SOUTHWEST FISHERIES CENTER

NATIONAL MARINE FISHERIES SERVICE
SOUTHWEST FISHERIES CENTER
P.O. BOX 271
LA JOLLA, CA 92038

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SUMMARY OF THE 1988 NORTH AND SOUTH PACIFIC ALBACORE FISHERIES DATA

by

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

ADMINISTRATIVE REPORT LJ-89-19

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Anthony P. Majors and Christina H. Perrin
Southwest Fisheries Center
National Marine Fisheries Service, NOAA
La Jolla, California 92038

and

Forrest R. Miller
Inter-American Tropical Tuna Commission
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National Marine Fisheries Service, NOAA
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INTRODUCTION

The 1988 fishing season marks the 15th consecutive year that state and federal fisheries agencies have worked together to collect information on U.S. North Pacific albacore fishery. From late June to late October 1988, 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/collected logbooks to/from fishermen and sampled size composition of albacore catches from fishing vessels at landing sites. This was also the 3rd consecutive year that the U.S. commercial jigboat fleet fished for albacore in the South Pacific (Laurs, et al., 1986 and 87). This austral (December - April) fishery started as a multinational exploratory effort in 1986 by researchers and fishermen from the United States, France, New Zealand, and the South Pacific Islands (Laurs, 1986).

In this report, we present a summary of fishing effort and catch with environmental data collected during the U.S. albacore fleet's 1988 fishing seasons in the North and South Pacific. Areas covered include those west of 140^{o}W in the North Pacific, the traditional fishing grounds off North America from central Baja California to British Columbia, and those south of French Polynesia in the South Pacific (Figure 1). Data from the 1988 U.S. North Pacific albacore fishing season are summarized and compared to those collected in 1987. Although we may frequently refer to data gathered from the South Pacific, we will not attempt any major comparison since only 7 jigboats fished in these waters in 1987 as compared to 43 in 1988.

SAMPLING COVERAGE

In June, before the start of the 1988 North Pacific albacore fishing season, approximately 300 logbooks were mailed to fishermen who were members of WFOA. An additional 320 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 log sheets were submitted to State samplers assigned to dock sites during the fishing season or sent directly to the SWFC. Port samplers completed the information for fishermen who did not fill in the log sheets by talking to the captain and/or crew and coping information from the ship's log (Majors, 1988). North American fishermen participating in the 1988 South Pacific albacore fishery were given logbooks in November of the previous year.

Sampling coverages for the 1987 and 1988 U.S. North and South Pacific albacore fisheries were estimated as the ratio of sampled landings to total landings in weight (Majors, et al, 1988). During the 1988 U.S. North Pacific albacore fishery, approximately 12% of the fish sampled for effort and catch was taken on bait, 87% on jig, and less than 1% each on gillnet and on a combination of bait and jig (Table 1a). The 43 U.S. vessels that fished for albacore in the South Pacific from late December 1987 to mid-April 1988 were all jigboats (Table 1b).

From late June through early October 1988, an estimated 4,825 mt (10,637,667 lbs) of albacore caught in the North Pacific by U.S. vessels were landed in ports throughout California, Oregon and Washington. Approximately 32% (1,560 mt; 3,438,595 lbs) mt) of this total was sampled for effort and catch and less than 3% (270,407 lbs; 123 mt) for length frequency (Tables 2a and b).

From January through April 1988, an estimated 3,527 mt (7,776,557 lbs) of albacore caught in the South Pacific by U.S. jigboats were landed in American Samoa, Fiji and Tahiti. Approximately 20% (720 mt; 1,587,075 lbs) of this total was sampled for effort and catch and less than 1% (32 mt; 69,630 lbs) for length frequency (Tables 2a and b).

Catch and effort coverage for the U.S. North Pacific albacore fishery, as estimated from sampled landings in weight, decreased from 50% in 1987 to 32% in 1988. Approximately 8% of the sampled catch was taken in California, 42% in Oregon and 50% in Washington. There were no albacore landed in Hawaii in 1988. In the south Pacific, catch and effort coverage decreased from the 83% in 1987 to 20% in 1988. The 720 mt of albacore sampled for catch and effort in the South Pacific was taken in Pago Pago, American Samoa. There was no coverage information from Fiji or Tahiti.

Length-frequency coverage for the U.S. North Pacific albacore fishery, as estimated from sampled landings in weight, decreased slightly from 1% in 1987 to less than 1% in 1988. Approximately 13% of the sampled length frequency was taken in

California, 39% in Oregon and 48% in Washingtion. In the South Pacific, 32% of the sampled fish was taken in American Samoa and 68% in Tahiti. There was no coverage information from Fiji.

CATCH

Commercial landings reported for the 1988 U.S. North Pacific albacore fishery totaled 4,825 mt (10,637,667 lbs). This represents a 39% increase from the 2,929 mt (6,458,296 lbs) recorded for 1987 (Tables 2a and b), but was 70% below the 20-year (1968-87) average of 16,088 mt (35,467,958 lbs). Commercial landings reported for the U.S. South Pacific albacore fishery in 1988 and 1987 were 7,776,000 lbs (3,527 mt) and 1,650,000 lbs (748 mt), respectively (Tables 2a and b). Catches for foreign North Pacific albacore fisheries in 1988 are unavailable at this time; however, historical data for the four major fisheries are presented for comparison purposes (Table 4, Figure 2).

As in 1987, the 1988 U.S. albacore fleet fished east and west of 140°W from June through October in the North Pacific. To simplify the presentation of information, we have arbitrarily divided the 1988 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.

Albacore fishing in the North Pacific in 1988 was better than 1987. Fishing started late in June with sporadic catches reported by a few vessels that left from Hawaii. Catches in the offshore area were limited to approximately 720 nautical miles (nm) north of Hawaii by jigboats heading eastward to participate in the traditional fishing area off the North American west coast. Catches of less than 25 fish-per day were taken by these vessels in a 5° quadrangle area 35°N and 155°W (Figures 3a). These vessels fished eastward between 33° and 36°N and from 155° to 140°W throughout July with catches of 50 to 200 fish per day (Figure 3b - c). The 1988 offshore fishing came to a close in late July (Figure 3d). Five jigboats were reported heading for the vicinity of the International Dateline; however, there were no logbooks collected from these vessels.

In contrast, the 1987 offshore fishing started in May and catches were made by vessels that left from U.S. west coast ports for the western Pacific. These vessels reported fairly good catches from 30° to 35°N, and 140° to 170°W in early May. Significant catches were also reported from these vessels during the latter half of May in areas 120 nm north of Midway and throughout June north of Hawaii. The 1987 offshore fishing lasted until late August (Majors, et al., 1988).

In the inshore area, fishing started in July with a few fish taken 180 and 300 nm off San Diego. Although the fleet fished in this same area in late June, no albacore were reported taken

until early July 60 nm west of Cortes Bank. In late July, the fishing moved closer to shore between 40 and 80 nm from Point Arguello to Point Reyes (Figures 3a-c). The shark/swordfish gillnet fishery in 1988 was active in this area and reported 15 mt of incidentally caught albacore from July through October. At the same time, excellent catches were reported from 42° to 46°N between 60 and 300 nm off Oregon. Relatively good catches were also reported from 47° to 49°N, between 80 and 240 nm off Washington (Figure 3c). Good fishing persisted off Oregon and Washington from mid-July to mid-September (Figure 3c - f). Like 1987, the fishing inshore was excellent north of 40°N, especially in the 5° quadrangle area 42°N and 125°W. The fishing in both years came to a close in mid-October. The price paid for albacore 9 pounds and over was $1,700 in ports throughout California, Oregon and Washingtion; fish smaller than 9 pounds was $1,200.

Catch distribution of U.S. caught North Pacific albacore by 1° quadrangle from early May to late August, 1987, covered a much larger area than from late June to late July, 1988 (Majors, et al., 1988). Vessels that fished west of 140° in 1987 were mostly from U.S. west coast ports and had left earlier in the year to participate in the Midway fishery. Those that fished offshore in 1988 left from Hawaii. An increase in the participation of jigboats in the South Pacific earlier in the year may have contributed to the decrease in offshore effort in 1988.

The most productive offshore fishing in 1988 was centered around 39° to 42°N and 141° to 149°W during July (Figure 10). The most productive inshore fishing was reported from a 10° quadrangle area 40°N and 125°W from mid-July to mid-September (Figures 9b - f). As in 1987, this nearshore area yielded the highest CPUEs for 1988 (Figures 4 and 10).

Approximately 93% (4,487 mt; 9,893,030 lbs) of the 1988 U.S. North Pacific albacore catch was taken from the inshore area, and 7% (338 mt; 744,637 lbs) from offshore. In contrast, 80% (1,166 mt; 2,570,697 lbs) of the catch in 1987 was taken from the inshore area, and 20% (286 mt; 631,343 lbs) from offshore. Compared to 1987, total landings in 1988 for California decreased 15%, and Oregon and Washington increased 78% and 256%, respectively (Tables 2a and b).

The U.S. South Pacific albacore fishing in 1988 began in late December 1987 and lasted until mid-April 1988. Catches were concentrated in two separate areas south of French Polynesia: 1) 38° to 41°S and 135° to 144°W, and 2) 36° to 41°S and 156° to 163°W (Figures 5a-d and 6). Approximately 49% of the albacore caught by U.S. jigboats were landed in Pago Pago, American Samoa, 1% in Lavuka, Fiji, and 50 % in Papeete, Tahiti. Fish landed in American Samoa were delivered to Star Kist and the Samoan Packing Company. Those landed in Tahiti were transshipped to the Pan Pacific Fisheries in Terminal Island, Neptune and Van Camps in Puerto Rico, and the higher quality fish were shipped to Japan.

The price paid for albacore 9 pounds and over in American Samoa and Fiji was $1,700; in Tahiti was $1,600.

EFFORT

Sampled effort in days fished for the 1988 U.S. North Pacific albacore fishery was significantly lower than in 1987. There was a decrease of 23% from the reported sampled effort of 3,120 days in 1987 to the 2,398 days in 1988. Effort in 1988 was 67% below the 20-year (1968-87) average of 7,209 days (Table 1a). In 1988, 97% of the sampled effort (2,340 days) spent inshore yielded 93% of the sampled catch (4,487 mt), and 3% (58 days) spent offshore yielded 7% (338 mt). In 1987, 79% of the sampled effort (2,484 days) spent inshore yielded 80% of the sampled catch (1,166 mt), and 21% (636 days) spent offshore yielded 20% (286 mt). The 55-foot jigboat expended the most effort in 1988, whereas the standard 45-foot jigboat expended the most in 1987 (Figure 7).

Sampled effort in days fished for the 1988 U.S. South Pacific albacore fishery was 437 days (Table 1b). Sizes of the 43 jigboats that participated in this fishery in 1988, and 7 in 1987 ranged 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 1988, in numbers of fish caught by a standard (45-foot; 14 meter) jigboat, increased from 70 fish per day in 1987 to 117 fish per day in 1988 (Figure 8). CPUE for the North Pacific in recent years may be slightly biased due to the estimation procedure. Estimates were based on a standard 45-foot vessel that fished inshore in the 1960s and early 1970s. Vessels that fished for albacore in the late 1970s and 1980s, however, were basically larger in sizes and have expanded their fishing activities offshore. Further research[1] is being conducted to accommodate the changes in vessel sizes and catch areas.

Highest CPUEs of 120 to 150 fish per day computed by half-months were reported from a 5^{o} quadrangle area 41^{o}N and 126^{o}W, 80 to 350 nm off Trinidad Head to the Columbia River from mid-July to late August (Table 3, Figures 9c - e). Catches of up to 65 fish per day were also reported from a 5^{o} quadrangle 44^{o}N and 125^{o}W in early September. In 1987, CPUEs of 105 to 135 fish per day were made in a 5^{o} quadrangle area 43^{o}N and 125^{o}W, between 60 and 300 nm off Cape Blanco to Cape Flattery late September to

[1]Kleiber, P. M. and C. H. Perrin. Ms. Review of routine procedure for standardizing fishing effort in the U.S. North Pacific albacore fleet. SWFC, La Jolla, California.

mid-October. The most productive fishing in both years occurred 60 to 360 nm off Oregon and Washington (Majors, et al., 1988).

The number of 1^{o} quadrangles in the North Pacific with CPUEs greater than 200 fish per day in 1988 was similar to those in 1987. However, all of the 1^{o} quadrangles with CPUEs greater than 200 in 1988 were located inshore and north of $40^{o}N$ (Figures 9b-f and 10). In contrast, those reported in 1987 were located south and north of $40^{o}N$ as well as in the offshore areas.

Estimated CPUEs for the 1988 and 1987 South Pacific albacore fishery for a standard vessel were 242 and 172 fish per day, respectively. CPUEs for both years were standardized to a 45-foot vessel, as was done in the North Pacific, so we may show the relative success of the vessels that fished in these waters in 1988 and 1987.

SIZE COMPOSITION OF ALBACORE

During the 1988 North Pacific albacore fishing season, 21,807 fork-length (from tip of the mandible to fork of the tail) measurements were taken of fish caught by the U.S. fishing fleet (Table 1a). Of the fish sampled, 99% (21,644 albacore) were measured from the inshore catch and 1% (163 albacore) from offshore (Figures 11a-c). Approximately 3% of the samples were taken from baitboats, 87% from jigboats, 8% from vessels using a combination of jig and bait and 2% from gillnet vessels (Figure 12). Like 1987, the smallest fish measured was 46 centimeters (cm) and the largest was 126 cm. The average fork length of albacore sampled in 1988 was 65.6 cm (12.8 lbs). This was lower than the average fork length of 68.9 cm (14.9 lbs) recorded for 1987.

