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Annual Report of the 1991 Western Pacific Longline Fishery

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PREFACE

The Western Pacific Regional Fishery Management Council (WPRFMC) developed the Pelagic Species fishery management plan (FMP) to manage the pelagic resources authorized by the Magnuson Fishery Conservation and Management Act of 1976. This plan regulates the fisheries for swordfish, marlin, and other non-tuna pelagic species. The FMP for the Pelagic Fisheries of the Western Pacific Region was implemented by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service on March 23, 1987.

Beginning in 1990 the WPRFMC recommended several changes to the FMP for the Western Pacific Region. Two of these changes became effective under emergency federal regulations beginning 27 November 1990 requiring federal longline fishing permits and logbooks to be filed by all operators of fishing vessels conducting longline fishing operations within the U.S. Exclusive Economic Zone from 3 to 200 nmi offshore American Samoa, Guam, Hawaii, the Northern Mariana Islands, and U.S. possessions in the western Pacific. This report includes some information descriptive of the logbook collection system which was previously detailed in Dollar and Yoshimoto (1991). It is reiterated here for completeness of the first annual report of the Western Pacific longline logbook program.

CONTENTS

INTRODUCTION

In a relatively short time the longline fishery in Hawaii has grown to be the largest and most prominent commercial fishery in the state. The number of permitted longline vessels has quadrupled, from approximately 37 vessels in 1987 (Kawamoto et al. 1989) to 156 vessels by the close of 1991. Initially, the Western Pacific Regional Fishery Management Council's (WPRFMC) fishery management plan (FMP) for pelagic species relied on shoreside monitoring by the National Marine Fisheries Service's (NMFS) Fishery Monitoring and Economics Program (FMEP) for longline off-loading data, and on the Hawaii Division of Aquatic Resources (HDAR) commercial fishing catch reports for landings and fishing effort data. However, with the dramatic expansion of the fishery, the increased interaction between the longliners and various small trollers and handliners, as well as reports of interactions between the longline vessels operating in the Northwestern Hawaiian Islands (NWHI) and endangered Hawaiian monk seals (see Table 1 for scientific names), the WPRFMC voted in June 1990 to implement a Federal logbook system for domestic longliners operating in the western Pacific region (Fig. 1).

This report deals primarily with commercial longline fishing activity in the Hawaii Exclusive Economic Zone (EEZ). Current landings, fishing effort, catch per unit effort (CPUE), vessel operations and interactions with endangered and protected species are all based on Federal longline logbook data from the NMFS, FMEP for 1991.

OVERVIEW

Prior to the new Pelagic FMP regulations (see Dollar and Yoshimoto, 1991, for complete regulations and documentation), monitoring vessels in the longline fishery was difficult and complicated. The HDAR commercial fishing catch reports could have provided detailed information on longline fishing practices, but these reports had two deficiencies: first, many vessels in the fleet did not file the reports with the State, and second, the reports were filed as complete trip reports, rather than day-to-day activity reports. The FMEP's monitoring program was based on voluntary access to fish landings records by the major buyers of longline-caught fish. The FMEP's program also lacked detailed daily fishing information. Although it covered a high percentage of longline landings, as the fishery grew the problems of monitoring the fishery with such a voluntary system became more apparent. The WPRFMC's Pelagic Plan Monitoring Team concluded that a mandated Federal longline logbook system was necessary to monitor the rapidly developing fishery.

The logbook requirement was one of several new Federal regulations initiated in 1990 and 1991 for all domestic longline vessels participating in the pelagic fishery of the Western Pacific Region (including a 3-year fishery moratorium until April

1994). Under these new federal regulations (Pelagic FMP Amendments 2 and 4), operators of all longline vessels fishing in the western Pacific must maintain on board an accurate and complete fishing logbook for each day of each fishing trip. Data from the logbooks will provide detailed information on the daily fishing effort (number of hooks fished per set), area fished, time of set and haul, number of light sticks, number of individuals kept or released per species caught, and endangered/protected species interactions. These logs must be submitted to the Southwest Region (SWR) of the NMFS within 72 hours after the catch is off-loaded. As of 30 September 1991 all longline vessel operators also were required to call the NMFS, SWR, within 12 hours of their arrival in any port in Hawaii, Guam, American Samoa, Northern Mariana Islands, or U.S. Pacific Island possessions, to provide the name of the vessel, the name of the person calling, the pier where the vessel is docked, and the date and time of landing or transshipment of longline-caught fish made by the vessel since its previous report. Vessels not complying are subject to possible fines by NMFS enforcement personnel.

To monitor the longline fleet and implement the permit and logbook requirement, all U.S. domestic longline fishing vessels operating in the western Pacific were issued Longline Fishing Vessel Permit Applications beginning 27 November through December 1990. Initially 145 general longline permits were issued, and by the first week of January 1991, 155 vessels had been issued general permits and logbooks and informed of their responsibilities as mandated by Federal law.

On 23 April 1991, Federal "limited entry" (LE) permits were required in addition to the general longline permits. The LE plan provided a method to temporarily restrict the number of longline vessels participating in Hawaii's pelagic longline fishery. This plan was designed to provide a period of relative stability in the fishery in which data could be collected and analyzed to evaluate the status of pelagic stocks and estimate the optimal fleet size for the longline fishery on these stocks (Pelagic FMP Amendment 2).

As of this writing, 163 vessels have LE permits authorizing them to catch and land fish within the Hawaii EEZ. (Al Katekaru, Pacific Area Office, NMFS, pers. commun., March 1992).

RECENT DEVELOPMENTS

Until recently, local longline fishermen mostly used established fishing areas and tried-and-true gear and fishing techniques. However, recent trends show that an increasing number of longline vessels have explored new fishing grounds within the EEZ and beyond. Many vessels also switched to high-tech monofilament line and a multitude of other more modern and

efficient technological advancements such as acoustic Doppler current profilers, chromoscope fish finders, satellite navigation systems, and color video echo sounders. This array of electronic devices (some vessels have two of each on board in case one system fails) greatly simplifies navigation and helps pinpoint distant fishing areas with exceptional accuracy.

Almost every aspect of the fishery, from marketing strategies, to gear technology, to the species composition of the landings, has witnessed changes over the past couple of years. Tunas traditionally were the target species of longline vessels operating in the Hawaii EEZ (Kawamoto et al. 1989), but since the swift expansion of the fishery, beginning in 1987-1988, longline vessels targeting swordfish instead of tuna have become prevalent throughout the fleet. During the last two years, swordfish has definitely become the major factor in the fishery in terms of growth. Targeting of swordfish for 1991 appears to be most prevalent during the months of April-June, which accounted for more than twice the number of swordfish-directed trips of any other quarter. Seasonal abundance of swordfish in those months appeared to be greatest. Whereas tunas (predominately bigeye), and tuna-directed trips, were the most predominant from October-March.

