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LA JOLLA, CA 92038

AUGUST 1988

SUMMARY OF THE 1987 NORTH AND SOUTH PACIFIC ALBACORE FISHERIES DATA

by

Anthony P. Majors, Christina H. Perrin and Forrest R. Miller

ADMINISTRATIVE REPORT LJ-88-21

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SUMMARY OF THE 1987 U.S. NORTH AND SOUTH PACIFIC ALBACORE FISHERIES DATA

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INTRODUCTION

The 1987 fishing season marks the 14th successive year that state and federal fisheries agencies have worked together to collect information on the U.S. North Pacific albacore fishery. During the 1987 season, the California Department of Fish and Game, Oregon Department of Fish and Wildlife, Washington Department of Fisheries, Pacific Marine Fisheries Commission (PMFC), Western Fishboat Owners Association (WFOA) and the Honolulu and La Jolla Laboratories of the Southwest Fisheries Center (SWFC) distributed logbooks to fishermen and sampled the size composition of albacore catches from fishing vessels at landing sites. The year 1987 was also the 2nd successive year that the U.S. commercial jigboat fleet fished for albacore in the South Pacific. This austral (November - April) fishery started as a multinational exploratory effort in 1986 by researchers from the United States, New Zealand, France, and by fishermen from the South Pacific Island nations, United States and New Zealand (Laurs, et al., 1986).

In this report, we present a summary of fishing effort and catch with environmental data collected during the U.S. albacore fleet's 1987 fishing seasons in the North and South Pacific. Areas covered include those south of French Polynesia in the South Pacific, and those in the vicinity of Midway Island, eastward to the U.S. west coast between Baja California and British Columbia in the North Pacific (Figure 1). Data from the North Pacific are summarized and compared with those collected during the 1986 albacore fishing season. And, although we may frequently refer to data gathered from the South Pacific in 1986 in this report, we will not attempt to make any comparison because only two jigboats fished in these waters in that year; there were seven in 1987.

SAMPLING COVERAGE

In June, before the start of the 1987 North Pacific albacore fishing season, approximately 300 logbooks were sent by mail to fishermen who are members of WFOA. An additional 350 were distributed from July to September at dock sites in ports throughout California, Hawaii, Oregon, and Washington by field biologists to interested fishermen who voluntarily participated in this sampling project. Fishermen recorded daily fishing effort, numbers of fish caught, types of gear used, and environmental conditions encountered during fishing activities. The completed logsheets were submitted to state samplers assigned to dock sites during the fishing season or sent directly to the SWFC. Fishermen who did not have access to the logbooks were interviewed by samplers for the information when they returned to port to unload their catches (Majors, 1988). Those participating in the 1987 U.S. albacore fishery in the South Pacific were given logbooks in November of the previous year.

Sampling coverage for the 1986 and 1987 U.S. North and South Pacific albacore fisheries was measured as the ratio of sampled landings to total landings in weight (Majors and Miller, 1987). During the 1987 U.S. North Pacific albacore fishery, approximately 5% of the fish sampled for effort and catch was taken from baitboats, 89% from jigboats, 4% from vessels using a combination of bait and jig and less than 1% each from gillnet and longline vessels. The fleet that fished in the South Pacific for albacore from January to March 1987 consisted of seven U.S. jigboats and three research vessels: one each from the United States, France and New Zealand (Laurs, et al., 1987; Tables 1a and b).

Table 1a. Sampling coverage for the U.S. North Pacific albacore fishery by gear and year.

Vessel	1987			1986		
Gear Type Used	Effort (days)	Catch (number)	No. Fish Measured	Effort (days)	Catch (number)	No. Fish Measured
1. Pole & Line	70	9,924	428	436	36,471	1,404
2. Jig	2,940	196,450	18,616	3,932	385,845	14,870
3. Both (1&2)	62	8,027	748	76	5,110	556
4. Gillnet	47	454	673	27	212	758
5. Purse Seine	1	47	0	11	3,386	248
6. Longline	0	0	0	0	0	0
Total	3,120	214,902	20,465	4,482	431,024	17,836

Table 1b. Sampling coverage for the U.S. South Pacific albacore fishery by gear and year.

Vessel Gear Type Used	1987 Effort (days)	1987 Catch (number)	1987 No. Fish Measured	1986 Effort (days)	1986 Catch (number)	1986 No. Fish Measured
1. Pole & Line	0	0	0	0	0	0
2. Jig	314	114,583	1,276	83	12,384	724*
3. Both (1&2)	0	0	0	0	0	0
4. Gillnet	0	0	0	0	0	0
5. Purse Seine	0	0	0	0	0	0
6. Longline	0	0	0	0	0	0
Total	314	114,583	1,276	83	12,384	724*

* The 724 fish measured were tagged and released.

From June through October 1987, an estimated 6,458,296 lbs (2,929 mt) of albacore caught in the North Pacific by U.S. vessels were landed in ports throughout California, Oregon and Washington. Approximately 50% (3,202,040 lbs; 1,452 mt) of this total was sampled for effort and catch and 5% (304,927 lbs; 138 mt) for length frequency. Earlier in the year, January through March, an estimated 1,650,000 lbs (748 mt) of albacore caught in the South Pacific by U.S. jigboats were landed in Papeete, Tahiti. Approximately 83% (1,369,571 lbs; 621 mt) of this total was sampled for effort and catch and 1% (20,926 lbs; 9 mt) for length frequency (Tables 2a and b).

Catch and effort coverage rates for the U.S. North Pacific albacore fishery, as estimated from sampled landings in weight, decreased from 59% in 1986 to 50% in 1987. Coverage rates for length-frequency increased from 2% in 1986 to 5% in 1987. Approximately 43% of the 1987 U.S. North Pacific albacore sampled catch was collected in California, 23% in Oregon and 34% in Washington. There were no albacore sampled in Hawaii for 1987 (Tables 2a and b).

Table 2a. Sampling coverage for the 1987 U.S. North and South Pacific albacore fisheries by state (or nation).

State/Nation Where Fish Landed	Total Landings (lbs)	Landings Sampled (lbs)	Percent Coverage	Number Vessel Landings	Number Landings Sampled
Catch and Effort					
North Pacific:					
California	3,089,698	1,371,903	44%	-	115
Hawaii	0	0	0%	0	0
Oregon	2,223,934	723,320	33%	274	61
Washington	1,144,664	1,106,817	97%	132	101
Total	6,458,296	3,202,040	50%	-	277
South Pacific:					
Tahiti	1,650,000	1,369,571	83%	16	12
Length Frequency					
North Pacific:					
California	3,089,698	93,065	3%	-	124
Hawaii	0	0	0%	0	0
Oregon	2,223,934	56,679	3%	274	33
Washington	1,144,664	155,183	14%	132	73
Total	6,458,296	304,927	5%	-	230
South Pacific:					
Tahiti	1,650,000	20,926	1%	16	5

Table 2b. Sampling coverage for the 1986 U.S. North and South Pacific albacore fisheries by state (or nation).

State/Nation Where Fish Landed	Total Landings (lbs)	Landings Sampled (lbs)	Percent Coverage	Number Vessel Landings	Number Landings Sampled
Catch and Effort					
North Pacific:					
California	7,017,924	3,498,818	50%	189	165
Hawaii	0	0	0%	0	0
Oregon	2,459,472	1,899,774	77%	156	59
Washington	1,861,544	1,239,176	67%	72	36
Total	11,338,940	6,637,768	59%	417	260
South Pacific:					
Am. Samoa	196,906	196,906	100%	2	2
Length Frequency					
North Pacific:					
California	7,017,924	203,449	3%	189	174
Hawaii	0	0	0%	0	0
Oregon	2,459,472	44,583	2%	156	26
Washington	1,861,544	22,822	1%	72	13
Total	11,338,940	270,854	2%	417	213
South Pacific:					
Am. Samoa	196,906	11,512	6%	2	2

CATCH

Commercial landings reported for the 1987 U.S. North Pacific albacore fishery totaled 6,458,296 lbs (2,929 mt). This represents a 43% decrease from the 11,338,940 lbs (5,143 mt) recorded for 1986 (Tables 2a and b) and an 83% decrease from the 20-year (1967-86) average of 37,635,433 lbs (17,071 mt). Commercial landings reported for the U.S. South Pacific albacore fishery in 1987 and 1986 were 1,650,000 lbs (748 mt) and 196,906 lbs (89 mt), respectively (Tables 2a and b). Catches for the entire North Pacific albacore fleets in 1987 are unavailable at this time; however, historical data for the four major fisheries are presented for comparison purposes (Table 4, Figure 2).

As in 1986, the 1987 U.S. albacore fleet fished east and west of 140°W from April through October in the North Pacific. To simplify the presentation of information presented in this report, we have arbitrarily divided the 1986 and 1987 U.S. North Pacific albacore fishery into two areas; the inshore area, from 140°W east to the North American coastline, and the offshore area, from 140°W west to the western Pacific region.

The 1987 U.S. North Pacific offshore albacore fishery started in early May with fair catches from the latter half of the month to mid-June. Fishing was concentrated during this 30-day period in a 10° quadrangle area 30°N and 170°W, approximately 120 nautical miles (nm) north of Midway Island (Figures 3a, 9b and c). In late June, the fishing shifted east to areas 720 nm north of Hawaii (Figures 3b and 9d). No effort was expended by the U.S. albacore fleet in early July (Figure 9e); by late July, however, fishing resumed and excellent catches were reported from a 3° quadrangle area 39°N and 156°W, approximately 1,020 nm north of Hawaii (Figures 3c and 9f). Albacore fishing was fair throughout August north of 40°N as the fleet fished from 160°W to 125°W (Figures 3d, 9g and h). In early September, the fishing shifted nearshore and was concentrated in a 5° quadrangle area 42°N and 125°W, approximately 50 to 350 nm between Cape Blanco, Oregon, and Willapa Bay, Washington (Figures 3e and 9i).

The U.S. North Pacific inshore albacore fishery started late in 1987. The earliest significant catches were reported from north of 40°N, approximately 120 to 420 nm off Cape Blanco north to the Columbia River in late July (Figure 3c). Fairly good fishing persisted in this area until mid-October (Figures 9f-k). Fishing south of 40°N was poor throughout the season. Best fishing in these southern waters was in an area 50 to 240 nm off Point Arguello north to Point Arena in late August (Figures 3d and 9h).

The most productive offshore fishing in 1987 was reported from a 3° quadrangle area 39°N and 156°W from mid-July to mid-August (Figures 9f and g). The most productive inshore fishing was reported from a 5° quadrangle area 42°N and 125°W from mid-September to mid-October (Figures 9i and k). This nearshore

area also yielded the highest CPUEs for the 1987 season (Figures 4 and 10).

Approximately 80% (2,570,697 lbs; 1,166 mt) of the North Pacific albacore catch was taken from the inshore area, and 20% (631,343 lbs; 286 mt) from offshore. In contrast, 61% (4,049,038 lbs; 1,837 mt) of the catch in 1986 was taken from the inshore area, and 39% (2,588,730 lbs; 1,174 mt) from offshore. Compared to 1986, total landings in 1987 for California decreased 56%, Oregon 10% and Washington 39% (Tables 2a and b).

In 1987, the U.S. fishery for albacore in the South Pacific started in late December 1986 and was concentrated south of French Polynesia between 32° to 42°S and 126° to 157°W (Figures 5a-d and 6). Albacore caught in 1987 were landed in Papeete, Tahiti, and those caught in 1986 were landed in Pago Pago, American Samoa (Laurs, 1986; Laurs, et al., 1987).

EFFORT

Sampled effort in days fished for the 1987 U.S. North Pacific albacore fishery was significantly lower than the effort in 1986. There was a decrease of 27% from the reported sampled effort of 4,482 days in 1986 to the 3,120 days in 1987 and a 57% decrease from a 20-year (1967-86) average of 7,262 days (Table 1a). In 1987, 79% of the sampled effort (2,484 days) spent inshore yielded 80% of the sampled catch (2,570,697 lbs; 1,166 mt), and 21% (636 days) of the sampled effort spent offshore yielded 20% (631,343 lbs; 286 mt) of the sampled catch. In 1986, 78% of the sampled effort (3,320 days) spent inshore yielded 61% of the sampled catch (4,049,038 lbs; 1,837 mt), and 22% (933 days) of the sampled effort spent offshore yielded 39% (2,588,730 lbs; 1,174 mt) of the sampled catch. The standard 45-foot jigboat expended the most effort in 1987, whereas the 55-foot jigboat expended the most in 1986 (Figure 7).

Jigboats participating in the 1986 and 1987 U.S. South Pacific albacore fishery expended approximately 83 and 314 days, respectively, in this fishery (Table 1b). The two jigboats that fished in these waters in 1986 were 73 and 78 feet in length; the seven in 1987 were from 55 to 80 feet in length.

CATCH-PER-UNIT EFFORT FOR A 45-FOOT JIGBOAT

Estimated annual catch-per-unit effort (CPUE) for the North Pacific in 1987, in numbers of fish caught by a standard (45-foot; 14 meter) jigboat, decreased from 117 fish per day in 1986 to 70 fish per day in 1987 (Figures 8 and 9a-k). Except for late September and early October, CPUEs in 1987 based on half-months were generally lower than those in 1986. As examples, the 10° quadrangle area 30°N and 170°W, approximately 120 nm north of Midway Island, which yielded 99 fish per day in the last half of

May 1986, yielded 41 fish per day for the same period in 1987 (Table 3, Figure 9b-c). The highest CPUEs in 1987 of 116 to 136 fish per day in the inshore fishery were reported from a 5° quadrangle area 42°N and 125°W, approximately 50 to 350 nm off Cape Blanco north to Willapa Bay from mid-September to mid-October (Figures 9j and k). Few albacore were caught in this 5° quadrangle for the same period in 1986 (Table 3). Highest CPUEs of 180 fish per day in 1986 were reported from a 10° quadrangle area 40°N and 135°W, approximately 660 nm off Oregon during August. This area, although very productive in 1986, yielded only 65 fish per day for a standard vessel for the same period in 1987.

The number of 1° quadrangles in the North Pacific with CPUEs greater than 200 fish per day in 1987 was 45 less than in 1986. In both years, the majority of 1° quadrangles with CPUEs greater than 200 were located north of 40°N. The majority of the 1° quadrangles with CPUEs higher than 200 in 1987 were located inshore, whereas those for 1986 were located offshore (Figures 9a-k).

Estimated CPUEs for the 1987 and 1986 South Pacific albacore fishery for a standard vessel were 316 and 172 fish per day, respectively. Although CPUEs were high and efforts low, effort and catch in both years were standardized to a 45-foot vessel, as was done in the North Pacific, and results presented in this report so we may show the relative success of the seven jigboats that fished in these waters in 1987 and the two in 1986. Because of uncertainties associated with this new fishery, these CPUEs should be considered approximate. Detailed information on the success of the vessels that fished in 1986 and 1987 can be found in Laurs (1986) and Laurs et al. (1987).

Table 3. U.S. North Pacific standardized jigboat effort (days), catch (numbers) and CPUEs (average number of fish caught per day) by half-month, month and year.*

Year	Period	1987			1986		
Month	Days 15/30	Standardized Effort	Catch	CPUE	Standardized Effort	Catch	CPUE
April	1-15	0	0	0	0	0	0
	16-30	2	0	0	5	0	0
	1-30	2	0	0	5	0	0
May	1-15	46	1,108	24	154	625	12
	16-31	110	4,497	41	125	12,340	99
	1-31	156	5,605	36	297	12,965	46
June	1-15	112	6,822	61	147	7,838	53
	16-30	109	6,417	59	159	13,899	87
	1-30	221	13,239	60	306	21,737	71
July	1-15	46	122	3	205	2,739	13
	16-31	262	18,739	72	407	38,545	95
	1-31	308	18,861	61	612	41,284	67
August	1-15	554	37,430	68	682	124,647	183
	16-31	695	44,025	63	556	98,100	176
	1-31	1,249	81,455	65	1,238	222,747	180
September	1-15	506	36,810	73	412	61,304	149
	16-30	212	28,820	136	222	12,245	55
	1-30	718	65,630	91	634	73,549	116
October	1-15	55	6,395	116	170	1,697	10
	16-31	9	203	23	45	144	3
	1-31	64	6,598	103	215	1,841	9
Annual		2,718	191,388	70	3,189	374,125	117

* There were few data on catch and effort for the 1986 and 1987 U.S. South Pacific albacore fishery and so were not included in this table.

LENGTH FREQUENCY

During the 1987 albacore fishing season, 20,465 fork-length (from tip of the mandible to fork of the tail) measurements were taken of fish caught by the U.S. North Pacific fishing fleet. Of the fish measured, approximately 93% were taken from the inshore catch and 7% offshore (Figures 11a-c). Approximately 2% of the samples were taken from baitboats, 91% from jigboats, 4% from vessels using a combination of jig and bait and 3% from gillnet vessels (Figure 12). In 1987, the smallest fish measured was 46 centimeters (cm) and the largest was 126 cm; in 1986, the smallest was 45 cm and the largest was 105 cm. The average fork length of albacore sampled in 1987 was 68.9 cm (14.9 lbs). This was slightly lower than the average fork length of 69.8 cm (15.4 lbs) recorded for 1986.

Fish sampled from catches inshore and south of 40°N in both years were mostly in the range of 60 to 84 cm. Those sampled from inshore and north of 40°N were mostly in the range of 62 to 72 cm. There were more fish in the 74 to 86 cm range caught inshore in 1986 than in 1987. These larger fish were especially vulnerable to baitboats and gillnet vessels in both years (Figures 11a-c). Size range of fish sampled from the offshore catches in 1987 was much like the size range of fish in 1986. Fish sampled offshore and south of 40°N were mostly 74 to 80 cm, and those north of 40°N were mostly 62 to 72 cm. Length-frequency histograms by gear show that the majority of fish caught in 1987 were in the 62 to 72 cm range, and those in 1986 were bimodal, ranging from 62 to 70 cm and from 72 to 80 cm (Figures 11a-c).

During the 1987 and 1986 U.S. South Pacific albacore fishing seasons, approximately 1,276 fork length measurements were taken of fish caught by the seven jigboats and 724 by the two jigboats, respectively (Table 1b). The average size of albacore measured was 72.0 cm (17.0 lbs) in 1987 and 70.4 cm (15.9 lbs) in 1986 (Laurs, 1986; Laurs, et al., 1987). Length compositions of fish sampled in both years were bimodal, ranging from 60 to 70 cm and 72 to 82 cm (Figure 12).

SEA-SURFACE TEMPERATURE

Sea-surface temperatures (SSTs) recorded by commercial transport vessels, fishing boats and research vessels were compiled into monthly means and plotted on charts with 1° quadrangle resolutions. Analyses of these charts (Figures 13a-h) show the distribution of sea-surface isotherms and the location of surface ocean fronts. Areas fished in 1987 by the U.S. North Pacific albacore fishing fleet (shaded) were included in these charts so that they could be identified with the monthly sea-surface isotherms and surface ocean fronts (Figures 13b-g).

During the spring and early summer (April - July) in 1987, SSTs were unusually cold from 30° to 45°N and west of 140°W. SSTs in these offshore areas were 2.0° to 4.0°C (3.6° to 7.2°F) below normal as a result of persistent, strong winds caused by a deep Aleutian low pressure system which was displaced to the southwest of its normal position. As a result, the subarctic ocean front was markedly stronger (closely packed isotherms) than usual during this period (Figures 13a-d).

The offshore fishing began in early May north of 30°N and west of 140°W where SSTs were 15.0° to 18.0°C (59.0° to 64.4°F). This area was the southern boundary of a strong subarctic front (Figure 13b) where SSTs were 1.0° to 2.0°C (1.8° to 3.6°F) below normal. In early June, the fishing moved north of 35°N as the southern edge of the subarctic front (depicted by the 15.0°C [59.0°F] isotherm) shifted north (Figure 13c). The fishing was active during this period in waters where SSTs were 1.0° to 2.0°C (1.8° to 3.6°F) above normal on the south side of an unusually sharp subarctic front.

In late June, the offshore fishing moved east 720 nm due north of Hawaii where SSTs were 15.0° to 18.0°C, which was 2.0° to 3.0°C (3.6° to 5.4°F) below normal. SSTs remained 1.0° to 3.0°C (1.8° to 5.4°F) below normal offshore throughout early July, but were slightly above normal along the coastal areas west to 130°W during this period. In late July, the offshore fishing moved north of 38°N in SSTs of 14.0° to 18.0°C (57.2° to 64.4°F). SSTs in these waters were warming to near normal rates and the subartic front north of the 15°C was much weaker than those west of 150°W (Figure 13d). In the meantime, coastal upwelling was becoming well established from Monterey Bay, California, north to areas off Oregon with the inshore fishing concentrated in waters 14.0° to 17.0°C (57.2° to 64.4°F). SSTs inshore and south of 40°N were slightly above normal from early April to early July with no well defined frontal boundaries from Baja California north to Point Conception.

In early August, the offshore fishing was concentrated in areas 38° to 42°N and west of 140°W where SSTs had been 1.0° to 2.0°C below normal since early April. This area was on the south side of a subarctic front, which by early August had become weaker as it shifted north with the season. In late August, the fishing shifted north and east following SSTs of 15.0° to 18.0°C (Figure 13e). The inshore fishing at this time was concentrated from Point Conception north to Cape Mendocino and from Cape Blanco to Willapa Bay in 14.0° to 16.0°C (57.2° to 60.8°F) waters. Also, coastal upwelling had become established during this period from Monterey Bay to Cape Blanco (Figure 13e). In early September, fishing was located 50 to 240 nm from Cape Blanco to Cape Flattery in waters 14.0° to 18.0°C (57.2° to 64.4°F).

Inshore SSTs in 1987 were less than 1.0°C (1.8°F) above normal in waters south of 40°N and approximately 1.0°C below

normal north of 40°N where fishing was most active. The temperature edges (fronts) associated with coastal upwelling were strongest north of 40°N from September to October (Figures 13f-g). This explains the success of the fleet with CPUEs of 116 to 136 fish per day late in the season. In early October, coastal upwelling was moderately intense off Monterey Bay north to Newport, Oregon, and most of the fishing was concentrated along and on the warmer side of the 15°C (59.0°F) isotherm in areas where temperature edges were sharpest.

During the 1987 North Pacific albacore fishery, SSTs inshore and offshore were slightly below normal. In contrast, inshore and offshore SSTs during the 1986 fishing season were well above normal.

Albacore caught in the 1987 U.S. fishery in the South Pacific were taken in waters 15.5° to 20.5 °C (60.0° to 69.0°F). The majority of the fish (69.0%) were taken in waters 18.6° to 19.7°C (65.5° to 67.5°F). Detailed information on oceanographic conditions observed in this fishery from January to February 1987 are given in Laurs, et al. (1987).

SUMMARY

Although the U.S. albacore fishery in the North Pacific has expanded its activity since 1975 farther west across the central North Pacific to the vicinity of the International Dateline (Majors, 1987), catches have declined rather than improved. Landings of 2,929 mt in 1987 were 43% less than the 5,143 mt in 1986 and were 83% less than the 20-year (1967-1986) average of 17,071 mt. During the fishing season, albacore fishermen had more buyers available for their catches and the average amount of $1400/t paid for fish caught in 1987 was much better than the $950/t in 1986.