Albacore sampled from catches inshore and south of $40^{o}N$ in 1988 were mostly in the range of 50 to 95 cm. Those sampled in 1987 from this same area were in the range of 60 to 85 cm. Fish sampled from inshore and north of $40^{o}N$ were mostly in the range of 56 to 68 cm. Those sampled in 1987 from this same area were in the range of 60 to 70 cm. Albacore sampled offshore were mostly 50 to 90 cm; very similar to fork-lengths taken for those in 1987. Length-frequency histograms by gear show that the majority of fish caught in 1988 were in the 55 to 70 cm range, and those in 1987 were from 60 to 72 cm range (Figure 12).

During the 1988 South Pacific albacore fishing season, 4,642 fork-length measurements were taken of fish caught by the U.S. jigboat fleet (Table 1b). The average size of albacore measured was 68.9 cm (14.9 lbs). Length compositions of fish sampled were trimodal, ranging from 59 to 69 cm, 70 to 78 cm, and 79 to 95 cm. Only a small portion of the catch was represented by the largest fish (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^{o} 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 successfully in 1988 by the U.S. North Pacific albacore fishing fleet are shaded on the SST charts to show the relationship among areas of fishing, surface ocean fronts, and sea-surface isotherms patterns (Figures 13c - g).

During the spring and early summer months (March to July), SSTs were 1^{o} to 2^{o}C (1.8^{o} to 3.6^{o}F) below normal between 30^{o} and 40^{o}N north of Hawaii where albacore fishing began in June. From May through July, the subarctic ocean front was strong west of 140^{o}W between 35^{o} and 40^{o}N. Fishing offshore started in a 5^{o} quadrangle area 35^{o}N and 155^{o}W where SSTs were 15^{o} to 18^{o}C (59.0^{o} to 64.4^{o}F) along the southern boundary of the subarctic front. This was a region of convergence of subtropic and subarctic waters as indicated by the tight packing of isotherms around 40^{o}N (Figures 13c - d). During July, the offshore fishing moved northeastward along with the 15^{o} to 18^{o}C isotherms' seasonal movement. At the same time, the inshore fishery was being established between 125^{o} and 131^{o}W north of 42^{o}N where SSTs were 15^{o} to 16^{o}C (59.0^{o} to 60.8^{o}F) and west of a sharp ocean frontal boundary off Oregon. This U.S. west coast ocean front was established by persistent northerly winds which caused strong upwelling along the coast from Point Sur to Cape Blanco.

In areas south of Point Conception, SSTs were 15^{o} to 18^{o}C from June through July. Most of the fishing effort south of 40^{o}N was concentrated in this area; however, there were no strong frontal boundaries found during this period (Figures 13 c - d). A similar pattern of weak fronts persisted in these inshore waters off southern California during the 1987 season and also resulted in fewer catches of albacore (Majors, et al., 1988).

In August, the fishing was concentrated between the 13^{o} and 16^{o}C (55.4^{o} and 60.8^{o}F) isotherms north of Cape Mendocino where strong coastal upwelling helped to maintain sharp frontal boundaries (Figure 13e). The most successful fishing appeared to be concentrated around the 15^{o}C isotherm north of Cape Mendocino where frontal edges were strongest. Farther south, there was considerable fishing effort, but fewer catches in coastal waters between San Francisco and Monterey Bay. In this area, upwelling of colder water was not as well defined and frontal boundaries seemed weaker along central California (Figure 13e). Off southern California, SSTs were from 0.5^{o} to 1.0^{o}C (0.9^{o} to 1.8^{o}F) above normal, but during most of the summer, there were no distinct temperature edges except near Point Conception.

In early September, the fishing was concentrated along the periphery of a coastal upwelling from Cape Blanco to Cape

Flattery. During the latter half of the month, the fishing slowed and was concentrated in areas inshore along the 16°C isotherm (Figure 13f). The strongest frontal boundaries that developed during this period in nearshore waters were off Cape Mendocino between 125° and 128°W.

During the first half of October, albacore fishing was confined to the central California area between the 14° and 16°C (57.2° and 60.8°F) isotherms. Some ocean frontal boundaries which were stronger than in September remained between Point Conception and San Francisco Bay, but SSTs were 1° to 2°C below normal. After mid-October, coastal upwelling was greatly diminished, and the ocean frontal boundaries became weak (Figure 13g).

Fish caught in the 1988 U.S. fishery in the South Pacific were taken in SSTs of 15.6° to 20.0 °C (60.0° to 68.0°F). The majority (70%) of albacore caught were taken in SSTs of 16.7° to 18.3°C (62.0° to 65.0°F).

SUMMARY

The U.S. North Pacific albacore landings were slightly better in 1988 than in 1987. Although the fishing had started late in June by a few transient vessels that left from Hawaii after the close of the South Pacific fishery, catches of up to 50 fish per day late in July offshore improved to 150 fish per day early in July inshore between 60 and 350 nm off Oregon. Excellent fishing persisted in a 10° quadrangle area 40°N and 125°W from late July to late August. In early September, the fishing shifted nearshore 50 to 180 nm from Cape Blanco to Cape Flattery. The availability of fish closer to shore may have contributed to the success of the Washington sport fishery that reported 60 mt taken 40 to 60 nm off the Columbia River.

Offshore catches in 1988 were the lowest ever since 1975 (Majors, 1987). Catches, however, may have been affected by the number of jigboats that participated in the South Pacific fishery from December to April. These larger jigboats usually fish offshore in larger numbers and did not in 1988. Five jigboats were reported heading for Midway, however, no information was made available from these vessels in 1988.

The inshore albacore fishery in 1988 started in early July with no significant catches reported until the latter half of the month. Like 1987, fishing began off southern California with sporadic catches around Cortes Bank. In late July, the fishing shifted nearshore with catches of up to 50 fish per day in areas 40 to 120 nm offshore from Point Arguello to Point Reyes. In areas north of 40°N, catches of up to 150 per day were reported taken in areas 60 to 350 nm offshore from Cape Blanco to Cape Flattery. Best fishing for the season occurred in this area from late July to late September. The inshore fishery in 1988 and 1987 started approximately during the same period.

The average size of albacore sampled in 1988 was 65.6 cm (12.8 lbs) in length, which was slightly smaller than the average size in 1987 of 68.9 cm (14.9 lbs). The estimated annual CPUE for a standard jigboat was 117 fish per day, which was much higher than the 70 fish per day in 1987. There was a decrease in sampled effort from 3,120 days fished in 1987 to 2,398 in 1988. The 58 days expended offshore by the fleet was the lowest since 1975; however, effort may have been greatly affected by sampling and the success and number of vessels that participated in the 1988 South Pacific fishery.

SSTs for the North Pacific from March to July were 1^{o} to 2^{o}C below normal between 30^{o} and 40^{o}N. The fishing offshore started in late June in a 5^{o} quadrangle area 35^{o}N and 155^{o}W where SSTs were 15^{o} to 18^{o}C along the southern boundary of the subarctic front. In the inshore areas, SSTs of 15^{o} to 16^{o}C were located west of a well defined frontal boundary off Oregon. This ocean front was established by persistent northerly winds which caused strong upwelling along the coast from Point Sur to Cape Blanco. This frontal boundary may have contributed to excellent catches of albacore in the 10^{o} quadrangle 40^{o}N and 125^{o}W from early July to early September. In areas south of 40^{o}N, there were no strong frontal boundaries and most of the fishing was concentrated in 15^{o} to 18^{o}C water nearshore from Point Arguello to Point Reyes. A similar pattern of weak fronts persisted in these coastal waters off southern and central California in 1987.

Highlights of the 1988 U.S. albacore fishing season in the North Pacific include: 1) total catch decreased by 39% and sampled effort decreased by 32%; 2) only 11 1^{o} quadrangles had CPUEs greater than 200, and were all located inshore and north of 40^{o}N; 3) offshore fishing lasted until late July; 4) inshore fishing started in early July with significant catches taken north of 40^{o}N; 5) best catches for the season were made 60 to 350 nm off Cape Blanco north to Cape Flattery; 6) fish in the 50 to 95 cm range were caught in areas south of 40^{o}N; 7) fish in the 56 to 68 cm range were caught north of 40^{o}N; 8) offshore SSTs from April to July were 1^{o} to 2^{o}C below normal; 9) inshore SSTs south of 40^{o}N were 0.5^{o}C above normal and those north of 40^{o}N were 1.0^{o}C below normal; 10) temperature edges associated with coastal upwelling were strongest north of 40^{o}N from September to October; 11) SSTs for the north Pacific throughout the 1988 season were slightly below normal, 12) average price paid for albacore was $1,650.

Highlights of the 1988 U.S. albacore fishing season in the South Pacific include: 1) the fleet was consisted of 43 jigboats; 2) sampled effort was 437 days fished; 3) the average size of fish caught was 68.9 cm (14.9 lbs); 4) the average size jigboat in the fleet was 70 feet; 5) CPUE for a standard vessel was 242 fish per day; 6) 70% of the fish caught were taken in SSTs of 16.7^{o} to 18.3^{o}C; 7) catches were unloaded in American Samoa, Fiji and Tahiti; 8) average price paid was $1,650 in American Samoa and Fiji, and $1,550 in Tahiti.

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

Vessel / Gear Type Used	1988 Effort (days)	1988 Catch (number)	1988 No. Fish Measured	1987 Effort (days)	1987 Catch (number)	1987 No. Fish Measured
1. Pole & Line	108	34,598	550	70	9,924	428
2. Jig	2,039	237,761	19,023	2,940	196,450	18,616
3. Both (1&2)	11	4,026	1,708	62	8,027	748
4. Gillnet	240	921	526	47	454	673
5. Purse Seine	0	0	0	1	47	0
6. Longline	0	0	0	0	0	0
Total	2,398	277,306	21,807	3,120	214,902	20,465

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

Vessel / Gear Type Used	1988 Effort (days)	1988 Catch (number)	1988 No. Fish Measured	1987 Effort (days)	1987 Catch (number)	1987 No. Fish Measured
Jig	437	105,805	4,642	314	114,583	1,276
Total	437	105,805	4,642	314	114,583	1,276

Table 2a. Sampling coverage for the 1988 U.S. North and South Pacific albacore fisheries by state or nation.

State/Nation Where Fish Landed	Total Landings (lbs)	Landings Sampled (lbs)	Coverage (percent)	Landings Sampled Number Vessels	Landings (no. ves.)
		Catch_and_Effort			
North Pacific:					
California	2,611,532	274,040	10%	643	87
Hawaii	-	-	-	-	-
Oregon	3,952,453	1,461,700	37%	467	80
Washington	4,073,683	1,702,855	42%	419	101
Total	10,637,667	3,438,595	32%	1,529	268
South Pacific:					
Am. Samoa	3,776,577	1,587,075	42%	31	15
Fiji	200,000	-	-	-	-
Tahiti	3,800,000	-	-	27	-
Total	7,776,577	1,587,075	20%	58	15
		Length_Frequency			
North Pacific:					
California	2,611,532	34,571	1%	643	96
Hawaii	-	-	-	-	-
Oregon	3,952,453	104,458	3%	467	62
Washington	4,073,682	131,378	3%	419	90
Total	10,637,667	270,407	3%	1,529	248
South Pacific:					
Am. Samoa	3,776,577	22,440	<1%	31	31
Fiji	-	-	-	-	-
Tahiti	3,800,000	47,190	1%	27	27
Total	7,776,577	69,630	<1%	58	58

Table 2b. 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)	Coverage (percent)	Landings Sampled Number Vessels	Landings Sampled (no. ves.)
		Catch and Effort			
North Pacific:					
California	3,089,698	1,371,903	44%	1,028	115
Hawaii	-	-	-	-	-
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%	1,434	277
South Pacific:					
Am. Samoa	-	-	-	-	-
Fiji	-	-	-	-	-
Tahiti	1,650,000	1,369,571	83%	16	12
Total	1,650,000	1,369,571	83%	16	12
		Length Frequency			
North Pacific:					
California	3,089,698	93,065	3%	1,028	124
Hawaii	-	-	-	-	-
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%	1,434	230
South Pacific:					
Am. Samoa	-	-	-	-	-
Fiji	-	-	-	-	-
Tahiti	1,650,000	20,926	1%	16	5
Total	1,650,000	20,926	1%	16	5

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	1988			1987		
Month	Days 15/30	Standardized Effort	Catch	CPUE	Standardized Effort	Catch	CPUE
April	1-15	0	0	0	0	0	0
	16-30	0	0	0	2	0	0
	1-30	0	0	0	2	0	0
May	1-15	0	0	0	46	1,108	24
	16-31	0	0	0	110	4,497	41
	1-31	0	0	0	156	5,605	36
June	1-15	0	0	0	112	6,822	61
	16-30	26	41	<2	109	6,417	59
	1-30	26	41	<2	221	13,239	60
July	1-15	48	2,932	61	46	122	3
	16-31	227	30,259	133	262	18,739	72
	1-31	275	33,191	121	308	18,861	61
August	1-15	704	105,592	150	554	37,430	68
	16-31	645	79,108	123	695	44,025	63
	1-31	1,349	184,700	137	1, 249	81,455	65
September	1-15	219	13,725	63	506	36,810	73
	16-30	72	2,293	32	212	28,820	136
	1-30	291	16,018	55	718	65,630	91
October	1-15	47	1,319	28	55	6,395	116
	16-31	15	14	<1	9	203	23
	1-31	62	1,333	22	64	6,598	103
Annual		2,003	235,283	117	2,718	191,388	70

* Effort and catch data from the 1987 - 88 U.S. South Pacific albacore fishery were few and were not included in this table.

Table 4. Catches of North Pacific albacore in metric tons by fisheries, 1952-1988.

