SOUTHERN CALIFORNIA FISHERIES MONITORING SUMMARY FOR 1993 AND 1994

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ABSTRACT

The southern California Monitoring and Management Units collectively gathered 803 discrete samples of 7,329 marine finfishes and invertebrates from local commercial fish markets or authorized fish transporters in 1993. Nineteen different species were sampled and biological information recorded for future summarization and use in formulating fisheries management strategies and decisions. Increased sampling efforts in 1994 resulted in 801 samples of 14,566 marine finfish and invertebrates representing 44 different species. Fisheries trends and threats to local fishing opportunities were identified. Results of Marine Recreational Fishery Statistics Survey interviews were also incorporated for a more complete overview of species targeted by both the sport and commercial industries.

TABLE OF CONTENTS

INTRODUCTION

The California Department of Fish and Game (Department) has the responsibility of managing state marine resources to ensure all marine species can be maintained at an optimum sustainable population level and population surplus can be wisely utilized by both recreational and commercial fisheries. These goals are stated in the California Fish and Game Code (Sections 1700, 1701) and implemented through various sections in Title 14 of the California Code of Regulations. To accomplish these goals, the Marine Resources Division has established Monitoring and Management Units (Units) that monitor commercial and sport marine fisheries, identify fishery trends, and provide sound fisheries management recommendations. The Southern Operations component is currently divided into three areas encompassing coastal counties from Point Conception to the U.S.- Mexican border (Figure 1). In addition, Unit personnel function as liaisons between the sport and commercial fishing industries, mariculturists, kelp harvesters, other governmental agencies, academic institutions, environmental groups, legislators, and the public at large. Local Department representation is provided by the Units at meetings, hearings, and media/outreach events pertaining to marine resource issues. Further, Unit personnel respond to focused fisheries investigation needs, maintain databases such as the commercial lobster, prawn, sea cucumber and high-seas longline fishery logbook systems and administer a pelagic shark tagging program.

This report summarizes our efforts to monitor and assess the status of important finfish species harvested by both commercial and sport fisheries. The ability to compare biological and harvest data from both commercial and sport fisheries over time is essential to identifying fishery trends, determining potential resource threats, and developing adequate resource management plans. Commercial fisheries monitoring was achieved by collecting biological and landing data for selected species (or species groups) from commercial markets/dealers or authorized fish transporters. Annual landing data were obtained for selected species from the Department's commercial fish landing database (CMASTR). Relevant sportfishing data was derived from expanded harvest estimates available from the U.S. Department of Commerce's Marine Recreational Fisheries Statistics Survey (MRFSS) program (U.S. Commerce, 1992).

METHODS

Although each Monitoring and Management Unit has unique fisheries or fishery variations that cause slight modifications to standard methodology, the *Monitoring and Management Sampling Manual & Scientific Aide Handbook* was developed to establish consistent market sampling protocol within the Units. The manual includes sampling procedures, measurement guides for sampling species, species identification, general information, and other duties and expectations of our temporary help. All rockfish sampling was conducted using the California Cooperative Groundfish Survey protocol for southern