The 1987 albacore landings from the North Pacific were the lowest ever recorded. Throughout the 1987 season, only one time-area stratum was productive enough to improve on the 1986 monthly CPUEs. This 5° quadrangle area, 50 to 350 nm off Cape Blanco north to Willipa Bay yielded 103 fish per day in October 1987 compared to 9 fish per day in 1986. Fishing was excellent in this area in late September and early October; the fleet's late success in this area, however, did not make up for poor catches earlier in the year.

Inshore fishing in 1987 started late in the season. No significant albacore catches were reported until late July, which was a month later than in 1986. The majority of albacore caught during this period were taken north of 40°N, approximately 100 to 600 nm off Cape Blanco north to the Columbia River. In contrast, inshore fishing in 1986 started early in June with significant catches taken south of 40°N, approximately 100 to 250 nm off San Diego, California, north to Point Arguello. Compared to the 1986

season, fishing in 1987 started 15 days later offshore and 30 days later inshore.

The average size of albacore sampled in 1987 was 68.9 cm (14.9 lbs) in length, which was slightly smaller than the average size in 1986 of 69.8 cm (15.4 lbs). The estimated annual CPUE for a standard jigboat was 70 fish per day, which was much lower than the 117 fish per day in 1986. There was a decrease in sampled effort from a high of 4,253 days fished in 1986 to a low of 3,120 in 1987. This decrease in effort caused, in part, by the success of the salmon fishery in northern California, Oregon, and Washington in 1987 may have contributed to lower total albacore catches for the season.

SSTs in the North Pacific early in the season were unusually cold in areas 30° to 45°N and west of 140°W. The fishing offshore started in early May and was located in the southern boundary of a well defined subarctic front with SSTs of 2.0° to 4.0°C below normal. This unusually strong subarctic front became weaker as it shifted north with the season. Strong coastal upwelling in inshore areas from mid-September to mid-October may have contributed to the success of vessels fishing in areas off Cape Blanco north to Cape Flattery late in the season.

Highlights of the 1987 U.S. albacore fishing season in the North Pacific include: 1) total catch decreased by 43% and sampled effort decreased by 27%; 2) only eight 1° quadrangles had CPUEs greater than 200, and these were located north of 40°N; 3) offshore fishing lasted until late August; 4) inshore fishing started in mid-July with significant catches taken in areas north of 40°N; 5) monthly CPUEs from May to September were lower than those in 1986; 6) best catches for the season were made 50 to 350 nm off Cape Blanco north to Willapa Bay; 7) fish in the 74 to 82 cm range were caught mostly in areas south of 40°N; 8) the majority of fish caught were 64 to 72 cm in length and were taken mostly north of 40°N; 9) offshore SSTs from April to July were unusually cold; 10) SSTs in areas south of 40°N were less than 1.0°C above normal; 11) those north of 40°N were 1.0°C below normal; 12) temperature edges associated with coastal upwelling were strongest north of 40°N from September to October; 13) offshore and inshore SSTs throughout the 1987 season were slightly below normal.

Highlights of the 1987 U.S. albacore fishing season in the South Pacific include: 1) the fleet consisted of seven jigboats and three research vessels; 2) total effort was 314 days fished; 3) the average size of fish caught was 72.0 cm; 4) the average size jigboat in the fleet was 69 feet; 5) CPUE for a standard vessel was 316 fish per day; 6) catches were unloaded in Papeete, Tahiti; 7) average price paid was $1,300/t.

ACKNOWLEDGMENTS

We thank William Perkins of WFOA, and the captains and crews of the U.S. North and South Pacific albacore fishing fleets for their cooperation and continuing support of this program. We also thank Russ Porter of PMFC, Brian Culver of WDF, Karen Worcester of CDFG, Larry Hreha of ODFW, and members of their staffs for distributing logbooks and collecting albacore fishing information during the fishing season.

Norman Bartoo, Atilio Coan and Robert Nishimoto of SWFC reviewed drafts of this report and provided useful comments. Douglas W. Prescott and Mark W. Hess helped in editing and retrieving data. Jean Davis edited the manuscript and provided technical support on the text as needed. Lorraine Prescott typed the final draft of the manuscript. Kenneth Raymond, Roy Allen and Henry Orr illustrated the maps and figures.

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Table 4. Catches of North Pacific albacore fishery in metric tons, 1952 – 1987.

	Japan					Taiwan	United States				Canada	
Year	Bait-boat	Long-line	Gill net	Other gear	Total	Long-line	Bait-boat	Jig-boat	Sport	Total	Jig-boat	Grand Total
1952	41,786	26,687	-	237	68,710	-	-	23,843	1,373	25,216	71	93,997
1953	32,921	27,777	-	132	60,830	-	-	15,740	171	15,911	5	76,746
1954	28,069	20,958	-	38	49,065	-	-	12,246	147	12,393	-	61,458
1955	24,236	16,277	-	136	40,649	-	-	13,264	577	13,841	-	54,490
1956	42,810	14,341	-	57	57,208	-	-	18,751	482	19,233	17	76,458
1957	49,500	21,053	-	151	70,704	-	-	21,165	304	21,469	8	92,181
1958	22,175	18,432	-	124	40,731	-	-	14,855	48	14,903	74	55,708
1959	14,252	15,802	-	67	30,121	-	-	20,990	0	20,990	212	51,323
1960	25,156	17,369	-	76	42,601	-	-	20,100	557	20,657	5	63,263
1961	18,636	17,437	-	268	36,341	-	2,837	12,061	1,355	16,253	4	52,598
1962	8,729	15,764	-	191	24,684	-	1,085	19,760	1,681	22,526	1	47,211
1963	26,420	13,464	-	218	40,102	-	2,432	25,147	1,161	28,740	5	68,847
1964	23,858	15,458	-	319	39,635	26	3,411	18,392	824	22,627	3	62,291
1965	41,491	13,701	-	121	55,313	16	417	16,545	731	17,693	15	73,037
1966	22,830	25,050	-	585	48,465	16	1,600	15,342	588	17,530	44	66,055
1967	30,481	28,869	-	520	59,870	17	4,113	17,826	707	22,646	161	82,694
1968	16,597	23,961	-	1,109	41,667	15	4,906	20,444	951	26,301	1,028	69,011
1969	32,107	18,006	-	1,480	51,593	21	2,996	18,839	358	22,193	1,365	75,172
1970	24,376	15,372	-	956	40,704	23	4,416	21,041	822	26,279	354	67,360
1971	53,198	11,035	-	1,262	65,495	24	2,071	20,537	1,175	23,783	1,587	90,889
1972	60,762	12,649	1	921	74,333	25	3,750	23,608	637	27,995	3,558	105,911
1973	69,811	16,059	39	1,883	87,792	35	2,236	15,667	84	17,987	1,270	107,084
1974	73,576	13,053	224	1,065	87,918	40	4,777	20,187	94	25,058	1,207	114,223
1975	52,157	10,060	166	402	62,785	28	3,243	18,975	640	22,858	101	85,772
1976	85,336	15,896	1,070	1,394	103,696	37	2,700	15,932	713	19,345	252	123,330
1977	31,934	15,737	688	1,039	49,398	61	1,497	10,005	537	12,039	53	62,051
1978	59,877	13,061	4,029	3,209	80,176	53	950	16,682	810	18,442	23	98,694
1979	44,662	14,249	2,856	1,280	63,047	81	303	6,801	74	7,178	521	70,827
1980	46,743	14,743	2,986	1,516	65,988	-	382	7,574	168	8,124	212	74,324
1981	27,426	18,020	10,348	956	56,753	-	748	12,694	195	13,637	200	70,590
1982	29,615	16,762	12,511	1,054	59,942	-	425	6,661	257	7,343	104	67,389
1983	21,098	15,103	6,884	471	43,556	-	607	9,512	87	10,206	225	53,987
1984	26,015	15,111	10,569	3,898	55,593	-	832	9,576	1,427	15,563[7]	50	71,206
1985	20,714	14,320	13,132	1,940	50,106	-	872	7,059	1,176	9,107	56	59,269
1986	12,000	12,945	9,749	-	34,694	-	309	4,834	196	5,339	30	40,034
1987	20,000	-	-	-	-	-	146	2,783	48	2,977	<1	-

Remarks:

1. Figures for 1986-87 are preliminary.
2. Japanese longline catches for 1952-60 exclude minor amounts taken by vessels under 20 tons. Longline catches in weight are estimated by multiplying annual number of fish caught by average weight statistics.
3. Japanese baitboat catches include fish caught by research vessels.
4. U.S. Jigboat catches for years 1952-60 include fish caught by baitboats.
5. U.S. catches from 1961 to 1985 include Hawaii.
6. U.S. total for 1984 include 3,728 mt caught by purse seines.

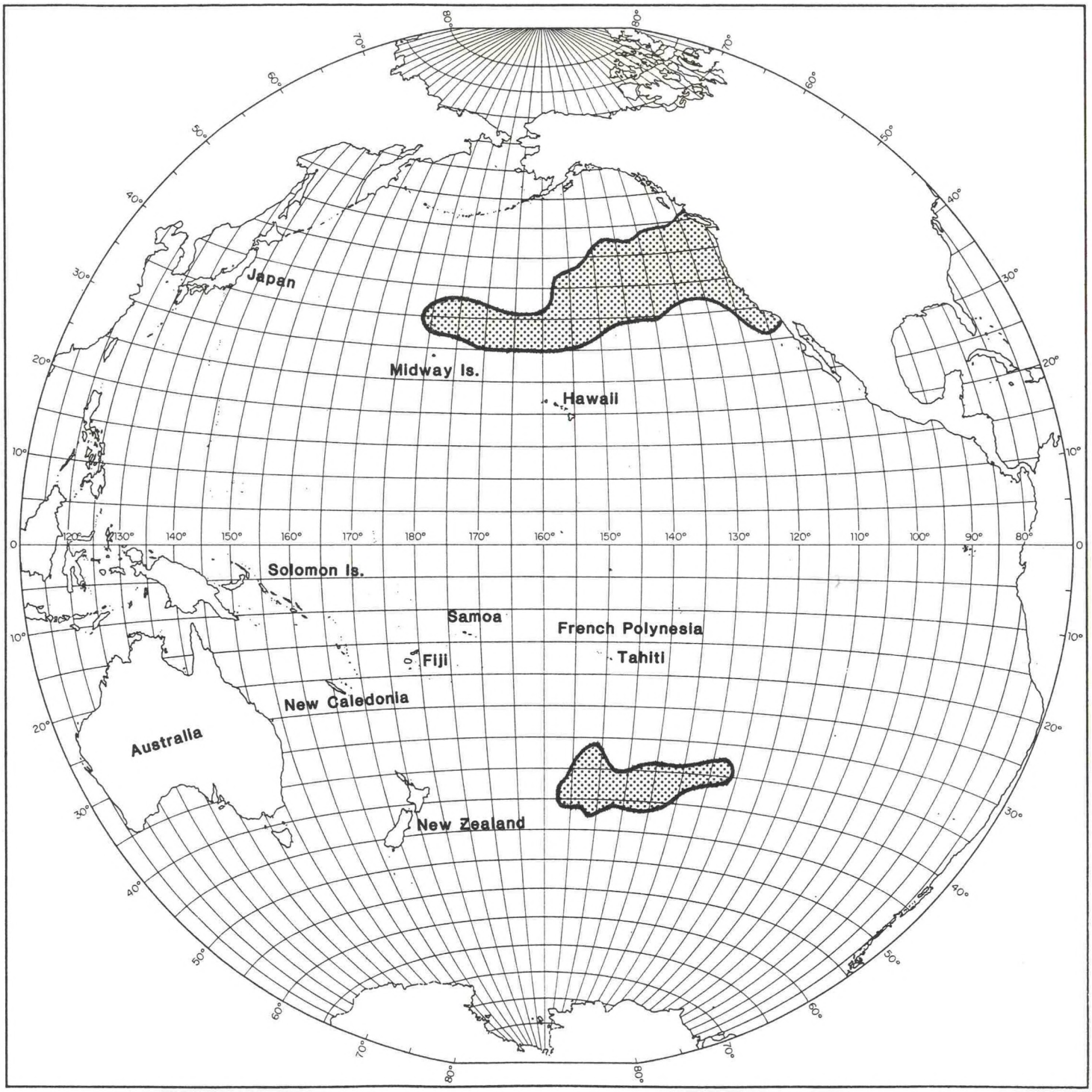

Figure 1. U.S. North and South Pacific albacore fisheries, 1987.

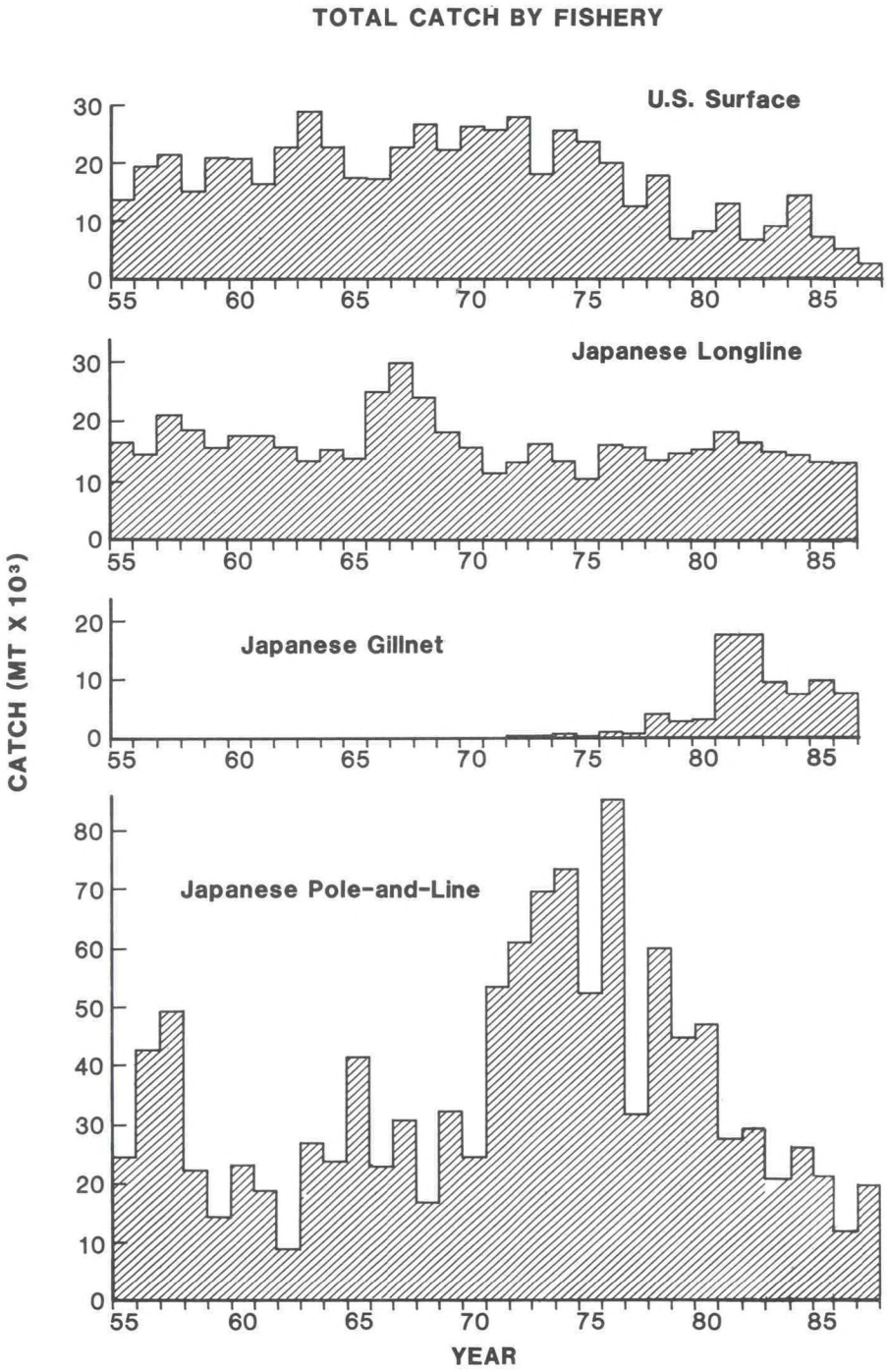

Figure 2. Total albacore catch in metric tons by fishery and gear for the North Pacific, 1955 - 1987.

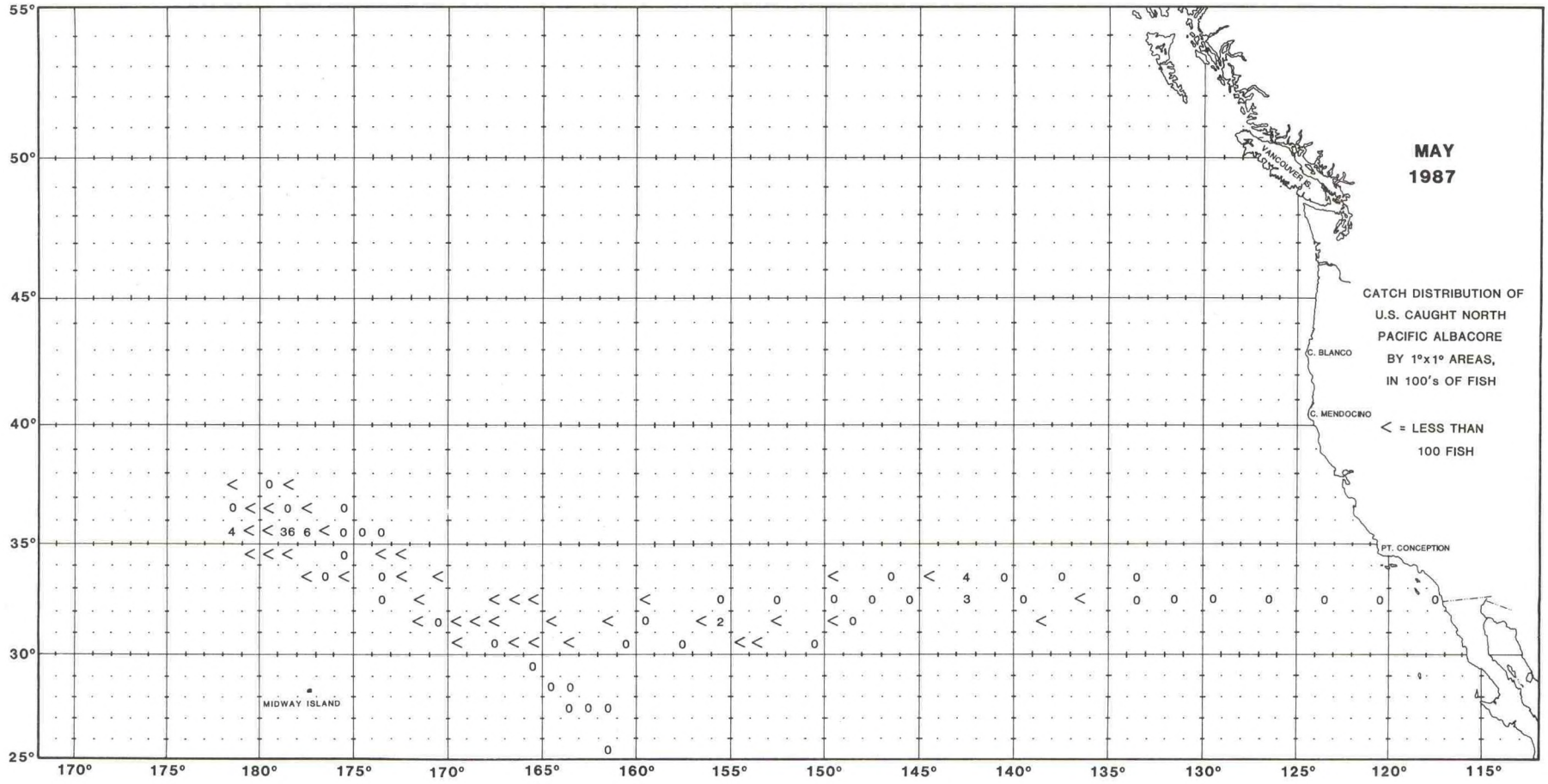

Figure 3a. Albacore catch (numbers of fish) by all vessels by 1° quadrangle in the North Pacific, May 1987.

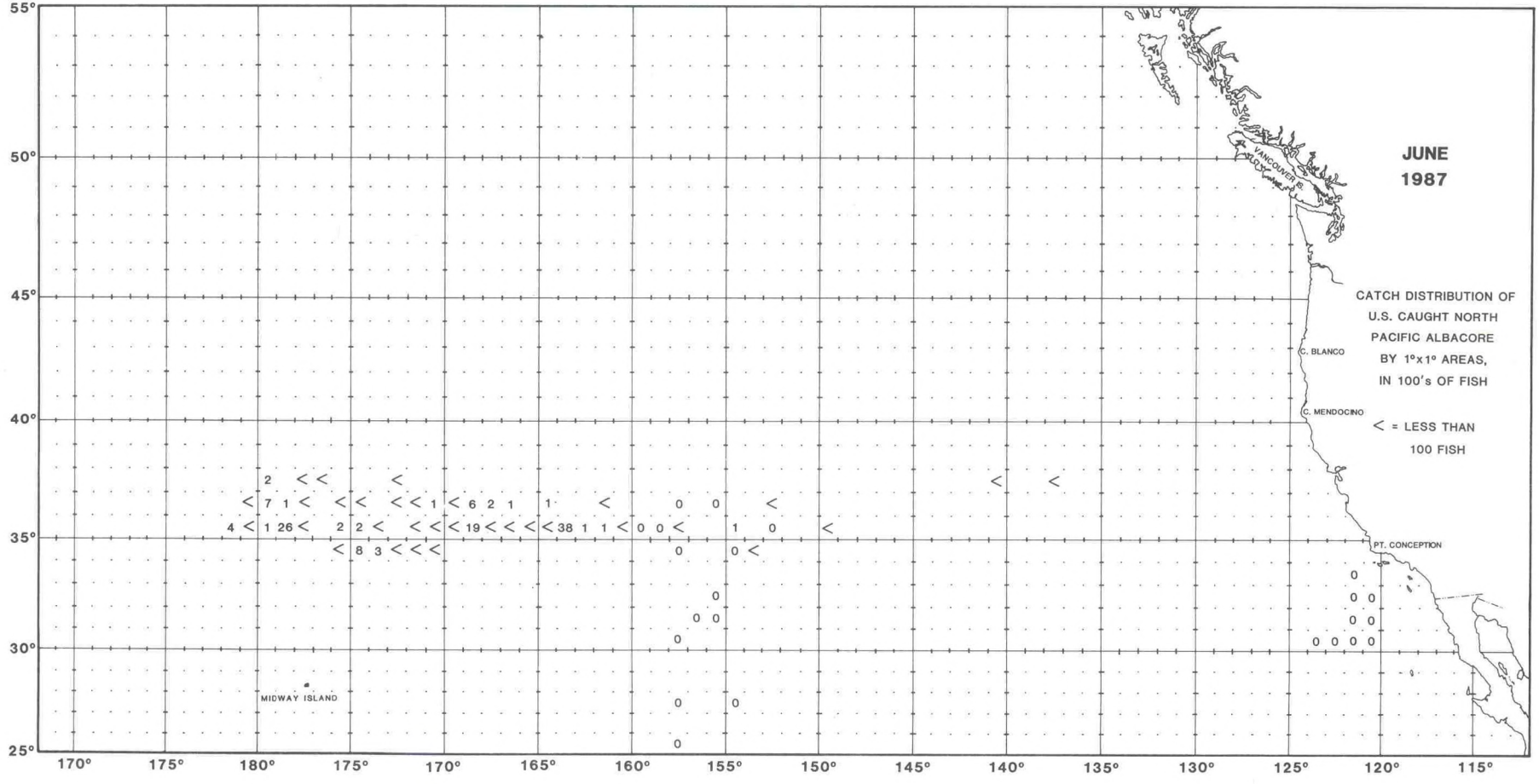

Figure 3b. Albacore catch (numbers of fish) by all vessels by 1^{o} quadrangle in the North Pacific, June 1987.