	JAPAN					TAIWAN			KOREA			UNITED STATES					CANADA	
YEAR	BAIT	LONG-LINE	GILL NET	OTHER GEAR	TOTAL	LONG-LINE	GILL NET	TOTAL	LONG-LINE	GILL NET	TOTAL	BAIT	JIG	SPORT	GILL NET	TOTAL	JIG	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		26				3,411	18,392	824		22,627	3	62,291
1965	41,491	13,701		121	55,313	16		16				417	16,545	731		17,693	15	73,037
1966	22,830	25,050		585	48,465	16		16				1,600	15,342	588		17,530	44	66,055
1967	30,481	28,869		520	59,870	17		17				4,113	17,826	707		22,646	161	82,694
1968	16,597	23,961		1,109	41,667	15		15				4,906	20,444	951		26,301	1,028	69,011
1969	32,107	18,006		1,480	51,593	21		21				2,996	18,839	358		22,193	1,365	75,172
1970	24,376	15,372		956	40,704	23		23				4,416	21,041	822		26,279	354	67,360
1971	53,198	11,035		1,262	65,495	24		24				2,071	20,537	1,175		23,783	1,587	90,889
1972	60,762	12,649	1	921	74,333	25		25				3,750	23,608	637		27,995	3,558	105,911
1973	69,811	16,059	39	1,883	87,792	35		35				2,236	15,667	84		17,987	1,270	107,084
1974	73,576	13,053	224	1,065	87,918	40		40				4,777	20,187	94		25,058	1,207	114,223
1975	52,157	10,060	166	402	62,785	28		28	319		319	3,243	18,975	640		22,858	101	86,091
1976	85,336	15,896	1,070	1,394	103,696	37		37	971		971	2,700	15,932	713		19,345	252	124,301
1977	31,934	15,737	688	1,039	49,398	61		61	65		65	1,497	10,005	537		12,039	53	61,616
1978	59,877	13,061	4,029	3,209	80,176	53		53	174		174	950	16,682	810		18,442	23	98,868
1979	44,662	14,249	2,856	1,280	63,047	81		81	27		27	303	6,801	74		7,178	521	70,854
1980	46,743	14,743	2,986	1,516	65,988				15		15	382	7,574	168		8,124	212	74,339
1981	27,426	18,020	10,348	959	56,753				600		600	748	12,694	195		13,637	200	71,190
1982	29,615	16,762	12,511	1,054	59,942				1,070		1,070	425	6,661	257		7,343	104	68,459
1983	21,098	15,103	6,884	471	43,556				1,233		1,233	607	9,512	87		10,206	225	55,220
1984	26,015	15,111	10,569	3,898	55,593				2,708		2,708	1,030	9,378	1,427		15,563	50	73,914
1985	20,714	14,320	13,132	1,940	50,106				5,447		5,447	1,498	6,431	1,176	2	9,109	56	64,718
1986	16,096	12,945	9,749	2,192	40,982							432	4,708	196	3	5,339	30	46,351
1987	19,091	14,642	7,617	1,394	42,744							158	2,766	74	5	3,003	104	45,851
1988	7,000		5,000		12,000		11,000	11,000				598	4,212	64	15	4,889	85	27,974

Remarks:

1. Figures for 1987-88 are preliminary. U.S. jig catches (1984-88) include gillnet.
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. Japanese longline catches from 1958-68 were readjusted in 1988.
5. U.S. Jigboat catches from 1952-60 include fish caught by baitboats, from 1961-85 include fish landed in Hawaii.
6. U.S. total for 1984 includes 3,728 mt caught by purse seines.
7. Japan gillnet catches include south Pacific catches.
8. Korean longline catches calculated from FAO statistics and Korean catch/effort data.
9. Korean and Taiwan gillnet catches are missing at this time.

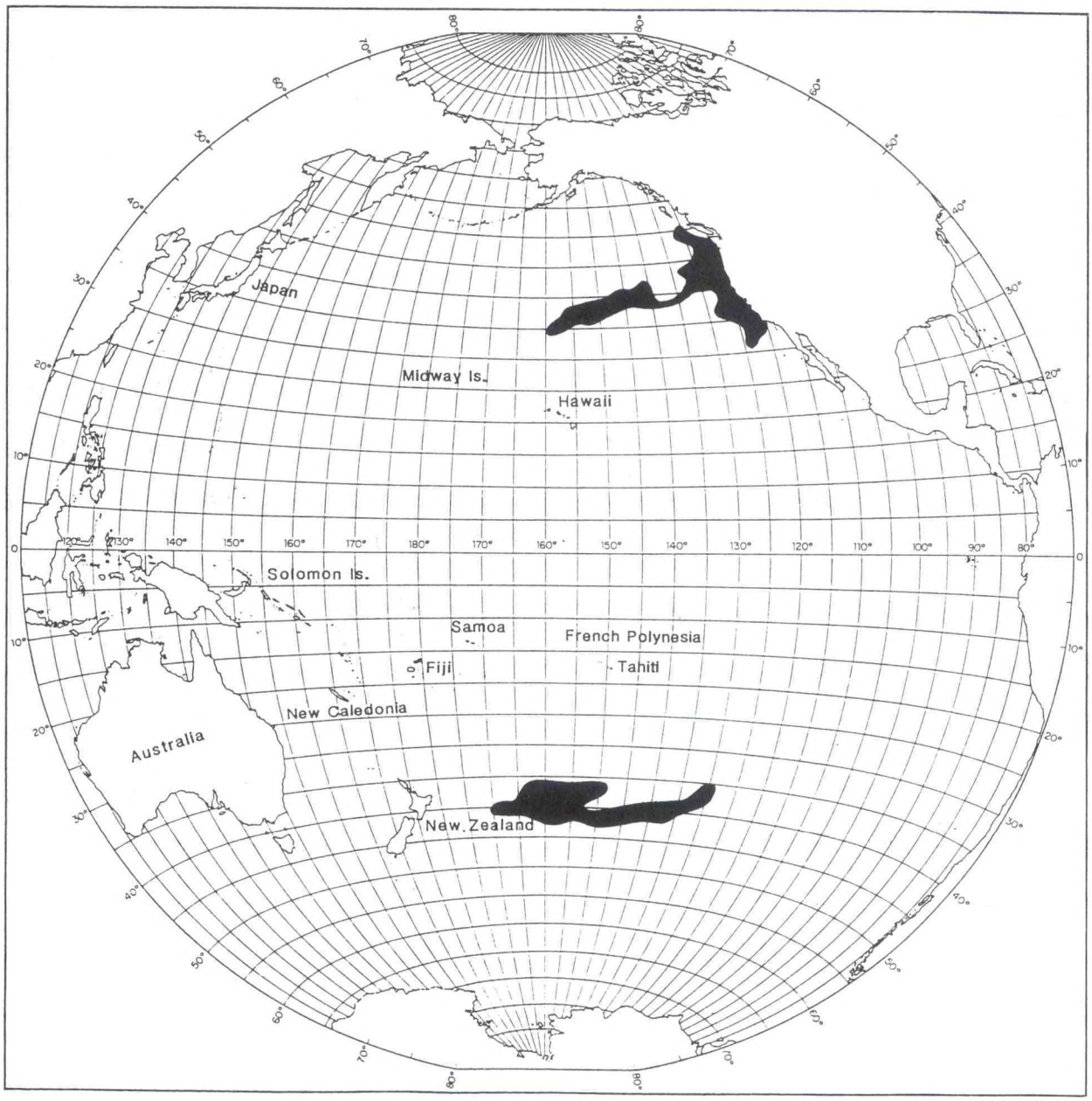

Figure 1. U.S. North and South Pacific albacore fisheries, 1988.

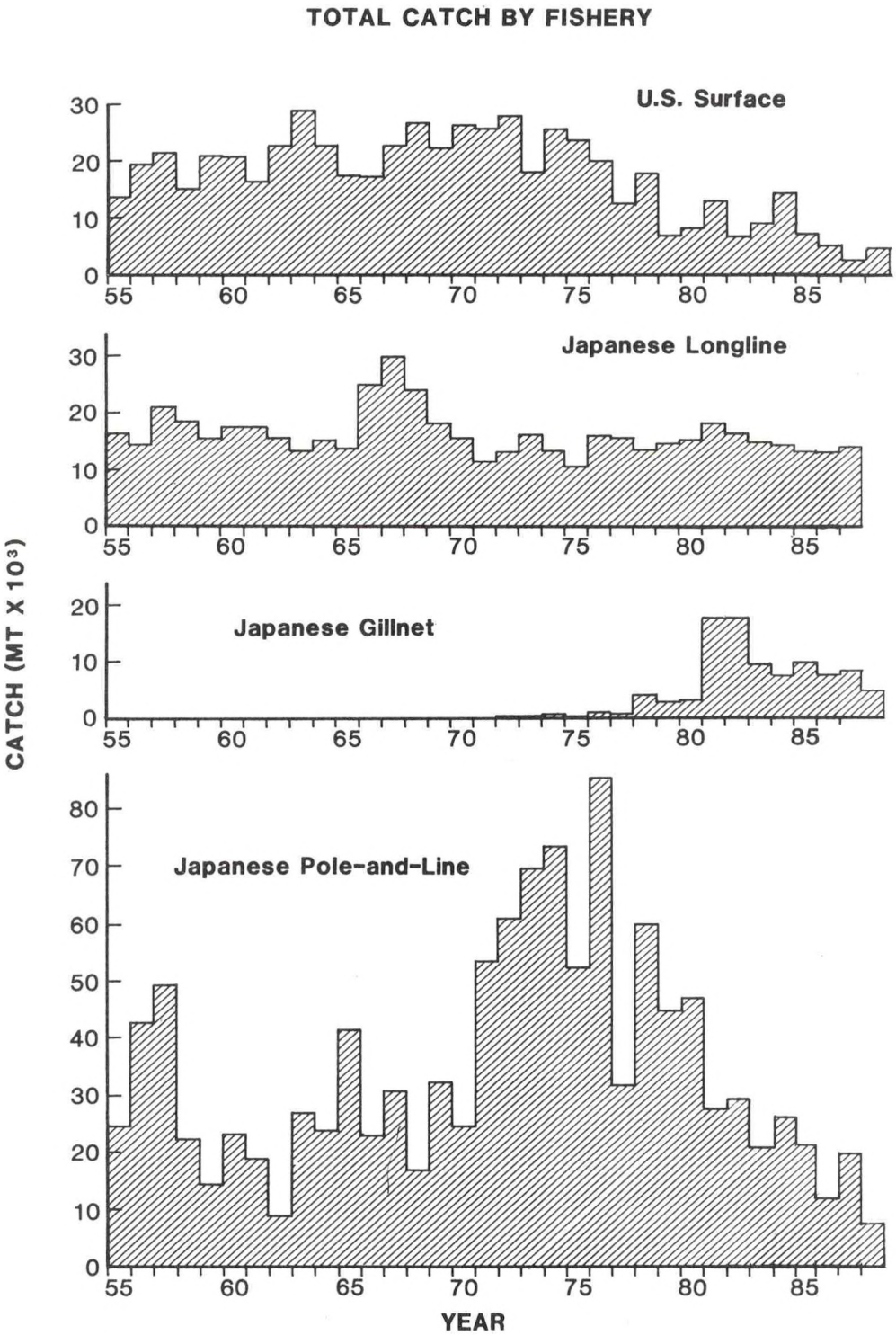

Figure 2. Total albacore catch in metric tons by fishery and gear for the North Pacific, 1955 - 1988.

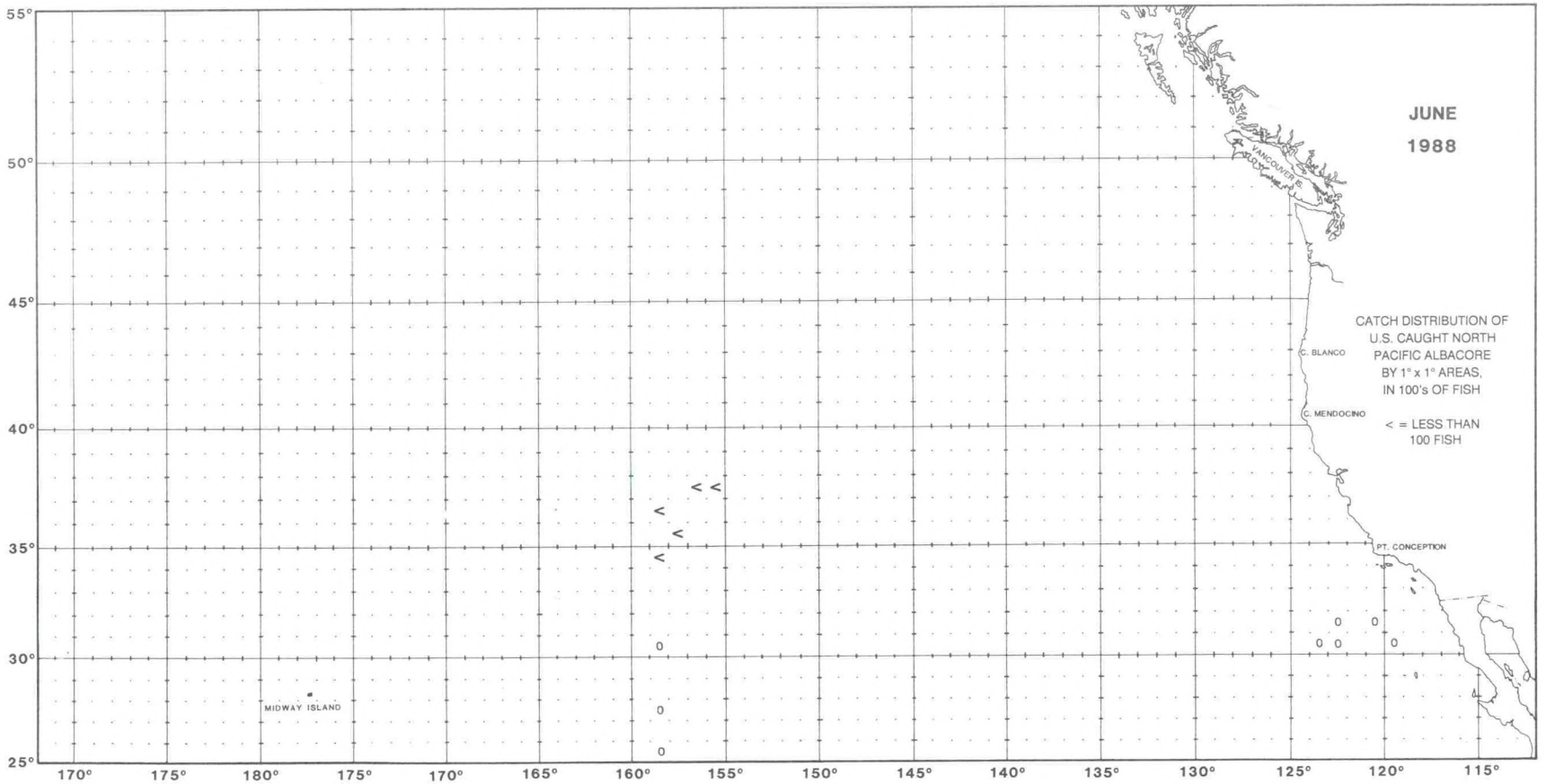

Figure 3a. Albacore catch (numbers of fish) by all vessels by 1° quadrangle in the North Pacific, June 1988.

