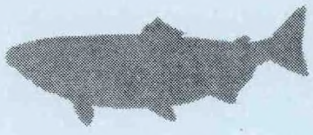
National Marine Fisheries Service

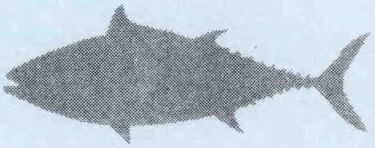
SOUTHWEST REGION

300 S. Ferry Street
Terminal Island, CA 90731



DRIFT GILL NET OBSERVATIONS FOR THE 1985 - 86 FISHING SEASON

Sandra L. Diamond, John P. Scholl, and Doyle A. Hanan



March 1987

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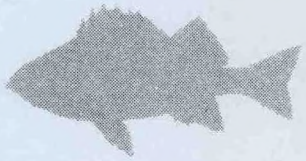

DRIFT GILL NET OBSERVATIONS FOR THE 1985-86 FISHING SEASON

by

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Southwest Region
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Terminal Island, California 90731

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DRIFT GILL NET OBSERVATIONS FOR THE 1985-86 FISHING SEASON

by

Sandra L. Diamond, John P. Scholl, and Doyle A. Hanan

INTRODUCTION

In the shark/swordfish drift gill net (DGN) fishery, California sea lion (Zalophus californianus) mortality from net entanglement has been a major concern. Based on Department of Fish and Game (DFG) observations, an estimated 600 to 1200 sea lions were killed in the DGN fishery between September 1980 and September 1981 (Miller et al. 1983). Subsequent DFG observations resulted in mortality estimates of 900 $\pm$ 425 (S.E.) sea lions killed from May 1983 to January 1984, and 225 $\pm$ 223 (S.E.) killed from May 1984 to January 1985 (Diamond et al. 1986a, Diamond et al. 1986b). The history of the observation programs and the legislation which affected them are documented in Diamond et al. 1986a.

This paper presents results from the observer program conducted from May 1985 to January 1986 (the 1985 fishing season). Characteristics of observed nets, observed catch, and an estimate of the number of California sea lions killed incidentally in the DGN fishery is presented and compared to the data from past years.

METHODS

DGN vessels were randomly contacted at sea immediately prior to net retrieval (net pull) to minimize altered fishing behavior due to an observer's presence. Once permission to board was obtained, observers were transferred to the fishing vessels from the research vessel by inflatable boat. Observers remained aboard fishing vessels for the duration of the net pull. Refusals to board the fishing vessels were rare; however, in such instances observations were made from the deck of the research vessel or from an inflatable boat positioned alongside the fishing vessel. During bad weather, observations were sometimes made from the research vessel using 7 to 10 power binoculars.

Ten observation days were scheduled each month of the fishing season except July when the contract for chartered vessel service was not yet signed. Observation trips were occasionally limited to fewer days because of bad weather or poor sighting conditions. The research vessel (R/V) WEST WIND was chartered for trips during May and June. The R/V WILD WAVE was chartered for trips from August through January (Table 1). Research vessels were used primarily to transport and house observers. Sampling

areas (Table 1) were chosen based on reports of drift gill net activity obtained from DFG market samplers, pilot-wardens, and past experience with the fishery. If no fishing vessels were sighted at the chosen location, other potential fishing locations were searched.

Observers gathered information on net length and width, mesh size, corkline depth, and set duration. The date, Fish and Game block number (Appendix I), and location by Loran C were also recorded. Net slack as measured by hanging length (distance from one knot to the next knot on the cork line) and the number of meshes per hanging was also recorded.

Data collected on catch were: 1) numbers by species; 2) shark sex, length, and reproductive condition; 3) swordfish fork and alternate lengths; and 4) marine mammal species, sex, and total length. Whenever the DGN skipper permitted, a numbered brown Temple tag was attached to the hind flipper of incidentally killed pinnipeds before they were discarded.

The estimate of California sea lion mortality was based on an estimate of total fleet effort, made by rounding the number of skipper's daily fishing logs (logs) upward to account for non-compliance by fishermen in submitting logs, and the observed kill of sea lions. For the purpose of analysis, each observed net pull was considered one observation. Kill estimates were calculated using the Bootstrap technique (Efron 1979).

RESULTS

Sixty-six net pulls representing less than 1% of the total fleet effort were observed from May 1985 through January 1986. Net pulls were observed in every fishing month except July, when there was no research vessel, and October because of a combination of bad weather and a "voluntary tie-up" declared by the fishermen to protest low market prices for swordfish. Of those months when net pulls were observed, August and January had the largest numbers of observations (18 and 15 respectively), and June and September had fewest with 3 observations each (Figure 1). All of the net pulls were observed south of Point Conception, with most of the nearshore observations made in the vicinity of Santa Barbara and Santa Catalina Islands. For the first time, net pulls were observed at or near two offshore seamounts, Rodriguez Seamount (2 observations), south of San Juan Seamount (5 observations), and southeast of San Juan Seamount (15 observations) (Figure 2).