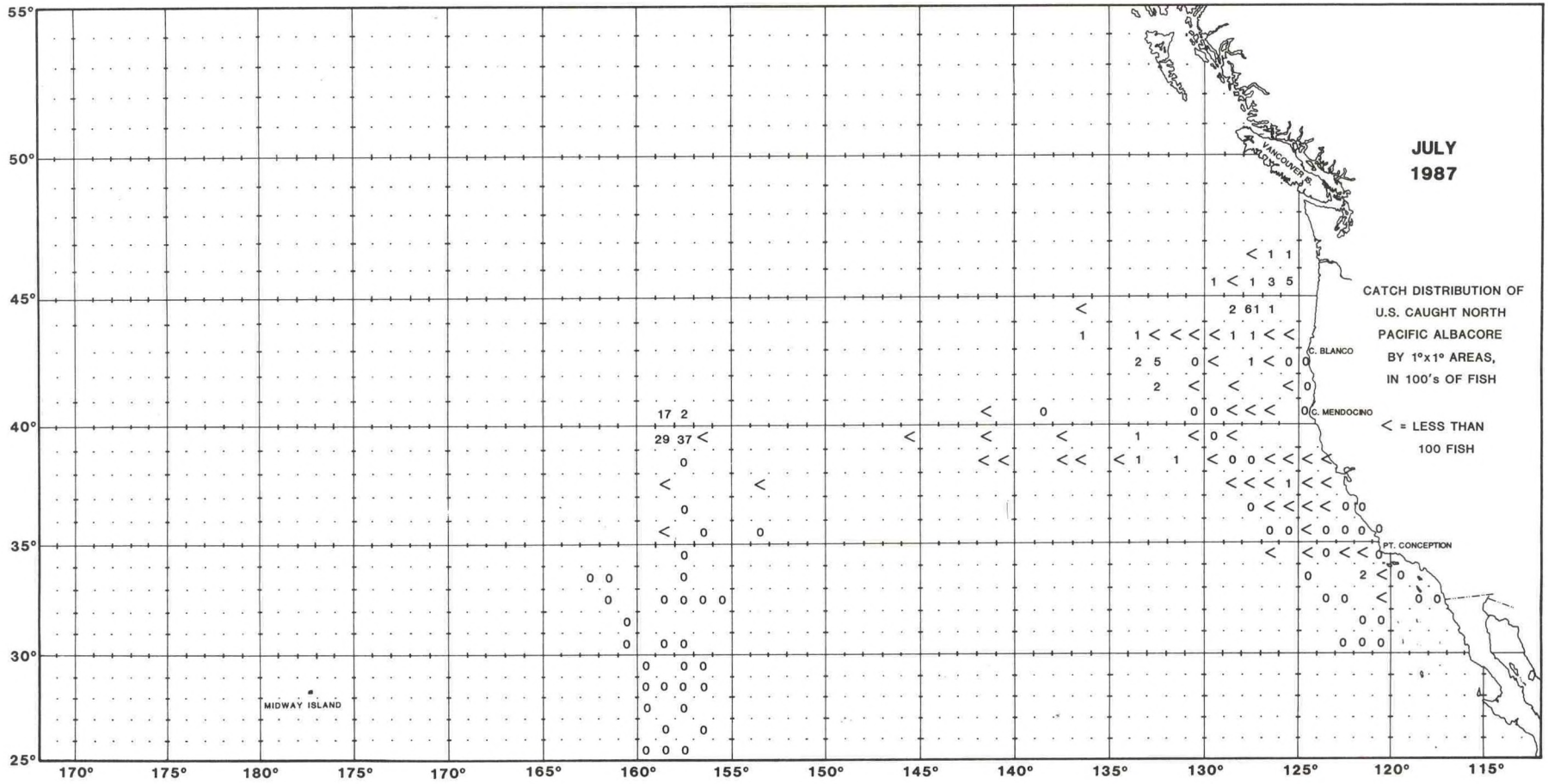

Figure 3c. Albacore catch (numbers of fish) by all vessels by 1^{o} quadrangle in the North Pacific, July 1987.

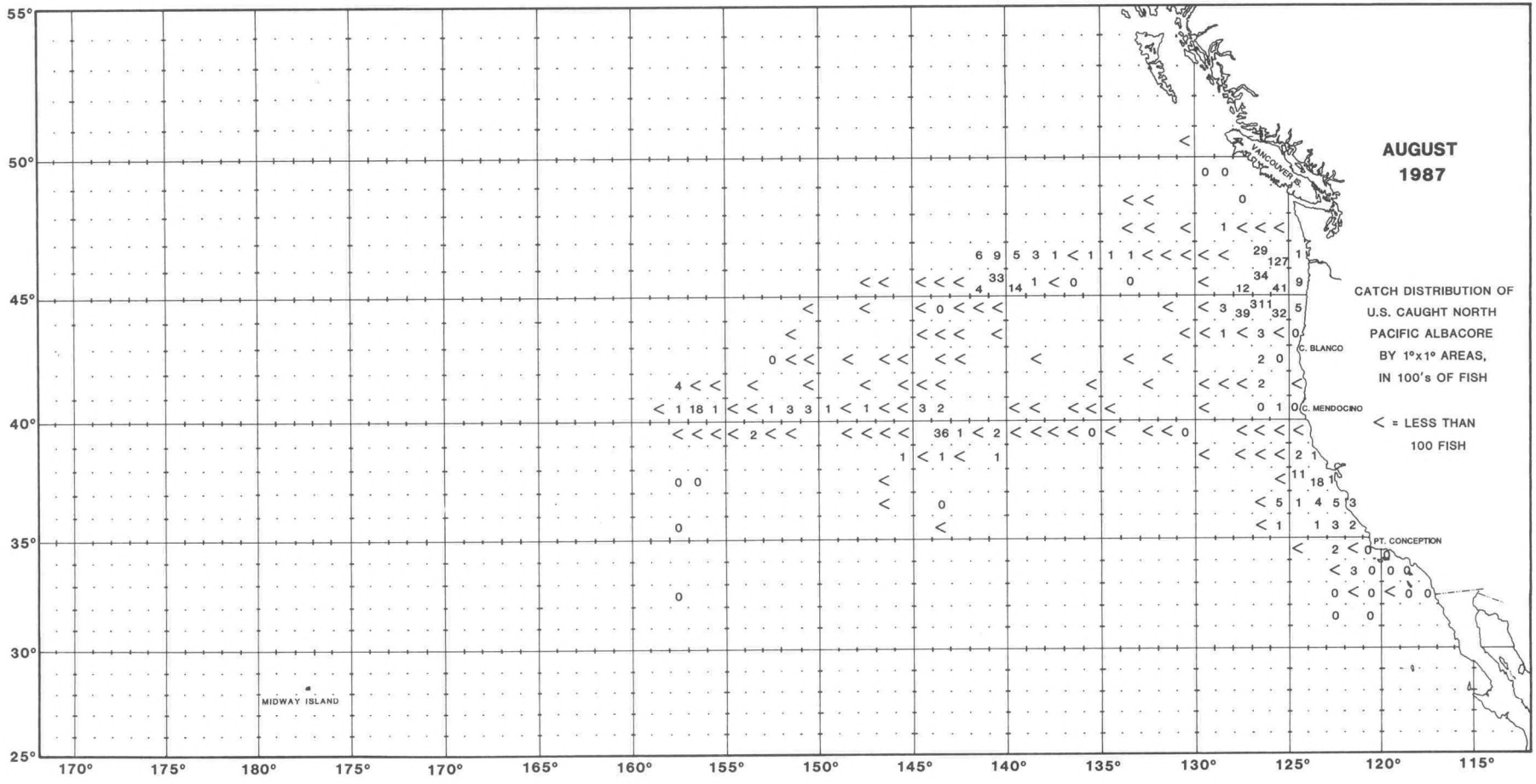

Figure 3d. Albacore catch (numbers of fish) by all vessels by 1^{o} quadrangle in the North Pacific, August 1987.

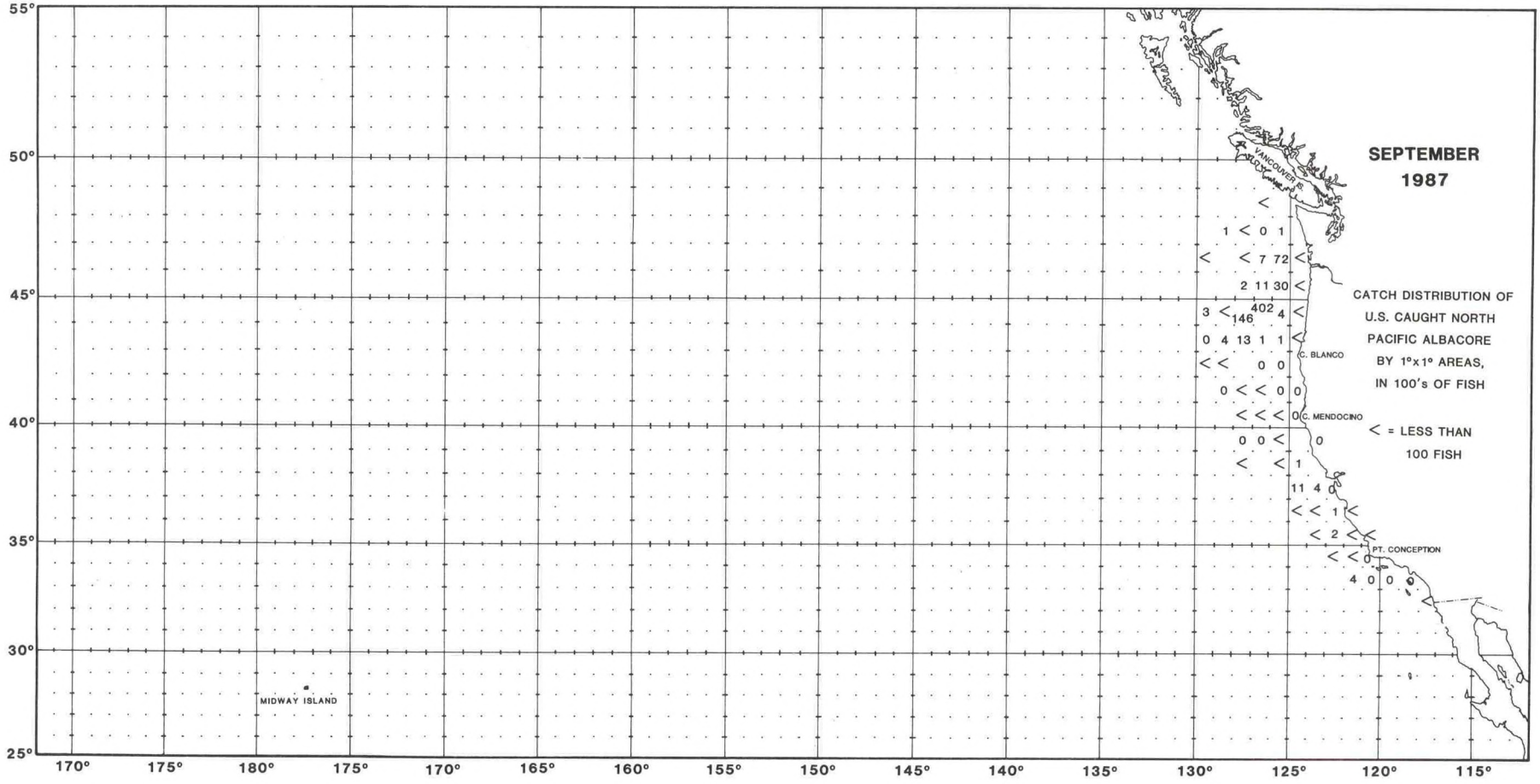

Figure 3e. Albacore catch (numbers of fish) by all vessels by 1^{o} quadrangle in the North Pacific, September 1987.

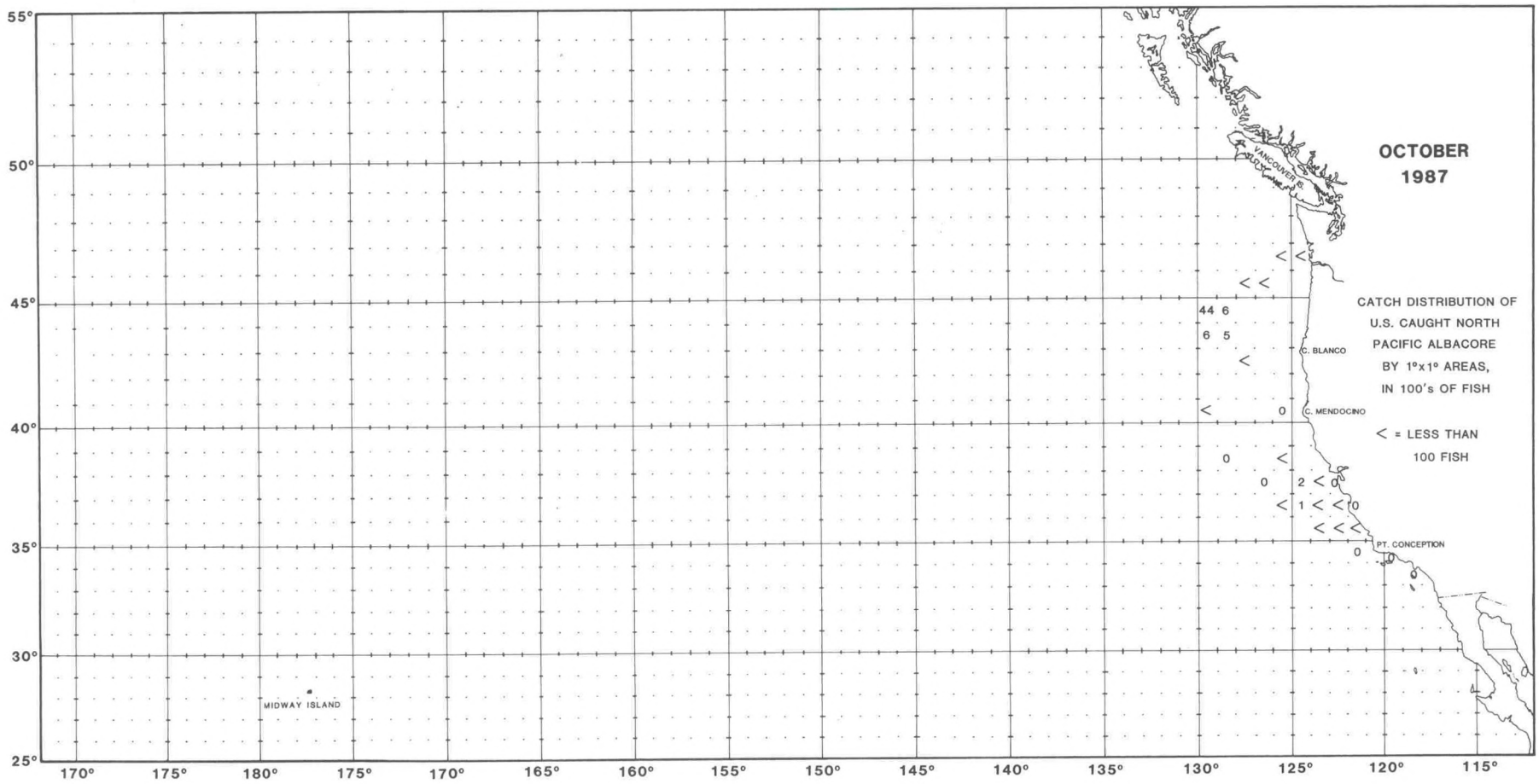

Figure 3f. Albacore catch (numbers of fish) by all vessels by 1^{o} quadrangle in the North Pacific, October 1987.

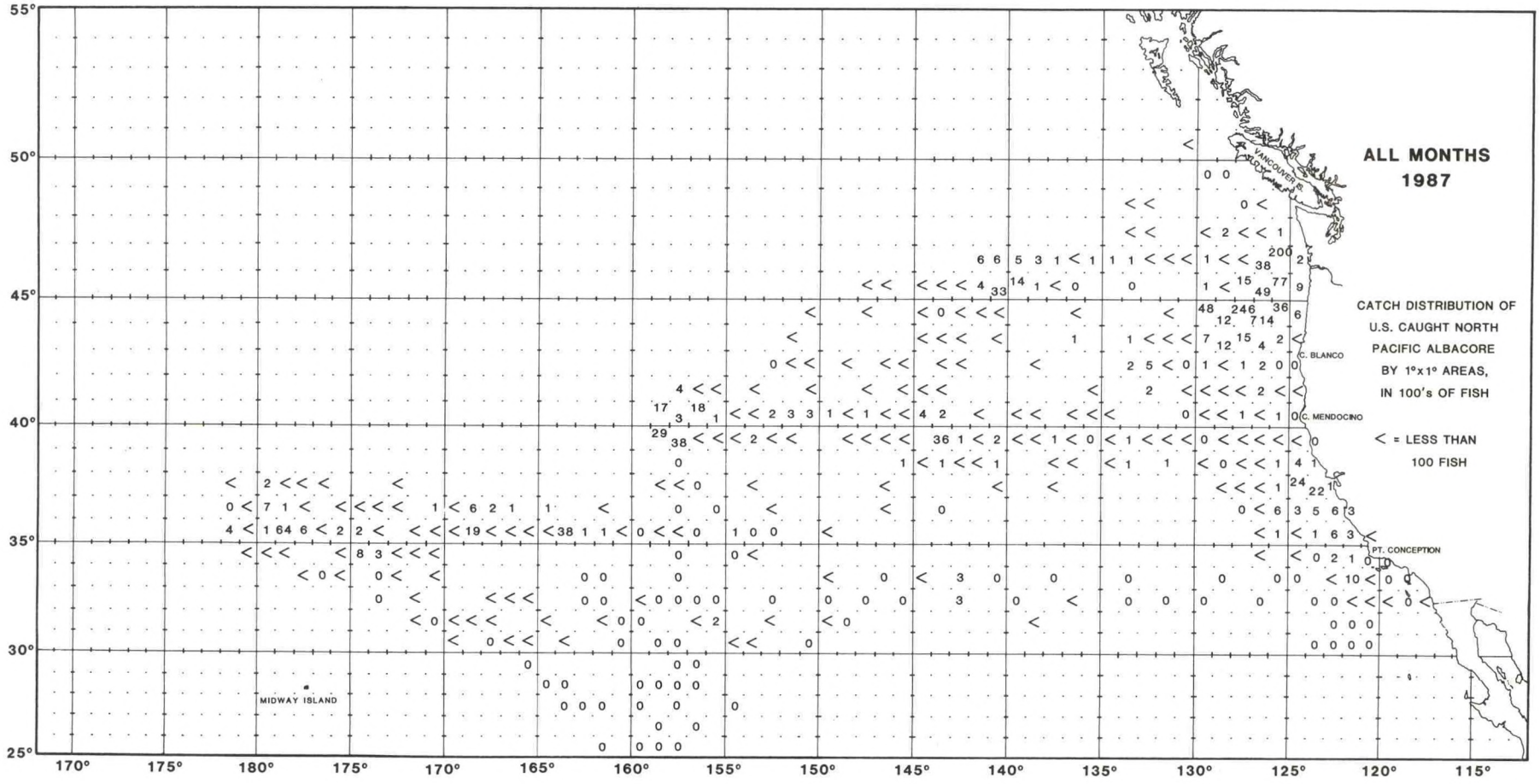

Figure 4. Annual albacore catch (numbers of fish) by all vessels by 1^{o} quadrangle in the North Pacific, 1987.

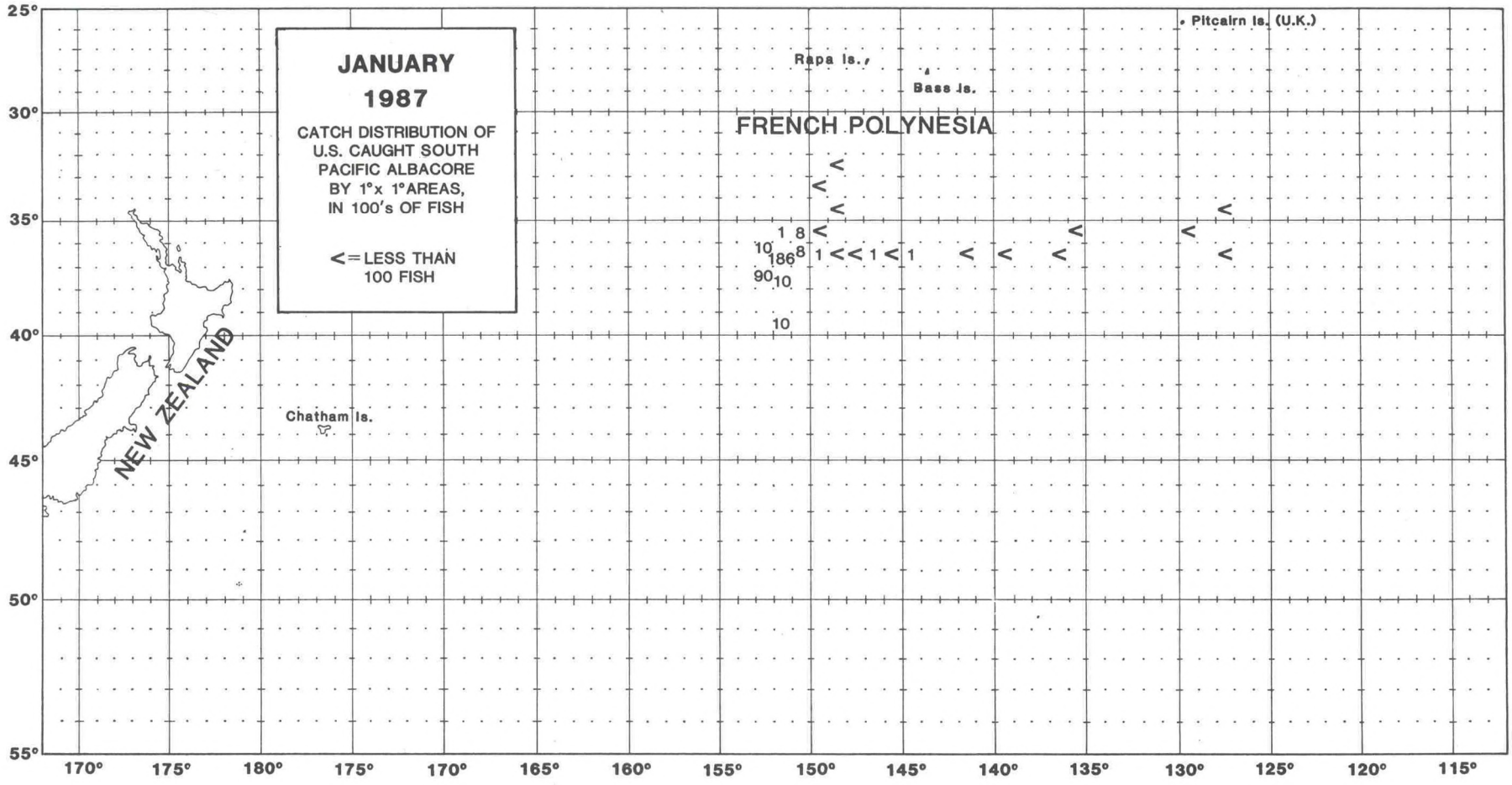

Figure 5a. Albacore catch (numbers of fish) by jigboats by 1^{o} quadrangle in the South Pacific, January 1987.