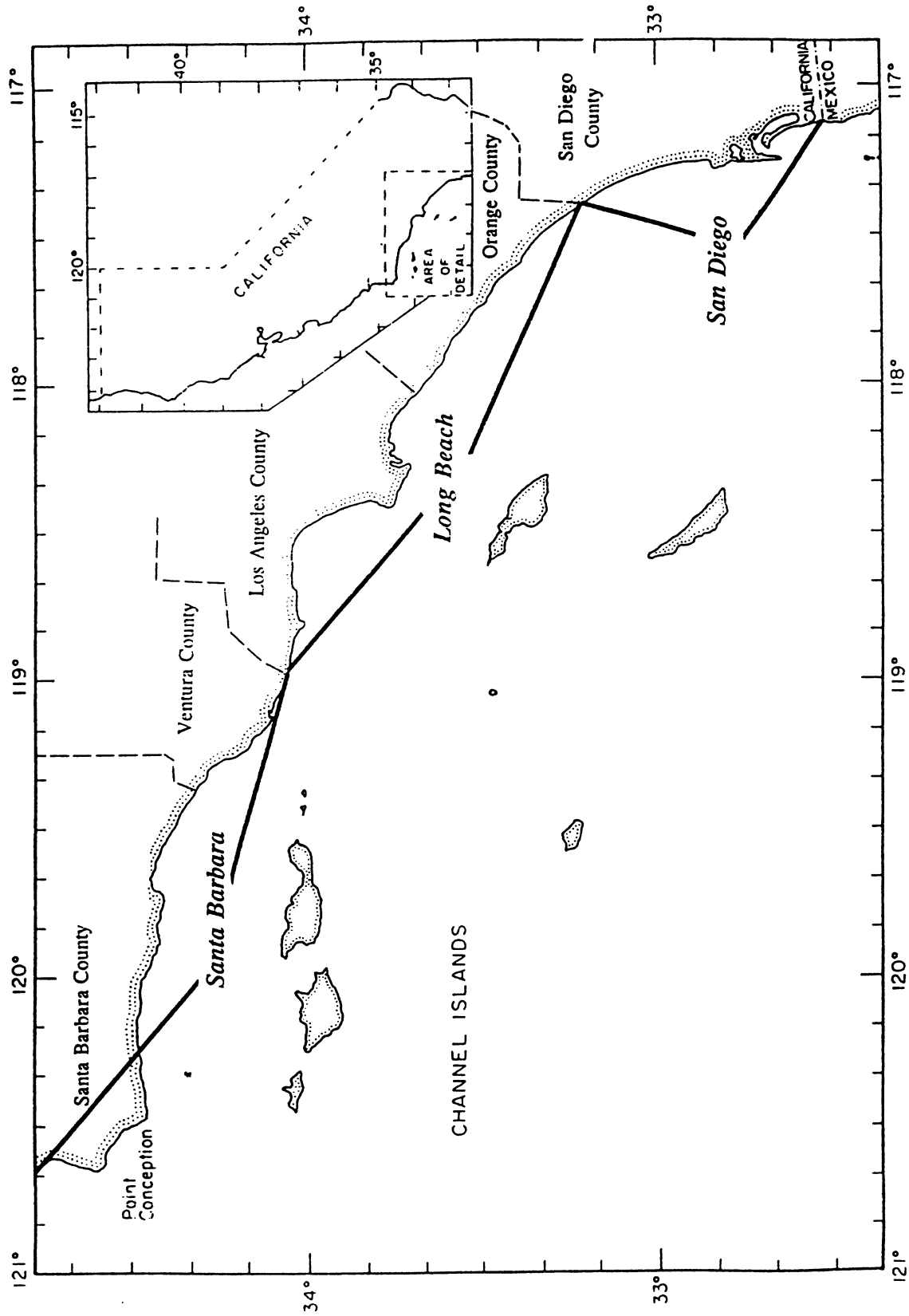

Figure 1. Locations of the Santa Barbara, Long Beach, and San Diego monitoring and management units in southern California.

California. Unit sampling priorities often fluctuate, illustrating the dynamic nature of fisheries development and management. The following groups of factors were considered to provide consistency and balance within the program:

Species Selection - Southern California commercial landings were categorized using three groupings: priority, all invertebrates, and all other finfishes (species mainly of commercial interest, quota species, or species whose management authority is other than the state: tunas, mackerels, etc.). Species (or species groups) determined to be of high sampling priority were those of greatest importance to both commercial and recreational fishers and under state fisheries management. Selection was focused on species targeted by both user groups since overutilization is potentially greatest for shared resources. Selection of secondary priority species was governed by identification of a developing threat to an existing fishery, needs of other Department/government projects, and legislative mandates. High priority species for 1993 and 1994 were California halibut, white seabass, nearshore rockfish, swordfish, sharks (threshers, shortfin mako, leopard and soupfin) and California sheephead. All sampled species for 1993 and 1994 are listed in Appendices A and B including those of secondary priority.

Species landed in the greatest numbers are presented (Table 1) to illustrate the variation in target species within Units. Note that virtually all the top commercially landed species are also targets of the sport fishery and are sampled by the Monitoring and Management Units.

Market/Dealer Selection - Selection of markets/dealers was focused on those handling or buying the greatest volume of priority species. However, market/dealer access was also a factor in the selection process. Markets were added or deleted as fishery or purchasing conditions changed. Variation in market/dealer selection incorporates new (sometimes non-traditional as well) and smaller markets, thereby decreasing our dependence on a few large buyers

Recreational and Commercial Data - Published and preliminary MRFSS statistically expanded sport fish data collected in southern California were used as a comparison to commercial data. MRFSS estimates included total catch and mean length for selected species. For a description of the MRFSS program refer to the literature citation section for the most recent MRFSS publication. Annual commercial landing data were obtained from the CMASTR database. Mean lengths and weights (where applicable) for priority commercial species were collected using the Unit market sampling protocol. Additional information was solicited from sportfishing organizations such as Sportfishing Association of California and the San Diego Sportfishing Council regarding sportfishing trends and threats. Requests were also fielded and information exchanged with various sport diving councils, as they comprise a significant proportion of the total sportfishing community. Biological (length, sex, and weight) and catch gear data from market sampling efforts were edited for errors and maintained on a personal computer (PC). These data combined with the CMASTR database and the MRFSS landing estimates were used to determine the sport and commercial fishing pressure on our local marine resources.

All landing weights in this report are given in pounds. Market-based length data

Table 1. Top 12 finfish species (pounds) landed commercially in each Monitoring and Management Unit.

SPECIES/SPECIES GROUP	1993	1994	% CHANGE
SANTA BARBARA			
* Rockfishes	1,616,393	1,138,807	-29
* Swordfish	242,869	1,048,372	+332
* California sheephead	180,349	108,898	-40
* California halibut	157,136	142,274	-9
* White seabass	56,768	44,444	-22
* Common thresher shark	56,540	180,744	+220
* Pacific angel shark	49,534	18,181	-63
White croaker	35,932	29,516	-18
* Shortfin mako shark	34,025	58,144	+71
* Soupfin shark	25,049	23,376	-7
* Shovelnose guitarfish	20,015	34,024	+70
* Opah	15,357	18,082	+18
LONG BEACH			
* Rockfishes	645,286	472,947	-27
* Swordfish	384,510	425,612	+11
White croaker	317,819	211,317	-34
* Common thresher shark	163,634	103,560	-37
California barracuda	94,589	291,708	+208
* Shortfin mako shark	51,561	50,953	-1
* California halibut	47,467	31,687	-33
California scorpionfish	36,806	57,262	+56
* White seabass	30,137	19,243	-36
* California sheephead	19,537	39,841	+104
* Opah	15,128	23,953	+58
* Soupfin shark	8,110	17,779	+119
SAN DIEGO			
* Swordfish	436,154	528,506	+21
* Rockfishes	332,074	244,958	-26
White croaker	132,386	132,760	no change
* California sheephead	113,157	105,297	-7
* California halibut	59,381	12,618	-79
* Common thresher shark	58,899	82,916	+41
* Opah	58,230	72,577	+25
* Shortfin mako shark	40,747	50,014	+23
Striped mullet	13,509	7,293	-46
California scorpionfish	11,122	40,394	+263
* Soupfin shark	10,683	16,814	+57
* White seabass	8,489	2,952	-66

Note: * - Species sampled by the Monitoring and Management Units.

were measured in millimeters for total length (TL), alternate length (AL), or fork length (FL) depending on the species. As of 1994, MRFSS length estimates are measured in millimeters FL.