Fleet effort was estimated at 10,000 net pulls for the season, based on the approximately 9300 logs submitted. Analysis of fleet effort by month showed a bimodal distribution with peaks in May and September (Figure 1). Location of fleet effort as reported on logs extended from the US-Mexican border to south of Cape Mendocino (Figure 3). Approximately 69% of the effort

which was reported by Fish and Game fishing blocks took place south of Point Conception; however, there was some fishing outside the existing fishing blocks and the location of this fishing effort was not reported.

Net characteristics varied a great deal among observed nets (Table 2). Average observed net length was 936 fathoms, with a range of 500-1000 fathoms. About 80% of the observed nets were longer than 900 fathoms. Width (corkline to leadline) of observed nets averaged approximately 22 fathoms, with a range from 15 to 34 fathoms. Mesh sizes (stretched measurement) of observed nets were obtained by averaging all mesh sizes on a single net and found to range from 14 to 22 inches with a 19 inch average over all observed nets. Corkline depth of observed nets averaged 4 fathoms, and ranged from 2 to 10 fathoms.

The catch observed during the 1985 fishing season was compared to that observed during the 1983 and 1984 seasons and to the May through January period of the combined 1980-82 seasons. The 1985 catch composition was similar to the previous years (Table 3), except that several new species were seen: louvar, Pacific electric ray, Northern right whale dolphin, and beaked whale (probably Hubbs). The catch per observed net pull (catch rate) of common thresher sharks was higher than the 1984 season (0.333 vs. 0.136), but still below 1983 levels (0.423). The catch rate of swordfish was lower than the 1984 season, (1.227 vs. 1.932), but was similar to the catch rates in previous years. The catch rate of blue sharks was approximately half the rate observed in any other season, while that of mola was four times higher than 1984, which was four times higher than 1983. The catch rate of opah, which has become more profitable with increasing market demand, increased ten times over 1984.

Several marine mammals were observed caught in the nets: one California sea lion, one harbor seal, two elephant seals, seven common dolphins, one pregnant Northern right whale dolphin, and a mother-calf pair of beaked whales (probably Hubbs) (Table 4). One minke whale was also caught, but was released alive by tightening the net.

The catch rate of California sea lions continued its downward trend, with the catch rate in 1985 substantially lower than the catch rate of the combined 1980-1982 seasons (Table 3). Based on estimated fleet effort (10,000 net pulls), and observed kills (1 sea lion out of 66 net pulls observed), approximately 152 $\pm$153 (S.E.) sea lions were estimated incidentally killed in the DGN fishery during the 1985 season.

DISCUSSION

The incidental take of sea lions around the Channel Islands no longer appears to be a problem in the DGN fishery, based on the declining catch rate and the low estimate of incidental mortality. It is uncertain whether the low take is due to closures enacted around the Channel Islands in 1983 by SB 1573 (Beverly) (Appendix II) or because of the change in target species from thresher shark to swordfish (Diamond et al. 1986b) with expanded fleet effort to locations north of Point Conception and farther offshore.

We do not have enough samples from north of Point Conception or from the offshore seamounts and escarpments to determine the effects on marine mammals of the expanding fishery in those areas. Since the observer program began in 1980, 443 net pulls have been observed; 419 of these were in the vicinity of the Channel Islands. Although thirty days of search effort were attempted north of Point Conception between the 1983 and 1985 seasons, only 2 net pulls were observed; high seas and generally bad weather was the major limiting factor. In 1985, for the first time, net pulls were observed at or near the offshore seamounts. The species of marine mammals observed caught in those 22 net pulls were species which had not previously been observed in drift gill nets, indicating that the kill of marine mammals in the expanded fishing range cannot be predicted by past observations. In addition, new legislation enacted in October, 1985 (AB 2199 Felando, Appendix II) prohibits the use of drift gill nets within 75 miles of the mainland coastline between June 1 and August 15, within 25 miles of the mainland coastline from December 15 to January 31, and opens the Central California DGN season between August 15 and January 31. This legislation will probably increase fishing pressure in those areas where we have few observations: north of Point Conception and at the offshore seamounts and escarpments.

In conclusion, although the take of sea lions around the Channel Islands has exhibited a dramatic decline since the observer program began, the take of marine mammals in other locations of the expanded fishery have not been investigated. Additional observations to identify marine mammal problems in those areas would be prudent.