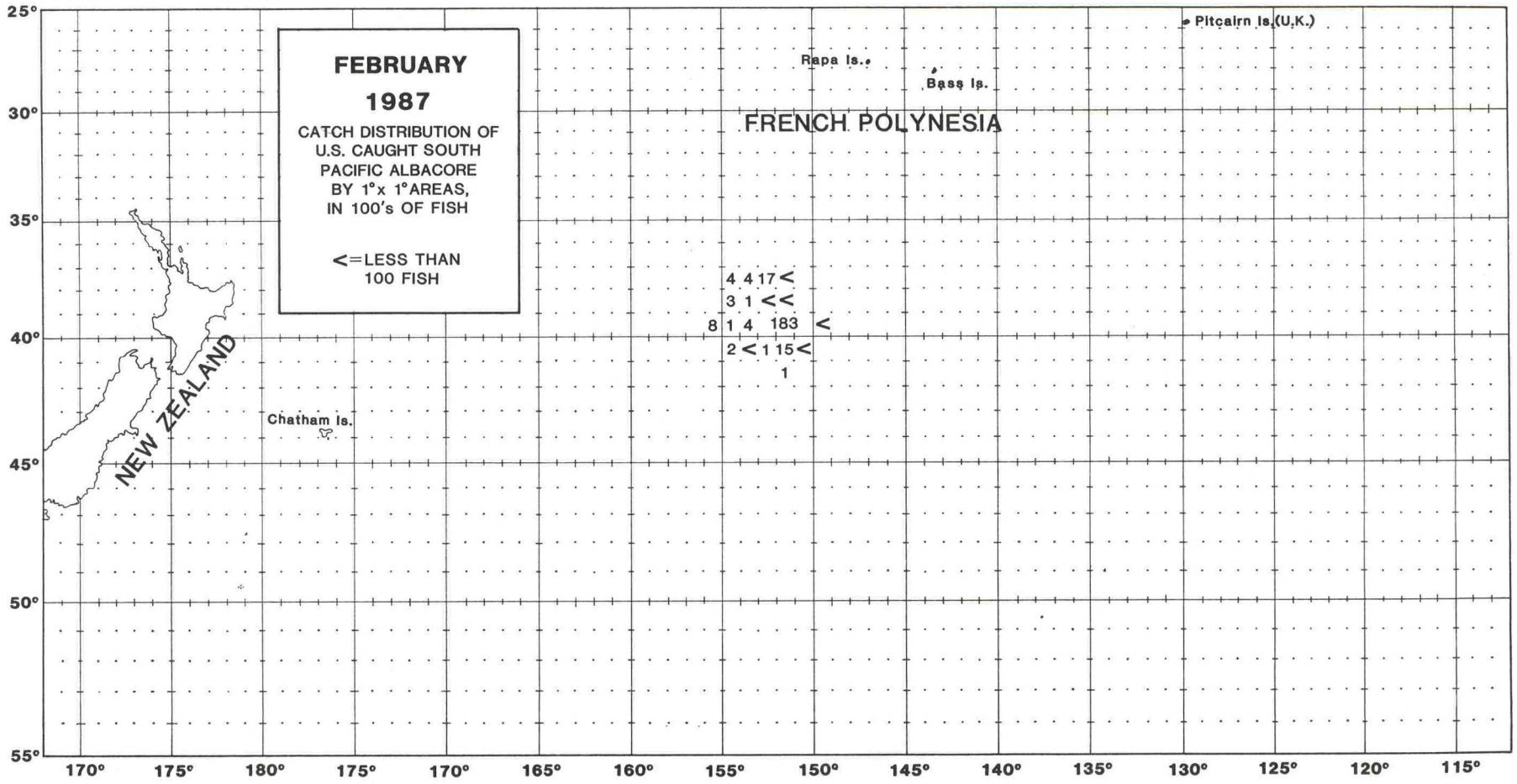

Figure 5b. Albacore catch (numbers of fish) by jigboats by 1° quadrangle in the South Pacific, February 1987.

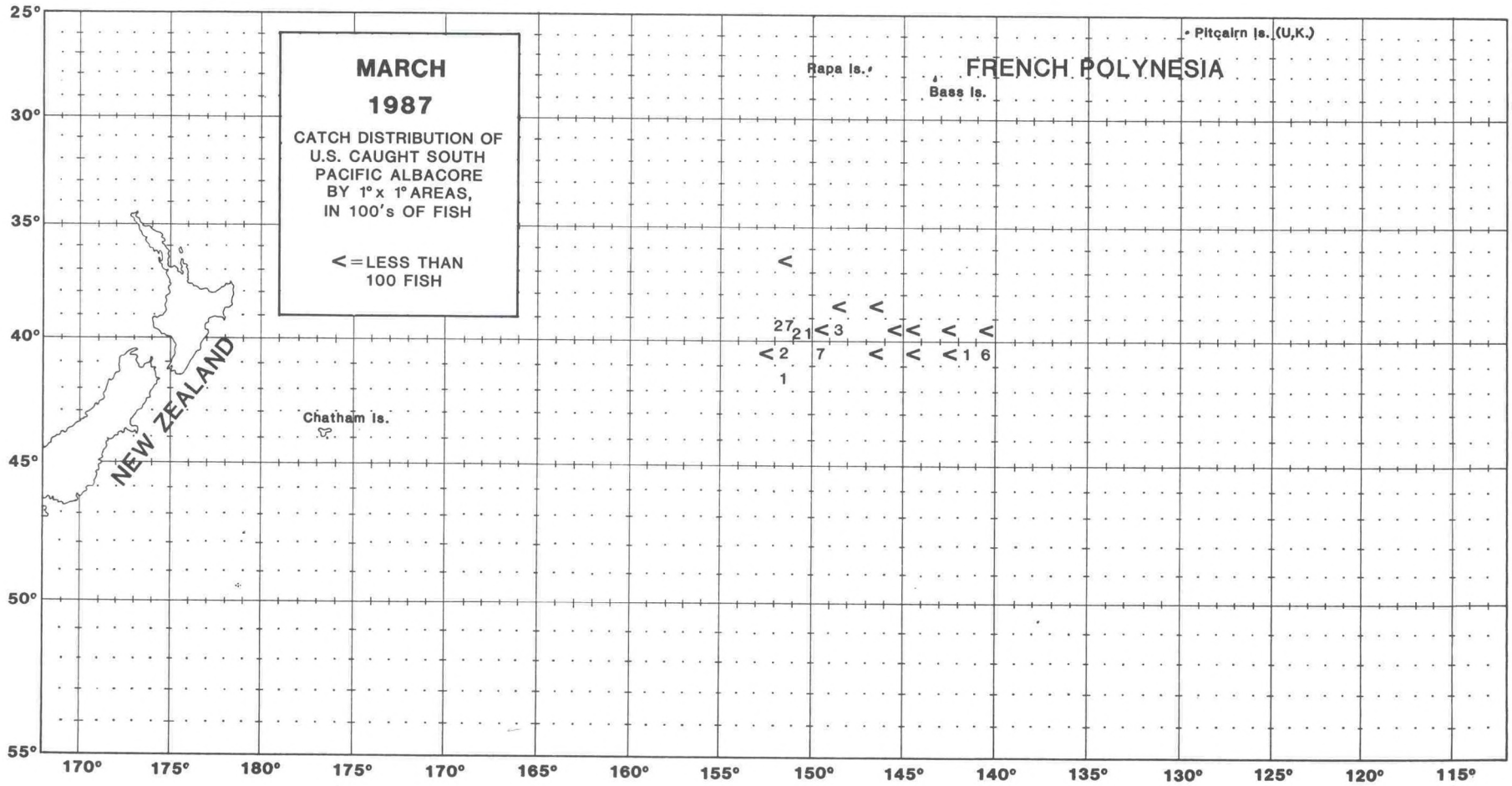

Figure 5c. Albacore catch (numbers of fish) by jigboats by 1^{o} quadrangle in the South Pacific, March 1987.

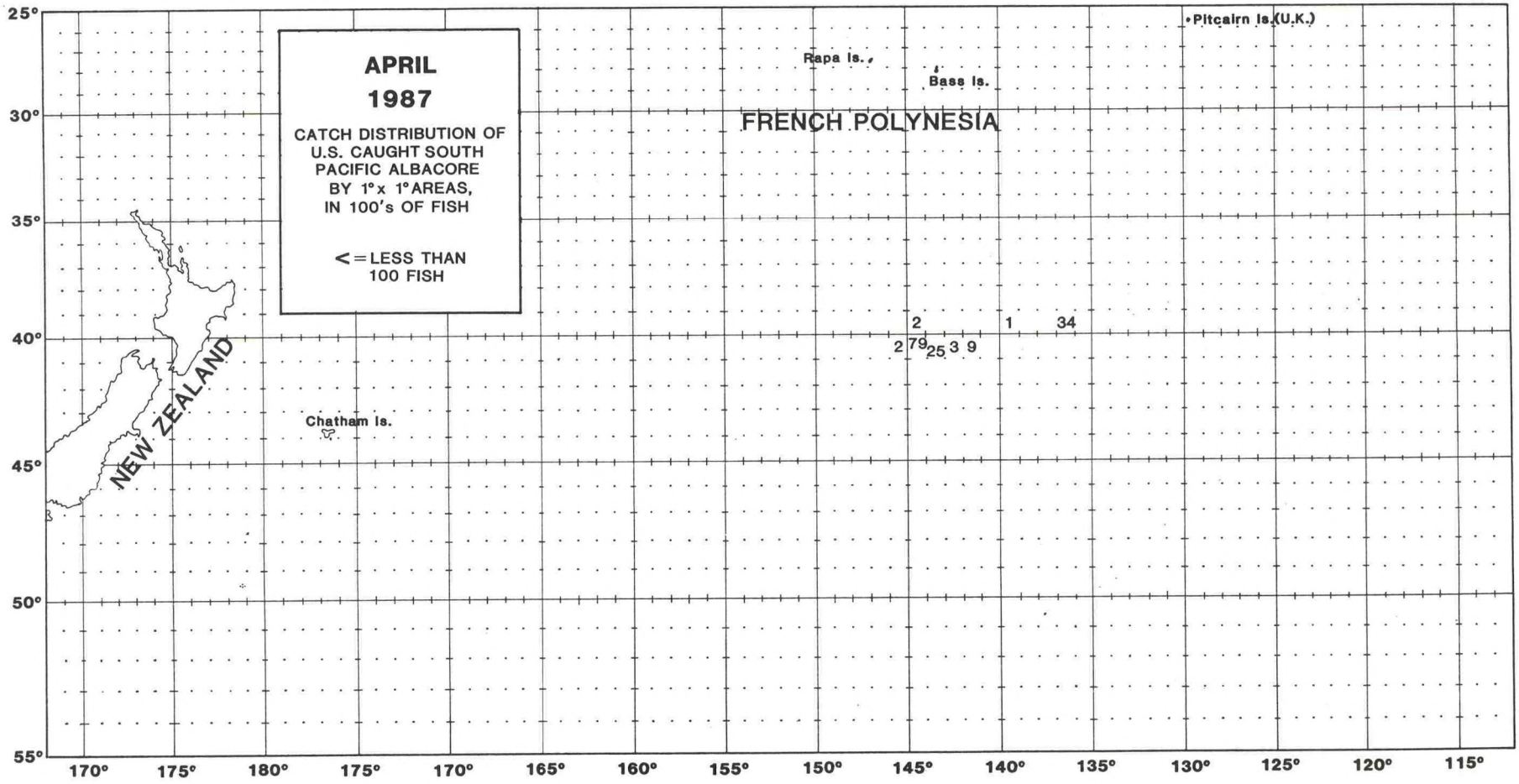

Figure 5d. Albacore catch (numbers of fish) by jigboats by 1^{o} quadrangle in the South Pacific, April 1987.

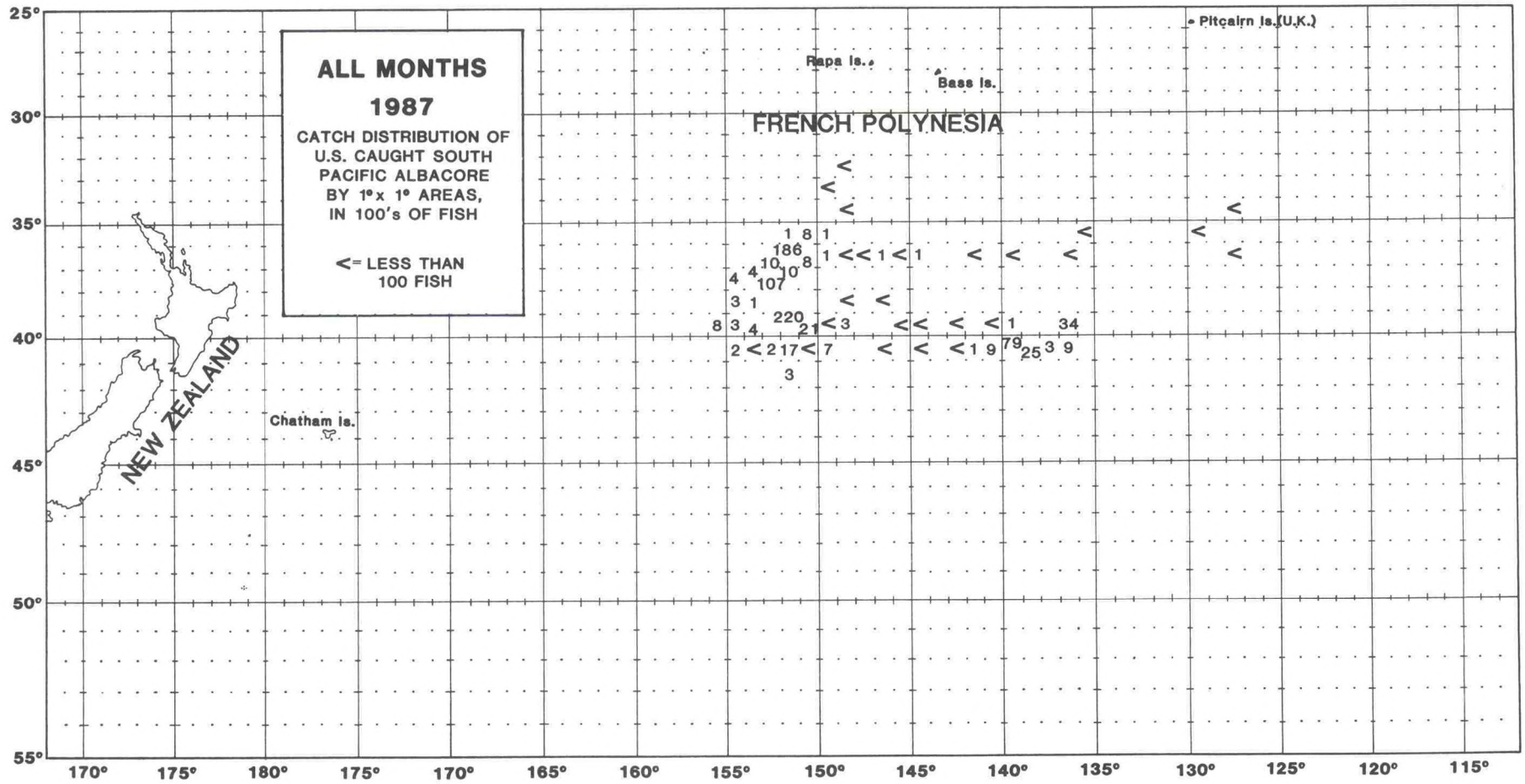

Figure 6. Annual albacore catch (numbers of fish) by jigboats by 1^{o} quadrangle in the South Pacific, 1987.

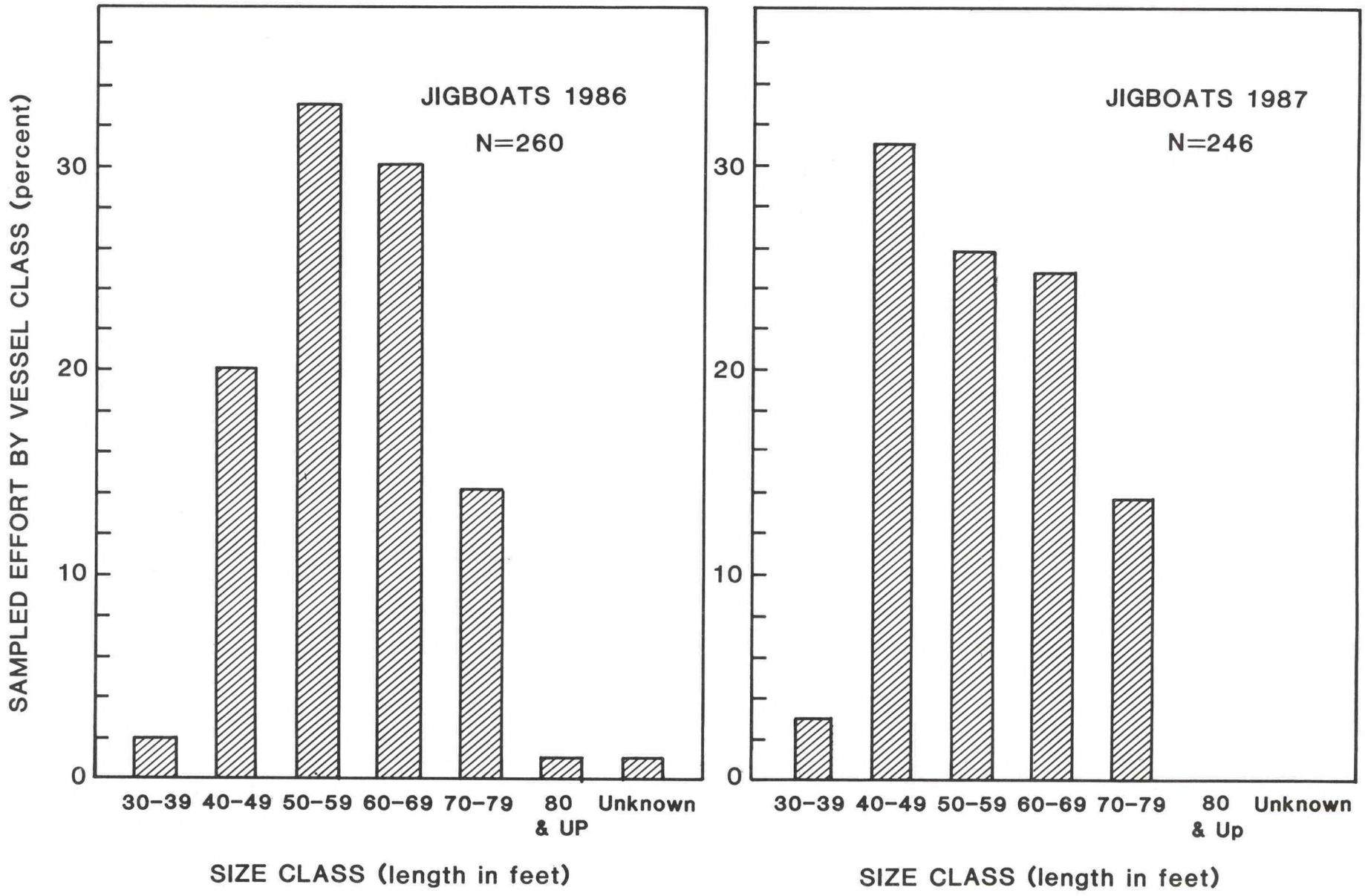

Figure 7. U.S. albacore jigboat sampled effort (days fished) by vessel class and year.

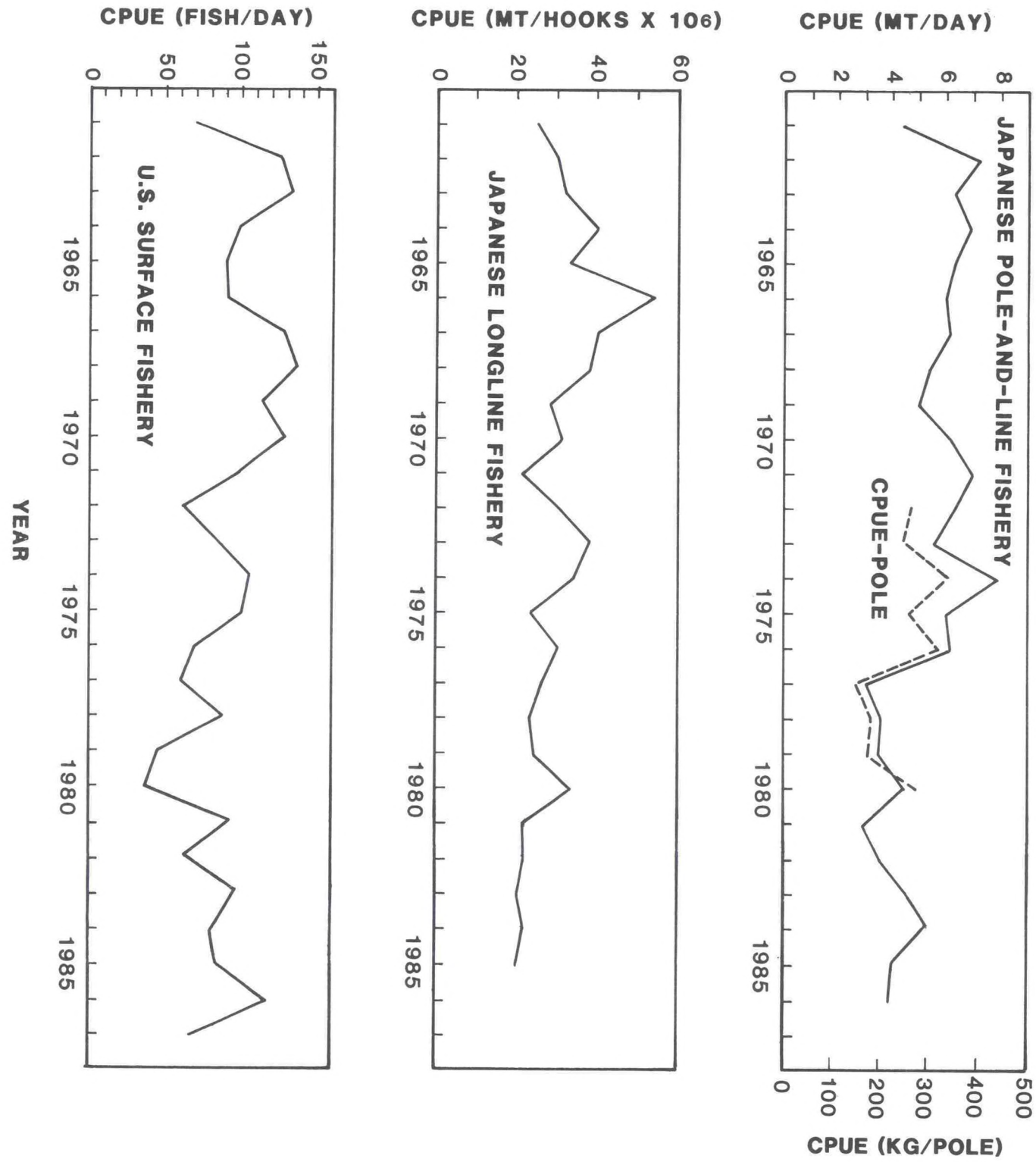

Figure 8. North Pacific albacore catch-per-unit effort (CPUE) by fishery and gear.