The rapid incursion of longline vessels to Hawaii from the U.S. mainland has caused continuing conflicts among troll and handline vessel operators and longliners fishing for pelagic species near the main Hawaiian Islands (MHI). Prior to the expansion of the longline fishery, local longliners typically fished for tunas close to shore, especially during the winter months when bigeye tuna was most abundant (June 1950). Since the arrival of the mainland vessels, however, many local captains and fishermen have complained that the U.S. east coast longliners and longline vessels from the Gulf of Mexico were arriving too fast, causing increased fishing pressure, depleting stocks, and fishing for tunas in "their" traditional fishing areas. Logbook data for 1991 indicate that while this was not the case with the long-range east coast longliners, who were inclined to target swordfish 500 to 1,000 miles away from the MHI, the Gulf of Mexico longline vessels and traditional Hawaiian sampan operators tended to fish closer to land. Several meetings aired concerns between the local fishing vessel operators and the newly arrived longliners. The local fishermen blamed the newcomers for reduced abundance of fish, fishing inside "their territories," and lowering prices at the auction; the mainland longliners accused the local trollers and handliners of damaging or stealing their gear.

Failure of the mainland longliners to observe a 1989 non-written agreement between the small trollers and handliners and local longliners which was to have established a voluntary 20-mile buffer zone near the MHI prompted the WPRFMC in 1991 to create a Federally mandated 50- to 75-nmi longline exclusion zone

around the MHI (Fig. 2) in an attempt to prevent further gear conflicts. A recent lapse in this closure zone at the close of 1991 caused the Hawaii Fisherman's Foundation to file for an injunction in Federal court to extend the emergency rulings that had expired in December, but the injunction was not granted. However, a revised closure went into effect on 4 March 1992.

LONGLINE FLEET OPERATIONS

The home port of most of Hawaii's longline fishing fleet (N = 185)[1] is Honolulu's Kewalo Basin and Piers 17, 35, 37, and 40. These piers are located within a 10 min drive of each other. Daily collection procedures require FMEP technicians to visit vessels docked at these piers to collect available logs and to issue new logbooks as necessary. A few (N = 11) vessels are based at other Hawaiian Islands (Hawaii, Maui, and Kauai), and some vessels (N = 3) are based in Guam and American Samoa. These vessels are required to mail their logs to the NMFS Pacific Area Office in Honolulu. These data are then transfered to FMEP for processing. FMEP staff are responsible for processing and summarizing the daily catch logs into quarterly and annual summary reports.

Of 156 LE longline fishing vessels registered in Hawaii at the close 1991, 18 had left the state and were fishing elsewhere, 4 were bottomfishing (had bottomfish/longline permits), 5 were lobster fishing (had lobster/longline permits), and 18 were not longlining (no longline logbook reports were received). The vessels not fishing were either under repair, impounded, for sale, handlining, or inactive for unknown reasons. This left 111 LE vessels actively participating in the Hawaii longline fishery at the end of the year.

The longline fleet is categorized by FMEP for descriptive purposes into three groups: The swordfish vessels (predominantly from the east coast); the Hawaiian tuna vessels (longlining in Hawaii before the expansion of the fishery and referred to as local boats); and the mixed target vessels (mostly vessels that have relocated from the Gulf of Mexico and basically land whatever species they can catch).

During 1991, there were approximately 23 vessels from the U.S. east coast, 60 from the Gulf of Mexico, 18 from the U.S. west coast, and about 62 vessels from Hawaii. During 1987-88, established local vessels constituted all of the longline fleet, whereas in 1991 the number of local longline vessels sub-

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[1]This figure includes longline vessels with general and limited entry permits.

stantially were outnumbered by recently arrived longliners from outside Hawaii (N = 101)[2].

The majority of the vessels participating in the fishery are steel hulled and range in length from 10 to 33 meters, with the mean length about 20 meters. Hooks used per set also differ substantially from a minimum of 60 up to 2,600 and trip lengths vary from less than a week for small local boats to over a month for the long range swordfish vessels. Longline vessel characteristics will be discussed in more detail in an upcoming FMEP report on the status of the swordfish fishery.

NUMBER OF TRIPS

Date of landing is used in this report when summarizing total number of trips and landings. Date of haul is used when summarizing more detailed parameters like CPUE. For example, if CPUE of bigeye tuna in September 1991 is desired, a report by date of haul would be appropriate since it would contain all of the information needed (hooks set and number of bigeye caught in September 1991). However, if we used date of landing to find the CPUE, the report would inappropriately include fishing in August 1991 from vessels which landed in September and exclude some fishing in September 1991 by vessels which landed in October.

Logbook data received and summarized (by date of landing) for the first half of 1991 reveal that during the first quarter (January-March 1991), there were 484 trips made by 125 vessels fishing within all areas: the MHI EEZ, the NWHI EEZ, areas outside the EEZ, and areas in other U.S. territories. During the second quarter (April-June 1991), 507 trips were completed by 124 longline vessels within the same areas.

During the third quarter of 1991 (July-September) 312 trips were taken by 108 longline vessels compared to 362 trips by 106 vessels in the last quarter. This was a substantial decrease in trips compared to the number of trips completed during the first half of 1991. This may have been caused in part by the emergency regulations implementing the closure around the MHI (Fig. 2) effective 14 June 1991 (and extended) until 16 December 1991.

During all of 1991, 140 vessels were active, taking 1,665 trips and completing 12,649 sets (by date of landing; all areas). Table 2 summarizes the activity of the longline fleet by area (by date of haul).

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[2]This figure includes longline vessels that had recently arrived and were pending limited entry permits.

Logbook data for 1991 were separated into trip type categories according to target species: Tuna, swordfish, or combination (mixed trips targeting swordfish and tuna). Identification or determination of target species usually is obtained dockside from the captain or deck boss by FMEP personnel whenever possible. When this information is unavailable or the logs are mailed in, a target species designation for the trip is assigned by FMEP. This can usually be determined by analyzing the time of day of the sets, the number of light sticks used, the type of gear used, the area fished, and the previous history of trip types for that particular vessel.

During 1991, summaries of trips made by date of landing show that 291 trips (17.5%) targeted swordfish, 550 (33%) were tuna directed, and 824 (49.5%) were mixed trips (Table 3).

FISHING EFFORT

Total fishing effort was 3.46 million hooks set in the first quarter of 1991, compared to 3.57 million hooks in the second quarter, (Tables 4, 5)[3]. Though little difference could be seen in total effort, outside the Hawaii EEZ effort increased substantially from 0.82 million hooks set in the first quarter to 1.33 million hooks the second quarter. Total effort in the third quarter dropped substantially to 2.10 million hooks set (Table 6) from the 3.57 million hooks set in the second quarter. Effort outside the Hawaii EEZ also declined from 1.3 million hooks in the second quarter to 0.96 million hooks in the third quarter. Effort in the MHI decreased to 0.93 million hooks. Again, this was the period that the emergency regulations went into effect implementing the closures around the MHI. From October through the end of December the number of hooks set rose to 3.2 million (Table 7).