ACKNOWLEDGMENTS

The authors wish to sincerely thank all of the people who participated in the DGN observer program between 1980 and 1986, particularly Vidal Torres, Kathy Waldron, Jim Chakarun, Rocky French, Mike Lonich, Sallie Beavers, Vaughn Silva, and Alex Vejas. We would also like to thank the captains and crews of the three research vessels: Mike Lonich, Fred Andal, Earle Andreason, Neptale Escalante and Jim Knox from the R/V KELP BASS, Larry and Lori Nufer from the R/V WEST WIND, and Mickey and Pat Pittman, and Donald from the R/V WILD WAVE. Dennis Bedford provided valuable support as the leader of the DFG shark/swordfish project, and Cedric Cooney helped with data analysis and graphics. Larry Heitz was extremely generous with his time and expertise, and we are deeply indebted to him. We are especially appreciative of the captains and crews of the fishing vessels who cooperated with our program by allowing observers onboard their vessels.

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TABLE 1: DATES and LOCATIONS of 1985 OBSERVATION CRUISES.

CRUISE DATES	RESEARCH VESSEL	APPROXIMATE SEARCH LOCATION
May 13-17	WEST WIND	Santa Catalina Is., 14-Mile Bank
May 20-24	"	Anacapa Is., Santa Cruz Is., Santa Barbara Is.
June 10-14	"	Santa Cruz Is., Anacapa Is., Santa Barbara Is.
June 17-21	"	San Clemente Is., 43-Fathom Spot
August 12-16	WILD WAVE	Anacapa Is., Santa Cruz Is., Santa Barbara Is. (skiff)*
August 19-23	"	Santa Barbara Is., Santa Catalina Is.
September 9-13	"	Morro Bay, Avila, Santa Lucia Escarpment (weather)*
September 16-20	"	Santa Barbara Is., Rodriguez Seamount (weather)*
October 7-11	"	Morro Bay, Avila, Santa Lucia Escarpment (weather)*
October 14-18	"	Morro Bay (fishermen's "tie-up")*
November 11-15	"	Santa Barbara Is., Santa Catalina Is., Osborne Bank
November 18-22	"	Santa Catalina Is., Santa Barbara Is., San Nicolas Is. (weather)*
December 9-13	"	Santa Catalina Is., Santa Barbara Is., San Clemente Is., 43-Fathom Spot (weather)*
December 16-20	"	San Juan Seamount
January 6-16	"	San Juan Seamount

* Parentheses indicate problem which shortened trip or hampered observations.

TABLE 2: CHARACTERISTICS OF OBSERVED NETS.

	MEAN	RANGE	NETS OBSERVED
Net length	936 fathoms	500-1000 fathoms	66
Net width	21.8 fathoms	14.9-34.4 fathoms	65
Mesh size	19 inches	14-22 inches	66
Corkline depth	4 fathoms	2.0-10.0 fathoms	66
TOTAL OBSERVATIONS			66

TABLE 3: MAY-JANUARY AVERAGE CATCHES PER OBSERVED NET PULLED. (1)

COMMON NAME (2)	1985	1984	1983	1980-1982 (combined)
No. of observations	66	44	71	226(1)
Estimated no. pulls	10,00	9700	11,000	14,150(3)
MARINE MAMMALS				
Beaked whale (Hubbs?)	.030	0	0	0
California sea lion	.015	.023	.085	.364
Common dolphin	.106	.068	0	0
Elephant seal	.030	0	.028	0
Harbor seal	.015	0	0	0
Minke whale	0*	.023	0	0
Northern right whale dolphin	.015	0	0	0
Pilot whale	0	0	0	.009
White-sided dolphin	0	0	0	.004
SHARKS				
Basking shark	0	0	0	.004
Bigeye thresher shark	0	.023	.070	.026
Common thresher shark	.333	.136	.423	2.785
Pelagic thresher shark	.015	0	.056	0
Blue shark	1.470	3.864	3.296	3.737
Bonito shark	.788	.614	1.197	2.539
Megamouth shark	0	.023	0	0
Soupfin shark	.015	0	0	.048
Smooth hammerhead	.015	0	.493	.009
Hammerhead (No ID)	0	0	0	.022
BILLFISH				
Marlin	.061	.068	.085	.048
Swordfish	1.227	1.932	1.070	1.496

(1) Between 1980 and 1982, there were no fishing closures from February through April. There were a total of 262 observations during these years, with 226 observations between May and January.

(2) Scientific names are included in Appendix III.

(3) Fleet effort for May - January of these years is based on the effort reported on logs. Fleet effort for the entire years 1980-82 is estimated at 15,000 net pulls. (Bedford 1982).