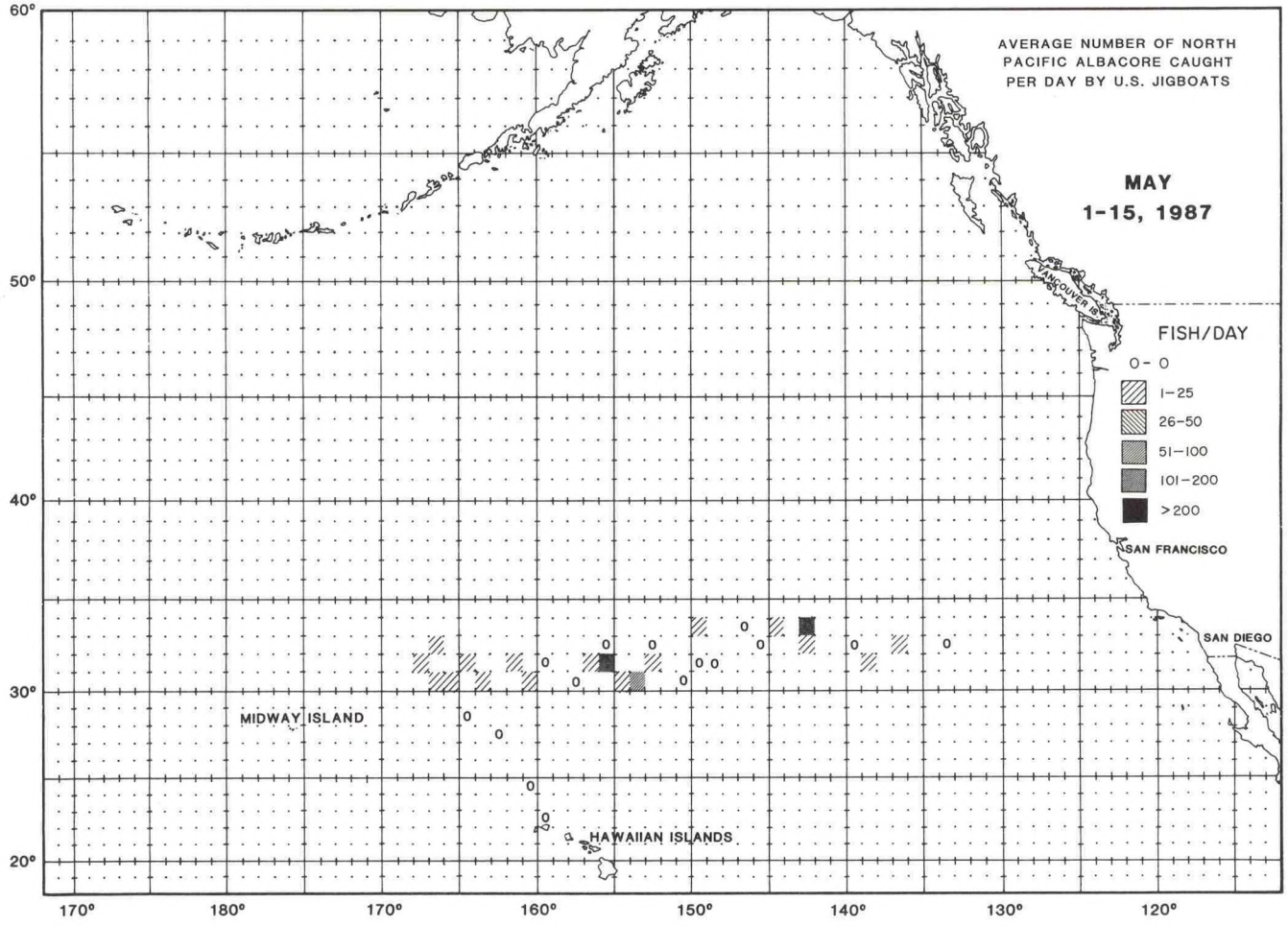

Figure 9a. Jigboat catch-per-standard-day fishing by 1^{o} quadrangle for May 1 - 15, 1987.

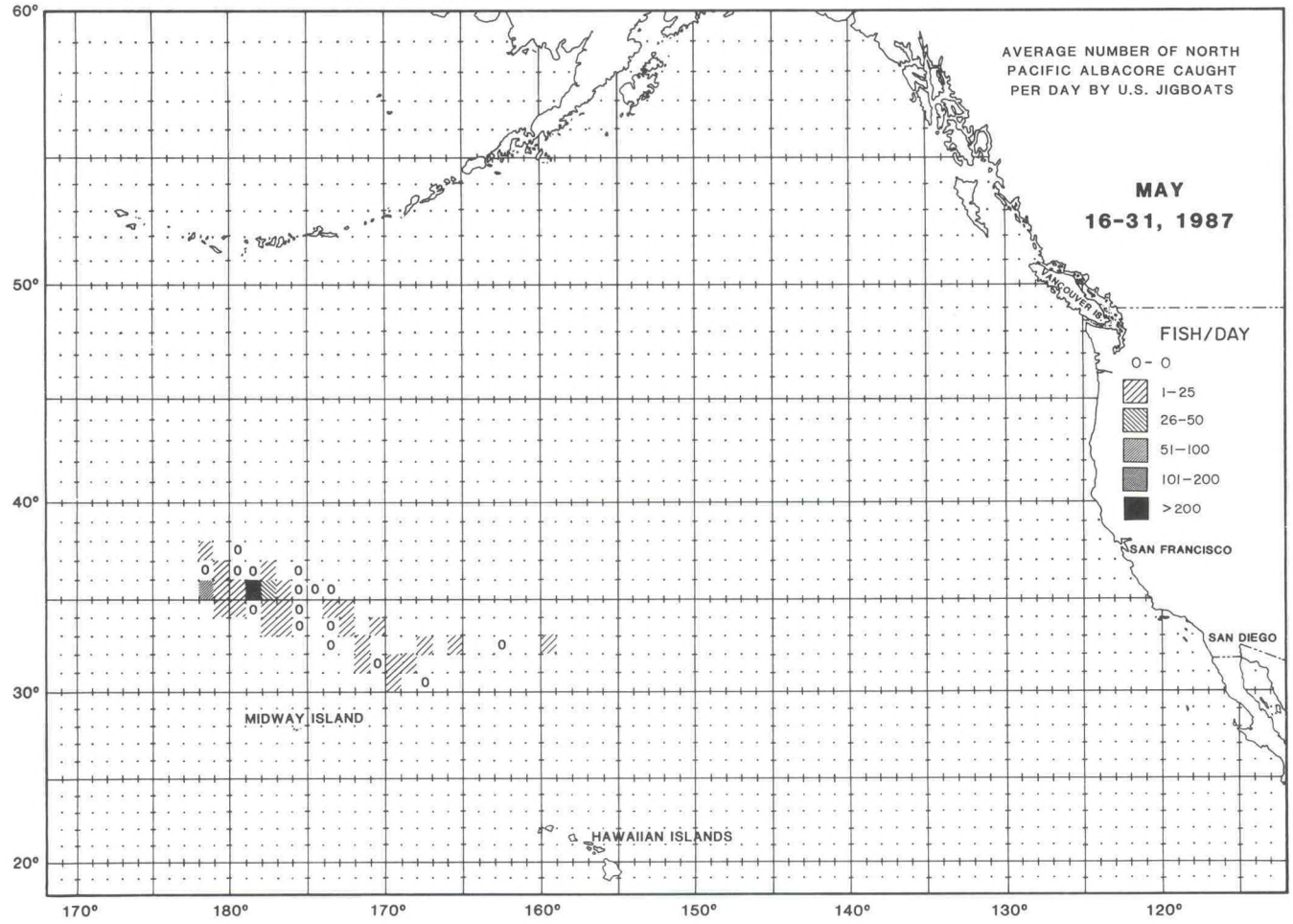

Figure 9b. Jigboat catch-per-standard-day fishing by 1^{o} quadrangle for May 16 - 31, 1987.

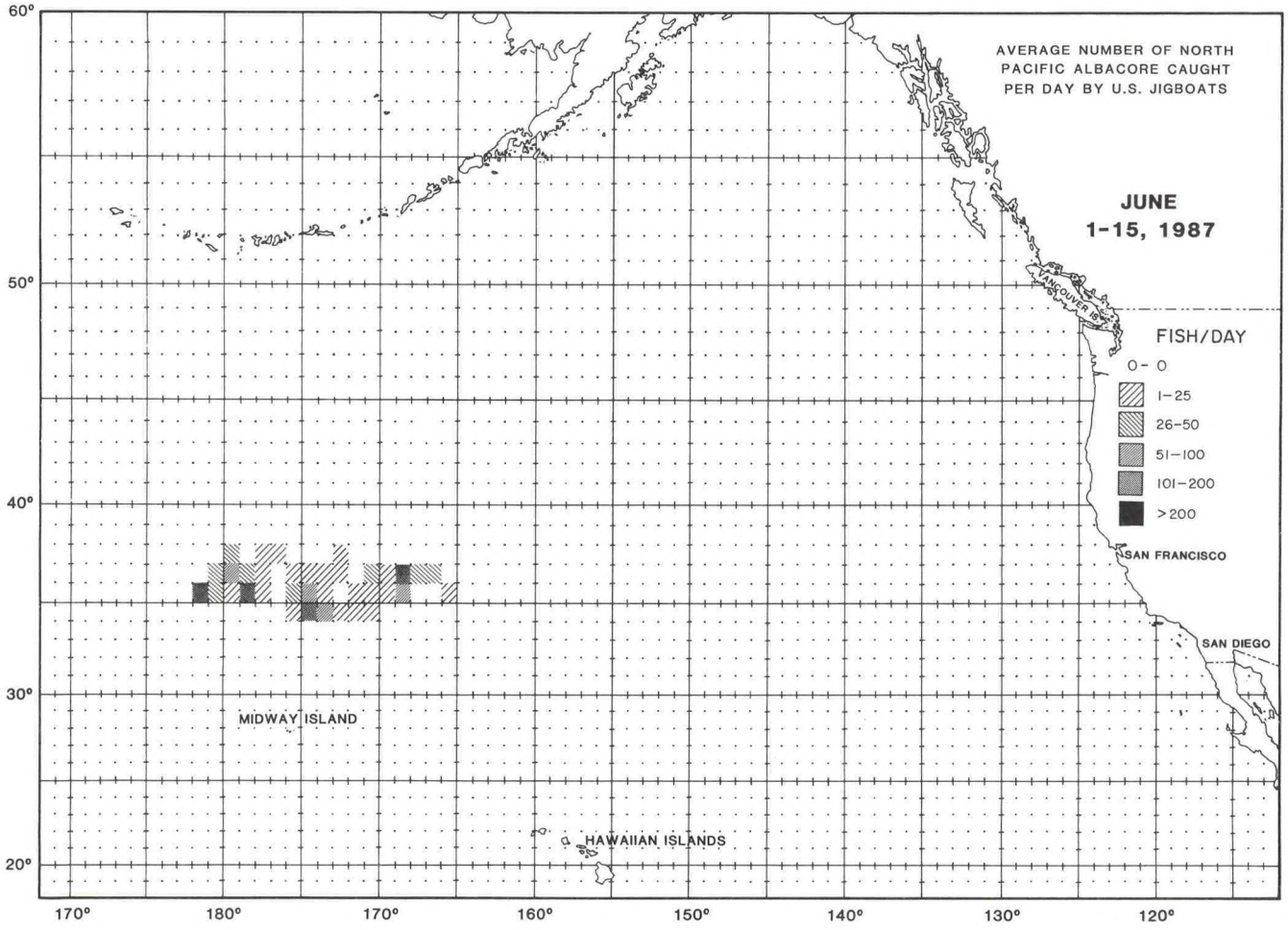

Figure 9c. Jigboat catch-per-standard-day fishing by 1° quadrangle for June 1 - 15, 1987.

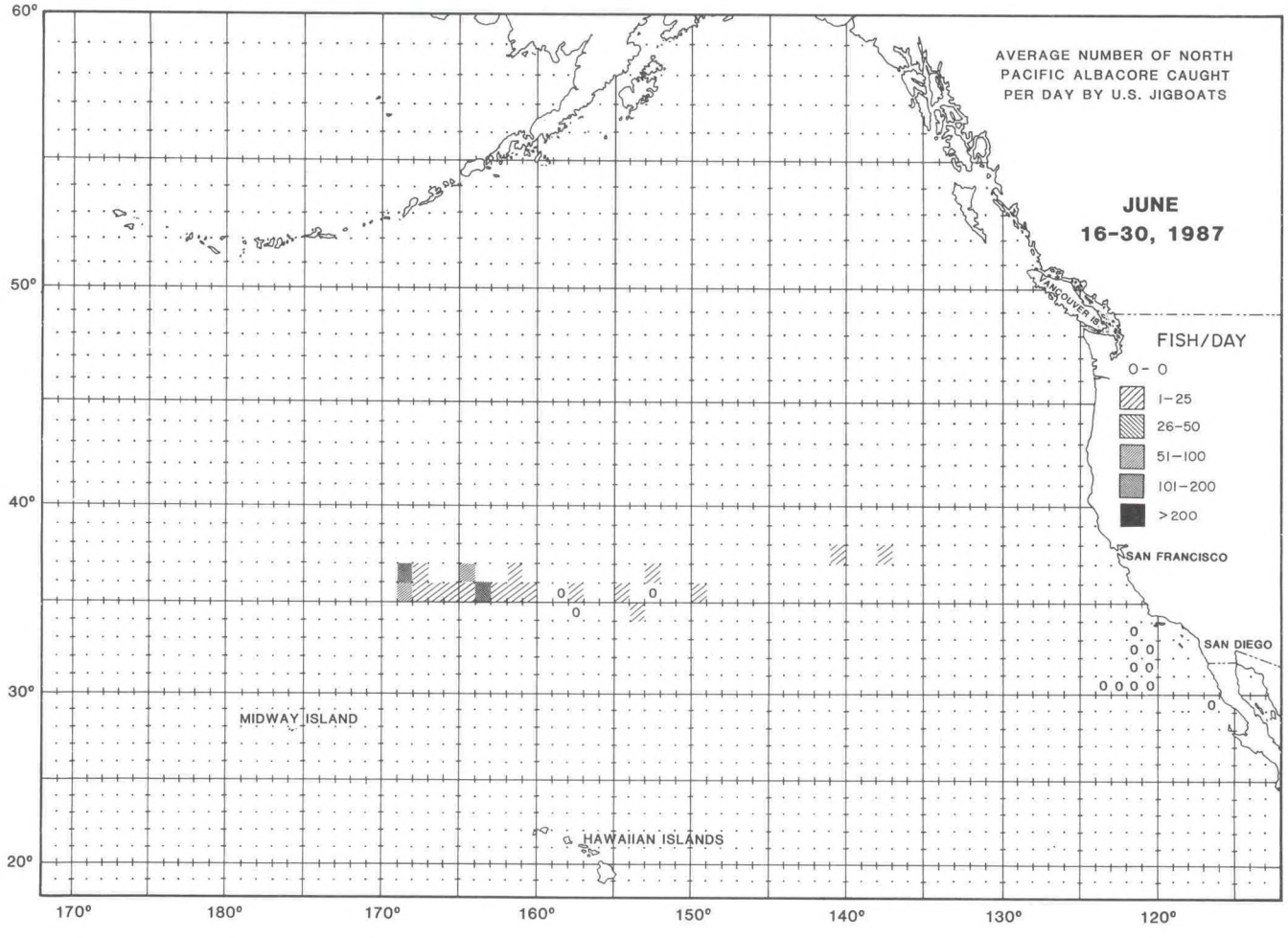

Figure 9d. Jigboat catch-per-standard-day fishing by 1^{o} quadrangle for June 16 - 30, 1987.

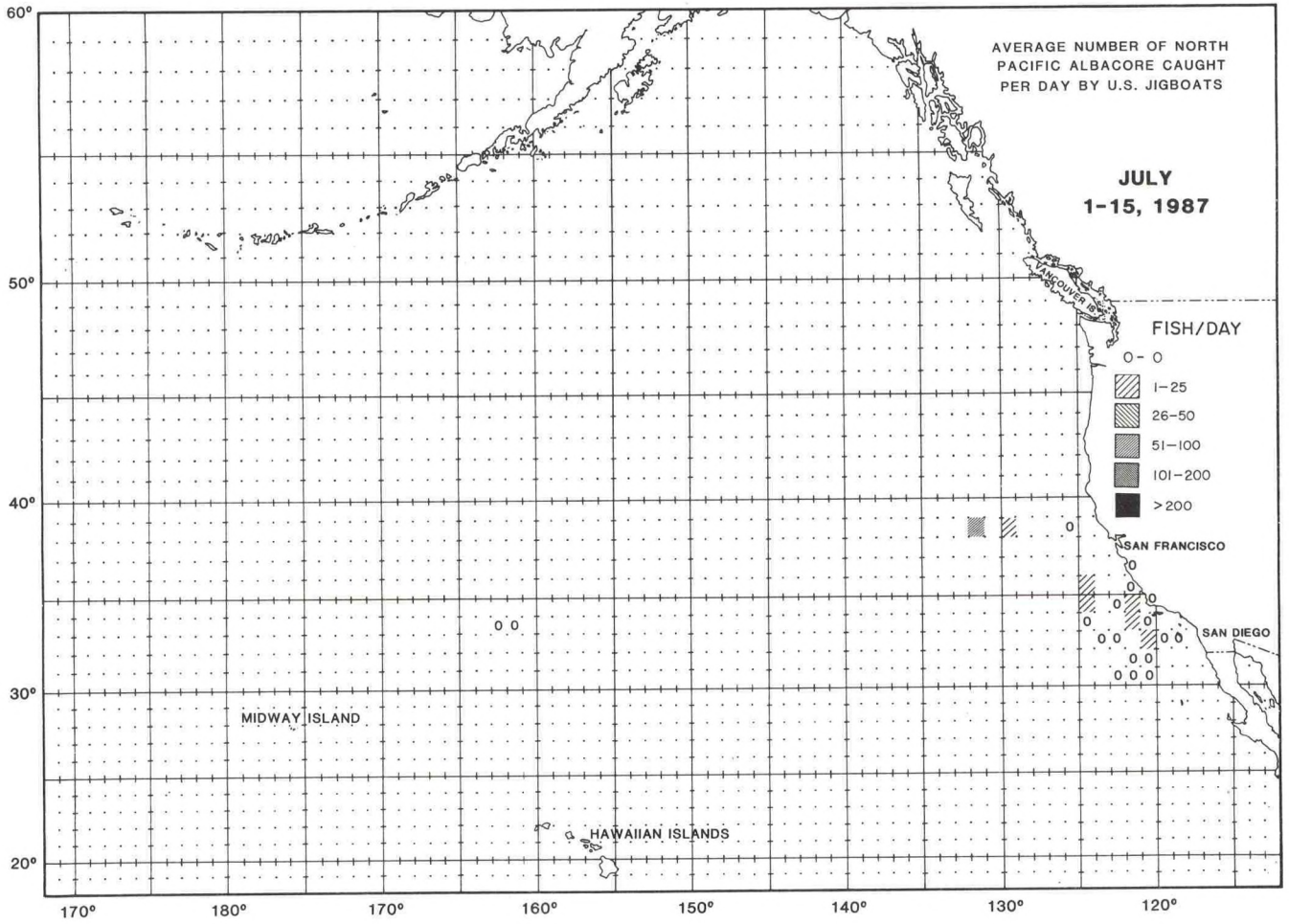

Figure 9e. Jigboat catch-per-standard-day fishing by 1° quadrangle for July 1 - 15, 1987.

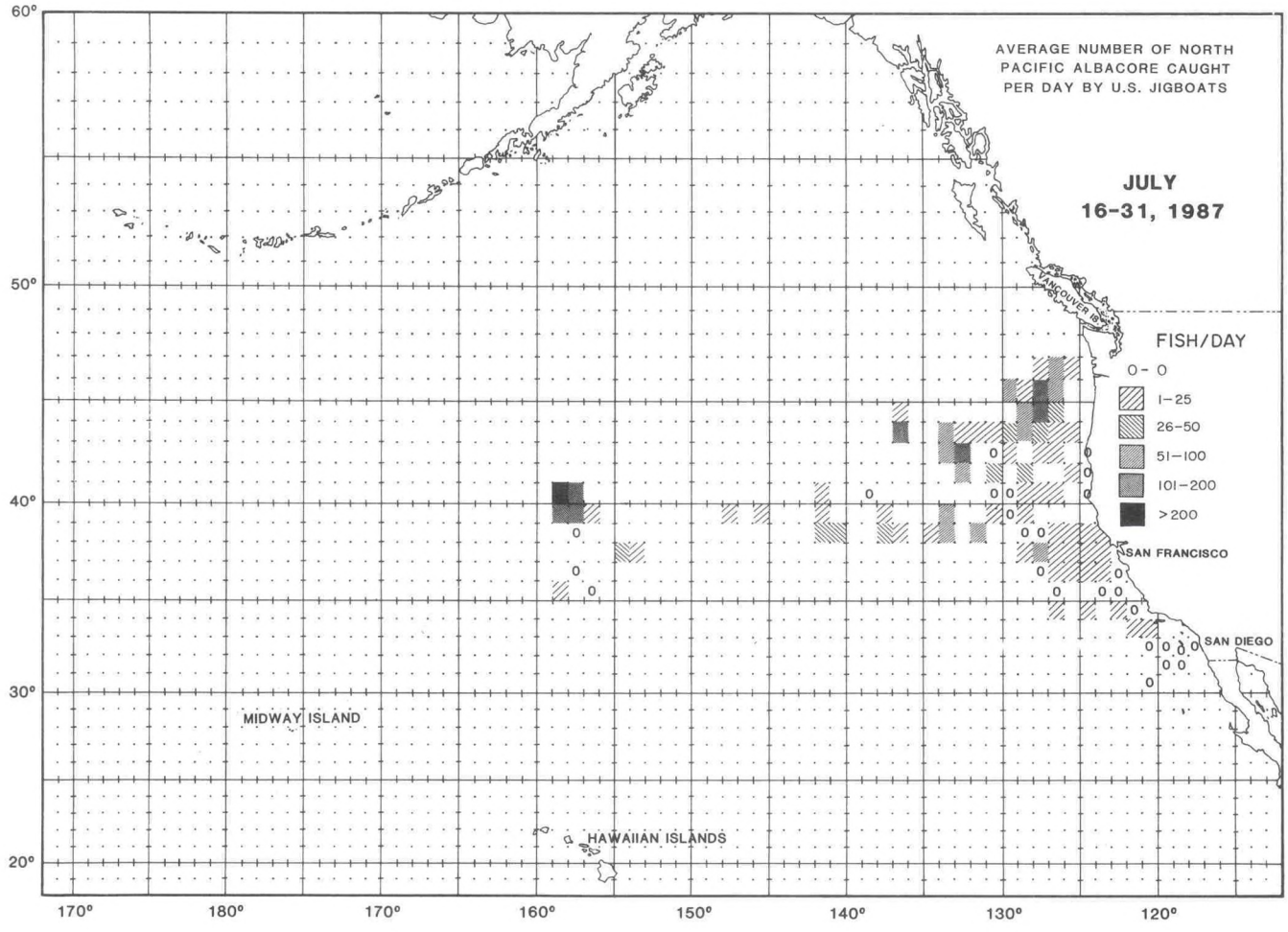

Figure 9f. Jigboat catch-per-standard-day fishing by 1° quadrangle for July 16 - 31, 1987.

