue sharks and squid and this species is dangerous.



Salmon Shark *Lamna ditropis*



Blue Shark *Prionace glauca*

Salmon Shark *Lamna ditropis*

Diagnostic Features

- * Smooth, un-serrated teeth
- * Secondary keel along the base of the tail
- * Back is blue-gray (rather than indigo as in the mako) and adults have dusky blotches ventrally



Salmon Sharks are stout with a bluntly conical snout. The gill slits are large. The first dorsal fin is uniformly dark, including the rear tip. The ventral surface is white with dusky blotches (in adults only) while the dorsal surface is dark. A distinguishing characteristic is the black spot that is located at the base of the pelvic fin. The second dorsal fin is small and is located above the anal fin. The caudal fin is crescent shaped and strongly keeled with short secondary keels at the peduncle base. This shark has a maximum range of 10 feet and can weigh up to 990 lbs.

Salmon sharks are epipelagic and are found inshore and offshore. They are most abundant in the colder waters off Alaska but have a range all the way down to Baja, California. They are opportunistic feeders but get their name from their primary prey, the salmon. This shark is ovoviviparous and may contain 2-5 embryos per litter. This shark is potentially dangerous to man both in the water and out of the water, so be careful. No known shark attacks have ever been recorded by this species, but it is often confused with the White Shark.

Carcharhinidae

The requiem sharks are moderate to large streamlined sharks best characterized by the lack of spiracles (in most species). Eyes are round or vertically oval, the pectoral fin origin is under the fourth or fifth gill slit and the base of the first dorsal fin is anterior to the pelvic fin base. An upper precaudal pit is present, but all but one species in our area lack a keel on the caudal peduncle.

Blue Shark *Prionace glauca*

Diagnostic Features

- * Long Pectoral fin with pointed tip
- * Dorsal coloration deep blue, fading to light blue laterally
- * Slender body with narrow snout



This is an elongate, slender-bodied shark with a long, narrow snout. The gill slits are relatively short. Spiracles are absent. The pectoral fin is very long and falcate with a pointed tip, and the large first dorsal fin is closer to the pelvic fin base than to the pectorals. There is a weak keel on the caudal peduncle that is more easily felt than seen. Dorsal coloration is deep iridescent blue, grading to light blue laterally; ventral coloration is white. Length is to nearly four meters.

Blue shark distribution is worldwide in temperate and tropical seas. This is primarily an epipelagic, oceanic shark, but it will come inshore, especially at night, and it ranges from near the surface to at least 120 fathoms deep. Blue sharks are more tolerant of cold water than other Carcharhinids; optimum water temperature ranges from 7° to 16°C. They prey on pelagic teleost fishes, squid and pelagic crustaceans and apparently show a greater tendency to scavenge than other pelagic sharks. As there are documented attacks on humans, blue sharks should be considered dangerous.



Smooth Hammerhead *Sphyrna zygaena*



Spiny Dogfish *Squalus acanthias*

Sphyrinidae

The hammerhead sharks are virtually unmistakable due to their dorsoventrally flattened heads with eyes located on the ends of laterally-extending hammer-shaped lobes. Nictitating membranes on the eyes are present while spiracles are absent. The second dorsal fin is the same size as or smaller than the anal fin. The lower lobe of the caudal fin is large.

Smooth Hammerhead *Sphyrna zygaena*

Diagnostic Features

- * notch on the anterior edge of base of each lateral eye



The smooth hammerhead can be distinguished from other members of the genus by a notch or depression on the anterior edge of the base of each lateral eye lobe. Coloration is gray or brown dorsally, grading to light gray laterally. Ventral coloration is white, and the ventral surface of each pectoral fin tip is sometimes black. Length is to four meters.

Smooth hammerheads occur in all warm-temperate and subtropical seas but are rare or absent from equatorial waters. They can be seasonally abundant north of Mexico in warm summer years, and are found primarily in coastal waters, but usually far from shore. These sharks are active, fast-swimming piscivores that frequently feed on other chondrichthians as well as pelagic cephalopods and crustaceans. Females are viviparous.

Squalidae

The dogfishes are small slender sharks lacking an anal fin and with spines at both dorsal fin origins. The entire first dorsal fin base is anterior to the pelvic fins, and well-developed spiracles are present.

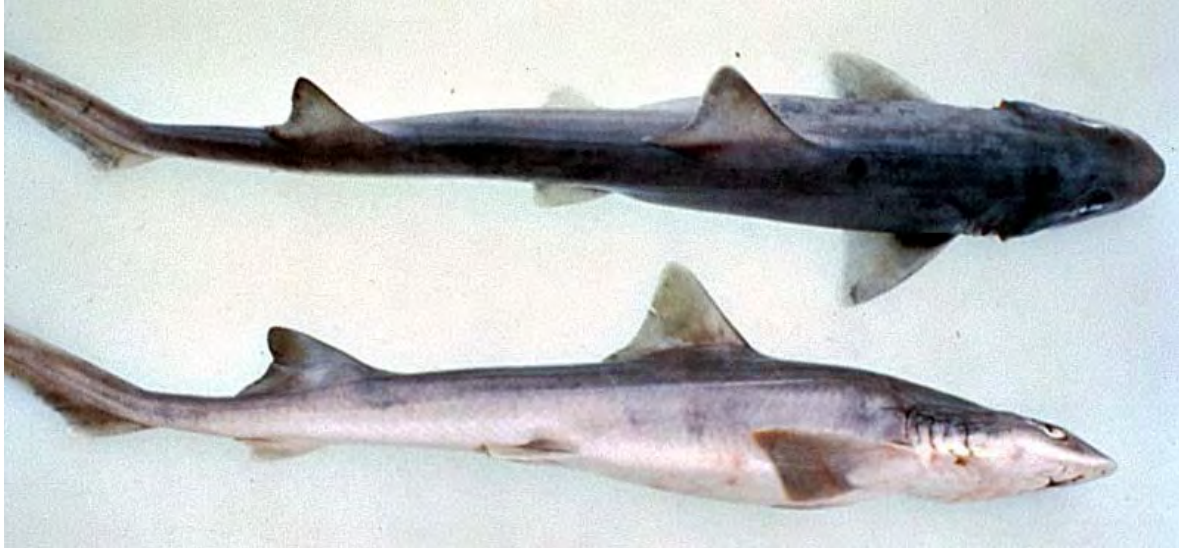
Spiny Dogfish *Squalus acanthias*

Diagnostic Features

- * Dorsal fin spines
- * Lack of anal fin



The spiny dogfish is a small, nondescript shark with a long, dorsoventrally flattened, pointed snout. The presence of dorsal fin spines combined with the lack of an anal fin is sufficient to distinguish this species from all other small sharks in our area. Dorsal coloration is gray or brown, usually overlaid with small white spots laterally, and ventral coloration is white. Length is to 1.6 meters. The spiny dogfish is common in temperate coastal waters in the northern hemisphere. This species supports substantial commercial fisheries in the eastern Atlantic and elsewhere (it's a source of English "fish and chips"), but in our fishery it's generally regarded as a worthless nuisance and seldom kept except for bait



Gray Smoothhound *Mustelus californicus*



Brown Smoothhound *Mustelus henlei*



Triakididae

The smoothhound sharks are small to medium-sized, fusiform sharks with horizontally elongated oval eyes with nictitating membranes. The first dorsal fin is located at about midbody, and the second dorsal is larger than the anal fin in all species except the Soupfin Shark. Smoothhounds lack precaudal pits.

Gray Smoothhound *Mustelus californicus*

Diagnostic Features

- * Monocuspid teeth and blunt
- * Smooth edges on dorsal fin



The gray smoothhound is a small slender shark with a flattened head and pointed snout. Its teeth are monocuspid and blunt. The origin of the first dorsal fin is located posterior to the pectoral fin insertion, and the rear margin of the first dorsal forms a solid, posteriorly inclined edge. The terminal lobe of the caudal fin is less than half the length of the entire upper caudal lobe. Dorsal coloration is gray or grayish brown, ventral coloration is white. Length is to 1.6 meters.

The gray smoothhound is an inshore species found from northern California to Mazatlan, Mexico, but is not common north of Point Conception, California. It usually inhabits depths of two fathoms or less, but it has been taken as deep as 25 fathoms. The gray smoothhound preys on crustaceans and small fishes, and forages alone or in schools with leopard sharks, *Triakis semifasciata*. Females are viviparous.

Brown Smoothhound *Mustelus henlei*

Diagnostic Features

- * Frayed edges on dorsal fin
- * Teeth are pointed and maxillary are tricuspid



The brown smoothhound closely resembles the preceding species, but can be distinguished by the following characters: Its teeth are pointed, the maxillary teeth are tricuspid, the first dorsal fin origin is located opposite, not posterior to, the pectoral fin insertion, and the rear margin of the first dorsal is frayed and angled more or less straight downward. Dorsal coloration is brown overlaid with an iridescent coppery sheen and ventral coloration is white. Maximum recorded length is 94 centimeters.

From San Francisco northward the brown smoothhound inhabits inshore waters, including shallow bays, but farther south it occurs offshore. This species feeds primarily on crustaceans, but also takes sessile invertebrates and small fishes. Females are viviparous.



Illustrations from *Pacific Coast Fishes*;
H. Hammann, and K. P. Smith 1983



Soupfin Shark *Galeorhinus galeus*



Horn Shark *Heterodontus francisci*

Soupin Shark *Galeorhinus galeus*

Diagnostic Features

- * Anal fin opposite of second dorsal fin, and nearly the same size
- * Snout is long and pointed
- * Terminal end of caudal fin large, nearly half the size of the upper lobe



The Soupin is a fusiform but robust shark with a long pointed snout. The labial groove is well-developed but doesn't extend to the front of the mouth. This species **can be distinguished from other smoothhounds by the second dorsal fin**, which is positioned opposite the anal fin and is about the same size as the latter, and by the very **large terminal caudal lobe**, which is half the length of the entire upper caudal lobe. Dorsal coloration is dark gray to bluish grading to white ventrally. Juveniles under about 60 centimeters are boldly marked with black and white spots on the dorsal, pectoral and caudal fin margins. Females grow larger than males and can reach lengths of two meters. Distribution is nearly worldwide in temperate waters excluding the western North Atlantic. Males apparently prefer deeper water while females occur closer inshore, the latter entering shallow bays and estuaries during the pupping season. Females are ovoviviparous and produce 6 - 52 pups per litter; larger females have larger litters

This species is not a scavenger, but an active, opportunistic predator of midwater and benthic teleost fishes and pelagic cephalopods. It's much sought-after as human food, and an important Soupin fishery has existed off California since before WWII. Although California stocks have since declined significantly below pre-WWII levels, the soupfin remains an important target species of the California gillnet fishery. There is no record of Soupin sharks attacking humans.

Heterodontidae

The bullhead sharks have blunt, angular heads and small, nearly terminal mouths with deep nasolabial grooves. They have an anal fin and spines at both dorsal fin origins.

Horn Shark *Heterodontus francisci*

Diagnostic Features

- * Spines on both dorsal fins
- * Head is broad and blunt, raised ridge above the eye
- * Distinctly spotted



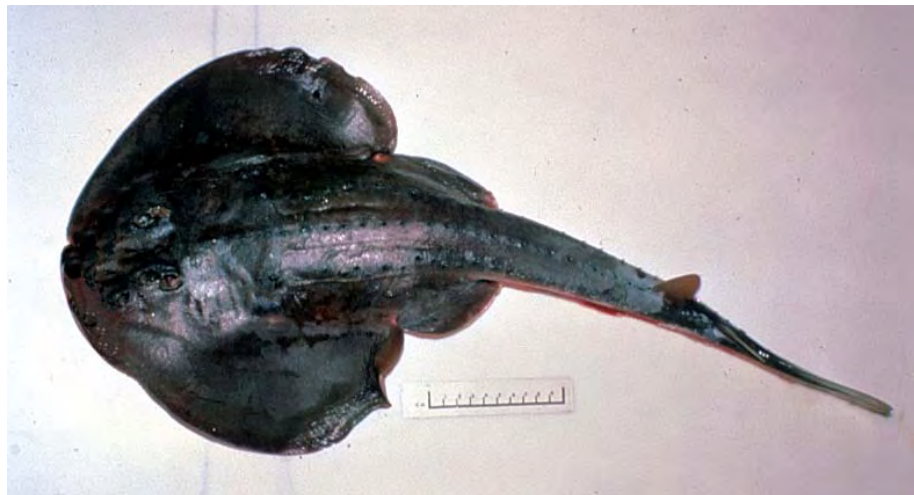
The horn shark is a small benthic shark with a prominent angular ridge above each eye. The pectoral and pelvic fins are broad and square-edged, and the lower caudal lobe is not well developed. Like the spiny dogfish, the horn shark possesses spines at the origins of both similarly sized dorsal fins, but unlike the spiny dogfish it also possesses an anal fin. Dorsal ground color is tan or brown overlaid with poorly defined lighter mottling and bold black spots. Ventral coloration is pale yellowish. Smaller specimens are sometimes also spotted with white. Maximum length is to 91 centimeters.

Horn sharks are a shallow water benthic species associated with rocky outcrops, kelp beds and sand bottoms. Horn sharks are solitary, nocturnal, ambush predators usually seen resting near cover on the bottom, or occasionally crawling along the bottom using their pectoral and pelvic fins. They prey on brachyuran crustaceans and benthic fishes. Females are oviparous.

Illustration from *Pacific Coast Fishes*;
H. Hammann, and K. P. Smith 1983



Pacific Angel Shark *Squatina californica*



Thornback *Platyrhinoidis triseriata*

Squatinaidae

The Angel sharks resemble rays in having a dorso-ventrally flattened bodies, dorsally located eyes, and spiracles. The gill slits are located laterally, unlike rays, and forward of the pectoral-fin origin. This family can be found world wide, has a single genus with 14 species. Most species live closed inshore but one can be found at a depth of 1300 m. The flesh of this shark is of high quality and is sometimes marketed under the name “monkfish”.

Pacific Angel Shark *Squatina californica*

Diagnostic Features

- * **Body flattened like a ray**
- * **Fins are not attached to the head**
- * **Front end is blunt and mouth is blunt with mouth located at the front end**



The Pacific Angle Shark can be identified by its large eyes, and its conspicuous spiracle, and a generally brown-gray coloration. It mostly resembles guitar fishes but front end is blunt and the mouth is up at the front of the body. The gill slits are in a notch, located at the rear of the head. The expanded pectoral fins are not attached to the head. Males and females mature at about 1 meter and the female is ovoviviparous.

Platyrrhinidae

The thornbacks get there name from the rows of large thorny spines along their back and sometimes their tail. They are similar to some round-snouted guitarfish found in other parts of the workd. There are 5 species but only one of these lives in our area.

Thornback *Platyrrhinoidis triseriata*

Diagnostic Features

- * **Three rows of enlarged hooked spines on back and tail**
- * **Disk is wider than it is long**

A skate like animal with a disk that is wider than it is long. Its coloration is brown above and white below. The front of the head is rounded and it has a long stout tail with two dorsal fins and one caudal fin. It can be recognized by the three rows of enlarged hooked spines on its back and tail. It lives over sand or mud up to depths of 50 meters and be grow up to 3 meters.





Pacific Electric Ray *Torpedo californica*



Pelagic Stingray *Dasyatis violacea*

Torpedinidae

The electric rays have round or oval discs that encompass the head region. The tail is short and stout, possesses two small dorsal fins and a well-developed, symmetrical caudal fin. Dorsal and ventral surfaces of the disc are smooth, lacking denticles, and a kidney-shaped electric organ is located dorsally at the base of each pectoral fin.

Pacific Electric Ray *Torpedo californica*

Diagnostic Features

- * **Round, flabby, pectoral disk**
- * **caudal fin rounded**



The pectoral disc of the Pacific electric ray is round, thick and flabby to the touch. The electric organs are visible through the skin as reticulated oval areas. Unlike other rays, the electric ray swims with sculling motions of the tail stock and caudal fin, not by undulating the pectoral disc. Dorsal coloration is slate gray, brownish gray, or bluish, with darker spotting in some specimens. Ventral coloration is white. Lengths is to 1.4 meters, with females growing the largest. Females are ovoviviparous.

The Pacific electric ray is found from off northern British Columbia south to central Baja California. Disjunct populations of this or a similar species are found off Japan, Chile and Peru. This ray frequents coastal waters at depths ranging from 1.7 to 150 fathoms, usually above sand substrates. It also is found in association with rock outcrops and kelp beds, where it preys primarily on fishes.

NOTE: As the electric discharge from large rays is theoretically capable of stopping a human heart, care should be taken when these rays are encountered.

Dasyatididae

In stingrays, the head is flat and not distinct from the disc, the latter usually being rhomboidal or rounded in shape. In all but one species in our area (**the Round Stingray**), the tail is long, whiplike and lacks a caudal fin. All species are armed with a long stinging barb located midway along the tail. There is no dorsal fin.

Pelagic Stingray *Dasyatis violacea*

Diagnostic Features

- * **Diamond shaped disk, rounded in front**
- * **Tail longer than disk with stinger halfway down**



The anterior margin of the pectoral disc is broadly rounded, and the lateral margins are straight-edged and angle inward toward the midline from the disc's anterior corners. The whiplike tail is longer than the disc, lacks a caudal fin and is armed with a very long barb approximately halfway along its length. Dorsal coloration is dark purplish and the ventral surface is purplish or gray. This species grows to 1.6 meters. The pelagic stingray is widespread in the Atlantic, Pacific and Mediterranean Oceans, but it is very rare north of southern Baja California. This is the only normally pelagic stingray. It occurs in both oceanic and coastal waters at depths between 10 and 13 fathoms. Females are ovoviviparous.



Round Stingray *Urolphus halleri*



Bat Ray *Myliobatis californica*

Round Stingray *Urolphus halleri*

Diagnostic Features

- * Caudal fin present and rounded
- * Circular pectoral disk



The disk is almost circular. The tail is shorter than the disk with a caudal fin. This is the only stingray that has a caudal fin. The rest are whip like. Its coloration is gray-brown above, sometimes with small, light spots. The ventral side is yellow. It lacks a dorsal fin and the venomous spine is long and can be found halfway down the tail. They can reach up to 22 inches long.

This is the most common stingray in California and large numbers may congregate off the beaches and can make these beaches unsafe for swimmers. They feed on shrimp, crabs, snails and clams.

Myliobatididae

This family is know as the eagle rays and is distinguished by its large head being elevated above the disk. These are found world wide in tropical and temperate shallow seas. Some are found in shallow bays and estuaries.

Bat Ray *Myliobatis californica*

Diagnostic Features

- * Raised massive head
- * Dorsal fin at the base of whip-like tail
- * Has stinger



The head is large and raided off of the disk. The dorsal fin is located at the base of the long whip-like tail, with a stinger just behind it. It has heavy jaws with platelike teeth. The color can range from dark brown, to blackish brown to blackish on the dorsal side, with the ventral side being white. Sometimes found singly or in groups and should be handled with care due to the stinger and its powerful crushing jaws. They feed on clams, oysters, snails, worms, shrimp and crabs. The Bat Ray's range is from Oregon to the Gulf of California.