* One minke whale was caught and released alive

TABLE 3: (CON'T)

RAYS				
Bat ray	.015	0	0	.022
Manta ray	0	0	.014	.004
Mobula	0	.091	.028	.057
Pacific electric ray	.046	0	0	0
Skate	0	.023	0	0
Sting ray	.106	.136	.014	.035
MISCELLANEOUS FISH				
Albacore	0	.568	0	0
Anchovy	.030	.023	0	0
Bluefin tuna	0	.023	0	.004
Bonito	0	.795	5.535	.684
Bullet mackerel	.046	.068	0	0
Hake	.015	.159	.042	.088
Kelp bass	0	0	.014	0
Louvar	.015	0	0	0
Mackerel (No ID)	.712	.136	0	0
Pacific mackerel	.348	.023	.817	1.211
Mola	8.242	4.636	1.254	1.452
Ocean whitefish	0	0	.028	0
Opah	2.894	.250	.282	.066
Pipefish	0	0	0	.053
Remora	0	0	.014	.048
Skipjack	0	.273	1.606	0
White sea bass	0	0	0	.004
Yellowfin tuna	0	.091	.300	.075
TURTLES				
Ridley's	0	0	.014	0
Loggerhead	0	0	.014	0

TABLE 4: MARINE MAMMALS OBSERVED TAKEN IN DRIFT GILL NETS.

DATE	FISHING BLOCK	COMMON NAME	NUMBER TAKEN
10/80	746	Ca. sea lion	1
11/80	757	Pilot whale	2
4/81	757	Ca. sea lion	1
	806	"	2
	862	"	2
	912	"	1
	916	"	1
5/81	721	"	1
	912	"	1
6/81	656	"	1
	670	"	5
	688	"	1
	706	"	1
	805	Whale (No ID)	1
	812	Ca. sea lion	2
7/81	687	"	1
	730	"	15
	812	"	4
	835	"	2
8/81	703	"	1
	764	"	1
9/81	811	"	2
	883	"	1
10/81	723	"	1
	742	"	2
	867	"	1
	879	White-sided dolphin	1
3/82	897	Whale (No ID)	1
4/82	686	Ca. sea lion	1
	686	Harbor seal	1
	720	Ca. sea lion	1
5/82	691	"	2
	691	Whale (No ID)	1
	714	Ca. sea lion	28
	728	"	1
	733	"	7
5/83	706	Ca. sea lion	1
6/83	656	"	2
	"	Elephant seal	2
	707	Ca. sea lion	1
10/83	706	"	1
	707	"	1
9/84	708	Common dolphin	1
	"	Minke whale	1
11/84	764	Ca. sea lion	1
	764	Common dolphin	1
	806	"	1

TABLE 4: (CON'T.)

5/85	760	Elephant seal	1
	"	Common dolphin	1
	707	Harbor seal	1
	"	Common dolphin	3
	"	Ca. sea lion	1
8/85	763	Common dolphin	1
	"	Elephant seal	1
11/85	762	Common dolphin	2
12/85	SE of San Juan Seamount	Beaked whale (Hubbs?)	2
1/86	"	Northern right whale dolphin	1