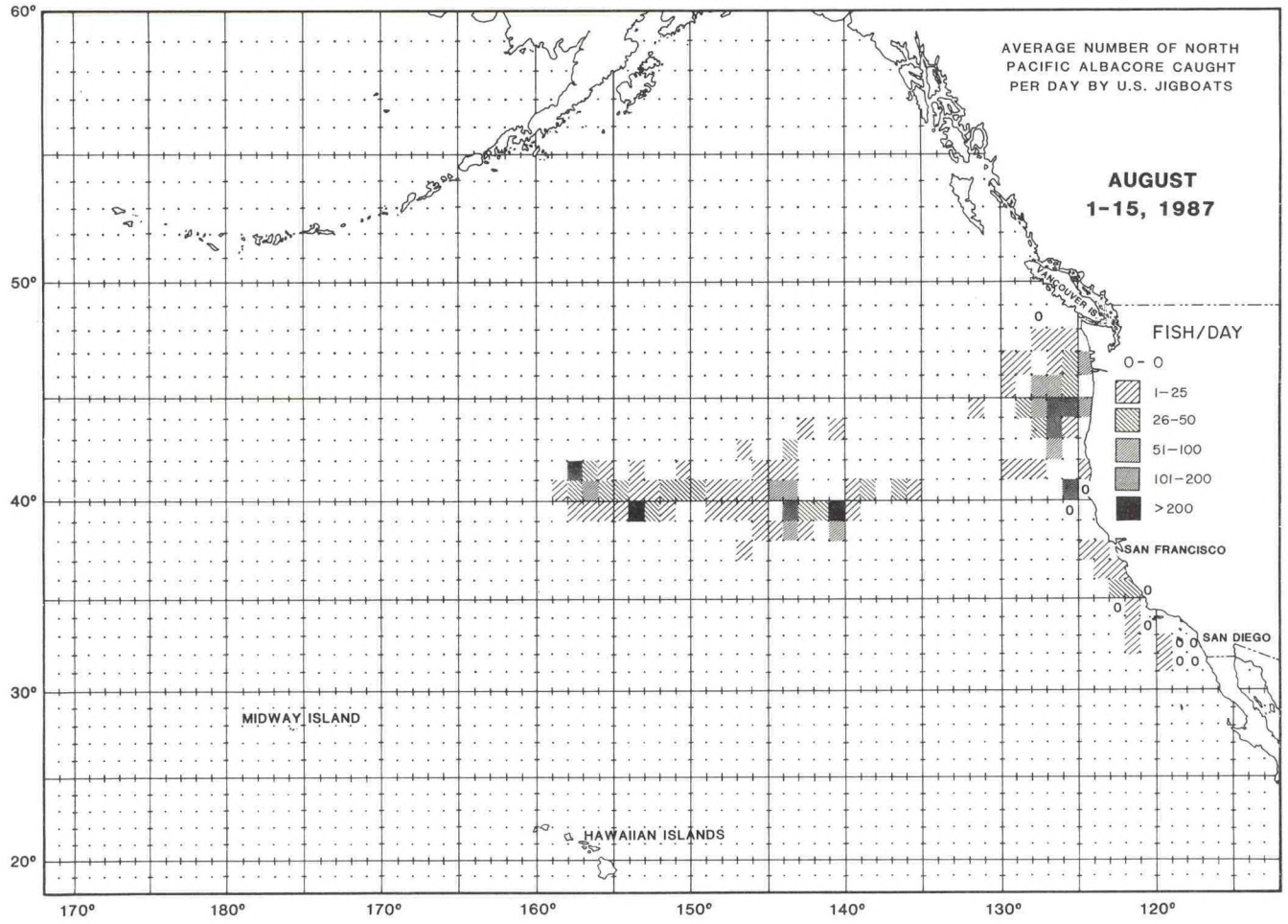

Figure 9g. Jigboat catch-per-standard-day fishing by 1° quadrangle for August 1 - 15, 1987.

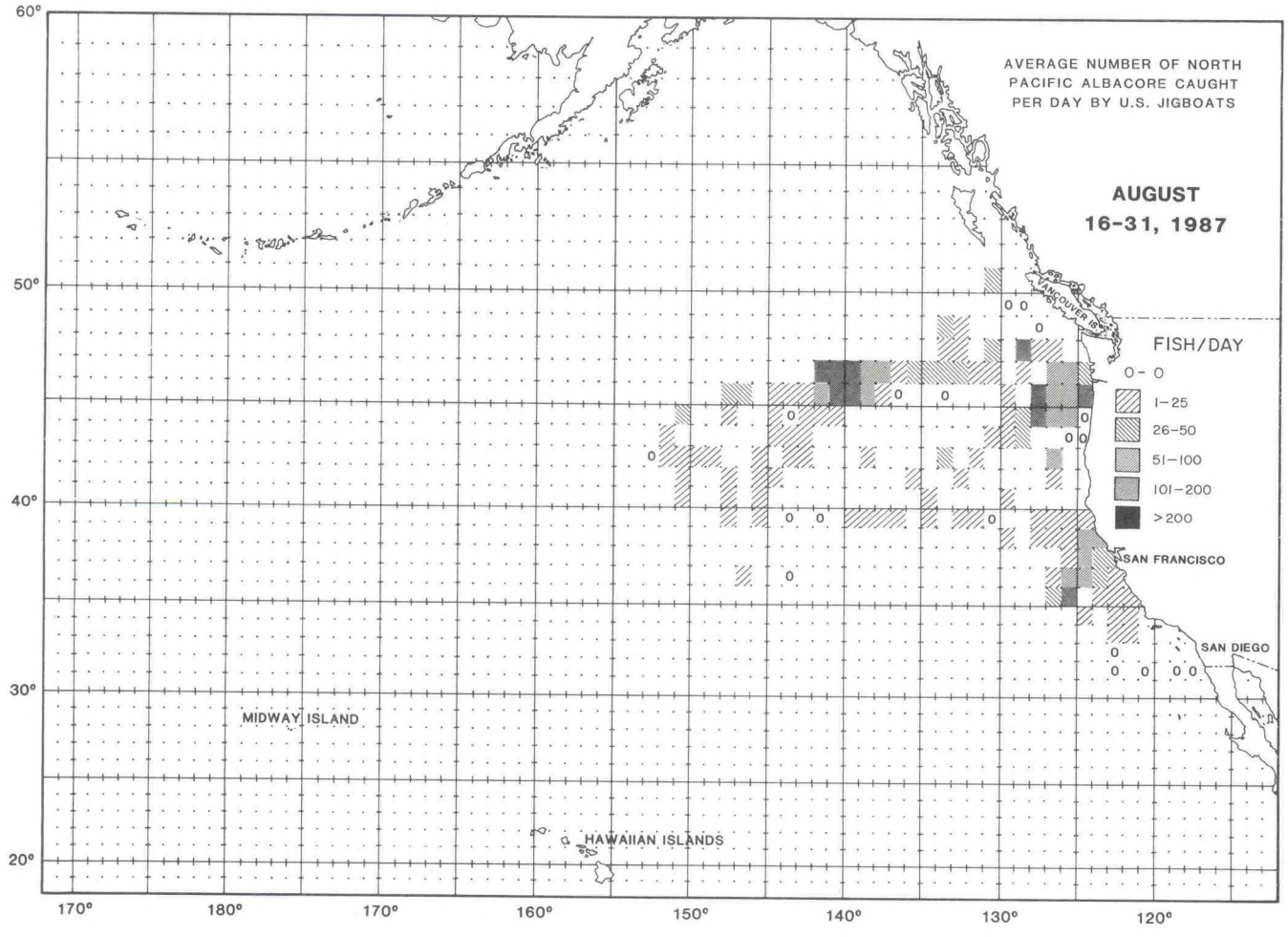

Figure 9h. Jigboat catch-per-standard-day fishing by 1° quadrangle for August 16 - 31, 1987.

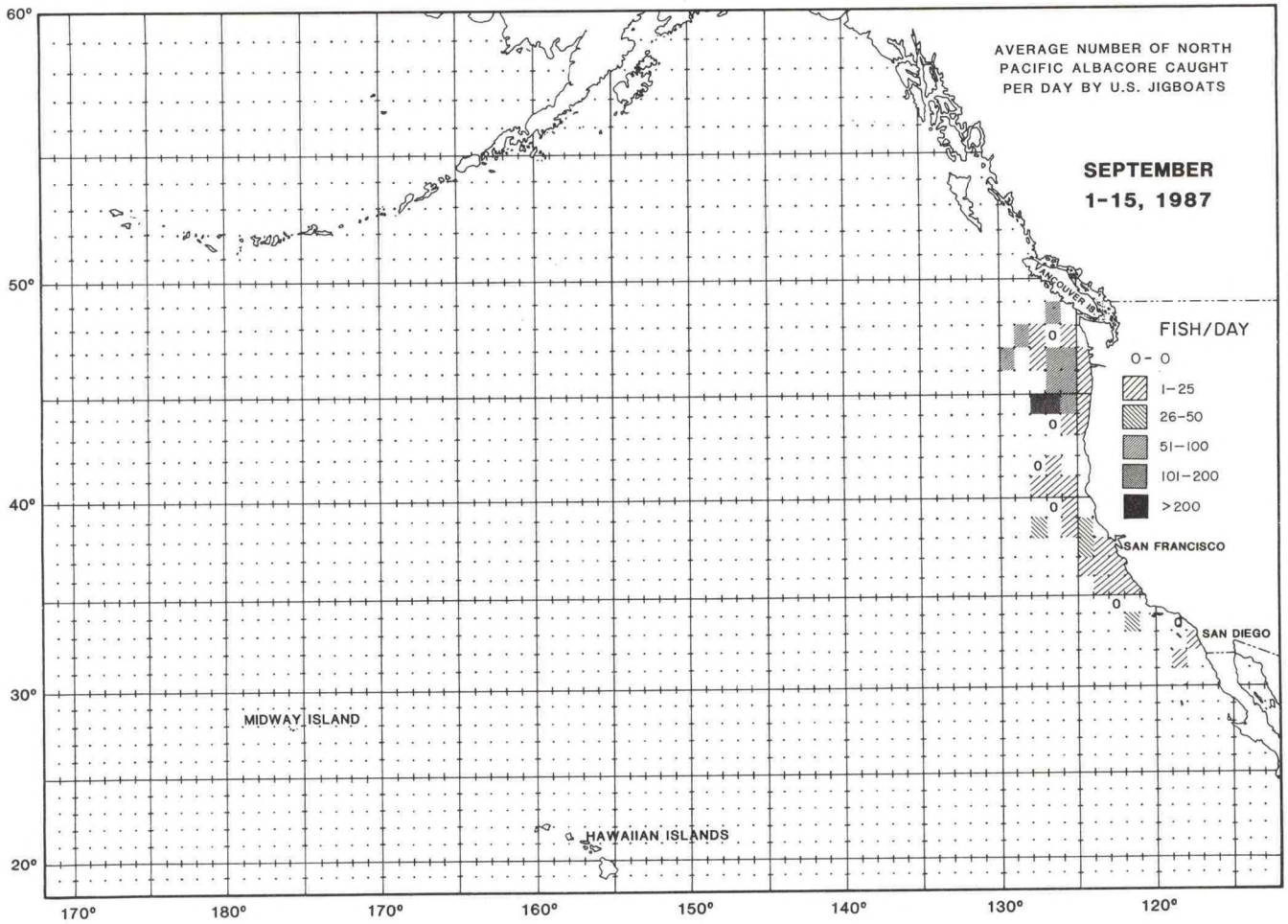

Figure 9i. Jigboat catch-per-standard-day fishing by 1^{o} quadrangle for September 1 - 15, 1987.

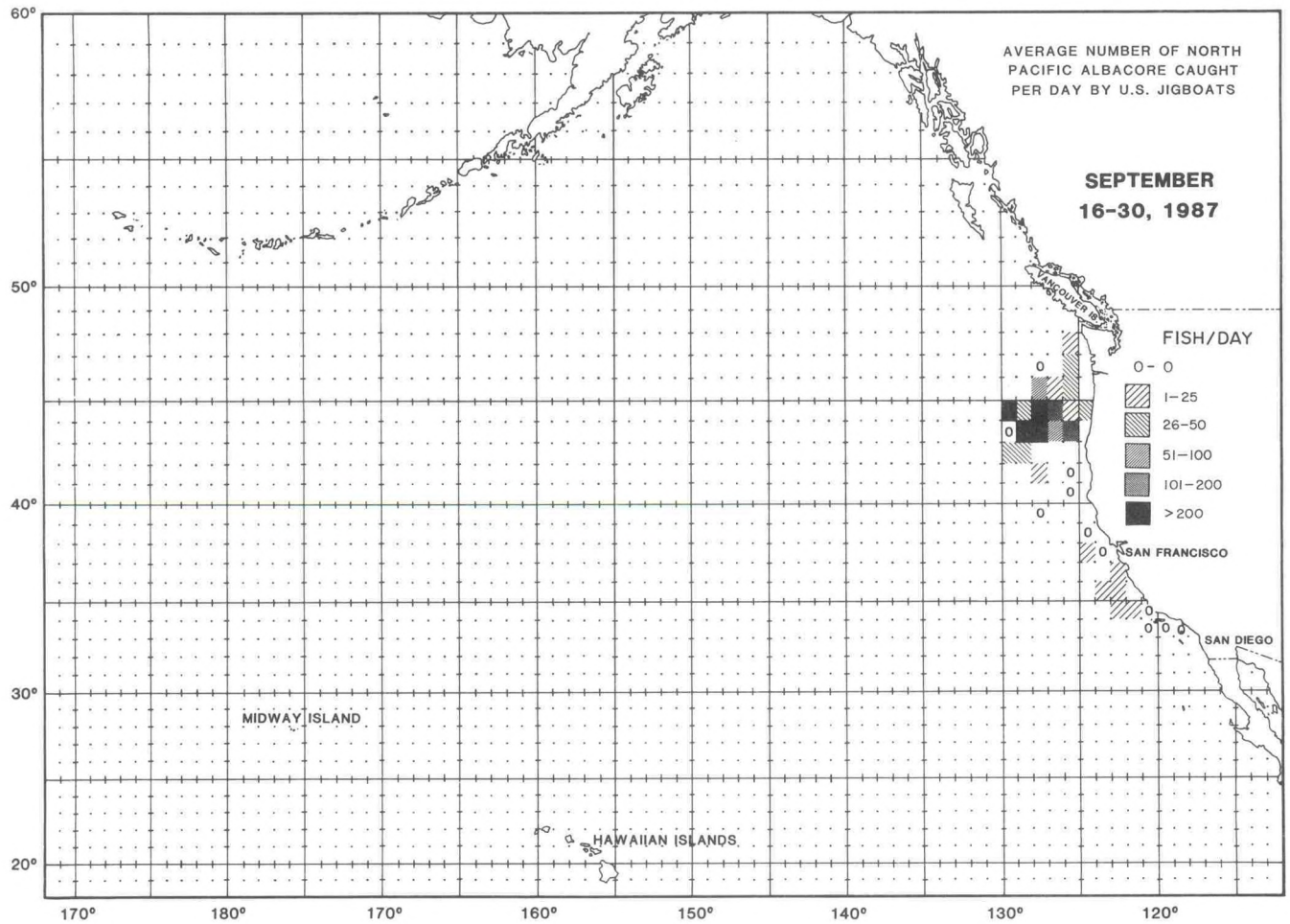

Figure 9j. Jigboat catch-per-standard-day fishing by 1^{o} quadrangle for September 16 - 30, 1987.

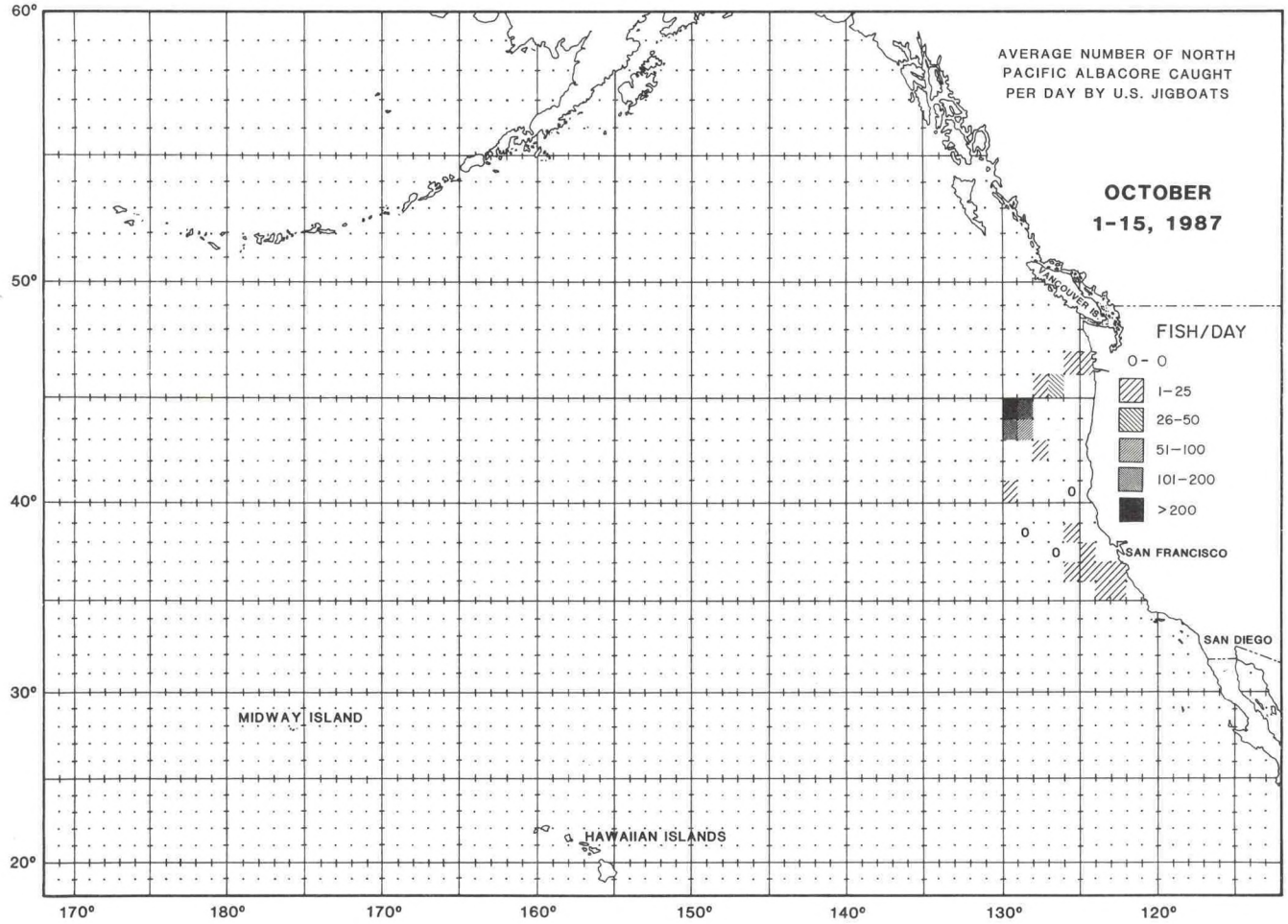

Figure 9k. Jigboat catch-per-standard-day fishing by 1^{o} quadrangle for October 1 - 15, 1987.

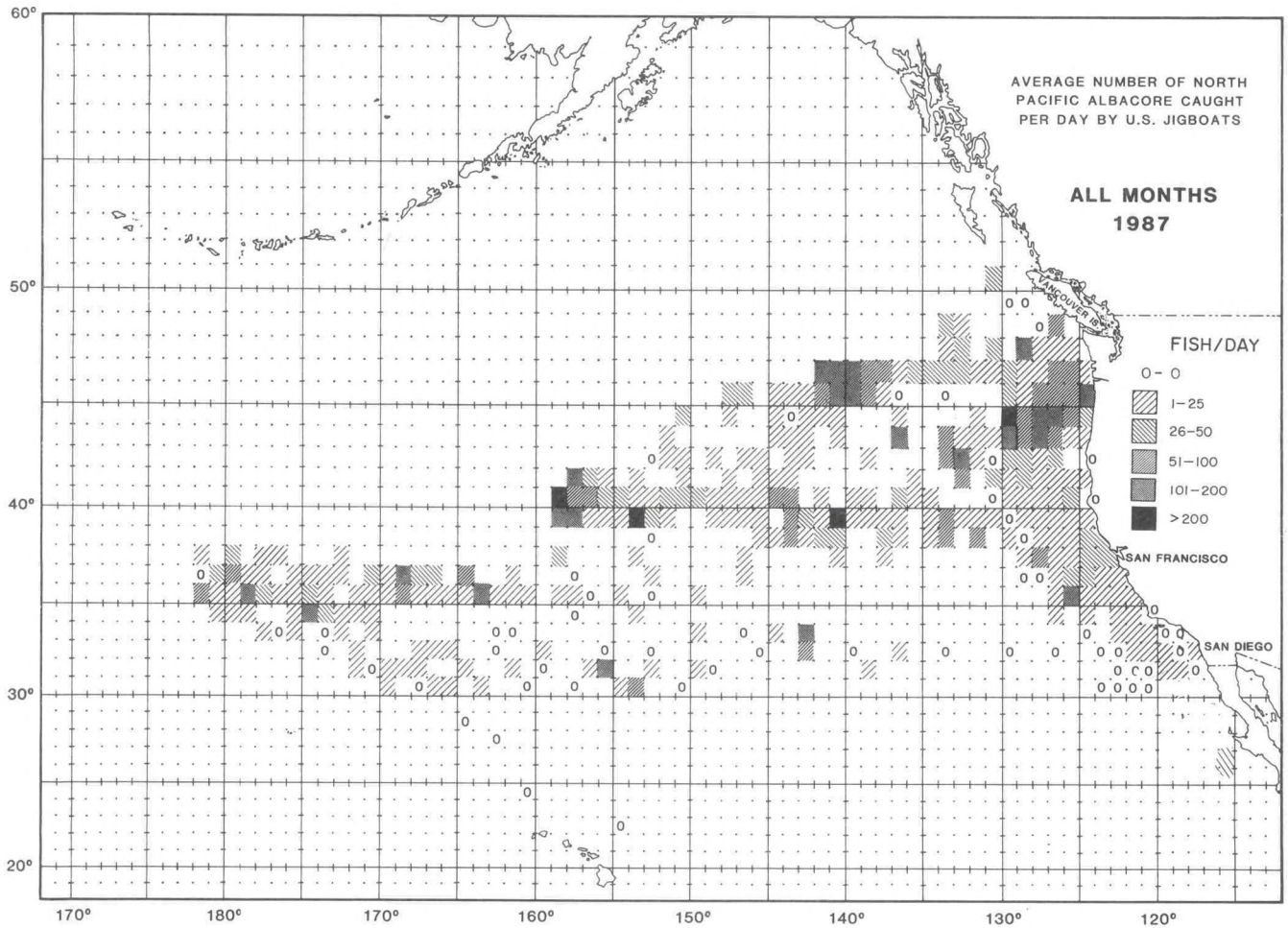

Figure 10. Jigboat catch-per-standard-day fishing by 1^{o} quadrangle and year, 1987.