Rajidae

The skates are the largest family of rays. In most species the dorsal surface of the disc is covered with bony denticles which give a sandpaper-like texture, as well as by discreet patches or rows of larger spines. There are also from one to three rows of larger spines on the dorsal surface of the tail stock. The latter is slender and possesses two dorsal fins near its tip and a vestigial caudal fin. Skates have pointed snouts and the disc is rhomboidal or diamond-shaped. At least three species are frequently caught in this fishery, but others can be expected to make rare appearances as well, so time spent learning their diagnostic characters would not be wasted. For terminology describing skate external anatomy, refer to fig. 11, p. 44 in your *Guide to the Coastal Marine Fishes of California*.



California Skate *Raja inorata*



Big Skate *Raja binoculata*

California Skate *Raja inorata*



Diagnostic Features

- * Moderately long pointed snout
- * Two dark rings or eyespots, not very prominent

This skate has a moderately long, pointed snout. The anterior edges of the pectoral disc are slightly concave and the pelvic fins are deeply notched. California skates lack supraorbital and scapular spines, but a short row of middorsal spines, and patches of spines on the dorsal surfaces of the pelvic fins are sometimes present. Adult males have malar hooks (larger spines located near the anterior margin of the disc, lateral to the eye), and alar hooks (rows of similar spines located near the lateral tips of the pectoral disc). The dorsal surface of the disc is otherwise smooth except for scattered small denticles, and the ventral surface of the disc lacks denticles. The dorsum of the tail possesses one median and two lateral rows of spines. Sensory pores on the ventral surface of the disc do not extend onto the pelvic fins. Dorsal coloration is olive brown, usually overlaid with darker mottling. A pair of indistinct dark ocelli are present posterior to the scapular area in some specimens. Ventral coloration is pale tan. Maximum length is to 76 centimeters.

California skates are found from southern Vancouver Island to central Baja California, usually in inshore waters. Although commercially important in trawl fisheries here and elsewhere, California skates are usually discarded by California set gillnet fishermen. They prey on benthic crustaceans and small fishes. All skates are oviparous and deposit their eggs in chitinous egg cases popularly known as "mermaids' purses".

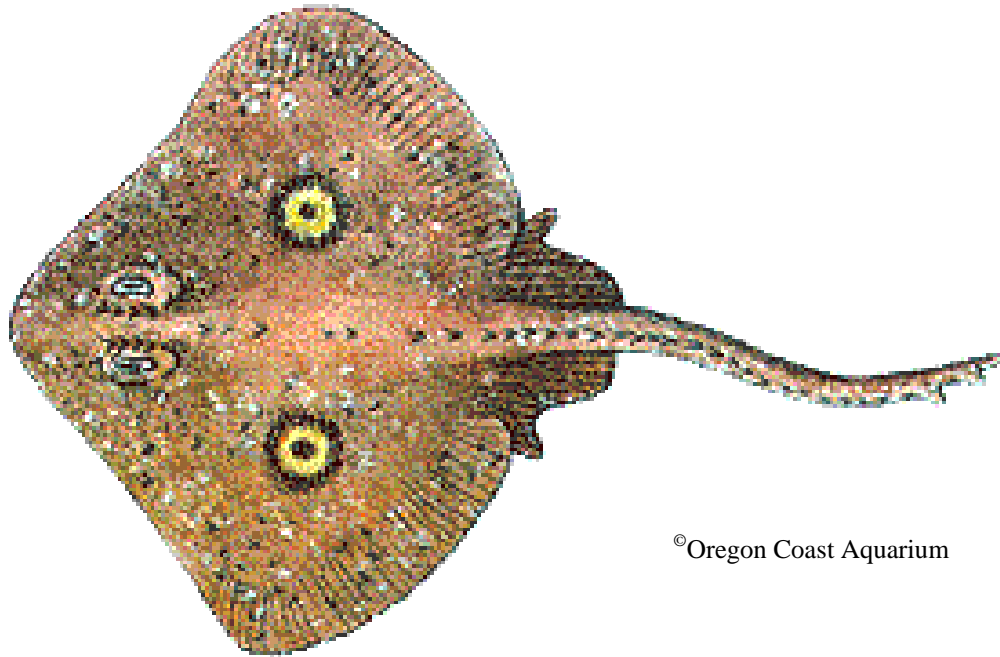
Big Skate *Raja binocularata*

Diagnostic Features

- * Weak notch in rear edge of each pelvic fin
- * Snout is long
- * Two prominent eyespots

This is the largest skate in our area, and can be distinguished from the California and starry skates by the following characters: supraorbital spines are present (but may be embedded in large specimens), the disc usually possesses only a single middorsal spine far anterior to and distinct from a short row of spines between the pelvic fins which extends onto the tail, the pelvic fins are not deeply notched, and the outer row of ventral sensory pores forms a distinct right angle lateral to the third and fourth gill slits. The dorsal surface of the disc lacks large spines (except for those described above and malar and alar hooks in adult males), and denticles are small, scattered, and few in number. The ventral surface is nearly smooth. The snout is very long, pointed and triangular. Dorsal ground color varies from light olive brown to nearly black overlaid with darker mottling and white spots. There are prominent ocelli posterior to the scapular area. Ventral coloration is whitish, sometimes blotched with darker pigment. Length is to 2.4 meters.

The big skate occurs from the Bering Sea south to San Quintin Bay, Baja California, but it's not common south of Point Conception. It ranges in depth from 1.7 to 60 fathoms, and although commercially important in other fisheries, is usually discarded by gillnet fishermen. It preys on benthic crustaceans and fishes.



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Starry Skate *Raja stellulata*

Starry Skate *Raja stellulata*

Diagnostic Features

- * Spiniest hardnosed skate (upper and lower surface covered with little spines)**
- * Pelvic fins are deeply notched**

This appears to be the second most commonly caught skate in the California set gillnet fishery. It can be distinguished from the preceding species by the following characters: the dorsal and ventral surfaces of the disc are covered with numerous denticles, supraorbital spines are present, three to six ventral sensory pores extend onto the pelvic arch at the base of the pelvic fin, the angular snout is short and bluntly pointed, and the anterior margins of the pectoral disc are straight or slightly convex.

Middorsal spines are present in either a continuous row or as discreet patches, but scapular spines are normally lacking. Malar and alar hooks are present in adult males. The pelvic fins are deeply notched. Dorsal ground color is dark grayish brown overlaid with darker spots and mottling. There are yellowish-centered ocelli posterior to the scapular area in most specimens, and ventral coloration is white. Length is to 76 centimeters. Starry skates are bottom-dwellers which feed primarily on benthic crustaceans.

Tunas





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Bullet Mackerel *Auxis rochei*



Pacific (Chub) Mackerel *Scomber japonicus*

TUNAS

Scombridae

The tunas are fast moving, schooling fish with streamlined, fusiform spindle-shaped bodies in which the caudal peduncle is very narrow and possesses one to three keels. The hypural plate is covered by caudal rays. There are two dorsal fins, and the anteriormost spines of the first (spinous) dorsal are much longer than the remaining spines, forming an anterior pointed "peak". Five to ten finlets follow the second (rayed) dorsal and anal fins. Some species are fully scaled, but in others scales are confined to an anterior corselet with posterior projections extending along the lateral line.

Bullet Mackerel *Auxis rochei*

Diagnostic Features

- * **Wide gap between dorsal fin**
- * **Scales do not cover last half of the body**



Bullet mackerel are distinguished by a wide gap between the dorsal fins. There are usually eight dorsal and seven anal finlets. A strong keel is followed by two smaller keels on the caudal peduncle (3 keels in all). A corselet of scales is prominent, extending far back along the lateral line. Fifteen or more diagonal bars are present on the back. The head is deep purple to black and the back is bluish. Ventrally they are silvery to white. Bullet mackerel attain a length of 50 cm.

Bullet mackerel are found worldwide in warm seas. They are an epipelagic fish. The adults are often found inshore.

Pacific (Chub) Mackerel *Scomber japonicus*

Diagnostic Features

- * **Wide gap between dorsal fin**
- * **Scales cover all the body**
- * **Wavy oblique bars on back**



The Pacific mackerel is recognized by widely separated dorsal fins and a fully scaled body. There are usually 5 dorsal and 5 anal finlets. Only two small keels are present on the caudal peduncle (versus three keels on Bullet Mackerels). About 30 irregular nearly vertical bars are located on the back. Coloration is greenish or bluish dorsally and shading to silvery ventrally. Pacific mackerel attain a length up to 64 cm and 3 kg.

Pacific mackerel are found worldwide in temperate and subtropical seas. They are pelagic and usually found inshore in schools.



Pacific Sierra mackerel *Scomberomorus sierra*



Pacific Bonito *Sarda chiliensis*



Skipjack *Katuswonus pelamis*

Pacific Sierra mackerel *Scomberomorus sierra*

Diagnostic Features

- * Rows of golden/yellow spots on the side of body



The Spanish Mackerel, like the previous two, has an elongated, fusiform and strongly compressed body. Its coloration is bluish-green or dark blue dorsally with a silvery underside. It can be distinguished from the previous two mackerels by the yellowish-brown or golden spots, which are evenly distributed laterally. There are three rows of spots below the lateral line and one row of spots above. The lateral line curves down towards the caudal peduncle. The first three rows of the spiny dorsal fin are black while the rest of the dorsal fins are white. The dorsal fin is far back on the body. The pelvic fins are also white. The snout is shorter than the rest of the head.

Pacific Bonito *Sarda chiliensis*

Diagnostic Features

- * Lightly oblique stripes on the back



The dorsal fins on Pacific bonito are not widely separated. While the body is fully scaled, the scales in the corselet are larger. There are seven to nine dorsal finlets and six to seven anal finlets. Pacific bonito are characterized by slightly oblique stripes on the back. Coloration is greenish blue dorsally, shading to silvery ventrally. They attain a length of one meter and weigh up to 5.4 kg.

Pacific bonito range from Alaska to southern Baja California and are found off Peru and Chile. They are found usually near shore, in schools. Their diet includes fish and squid.

Skipjack *Katuswonus pelamis*

Diagnostic Features

- * Four to six stripes on the lower side and belly



Skipjack are best recognized by four to six stripes on the lower side and belly. There are no stripes on the back. Scales are present only on the front of the body. There are seven to nine dorsal finlets and seven to eight anal finlets. Coloration is bluish to violet above, shading to silvery below. While adults can reach a length of one meter, skipjack are usually a small tuna attaining a size less than two feet and a weight of 23 kg.

Skipjack are found world wide in all temperate and tropical seas where they form large schools both in-shore and offshore.



Albacore *Thunnus alalunga*



Yellowfin Tuna *Thunnus albacares*



Bluefin Tuna *Thunnus thynnus*

Albacore *Thunnus alalunga*

Diagnostic Features

- * **Extremely long pectoral fin**

The pectoral fin on albacore is extremely long, extending well past the anal fin origin. In specimens under 1 foot the pectoral fin does not extend as far. There are usually seven to nine dorsal finlets and seven to eight anal finlets. The first dorsal fin is deep yellow; the second dorsal fin and anal fins are light yellow. Anal finlets are dark and the caudal fin is white edged. Coloration is dark blue above, shading to silvery white ventrally. The liver is striated on the ventral surface. Albacore reach lengths of 1.4 m and weigh up to 43 kg.

Albacore are found worldwide in temperate seas. They are rare in tropical seas. Seldom are they seen close to shore, as they prefer open seas and clear water. They migrate across the Pacific in one year and probably spawn somewhere in the mid-Pacific. The albacore is fished commercially around the world.



Yellowfin Tuna *Thunnus albacares*

Diagnostic Features

- * **Fins are yellow and the finlets are even a brighter yellow**

Yellowfin tuna are best recognized by yellow tinged fins. Finlets are bright yellow with black edges. The pectoral fin is long but does not extend past the anal fin origin. The second dorsal and anal fins are often greatly elongate in large adults. There are no liver striations. In some specimens there is a horizontal yellow stripe. Coloration is dark blue above and gray below. A length of 1.9 m and weight of 204 kg is possible.

Yellowfin tuna are found in the temperate and tropical waters of the Pacific, Atlantic and Indian Oceans. They form schools in the open seas and sustain commercial fisheries from many nations.



Bluefin Tuna *Thunnus thynnus*

Diagnostic Features

- * **Large tuna with short pectoral fin**
- * **Back is dark bluish to yellowish**

Bluefin tuna are the only large tuna with a short pectoral fin, which ends below the first dorsal fin. The first dorsal fin is bluish or yellow and the second dorsal fin is reddish brown. Finlets are dusky yellow and black-edged. Coloration is dark blue to black dorsally and silvery white ventrally. There are usually white spots and lines on the belly. The ventral surface of the liver is striated. A size of 1.9 m and 135 kg can be attained. Most in our area weigh 5-20 kg.

Bluefin tuna range from Alaska to southern Baja California, but are most common south of Los Angeles. They are found in open seas, both inshore and offshore.





Bigeye Tuna *Thunnus obesus*

Bigeye Tuna *Thunnus obesus*

Diagnostic Features

- * Pectoral fin extends past second dorsal
- * Eye is very large



The pectoral fin of bigeye tuna extends past the second dorsal fin origin. There are 8-10 dorsal finlets and 7-10 anal finlets. The first dorsal fin is deep yellow; the second dorsal fin and anal fins are light yellow. The finlets are yellow and black-edged. There is often a blue stripe on the side. Coloration is dark metallic blue dorsally and whitish ventrally. The liver is striated ventrally. Bigeye tuna reach a length of 2.4 m and a weight of 197 kg, but most are usually less than 1.8 m.

Bigeye tuna are found worldwide in warmer seas, ranging from central Washington to Peru and the Galapagos Islands.

Other Fishes





Northern Anchovy *Engraulis mordax*



Pacific Sardine *Sardinops sagax*

OTHER FISHES

INTRODUCTION

The remaining species captured by the fisheries observed by the SWR are an assortment of common, rare and unusual species. There are more fish that are not listed below, which are caught, but only on rare instances. For these fish the use of the field guide is crucial for identification.

Engraulidae

Northern Anchovy *Engraulis mordax*

Diagnostic Features

- * Long snout overhanging large mouth
- * No adipose fin



The anchovies are small, silvery, compressed fish that have a long snout overhanging a large mouth. They have soft rays and are recognized by the absence of the adipose fin, also seen in the sardines. They are small in size and can reach up to 3 to 9 inches in length (depending on the species). The lateral line is absent and the pelvic fin ends before the front of the dorsal fin.

These are considered bait fish and are caught for use as bait in other fisheries. They are also consumed by humans. They can be found in near shore warmer waters and usually in schools. There are three species of anchovies that can be found in the Pacific Ocean. The most common of these is the Northern Anchovy and this will represent the archetypal anchovy for us. Although all three may be found, their similarities are strong enough to use one as an example. This will be the Northern Anchovy.



Clupeidae



This family is similar to the anchovy family in that it has no adipose fin, no lateral line and it is a laterally compressed silvery fish. They also have one dorsal fin with the pelvic fin in line with the dorsal fin. This family includes the sardines and the herrings. We will focus on the sardine, which is a targeted species in the coastal pelagic purse seine fishery.

Pacific Sardine *Sardinops sagax*

Diagnostic Features

- * Jaw is slightly longer than snout
- * Dark spots, laterally
- * No adipose fin or lateral line



This species can be characterized by the dark spots that run laterally on the body. The jaw is slightly longer than the snout and the gills cover is striated. There is no lateral line or adipose fin. The body is bluish to dark green above with a white/silvery belly. This species is found in the eastern Pacific from Alaska to Baja, CA. They form large schools and are often associated with herring at hake. They can reach up to 18 inches in length.



Opah *Lampris guttatus*



Louvar *Luvarus imperialis*

Lampridae

Opah *Lampris guttatus*

Diagnostic Features

- * Laterally compressed
- * Protrusible terminal mouth
- * Pectoral fins angle upward



The opah family consists of a single bizarre species. Adults are very large, oval shaped, strongly laterally compressed and covered with minute cycloid scales. The terminal mouth is protrusible. The ground color is silvery blue overlaid with an iridescent scarlet wash (especially on the head and mouth) and prominent white spots. All fins are scarlet; the eyes are yellow. The pectoral fins are angled upward. The dorsal fin is long and high in front. Opahs reach 1.4 m and 73 kg. They are found worldwide. Their diet includes a variety of fish, squid and crabs.

Luvaridae

Louvar *Luvarus imperialis*

Diagnostic Features

- * Head blunt, with tiny mouth
- * Single dorsal fin
- * Red Fins



This family consists of a single tuna like species, the Louvar. It is distinguished by a blunt, rounded head with a very small, terminal mouth. The eyes are set low on the head. There is a single long low spinous dorsal fin opposite a similar anal fin, the pelvic fin is thoracic but extremely small, and the caudal fin is symmetrical and lunate. All fins are red. The body is pinkish with dark spots on the side. There is a strong keel on the caudal peduncle. A maximum length of 1.9 m and weight of 138 kg are possible. This oceanic fish is found near the surface worldwide. Louvars feed mainly on jellyfish and other gelatinous planktonic animals.

Carangidae

Jacks and their relatives comprise a highly diverse family of pelagic fishes varying from fusi-form and spindle-shaped to deep-bodied and laterally compressed. In most species the lateral line is arched anteriorly and straight behind, the posterior portion often covered with enlarged pointed scutes. The two anterior most anal spines are detached (i.e. free of webbing), and this is the most diagnostic character. Many Jacks superficially resemble Scombrids, but the former usually lack, or have no more than one or two finlets.



Yellowtail *Seriola lalandei*



Jack Mackerel *Trachurus symmetricus*



Pacific Hake *Merluccius productus*

Yellowtail *Seriola lalandei*

Diagnostic Features

- * Low spinous dorsal fin
- * Deeply forked caudal fin
- * Yellowish fins and side stripe



The caudal fin is deeply forked with a narrow caudal peduncle. The lateral line is arched in front and straight behind. The dorsal fin is spinous and low. There are no scutes on the lateral line. Coloration is silver with yellowish fins and a yellow to dusky side stripe. They reach 1.5 m and 36 kg. Yellowtail are worldwide in subtropical waters. They are coastal, found off kelp beds and islands. Their diet includes fish, squid, pelagic crabs and other invertebrates.

Jack Mackerel *Trachurus symmetricus*

Diagnostic Features

- * Pointed scutes along the entire length of lateral line



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This is a small, cigar-shaped, fusiform fish, which is easily recognized by the presence of pointed scutes along the entire length of the lateral line. The spinous dorsal fin is separate from and slightly higher than the soft-rayed dorsal, and the latter is anteriorly elevated, long, and extends to the caudal peduncle. The soft anal fin origin is nearly opposite that of the soft dorsal. Dorsal coloration is dark metallic blue or green grading to silver ventrally. There is a well-defined dark spot on the rear margin of the opercle, and the caudal fin may have a reddish or yellowish wash.

Merlucciidae

Hake are elongate, fusiform, dark silvery fishes covered with very small cycloid scales. They are easily distinguished by the presence of a V-shaped ridge on the top of the head. The mouth is large with a slightly projecting mandible and strong, pointed teeth. There are two separate dorsal fins, and the second dorsal and anal fins are deeply notched. All fins lack spinous rays.