Total number of hooks set in all areas for 1991 was over 12.3 million along with a total of 3.1 million light sticks (Table 8). Figure 3 depicts fishing effort by area by number of trips, sets and vessels, and Figure 4 shows effort (by number of hooks set) by area. Over half the fishing effort for 1991 was within the 200-mile EEZ of the MHI, where bigeye tuna comprised the most landings. About 9% of the fishing effort was within the 200-mile EEZ of the NWHI, where swordfish constituted the largest landings, and about one-third of the effort was outside the Hawaii EEZ, with most landings also being swordfish (Fig. 4).

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[3]Figures rounded-off for purposes of comparison. All summary tables are by date of haul.

CATCH AND LANDINGS

Swordfish was by far the largest component of the landings in 1991 (N = 61,500), followed by bigeye tuna (N = 40,700) and mahimahi (N = 38,700) (Table 8). More than two times the number of swordfish were landed in the first half of 1991 (N = 45,500) than were landed in the second half (N = 20,000). The total number of swordfish caught and retained comprised 28% of the total number of fish landed (N = 220,450). Landings for bigeye and yellowfin tunas were more similar throughout the year and comprised 18% and 6%, respectively, of the 1991 landings. Twice as many "other billfish" (blue and striped marlins, spearfish, etc.) were landed in the first half of the year (N = 24,000).

Sharks accounted for the largest component of the catch (N = 71,000), but relatively few were landed (N = 2,300). Total blue sharks caught represented approximately 22% of the total catch for 1991, compared to 2% for mako, thresher, and miscellaneous sharks. However, the number of blue sharks caught is probably underreported, since data from observer trips during 1990-91 indicate blue sharks (by number) usually represented the largest individual component of longline catches (usually over 30%). Sharks caught and released (dead, alive, or finned) may not always be recorded in the logs.

Figure 5 depicts seasonal patterns in the longline fishery (by number caught) for each quarter, and Figure 6 shows the species composition (percent of total number caught) for 1991.

There is no direct comparison between 1991 catch and effort and that of previous years, because the logbook program only began in late 1990. However, average sampling weights from dockside and wholesale market monitoring in Honolulu suggest that landing of swordfish more than doubled in 1991 to approximately 9.6 million pounds (round weight). Landings of bigeye tuna (4.1 millions pounds) were approximately the same as the previous year, while landings of yellowfin tuna (2.8 million pounds) were substantially down. A more detailed assessment of these figures will be included in the annual report on the pelagic fishery prepared by FMEP staff (Ito 1992, in prep.).

CATCH PER UNIT EFFORT (CPUE)

Billfish (e.g., blue and striped marlins, swordfish) catch per unit effort (CPUE; number caught per 1,000 hooks) in the first quarter was 8.9 (Table 4), compared to 11.0 for second quarter (Table 5). The CPUE for other pelagic management unit species (PMUS), i.e., mahimahi, wahoo, and sharks, increased from 6.6 to 8.2, and CPUE for tunas declined from 6.7 to 4.4 during the same time period.

CPUE for billfish decreased substantially from 11.0 in the second quarter to 7.1 in the third quarter (Tables 5, 6). CPUE for other PMUS (mahimahi and ono) was fairly similar for both quarters, but CPUE for sharks dramatically increased to 12.4 in the third quarter, as compared to 4.65 in the second quarter. CPUE for tunas rose slightly to 5.36.

In the last quarter total CPUE for billfish dropped to 5.7 (Table 7). Other PMUS declined sharply to 7.71: mahimahi dropped to 2.78 from 5.0, and sharks fell by almost 6 points to 4.68. Tunas increased to 6.97. Figure 7 shows quarterly CPUE for the majority of the species caught in 1991.

ACCURACY OF DATA

A number of problems with logbook data quality have become apparent in the first year of its implementation. Although cooperation among vessel owners and captains in the logbook program generally has been good, initially there were several problems. Primarily, logs were not completed and submitted on time or were improperly completed (e.g., only partially completed or with misidentified species).

One of the most noticeably persistent problems is misidentification of marlin species by vessel operators, especially blue and striped marlins. Because of these identification problems, monthly and annual landings of blue, striped, and black marlin should be viewed with care. A correction may be incorporated in next year's report, cross-linking FMEP shoreside monitoring of landings information by vessel with logbook information. To address the marlin and other pelagic species misidentification problems, the FMEP developed and distributed laminated English, Korean, and Vietnamese versions of a pelagic species identification guide during 1991. This guide has been well received and useful in identifying the major pelagic fishes. However, receiving consistently good data is still a problem.

Other problems, such as operators not completing their log sheets or completing them improperly, vessels with no logs because of their own definitions of longlining (i.e., kaka lining, vertical longlining), trip pages missing, etc. are continuing to be resolved through concerted efforts by FMEP personnel and by the NMFS office of enforcement making personal contacts with individual vessel operators.

INTERACTIONS WITH ENDANGERED AND PROTECTED SPECIES

Endangered and protected species interactions are summarized in Table 9 using data received from longline vessel logs from

November 1990 through December 1991. These data are hand-tallied and edited by FMEP personnel and comprise a separate data base.

These data raise concerns that many vessels may be underreporting their interactions with endangered and protected species. However, as with most logbook programs, the degree to which interactions are underreported is uncertain. Nonetheless, out of 1,665 longline trips completed in 1991, only 118 trips (7%) reportedly had any type of interactions with protected species, whereas data from the 10 observer trips indicated 60% of the trips had interactions. The general consensus among shoreside monitoring personnel, as well as observers returning from trips aboard vessels fishing in the NWHI and mid-Pacific, is that more accurate reporting of interactions should be emphasized. This became obvious when fishermen on some observer trips could not identify the marine animals they encountered. Improved logging of protected species interactions is important, not only from a regulatory point of view but also for determining the range and prevalence of the protected species. Past experience has shown that notices mailed or simply handed out are usually not read or understood. Language barriers are also a problem because of the substantial number of vessels participating in the fishery operated by people whose second language is English (N = 89).

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Table 1.--List of common and scientific names of fishes and endangered or protected species commonly encountered by longliners.