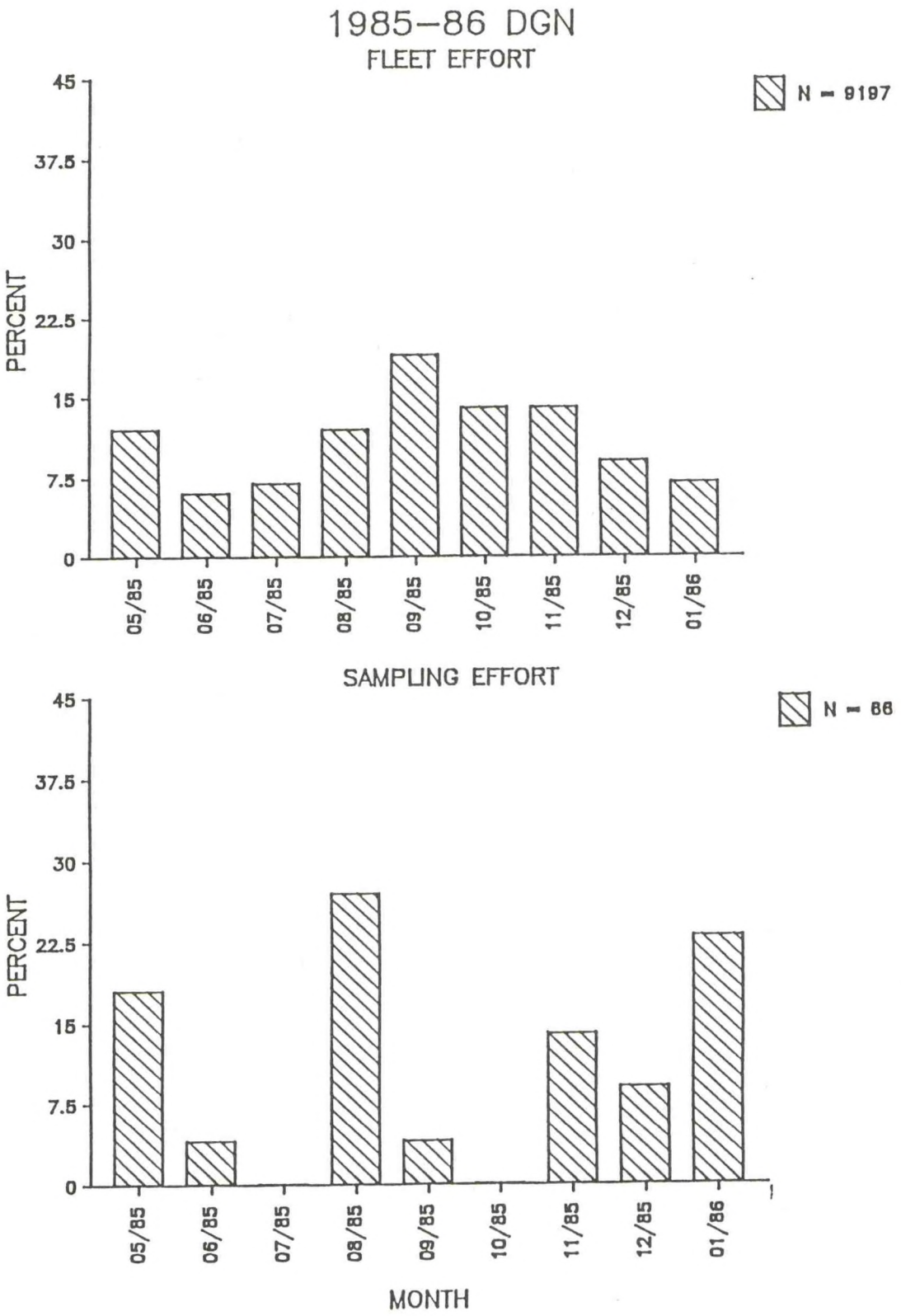


FIGURE 1. Percentages of fleet effort and sampling effort by month in the DGN fishery, May 1, 1985 - January 31, 1986.

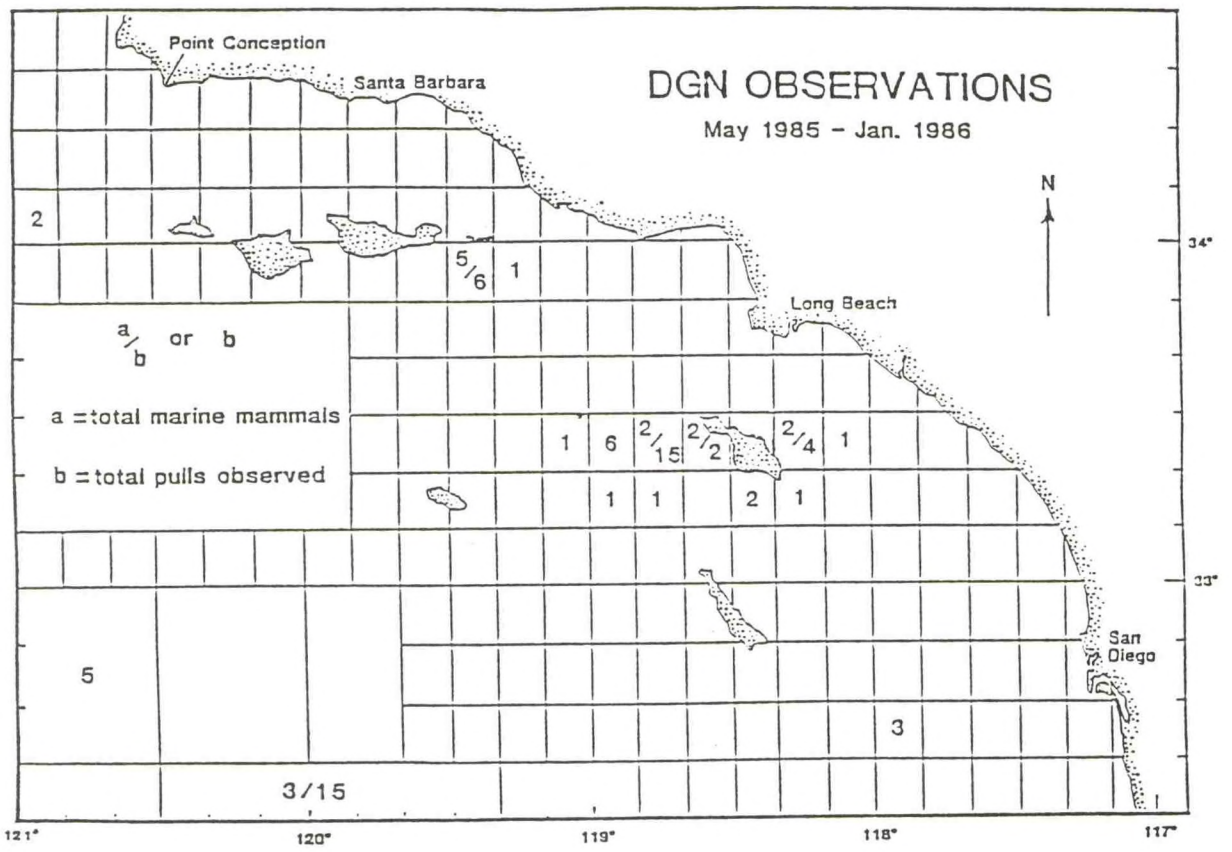


FIGURE 2. Location of DGN observations and total marine mammal take in the Southern California Bight, May 1, 1985 - January 31, 1, 1986. Each square represents a Fish and Game block number (see Appendix I).