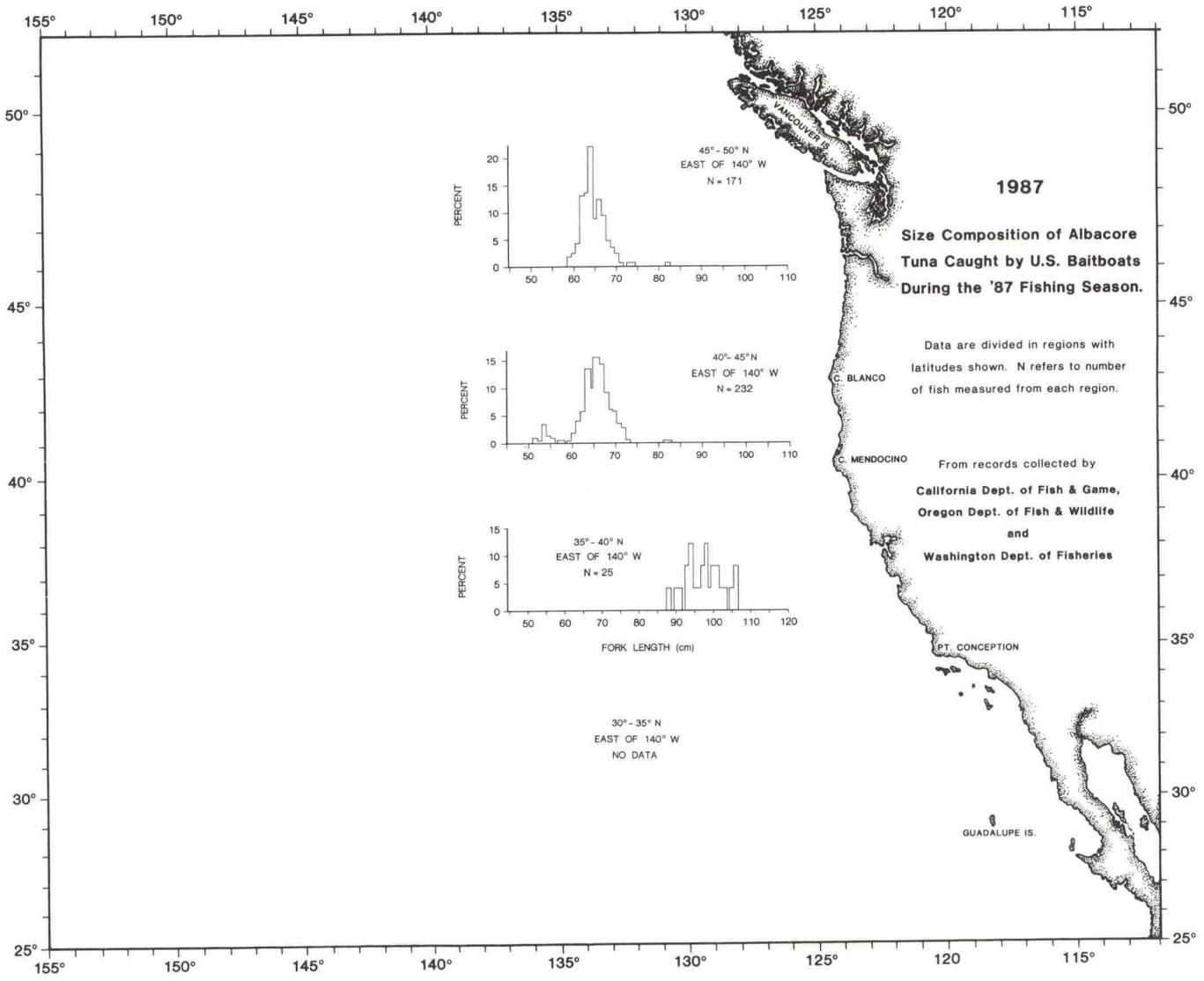

Figure 11a. Length-frequency histograms of albacore caught by the U.S. baitboat fishery in the North Pacific, 1987.

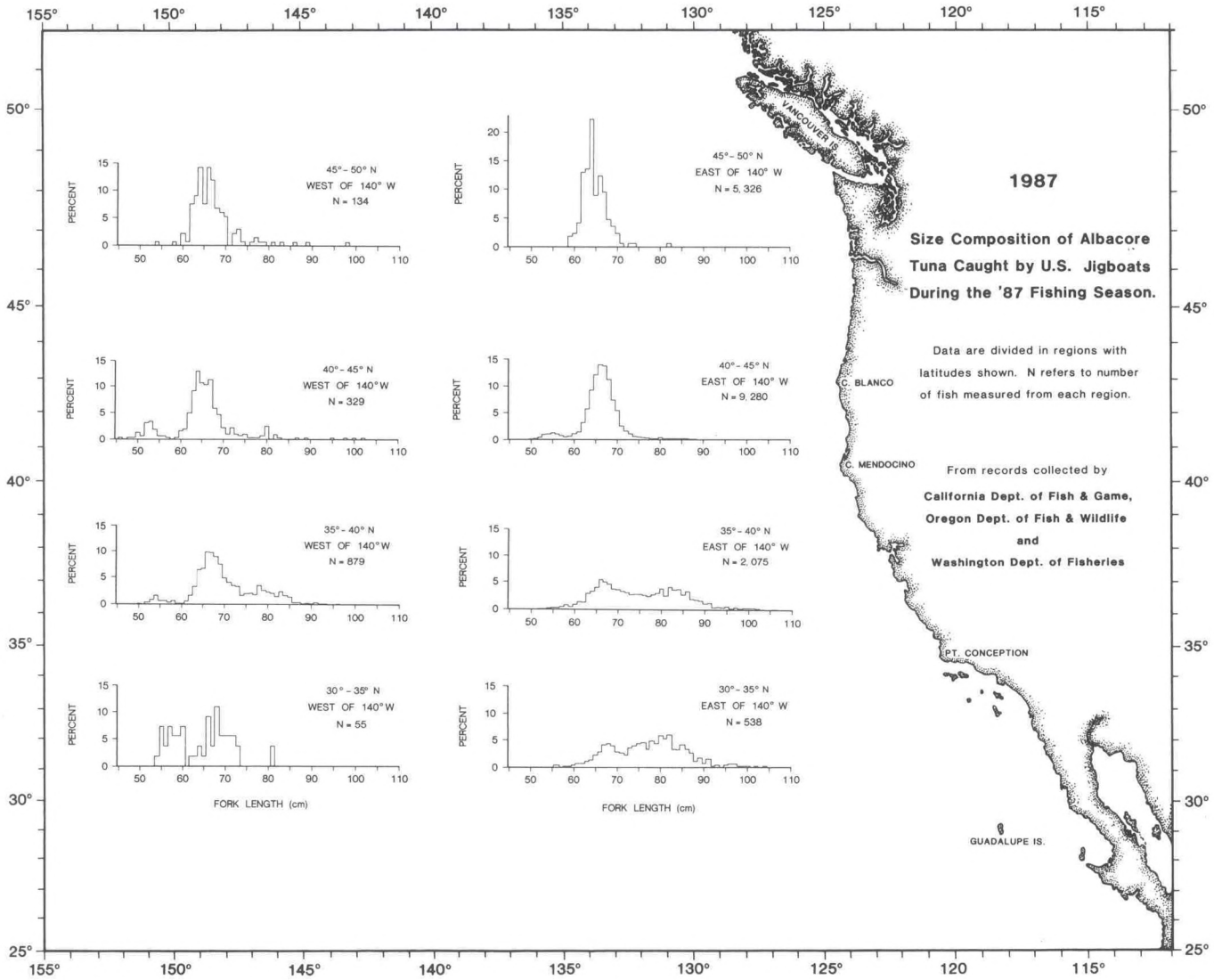

Figure 11b. Length-frequency histograms of albacore caught by the U.S. jigboat fishery in the North Pacific, 1987.

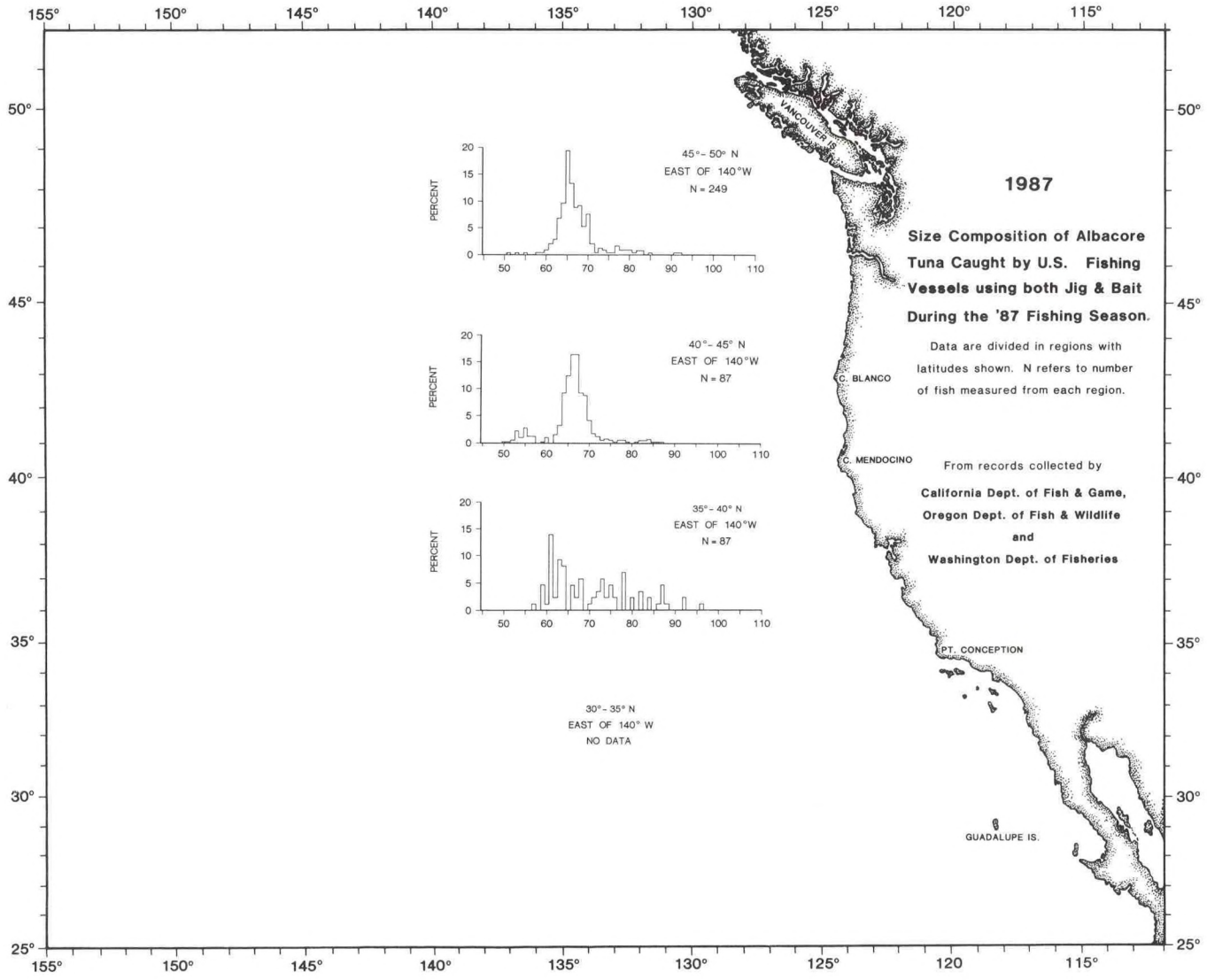

Figure 11c. Length-frequency histograms of albacore caught by U.S. vessels using both bait and jig in the North Pacific, 1987.

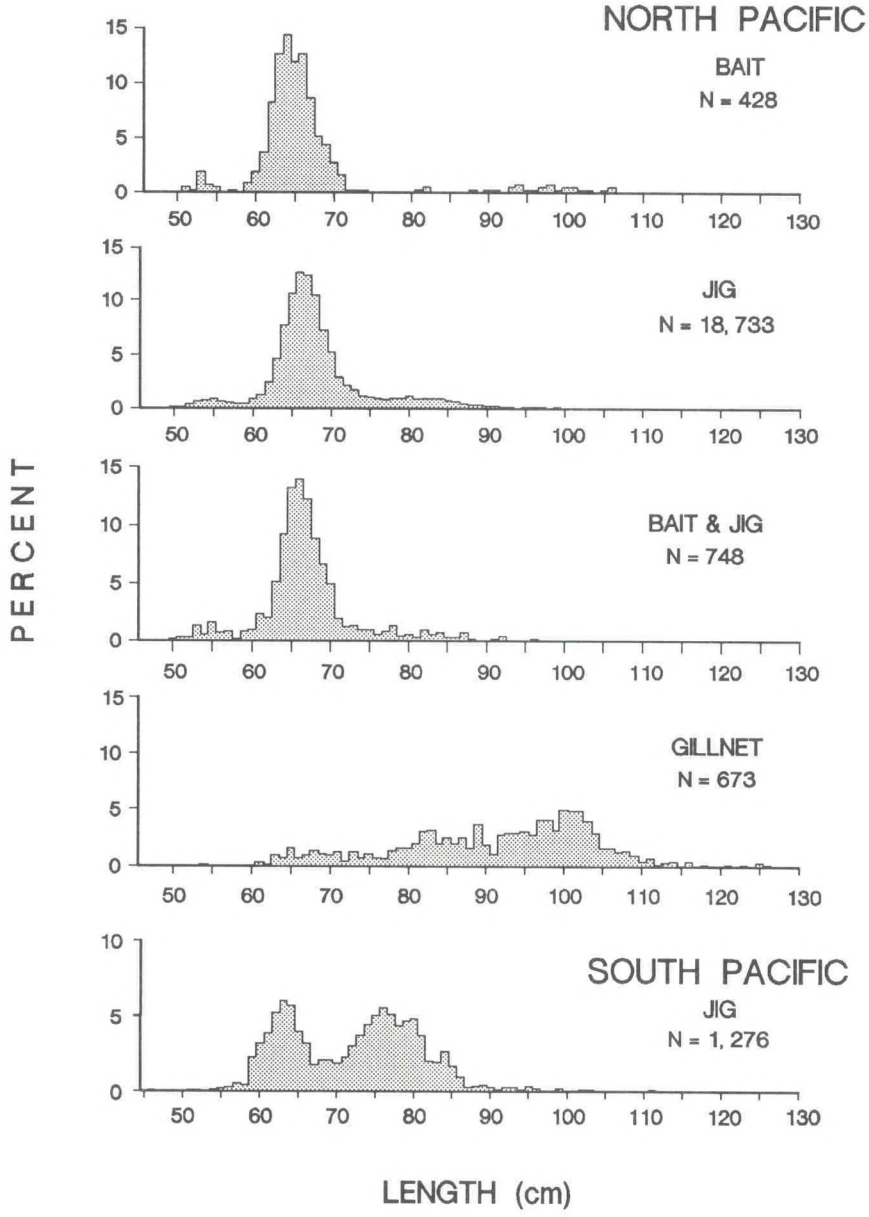

Figure 12. Size compositions of fish caught by the U.S. North and South Pacific albacore fleets in 1987 by gear.

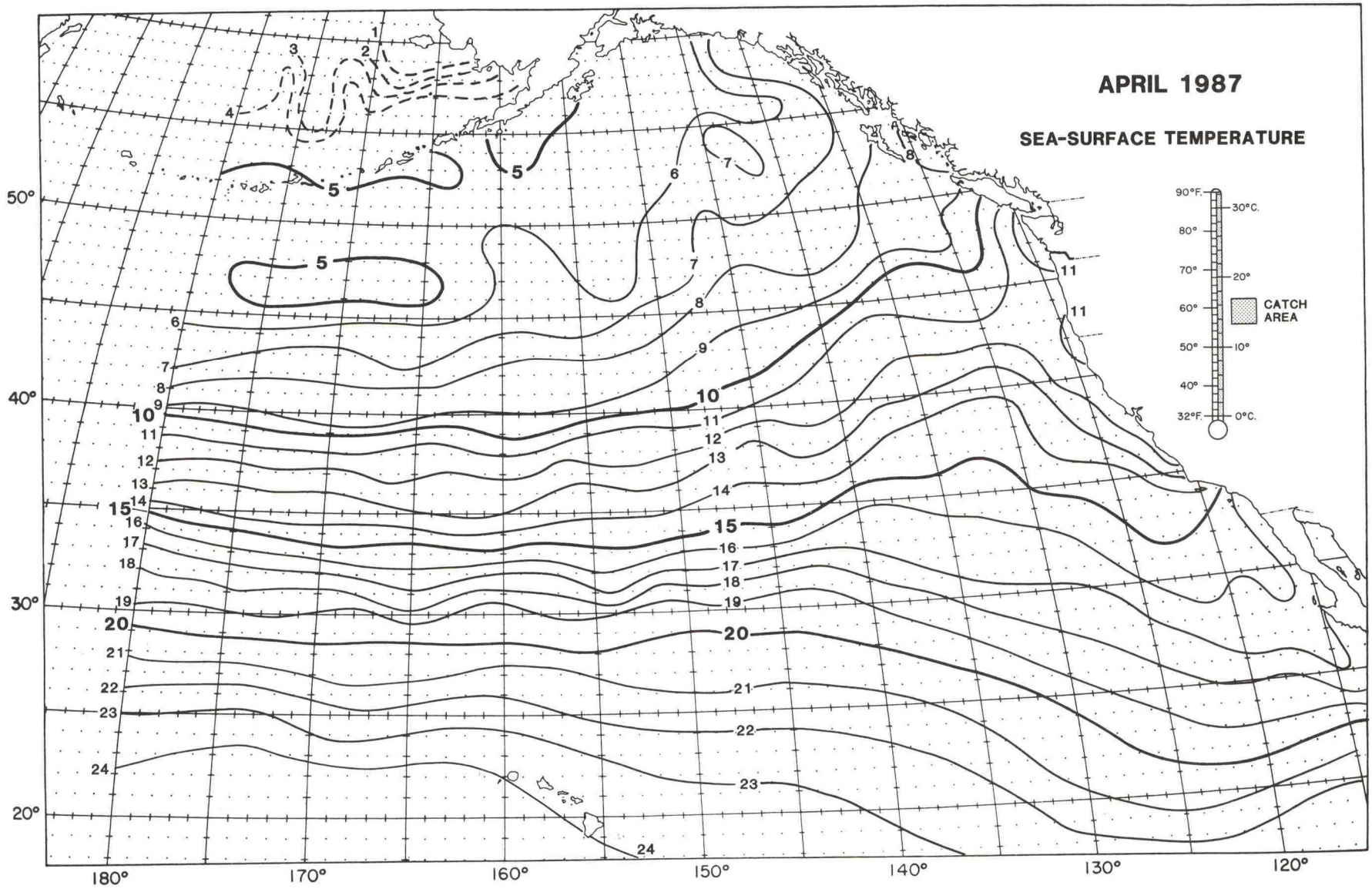

Figure 13a. Average sea-surface temperature (SST) isopleths (^{o}C) and catch area for the North Pacific, April 1987.

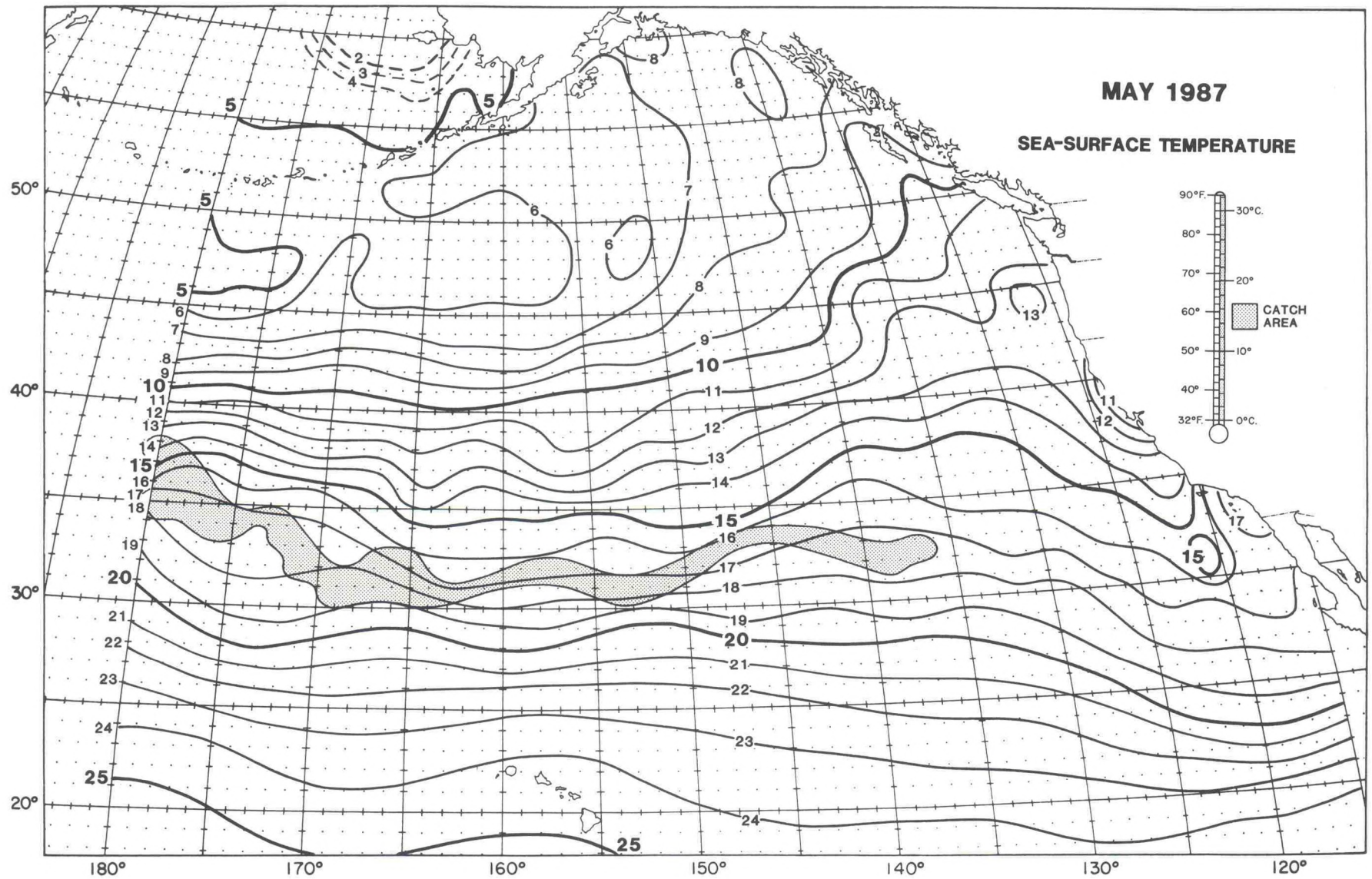

Figure 13b. Average sea-surface temperature (SST) isopleths (^{o}C) and catch area for the North Pacific, May 1987.