Common name	Scientific name
Pelagic Management Unit Species	
Swordfish	*Xiphias gladius*
Blue marlin	*Makaira mazara*
Black marlin	*Makaira indica*
Striped marlin	*Tetrapturus audax*
Shortbill spearfish	*T. angustirostris*
Sailfish	*Istiophorus platypterus*
Mahimahi	*Coryphaena hippurus*
Wahoo (ono)	*Acanthocybium solandri*
Blue shark	*Prionace glauca*
Thresher (big eye)	*Alopias superciliosus*
Mako (short fin)	*Isurus oxyrinchus*
White tip (oceanic)	*Carcharhinus longimanus*
Tiger shark	*Galeocerdo cuvieri*
Miscellaneous sharks	Carcharhinidae, Alopiidae, Sphynidae and Laminidae
Tunas	
Bigeye tuna	*Thunnus obesus*
Yellowfin tuna	*T. albacares*
Albacore	*T. alalunga*
Kawakawa	*Euthynnus affinis*
Skipjack tuna	*Katsuwonus pelamis*
Miscellaneous	
Moonfish	*Lampris guttatus*
Lancetfish	*Alepisaurus* spp.
Walu	*Lepidocybium flavobrunneum*
Barracuda	*Sphyraena barracuda*
Brown stingray	*Dasyatis violacea*
Endangered or Protected Species	
Hawaiian monk seal	*Monachus schauinslandi*
Humpback whale	*Megaptera novaengliae*
Killer whale	*Orcinus orca*
False killer whale	*Pseudorca crassidens*
Bottlenose dolphin	*Tursiops truncatus*
Rough-toothed dolphin	*Steno bredanensis*
Spinner dolphin	*Stenella longirostris*
Green turtle	*Chelonia mydas*
Olive ridley turtle	*Lepidochelys olivacea*
Hawksbill turtle	*Eretmochelys imbricata*
Leatherback turtle	*Dermochelys coricea*
Laysan albatross	*Diomedea immutabilis*
Black-footed albatross	*D. nigripes*
Brown booby	*Sula leucogaster plotus*

Table 2.--Summary of Hawaii's domestic longline fleet activity by area for 1991 (by date of haul); total number of vessels fishing and trips completed, number of longline sets, light sticks used, and hooks set. Total number of selected species caught and catch per unit effort (CPUE; number caught per 1,000 hooks). Columns may not sum for number of vessels and fishing effort information due to multi-area trips. Data are from vessel logbooks.

				Hawaii EEZ	
	All areas	MHI	NWHI	Inside	Outside
Vessels fishing	140	132	82	139	114
Trips completed	1,681	1,207	239	1,338	721
Sets	12,625	6,205	1,257	7,462	5,108
Light sticks	3,138,389	824,435	473,464	1,297,899	1,840,190
Hooks set	12,323,686	6,851,172	1,056,478	7,907,650	4,362,098
Bigeye tuna catch	40,824	22,418	4,473	26,891	13,559
Bigeye tuna CPUE	3.31	3.27	4.23	3.40	3.11
Yellowfin tuna catch	13,269	7,150	1,375	8,525	4,305
Yellowfin tuna CPUE	1.08	1.04	1.30	1.08	0.99
Swordfish catch	66,289	13,598	9,472	23,070	43,194
Swordfish CPUE	5.38	1.98	8.97	2.92	9.90
Other billfish catch	36,611	23,573	3,957	27,536	8,968
Other billfish CPUE	2.97	3.44	3.74	3.49	2.06
Mahimahi catch	39,525	17,672	2,003	19,675	19,766
Mahimahi CPUE	3.21	2.58	1.90	2.49	4.53

Table 3.--Summary of Hawaii's domestic longline fleet activity by quarters for 1991 (by date of landing; all areas). Total number of trip types and and selected species caught. Data may not match date of haul tables. Data are from vessel logbooks.

	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Total
Vessels Fishing	125	124	108	106	140
Trips landed	484	507	312	362	1,665
Sets	3,139	3,865	2,528	3,117	12,649
Swordfish trips	67	140	59	25	291
Swordfish sets	565	1,397	798	366	3,126
Swordfish catch	7,793	17,137	7,579	3,352	35,861
Bigeye tuna catch	1,877	1,630	1,336	568	5,411
Yellowfin tuna catch	404	1,069	376	71	1,920
Tuna trips	183	126	64	177	550
Tuna sets	1,337	972	491	1,518	4,318
Bigeye tuna catch	7,912	3,794	773	8,054	19,533
Yellowfin tuna catch	1,403	659	716	929	3,707
Swordfish catch	572	480	302	826	2,180
Mixed trips	234	241	189	160	824
Mixed sets	1,237	1,496	1,239	1,233	5,205
Swordfish catch	6,116	11,281	4,950	5,595	27,942
Bigeye tuna catch	6,442	1,939	3,279	5,082	16,742
Yellowfin tuna catch	1,311	2,280	2,982	1,269	7,842

Table 4.--Hawaii's domestic longline logbook summaries, by date of haul, from January-March 1991 (all areas).

Trip Information

Number of vessels	130
Number of trips	559
Number of sets	3,379
Number of hooks set	3,460,842
Number of lights sticks used	800,190
Minimum hooks per set	80
Maximum hooks per set	2,600

	Species catch information		
Species class	No. kept	No. caught	No. caught per 1,000 hooks
Billfishes			
Blue marlin[a]	3,029	3,093	0.89
Swordfish	17,603	18,968	5.48
Striped marlin[a]	6,127	6,374	1.84
Other	2,063	2,188	0.63
Total	28,822	30,623	8.85
Other Pelagic Management Unit Species			
Mahimahi	8,308	8,547	2.47
Wahoo (Ono)	356	371	0.11
Sharks[b]	1,266	13,969	4.04
Total	9,930	22,887	6.61
Tunas			
Albacore	2,159	2,256	0.65
Bigeye tuna	15,210	15,742	4.55
Yellowfin tuna	3,079	3,231	0.93
Other	2,028	2,067	0.60
Total	22,476	23,296	6.73
Miscellaneous	1,805	1,841	0.53

[a]Blue and striped marlins are misidentified in some cases.
[b]Blue sharks are incorrectly logged as "kept" in some cases.

Table 5.--Hawaii's domestic longline logbook summaries, by date of haul, from April-June 1991 (all areas).

Trip Information

Number of vessels	128
Number of trips	549
Number of sets	3,909
Number of hooks set	3,574,118
Number of light sticks used	1,157,971
Minimum hooks per set	180
Maximum hooks per set	2,400

	Species catch information		
Species class	No. kept	No. caught	No. caught per 1,000 hooks
Billfishes			
Blue marlin[a]	2,734	2,976	0.83
Swordfish	25,399	26,701	7.47
Striped marlin[a]	5,733	6,306	1.76
Other	3,323	3,406	0.95
Total	37,189	39,389	11.02
Other Pelagic Management Unit Species			
Mahimahi	11,346	11,612	3.25
Wahoo (Ono)	1,040	1,049	0.29
Sharks[b]	1,554	16,578	4.64
Total	13,940	29,239	8.18
Tunas			
Albacore	3,893	3,969	1.11
Bigeye tuna	5,977	6,112	1.71
Yellowfin tuna	4,490	4,542	1.27
Other tuna	1,017	1,024	0.29
Total	15,377	15,647	4.38
Miscellaneous	1,590	1,609	0.45

[a]Blue and striped marlins are misidentified in some cases.
[b]Blue sharks are incorrectly logged as "kept" in some cases.