Pacific Hake *Merluccius productus*

Diagnostic Features

- * No chin barbels
- * Second dorsal fin and anal fin deeply notched



Pacific hake are silvery with black speckles on back. There are no chin barbels. The body is soft and has a square cut caudal fin. They reach 91 cm. Pacific hake range from Asia to Alaska to s. Baja. They are common at moderate depths.



Ocean Sunfish *Mola mola*



Slender Mola *Ranzania laevis*



Pacific Pomfret *Brama japonica*

Molidae

The molas are strange, often very large, pelagic fishes not likely to be mistaken for anything else. The caudal fin is reduced to a narrow, scalloped-edged leathery flap which makes these fishes look as if they consist of nothing but head. The dorsal and anal fins are tall, short-based and set anterior and adjacent to the caudal, and pelvic fins are lacking. The gill slit is minute and located just anterior to the pectoral fin insertion. The mouth is small and terminal; the teeth form beaklike plates. Molas eat jellyfish but are known to eat other fish and algae.

Ocean Sunfish *Mola mola*

Diagnostic Features

- * Body nearly oval
- * Tiny mouth
- * Dorsal fin far back, opposite anal fin

The body is nearly oval. The dorsal fin is opposite the anal fin. Coloration is gray to silvery. Old adults reach 3 m and 1361 kg. Ocean sunfish are worldwide in tropical and temperate seas.



Slender Mola *Ranzania laevis*

Diagnostic Features

- * Body is two times long as it is deep
- * Similar looking to the ocean sunfish

Slender molas are two times as long as deep. Coloration is dusky on back and silvery on the sides with white streaks below the eyes. They reach 46 cm. Slender molas are found in the tropical Pacific.



Bramidae

Pacific Pomfret *Brama japonica*

Diagnostic Features

- * Nearly oval and blunt headed
- * Large forked caudal fin

The body is nearly oval, blunt headed and compressed. The caudal fin is large and forked. The fronts of the dorsal and anal fins are high in adults and rounded in young. Dorsal and anal fins are black-edged. Coloration is silvery black with pectoral, pelvic and caudal fins paler at the edges. Length is to 61 cm.

Pacific pomfrets are found from Japan to the Bering Sea to Peru. They are oceanic and found near the surface. They feed on squid and fish.





Spotted Sand Bass *Paralabrax maculofasciatus*



Barred Sand Bass *Paralabrax nebulifer*



Kelp Bass *Paralabrax clathratus*

Serranidae

Sea basses are moderately large, robustly fusiform fishes best characterized by the presence of a serrate opercular margin with two or three flattened spines, and a large, upturned mouth with a protruding mandible. The rear margin of the maxillary is exposed, not obscured by the premaxillary, when the mouth is closed. The gill opercle is scale-covered, and most species have ctenoid (a few have cycloid) body scales. The dorsal fin is continuous and spinous and rayed portions may be differentiated by a shallow notch. The anal fin is short, narrow-based, and consists of two or three anterior spines followed by seven to 14 (usually eight to nine) soft rays. The pelvic fins are thoracic and consist of one spine and five soft rays. In most species the caudal fin is unforked.

Spotted Sand Bass *Paralabrax maculofasciatus*

Diagnostic Features

- * First two spines in dorsal fin short, third spine long (same in all sand bass')
- * Broad faint bars on back and side



This species has three opercular spines, the spinous dorsal fin consists of 10 spines and the prominent third dorsal spine is twice as long as the second spine. The anal fin has three anterior spines and its rear margin is rounded. Dorsal ground color is gray to olive brown overlaid with profuse dark spots on the body and fins, and poorly defined dark bars extending vertically from the dorsum to the sides. Ventral coloration is pale gray. The spotted sand bass attains lengths up to 56 centimeters.

The spotted sand bass occurs over sand and mud substrates or near rocky outcrops and eelgrass beds. It preys on fishes and crustaceans and is a popular sport fish which cannot be taken commercially.

Barred Sand Bass *Paralabrax nebulifer*

Diagnostic Features

- * First two spines in dorsal fin short, third spine long (same in all sand bass')
- * Gray to greenish brown above, faint to dark bars on blotches on side



The barred sand bass is very similar structurally to the preceding species but has a somewhat more robust head. There are three opercular spines, 10 dorsal and three anal fin spines, and the third dorsal spine is twice as long as the second. Dorsal ground color ranges from gray to greenish brown overlaid with poorly-defined broad vertical bars laterally. Ventral coloration is whitish. This species reaches 65 centimeters in length.

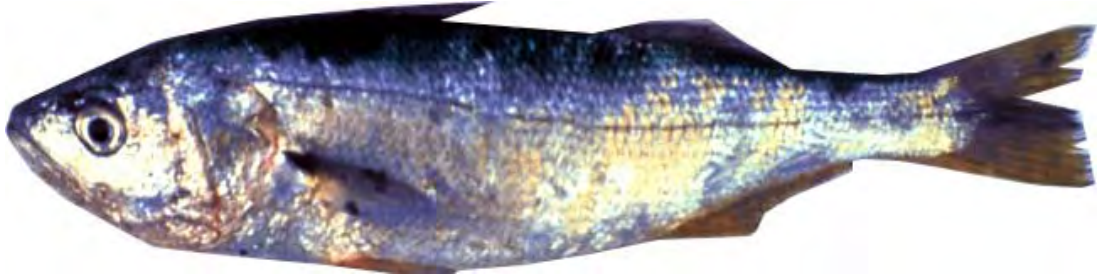
The barred sand bass is found in shallow water over sandy substrate near or among rocks. It also supports a popular sport fishery and can't be taken commercially.

Kelp Bass *Paralabrax clathratus*

Diagnostic Features

- * First two spines in dorsal fin short, third spine long (same in all sand bass')
- * Fins have a yellowish tinge, Olive or brown above, cream below, pale blotches on back





Queenfish *Seriphus politus*



White Croaker *Genyonemus lineatus*

(Kelp Bass cont.)

The kelp bass can be differentiated from the preceding two species by its third dorsal spine, which is not twice as long as the second and does not extend prominently above the remaining (9-10) dorsal fin spines. There are three opercular spines, three anal fin spines and the rear margin of the anal fin is rounded. Dorsal coloration is olive brown with pale angular blotches on the back. Ventral coloration is pale yellowish-white, and the fins are yellowish. This species superficially resembles the olive rockfish *Sebastes ser-ranoides*, but lacks a suborbital stay and preopercular spines, and the olive rockfish has 12-13 dorsal spines. The kelp bass is the largest member of the genus in our area and attains lengths up to 72 centimeters.

This species is usually found in or near kelp beds at depths of 25 fathoms or less, with larger specimens occurring deepest in the water column. The kelp bass is an important sport species and can't be taken commercially.

Sciaenidae

The croakers are generally fusiform fishes with subterminal mouths, and some species possess short chin barbels. A few species in our area have oblique mouths with protruding mandibles. Body scales may be cycloid or ctenoid. Diagnostic characters of the family are the presence of a lateral line which extends to the rear margin of the caudal fin, and the presence of one to three (usually two) strong anal fin spines, which are serrated in some species. The caudal fin may be straight-edged, rounded or concave but is never deeply forked. The dorsal fin is long and deeply notched, and in many species the spinous and soft-rayed dorsals are completely separate. Dorsal fin count ranges from seven to 16 (spines), and 18-30 (rays). Croakers are capable of producing sound through muscular contraction of the swim bladder

Different members of the croaker family can be distinguished by their color pattern and the presence or absence of a chin barbell. Most live in shallow waters, but some can be found in deeper water. The most common members caught in the SWR fishery are the white seabass, the queenfish and the white croaker.

Queenfish *Seriphus politus*

Diagnostic Features

- * Wide gap between first dorsal and second dorsal fin
- * Snout does not project beyond the mouth
- * No chin barbell



White Croaker *Genyonemus lineatus*

Diagnostic Features

- * Snout projects slightly beyond the mouth
- * Usually a small black spot at the top of pectoral fin
- * No single large barbel





Yellowfin Croaker *Ubrina roncador*



White Seabass *Atractoscion nobilis*



California Scorpionfish *Scorpaena guttata*

Yellowfin Croaker *Ubrina roncador*

Diagnostic Features

- * Short chin barbel
- * Two strong anal fin spines
- * Fins mostly yellow



White Seabass *Atractoscion nobilis*

Diagnostic Features

- * Lower jaw projects slighter beyond upper jaw
- * Juveniles have stripes which fade when they are adults
- * Black spot at base of pectoral fin



Scorpaenidae

Scorpaenids are one of the largest families of fishes in the north Pacific. 65 species occur in our area, and all but four are rockfish (genus *Sebastes*). Scorpaenids are characterized by the presence of a suborbital stay with 5 strong preopercular spines. Their heads are robust and most species possess cranial spines. The mouth is large with a projecting mandible, and the posterior edge of the maxillary is not obscured by the premaxilla when the mouth is closed. The body is covered with ctenoid scales. The dorsal fin is continuous but deeply notched in most species, with 12 - 15 spinous rays and 9 - 16 soft rays. The anal fin is narrow based and has three spines and five to nine soft rays. In both the dorsal and anal fins the last soft ray divides in two above the fin insertions, and the pelvic fins are thoracic with one spine and five soft rays. The cranial and fin spines in most species are venomous and can inflict painful wounds, but scorpaenids are generally good eating and many species support active commercial and sport fisheries.

California Scorpionfish *Scorpaena guttata*

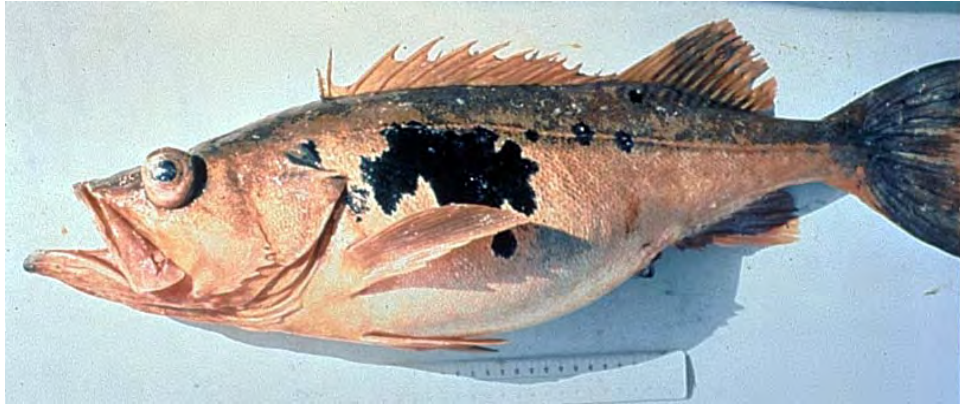
Diagnostic Features

- * Spines under eye extend to rear cheek
- * Maxillary extends to rear margin of orbit, large mouth
- * Dorsal color red or brown mottled with white and has small dark spots



This is a small, robust fish with a large head and mouth and a foreshortened body. The maxillary usually extends to the rear margin of the orbit. There are numerous strong cranial spines, including a row of lacrimal spines that extends onto the gill opercle, and the pectoral fin is large and fanlike. Dorsal ground color is red or brown mottled with white and overlaid with numerous small dark spots. Length is to 43 centimeters.

Specimens from deep water are more red in color than shallow water specimens. This is a minor target species of the California set gill net fishery and is referred to by most fishermen as "sculpin". It is the most venomous scorpaenid in this fishery, and should be treated with caution. First aid treatment for scorpionfish sting is the same as that described for the round stingray.



Bocaccio *Sebastes paucispinis*



Brown Rockfish *Sebastes auriculatus*



Olive Rockfish *Sebastes serranoides*

Bocaccio *Sebastes paucispinis*

Diagnostic Features

- * **Large mouth**
- * **Cranial spines are weak**
- * **Dorsal coloration red or brown fading to pinkish silver laterally and ventrally**



This is a large, fusiform rockfish with a somewhat laterally compressed body and a very large mouth. The maxillary extends to or past the posterior margin of the orbit and the very prominent mandible terminates in a projecting (symphyseal) knob. The lateral aspect of the head is concave. Unlike most rockfish, cranial spines are weak or absent. Dorsal coloration is red or brown grading to pinkish silver laterally and ventrally. Occasional specimens are marked with large, irregularly shaped black patches. Maximum length is to 91 centimeters. It supports both commercial and sport fisheries in California.

Brown Rockfish *Sebastes auriculatus*

Diagnostic Features

- * **Six pairs of strong head spines**
- * **Mandible is covered with few or no scales**
- * **Dark blotch at posterior edge of gill opercle**



The brown rockfish has a shorter body and proportionately larger head than the preceding species. The lateral aspect of the head is convex, the interorbital space is flat. Six pairs of strong head spines, and 13 dorsal fin spines, are present. The mandible is covered with few or no scales and is smooth to the touch. The rear margins of the anal and caudal fins are rounded. Dorsal coloration is light brown overlaid with darker mottling, grading to brownish pink ventrally; the base of the pectoral fin is also pinkish. The presence of a prominent dark blotch at the posterior edge of the gill opercle is diagnostic. Maximum length is to 55 centimeters.

Olive Rockfish *Sebastes serranoides*

Diagnostic Features

- * **Large mouth and strong projecting mandible**
- * **First dorsal fin is prominent**
- * **Mandible is scale covered**
- * **No lacrimal spines and cranial spines are virtually absent**



This is a moderately large, basslike rockfish with a large mouth and strongly projecting mandible. The latter is scale-covered, and the maxillary extends posteriorly past the center of the orbit. There are no lacrimal spines, and other cranial spines are virtually absent. The first dorsal fin is prominent and has 12-13 spines and the second dorsal has 16 rays and a squarish rear margin. There are usually nine anal soft rays. Dorsal ground color is dark olive, grading to yellowish white ventrally, and there are several paler blotches near the base of the dorsal fin. Fin membranes are olive with a yellowish wash, and are not noticeably spotted. Length is to 61 centimeters.



Vermilion Rockfish *Sebastes miniatus*



Canary Rockfish *Sebastes pinniger*

Vermilion Rockfish *Sebastes miniatus*

Diagnostic Features

- * Robust head and mandible is rough to the touch
- * Six pair of strong cranial spines
- * Indistinct grayish mottling on the dorsal and lateral surfaces



This is one of the larger species of rockfish, and attains lengths up to 76 centimeters. It is robust with a proportionately large head and mouth, and the projecting mandible is rough to the touch. The interorbital space is strongly convex in adults, but is nearly flat in specimens under 23 centimeters. There are six pairs of strong cranial spines and 13 to 15 dorsal fin spines. Coronal spines are absent. Anal fin ray count ranges from six to eight, but most specimens have seven. The posterior margin of the anal fin is rounded and is anteriorly slanted in adults. Dorsal coloration is reddish grading to orange or pale red ventrally, and three bright orange stripes radiate from the eye. There is often indistinct grayish mottling on the dorsal and lateral surfaces, which is especially pronounced in small specimens. All fins are deep red with dark margins, the dark pigment also most apparent in small specimens.

Canary Rockfish *Sebastes pinniger*

Diagnostic Features

- * Cranial spines are weak, coronal spines are absent
- * Mandible is smooth to the touch
- * Lateral line is gray and the fins are bright orange



The canary rockfish is difficult to distinguish from the preceding species, but the following characters can be used: The cranial spines are weak, with both nuchal and coronal spines absent. The mandible is smooth to the touch, in specimens 35 cm long or smaller there is a distinct black blotch located between about the seventh and tenth dorsal fin spines. The lateral line is bordered by a poorly-defined pale gray area, and the anal fin ray count is seven, never six or eight. The rear margin of the anal fin is straight-edged and anteriorly slanted. Dorsal coloration is orange over an indistinct gray field (the gray is most visible along the lateral line), and the fins are bright orange. Note that the gray zone bordering the lateral line may be lacking in very large specimens. Length is to 76 centimeters.

NOTE: Many rockfish are notoriously difficult to identify. It's possible to encounter at least 45 rockfish species in California, especially in the set net fishery, so the ability to identify on sight at least the most common rockfish is essential. Refer to the glossary, pp. 6 and 7, Fig. 1 on p. 7, and Fig. 12 on p. 90 of Guide to the Coastal Marine Fishes of California for descriptions of external anatomical terminology. Any opportunity to key out rockfish should be taken.

Bothidae

The left-eyed flounders are one of six families of laterally compressed bottom fishes in which the eyes and dorsal pigment are restricted to one side of the body, and which rest with the other unpigmented side in contact with the substrate. Larval flatfish swim (or drift) upright, and eye configuration is like that of most fishes, one eye on each side of the head. As the larva grows, however, one eye migrates to the other side of the head, the pectoral fin on the unpigmented "blind" side often atrophies, and the young flatfish begins to swim on its side. In some species, the mouth reforms asymmetrically, so



California Halibut *Paralichthys californicus*



Pacific Sanddab *Citharichthys sordidus*

that the opening is turned more or less parallel to the fish's dorsal-ventral axis, in others the teeth are restricted to the unpigmented side of the jaw, and in bothids one of the pelvic fins migrates to the mid-ventral ridge (toward the pigmented side). In most bothids, the left side of the body is the eyed, pigmented side, but this is subject to considerable variation in some species. In this family the lateral line is single, lacking a dorsal branch, but in some species it forks anteriorly behind the "uppermost" eye. All flatfish families in our area lack spinous fin rays, and many species are capable of rapid changes of color.

California Halibut *Paralichthys californicus*

Diagnostic Features

- * **Mouth is large**
- * **Single lateral line is arched anteriorly above the pectoral fin**
- * **Double truncated caudal fin**



In this large flatfish, eyes and pigment can be found on either side of the body with about equal frequency. The mouth is proportionately large, with the maxillary extending past the rear margin of the orbit, and is armed with numerous needle-sharp teeth. The single lateral line is arched anteriorly above the pectoral fin, the dorsal fin origin is at or immediately posterior to the upper eye, and there are 66 to 76 dorsal rays. The caudal fin is "double-truncate", i.e. slightly concave with a median convex or pointed lobe. Ground color of the eyed side is dark olive brown or gray, often overlaid with indistinct dark and light mottling, and the blind side is white. California halibut attain lengths up to 1.5 meters and weights up to 33 kilograms

This species occurs from northern Washington to southern Baja California, from shallow bays and estuaries to depths of 100 fathoms, and is usually associated with sandy or muddy substrates. It feeds on fishes and cephalopods, and will often swim high up into the water column when foraging for prey. The California halibut is the primary target species of the California set gillnet fishery, and is also a highly sought-after sport species. Handle this species with caution; it will bite without hesitation when molested and can inflict painful puncture wounds.