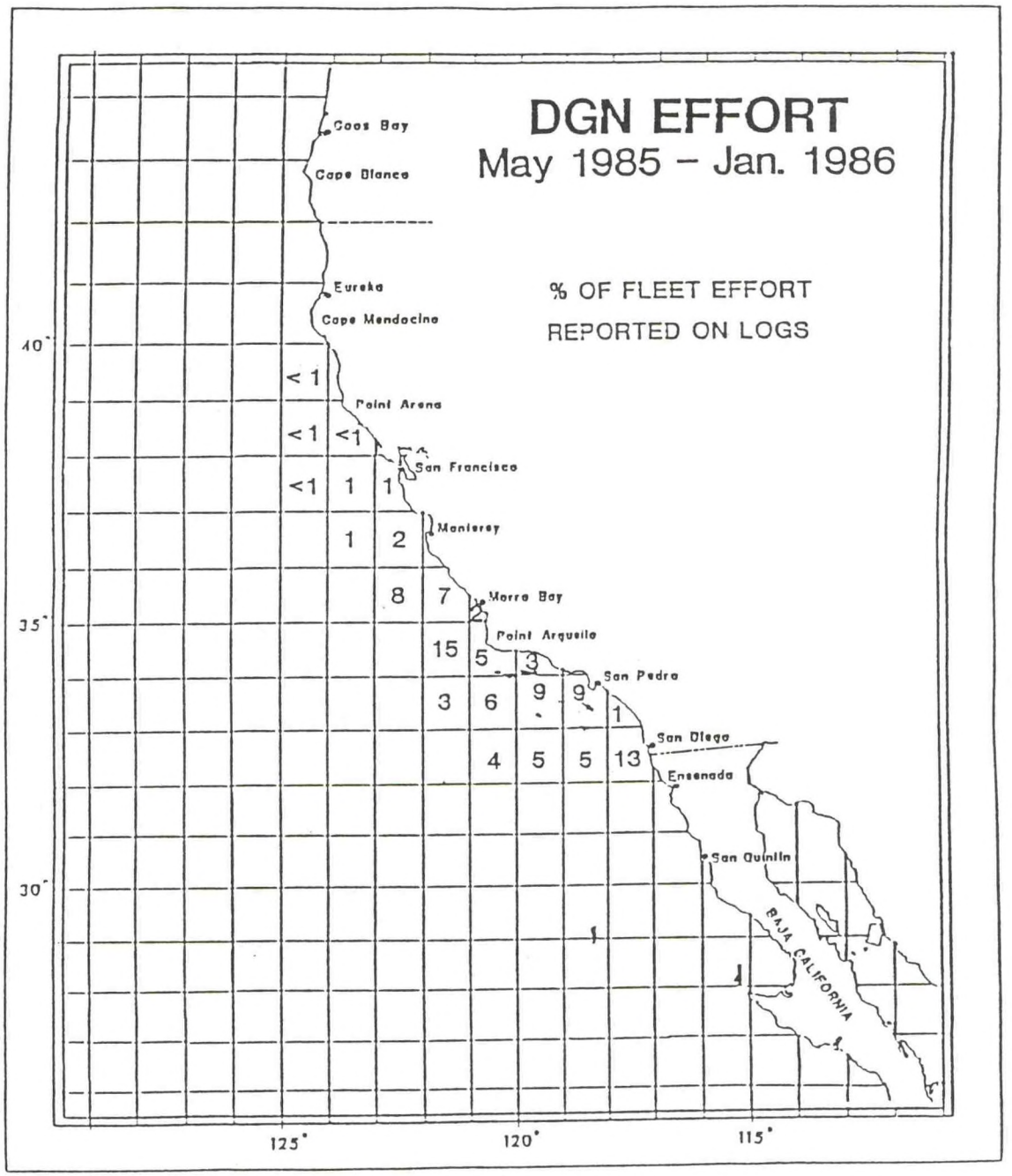
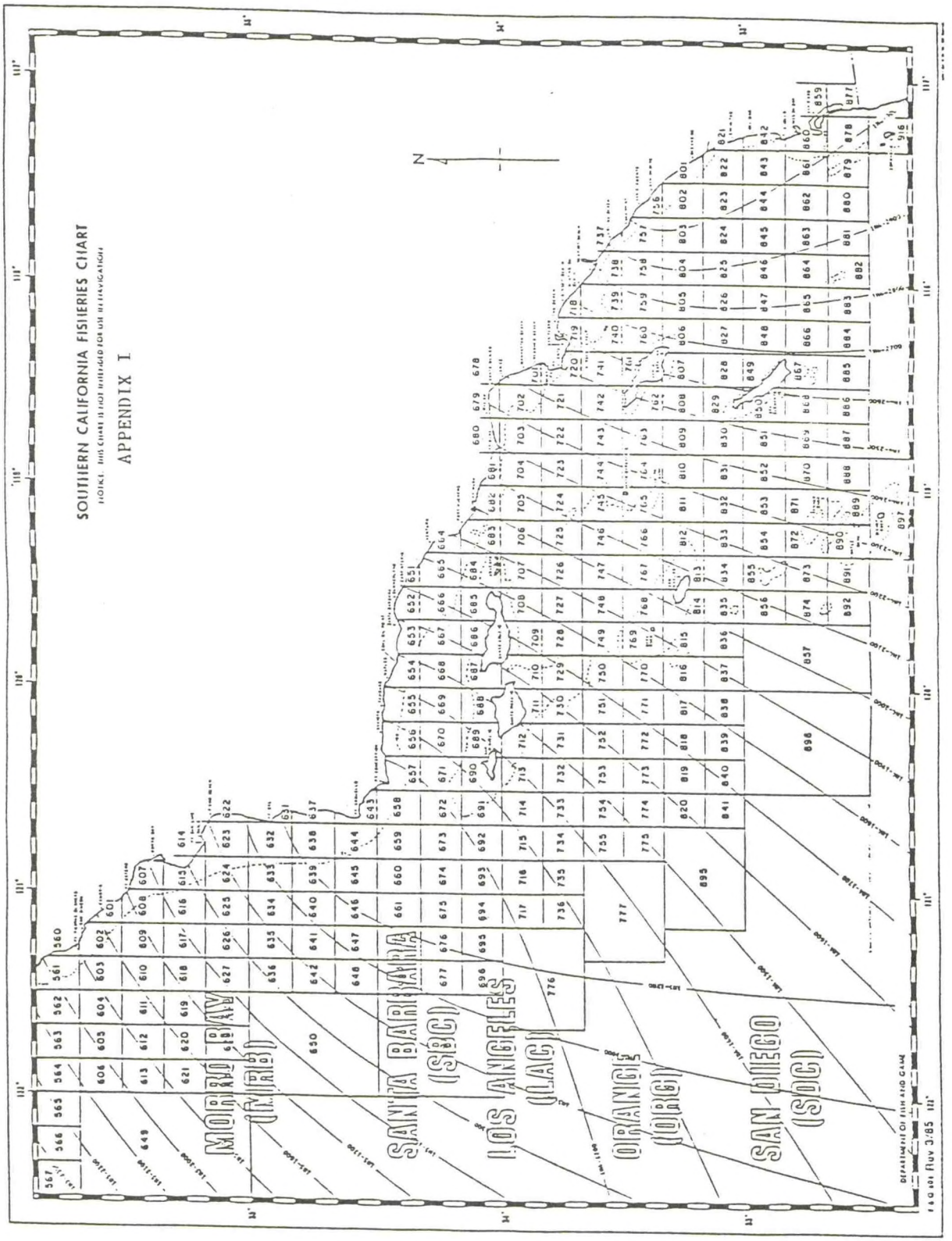