Table 6.--Hawaii's domestic longline logbook summaries, by date of haul, from July-September 1991 (all areas).

Trip information

Number of vessels	113
Number of trips	336
Number of sets	2,382
Number of hooks set	2,095,519
Number of light sticks used	718,338
Minimum hooks per set	100
Maximum hooks per set	2,000

	Species catch information		
Species class	No. kept	No. caught	No. caught per 1,000 hooks
Billfish			
Blue Marlin[a]	943	1,092	0.52
Swordfish	9,486	10,286	4.91
Striped Marlin[a]	1,526	1,745	0.83
Other	1,558	1,589	0.76
Total	13,513	14,712	7.02
Other Pelagic Management Unit Species			
Mahimahi	10,168	10,477	5.00
Wahoo	548	549	0.26
Sharks[b]	295	26,016	12.42
Total	11,011	37,042	17.68
Tunas			
Albacore	1,841	1,871	0.89
Bigeye	5,508	5,596	2.67
Yellowfin	3,306	3,340	1.59
Other	405	432	0.21
Total	11,060	11,239	5.36
Miscellaneous	1,774	2,036	0.97

[a]Blue and striped marlins are misidentified in some cases.
[b]Blue sharks are incorrectly logged as "kept" in some cases.

Table 7.--Hawaii's domestic longline logbook summaries, by date of haul, from October-December 1991 (all areas).

Trip information

Number of vessels	107
Number of trips	374
Number of sets	2,955
Number of hooks set	3,193,207
Number of light sticks used	461,890
Minimum hooks per set	60
Maximum hooks per set	2,040

	Species catch information		
Species class	No. kept	No. caught	No. caught per 1,000 hooks
Billfishes			
Blue Marlin[a]	1,772	1,814	0.57
Swordfish	9,424	10,334	3.24
Striped Marlin[a]	3,762	3,858	1.21
Other	2,138	2,170	0.68
Total	17,096	18,176	5.69
Other Pelagic Management Unit Species			
Mahimahi	8,732	8,889	2.78
Wahoo	765	766	0.24
Sharks[b]	721	14,956	4.68
Total	10,218	24,611	7.71
Tunas			
Albacore	5,496	5,955	1.86
Bigeye	13,224	13,374	4.19
Yellowfin	2,110	2,156	0.68
Other	755	763	0.24
Total	21,585	22,248	6.97
Miscellaneous	3,182	3,349	1.05

[a]Blue and striped marlins are misidentified in some cases.
[b]Blue sharks are incorrectly logged as "kept" in some cases.

Table 8.--Hawaii's domestic longline logbook summaries, by date of haul, from January-December 1991 (all areas).

Trip information

Number of vessels	140
Number of trips	1,681
Number of sets	12,625
Number of hooks set	12,323,686
Number of light sticks used	3,138,389
Minimum hooks per set	60
Maximum hooks per set	2,600

	Species catch information		
Species class	No. kept	No. caught	No. caught per 1,000 hooks
Billfishes			
Blue Marlin[a]	8,478	8,975	0.73
Swordfish	61,912	66,289	5.38
Striped Marlin[a]	17,148	18,283	1.48
Other	9,082	9,353	0.76
Total	96,620	102,900	8.35
Other Pelagic Management Unit Species			
Mahimahi	38,554	39,525	3.21
Wahoo	2,709	2,735	0.22
Sharks[b]	2,289	71,183	5.78
Total	43,552	113,443	9.21
Tunas			
Albacore	13,389	14,051	1.14
Bigeye	39,919	40,824	3.31
Yellowfin	12,985	13,269	1.08
Other	4,205	4,286	0.35
Total	70,498	72,430	5.88
Miscellaneous	8,351	8,835	0.72

[a]Blue and striped marlins are misidentified in some cases.
[b]Blue sharks are incorrectly logged as "kept" in some cases.

Table 9.--Interactions with endangered and protected species reported by Hawaii's longline fleet, November 1990 through December 1991. Numbers indicate animal count, not sets with interactions.

	Observed or actual interaction						
	Monk seals		Turtles		Whales/porpoises		Birds
Month	SIAG	RAID	SIAG	RAID	SIAG	RAID	RAID
			1990				
Nov	2*	0	1	0	21	0	3
Dec	0	0	2	1	45	0	0
			1991				
Jan	0	0	1	3	24	0	1
Feb	0	0	2	2	12	0	14
Mar	0	0	3	8	0	2	6
Apr	0	0	2	7	3	1	12
May	0	0	3	8	7	1	12
Jun	3*	0	9	10	208	0	33
Jul	0	0	6	1	5	0	1
Aug	0	0	20	8	108	3	2
Sep	0	0	2	2	113	0	29
Oct	0	0	0	3	90	0	2
Nov	0	0	1	2	1	0	4
Dec	0	0	2	5	1	0	2
Totals	5*	0	54	60	638	7	121

Total number of sets with reported interactions = 199.
Total number of vessels reporting interactions = 65.

SIAG = Species sighted in area of longline gear.
RAID = Retrieved alive, injured, or dead.
* = Not positively identified as monk seals.