Pacific Sanddab *Citharichthys sordidus*

Diagnostic Features

- * **Concave bony ridge between eyes**
- * **Lateral line is straight**
- * **Left pectoral fin is shorter than head length**



The Pacific sanddab can be identified by the following characters: eyes and pigment are on the left side of the body, there is a concave bony ridge between the eyes, the diameter of the lower eye is greater than snout length, no more than two (if any) dorsal fin rays extend onto the blind side of the head, and the pectoral fin is shorter than head length, i.e. when depressed forward the pelvic fin tip extends only to about mid-orbit. The lateral line is straight, the pelvic fins are a-symmetrical, with the upper fin positioned on the mid-ventral ridge, the dorsal fin origin is at the eyes and the anal fin origin is opposite the pelvic fin base. Body scales in this species are relatively larger and more distinct than in most other flatfish in our area. Left side coloration is light brown overlaid with darker mottling, and with vague, dull yellow or orange spots in some specimens. Right side coloration is pale tan to white. Maximum size is 41 cm.



Bigmouth Sole *Hippoglossina stomata*



Petrale Sole *Eopsetta jordanii*

Bigmouth Sole *Hippoglossina stomata*

Diagnostic Features

- * **Large mouth**
- * **Shorter weaker teeth (unlike the halibut)**
- * **More laterally compressed**



This species superficially resembles the California halibut due to its large mouth; the maxillary is about half as long as the head, but only extends to, not past, the rear margin of the orbit. Also, the bigmouth sole is much more laterally compressed than the halibut, has shorter, weaker teeth, and is almost never right-eyed. The rear margin of the caudal fin in the former is rounded, not concave or truncate, and the maximum dorsal fin ray count is 70. The lateral line is arched anteriorly over the pectoral fin, and the latter is shorter than the head. The left side is brown overlaid with darker blotching and poorly-defined bluish specks, and the blind side is white. The bigmouth sole attains lengths up to 40 centimeters and occupies habitat similar to that of the California halibut.

Pleuronectidae

The right-eyed flounders are adapted to colder water than the previous family, and are therefore better represented in our area. Any flatfish in which the lateral line has a distinct dorsal branch extending along the base of the dorsal fin belongs to this family, but note that all pleuronectids don't display this character, and that even in species which typically do, the dorsal branch is often not prominent, and must be carefully looked for to be seen. The pelvic fins are positioned symmetrically, one on each side of the midventral ridge. The eyes and pigment are normally restricted to the right side of the body, but some species exhibit considerable variation in this character. Identification is further complicated in that possibly four species of pleuronectids may hybridize.

Petrale Sole *Eopsetta jordani*

Diagnostic Features

- * **Presence of two rows of maxillary teeth on both sides of jaw**
- * **Lateral line is straight with no dorsal branch**
- * **Caudal fin is double truncated**



The petrale sole is a deep-bodied, right-eyed flatfish with a fairly large mouth, the maxillary extending to about the middle of the orbit. The presence of two rows of maxillary teeth on both the pigmented and unpigmented sides of the jaw is diagnostic. Minimum dorsal fin ray count is 82, the dorsal fin origin is at the eye with no more than two dorsal rays extending onto the blind side, and the upper eye is not visible from the blind side. Total length is less than three times body depth, the lateral line is straight and lacks a dorsal branch, and the caudal fin is double-truncate. The right side is uniform brown in color, blind side coloration is white, occasionally with a pinkish wash.

The petrale sole attains lengths up to 70 centimeters and is a highly sought after food fish. It's primarily associated with sand substrates at depths between ten and 250 fathoms.



Diamond Turbot *Hypsopsetta guttulata*

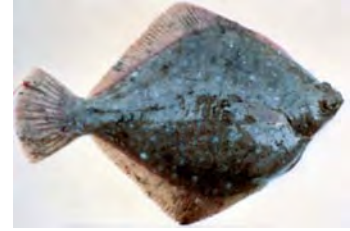


English Sole *Parophrys vetulus*

Diamond Turbot *Hypsopsetta guttulata*

Diagnostic Features

- * **Dorsal and anal fin rays longest at mid-body (Diamond shaped)**
- * **Lateral line is straight with a dorsal branch**



This is a deep-bodied, small-mouthed pleuronectid best distinguished by the following characters: dorsal and anal fin rays are longest at about mid-body, giving a diamond-shaped body outline, and the lateral line is straight with a long dorsal branch which extends more than half the curvilinear length of the body. The pectoral fin is shorter than head length, and the rear margin of the caudal fin is rounded. The right (eyed) side is dark gray or grayish brown overlaid with light blue or blue-gray spots, and blind side coloration is white, usually with a bright yellow wash around the mouth. Maximum length is to 46 centimeters.

The diamond turbot is a common inshore species with a disjunct population in the Gulf of California. It occurs on muddy or sandy substrates in estuaries and bays.

English Sole *Parophrys vetulus*

Diagnostic Features

- * **Upper eye is visible from the blind (left) side**
- * **Pointed/ angular snout, mouth is twisted asymmetrically toward body's dorsal ventral axis**



The English sole is a right-eyed flatfish with a distinctively pointed or angular snout, and the mouth is twisted asymmetrically toward the body's dorsal-ventral axis. The upper eye is visible from the blind (left) side, the right side of the body is covered with ctenoid scales anteriorly and cycloid scales posteriorly, body scales do not extend onto the fin bases as in the butter sole, and the lateral line is fairly straight with a dorsal branch extending posteriorly about 1/3 of curvilinear body length. The rear margin of the caudal fin is straight-edged or double truncate. The eyed side is uniform brown in color, blind side coloration varies from white to pale yellow overlaid with a reddish or reddish-brown wash. **Maximum length is to 57 centimeters**

The English sole is found from the intertidal zone to 300 fathoms. This is a commercially important species also known as the lemon sole.

Note: Numerous flatfish species occur in the California gillnet and purse seine fishery, and they are difficult to identify. Work aboard vessels is fast-paced, often leaving minimal time to key out specimens brought aboard before they are cleaned or discarded, so a special effort to familiarize yourself with both local flatfish families is advised.

Fish Identification Practice

This exercise is designed for use with the dichotomous keys found in *Guide to Coastal Marine Fishes of California*. The exercise consist of general descriptions of 3 fish specimens, to be keyed beginning with “KEY TO THE FAMILIES”. Work Through subsequent keys for lower taxa as indicted by each specimen’s characteristics.

Specimen 1

A Moderately large (56 cm) fusiform fish with an unforked, square cut caudal fin. A prominent spiny first dorsal fin (10 spines) is joined to a long, low soft rayed second dorsal fin. The third dorsal spine is much longer than the forth and fifth. The dorsals are differentiated by a slight notch, and the rayed dorsal is longer than the rayed portion of the anal fin. The rear margin of th anal fin is rounded and it consist of 3 spines followed by 7 soft rays. The pelvic fins are paired, thoracic and consist of 1 spine and 5 soft rays. No fin rays or spines are free of webbing.

The snout and head are robust. The mouth is larger with a projecting mandible; the posterior edge of the maxilla is exposed (i.e. not covered by a sheath of skin or bone) when the mouth is closed. The premaxillaries are not greatly protractile and the maxillary is only slightly obscured by an overlapping shelf of bone on the snout when the mouth is closed. The operculum is covered with scales and has a serrated rear margin. There are 3 opercular spines, but no suborbital stay or preopercular spines. Ventrally, the fill membranes are not attached to the isthmus between the gill slits (see Fig. 4, p. 9). The gill slits are anterior to the pectoral fins.

Dorsal ground color is olive, ventrally it is grayish white. All surfaces of body and fins suffused with small dark spots which overlay indistinct dark vertical bars on back and sides.

This fish is: _____

Specimen 2

A moderately large (61 cm), fusiform fish, with an unforked, but slightly concave, caudal fin. The prominent spiny dorsal fin has 13 spines: the 16 rayed, soft dorsal fin has a squarish rear margin. The dorsals are continuous but differentiated by a well defined notch. The short, squarish anal fin consist of 3 spines and 9 rays, the last ray divides in two above the fin insertion. The second anal spine is approximately the same length as the third. The pectoral fins consist of 17 soft ray, have rounded rear margins that are not noticeably split or notched. Pelvic fins are paired, thoracic and consist of 1 spine and 5 rays. No spines or rays are free of webbing.

The snout and head are robust, the mouth is large with a projecting mandible, the maxilla is exposed when the mouth is closed and extends posteriorly past the center of the eye. The mandible is scale covered and rough to the touch. Palatine teeth can be felt by carefully stroking the roof of the mouth (the critter bites). The gill slits are anterior to the pectorals, a suborbital stay with 5 strong preopercular spines is present. The specimen lacks a prominent lateral ridge between preorbital and preoperculum, and cranial spines are virtually absent. Lacrimal spines are

absent.

The specimen has 53 lateral line pores and a diagonal row of 65 scales below the lateral line (see fig. 1 page 7). Dorsal ground color is dark olive, grading to yellowish ventrally. There are several paler blotches on the dorsum, especially near the base of the dorsal fin. The fins are olive with yellowish tinge are not noticeably spotted.

This fish is: _____

Specimen 3

A fairly small (38 cm) streamlined, spindle-shaped fish with a very narrow caudal peduncle and a strongly forked, homocercal tail. The spinous and soft-rayed dorsal fins are separate, the former consisting of eight spines, the latter of one weak anterior spine and 23 rays. The anal fin consist of 3 very small spines, the first two are detached from the soft rayed portion, and 19 rays. Both soft rayed dorsal and anal fins begin with high, pointed anterior lobes and are long and low posteriorly. They extend well onto the caudal peduncle, and are situated roughly opposite each other. The rayed dorsal lobe is higher than the spinous dorsal fin.

The pectoral fins are long sickle shaped; they extend pst the base of the first anal soft ray. None of th pectoral rays are free of membranes. The pelvic fins are paired, thoracic and unmodified, and consist of one spine and five soft rays.

The snout is rounded; the mouth is nearly terminal and relatively small. The maxilla extends posteriorly only to the center of the eye and no suborbital stays, preopercular, opercular or cranial spines., no chin barbell. The gill slits are anterior to the pectoral fins.

The body, including the entire breast, is covered cycloid with scales. The lateral line is strongly arched anteriorly and straight posteriorly. The posterior portion is overlaid with 35 large pointed scutes. The general body contour is more strongly curved dorsally than ventrally (does not present a “deep bodied” profile).

Dorsal coloration is greenish, grading to silver ventrally. There is a small dark spot on the edge of the operculum.

This fish is: _____

Chapter 4 - Safety at Sea



Safety at Sea: An Overview of General Health and Safety Practices

Becoming an observer can be a rewarding but challenging job. The main challenge to working within the fishing industry is maintaining and remembering the number one rule, which is **SAFETY FIRST**. Commercial fishing is dangerous, and is considered one of the most dangerous jobs out there. The weather can turn at any moment, the decks are slippery, and the gear used is heavy and often under a lot of stress, which means lines could snap at any time leading to serious injuries. You have to be constantly aware of your surroundings and you must do your part to ensure your safety as well as those around you.

The observer training course is designed to prepare you as best as possible for many different situations. This course will provide you with many core lessons that if properly followed, could guide you through emergency situations. It should be noted that this training class is only an introductory course to many of the safety topics that will be discussed. There are many pamphlets, books, and videos that provide more detailed information to these topics. One of these books you will receive is “Beating the odds on the North Pacific”, produced by the University of Alaska’s marine Advisory Bulletin. Other good sources of information come from the skippers and crew themselves. Use the knowledge and experience of the vessel’s crew for guidance on safety on board the vessel. Remember, *no matter how cautious the crew observers’ responsibility to keep themselves safe and alert in order to react to all emergency situations.*

Pre-Boarding Duties

Before any observer boards a fishing vessel, you are required to check for the U.S. Coast Guard Commercial fishing Safety Examination decal. If the vessel does not have this decal then **YOU SHOULD NOT BOARD**. These decals are valid for two years from the dated that is indicated by the hole punches. If the decal is missing or out of date, then inform the captain that you are not able to board vessel and you should contact your employer (Frank Orth and Associates) immediately.



The Commercial Fishing Vessel Safety Act of 1988 mandates certain safety equipment, instructions, and drills aboard vessels that operate beyond the boundary line (a federally designated line between points of land) or carry more than 16 individuals. Most vessels that need Observers fall under these regulations.

In mid 1998, NOAA Fisheries adopted regulations to ensure the adequacy and safety of fishing vessels carrying Observers. Under 50 CFR Part 600, owners and operators of fishing vessels that carry Observers are required to comply with U. S. Coast Guard safety regulations (see Appendix P). A vessel is considered inadequate or unsafe if it does not comply with the regulations regarding Observer accommodations or if it has not passed a USCG safety examination or inspection.

It is important for the observers to recognize unsafe vessels that are not in compliance with these regulations. This can be done by filling out a Vessel Safety Orientation Checklist and checking to make sure the USCG decal is present and up to date. A vessel that would normally carry an Observer, but is deemed unsafe, is prohibited from fishing without an Observer or a waiver.

When you board the vessel and if the vessel is new to you, ask the captain (or crew member) to give you a tour of the vessel. If the captain refuses do so then note this down in your log book. Do a vis-

ual inspection of the vessel by looking for rust holes through the hull or deck, missing hatches, cluttered work areas, missing windows and spilled lubricants fuel and hydraulic fuel. Also pay attention and look out stability concerns such as bilge pumps running at the docks, excess water stored in tight spaces, and weight stored high above the deck. If you notice any of these issues and do not feel comfortable at what you see do not board the vessel.

Vessel Safety Orientation Checklist

This safety check list is designed to walk the Observer through the vessel with clear safety guidelines in mind. This checklist should be done **every time an observer boards a vessel.**

1. USCG Commercial Fishing Vessel Safety Examination decal

-Valid for two years from the month issued

2. Station billet – many vessels do not have this. If a Documented vessel does not have a station bill, give them one.

3. Life rafts/Buoyant apparatus – Locate the life rafts. Does the carrying capacity of the life raft satisfy the amount of potential crew members on board? Check and record the service dates displayed on the canister and hydrostatic release.

4. Life raft equipment – Is the life raft equipped with a SOLAS pack? Check for SOLAS sticker. If no sticker then ask the captain.

5. Immersion suits/PFD - where are the survival suits and PFDs located? Are there enough for everyone on board? Observers should always keep the immersion suits in a place where it can be accessed easily and quickly. The cabin is recommended, but may have limited space.

6. Life rings/Type IV throwable device - Where are they? Are they accessible?

7. Flares – Where are the flares located? Check and record the expiration dates

8. EPIRBS – Where is the EPIRB? Is there more than one? Read the instructions. Check and record battery, hydrostatic release, and NOAA registration expiration dates.

9. Fire extinguishers – Where are they? Are they accessible? Are they up to date, charged, and ready to use?

VESSEL SAFETY ORIENTATION CHECKLIST

Verify all items on this checklist before embarking on a vessel. Record the Vessel Safety Examination Decal expiration date. Record the life raft size, ex. 4 or 6 person. Write thorough comments on any items that are unavailable, unsafe or you feel are not adequate. Advise your NMFS coordinator on any unsafe situations. **DO NOT LEAVE ON A VESSEL THAT YOU DO NOT FEEL IS SAFE.** Items listed below may not necessarily deem a vessel safe. Mail or fax this form to your coordinator prior to leaving on the first trip.

Vessel Name: _____

Observer Name: _____

Date: _____

	Available	Unavailable	Comments/Date
Commercial Fishing Vessel Safety Decal	()	()	Date: _____
Station bill/placard	()	()	_____
Life raft	()	()	Date: _____
Liferaft equipment	()	()	_____
Immersion Suits/PFDs	()	()	_____
Life rings	()	()	_____
Flares/Distress signals	()	()	Date: _____
EBIRBs	()	()	Date: _____
Fire extinguishers	()	()	_____
First aid materials	()	()	_____
Radios/Communication equipment	()	()	_____
Emergency instructions	()	()	_____
Injury placard	()	()	_____
Compass	()	()	_____
Anchor	()	()	_____
General alarm	()	()	_____
High water alarm	()	()	_____
Bilge pump	()	()	_____
Adequate means of escape	()	()	_____
Watertight closures present	()	()	_____
Nautical charts for applicable areas	()	()	_____

Additional Comments/concerns:

Observer _____ Date _____

10. First aid materials – Where are first aid materials kept? Is there a reference book on board? Is anyone else trained in 1st Aid?

11. Radios – Where are the radios? Are emergency call instructions posted nearby? Do you know how to operate the radio for an emergency call?

12. Are there emergency instructions for the vessel? Did the skipper ensure that you were given a safety orientation explaining the following? If not ask.

- Survival craft embarkation stations
- Survival craft assignments
- Fire/emergency/abandon ship signals
- Immersion location
- Procedures for making a distress call
- Essential actions required of each person in an emergency
- Procedures for recovering a person overboard
- Procedures for fighting a fire

13. Injury placard – Is there an injury placard?

14. Compass – Does the vessel have a compass?

15. Anchor – Does the vessel have an anchor? Anchor chain?

16. General alarm – Does the vessel have a general alarm? Ask the captain to test the general alarm so that you can hear what it sounds like.

17. High water alarm – Does the vessel have a high water alarm? How does it differ from the general alarm?

18. Bilge pump – Does the vessel have working bilge pumps?

19. Adequate means of escape – Does the vessel have adequate means of escape from the quarters? Are any hatches or passageways blocked or difficult to get to? Memorize the exit route from the cabin, the galley, and other locations where a fair amount of time is spent.

20. Water/weather tight closures present both on the interior and outside? Can they be secured in case of heavy weather or emergencies?

21. Nautical charts for applicable areas – Does the vessel have the applicable charts?

Wheelwatch arranged – All vessels must maintain a proper wheel watch at all times.

We should also note the following:

-Insure that the captain plans on maintaining a proper wheelwatch.

Notify your coordinator if they do not plan to maintain a wheelwatch. Do not go on a vessel that refuses to maintain a wheelwatch.

Emergencies on Board

The dangers existing on a fishing vessel can lead to an emergency occurring at anytime. It is in

your best interest to understand these emergencies and be prepared for them as best as possible. Any preparation is as good as no preparation. The following list is an overview of the emergency situations that require our attention.

Man Overboard

When someone falls overboard it is important that action is taken as soon as possible. The quick response of the crew to recognize that someone has either falling overboard or is missing is crucial to the survival of that victim. Everyone on board has a role in a man overboard emergency. The first person to witness someone falling off the vessel is responsible for keeping the victim in sight at all times. It helps to keep your finger pointed in the victim's direction. Other crew members will follow the assignments on the station bill which include, donning an immersion suit, directing the captain to steer the boat back toward the person in the water, launching the life raft, or throwing a life ring. The person in the immersion suit should never jump in the water after the victim. This is done as a last resort.

Cold-Water Near Drowning

Cold water is considered any water temperature that is less than 70° F. In the case of the above situation, when a person falls overboard, there is a chance that the victim may drown during the event, or come close to doing so. Victims have been revived after being submerged in cold water for up to an hour. Some factors for survival in cold water include: **water temperature**- the colder the better, **cleanliness of water**- the cleaner the better, **length of time submerged**- the shorter the better, age of victim- **the younger the more likely to survive, and the will to survive**. As an Observer, you are trained in first aid and CPR and may need to use these skills. Performing CPR increases survival rates greater than not performing CPR. Victims rescued from cold water may appear dead but may be revived using CPR. Remember your technique – thirty compressions for every two breaths.