FIGURE 3. Percentages of DGN fleet effort by location as derived from log information, May 1, 1985 - January 31, 1986. Each square represents one degree of latitude and longitude (note difference in scale from Figure 2).

APPENDIX I. CHART OF FISH AND GAME BLOCK NUMBERS.



APPENDIX II. SUMMARIES OF AB2199(FELANDO) AND SB1573 (BEVERLY).

STATE OF CALIFORNIA—THE RESOURCES AGENCY GEORGE DEUKMEJIAN, Governor

DEPARTMENT OF FISH AND GAME
1416 NINTH STREET
SACRAMENTO, CALIFORNIA 95814

(916) 445-3531

October 3, 1985

TO: DRIFT GILL NET SHARK AND SWORDFISH PERMITTEES

The purpose of this letter is to advise you that legislation (Assembly Bill 2199, introduced by Assemblyman Gerald Felando), affecting the drift gill net shark and swordfish fishery, has been signed into law by Governor George Deukmejian. This legislation contains an urgency clause; therefore, the provisions of this bill became effective immediately upon signing by the Governor.

Attached is a copy of this bill, as signed by the Governor. The following discussion is designed to highlight the major provisions of the legislation. You should review the provisions of AB 2199 carefully and contact one of our local offices if you have any questions.

This legislation prohibits the use of drift gill nets within 75 nautical miles of the mainland California coastline from June 1-August 14, inclusive. The bill also prohibits the use of drift gill nets within 25 nautical miles of the mainland California coastline from December 15-January 31.