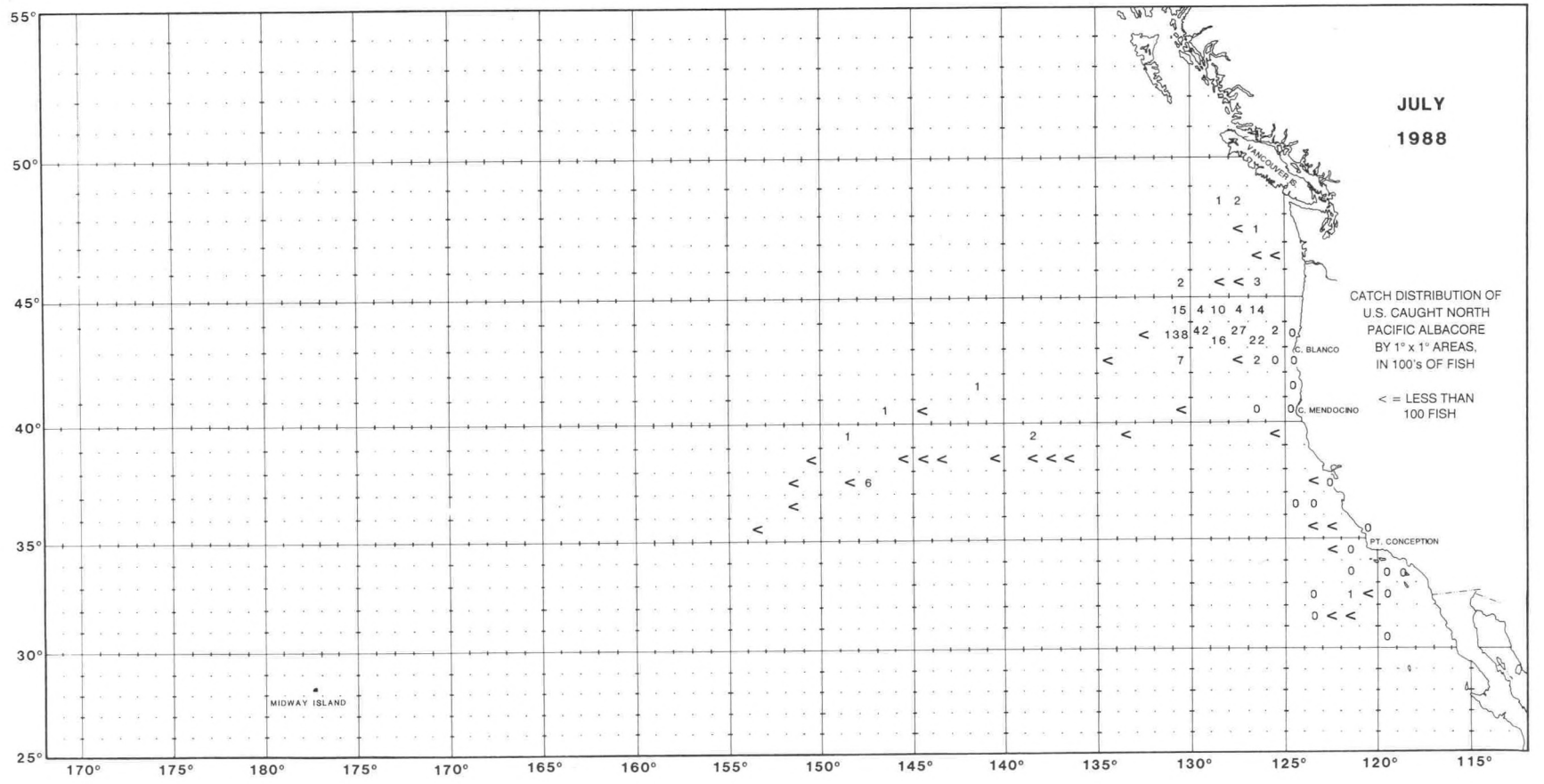

Figure 3b. Albacore catch (numbers of fish) by all vessels by 1^{o} quadrangle in the North Pacific, July 1988.

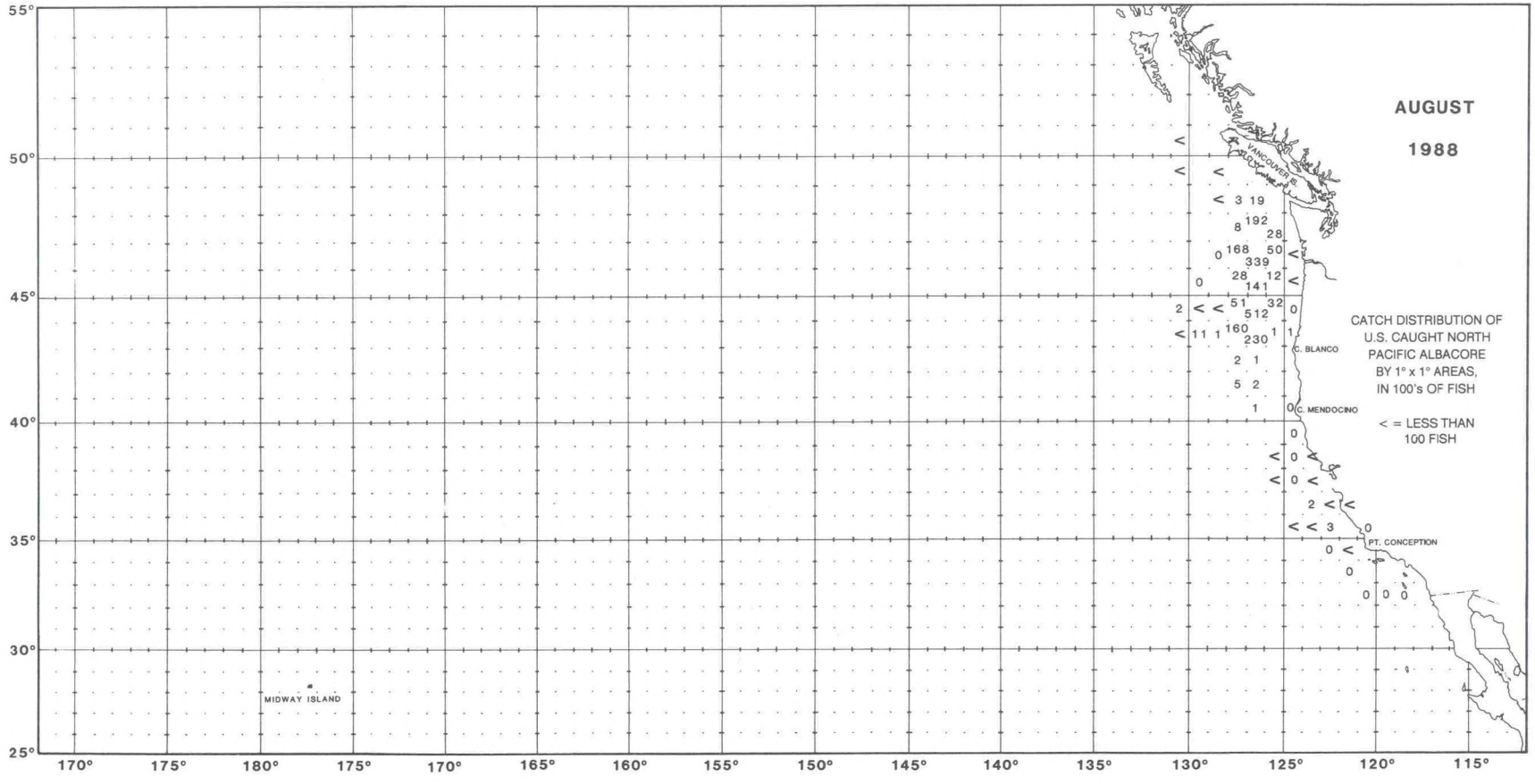

Figure 3c. Albacore catch (numbers of fish) by all vessels by 1^{o} quadrangle in the North Pacific, August 1988.

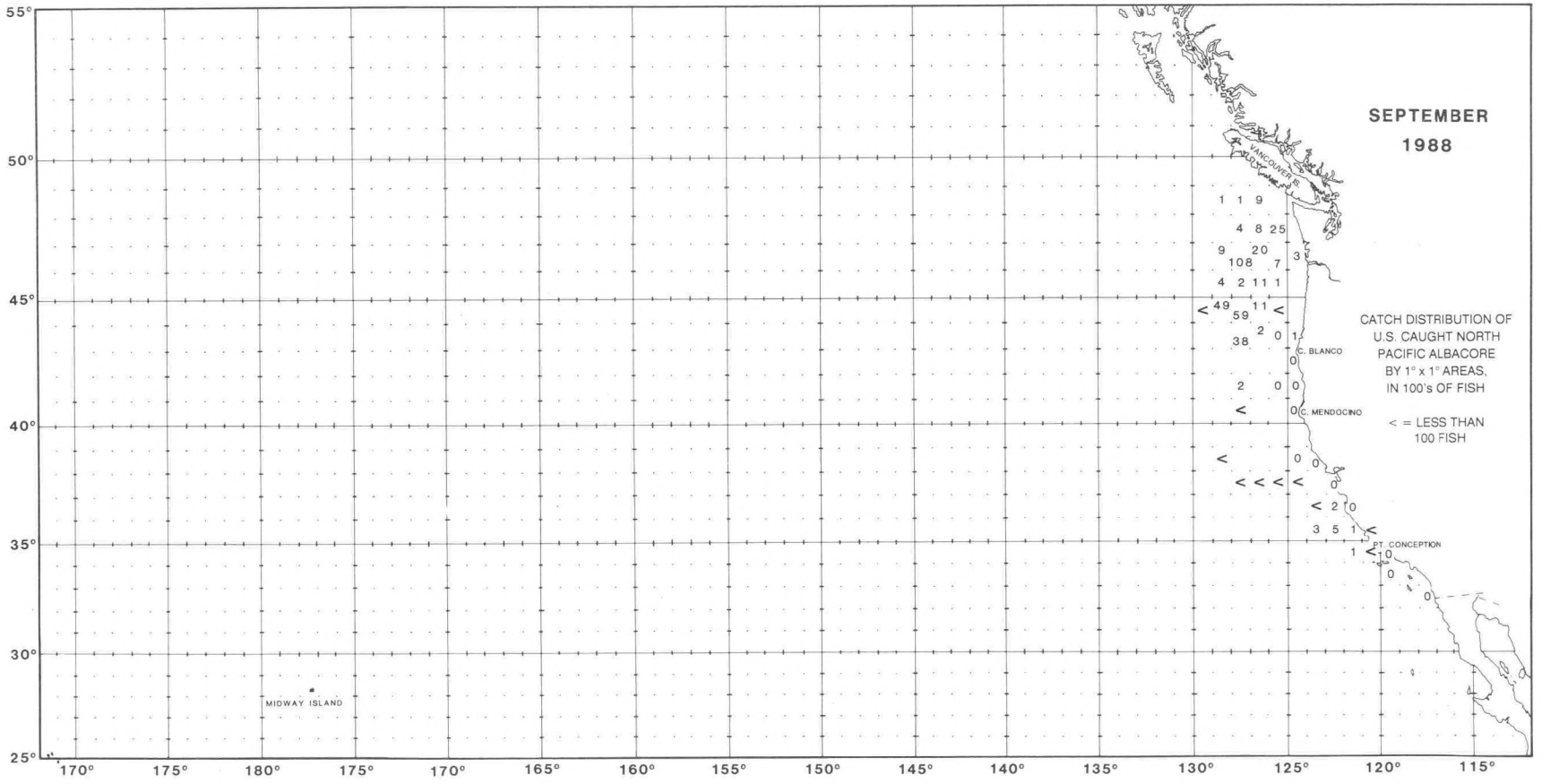

Figure 3d. Albacore catch (numbers of fish) by all vessels by 1° quadrangle in the North Pacific, September 1988.