The following are Cold Water Near Drowning Signs/Symptoms

- Color – Blue
- Cold
- Pulse – Very Slow or Absent
- Pupils – Fixed and Dilated
- Respiration – Absent
- Rigid – Body May seem Rigid

Flooding

Flooding, foundering and capsizing are the leading cause of the loss of fishing vessels and fisherman in the United States. Incidences of flooding usually occur when the crew are aware that the vessel is taking on water. The crew will have time to try and solve the problem or send the warning out that the flooding is beyond their control. Leaks in the through-hull fittings and malfunctioning pumps are not uncommon, and can be fixed with equipment on board. In instances of flooding it is important to remember the following damage control steps:

1. Plug – damage control kits (which contain hose clamps, canvas, rubber sheathing, oakum, softwood plugs, metal flashing, ect.) can be used to plug the hole. If these aren't available then other gear on board the vessel can be used such as; tarps, blankets and wood.

2. Close- weather tight hatches and doors should be sealed and the integrity of the water tight components should be maintained.

3. Pump- dewatering pumps should be on board and if one is not available for the incidence then the U.S. Coast Guard should be notified and they can deliver these pumps to the vessel during a flooding event (if time allows it).

It is important to note that as an observer, you will have limited roles in these types of emergency but you should be prepared to assist if needed.

Fire

Vessels contain the right mix of ingredients for fires to develop. These three things are heat, fuel, and oxygen. There are a variety of fires ranging from electrical to gas to sometimes chemical that might occur on a vessel. Station bills give specific duties responding to a fire on board including who is in charge of fighting the fire. Knowing where the fire extinguishers are is important in having a quick reaction to the developing fire. Fire extinguishers should be used by firing in short burst, keeping the retardant aimed low and at the base of the fire and in a sweeping motion. Back up extinguishers should be available because of the limited volume of retardant contained within the extinguisher itself. Keep your body low to avoid smoke inhalation and heat and do not attempt to fight the fire by yourself (unless is a reasonably small fire) and the alarm should be sounded immediately. Once the fire has been put out, a thorough inspection of the site should be conducted by using your hand to carefully feel for any hot spots, this includes checking all the adjacent rooms and ventilation shafts.

Fire aboard a vessel is much more serious than on land because help is not readily available. Fires are classified as one of three types: A, B or C. Class A fires are fueled by combustibles such as paper or wood; class B fires are burning liquid fuel like oil or gasoline for example; class C fires are electrical fires. The type of fire dictates the best method for extinguishing it, but in general a fire is extinguished by removing the oxygen, the fuel or the heat.

Radio Distress Procedure: Sending a May Day

In case it is necessary to transmit an emergency radio distress signal, it is important that the following procedure is used. Most single side band radios have a small red button that automatically switches the radio to the emergency broadcasting frequency and transmits an alarm signal. Others it is necessary to switch over to **2182 kHz or 4125.0 kHz on single side band radios (SSB)** or to **channel 16 on VHF radios**. VHF radios are for short range and SSB are for long range.

A radio distress signal may be sent by depressing the key button and performing the following call:

- Mayday Mayday Mayday (said three times)
- Vessel Name (said three times)
- Location
- Nature of Emergency
- How Many People on Board
- Vessel Description
- What Radio Frequency is Being Used

The May Day call should be done in English and should continue until a response is received and understood or you can no longer safely make the call. Always stay on the line when you get the coast and wait for instructions from them.

Abandon Ship

The last and worst case emergency is when you are forced to abandon ship. This should never be done unless it is absolutely necessary and when it is more dangerous on board the vessel than it would be in the water. Leaving the boat means that you are leaving your primary shelter. There are times when emergency occur so quickly that your only option will be to abandon ship. Knowing the nearest exits, mustering areas, life raft locations and launching procedures, EPIRB locations, and the emergency equipment available become critical factors in helping you survive an abandon ship emergency.

If capsizing of the vessel is imminent, don your immersion suit. It is best to don the immersion suit before entering the water; it will keep you warmer. However, it may be put on in the water. It is recommended to stay on the deck after the immersion suit is donned since the suit's buoyancy may prevent you from being able to dive under water to escape from a submerged compartment. The life raft should be launched, with the sea painter attached to the vessel, and your signaling devices should be collected which include: EPIRBs, flares, smoke signals, and first aid or survival kits. When jumping into the water enter feet first and stay with the vessel as long as possible, or board the life raft, while waiting for help to arrive. Activate the EPIRB and commence the 7 Steps to Survival. If things are too hectic, activate the EPIRB before you enter water, but make sure the EPIRB is somehow attached to you.

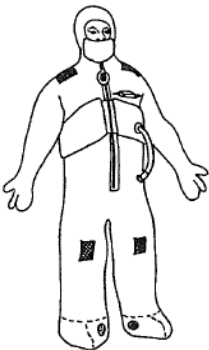
Safety Equipment

Beginning in January 1991, the U.S. Coast Guard requires commercial fishing vessels to carry certain safety equipment including an **E**mergency **P**osition **I**ndicating **R**adio **B**eacon (EPIRB), fire extinguisher, flares and life rafts. Prior to the new regulations commercial fishing vessels were required to carry only the minimum safety equipment that was the same as pleasure boats.

Once aboard a new vessel, observers should familiarize themselves with the location of safety equipment. After locating a fire extinguisher, examine it to ascertain what types of fires it is intended for, A, B or C. Find the EPIRB and see if it is the type that will automatically turn on when in the water, or if it needs to be switched on. Locate the life raft, and think about what you would do in an emergency; have a plan. Ask the skipper what the plan is in case of an emergency. What would he require of you in different emergency situations? Does the skipper want to instruct you on operating the radio or vessel?

Put your life jacket, immersion suit, and EPIRB somewhere out of the way, but accessible. Also, you should know where the boat's life jackets are kept.

Immersion Suits



Immersion, or survival suits, are designed to provide floatation and prevent body heat loss. It is a more complicated piece of equipment, and requires regular maintenance. Before each trip, the zipper should be tested and lubricated with special zipper grease. Also, inspect the suit for tears and holes. It is important also that you be able to don the suit quickly, and this may take some practicing. Remember that you may have to don the suit in a hurry and in the dark; for your own safety learn how to get into the survival suit and practice doing it in less than one minute, the faster the better. Also it is wise to practice putting the suit on

in the dark and under different situations.

Survival Without an Immersion Suit

If you find yourself in the water without an immersion suit, do not swim unless you can reach a nearby boat, fellow survivor or floating object. Since water cools your body temperature twenty five times faster than air, you will remain warmer if you are able to pull yourself completely out of the water. In view of this, survival time in the water will be extended if drown proofing techniques are used that will minimize the amount of your body in the water. The rate at which people lose body heat varies depending on body size, water temperature, amount of body fat and movement in the water.

Fat acts as an insulator. Thus, the more body fat one has, the slower heat will be lost through the skin. Personal floatation devices also help reduce the amount of heat loss by reducing the amount of surface area exposed to the water. If there is more than one person in the water, huddling together will reduce the amount of heat loss for the same reason. It is important to maintain a positive outlook while waiting for help to arrive. .

Survival With an Immersion Suit

If in the water with an immersion suit, stay with the vessel as long as possible. It is important that all survivors stay together to improve the chances of everyone being located and rescued. It is a good idea to keep a small amount of fresh water and food with the survival suit to increase the amount of survival time before help arrives. Keep a positive outlook while waiting for help to arrive.

Personal Floatation Devices (PFDs)

You can never guarantee you will not end up in the water, no matter how cautious you are. PFDs are issued to all observers and NMFS requires that all observer wear the PFDs at all times. The PFD that you will be issued are inflatable suspenders. These provide the observer with the most flexibility while offering protection from sinking. The best PFD is the one you wear!

Life Rafts

The vessel that you are assigned to should have enough capacity on the life raft to fit all crew members, including yourself. The life rafts are stored in canisters that allow them to float in the water and automatically inflate if the vessel sinks. Take every measure to manually inflate the life raft yourself, if time permits it. This is done by tying off the painter to the vessel, throwing the canister overboard and pulling the painter. This will inflate the life raft. When you are in the raft then the painter line should be cut. There should be a knife in the raft or in the SOLAS kit.

EPIRBs

These devices work by signaling a satellite and transmitting a beacon to the nearest receiver station. In the newer styles the sender will be identified. Rescues teams take the activation of EPIRBs very seriously and once activated rescue should be on the way. The vessel will have at least one 406 MHz EPIRB mounted in a float-free bracket that will automatically activate in the event of sinking. If you

need to abandon ship, this is one item you should take with you. Some one should be assigned this duty on the station bill. Make sure you know how to use the specific EPIRB on your assigned vessel before departing.

Signaling Flares

Signal flares may also be available to call attention to the vessel and signal an emergency. There are two types of flares commonly carried aboard the pelagic fishing fleet. Hand held smoke flares and rocket flares that are shot from a launcher or gun. Read the instructions for the different types of flares and learn how to use them. You may be the only person able to assist in an emergency situation. Do not use the flare until you can visually see rescue in sight. This helps to conserve what limited flares you have, since activated flares have short life spans.

Survival Kits

Personal survival kits can be assembled by you and done so by purchasing simple items at most grocery stores. These kits greatly increase your chance of survival. Items such as a knife, plastic garbage bags, dental floss, matches, signal mirrors, a compass and some candy (preferably hard candy) are small things that can fit in a relatively compact space like a small zip lock, waterproof bag. Vessels may also have emergency survival kits on board. Station bills will have a person assigned to grab these kits during an emergency.

The Seven Steps to Survival

The USCG assembled the Seven Steps to Survival from personal experiences of those who survived emergency situations. Committing the seven steps to survival to memory should be one of the goals of every Observer learning how to survive at sea. Every time the situation changes—boarding a raft, reaching land, etc., the seven steps begin again.

1. Recognition

You must recognize that you're in trouble and take some action. If you don't you may die.

2. Inventory

Take the time to stop and assess your situation. Take into account things that work for you and things that work against you. Inventory equipment, injuries, environment, skills, and your mental condition. All this can help you make good decisions and help you survive.

3. Shelter

Shelter can be clothing, an immersion suit, a raft, or an overturned vessel—anything that protects you against the loss of your body heat. Water can take heat away from your body much quicker than air, so shelter also helps you keep as dry as possible. High heat loss areas, including the head and neck, need to be protected most. The added buoyancy of a PFD helps to keep your head and neck out of water, therefore conserving heat. In a

shore survival situation, the seven steps to survival start over again and shelter is your first priority after you inventory the situation. It takes hours to construct adequate shelter on shore and you must do so as soon as possible.

4. Signals

Anything that attracts attention and conveys a message is a signal and all signals should be bigger, brighter or different from your surroundings. Radios, EPIRBs, and flares are signals carried by vessels. Immersion suits have lights attached and you may also have a signal mirror or a rescue strobe attached to your suit. If abandoning ship, anything that can be tossed overboard may help an aircraft spot your position. Attempt to gather items, which float, from a sinking ship should be made. In a shore survival situation, three of anything (fires, buoys, immersion suits on the beach) is an internationally recognized distress signal.

5. Water

You can live without water for only a few days, and will suffer dehydration from the onset of any abandon ship emergency. Humans need around two to three liters of water a day to stay healthy, but this amount may not be there for you in an emergency situation. Life rafts have limited rations of water, so it is advised to gather as much as possible before abandoning ship, if time permits. Have a strategy for gathering extra water in an emergency. **Never drink seawater or urine.**

6. Food

A person can go without food much longer than without water. Never eat food without water—your body requires water to digest food. Life rafts are supplied with limited food rations. In a shore survival situation, many types of edibles can be found near shore. Almost any animals or green plants in the inter-tidal zone are edible, but avoid mussels or clams—they may cause paralytic shellfish poisoning.

7. Play

Having a positive mental attitude has been shown to help be survive in the harshest of situations. Anything that keeps you occupied and focuses your mind on other things besides the difficulties you are facing, is considered playing. This includes singing, telling jokes, stories, improving your shelter, or if a book is handy, reading. The will to survive can make all the difference.

Working Safely on Deck - Minimizing the Risks

When working on the deck, it is important to be aware of your surroundings. This is especially true in rough weather. On many of these boats, the rail height may be only one foot high, making it imperative that you are aware of its location at all times to prevent falling overboard. Staying safe onboard a vessel includes more than just the safety equipment. The following guidelines should help you avoid injury, illness and strain while doing your duties:

- Watch out for loose or swinging rigging and unguarded machinery.

- A personal floatation device should be worn when out on the deck, regardless of the weather conditions and so should a hard hat. These will be provided for you.
- During net roll, it is important to stay clear of the fishing operations to prevent becoming entangled or injured.
- During rough weather, it is important to keep one hand holding on to something secure at all times to prevent you from falling overboard, into the fish hold or slipping and hurting yourself. Often the deck is awash with sea water or slippery due to hydraulic fluid or fish blood.
- If climbing a ladder, remember to hold on. Even experienced skippers have fallen and hurt themselves.
- It is important to keep a clear head at all times on these boats.
- One should avoid alcohol because it impairs your reflexes, prevents you from thinking clearly and lowers your body temperature putting you at a disadvantage if you were to fall overboard. Keeping a clear head will enable you to foresee potential hazardous situations.
- Lift correctly! When lifting, get as close as possible to the object, keep the back straight while using your legs. On a moving vessel, this is critical because unexpected movements can cause back strain. Don't be afraid to ask for assistance in moving large weights.
- Fatigue and sleep deprivation suffered by the crew and by the Observer are threats to everyone's safety. Be aware of the physical state of other people on the vessel—whether the person on watch or in control of the gear. Fatigued individuals make mistakes. Monotonous work, such as longline tally samples, is difficult to do accurately and safely when tired. Follow the example of the crew and “catch up” on sleep when there are breaks in fishing.
- Vegetarians (due to meat-and-potatoes menus) and diabetics (due to odd eating schedules) need to be especially concerned about getting a proper diet. Dietary supplements, vitamins, and extra medications should be considered.

Use common sense when working aboard these vessels. On overnight trips, do not go out alone on the deck at night without telling someone. Wear your foul weather gear to keep warm and dry. It is easier to maintain a positive outlook about your duties and think clearly when you are warm and dry.

To prevent personal injury while conducting dissections, it is important to use common sense and perform your duties in a safe manner away from the net and reel. Remember that fish spines are sharp and that sharks may appear dead, but are still able to bite. When using a knife on the deck, be aware of how you are handling it. Cut away from yourself, keep your knife sharp and don't leave it lying around on the deck where someone else may be injured. Maintain sure footing while doing specimen workups to prevent accidentally cutting yourself and be careful not to strain yourself when moving specimens.

Seasickness

One of the least pleasant aspects of going to sea is the possibility of seasickness. An individual's susceptibility to seasickness is highly variable. Observers that have experienced motion sickness in cars,

planes, or amusement park rides, may experience seasickness during the cruise. Most people feel some level of discomfort when they first go to sea. Seasickness is a result of a conflict in the inner ear (where the human balance mechanism resides) caused by the erratic motion of the ship through the water. Inside the cabin of a rocking boat, for example, the inner ear detects changes in linear and angular acceleration as the body bobs with the boat. But since the cabin moves with the passenger, the eyes register a relatively stable scene. Agitated by this perceptual incongruity, the brain responds with stress-related hormones that can lead to nausea and vomiting. Its effect can be magnified by strong smells (like diesel fumes or fish, which are part of daily life at sea).

Seasickness usually occurs in the first 12-24 hours after sailing. For most people, seasickness dissipates when the body becomes acclimated to the ship's motion (getting one's "sea-legs"). In rare cases, an individual may stay ill beyond the first couple of days at sea, regardless of sea state. If this occurs, dehydration may become life threatening if it leads to shock. Take seasickness medication before going to sea. There are several over-the-counter or prescription medications available to minimize seasickness. Antihistamines such as Dramamine (generic name is dimenhydrinate) or Bonine (generic name is meclizine) are effective and are available over-the-counter. However, these drugs cause drowsiness.

A two part, prescription-only drug called the "Coast Guard Cocktail", contains promethazine, a seasick-preventing antihistamine coupled with ephedrine, which prevents drowsiness. Transderm Scop is another prescription-only motion sickness drug. It is a dime-sized adhesive patch that is worn behind the ear and delivers a continuous dose of scopolamine. Each patch lasts for 72 hours. The main side effects of the patch are dry mouth and occasionally blurry vision, but there is less drowsiness.

Acupressure wristbands and eating crystallized ginger are other remedies used with varying success. Seasick medications must be taken before the symptoms begin. Most medications take several hours to be absorbed into the body. If you are vomiting and cannot keep anything in your stomach taking medication at sea will not be an option. Even if you doubt that you will get seasick, you might want to take the medication before you board as a precaution against rough weather. If you should get seasick, take comfort in the fact that recovery is only a matter of time. All that is usually required for a complete recovery is some patience. Here are a few tips and considerations regarding seasickness:

- ♥ Continue eating items like crackers, dry toast, dry cereal, etc. (avoid anything greasy, sweet, or hard to digest). Keeping something in your stomach suppresses nausea, or, when vomiting, eliminates painful "dry heaves".
- ♥ Keep drinking fluids. Seasickness and related medications cause dehydration and headaches. Try to drink juices low in acidity, clear soups, or water, and stay away from milk or coffee.
- ♥ Focus on the horizon to eliminate the visual conflict in your brain. The vessel's motion is generally less pronounced the further astern you go. Try to stay as far back from the bow as possible.
- ♥ Keep working. Most people find that being busy on deck keeps their minds off their temporary discomfort. Also, the fresh air out on deck is often enough to speed recovery.
- ♥ Carry a plastic bag. This simple trick allows some peace of mind and eliminates some of the panic of getting sick. When vomiting over the

Fish and Mammal Poisoning

Bacteria from fish may lead to infection in cuts, scrapes, or punctures. To prevent “fish poisoning”, wash your hands thoroughly after sampling in a solution of hot, soapy water. Change gloves often to keep them dry and discard any torn gloves. Treat all minor cuts, especially those on your hands, with antiseptic such as Betadine to avoid infection from fish slime.

Be cautious whenever wading through fish on deck. Fish spines, especially on rockfish, can penetrate rubber boots and cause painful wounds to the feet. Spines often carry bacteria and can lead to fish poisoning.

If a wound gets red or swollen, soak it for ½ hour in very hot, soapy water at least three times a day. Dry and bandage the wound. Antibiotics are commonly prescribed for fish poisoning. The vessel will probably have some on board should they be needed. Never leave an infection untreated--the threat to your health can become much more far-reaching than simply a pair of inoperative hands.

Take extra precautions against infection when collecting specimens from marine mammals. Because these mammals have similar biological systems to our own, organisms that infect them, can infect us. “Seal finger” is a fungal infection of the hands that can easily be contracted by a scratch or bite

Chapter 5– Conflict Resolution and the Green Book

CONFLICT RESOLUTION

COPING WITH DIFFICULT PEOPLE

Focus

Understanding aspects of inter-personal behavior.

Strategies to change negative behavior.

Effective communication.

Definition

What constitutes a difficult person for you?

It probably boils down to your own personal perception, level of frustration, or lack of recognition.

Unacceptable Behavior

What difficult behavior is unacceptable to you?