For ease of reference, the rockfish category listed in all tables encompasses all *Sebastes* and *Sebastolobus* species. This group is also referred to as the "rockfish complex". Although the California scorpionfish, *Scorpaena guttata*, is a member of the rockfish family, it was monitored separately since it is one of the primary target species of the live finfish fishery. A complete list of common and scientific names of species mentioned in this document is provided in Appendix C.

CHARACTERIZATION OF MONITORING AND MANAGEMENT UNITS

Santa Barbara/Ventura Counties

The four harbors in the Santa Barbara Unit consist of Santa Barbara Harbor (Santa Barbara County), and Port Hueneme, Channel Islands, and Ventura Harbors (Ventura County). Each harbor accommodates a varying mix of sport and commercial fishing activity. Port Hueneme Harbor is unique in having deep water port capacity. This attribute has attracted large scale industrial and military users to its facilities, almost completely replacing the blend of sport/commercial fishing vessels seen at other ports. Port Hueneme Harbor serves as a primary offloading point for local and transient purse seiners that land large quantities of mackerel, sardines, anchovies, and market squid. The four harbors, combined, accommodate approximately 655 commercial fishing vessels and 40 commercial passenger fishing vessels (CPFV). There is one CPFV landing in Santa Barbara County and five in Ventura County. The total estimated commercial landings for the Unit in 1993 were over 67 million pounds and had a value to the fishermen (ex-vessel value) of $30 million. Landings and ex-vessel value increased in 1994 as nearly 80 million pounds were brought to port and valued at almost $35 million. Invertebrate landings, almost exclusively market squid and sea urchin, represented virtually all of the landings and provided the majority of the total ex-vessel dollar value to the port. Landings of finfish species important to both recreational and commercial fisheries totaled 2.7 million pounds in 1993 and increased to 3 million pounds in 1994. Rockfishes, California halibut, California sheephead, thresher sharks, swordfish and white seabass were the major components of this category. The Ventura Harbor-based high-seas longline fishery for swordfish experienced considerable political turmoil during 1994 as sportfishing groups and some commercial fishermen lobbied vigorously for further regulation of this fishery.

Los Angeles/Orange Counties

The Long Beach Unit oversees the commercial and recreational fisheries that occur within Los Angeles and Orange Counties. Total landings for these counties were over 116 million pounds with an ex-vessel value of $25 million in 1993. Landing estimates for 1994 were over 100 million pounds and valued at $25 million ex-vessel. A majority of the commercial catch was offloaded at San Pedro and Terminal Island's 10 municipal fish businesses, two canneries, and numerous mobile dealers. The largest purse seine fleet in the state also resides in San Pedro. Wetfish landings of Pacific sardine, Pacific mackerel, jack mackerel,

and market squid accounted for most of all landings and fish landing revenues to the Los Angeles and Orange County area. The Long Beach Unit has the additional responsibility of sardine and mackerel quota monitoring under legislative mandate.

Eleven CPFV landings located from Malibu to Dana Point hosted about 100 CPFV vessels. These vessels join private vessel operators to fish the coastal kelp beds and southern Channel Islands.

San Diego County

Three major ports: Oceanside Harbor, Mission Bay, and San Diego Bay are within the purview of the San Diego Unit. Berthed at these ports are approximately 300 commercial fishing vessels. Total commercial landings of over 3 million pounds were recorded in 1993 with an ex-vessel value of over $6 million. Landings as well as ex-vessel value increased in 1994 to 5 million pounds and over $7 million. Commercial fisheries for sea urchin, California spiny lobster, swordfish, rockfishes, and pelagic sharks produced the greatest landings and dollar value. A 52% increase in total landings for 1994 resulted from a higher volume of tunas, swordfish, and pelagic sharks. Tuna landings were elevated dramatically due to a local Wildlife Protection Division investigation which uncovered large previously undocumented landings of bluefin and yellowfin tunas, skipjack and Pacific bonito. Landings of live and premium fresh (dead) finfish continued to contribute significantly to the total ex-vessel value to the port as price was generally 3-5 times greater than fresh (dead) fish.

The multi-million dollar recreational fishing industry consists of over 80 CFPVs capable of carrying anglers to distant international waters in search of tuna and large gamefish as well as to local kelp beds to target nearshore finfishes. Numerous marinas and trailered boat launching facilities provide additional ocean fishing opportunities.

RESULTS AND DISCUSSION

Total southern California commercial landings were estimated to be 187,552,000 pounds in 1993 and 184,736,000 pounds in 1994. The Monitoring and Management Units collected 803 samples from 18 different species of finfish, one invertebrate species, and the rockfish complex (representing 21 species of rockfish and thornyhead) in 1993. A total of 7,329 finfish and 175 invertebrates were sampled throughout southern California. Sampling efforts increased in 1994 as 12,115 finfishes and 2,451 invertebrates were examined from 801 discrete samples. These samples included 22 different finfish species, one invertebrate species and 24 species of the rockfish complex. Low priority species were sampled as time and interest permitted and are also included in Appendices A and B. Specific issue-driven sampling included the live-finfish fishery, spot prawn, and the high-seas longline fishery. The MRFSS program conducted 16,778 intercept interviews with southern California sport anglers in 1993. This information combined with statistical expansion surveys resulted in an estimate of 16.5 million marine fishes landed during 3.6 million fishing trips by 887,000 sport anglers (Table 2). The 12,732 MRFSS intercept interviews conducted in 1994 resulted in expansion estimates of 25 million marine fishes landed during 4.3 million fishing trips by 1.2 million sport anglers.

The following section is a summary of southern California fisheries data derived

Table 2. Estimated total numbers of fishes caught by southern California sport anglers.