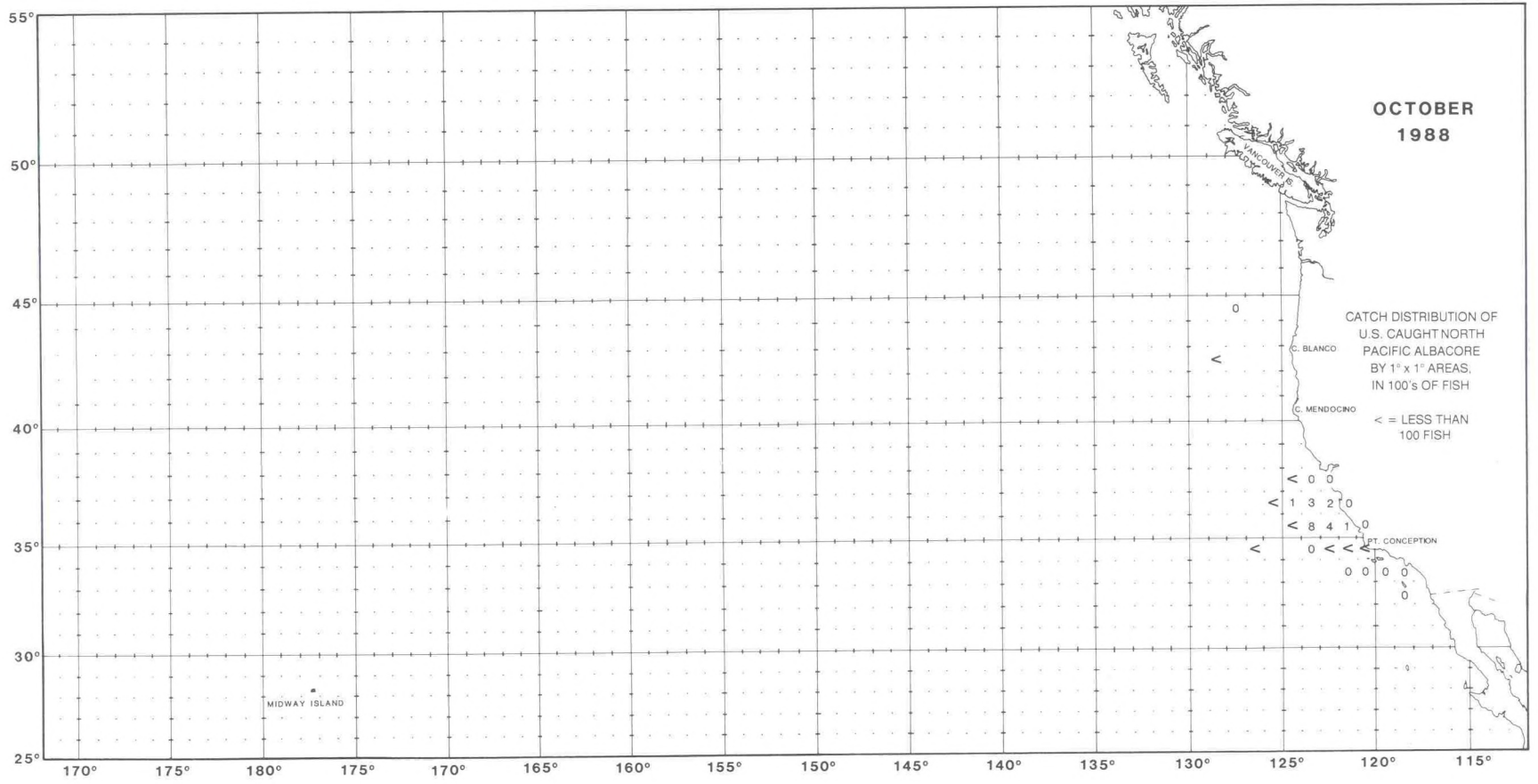

Figure 3e. Albacore catch (numbers of fish) by all vessels by 1^{o} quadrangle in the North Pacific, October 1988.

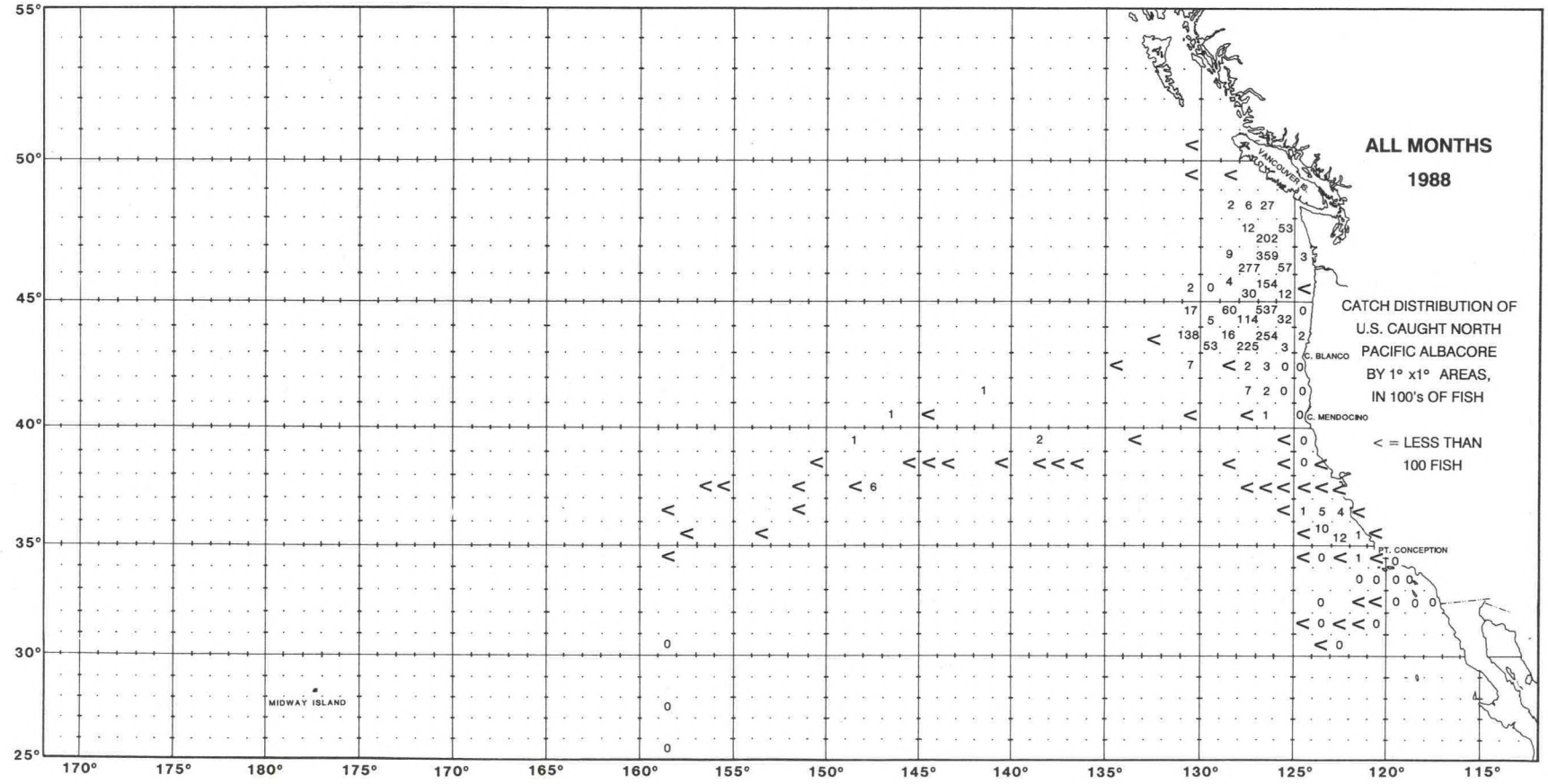

Figure 4. Annual albacore catch (numbers of fish) by all vessels by 1^{o} quadrangle in the North Pacific, 1988.

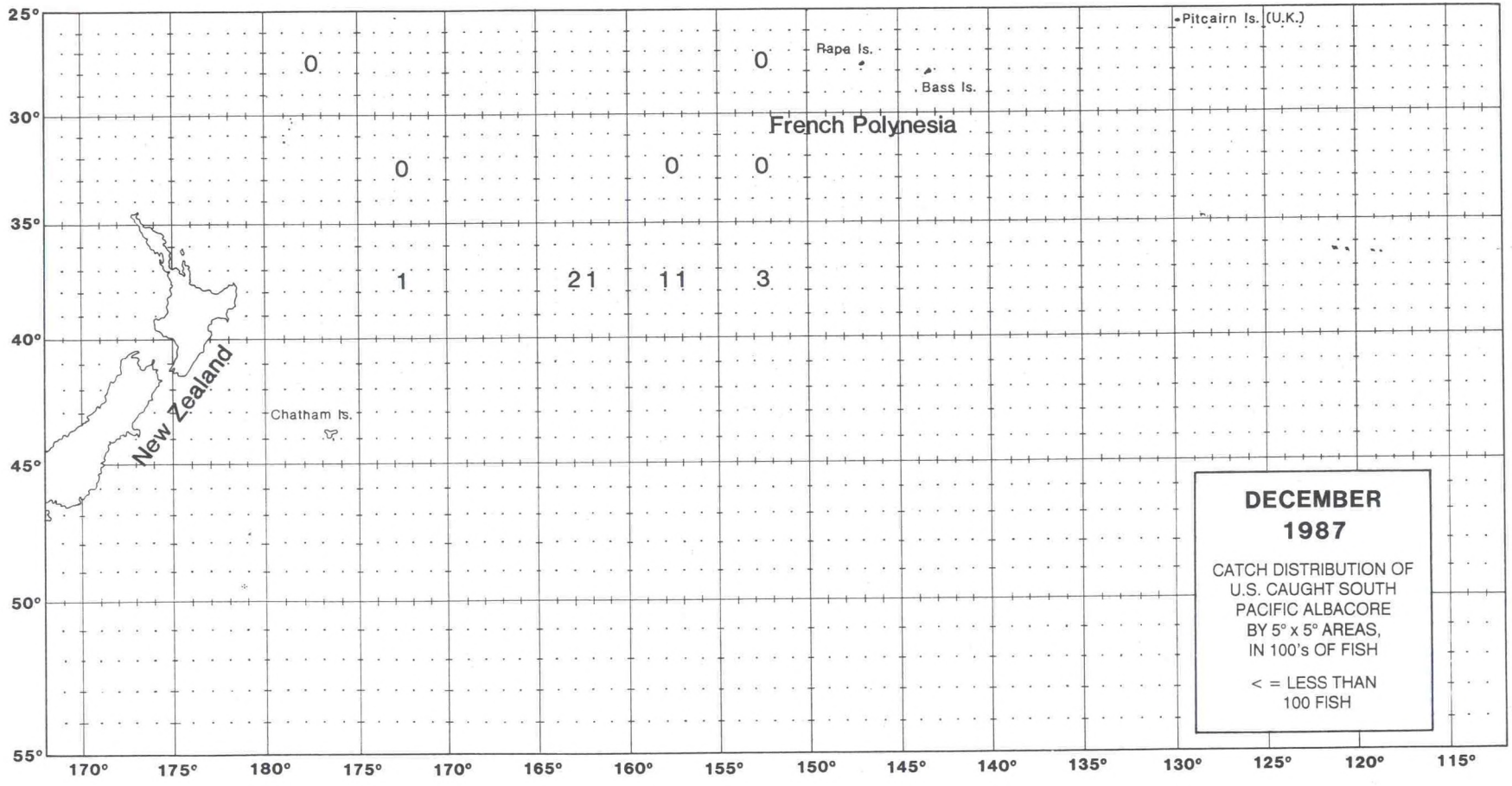

Figure 5a. Albacore catch (numbers of fish) by jigboats by 5^{o} quadrangle in the South Pacific, December 1987.