Can you describe behavior that you have experienced from peers, bosses or others that is unacceptable to you?

Non-threatening Approaches

Avoid using "why questions" when dealing with difficult behavior.

Asking someone, "Why did you do this?" or "Why did you do that?" probably will cause a defensive response and may create further problems.

Instead ask yourself, "What is the purpose of the behavior you see and what is the payoff for the person exhibiting it?"

Avoid using "you messages." Statements like, "You are the problem" or "You don't understand" also are likely to cause defensive replies.

Instead use "I messages." "I have a problem" or "I don't understand" are non-threatening statements.

Payoffs for Misbehavior

Psychologists identify four principal payoffs for misbehavior:

1. Attention Getting Payoff - Can be positive "Hey look at me" or negative "doing the right thing for the wrong reason."
2. Power Payoff - "I win, you lose obsession."
3. Revenge Payoff - "Win or lose, I can hurt you."
4. Assumed Disability Payoff - "I can't do it, will you do it for me?" or "Nobody understands me!"

Changing Negative Behavior

Remember behavior can be changed; personalities cannot.

When criticism is necessary, criticize the act not the person.

Low self-esteem means friction and trouble (LSMFT).

"Hard-to-get along with" means friction and trouble.

Honest praise is the wonder drug for low self-esteem;

- give credit
- show efforts are appreciated
- give recognition
- praise a job well done

The RRA Model

The use of three specific "I" statements to communicate dissatisfaction.

"I resent..., I request..., I appreciate..."

"I resent that you are consistently late."

"I request that you respect my need to be on time."

"I appreciate the quality and creativity of your work."

One way to change negative behavior is to change the payoffs for misbehavior.

1. ENCOURAGEMENT -- a planned, systematic effort to encourage a person by complementing a person for cooperative behavior. Positive reinforcement is the only effective cure for a discouraged person.
2. NATURAL CONSEQUENCES -- a natural turn of events; you don't have to do anything to implement this strategy.

3. LOGICAL CONSEQUENCES -- the use of logical thinking to affect negative actions.
4. FIRMNESS WITHOUT DOMINATION -- a firm, calm manner of conduct that communicates professionalism. No person has the right to attempt to dominate anyone else for revenge or ridicule so as to take away the person's self esteem.
5. WITHDRAWAL -- removal for self respect; allows a person to defuse a volatile situation with anyone who is about to lose self control.
6. RELATIONSHIP BUILDING -- any technique used to affect behavior also must allow time to create a positive relationship.

Effective Communication

Within the communication model, there are four key factors associated with a transmitted message:

1. words themselves,
2. body language,
3. tone of voice, and
4. the hidden meaning of words.

Words alone are said to account for only 10 to 20 percent of a communicated message. Thus, one should not rely on words alone to fully understand inter-personal communication.

Because you have no control over decoding by a receiver, sincere projection is especially important.

A good communicator strives for congruency among the four key communication factors.

Difficult people usually display "short circuits" to effective communication. Especially those who:

1. are not open to communicate,
2. don't want to communicate,
3. have their minds made up, or
4. use buzz words or phrases as lip service.

COPING WITH DIFFICULT SITUATIONS

Assessing the Situation

Is it worth being involved?

What is the purpose of the actions of others?

Solve problems at the lowest possible level.

Stand your ground and make it clear that you have a job to do and nothing will change that.

Vessel personnel may not like what you do, but they will, more often than not, respect you for being firm with your commitments.

What to Expect

Because you represent the government, vessel personnel are likely to vent their frustrations on you about their dissatisfaction with any aspect of government.

Most fishermen do not discern differences between NMFS, Cal Fish & Game and IATTC. To them, individuals from these groups are all government guys like you.

When first aboard your assigned vessel, you are likely to be tested. How will you respond to them? How far can you be manipulated? What gets you on edge?

How you come across will set the pattern for how you are treated. Your tact, firmness and personality are your greatest assets.

If you are standoffish or quiet to where no one knows what you are thinking, this can be a greater problem than being open, friendly and talkative. Fishermen like to talk!

Interference and Harassment

Document any attempt to interfere with your work or any incidence of harassment by preparing answers to the questions: Who? What? Where? When? Why? and How?

Possible interference problems might include:

- ⊗ blocking view for needed observations;
- ⊗ obstructing data collection;
- ⊗ preventing specimen work-ups;
- ⊗ taking data records;
- ⊗ statements to record bogus data; or
- ⊗ gratuity inducements to alter, falsify or compromise duties.

Acts of harassment will not be tolerated within the National Marine Fisheries Service. Such behavior is totally improper and illegal.

OBSERVERS ARE TO DOCUMENT ALL INCIDENTS OF HARASSMENT, NO MATTER HOW MINOR.

Harassment is defined as any conduct which has the purpose or effect of unreasonably interfering with the observer's work performance or which creates an intimidating, hostile or offensive work environment.

Sexual harassment is any unwelcome verbal comments, gestures, or physical contacts of a sexual nature.

On Your Return From Sea

During post-cruise procedures observers complete a questionnaire about their cruise assignment.

An enforcement agent may review this questionnaire to uncover any problems you might have faced on your cruise. The agent will determine if your facts warrant action. You should bring up events that were problems for you, instead of waiting to be asked.

You may be asked to prepare a written statement about specific events.

You may be asked to appear in court if the need arises.

ADVICE TO WOMEN GOING TO SEA

Useful to Men Also

The National Marine Fisheries Service is absolutely and emphatically opposed to harassment in any form. Any instances of harassment should be documented and brought to the attention of the enforcement agent assigned to our program. Furthermore, please do not hesitate to discuss any incidents of harassment with your superiors.

The following information is taken from Connie Sancetta's December 1984 paper prepared for the College of Ocean and Fishery Sciences, University of Washington, following the rape of a female student aboard a Scripps Institution of Oceanography research vessel.

Sexual harassment occurs at sea, from verbal harassment to assault and rape.

Such incidents are frequently not reported, for reasons ranging from a desire to be a good sport in minor cases to embarrassment in more serious cases.

The following information is intended to alert observers:

to the different nature of social conditions at sea, and

to suggest some actions you should take if you feel uncomfortable or harassed.

Social Conditions

Social conditions are different from those on land.

Privacy is lacking.

Interactions are more intense.

Feelings of intimacy are more quickly established.

People with diverse backgrounds & value systems are together.

Intercultural differences require awareness & sensitivity.

For some, sexual remarks or actions are considered acceptable.

Value systems of many men change during a cruise.

Small incidents, both pleasant and unpleasant, can quickly take on exaggerated importance because of:

1. close quarters,

2. the prevalence of gossip, and
3. the sense of isolation from "the world" back on shore.

The crew of a vessel have usually established a workable interaction among themselves, while observers, who come on board for a single cruise, are not part of that system.

Observers are therefore particularly apt to draw:

attention,

comment, and

speculation.

Sexual awareness and tensions can be heightened at sea, because of the unusual social closeness and deprivation of normal outlets.

Behavior and attire that are acceptable on shore can be viewed as provocative at sea, and close relationships between people of opposite sexes can strongly affect the atmosphere in which every one must work and live.

The result often is that a woman on board is subject to far more attention than she would be on shore. While some of the attention may be pleasant and even flattering, some of it is not.

It is necessary to be aware of the different social situation and to modify your normal behavior if necessary.

Suggested Actions

At the very least, you should consider the possible consequences of some situations so you can react appropriately.

Below are examples of the sort of actions you might adopt or avoid:

Strictly obey the ship rules regarding drinking, which can lead to poor judgment, lack of control and alertness, and hasty actions.

If the ship allows consumption of alcohol, do so only in moderation. At sea you must be prepared for any emergency. Consider yourself on duty 24 hours a day.

Refrain from wearing potentially provocative clothing such as bikinis, halter tops, short-shorts and tight clothing; avoid going braless.

Be aware that if you show more attention to one man than others, it may be misinterpreted by him or by others.

Do not invite a man to your cabin if you are alone, or accept an invitation to be alone with him ("a friendly chat," or "a little drink").

Leave the cabin door open or go to a public area if a man comes to talk to you without your invitation.

Activities such as flirting, joking about sex, or touching may be misinterpreted by the persons involved or by others.

Unwanted approaches should be responded to politely but very firmly.

You yourself should avoid flirtatious behavior or obscene humor.

Do not engage in sexual affairs. Such affairs will distract you and your partner from doing your work, can breed resentment and jealousy, and will increase sexual pressure, both on your cruise and on subsequent cruises involving other women. Remember, you are at sea to work, not to amuse yourself.

Make it clear that your interests in male companionship are elsewhere (some women wear wedding rings) or that you are "not available."

Do not stand around on deck or other deserted areas alone at night.

Use your government status or reminders about regulations concerning observer safety to deter unwanted behavior.

In general, be very sensitive to the altered social conditions and their possible implications. Use your common sense.

An assault often occurs with "warning signs" of milder behavior. If you act firmly and decisively during the early stages, you may reduce the chances of future harassment. Some warning signs to watch for are:

A man makes frequent attempts to detain you, to be in your company, or to visit you in your cabin.

Mild or casual sexual remarks become more frequent, pointed, and/or objectionable.

A man attempts any physical contact, even if it appears innocent.

Other people warn you about a man who begins to harass you.

A man whom you have repeatedly attempted to discourage continues or escalates his advances.

Defining Harassment

The definition of harassment is subjective. Federal law defines sexual harassment as:

"Unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature."

Thus, it is your decision at what point you will draw the line.

Many women feel uncomfortable with milder forms of harassment, but tolerate it, not wanting to cause trouble, or to appear to be over-sensitive or bad sports.

The unfortunate result of this passivity is that harassment may continue or increase until it becomes serious. It is best to take action at the time that you first feel uncomfortable.

There are a variety of actions you may adopt, which must depend on your judgement. In general, the best sequence to follow is:

Indicate to the harasser that you do not enjoy or appreciate his actions. Do not make a joke of his behavior. Speak firmly and coldly, or pointedly avoid him.

Do not make the mistake of pretending to ignore it; this invites continuation at a higher level.

Losing your temper may be effective in some cases but usually is not, and may even encourage the harasser.

Discuss the problem with someone, preferably the vessel captain. Ask for his advice. If appropriate, you might ask the captain or other ship's officer to speak to the harasser, warning him off.

If the problem continues or worsens to the point that you feel upset or threatened, report it to the captain immediately.

Tell him the full story, explain that it is affecting your work, and request that he take steps to end the problem.

If the harassment advances to the point of assault, such as ripped off clothing, it becomes a felony. You should immediately report the offense to the captain, who is required to take action.

Make sure that the incident is reported to the San Diego Field Office and is not swept under the rug. Failure to report a felony can itself be punishable under law.

Conclusions

Sexual assault and rape, sex without mutual consent, have occurred on research and commercial fishing vessels at sea. These serious offenses might be prevented if appropriate action is taken in the early stages.

Never believe that the problem is trivial, or that you are over-reacting. If you feel harassed, then it has gone too far. It is your right to complain, and even your obligation.

By reporting harassment you are protecting others as well as yourself. The captain does not want trouble on his cruise, and if you indicate to him that trouble may be brewing, he will take appropriate action.

GREENBOOK

INTRODUCTION

The *Greenbook* is a supplemental record book issued to drift gillnet observers on each observed fishing trip for recording certain facts subordinate to issued data forms. The title has its origins in the early years of the Tuna-Dolphin Observer Program. Then observers carried a bound government record book to record miscellaneous information. Today, there remains a need for the record book; it is more structured and convenient in its present form.

The *Greenbook* provides space for the observer to record instances of job interference or personal harassment, as well as accidents, injuries, or illnesses. In general, information is recorded as notes that would, in a more conventional working environment, be reported to the observer's supervisor.

In no circumstance is the *Greenbook* to be used to record superfluous information that could be construed as a diary. All observer records will be found in the *Greenbook* or in issued data forms proper.

Pages are numbered to ensure the completeness of the *Greenbook* record. Pages are not to be removed. The *Greenbook* consists of pages 1 through 9. If you need to record something that does not seem to quite fit into one of the categories, delineate a new section in pencil.

INTERFERENCE

This section is for narrative documentation of any attempts to interfere with observer assigned duties. Documentation should include brief, non-inflammatory answers to the questions: Who? What? Where? When? Why? and How?

Examples of interference include failure to provide position information when requested, failure to permit use of the ships communication equipment, and failure to retain on deck accessible marine mammal specimens for processing when requested. Attempts to obstruct observer observations or data collection, and any enticements to alter data, falsify data or otherwise compromise observer responsibilities also are to be recorded here.

Notes in this section will be used during post-cruise debriefing procedures by the observer to prepare a more formal report on interference.

INTIMIDATION

This section is for the documentation of incidents of harassment or intimidation that an observer may experience during an observed fishing trip. Conduct by others which creates a hostile environment can be considered harassment or intimidation. Federal law defines sexual harassment as "any unwelcome sexual advance, request for sexual favors, or other verbal and physical conduct of a sexual nature which has the purpose or effect of substantially interfering

with an individual's work performance or creating an intimidating, hostile or offensive working environment." Documentation should include brief non-inflammatory answers to the questions: Who? What? Where? When? Why? and How?

Notes in this section will be used during post-cruise debriefing by the observer to prepare a more formal report of intimidation.

INJURIES

In the event an observer is injured or becomes ill while on a cruise assignment, it is important that the following information is recorded in this section: the date and time of the occurrence, the type and extent of the injury or illness, how it occurred, what treatment was received and from whom, and the names of witnesses. Circumstances should be recorded on the day of occurrence. The observer is reminded to answer the questions: Who? What? Where? When? Why? and How?

Chapter 6– Observer Trip Tips

OBSERVER TRIP TIPS

INTRODUCTION

To prepare observers for sea duty, the following recommendations were compiled for items to take along on vessel assignments, personal safety, and vessel etiquette. Additionally, due to the various cultures in the commercial fishing industry, there is a need for observers to be aware of some customs and traditions. There is no better source to gather this information than from observers who have been there and know first hand.

GENERAL CONSIDERATIONS

When preparing to organize and pack your personal gear, consider the following environmental conditions and vessel arrangements:

- You will be exposed to wet conditions, even when it is not raining.
- You must be ready for hot and cold temperatures and be prepared for quick weather changes.
- When working out on deck you may be exposed to strong wind conditions.
- There may be a limited amount of space aboard the vessel.
- You will not have a dresser with drawers to place your personal items, pack your sea bag so that you can get to anything easily.

Remember, everyone's needs, personalities and interests are different. Be professional.

Personal Items (what to take)

- ⊗ Take along sun block with a high Sun Protection Factor (SPF 30-45). If you have fair skin, then you will need more sun protection.
- ⊗ Bring good sunglasses. They should protect against UV radiation. Polarized sunglasses are good for seeing beneath the water; consider the investment of having a spare set.
- ⊗ Take along spare hats with visors and straps; they are easily blown overboard.
- ⊗ A small first-aid kit (including an antibiotic ointment or a broad spectrum antibiotic).
- ⊗ You might want to take along some vitamins and some personal medicines (aspirin, diarrhea medicine, antibiotics, etc.)
- ⊗ Bring a supply of non-perishable snack foods. Suggested snack items include: canned foods, freeze dried foods, pasta, power bars, dried fruits, nuts, powdered milk, peanut butter, instant oatmeal.
- ⊗ A small pocket knife.

- ⚙ Bring your rain gear, boots, life jacket, survival suit, and food/water survival kit.
- ⚙ Take a variety of reading material.
- ⚙ Cassette tape player or a radio. Headphones are a must for the privacy of others.
- ⚙ Rechargeable batteries are a good option.
- ⚙ A flashlight or two.
- ⚙ Bring a pair of "slippas" or sandals for wearing when showering.
- ⚙ Take along all needed toiletries.
- ⚙ Your own pillow, or at least your own pillowcase is a good idea. A sheet is also a good idea.
- ⚙ Have at least one set of casual traveling clothes.
- ⚙ Carry the emergency telephone numbers card with you.

Vessel Etiquette (rules of conduct)

- ⚙ **Always Ask First!**
- ⚙ Let the captain and crew on board know exactly what you are doing. Don't be secretive.
- ⚙ Ask before the first gear pull where would be the most convenient place from which to make your observations.
- ⚙ Help out with shipboard household chores (dishes, cleaning, etc.). Be willing to help with other things on board when possible, but don't get in the way. Ask where you should sit in the galley.
- ⚙ If you don't think the cooking is good, keep your comments to yourself. Cuisine is a large part of cultures; eating their food goes a long way to building mutual respect. Note: Rice is usually part of every meal.
- ⚙ It is common for crews to eat most of the groceries early in the trip, leaving simple staples (rice, fish, and ramen noodles) for the remainder of the trip.
- ⚙ If you take special foods or drinks aboard with you, be prepared to share with others.
- ⚙ Offer to cook a meal once or twice a week. Example, some Vietnamese fishermen like "American Spaghetti".

- ⊗ If fresh water is in short/limited supply, it is common for crews to wash with salt water first and then rinse with a small amount of fresh water. This goes for bathing, dishes, and clothes.
- ⊗ Behave like a guest - the best observers are experts at staying out of the way.
- ⊗ Have a sense of humor. Don't take everything personally.
- ⊗ Respect religious practices and vessel shrines.
- ⊗ Do not mock superstitious practices or beliefs. Bananas, black suitcases, whistling and leaving on Friday are considered bad luck by some crews.

Vessel Safety

- ⊗ Foresee potential hazardous situations by using common sense. Stay alert.
- ⊗ Look for safety gear (life rings, life raft, EPIRB, fire extinguishers) and listen to the captain (or Coast Guard) in an emergency. Ask the skipper what he would want you to do if there was a fire, person overboard, or abandoning ship.
- ⊗ Do not be pressured into stowing your survival suit somewhere convenient for operator or crew, but not readily accessible.
- ⊗ Always wear appropriate footwear.
- ⊗ Be careful when walking on deck at night.
- ⊗ Use handrails, especially when on ladders (stairs).
- ⊗ Have a sheathed knife accessible.
- ⊗ Never run on a boat.
- ⊗ Put a fresh water supply with your survival suit.
- ⊗ Be cautious of leaders snapping (often caused by sharks on the line) as flying lead weights can cause serious injury. When the leader has tension on it, it is safer to wait for the sinker to be pulled up before identifying the animal.
- ⊗ Keep a clear head by avoiding alcohol.
- ⊗ Be attentive when performing specimen dissections to prevent injuries and infections from fish spines, shark teeth, or knives.
- ⊗ Do not wear loose clothing or jewelry. It can get caught in machinery.

- ⚙ In case of accident or emergency, know your escape route.

Do's and Don'ts

- ⚙ Do review your data and field manual regularly.
- ⚙ Be a good shipmate.
- ⚙ Do try to get to know each individual and be on good terms with the captain.
- ⚙ Do try to learn a few words or phrases of whatever language is predominate aboard the vessels.
- ⚙ Learn seamanship skills - fisherman will respect your interest, and they can help.
- ⚙ Be orderly and keep all your gear secured - especially on deck.
- ⚙ Take two or three "Time and Attendance Worksheets" with you at sea to record times and weather conditions (Wind Wave Size and Wind Speed).
- ⚙ Be sensitive to the atmosphere on the boat - if things don't appear to be going well (no fish, gear problems, etc.), don't be a part of the problem - stay out of the way.
- ⚙ Stay out of crew fights and arguments. Siding with anyone can lead to problems.
- ⚙ Don't waste fresh water. Try to conserve water even if they say there is plenty.
- ⚙ Don't leave water running in shower, when brushing your teeth, when washing dishes, etc.
- ⚙ It may be helpful to shake out bedding frequently to minimize contact with cockroaches and bedbugs.