SELECTED SPECIES	1993	1994
Pacific mackerel*	3,882,000	6,989,000
Rockfishes*	2,341,000	5,628,000
Kelp bass	2,268,000	1,729,000
Barred sand bass	1,417,000	1,688,000
California barracuda*	1,071,000	1,994,000
White croaker	1,014,000	761,000
Pacific bonito	539,000	411,000
Barred surfperch	345,000	358,000
Spotted sand bass	332,000	107,000
Sharks / rays*	293,000	348,000
Jacksmelt	276,000	383,000
California halibut*	250,000	497,000
California scorpionfish*	202,000	440,000
Queenfish	156,000	242,000
Halfmoon	120,000	102,000
Sanddabs	116,000	152,000
Yellowtail	101,000	25,000
California lizardfish	99,000	122,000
Opaleye	77,000	81,000
Ocean whitefish*	75,000	516,000
Blacksmith	73,000	29,000
Walleye surfperch	61,000	134,000
California sheephead*	57,000	103,000
Topsmelt	21,000	252,000
Total For *All* Sport Caught Fish:	***16,473,000***	***24,953,000***

Data compiled from Marine Recreational Fisheries Statistics Survey preliminary results for 1993 and 1994.
* = Species sampled by Monitoring and Management Units.

from market sampling, the CMASTR database, and the MRFSS program. Anecdotal information has been included to add detail to fishery profiles.

Fisheries Utilizing Entangling Nets

Commercial fishermen used entangling nets to land over 2 million pounds of various priority finfishes at southern California ports in 1994. This is a slight decrease from the 2.3 million pounds landed in 1993. Drift and set gill nets were the primary entangling nets used by these fishermen.

Set Gill Net: This fishery uses primarily monofilament nets 600 to 1800 feet in length anchored at both ends to target a variety of fishes inhabiting nearshore areas. The fishery operates in waters off the Channel Islands and along the mainland to the U.S./Mexican border. Specific net mesh size and depth combinations are employed to target certain species and are controlled by law. The primary species landed are California halibut, lingcod, Pacific angel shark, soupfin shark, and various rockfishes.

The most dramatic fishery trend occurred as the Marine Resources Protection Act of 1990 became fully functional. The Act was phased-in over a four year period which resulted in successively more restrictive nearshore gill net fishing. Gill net fishermen making landings decreased from 95 in 1993 to 71 in 1994. Gill net use within three nautical miles of shore south of Point Arguello and around the Channel Islands is now prohibited. Consequently, total landings of the traditional gill net caught species such as California halibut, white seabass, leopard shark, and rockfishes declined 40%, 28%, 53%, and 20%, respectively, from those of 1993. A newly implemented size requirement for leopard shark (now in line with the sport fishery) was partially responsible for the dramatic reduction in landings. The rockfish complex continues to be the largest species group caught by set gill nets (this fishery occurs well beyond the three-mile limit). Traditional gill net effort was redirected to other gear types, particularly hook-and-line gear (Table 3). In contrast to the declines in commercial landings, the MRFSS estimated sport landings for the same species increased, particularly for white seabass (240%), all rockfishes (140%) and California halibut (98%).

Mean lengths of sampled California halibut in both 1993 and 1994 were comparable for commercial and sport fishers (Appendices D and E). In contrast, commercial fishermen caught larger leopard shark, white seabass, and rockfishes (bank, bocaccio, bronzespotted, chilipepper, speckled, splitnose, and vermilion) for the same two years. This suggests older age groups of these fishes were caught by commercial fishermen.

Drift Gill Net: Large mesh multifilament nets are employed by the southern California drift gill net fleet to target pelagic sharks and swordfish. Nets range from 5,000 to 6,000 feet in length, composed of 16 to 22 inch mesh, and buoyed to fish an average depth of 25 feet below the surface. This fishery operates in the deeper waters off San Francisco to San Diego. State law limits this fishery to 150 permittees, and 126 made landings in Southern California. Drift gill nets targeted swordfish, common thresher shark, and shortfin mako shark. Landing estimates for those species captured by drift gill net in 1993 were 1,042,500; 260,800; and 126,400 pounds, respectively. Landings for 1994 were 642,400; 374,500; and 160,100, respectively. Bigeye and pelagic thresher sharks, various tuna species, opah and louvar were also taken and marketed. For trend comparison, MRFSS estimates sport anglers caught 5,000 shortfin mako and 3,000 thresher sharks during 1993. In 1994, sport take of shortfin makos increased dramatically to 21,000 while the

Table 3. Comparison of percent catch by gear for 1993 and 1994 in southern California.

	Set Gill Net		Drift Gill Net		Trawl		Hook & Line		Longline [1]		Miscellaneous	
Species	1993	1994	1993	1994	1993	1994	1993	1994	1993	1994	1993	1994
CA halibut	86%	57%	0%	0%	10%	39%	3%	4%	0%	0%	1%	0%
White seabass	58%	37%	39%	56%	0%	0%	3%	7%	0%	0%	0%	0%
Leopard shark	86%	42%	1%	0%	0%	1%	10%	41%	0%	14%	3%	2%
Rockfishes	25%	16%	0%	0%	0%	3%	70%	48%	4%	32%	1%	1%

1 - Longline includes set and Portuguese longline gear only

number of threshers remained at 3,000.

Fisheries Utilizing Roundhaul Nets

Roundhaul gear includes purse seines, drum seines and lampara nets. These are large panels of webbing used to surround schools of fish. The bottom edges of the panels are drawn tight or pursed, enclosing the school of fish. The captured fish are scooped or brailed into the hold. The fisheries that use roundhaul gear are commercial wetfish, squid, and live-bait.

Commercial Wetfish: This fishery used purse and drum seines to land primarily Pacific sardine, mackerels, and northern anchovy at southern California ports (Table 4). Fishing occurred throughout the southern California Bight with approximately 25 roundhaul boats making landings mainly in San Pedro/Terminal Island and Santa Barbara. These species were canned or frozen whole for human consumption, canned for pet food, or packaged as dead bait. Focused sampling of sardines and mackerels was conducted by the Long Beach Unit pursuant to legislative mandate.