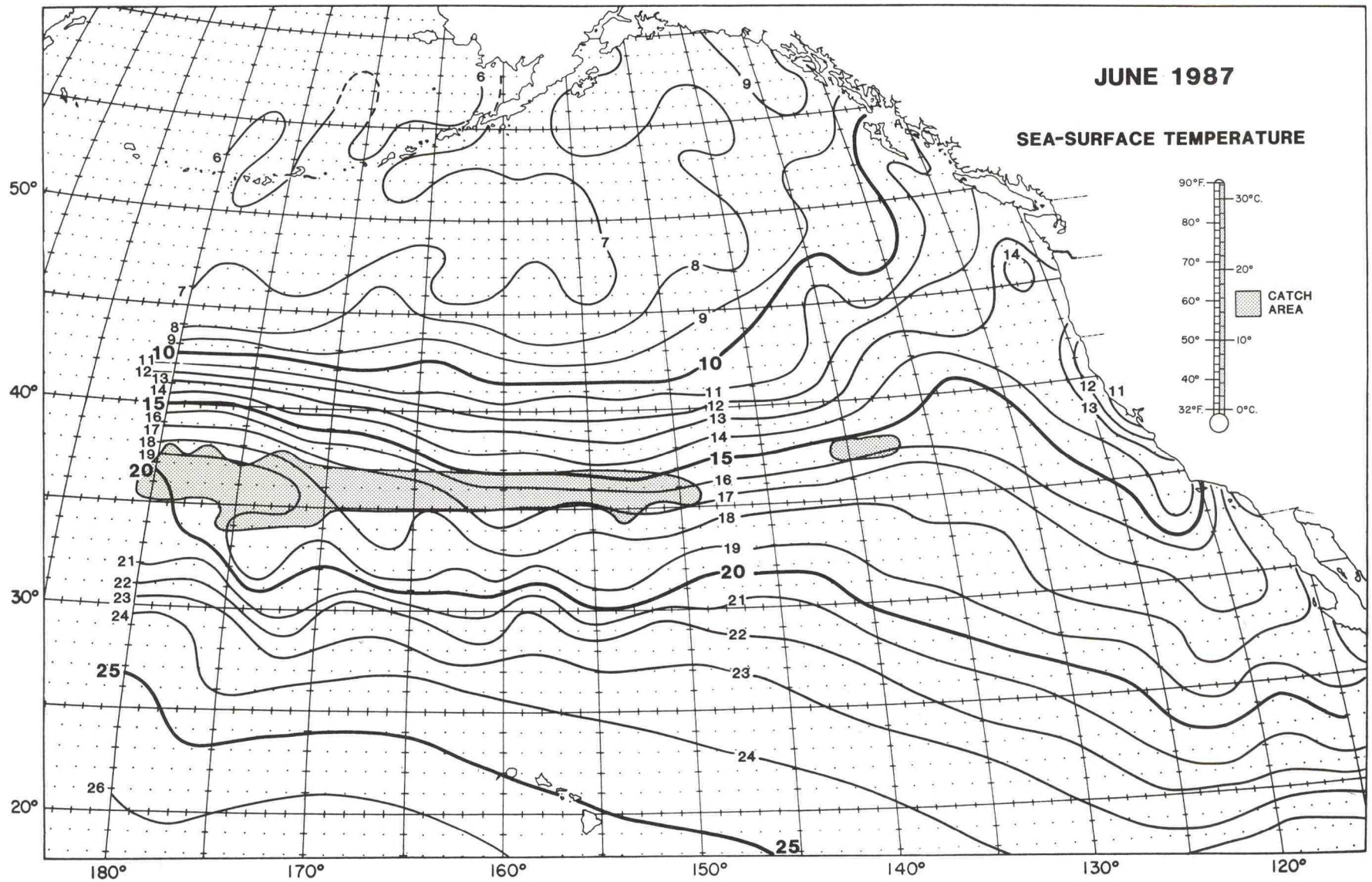

Figure 13c. Average sea-surface temperature (SST) isopleths (^{o}C) and catch area for the North Pacific, June 1987.

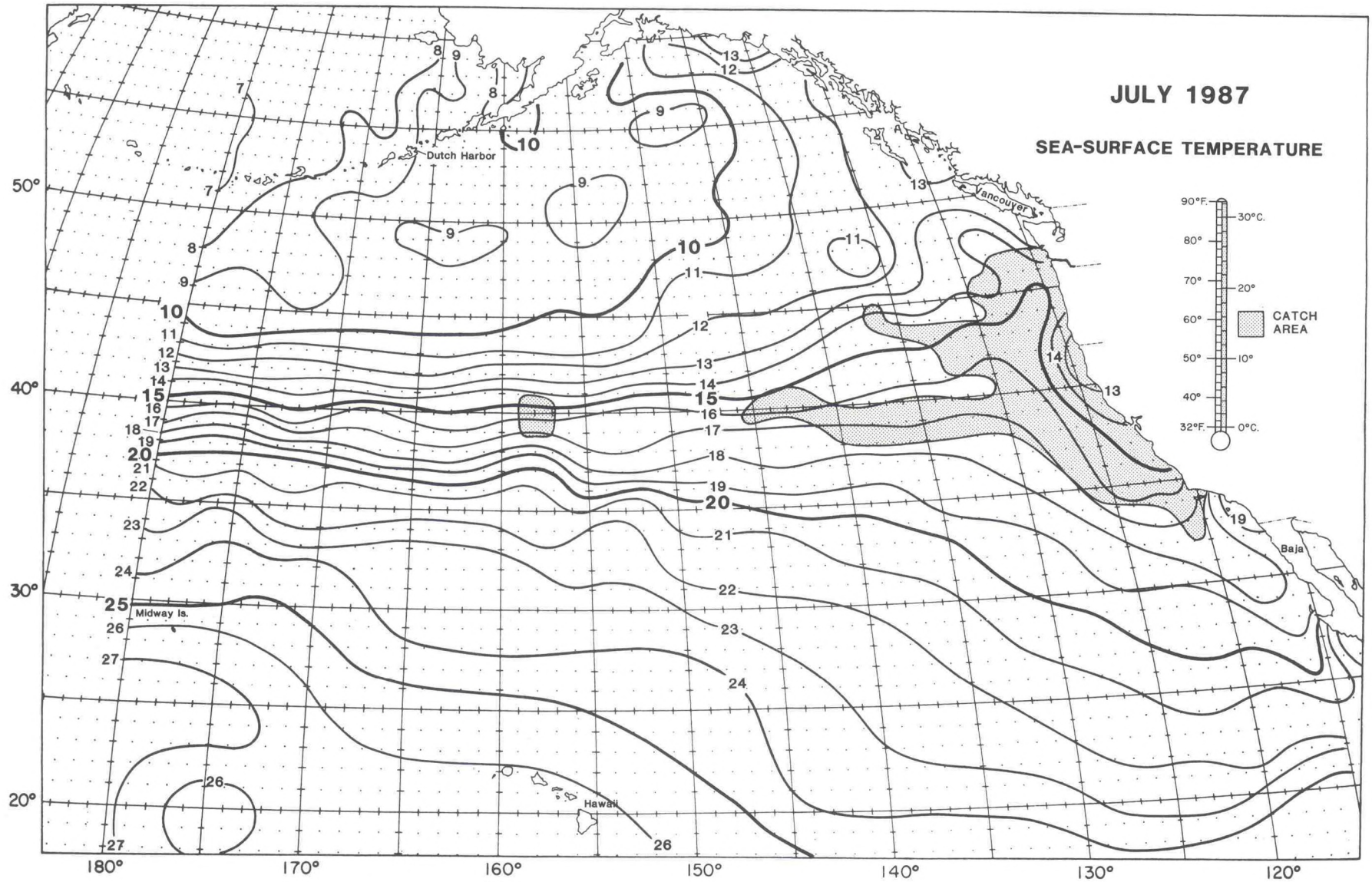

Figure 13d. Average sea-surface temperature (SST) isopleths (°C) and catch area for the North Pacific, July 1987.

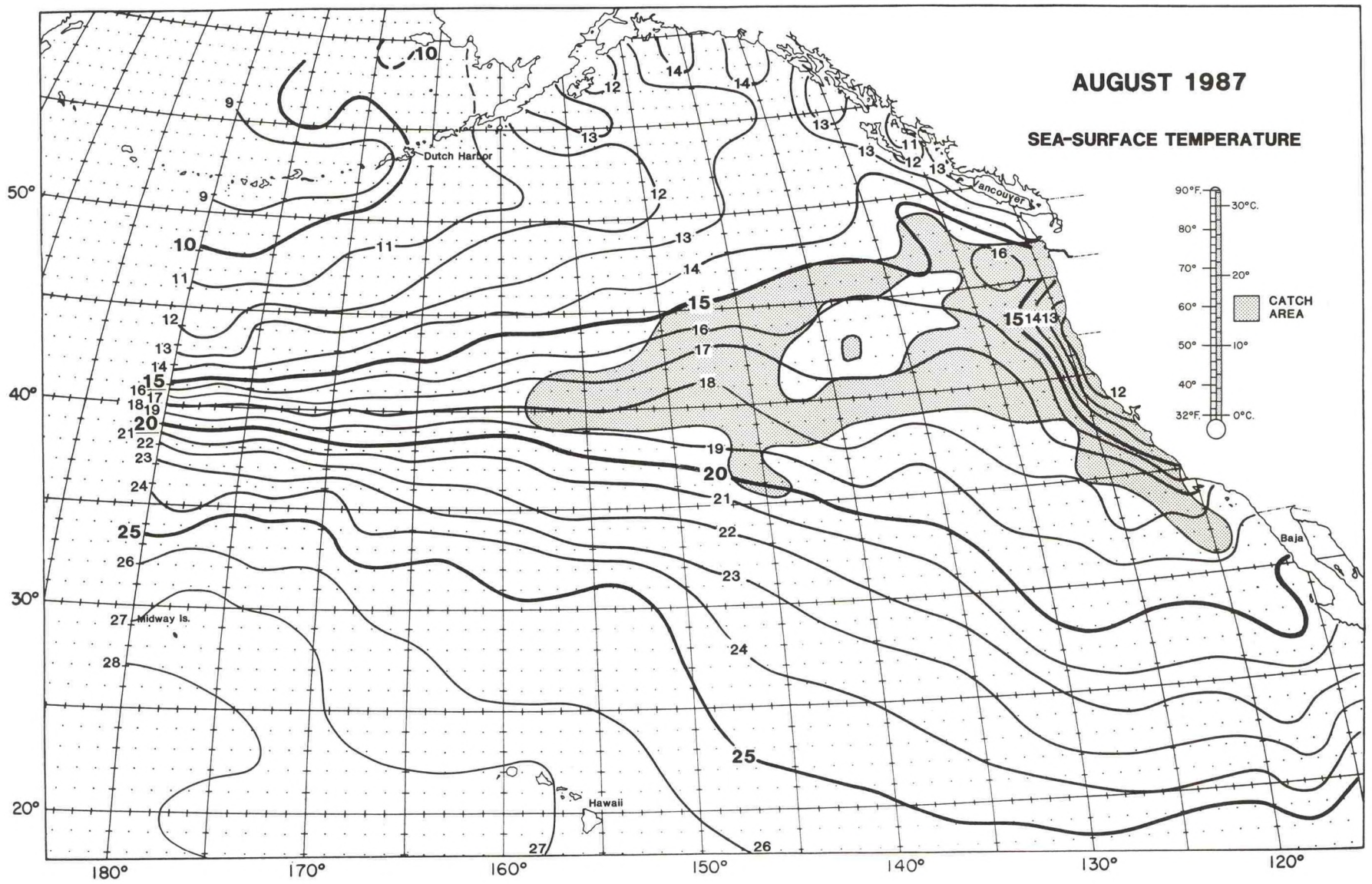

Figure 13e. Average sea-surface temperature (SST) isopleths (^{o}C) and catch area for the North Pacific, August 1987.

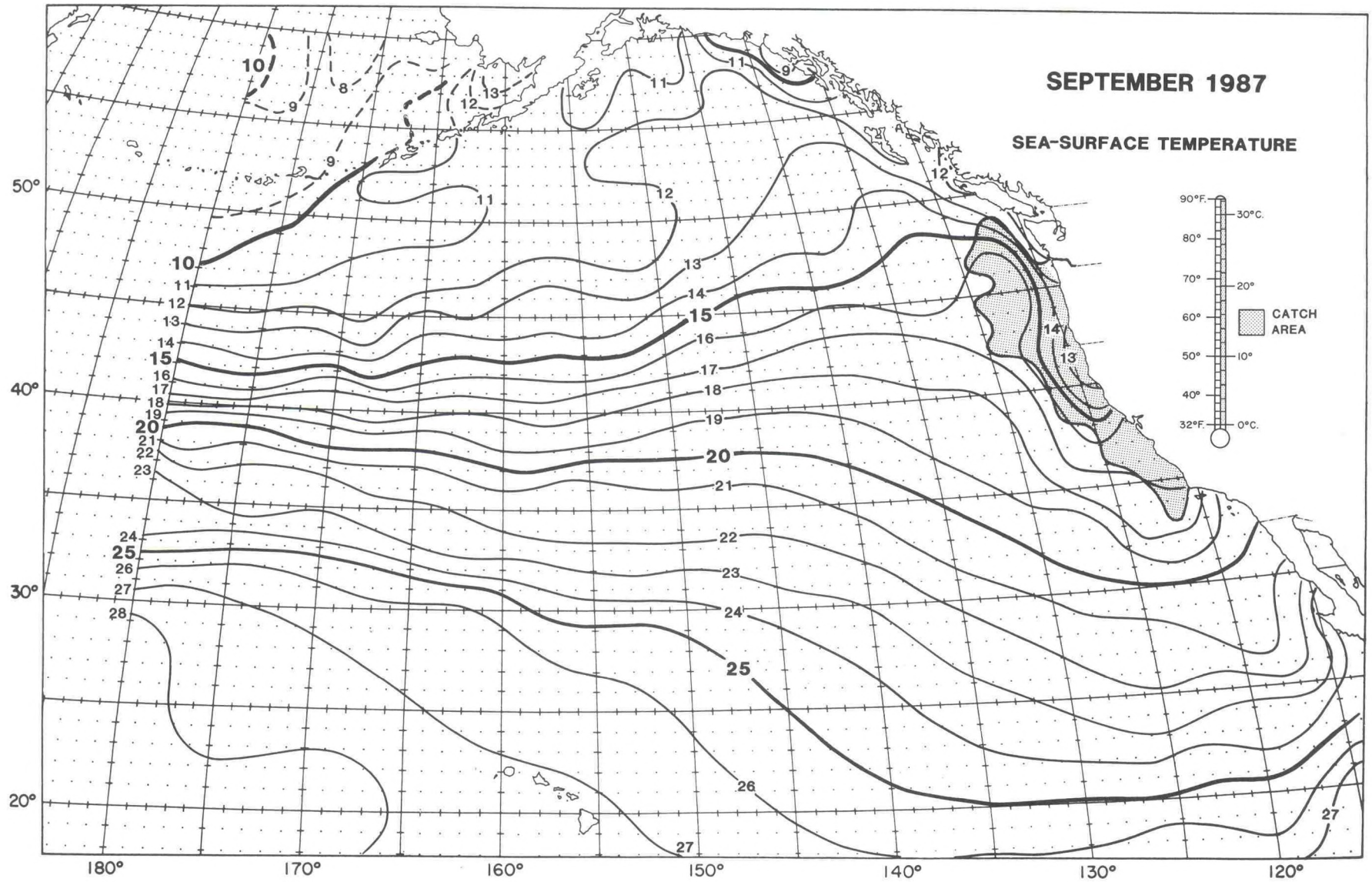

Figure 13f. Average sea-surface temperature (SST) isopleths (^{o}C) and catch area for the North Pacific, September 1987.

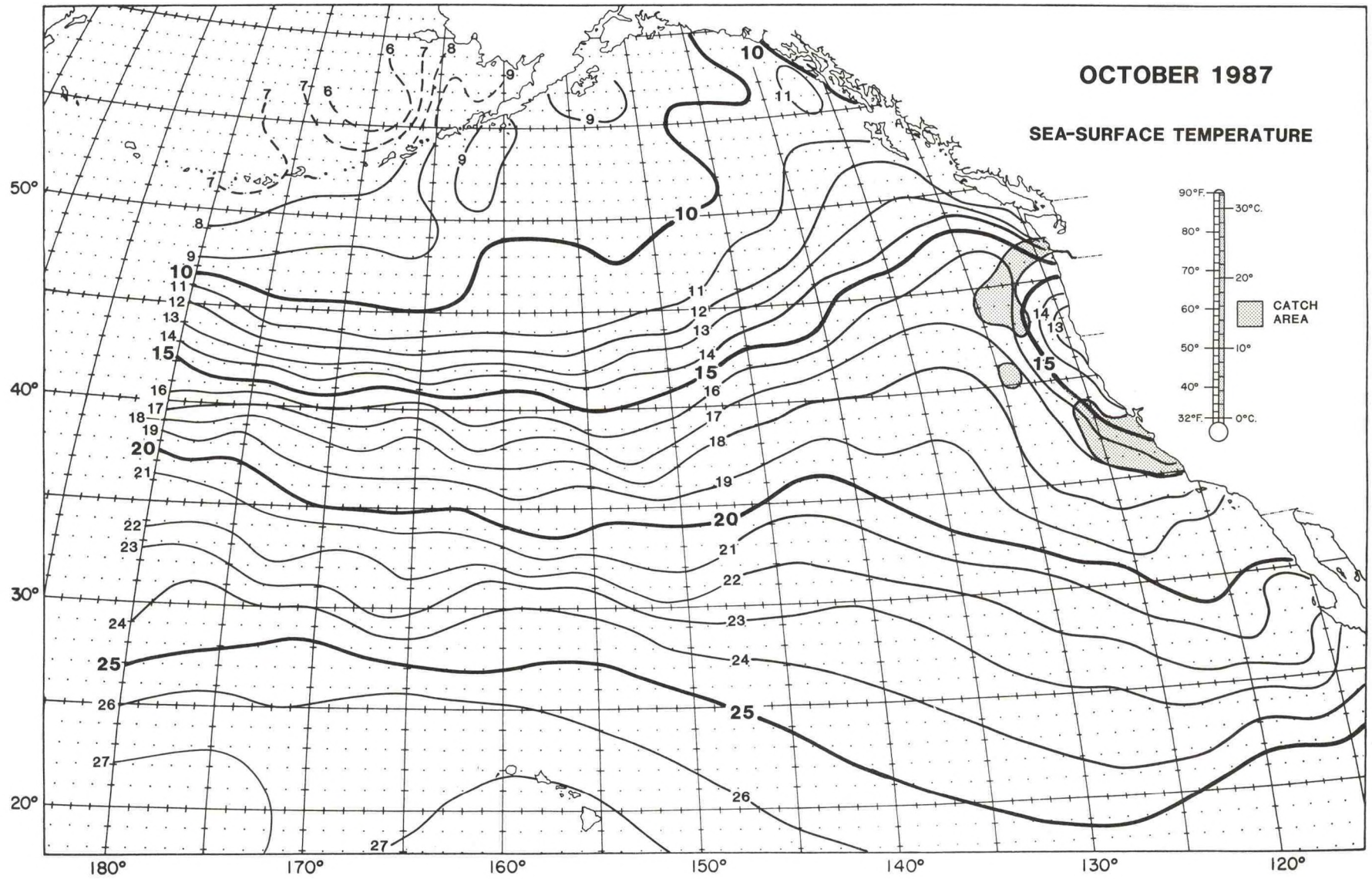

Figure 13g. Average sea-surface temperature (SST) isopleths (^{o}C) and catch area for the North Pacific, October 1987.

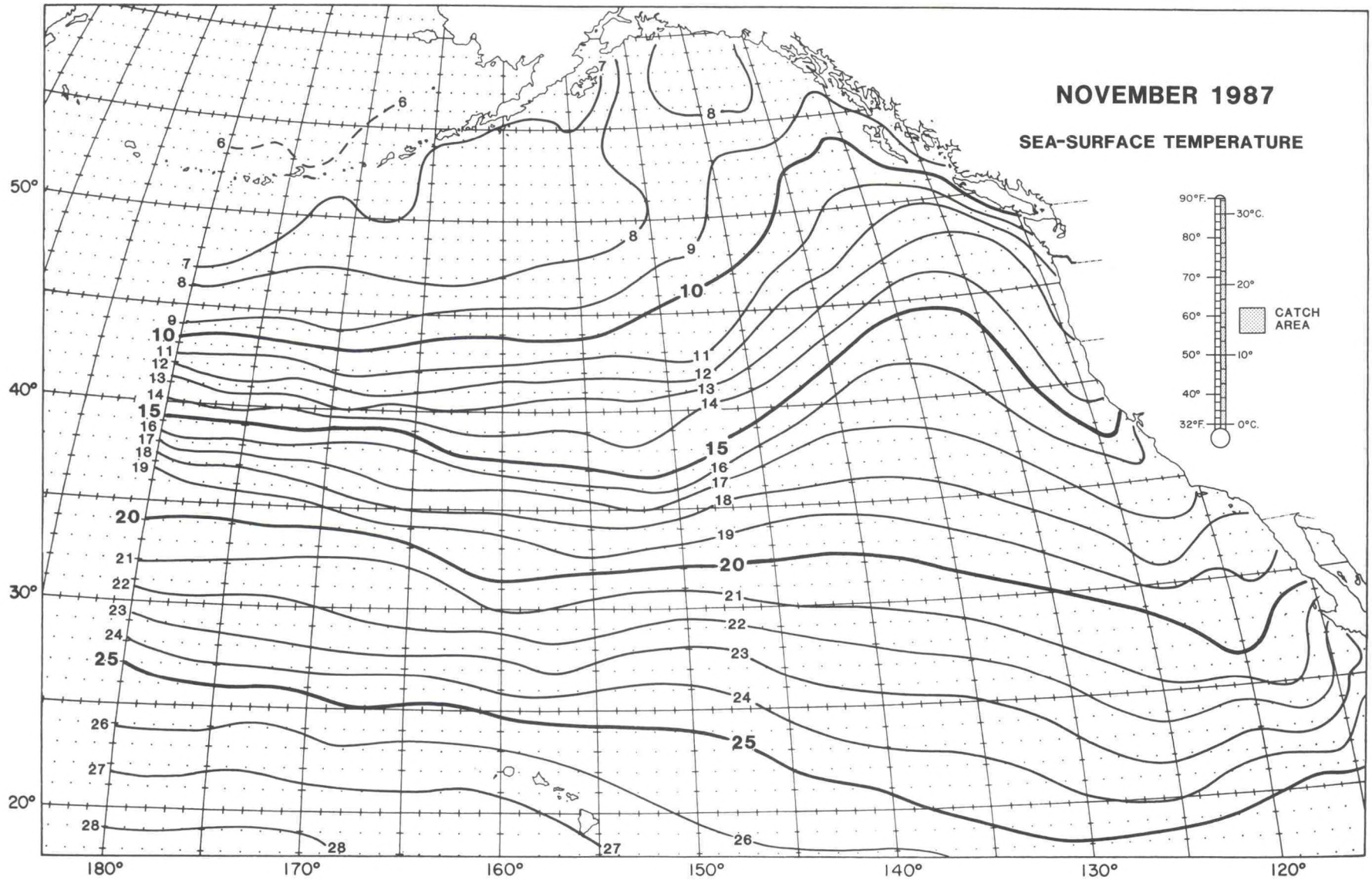

Figure 13h. Average sea-surface temperature (SST) isopleths (°C) and catch area for the North Pacific, November 1987.