Travel Recommendations (hotels, transportation)

- ⚙ Pack light - travel light.
- ⚙ Write down all times (departure, arrival, port stops, etc.).
- ⚙ Keep receipts for all forms of travel (taxi, shuttle, plane, etc.).
- ⚙ If possible, always take extra money, an ATM card, or a credit card for unexpected emergencies.
- ⚙ Hotels - Check the maximum allowable rate for the area where you will be staying (ask your supervisor).

- ⊗ Give yourself extra time before a flight

Food and Water Safety

- ⊗ If unsure of water quality, bring water to a rolling boil (10 min) or use liquid bleach (5 drops/gal) to kill bacteria.
- ⊗ Be aware that contamination may occur by preparing meats on the deck carpet where fish are gutted, by dirty cutting boards, or by using a dirty knife. If unsure of the cleanliness, offer to cook or help prepare meals. Use a 10% solution of bleach to clean cutting boards or other food preparation surfaces. This solution is used by medical professionals who clean up blood from AIDS patients.
- ⊗ Fish in the Gempylidae Family (snake mackerels, escolars, oilfish) may cause diarrhea when eaten. Diarrhea may be caused by the ingestion of oil contained in the flesh and bones of these fishes. Also know that raw fish (sashimi), and dried or raw squid are sometimes part of the meals. If you aren't used to these foods try small portions at first.
- ⊗ Common food poisoning symptoms include diarrhea, abdominal cramps, nausea, vomiting, fever, chills, and/or headache.
- ⊗ Force yourself to drink a personal quota of water per day.
- ⊗ Remember bread and other cereal products mold quickly while at sea. Freezing will help keep them edible for the duration of the trip.
- ⊗ Document date and time of unusual health symptoms in your greenbook. This includes cases of diarrhea.
- ⊗ It is recommended that you use your shore-side time to educate and train yourself in proper health safety procedures and food handling techniques. Consult with your doctor, colleagues, State of Hawaii-Department of Health, Peace Corps, and other professionals.

Appendix A - Species Composition in Selected Fisheries

Species Caught in the California Drift Net Fishery
(CY 1990 – CY 2004)

Billfish

Black Marlin (*Rarely Caught*)
Blue marlin
Shortbill Spearfish (*Rarely Caught*)
Swordfish
Striped Marlin
Sailfish (*Rarely Caught*)

Tunas

Albacore
Bigeye Tuna
Bluefin Tuna
Skipjack
Yellowfin

Sharks and Rays

Blue Shark
Bat Ray
Basking Shark
Bigeye Thresher
Common Thresher
Shortfin Mako
Manta Ray
Megamouth (*Rarely Caught*)
Mobula (*Rarely Caught*)
Pacific Electric Ray
Pacific Angel Shark
Pelagic Thresher
Pelagic Stingray
Prickly Shark (*Rarely Caught*)
Round Stingray
Salmon Shark
Sevengill Shark (*Rarely Caught*)
Sixgill Shark (*Rarely Caught*)
Smooth Hammerhead Shark
Soupfin Shark
Spiny Dogfish (*Rarely Caught*)

Other Fish

Bay Pipefish (*Rarely Caught*)
Bullet Mackerel
California Barracuda
Common Mola

Other Fish (cont.)

Jack Mackerel
King of the Salmon (*Rarely caught*)
Longnose Lancetfish
Northern Anchovy (*Rarely caught*)
Louvar
Oarfish
Opah
Pacific Bonito
Pacific Electric Ray
Pacific Hagfish (*Rarely Caught*)
Pacific Hake
Pacific Mackerel
Pacific Pomfret
Pacific Sardine
Remora
White Seabass
Yellowtail

Cetaceans

Long-Beaked Common Dolphin
Short-Beaked Common Dolphin
Cuvier's Beaked Whale
Dall's Porpoise
Gray Whale (*Rarely Caught*)
Hubbs' Beaked Whale (*Rarely Caught*)
Humpback (*Rarely Caught*)
Killer Whale (*Rarely Caught*)
Minke
Northern Right Whale Dolphin
Pacific White-sided Dolphin
Pygmy Sperm Whale (*Rarely Caught*)
Risso's Dolphin
Short-Finned Pilot Whale (*Rarely Caught*)
Sperm Whale (*Rarely Caught*)
Stejneger's Beaked Whale (*Rarely Caught*)

Pinnipeds

California Sea Lion
Northern Elephant Seal
Steller Sea Lion

Sea Turtles

Leatherback Sea Turtle
Loggerhead Sea Turtle

Species Caught in the West Coast Coastal Pelagic
And Tuna Purse Seine Fishery
(CY 2004– CY 2006)

Tunas

Skipjack
Yellowfin

Sharks and Rays

Bat Ray
Blue Shark
Round Stingray
Pelagic Stingray
Shovelnose Guitarfish
Spiny Dogfish
Thornback Ray

Other Fish

Anchovy
Bat Star
Brittle Star
CA Barracuda
CA Halibut
CA Lizardfish
Ca Yellowtail
Common Mola
Flyingfish
Giant Sea Bass
Jack Mackerel
Jacksmelt
Kelp Bass
Midshipman
Moon Jelly
Pacific Bonito
Pacific Butterfish
Pacific Electric Ray
Pacific Mackerel
Pacific Tomcod
Pompano
Queenfish
Sardine
21 legged seastar
Scorpionfish
Sculpin

Other Fish(cont.)

Spanish Mackerel
Squid
Starry Flounder
Sunstar
Squid
Squid Eggs
Unid. Batfish
Unid. Crab
Unid. Croaker
Unid. Flatfish
Unid. Groundfish
Unid. Hake
Unid. Jellyfish
Unid. Lobster
Unid. Mackerel
Unid. Octopus
Unid. Rockfish
Unid. Ray
Unid. Sanddab
Unid. Seastar
Unid. Seaslug
Unid. Scorpionfish
Unid. Surfperch
Unid. Smelt
Unid. Sole
Unid. Turbot
White Croaker
Yellowfin Croaker

Cetaceans

Unid. Common Dolphin

Pinnepeds

CA Sea Lion
Harbor Seal

Other Protected species

Sea Otter

Appendix B - Sample Data Forms

TRIP SPECIFICATIONS RECORD

TRIP NUMBER. <input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	OBSERVER # <input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	VESSEL NAME <input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	VESSEL LENGTH <input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>
--	--	---	---

VESSEL ID # <input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	STATE PLATE # <input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	OPERATOR NAME <input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>
---	---	---

Observation Type (GILLNET ONLY) <input type="checkbox"/> 1. Pre-net-set <input type="checkbox"/> 2. S/ Post-net-set <input type="checkbox"/> 3. R/ Post-net-set <input type="checkbox"/> 4. Other	<input type="checkbox"/> 1- On Board <input type="checkbox"/> 2- From Other Vessel	<u>DEPARTURE</u>	PORT <input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	DATE (YYYY MM DD) <input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	TIME (HH MM) <input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>
---	--	------------------	--	---	--

PORT STOPS

BEGIN DATE (YYYY MM DD)	TIME (HH MM)	PORT	END DATE (YYYY MM DD)	TIME (HH MM)
<input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	<input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	<input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	<input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	<input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>
<input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	<input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	<input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	<input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	<input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>
<input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	<input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	<input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	<input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	<input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>
<input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	<input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	<input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	<input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	<input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>

	PORT <input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	DATE (YYYY MM DD) <input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>	TIME (HH MM) <input style="width: 100%; height: 20px; border: 1px solid black;" type="text"/>
--	--	---	--

ARRIVAL

COMMENTS

Gear and Set Data ~ Drift Net

TRIP NUMBER.

--	--	--	--	--	--	--	--	--	--

SET NUMBER

--	--

PULL DATE (YYYY MM DD)

--	--	--	--	--	--	--

Percentage of Net Observed

--	--	--	--	--	--	--	--	--

 %

Target Sp. 1

--	--	--	--

Target Sp. 2

--	--	--	--

1) _____

2) _____

Position Type

--	--	--	--

- 1- Loran 3- Satellite
- 2- DR 4- Verbal

Latitude

--	--	--	--	--	--	--	--	--	--

Deg. Min.

Longitude

--	--	--	--	--	--	--	--	--	--

Deg. Min.

Environment

--

- 1- Inshore of Kelp 4- No Kelp
- 2- In Kelp 5- Unknown
- 3- Outside of Kelp

Begin Set

Latitude

--	--	--	--	--	--	--	--	--	--

Deg. Min.

Longitude

--	--	--	--	--	--	--	--	--	--

Deg. Min.

Ship Activity

--

- 1- Pull / Reset 4- Tend Only
- 2- Pull / Move / Reset 5- Net Lost
- 3- Pull / Bring In

Begin Pull

Latitude

--	--	--	--	--	--	--	--	--	--

Deg. Min.

Longitude

--	--	--	--	--	--	--	--	--	--

Deg. Min.

Set Date (MM DD)

--	--	--	--

Begin Set Time

--	--	--	--

Water Depth

--	--	--	--	--	--	--

 fms

Beaufort

--

Water Temp.

--	--	--	--	--	--	--

Temp. Type

- 1- Spirit
- 2- Mercury
- 3- Digital
- 4- Vessel
- 5- Other

Cloud Cover

--

Number of Lightsticks

--	--

Floatline Pingers

--	--

Distance to Floatline

--	--	--	--

 ft

Pinger Type

- 1- Dukane 3- Fumunda
- 2- Other 4- Mixed

Leadline Pingers

--	--

Distance to Leadline

--	--	--	--

 ft

Pinger Type

- 1- Dukane 3- Fumunda
- 2- Other 4- Mixed

Begin Pull Time

--	--	--	--

Water Depth

--	--	--	--	--	--	--

 fms

Beaufort

--

Water Temp.

--	--	--	--	--	--	--

Cloud Cover

--

Main Engine (Y/N)

--

Generator (Y/N)

--

Sonar (Y/N)

--

Deck Light (Y/N)

--

Patrol Net (Y/N)

--

Soak Total

--	--	--	--	--

 hrs

Lost Netting

--	--	--	--	--	--	--

 fms

Pingers Functioning (Y/N)

--

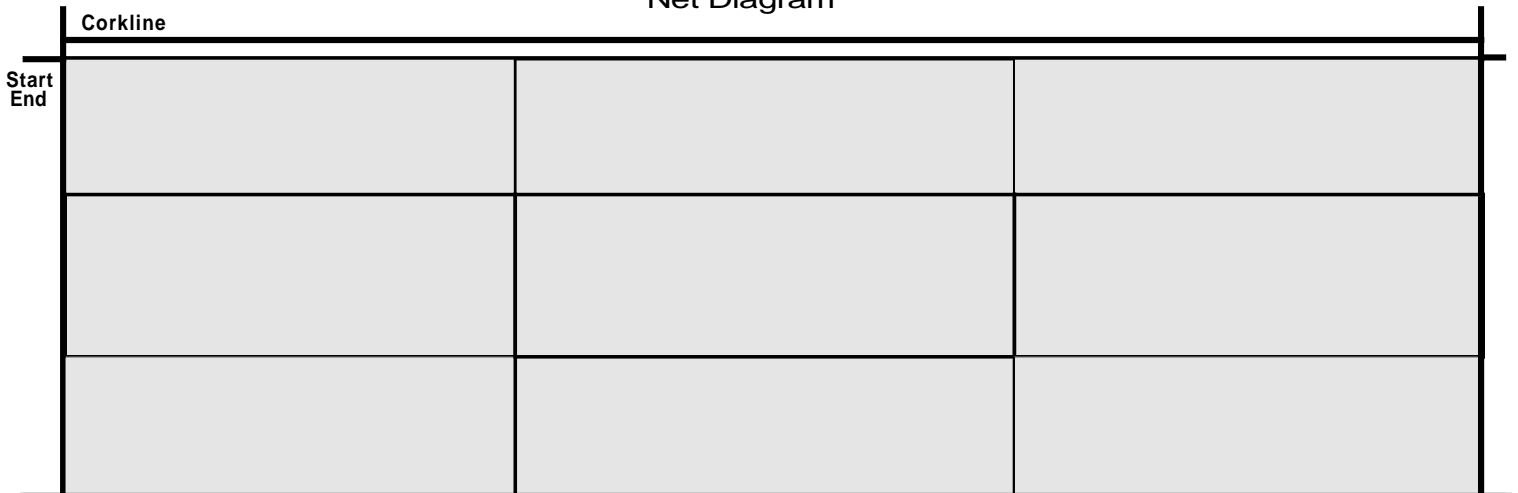
Notes:

Net Characteristics

Section #	Total Sections	Percent of Net	Net type	Net Material
<input type="text"/> <input type="text"/> OF <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> %	<input type="text"/> 1 - Set 2 - Drift 3 - Float	<input type="text"/> 1. Monofilament 2. Multifilament 3. Combination 4. Twisted Mono.
Strength	Strength Code	Net Length	Net Depth	
<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> 1 - Lb. Test 2 - Twine Size	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> fms	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> meshes	
Net Color	Mesh Size	Extender Length		
<input type="text"/> 1. Green 4. Brown 2. Red 5. Other 3. Blue	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> ins	<input type="text"/> <input type="text"/> ft		
Hanging Line Material	Percent Slack	Number of Meshes Hanging	Hanging Length	
<input type="text"/> 1 - Synthetic 2 - Natural	<input type="text"/> <input type="text"/> %	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> ins	

Section #	Total Sections	Percent of Net	NetType	Net Material
<input type="text"/> <input type="text"/> OF <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> %	<input type="text"/> 1 - Set 2 - Drift 3 - Float	<input type="text"/> 1 - Monofilament 2 - Multifilament 3 - Combination 4 - Twisted Mono
Strength	Strength Code	Net Length	Net Depth	
<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> 1 - Lb. Test 2 - Twine Size	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> fms	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> meshes	
Net Color	Mesh Size	Extender Length		
<input type="text"/> 1- Green 4. Brown 2. Red 5. Other 3. Blue	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> ins	<input type="text"/> <input type="text"/> ft		
Hanging Line Material	Percent Slack	Number of Meshes Hanging	Hanging Length	
<input type="text"/> 1 - Synthetic 2 - Natural	<input type="text"/> <input type="text"/> %	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> ins	

Net Diagram



Notes:

Gear and Set Data ~ Set Net

TRIP NUMBER

		-			-				
--	--	---	--	--	---	--	--	--	--

SET NUMBER

--	--

PULL DATE (YYYY MM DD)

--	--	--	--	--	--	--

Percentage Net Observed

				%
--	--	--	--	---

Target Sp. 1

--	--	--

Target Sp. 2

--	--	--

1) _____

2) _____

Begin Pull Position

Latitude

--	--	--	--	--	--	--	--

Deg.

Min.

Longitude

--	--	--	--	--	--	--	--

Deg.

Min.

Position Type

--

1- Loran 3- Satellite
2- DR 4- Verbal

Environment

--

1- Inshore of Kelp 4- No Kelp
2- In Kelp 5- Unknown
3- Outside of Kelp

Orientation to Shore

--

1- Parallel 4- Unknown
2- Perpendicular
3- Diagonal

Distance Offshore

--	--	--	--	--

nms

Set Date (MM DD)

--	--	--	--

Begin Set Time

--	--	--	--

Begin Pull Time

--	--	--	--

Water Depth

--	--	--	--

fms

Beaufort

--

Water Temp.

--	--	--	--

Type

--

1- Spirit
2- Mercury
3- Digital
4- Vessel
5- Other

Number of Pingers

--	--

Pinger Type

--

1- Netmark 1000
2- Other
3- Fumunda
4- Mixed

Water Depth Final

--	--	--	--

fms

Ship Activity

--

1- Pull / Reset 4- Tend Only
2- Pull / Move/Reset 5- Net Lost
3- Pull / Bring In

Soak Total

				hrs
--	--	--	--	-----

Lost Netting

						fms
--	--	--	--	--	--	-----

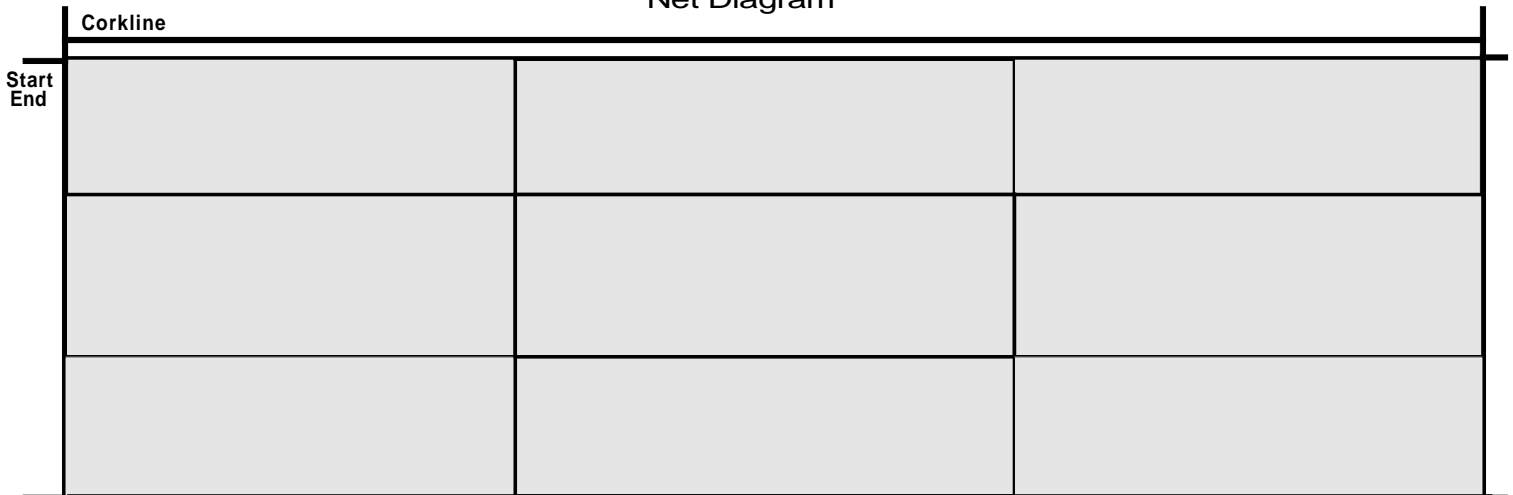
Notes:

Net Characteristics

Section #	Total Sections	Percent of Net	Net Type	Net Material
<input type="text"/> <input type="text"/> OF <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> %	<input type="text"/> 1 - Set 2 - Drift 3 - Float	<input type="text"/> 1. Monofilament 2. Multifilament 3. Combination 4. Twisted Mono.
Strength	Strength Code	Net Length	Net Depth	
<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> 1 - Lb. Test 2 - Twine Size	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> fms	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> meshes	
Mesh Size	Mesh Size (Multi-Panel Trammel Only)	Suspender Length		
<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> ins	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> ins	<input type="text"/> <input type="text"/> ft		
Hanging Line Material	Percent Slack	Number of Meshes Hanging	Hanging Length	
<input type="text"/> 1 - Synthetic 2 - Natural	<input type="text"/> <input type="text"/> %	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> ins	

Section #	Total Sections	Percent of Net	Net Type	Net Material
<input type="text"/> <input type="text"/> OF <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> %	<input type="text"/> 1 - Set 2 - Drift 3 - Float	<input type="text"/> 1 - Monofilament 2 - Multifilament 3 - Combination 4 - Twisted Mono.
Strength	Strength Code	Net Length	Net Depth	
<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> 1 - Lb. Test 2 - Twine Size	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> fms	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> meshes	
Mesh Size	Mesh Size (Multipanel Trammel Only)	Suspender Length		
<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> ins	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> ins	<input type="text"/> <input type="text"/> ft		
Hanging line Material	Percent Slack	Number of Meshes Hanging	Hanging Length	
<input type="text"/> 1 - Synthetic 2 - Natural	<input type="text"/> <input type="text"/> %	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> ins	

Net Diagram



Notes:

Catch Tally Sheet

Number of Albacore
With Gillnet Markings
(Albacore Troll / Bait Boat)

TRIP NUMBER

		-			-				
--	--	---	--	--	---	--	--	--	--

SET NUMBER

--	--

MM DAMAGE (Y/N)

--

--	--	--

1	SPECIES NAME (Fish and Invertebrates)	Sp. Code	Units 1. Ton 2. Lbs 3. Single Purse Seine Only	Total	DISPOSITION			DAMAGED	MM DAMAGED
					Kept	Returned			
						Alive	Dead		
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									

	SPECIES NAME (Fish and Invertebrates)	Sp. Code	Units 1. Ton 2. Lbs 3. Single Purse Seine Only	Total	DISPOSITION			DAMAGED	MM DAMAGED
					Kept	Returned			
						Alive	Dead		
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									

Notes:

Non-Fish Tally Sheet

TRIP NUMBER

		-			-				
--	--	---	--	--	---	--	--	--	--

SET NUMBER

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	Species Name	Sp. Code	Location (GN Only)		Condition	Sex	Specimen Number	Tag Y/N	Pinger Distance (ft)	Pinger Type	Pinger Location	Pinger Functioning (Y/N)	Notes
			H	V									
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													

<u>Location</u>	<u>Condition</u>	<u>Sex</u>	<u>Pinger Type</u>	<u>Pinger Location</u>
1 - First 3rd/upper 3rd	D - Dead	M - Male	1 - Dukane	1 - Floatline
2 - Middle 3rd	A - Alive	F - Female	2 - Other	2 - Leadline
3 - Final 3rd/lower 3rd	I - Injured	U - Unknown	3 - Fumunda	
4 - Unknown	U - Unknown			

	Species Name	Sp. Code	Location (GN Only)		Condition	Sex	Specimen Number	Tag Y/N	Pinger Distance (ft)	Pinger Type	Pinger Location	Pinger Functioning (Y/N)	Notes
			H	V									
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													

Location

- 1 - First 3rd/upper 3rd
- 2 - Middle 3rd
- 3 - Final 3rd/lower 3rd
- 4 - Unknown

Condition

- D - Dead
- A - Alive
- I - Injured
- U - Unknown

Sex

- M - Male
- F - Female
- U - Unknown

Pinger Type

- 1 - Dukane
- 2 - Other
- 3 - Fumunda

Pinger Location

- 1 - Floatline
- 2 - Leadline

Fish and Invertebrate Measurement Data

TRIP NUMBER

SET NUMBER

		-			-				
--	--	---	--	--	---	--	--	--	--

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	Species Name	Sp. Code	LENGTH (CM)	SEX	DISP. CODE	NOTES, PHOTO FRAME & CAMERA *
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Disposition Codes

- 1 - kept, not damaged
- 2 - kept, damaged
- 3 - returned dead, not damaged
- 4 - returned dead, damaged
- 5 - returned alive

- 6. returned Alive, tagged
- 7. fined, shark only
- 8. dispatched, shark only
- 9. returned unknown

Sex Codes

- M - male
- F - female
- U - unknown

	Species Name	Sp. Code	LENGTH (CM)	SEX	DISP. CODE	NOTES, PHOTO FRAME & CAMERA *
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Disposition Codes

- 1 - kept, not damaged
- 2 - kept, damaged
- 3 - returned dead, not damaged
- 4 - returned dead, damaged
- 5 - returned alive

- 6. returned Alive, tagged
- 7. fined, shark only
- 8. dispatched, shark only
- 9. returned unknown

Sex Codes

- M - male
- F - female
- U - unknown

Shark/Billfish Life History Data

TRIP NUMBER

		-			-			
--	--	---	--	--	---	--	--	--

SET NUMBER

--	--

Shark Species	Code	Sex	Lengths (cm)				Collection		Maturity Y/N						
		M / F	Total	<u>Fork</u>	Dors1 -Dors2	<u>Clasper</u>	Y / N	Specimen Number	Males			Females			
									Claspers Calcified	Claspers Rotate Forward	Seminal Fluid Present	Developing Eggs in Ovary	Enlarged Uterus	Eggs, Capsules or Fetus in Uterus	

Billfish	Code	<u>Half Girth</u>	Fork Length	<u>Eye to Fork</u>	Cleith. to Fork	Collect Y/N	Specimen Number

Comments:

MARINE MAMMAL LIFE HISTORY FORM

NOAA FORM 88-

SPECIMEN # 1 7

CARD 1 CRUISE # 13 YR 17 MO 19 DAY 21 SET # 23 LATITUDE 25 NS 1 LONGITUDE 35 EW 2

SPECIES: _____ SEX: M F 40 39

LENGTH (cm) 41 44 CURVILINEAR? Y N 45 GIRTH (cm) 46 49 FLIPPER LENGTH (cm) 50 52

LACTATING?: Y N 53 FETUS: M F 54 FETUS LENGTH (cm) 55 58 CURVILINEAR? Y N 59

WERE THESE COLLECTED? :

YES NO		YES NO		YES NO	
<input type="checkbox"/> <input type="checkbox"/>	CARCASS 60 <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	HEAD 61 <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	TEETH 62 <input checked="" type="checkbox"/>
<input type="checkbox"/> <input type="checkbox"/>	STOMACH 63 <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	BLUBBER 64 <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	BIOPSY 65 <input checked="" type="checkbox"/>
<input type="checkbox"/> <input type="checkbox"/>	OVARIES 66 <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	FETUS 67 <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	FETUS BIOPSY 68 <input checked="" type="checkbox"/>
<input type="checkbox"/> <input type="checkbox"/>	TESTIS 69 <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	ADRENALS 70 <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	OTHER 71 <input checked="" type="checkbox"/>
<input type="checkbox"/> <input type="checkbox"/>	PHOTOS 72 <input checked="" type="checkbox"/>				

COMMENTS: _____

DIAGNOSTIC CHARACTERISTICS:

SKETCH THE ANIMAL:

- 1
- 2
- 3
- 4
- 5

N FIELD
LAB

CARD 2

8	9	15	21	27	33	39 Ln (mm)	SG	E
TOTAL WEIGHT (gm)	L GONAD w/epi (gm)	L GONAD w/o epi(gm)	R GONAD w/epi (gm)	R GONAD w/o epi(gm)	RIGHT TESTIS			

44 TUBULE DIAM (µm)	47 FOLL DIAM (mm)	50 CL	51 C.L. DIAMS. (mm)	53	55	57 1	59 2	61 3	63 4	65 5	67 6	69 1	71 2	73 3	75 4
			C.A. IN LEFT OVARY				C.A. IN RIGHT OVARY								

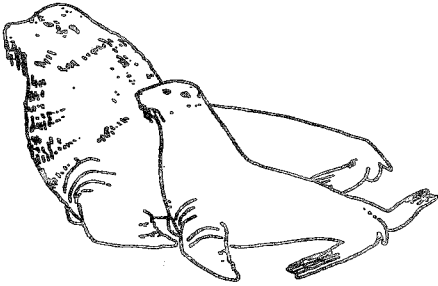
CARD 3

8	9	5	11	6	13	15	17 TOT	19	20	26	27	30 1	33 2
CA. IN RT. OV.	CA (L)	CA (R)	CORP	PG	FETUS WEIGHT (gm)	MD	GLGs	ADRENAL WTS (gm)					
C.A.+C.L.													

C.A. diams. (mm) by Type

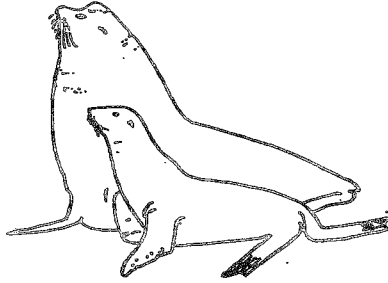
1	2	3	4	5	6

NOTES:



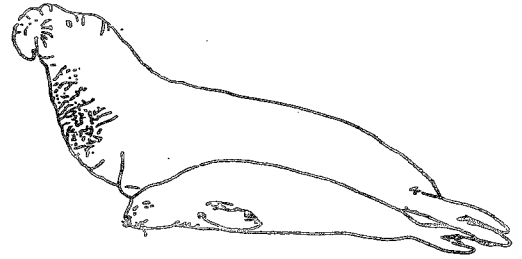
Steller Sea Lion
(*Eumatopias jubatus*)

M. to 13'/1800#; F. to 9'/600#; external ear flaps; long foreflippers; gap between 4th and 5th post canine teeth; short, stiff hair, brown to blonde; no distinct sagittal crest.



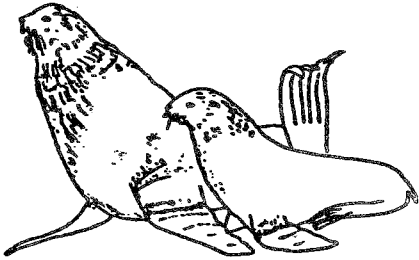
California Sea Lion
(*Zalophus californianus*)

M. to 8'/800#; F. to 6'/600#; external ear flaps, long foreflippers; M. prominent sagittal crest-light top knot; short, stiff hair, dark brown to light tan.



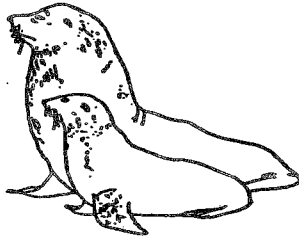
Northern Elephant Seal
(*Mirounga angustirostris*)

M. to 16'/4000#; F. to 10'/2000#; M. large, pendulous nose; F. "roman nosed"; short foreflippers; hind flippers angled backwards; 1st and 5th hind toes noticeably longer than others; minute ear hole; 4 incisors upper jaw.



Northern Fur Seal
(*Callorhinus ursinus*)

M. to 7'/650#; F. to 5'/130#; very long hind flippers; short, pointed snout; fur on foreflippers stops abruptly at wrist; soft underfur/course guard hairs; external ear flaps.



Guadalupe Fur Seal
(*Arctocephalus townsendi*)

M. to 8.5'/650#; F. to 6'/270#; very long hind flippers; fur extends onto foreflippers; "collie-like" face-dished in profile; soft underfur/course guard hairs; external ear flaps.



Harbor Seal
(*Phoca vitulina*)

M./F. to 6'/300#; spotted/blotchy coat-variable coloration; short foreflippers; hind flippers angled backwards; large ear hole; sharp nails near ends of toes; round head; 6 incisors upper jaw.

ADDITIONAL COMMENTS:

Sighting Record

TRIP NUMBER - -
 SIGHTING # DATE (YYYY MM DD)
 SET NUMBER

Position - Latitude
 Position - Longitude
 Loran: _____
 Deg. Min. Deg. Min.

Time Begin Time End
 Vessel Activity 1- Net Retrieval 5- Other
 2- Net Set 6- Trolling
 3- Drifting 7- Pole & Line
 4- Motoring
 Gear Encounter (Y/N)
 Closest Distance to Vessel Meters
 Closest Distance to Gear Meters
 Deterrent(s) Used (Y/N) Fire arm Seal Bomb Other

Species 1 Species Name _____ Sp. Code
 Best Estimate High Low
 Injured Dead

List Identifying Characteristics:

Sketch Identifying Characteristics:

Narrative:

Species 2

Species Name

Sp. Code

--	--

Best Estimate

--	--	--	--

High

--	--	--	--

Low

--	--	--	--

Injured

--	--	--

Dead

--	--	--

List Identifying Characteristics:

Sketch Identifying Characteristics:

Species 3

Species Name

Sp. Code

--	--

Best Estimate

--	--	--	--

High

--	--	--	--

Low

--	--	--	--

Injured

--	--	--

Dead

--	--	--

List Identifying Characteristics:

Sketch Identifying Characteristics:

Additional Notes / Sketches:

Appendix C

Data Form Quick Tips

Gear and Set Data Forms

POINTS TO REMEMBER

All Fisheries

Observation Type is determined by when the captain was notified of observer assignment and the time (or day) when the observed nets were set.

Target Species is not necessarily the most numerous species found in the net. It is the species the fisherman was planning to catch and market i.e. swordfish, thresher shark.

Record times as four digits using the 24 hour clock and local time (e.g., 5:30 p.m. is encoded 1730). Do not round off to 5's and 0's.

If there was zero catch for this set, write **ZERO CATCH** in the notes section of the net diagram.

Drift Gillnet and Set Gillnet

If only a portion of the net is observed, Percentage Net Observed should be less than 100%. The unobserved net is not described in a Net Characteristics Section.

If you are observing a net composed of differing gear types and you have filled out more than one Net Characteristics Section, be sure that the percentages of Net Characteristics add up to 100%.

Be sure the Length recorded in the Net Characteristics Section refers to the net section described. If you are observing a net composed of differing gear types this length is a percentage of the total net observed.

For the net diagram, record the location of all entangled marine mammals, sea turtles, and birds. **Target species** should be depicted individually using the three digit code.

Albacore Troll

If different types of jigs are used, make sure to note them in the comments section

Be sure to record the number of lines used during the troll.

Be sure to note, by recording the time, when a pole and line was used during the set

Purse Seine

Record the time the skiff has departed, record the time the skiff has circled, record the time the rings are pulled, record the time the fish are pumped and the finish time. A location should be recorded for all of these events too.

Marine Mammal interaction can occur when gear is deployed. Be sure to record the interaction at each stage of purse seine activity.

Catch Tally Sheet

POINTS TO REMEMBER

Species and Codes should appear as they do in the Species Codes listed your field manual. If there is not enough space to write the name, use the margin. There are names and codes for unidentified or incompletely identified animals.

If tallies are kept using hash marks or counters, enter whole numbers and circle them when the set is complete.

For each species the sum of the disposition columns should equal the total caught.

Disposition refers to what is done with the animal by the fisherman. Those specimens retained by the observer are considered discarded.

If any part of the animal is retained by the fisherman it is considered kept (e.g. crab claws).

The "Damaged" column is used to record damage caused by marine mammals or other causes before removal from the net, not damage caused by fishermen.

Record a "Y" in the code box for marine mammal damage if you believe the fish have been damaged by marine mammals or if you see marine mammals depredate the catch. Record an "N" for no if you are unsure of the source of damage or there is no damaged catch.

Non-Fish Catch Tally Sheet

POINTS TO REMEMBER

Complete an entry for every entangled marine mammal, sea turtle, or seabird.

Marine mammals, sea turtles, or seabirds observed becoming entangled during net pull are also recorded on a Sighting Record.

Use common names on this form.

Record characteristics used to identify the specimen in the Notes Section.

Specimen numbers for marine mammals are composed of your unique three letter code, and a consecutive four digit number.

Sea turtle specimen numbers are similar to marine mammal specimen numbers, but have a "T" embedded between the alphabetic code and the serial number. The serial number sequence for turtles is separate from your marine mammal serial numbers.

Record the camera number and photograph frame numbers in the Notes Section.

Fish and Invertebrate Measurement Form

POINTS TO REMEMBER

Species and Codes should appear as they do in the Species Codes listed in your field manual. There are names and codes for unidentified or incompletely identified animals.

Record lengths in centimeters.

Disposition is recorded for **All** fish.

Be aware of the different length measurements required for the different species.

Record the frame number(s) of photograph(s) in the Comments Section.

Record data only for those species listed on page 41 of your field manual

Shark and Billfish Life History Form

POINTS TO REMEMBER

Species and Codes should appear as they do in the Species Codes listed in the your field manual. If there is not enough space to print the name, use the margin. There are names and codes for unidentified or incompletely identified animals.

Notice that different measurements and samples are taken for different species.

Record all measurements to the nearest centimeter.

Sequencing of sample numbers is continuous across taxa except sea turtles. Shark and billfish sample numbers are followed by an "S".

If maturity is not checked, do not fill the fields with N's, leave the fields blank.

If the question is irrelevant to the gender of the animal, leave the box blank.

Maturity questions are not mutually exclusive. The answers can be any combination of Y's and N's.

If there are more of a species than there are lines provided in the appropriate section, continue on another form.

Marine Mammal Life History Form

POINTS TO REMEMBER

Collect the entire carcass of cetaceans, sea otters, Steller's sea lions, and fur seals whenever possible.

If you are unable to bring back the carcass, bring back the head and other requested parts.

If you are unable to collect carcasses or other samples, document the circumstances in the Additional Comments Section.

Specimen Numbers are composed of a unique three letter code and a four digit serial number.

Mark the boxes indicating which items were collected. If the question is irrelevant to the gender of the specimen, leave the box blank.

The Diagnostic Characteristics and the Sketch should be detailed enough to confirm the identification recorded at the top of the page.

Sea Turtle Life History Form

POINTS TO REMEMBER

Complete a life history form for every turtle brought aboard or biopsied alongside the vessel.

Turtle specimen numbers have a "T" embedded between your three letter code and the three digit serial number and are separate from marine mammal specimen numbers.

The counts of scales, scutes and pores, and the answers to the questions in the Identification Section should be consistent with your encoded species identification.

Carapace measurements are curvilinear; use only a measuring tape.

Return dead turtles to the environment after checking the flippers for tags.

Sighting Record

POINTS TO REMEMBER

Interactions are high priority; sightings are low priority.

Execute a sighting record for each discrete aggregation of marine mammals or sea turtle(s) observed. What constitutes a discrete aggregation is somewhat subjective. When a sighting occurs, look around!

Diagnostic Characteristics and Sketches should be sufficiently descriptive to support your species identification.

Sightings become interactions when marine mammals or sea turtles come within 100 meters of the vessel or fishing gear.

Sighting numbers are consecutive for each trip.

If a sighting takes place while the vessel is tending the net, you may use the Begin Pull position data from the Gear & Set Data Form.

Acknowledgements

We would like to thank John Lafargue and the Northwest Regional Office for providing some of the material used in the General Health and Safety section on this manual. We would also like to thank Jerry Dzugan and A.M.S.E.A. for providing the handouts that went along with the lessons given in class.