Squid: The total number of vessels that participated in the southern California fishery climbed from 63 vessel in 1993 to 71 vessels the following year. The preponderance of these vessels were using roundhaul nets. Landings also increased accordingly from 74,138,000 pounds to 86,055,000 within the

Table 4. Estimated wetfish landings in pounds for southern California ports.

SPECIES	1993	1994
Pacific sardine	35,698,000	28,010,000
Pacific mackerel	27,954,000	22,140,000
Jack mackerel	3,938,000	6,438,000
Northern anchovy	944,000	1,127,000
TOTAL	**68,534,000**	**57,715,000**

same two year period. Elevated interest and participation in this fishery was due to increased availability of product and stronger overseas market demand. These favorable fishery conditions attracted numerous out-of-state vessels that spawned a groundswell of public concern regarding overutilization and competition for the resource.

Live-Bait: Lampara nets and drum seines were used to catch an estimated 9.4 million pounds of live-bait in 1993 and 7.9 million pounds in 1994 (Table 5). Landings were tallied from logbook data received from the live-bait fishermen. Bait was generally plentiful and easy to find allowing vessels the opportunity to fish close to shore, averaging only 6 miles from their home port. Live-bait species include northern anchovy, Pacific sardine, Pacific mackerel, brown bait (a mixture of small fishes such as queenfish and pompano), and market squid. These fish were sold to live bait receivers, CPFVs, and individual marine recreational anglers. Live-bait availability and harvest is vital to sportfishing operations throughout southern California.

Pacific mackerel was the top sport species caught both in 1993 and in 1994 (Table 2). Increased fishing pressure applied by both the sport and commercial fisheries necessitates close monitoring by Unit staff to ensure future availability. Monitoring of these fisheries and recommending management strategies are essential in preventing economic hardships on either industry.

Fisheries Utilizing Line Gear

The commercial finfish catch by all hook-and-line gear types in southern California was estimated at 2.9 million pounds of priority finfishes for 1993, and 3.6 million pounds in 1994. Hook-and-line gears included rod-and-reel, hand line, vertical set line, longline, jig and troll.

Hook-and-line (excluding longline): Participation in this fishery increased from approximately 300 vessels in 1993 to 500 vessels by the close of 1994. This open-access fishery provided a viable alternative for displaced gill netters since gear requirements and cost of entry into this fishery are minimal. The primary species landed, excluding pelagic

Table 5. Estimated live-bait landings[1] in pounds for southern California ports.

Species	1993	1994
Northern anchovy	5,558,000	4,552,000
Pacific sardine	3,634,000	3,312,000
Pacific mackerel	14,000	20,000
Brown bait[2]	8,000	14,000
Market squid	212,000	8,000
TOTAL	**9,426,000**	**7,906,000**

1 - Derived from vessel logbook data
2 - Mixture of any small fish such as queenfish or pompano

species, were rockfishes, California scorpionfish, white croaker, California sheephead, cabezon, lingcod, sablefish, ocean whitefish, and California halibut. Many of these same species were also among the top species caught by southern California anglers (Table 2). Commercial fishermen operate along the mainland and island coastlines and on offshore banks. The nearshore hook-and-line fishery is visible to, and often in direct conflict with, the local angling community due to the competition for the same resources. The preliminary estimate for the sport rod-and-reel catch for the southern California Bight increased from 16.4 million fish in 1993 to 24.9 million fish in 1994 (Table 2).

Intense sport and commercial fishing effort is expended on the nearshore rockfish complex. Commercial landing estimates for hook-and-line caught rockfish totaled over 1.8 million pounds for 1993 which represented 74% of all rockfish taken by all gear types. Landings decreased slightly to 1.6 million pounds in 1994, however, hook-and-line gear captured 82% of all rockfish landed. MRFSS data on rockfishes suggests sport anglers captured 2.3 million pounds in 1993 and another 5.6 million pounds in 1994 (using MRFSS calculated average rockfish weight of one pound and applying it to Table 2) . MRFSS preliminary data indicates that blue, yellowtail, and vermilion rockfishes were caught in greater numbers by sport anglers than any other rockfish species. Commercial market categories of bocaccio, blackgill, and miscellaneous red rockfish recorded the greatest volume of landings for both 1993 and 1994. In general, sampled commercial hook-and-line caught rockfishes were larger than sampled sport caught rockfishes (Appendices D and E).

Included within the hook-and-line fishery is the live finfish component. Twenty-nine percent of all hook-and-line caught live finfishes were rockfishes in 1993. This value climbed to 43% in 1994. High prices were paid for resident rockfishes, such as grass rockfish, fueling focused fishing efforts and increased landings. Both recreational and commercial fishers reported the need to find new fishing grounds as local populations were depleted. Primarily a sport target in the past, grass rockfish comprised only 4% of the total commercial hook-and-line live rockfish catch in 1993. Commensurate with its meteoric rise in popularity, the percentage rose to 51 by the end of 1994. With an average ex-vessel price of $5.00 per pound, intense fishing pressure is expected to continue and shift to other rockfish species when landings of the current target species fail to meet demand. Some rockfishes tend to be slow growing, habitat-specific species and are susceptible to intense and localized fishing pressure. Market sampling of rockfishes continued as documenting species composition from various locations became increasingly important. Additional general information on the live finfish fishery can be found in the Live Finfish section of this report.

Longline: The number of active high-seas longline vessels fishing in waters beyond the U.S. Exclusive Economic Zone swelled from 16 in 1993 to 30 by the end of 1994. Target species were swordfish, tunas, and common thresher shark. Marketable bycatch included opah, dolphinfish (mahi mahi), shortfin mako shark, and escolar. Typically, vessels fish 15 to 45 miles of monofilament mainline per set. Each set is rigged with swiveled gangions baited with large squid and colored light sticks. Fishing takes place at night when swordfish are available in surface waters.