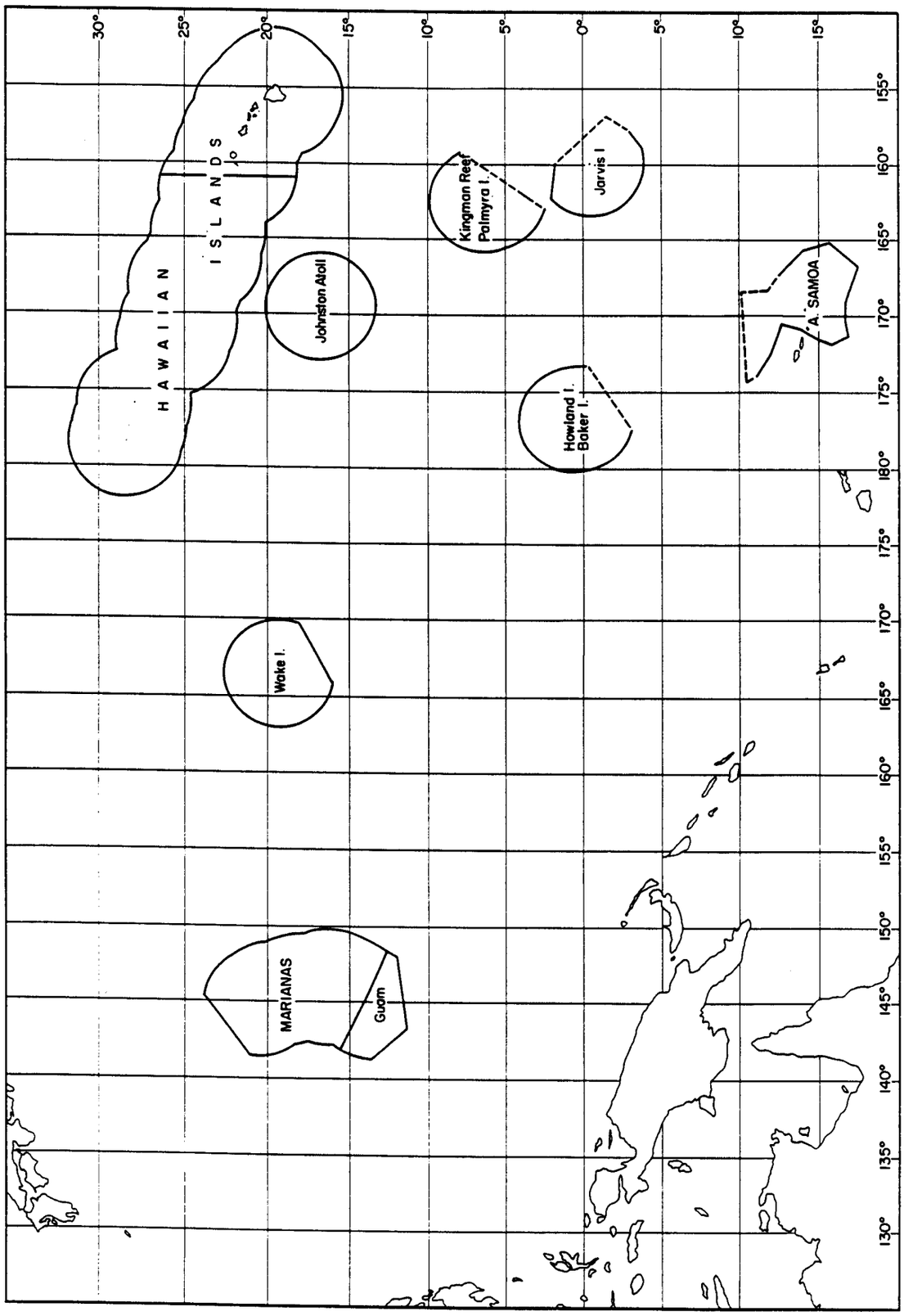


Figure 1.--Exclusive economic zones (3-200nmi offshore around the Hawaiian Islands and U.S. possessions).

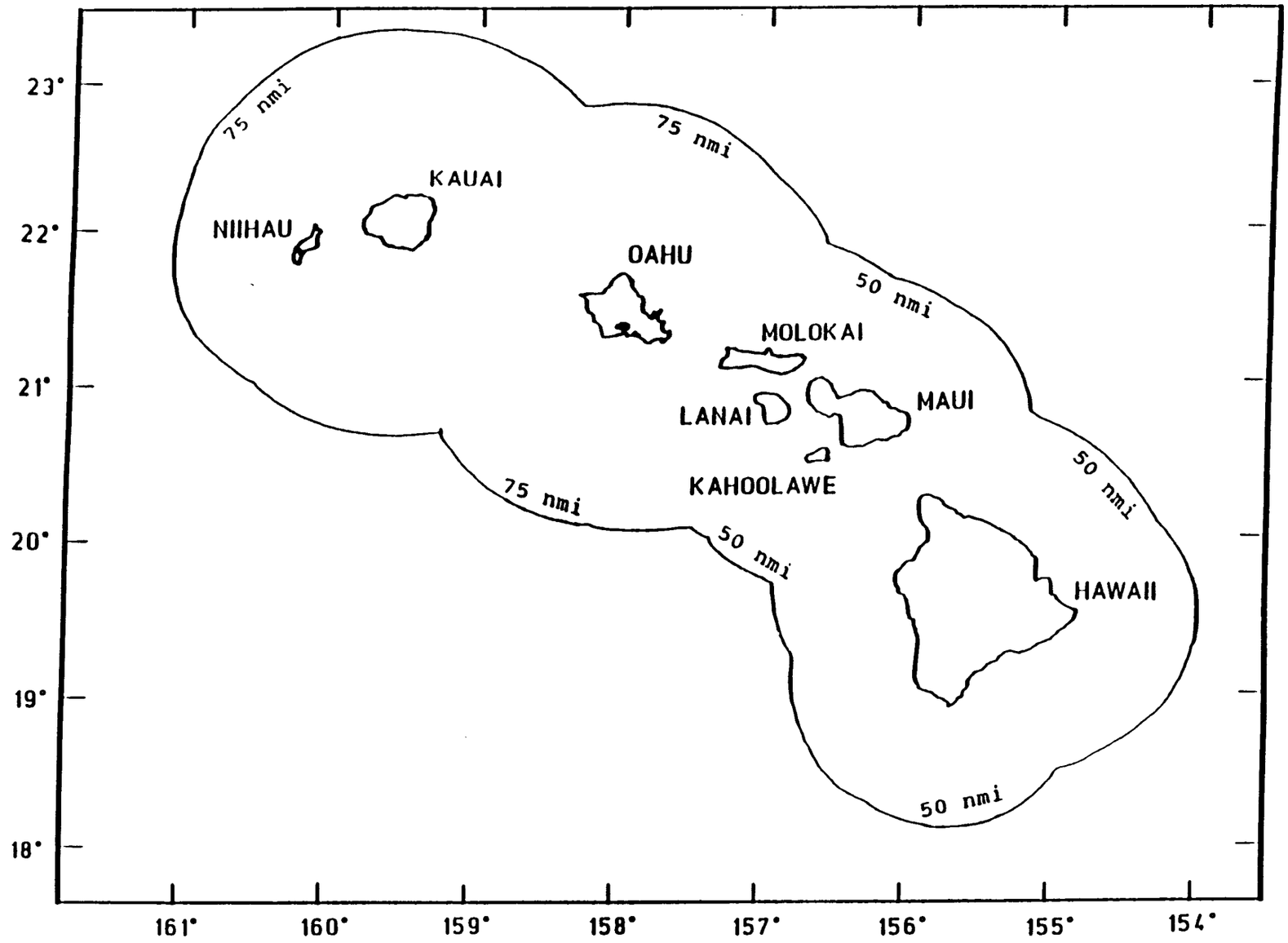


Figure 2.--Closure zone. Prohibited longline fishing area around the main Hawaiian Islands (within 75 nmi of Kauai and Oahu, and 50 nmi of Maui and Hawaii).