This bill also clarifies the statutes restricting the length (6,000 feet) of drift gill nets which may be used, and also imposes a limitation on the total length (1,500 feet) of unrigged replacement drift gill net panels which may be stored (not on net reel) aboard a permittee's vessel in lockers, wells or other storage space. AB 2199 also expressly prohibits the possession or deployment of any gill net with mesh between 8 and 14 inches in length.

In addition, AB 2199 imposes a $100 fee on requests by permittees to transfer their permits from one vessel to another and prohibits such permit transfers between May 1 and January 31, except as authorized by the Department upon receipt of proof of a compelling reason, such as the sinking of the permittee's vessel.

Finally, under existing law, drift gill nets, used to take shark and swordfish, may not be in the water from two hours after sunrise to two hours before sunset. This bill provides that

these restrictions shall only apply to a designated area off southern California during the time period from June 1-November 15. (See Section 8573).

Again, we remind you that the foregoing is intended merely to highlight the major provisions of AB 2199. It is your responsibility to review carefully and fully, the provisions of the bill. These laws are now in effect and will be enforced.

A. Petrovich, Jr.
Acting Regional Manager
Marine Resources Region

APPENDIX II. (continued)

STATE OF CALIFORNIA—THE RESOURCES AGENCY GEORGE DEUKMEJIAN, Governor

DEPARTMENT OF FISH AND GAME
1416 NINTH STREET
SACRAMENTO, CALIFORNIA 95814

October 3, 1985

TO: CENTRAL CALIFORNIA DRIFT GILL NET SWORDFISH PERMITTEES

The purpose of this letter is to advise you that legislation (Assembly Bill 2199, introduced by Assemblyman Gerald Felando), which affects the central California drift gill net swordfish fishery has been signed into law by Governor George Deukmejian. This legislation contains an urgency clause and, therefore, the provisions of the bill became effective immediately upon signing by the Governor.

Attached is a copy of this bill, as signed by the Governor. Most of the provisions of this bill relate to the drift gill net shark and swordfish fishery. However, the amendments to Fish and Game Code Sections 8585.6 through 8586.7 apply directly to the central California drift gill net swordfish fishery.

Specifically, the legislation expands the open season for this fishery to the time period from August 15 through January 31. The deadlines for the submission of permit applications have also been changed to coincide with this expanded open season.

The foregoing is intended to highlight the provisions of AB 2199 as they relate to the central California drift gill net swordfish fishery. It is your responsibility to review carefully and fully, the provisions of the bill. If you have any questions, please contact one of our local offices.

A. Petrovich, Jr.
Acting Regional Manager
Marine Resources Region

APPENDIX III:
SCIENTIFIC NAMES OF ANIMALS CAUGHT IN DRIFT GILL NETS.

COMMON NAME	SCIENTIFIC NAME
MARINE MAMMALS	
Beaked whale (Hubbs?)	Mesoplodon carlhubbsi
California sea lion	Zalophus californianus
Common dolphin	Delphinus delphus
Elephant seal	Mirounga angustirostris
Harbor seal	Phoca vitulina
Minke whale	Balaenoptera acutorostrata
Northern right whale dolphin	Lissodelphis borealis
Pilot whale	Globicephala macrorhynchus
White-sided dolphin	Lagenorhynchus obliquidens
SHARKS	
Basking shark	Cetorhinus maximus
Bigeye thresher shark	Alopias superciliosus
Blue shark	Prionace glauca
Bonito shark	Isurus oxyrinchus
Common thresher shark	Alopias vulpinus
Hammerhead (No ID)	Sphyrna spp.
Megamouth shark	Megachasma pelagios
Pelagic thresher shark	Alopias pelagicus
Soupfin shark	Galeorhinus zyopterus
Smooth hammerhead	Sphyrna lewini
BILLFISH	
Marlin	Tetrapturus audax
Swordfish	Xiphias gladius
RAYS	
Bat ray	Myliobatis californica
Manta ray	Manta hamiltoni
Mobula	Mobula spp.
Pacific electric ray	Torpedo californica
Skate	Raja spp.
Sting ray	Dasyatis spp.
MISCELLANEOUS FISH	
Albacore	Thunnus alalunga
Anchovy	Engraulis mordax
Bluefin tuna	Thunnus thynnus
Bonito	Sarda chiliensis
Bullet mackerel	Auxis rochei
Hake	Merluccius productus
Kelp bass	Paralabrax clathratus
Louvar	Luvarus imperialis

APPENDIX III: (CON'T)

Mackerel (No ID)	Scomber spp.
Pacific mackerel	Scomber japonicus
Mola	Mola mola
Ocean whitefish	Caulolatilus princeps
Opah	Lampris regius
Pipefish	Syngnathus spp.
Remora	Remora remora
Skipjack	Euthynnus pelamis
White sea bass	Cyniscion nobilis
Yellowfin tuna	Thunnus albacares
TURTLES	
Ridley's	Lepidochelys spp.
Loggerhead	Caretta caretta