Landings for all longline caught fish rose from 316,000 pounds in 1993 to 1.4 million pounds in 1994 as interest in this fishery increased. The percent of swordfish caught by longline vessels compared to all gear types also increased dramatically, from 8% in 1993

to 43% in 1994.

Although fishing activity occurs in distant fishing grounds outside of the State's jurisdiction, the target species are presumed to be the source for our local populations. It is also believed that shark populations are highly susceptible to sustained intense fishing pressure. Issues regarding bycatch and increased fishing pressure on target species were raised by sport fishing organizations and resulted in legislation to limit the number of vessels and required improved documentation of fishing activities. While the original bill was defeated, the sport fishing community pledged to seek similar legislation in 1995.

As the controversy over longline caught bycatch increases, so does the need for additional data on our local stocks affected by increasing fishing pressure. Pelagic shark species, in particular, have been landed in increasingly large numbers by the longline and net fisheries as well as by local sport anglers. The Long Beach Unit administers a pelagic shark tagging program that collects vital biological and fisheries data used to address abundance and sustainability of our local shark populations. In 1994, 865 sharks were tagged, more than doubling the number tagged in 1993 (Laughlin, 1994 and 1995). A total of twenty-one tagged shortfin mako and blue sharks were recaptured in 1994, resulting in the highest recapture total in the program's history.

Fisheries Utilizing Entrapping Gear

Prawn: Spot prawns are landed both fresh and live by trawl and trap gear. Traps can be no larger than 6 feet and placed in waters no less than 300 feet. The most productive fishing areas seem to be at the outer Channel Islands, especially San Clemente and San Nicolas Islands. Total landings for 1993 and 1994 were estimated at 278,400 and 394,000 pounds, respectively. The ex-vessel price for fresh spot prawns was $3.00 to $4.00 per pound, while $6.00 to $7.00 per pound was offered for the live product. Due to the significant price differential, there has been an increased interest in trapping.

The Long Beach Unit drafted proposed regulatory changes in an Environmental Document during 1994. The Department sought changes in the fishing seasons and additional gear limitations. Mean carapace length for spot prawn sampled in 1993 was 45 mm. and the ratio of males, females and transitionals was 1.0 : 2.0 : 1.0. Prawns sampled in 1994 were slightly larger (46 mm.) And the sex ratio was 2.4: 2.0: 1.0.

Multi/Miscellaneous Gear Fisheries

Live Finfish: An estimated 319,000 pounds of live fish valued at $1 million were taken from nearshore rocky habitats along the mainland coast and offshore islands in 1993 (Table 6). Estimated landings for 1994 were 393,000 pounds valued at over $1.3 million (Table 7). Major target species continue to be California sheephead, rockfishes, California scorpionfish, cabezon, and California halibut. What began as a small trapping operation is now a complex million dollar fishery using many gear types, targeting a multitude of species, and delivering the product in a variety of ways and conditions. Five major gear types are now employed to deliver both live and premium quality fresh (dead) fish to mainly mobile buyers (Tables 6 and 7). Numbers of fishermen making at least one live fish landing increased from 617 in 1993 to 802 in 1994. Some of these fishermen, however, were not regularly seeking live fish and were only making occasional landings when the opportunity presented itself. Although trapping and hook-and-line were used to capture the most live fish in both years, net and trawl gear gained in popularity and use. Increasing concern has been expressed by the sportfishing

Table 6. Total live finfish landings (pounds) by gear type in southern California for 1993.

SPECIES	H & L [1]	TRAP	NET[2]	TRAWL	DIVE	MISC.	TOTAL	VALUE[3]
California sheephead	78,517	103,349	1,749	269	1,858	27,345	213,162	$ 693,138
Rockfishes	38,088	785	38	24	0	4,113	43,028	118,863
California halibut	184	142	24,302	2,020	0	1,405	28,016	115,285
California scorpionfish	6,372	1,679	2,164	11,317	0	1,722	23,254	57,077
Lingcod	4,018	21	45	149	0	15	4,248	1,856
Cabezon	74	367	59	5	0	16	521	5,186
All other[4]	2,398	3,310	1	1	0	977	6,687	17,854
TOTAL	129,651	109,330	28,321	13,785	1,858	35,991	318,936	$ 1,009,259

1 - Hook-and-line
2 - Gill and trammel net
3 - Ex-vessel
4 - All Other category contains 3 additional species

Table 7. Total live finfish landings (pounds) by gear type in southern California for 1994.

SPECIES	TRAP	H & L [1]	TRAWL	NET [2]	DIVE	MISC.	TOTAL	VALUE[3]
California sheephead	143,137	37,955	1,804	264	11,330	2,723	197,213	$ 645,551
California halibut	66	785	32,993	30,074	39	923	64,880	267,494
Rockfishes	6,711	51,006	382	593	169	291	59,152	178,040
California scorpionfish	12,280	13,434	12,990	956	70	358	40,088	89,444
Cabezon	2,372	9,760	6	18	10	5	12,171	54,424
Lingcod	268	554	562	26	0	31	1,441	2,124
All other[4]	11,352	5,124	352	569	0	551	17,948	24,602
TOTAL	176,186	118,618	49,089	32,500	11,618	4,882	392,893	$ 1,261,679

1 - Hook-and-line
2 - Gill and trammel net
3 - Ex-vessel
4 - All Other category contains 28 additional species

community. A more detailed fishery description can be found in McKee (1994 and 1995) and Palmer-Zwahlen (1993).

Documented live California sheephead landings of 213,000 pounds represented 67% of the total live catch and 70% of all California sheephead landed in 1993. Landing values for 1994 were 197,000 which represented 50% of the live catch and 63% of all California sheephead taken. The total sport

fishery for California sheephead was estimated at 57,000 fish in 1993 and 103,000 fish in 1994 (Table 2). Mean total length for sampled commercial live California sheephead was 36 cm. compared to 39 cm. for the sport caught component for 1993 (Appendix D). Market preference for sheephead weighing 1 to 2 pounds would account for the size difference between the commercial and sport caught fish. Both length estimates in 1994 were slightly lower than those of 1993.