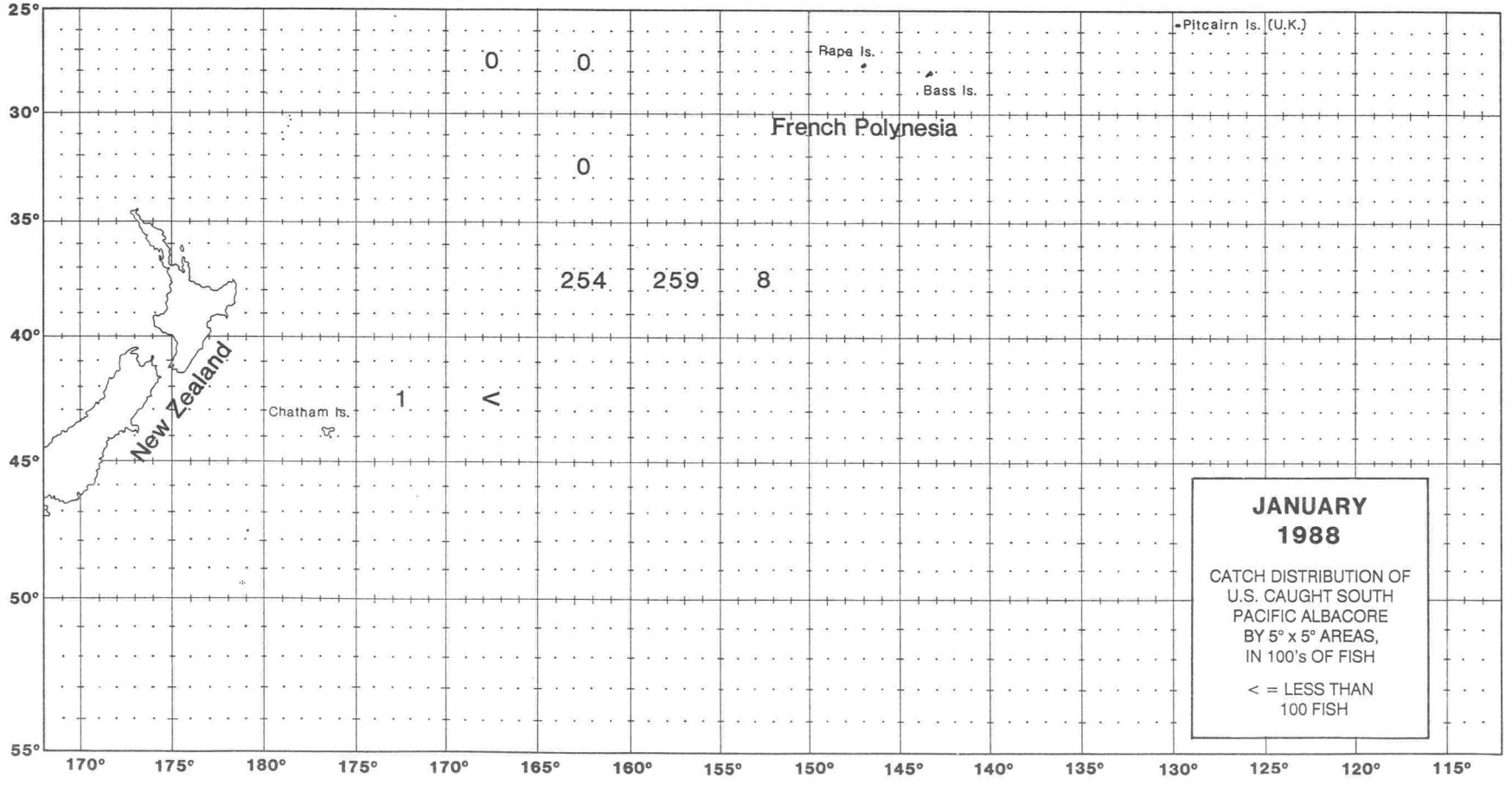

Figure 5b. Albacore catch (numbers of fish) by jigboats by 5° quadrangle in the South Pacific, January 1988.

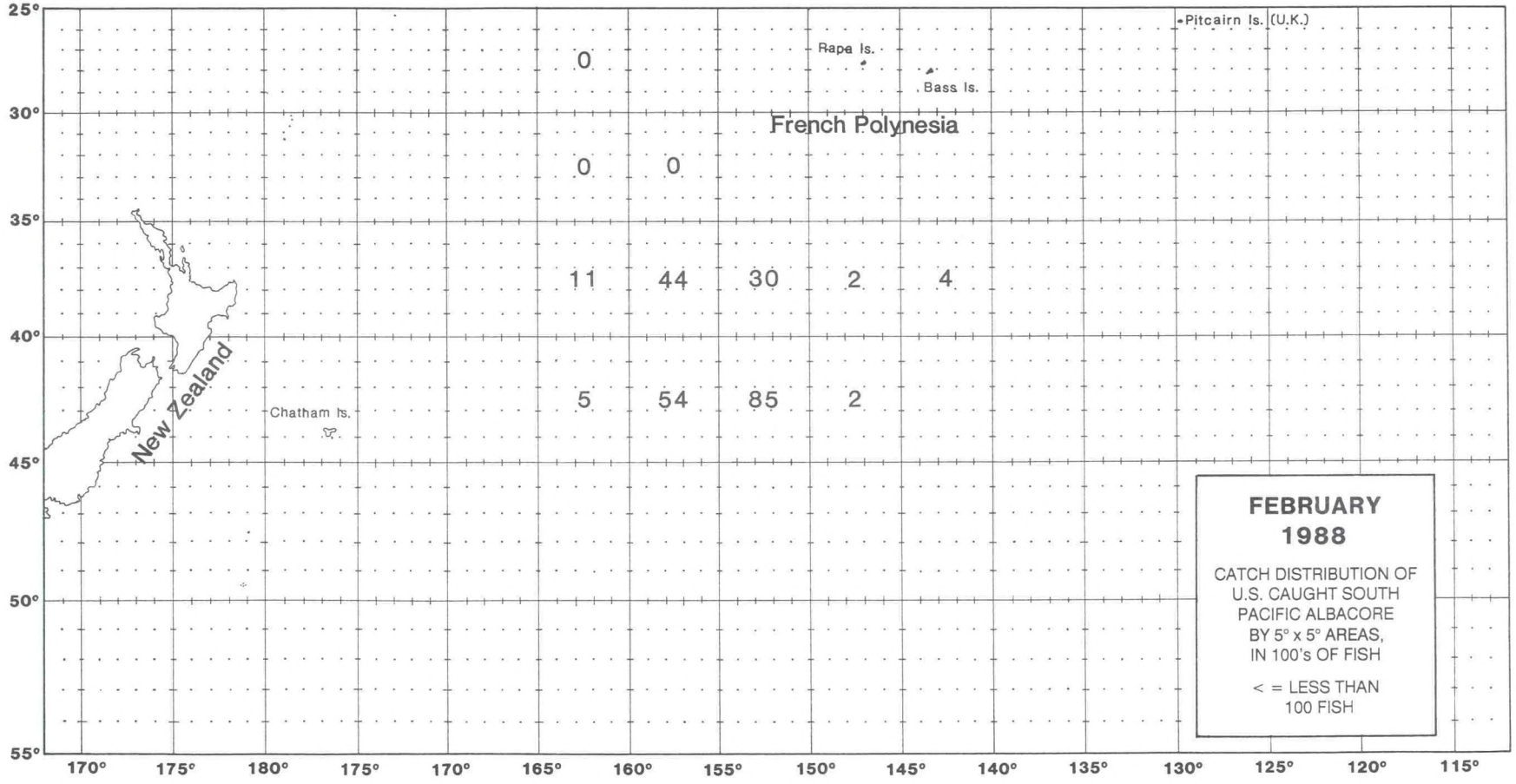

Figure 5c. Albacore catch (numbers of fish) by jigboats by 5° quadrangle in the South Pacific, February 1988.

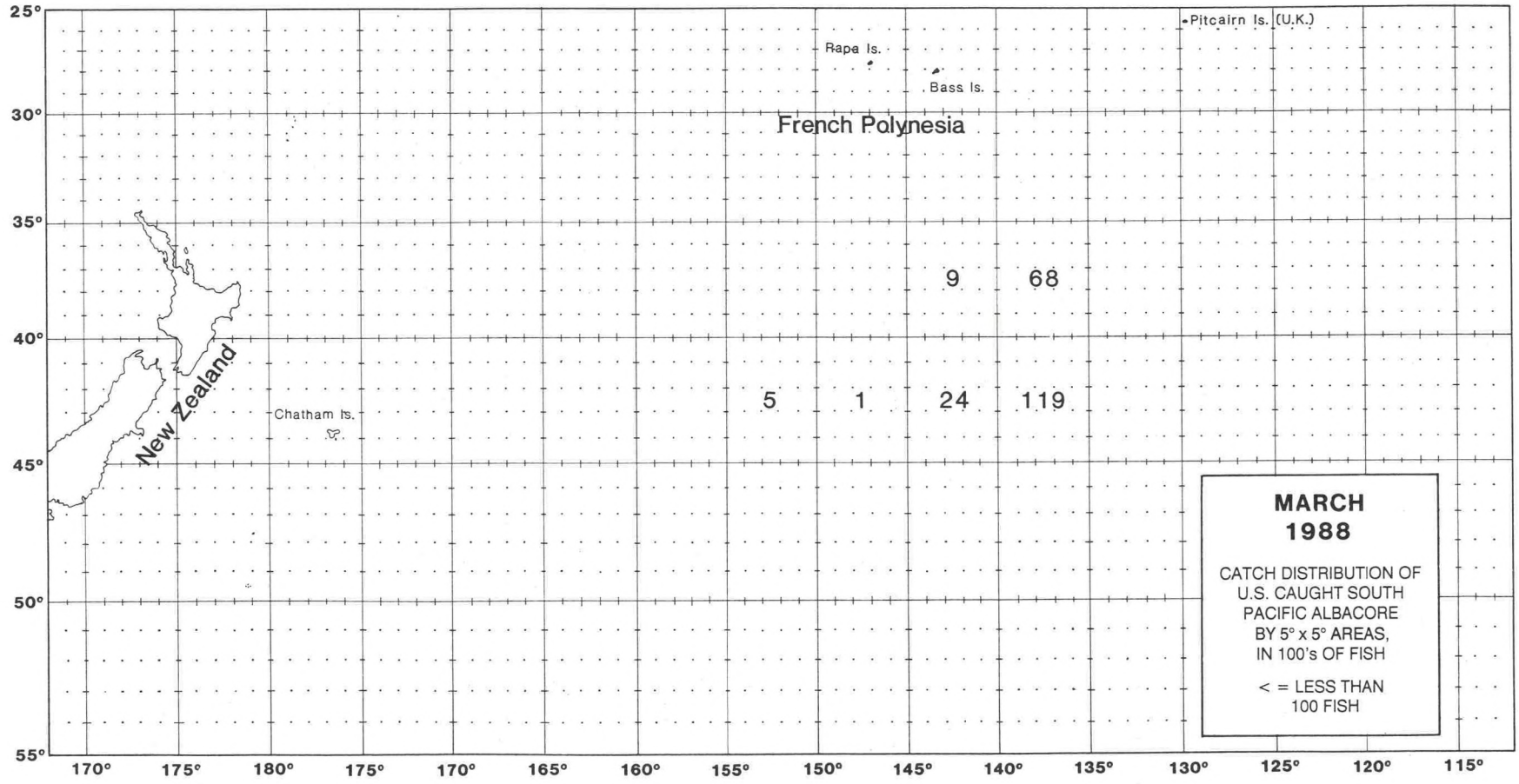

Figure 5d. Albacore catch (numbers of fish) by jigboats by 5° quadrangle in the South Pacific, March 1988.

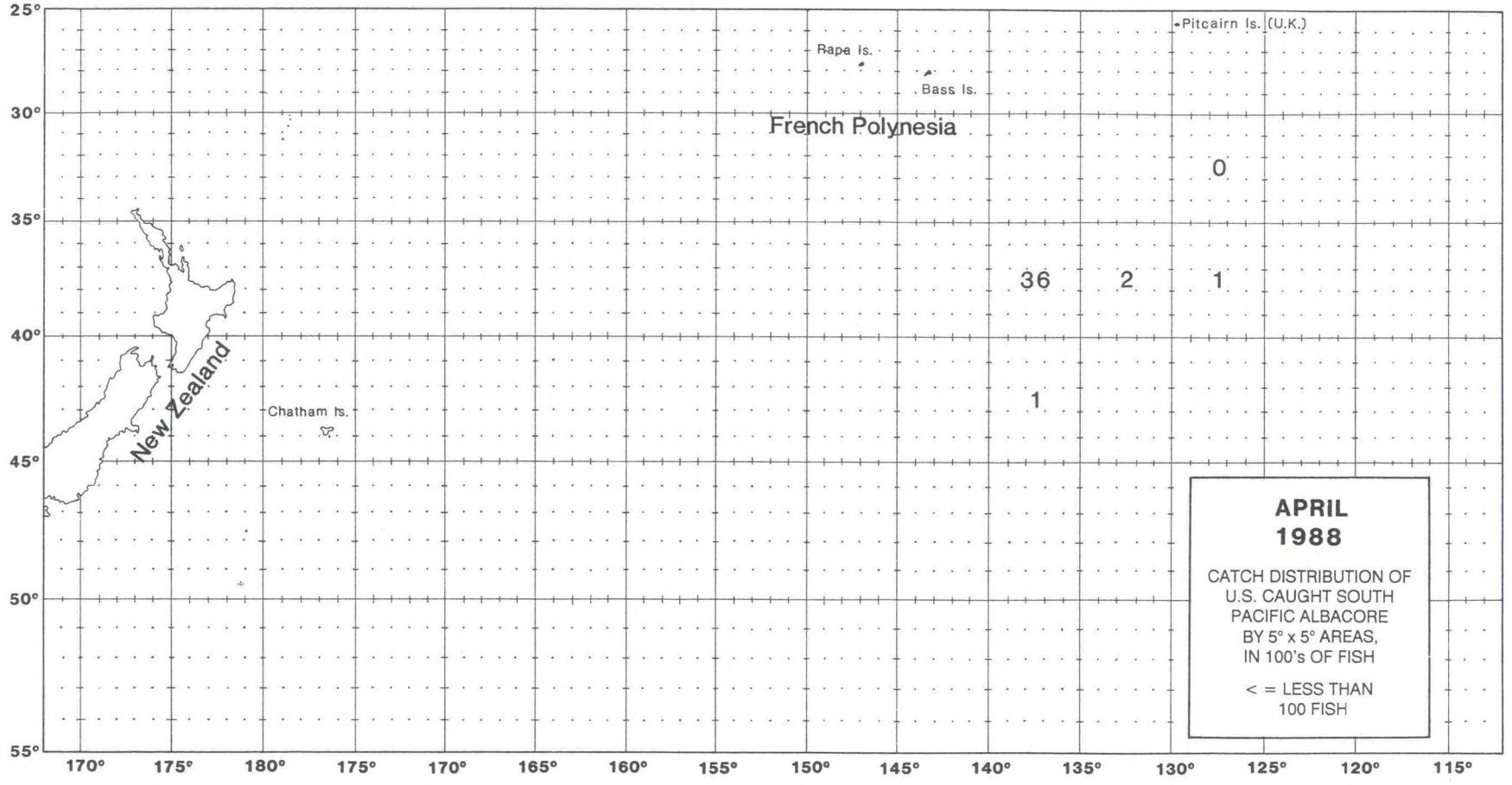

Figure 5e. Albacore catch (numbers of fish) by jigboats by 5^{o} quadrangle in the South Pacific, April 1988.