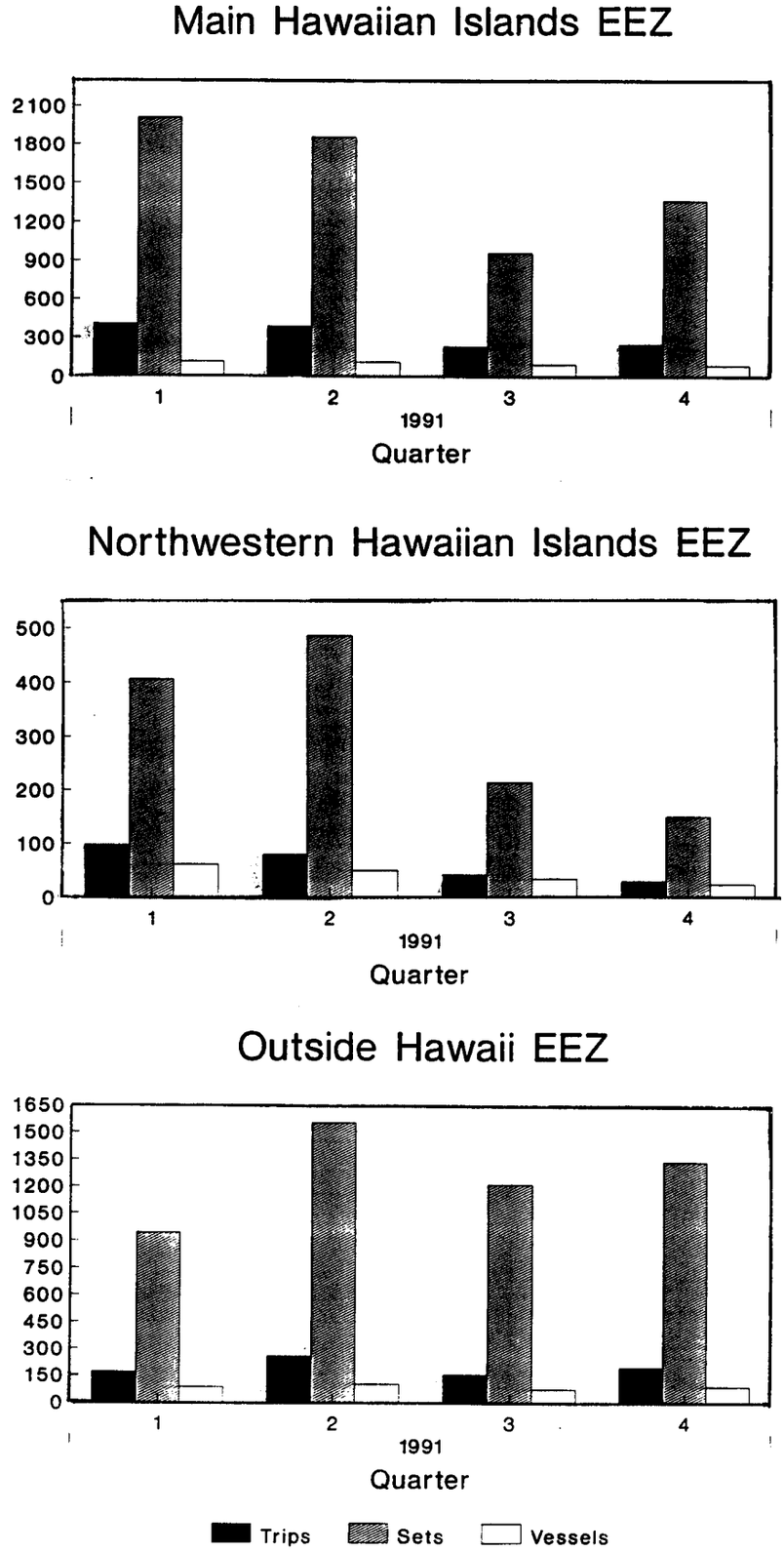
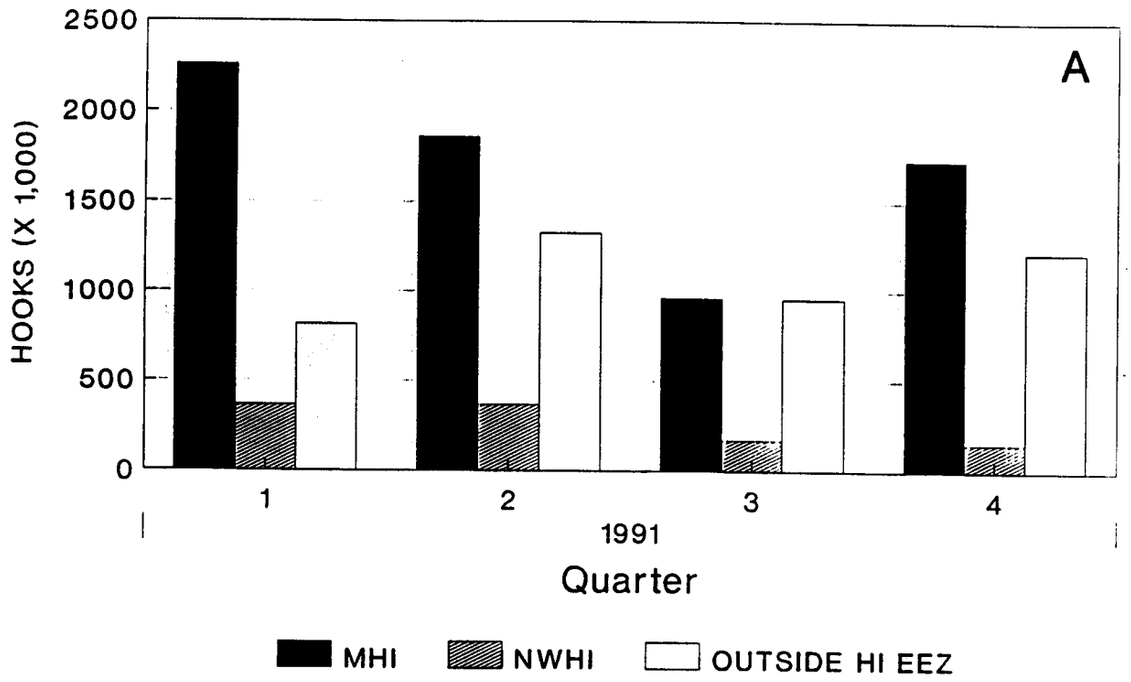


Figure 3.--Quarterly fishing effort by number of trips, sets, and vessels by Hawaii's domestic longline fishing fleet (by area fished), January-December 1991.