One trend of major biological concern is the wide variety of "reef" dwelling fishes now caught and brought to market. By the end of 1994, 47 different nearshore finfish species were captured for sale. Historically, many of these species have not had value to sport or commercial fishermen. It is unknown what effect increased fishing effort may have on the entire assemblage of species residing within the nearshore rocky habitat. Management recommendations to further restrict commercial trapping effort were developed by the Monitoring and Management staff and are incorporated into pending legislation that will likely become law.

Harpoon: Harpoon gear was used to capture over 214,000 pounds of swordfish in 1993 and over 239,000 in 1994. The season typically begins in May, peaks in the summer months, and ends in December. Although this fishery targets swordfish, small quantities of shark, primarily common thresher and shortfin mako, are also taken. The modern harpoon fishery began in the early 1900's and peaked in 1978 when over 300 vessels participated. This decade has seen less than 50 vessels per year, as the more efficient drift gill netting has replaced harpooning as the primary gear type to harvest swordfish. Harpoon gear consists of a wood or metal handle tipped with a bronze dart. A 15-46 meter mainline is attached to the dart and has a float and vessel marker buoy attached to the end. Harpooners lean out on a "pulpit" on the bow of the vessel and thrust the dart and buoy system into the fish. The harpooned fish is left to exhaust itself and is retrieved a few hours later. Exceptional condition and quality of fish results from harpooning and these fish garner prices up to $6.00 per pound.

SUMMARY

The commercial fishing industry often experiences swift and dynamic changes, unlike the sport fishing industry, which changes little from year to year. New commercial fisheries, such as the live fish fishery, combined with continued pressure from recreational anglers can prove deleterious to local finfish and invertebrate populations. Consistent monitoring by the Department is requisite in obtaining and/or maintaining the comprehensive view necessary for proactive and cooperative fisheries management decisions.

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Appendix A. Commercial market sampling summary for southern California for 1993.

SPECIES	# SAMPLES	# LENGTHS	# WEIGHED	# SEXED
Swordfish	83	709	41	0
Common thresher shark	55	190	31	136
Leopard shark	64	288	31	80
Bigeye thresher shark	9	15	4	4
Soupfin shark	53	173	30	73
Shortfin mako shark	80	326	41	110
White seabass	48	215	33	109
Opah	15	76	7	0
California halibut	231	2,050	173	387
All Rockfishes*	73	1,127	0	0
Brown smoothhound	17	74	5	50
Shovelnose guitarfish	23	194	10	0
Dolphinfish (mahi mahi)	2	7	0	0
California sheephead	18	190	10	190
Pacific angel shark	11	31	3	27
Tuna/albacore	10	116	10	0
Spot Prawn	4	175	3	167
Escolar	5	5	5	0
Skipjack	1	2	0	0
Lingcod	1	1	0	0
TOTALS	**803**	**5,964**	**437**	**1,333**

* - Rockfish category includes 21 species of rockfish and thornyhead
Note: **# WEIGHED** - Number of samples where a sampled weight was recorded.

Appendix B. Commercial market sampling summary for southern California for 1994.

SPECIES	# SAMPLES	# LENGTHS	# WEIGHED	# SEXED
Pacific sardine	119	3281	3281	3281
Swordfish	118	1283	1637	0
Pacific mackerel	113	2614	2614	2614
Shortfin mako shark	112	465	99	228
All rockfishes*	64	1634	0	0
Jack mackerel	55	1678	1678	1678
Spot prawn	45	2451	0	2451
Common thresher shark	39	257	13	228
California halibut	36	201	126	34
Soupfin shark	23	101	24	36
California barracuda	19	352	65	48
Bigeye thresher shark	15	28	9	14
White seabass	11	62	9	0
Leopard shark	8	42	2	1
Opah	6	7	8	0
Tuna/skipjack	5	0	155	0
California sheephead	4	73	29	73
Angel shark	2	4	2	2
Hammerhead shark	2	2	1	2
Lingcod	1	1	0	0
Cabezon	1	0	1	0
Dolphinfish	1	0	6	0
Ocean whitefish	1	5	0	0
TOTALS	**801**	**14,566**	**9,759**	**10,690**

* - Rockfish category includes 24 species of rockfish and thornyhead

Note: **# WEIGHED** - Number of fish where a sampled weight was recorded

Appendix C. List of common and scientific names.

Anchovy, Northern	*Engraulis mordax*
Barracuda, California	*Sphyraena argentea*
Barred sandbass	*Paralabrax nebulifer*
Barred surfperch	*Amphistichus argenteus*
Bocaccio	*Sebastes paucispinis*
Bonito, Pacific	*Sarda chiliensis*
Cabezon	*Scorpaenichthys marmoratus*
Chilipepper	*Sebastes goodei*
Croaker, white	*Genyonemus lineatus*
Dolphinfish	*Coryphaena hippurus*
Escolar	*Lepidocybium flavobrunneum*
Halibut, California	*Paralichthys californicus*
Halfmoon	*Medialuna californiensis*
Jacksmelt	*Atherinopsis californiensis*
Kelp bass	*Paralabrax clathratus*
Lingcod	*Ophiodon elongatus*
Lizardfish, California	*Synodus lucioceps*
Lobster, California spiny	*Panulirus interruptus*
Louvar	*Luvarus imperialis*
Mackerel, jack	*Trachurus symmetricus*
Mackerel, Pacific	*Scomber japonicus*
Marlin, striped	*Tetrapturus audax*
Mullet, striped	*Mugil cephalus*
Opah	*Lampris regius*
Pompano	*Peprilus simillimus*
Prawn, spot	*Pandalus platyceros*
Queenfish	*Seriphus politus*
Rockfish, bank	*Sebastes rufus*
Rockfish, bronzespotted	*Sebastes gilli*
Rockfish, brown	*Sebastes auriculatus*
Rockfish, chameleon	*Sebastes phillipsi*
Rockfish, copper	*Sebastes caurinus*
Rockfish, flag	*Sebastes rubrivinctus*
Rockfish, grass	*Sebastes rastrelliger*
Rockfish, greenspotted	*Sebastes chlorostictus*
Rockfish, greenstriped	*Sebastes elongatus*
Rockfish, honeycomb	*Sebastes umbrosus*
Rockfish, pink	*Sebastes eos*
Rockfish, rosy	*Sebastes rosaceus*
Rockfish, speckled	*Sebastes ovalis*
Rockfish, splitnose	*Sebastes diploproa*
Rockfish, starry	*Sebastes constellatus*
Rockfish, treefish	*Sebastes serriceps*