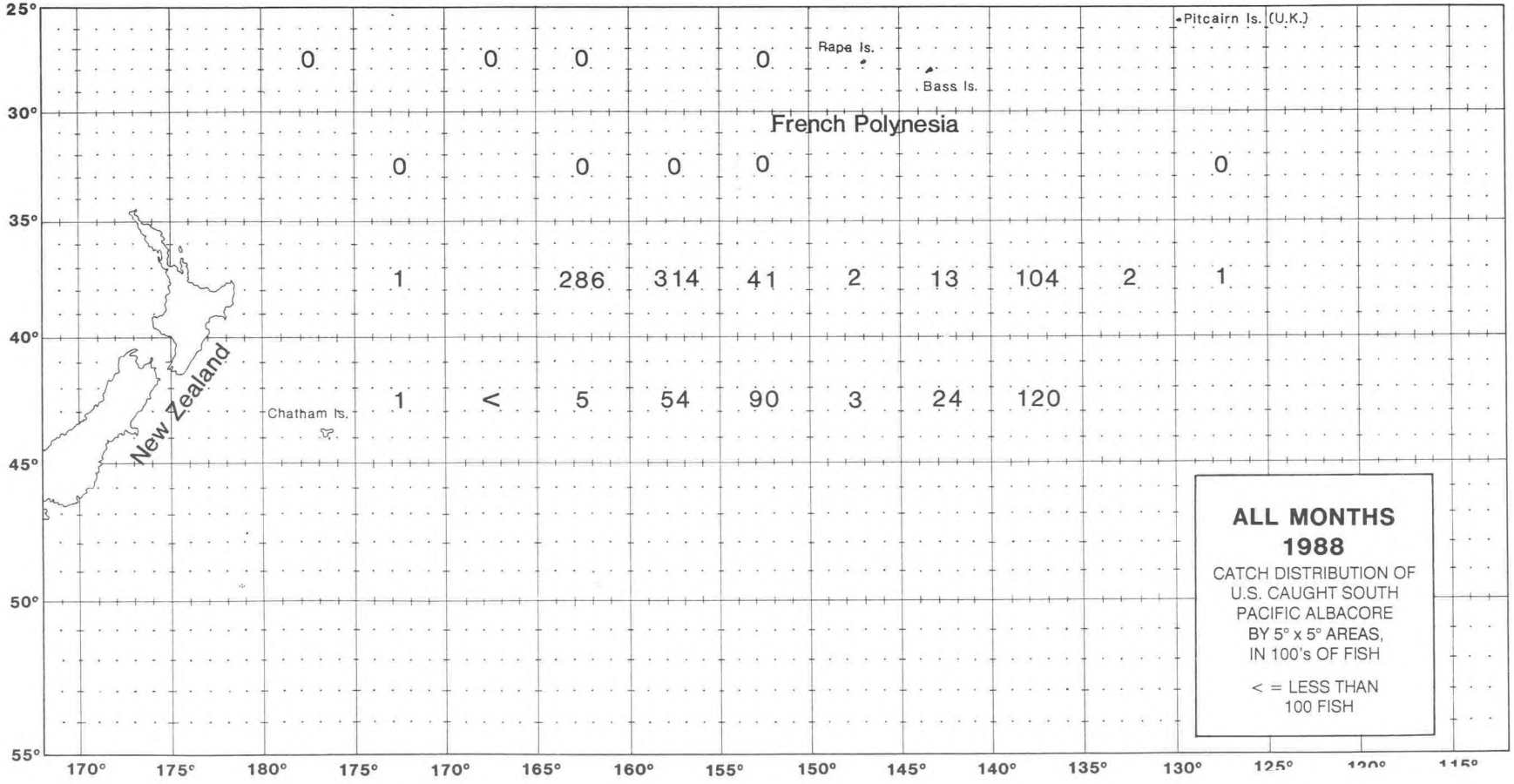

Figure 6. Annual albacore catch (numbers of fish) by jigboats by 5^{o} quadrangle in the South Pacific, 1988.

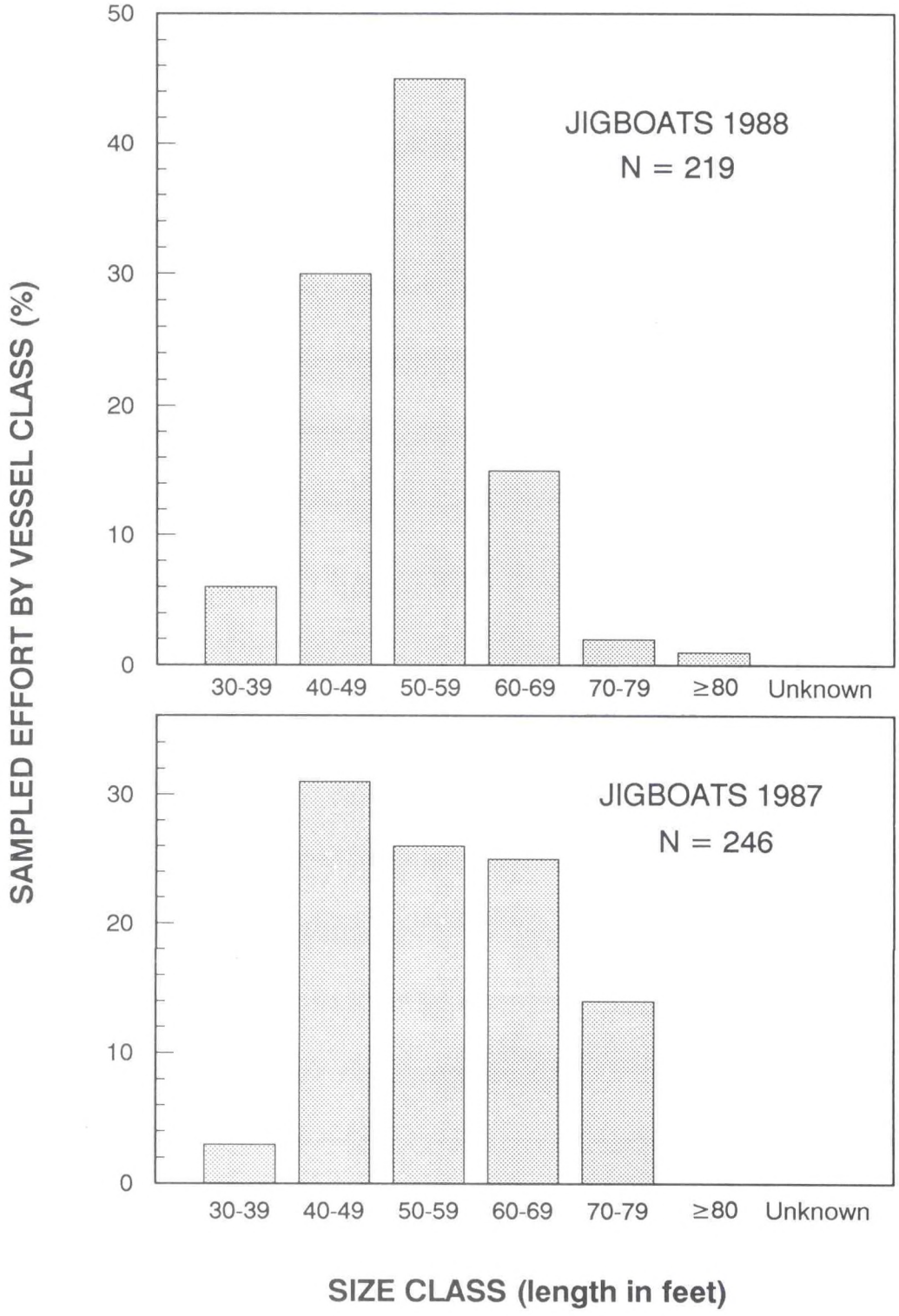

Figure 7. U.S. albacore jigboat sampled effort (days fished) by vessel class and year.

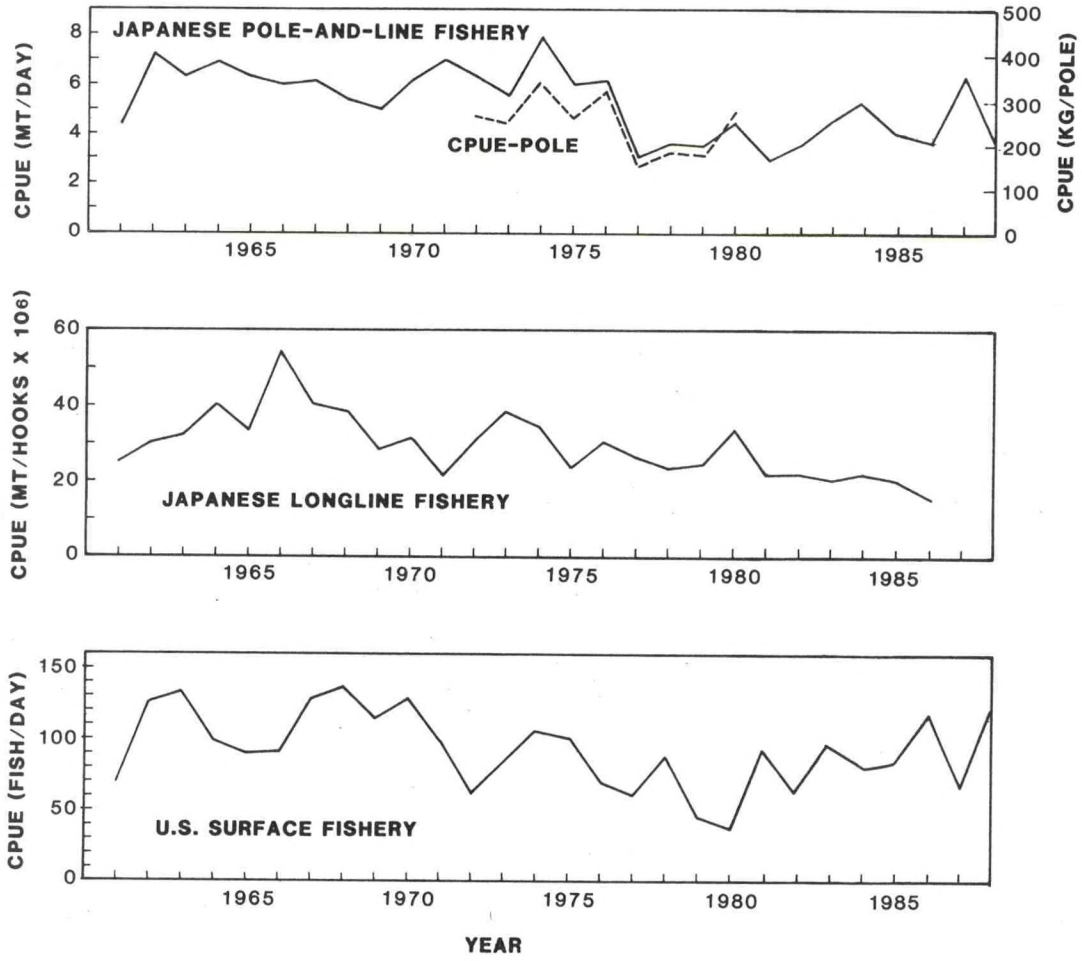

Figure 8. North Pacific albacore catch-per-unit effort (CPUE) by fishery and gear.

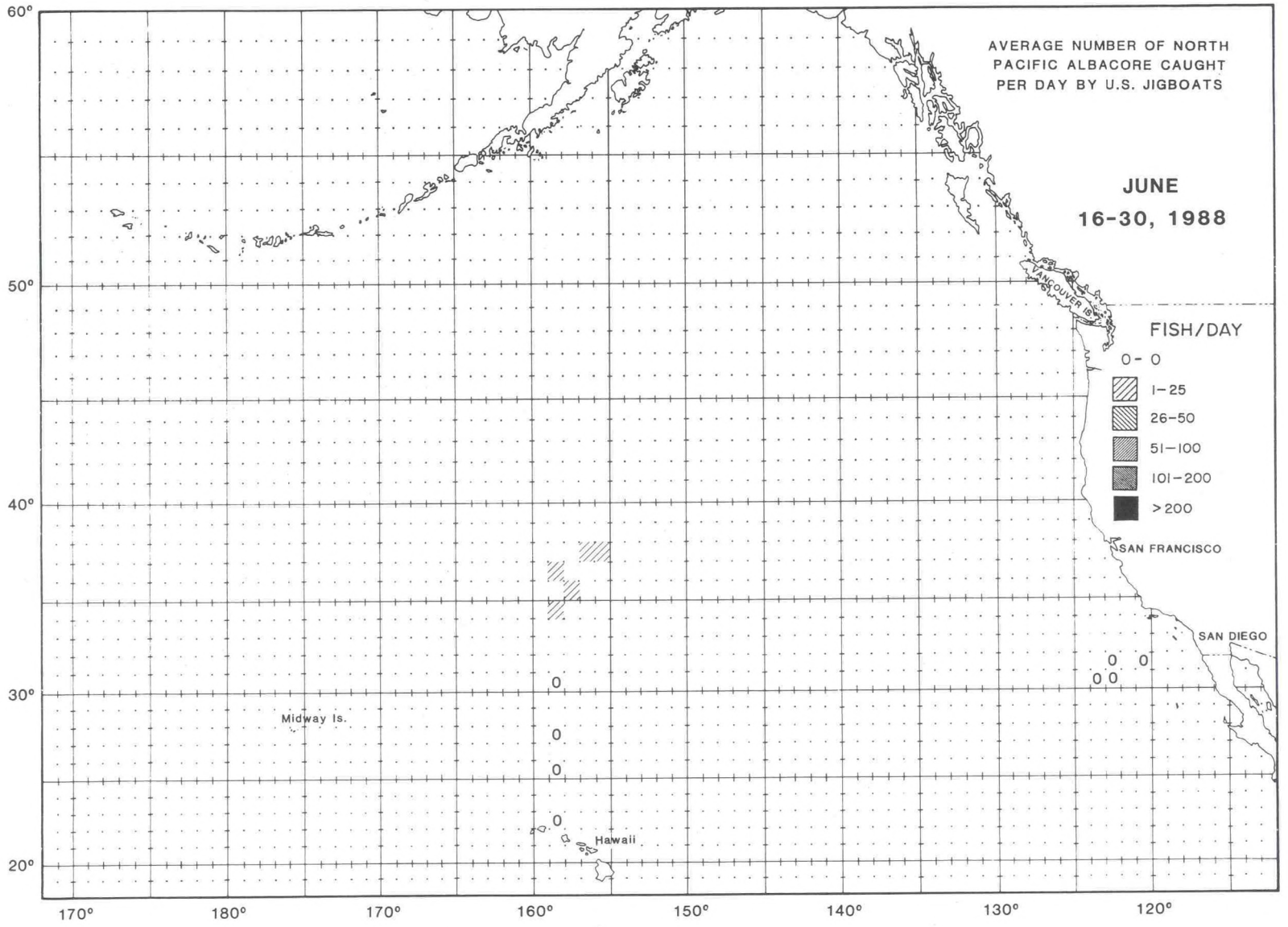

Figure 9a. Jigboat catch-per-standard-day fishing by 1^{o} quadrangle for June 16 - 30, 1988.