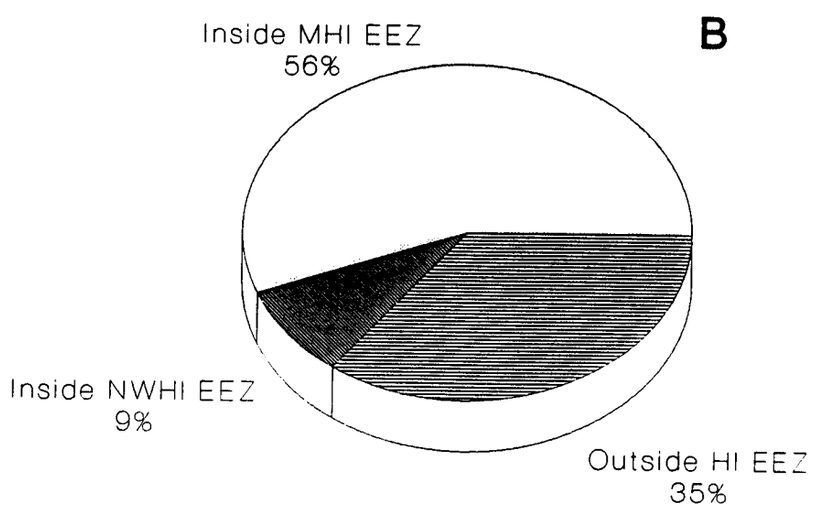


Figure 4.--Hawaii's domestic longline fishing effort; A) by number of hooks set by area and, B) percent of effort by number of hooks set by area (January-December 1991).

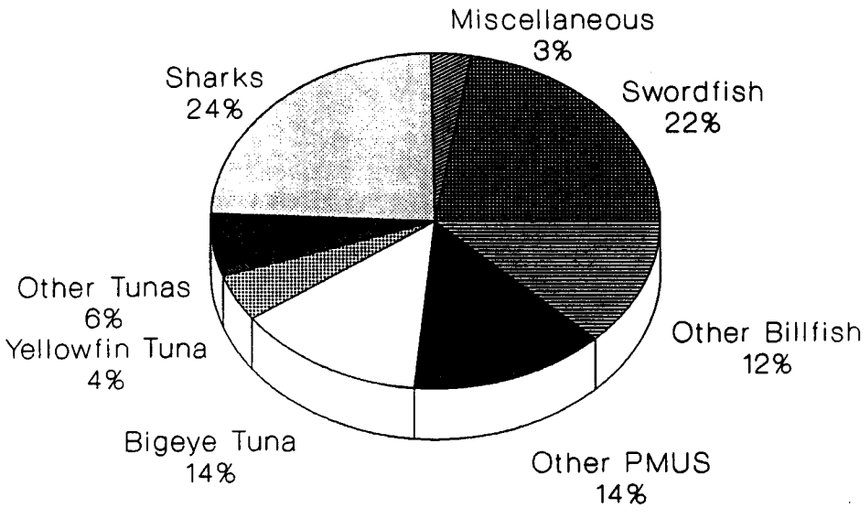


Figure 6.--Total percent species composition (by number caught) by Hawaii's domestic longline fishing fleet, January-December 1991.

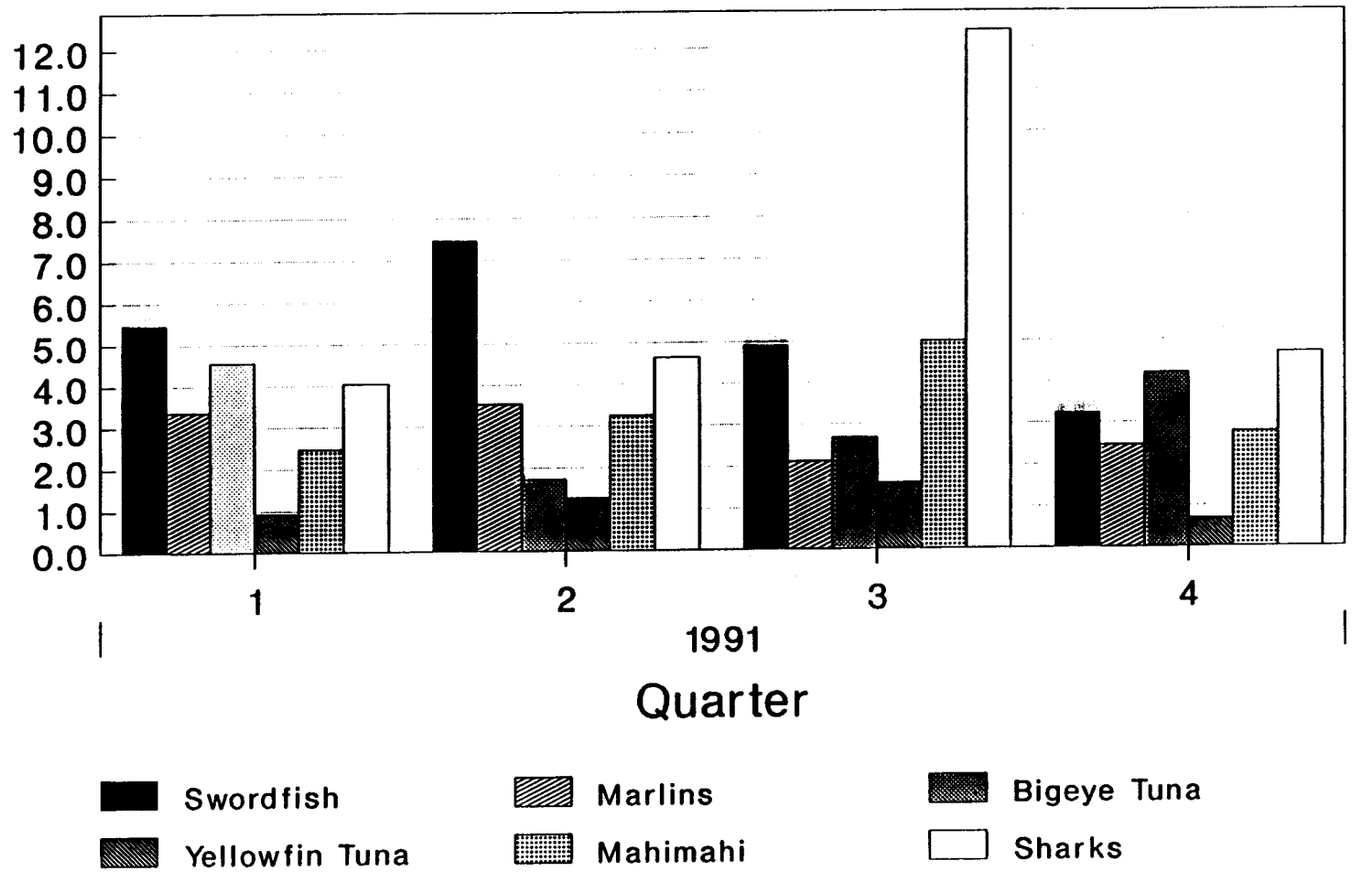


Figure 7.--Quarterly catch per unit effort (CPUE; catch per 1,000 hooks) of selected species by Hawaii's domestic longline fleet, January-December 1991.