Appendix C (Continued)

Rockfish, vermilion	*Sebastes miniatus*
Rockfishes	*Sebastes spp.*
Sablefish	*Anoplopoma fimbria*
Sanddabs	*Citharichthys spp.*
Sardine, Pacific	*Sardinops sagax*
Scorpionfish, California	*Scorpaena guttata*
Seabass, white	*Atractoscion nobilis*
Sea urchin, red	*Strongylocentrotus franciscanus*
Shark, blue	*Prionace glauca*
Shark, bigeye thresher	*Alopias superciliosus*
Shark, common thresher	*Alopias vulpinus*
Shark, leopard	*Triakis semifasciata*
Shark, Pacific angel	*Squatina californica*
Shark, shortfin mako	*Isurus oxyrinchus*
Shark, soupfin	*Galeorhinus zyopterus*
Sharks	All Class *Chondrichthyes*
Sheephead, California	*Semicossyphus pulcher*
Spotted sandbass	*Paralabrax maculatofasciatus*
Squid, market	*Loligo opalescens*
Swordfish	*Xiphias gladius*
Tuna, skipjack	*Euthynnus pelamis*
Tuna, yellowfin	*Thunnus albacares*
Walleye surfperch	*Hyperprosopon argenteum*
Whitefish, ocean	*Caulolatilus princeps*
Yellowtail	*Seriola lalandei*

Appendix D. Comparative mean lengths (millimeters) by different catch types for 1993.

Species	MRFSS Sport Anglers	Commercial Hook & Line	Gill Net Set or Drift	Longline	Trap Gear
California halibut	620 TL		654 TL		
California scorpionfish	276 TL				
California sheephead	390 TL				361 TL
White seabass	710 TL	973 TL	973 TL		
Bigeye thresher			423 AL		
Common thresher			529 AL		
Leopard shark	208 AL		378 AL		
Shortfin mako shark	413 AL		454 AL	617 AL	
Soupfin shark			476 AL		
Swordfish			1419 AL	1341 AL	
Bank rockfish	352 TL	399 TL	388 TL		
Bocaccio rockfish	471 TL	530 TL	535 TL		
Chilipepper rockfish	354 TL	393 TL	405 TL		
Cowcod rockfish	606 TL		646 TL		
Greenspotted rockfish	351 TL	294 TL	379 TL		
Speckled rockfish	305 TL	318 TL			
Starry rockfish	258TL	343 TL	319 TL		
Vermilion rockfish	342 TL	391 TL	445 TL		

Note: Preliminary MRFSS sport fish data from Marine Recreational Fisheries Statistics Survey.

Appendix E. Comparative mean lengths (millimeters) by different catch types for 1994.

Species	MRFSS Sport Anglers	Commercial Hook & Line	Gill Net Set or Drift	Longline	Trap Gear	Purse Seine	Harpoon
California barracuda	733 FL	815 TL	816 TL				
California halibut	639 FL	679 TL	644 TL				
California scorpionfish	290 FL	294 TL					
California sheephead	368 FL				317 TL		
Jack mackerel	193 FL					187 TL	
Pacific mackerel	299 FL					236 TL	
Pacific sardine	217 FL					174 TL	
White seabass	751 FL		1001 TL				
Blue shark	1933 FL			1931 FL			
Bigeye thresher			465 AL	525 AL			
Common thresher			607 AL	630 AL		352 AL	
Leopard shark	959 FL	1050 FL					
Shortfin mako shark	1225 FL	1475 FL	1195 FL	1789 FL			1152 FL
Soupfin shark		663 AL	512 AL				
Swordfish			1348 AL	1386 AL			1516 AL
Bank rockfish	375 FL	389 TL	405 FL				
Bocaccio rockfish	483 FL	494 FL	533 FL		401 FL		
Bronzespot rockfish	365 FL		459 FL				
Brown rockfish	282 FL	376 FL					
Chameleon rockfish	246 FL	329 FL					
Chilipepper rockfish	316 FL	388 FL	397 FL				

Appendix E (Continued)

Species	MRFSS Sport Anglers	Commercial Hook & Line	Gill Net Set or Drift	Longline	Trap Gear	Purse Seine	Harpoon
Copper rockfish	326 FL	362 FL					
Flag rockfish	270 FL	298 FL					
Greenspotted rockfish	297 FL	275 FL					
Greenstriped rockfish	262 FL	264 FL					
Honeycomb rockfish	170 FL				228 FL		
Pink rockfish	203 FL	357 FL					
Rosy rockfish	230 FL	237 FL			205 FL		
Speckled rockfish	331 FL	362 FL	372 FL				
Splitnose rockfish	315 FL	351 FL	362 FL				
Starry rockfish	294 FL	301 FL			307 FL		
Treefish rockfish	276 FL	296 FL			275 FL		
Vermillion rockfish	364 FL	383 FL	480 FL		390 FL		

Note: Preliminary MRFSS sport fish data from Marine Recreational Fisheries Statistics Survey. MFSS sampling protocol changed from TL measurements to FL. Market sampling for rockfish also changed to conform to sampling protocol set forth by the Department Groundfish Coordinator.