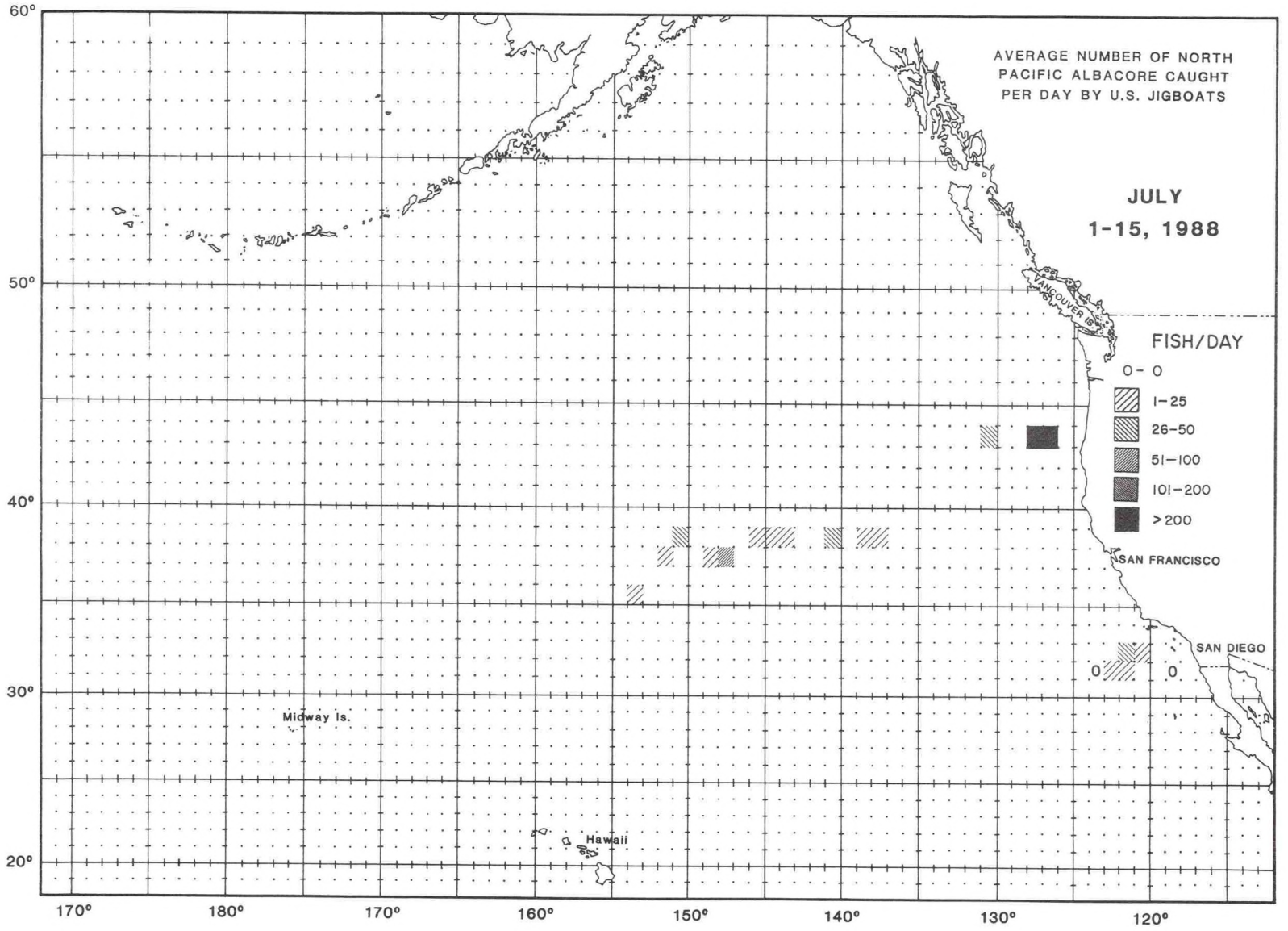

Figure 9b. Jigboat catch-per-standard-day fishing by 1^{o} quadrangle for July 1 - 15, 1988.

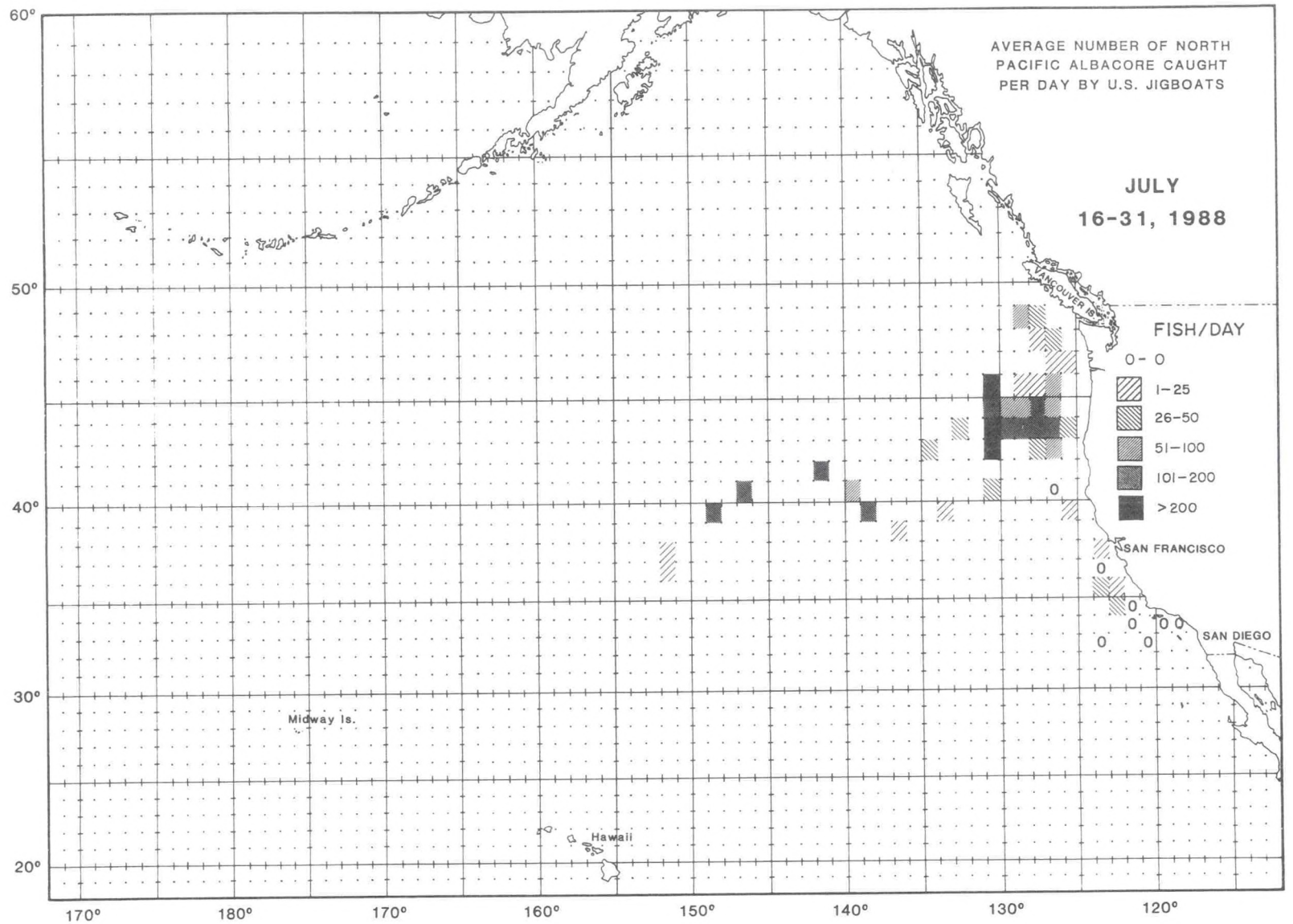

Figure 9c. Jigboat catch-per-standard-day fishing by 1° quadrangle for July 16 - 31, 1988.

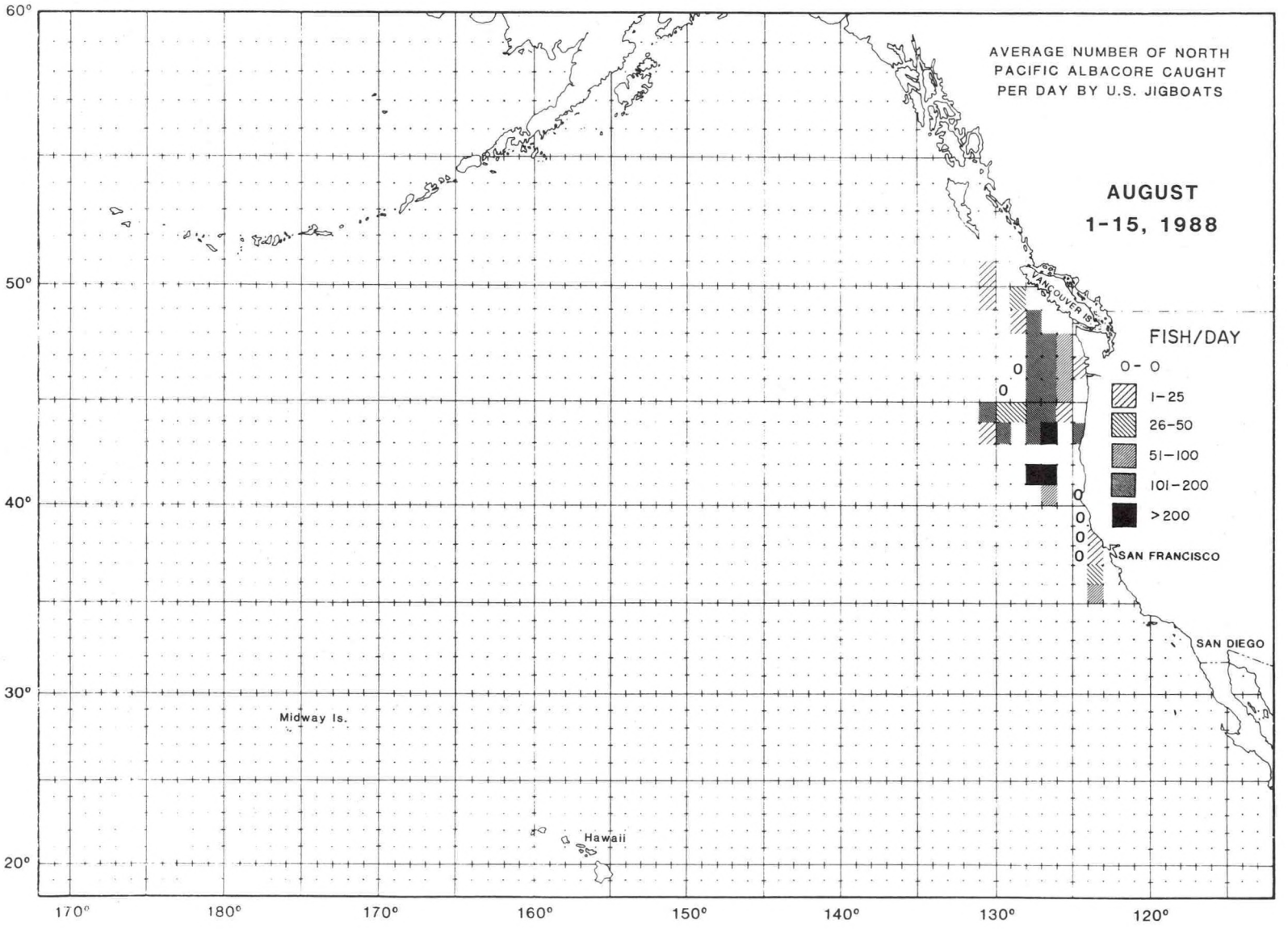

Figure 9d. Jigboat catch-per-standard-day fishing by 1° quadrangle for August 1 - 15, 1988.

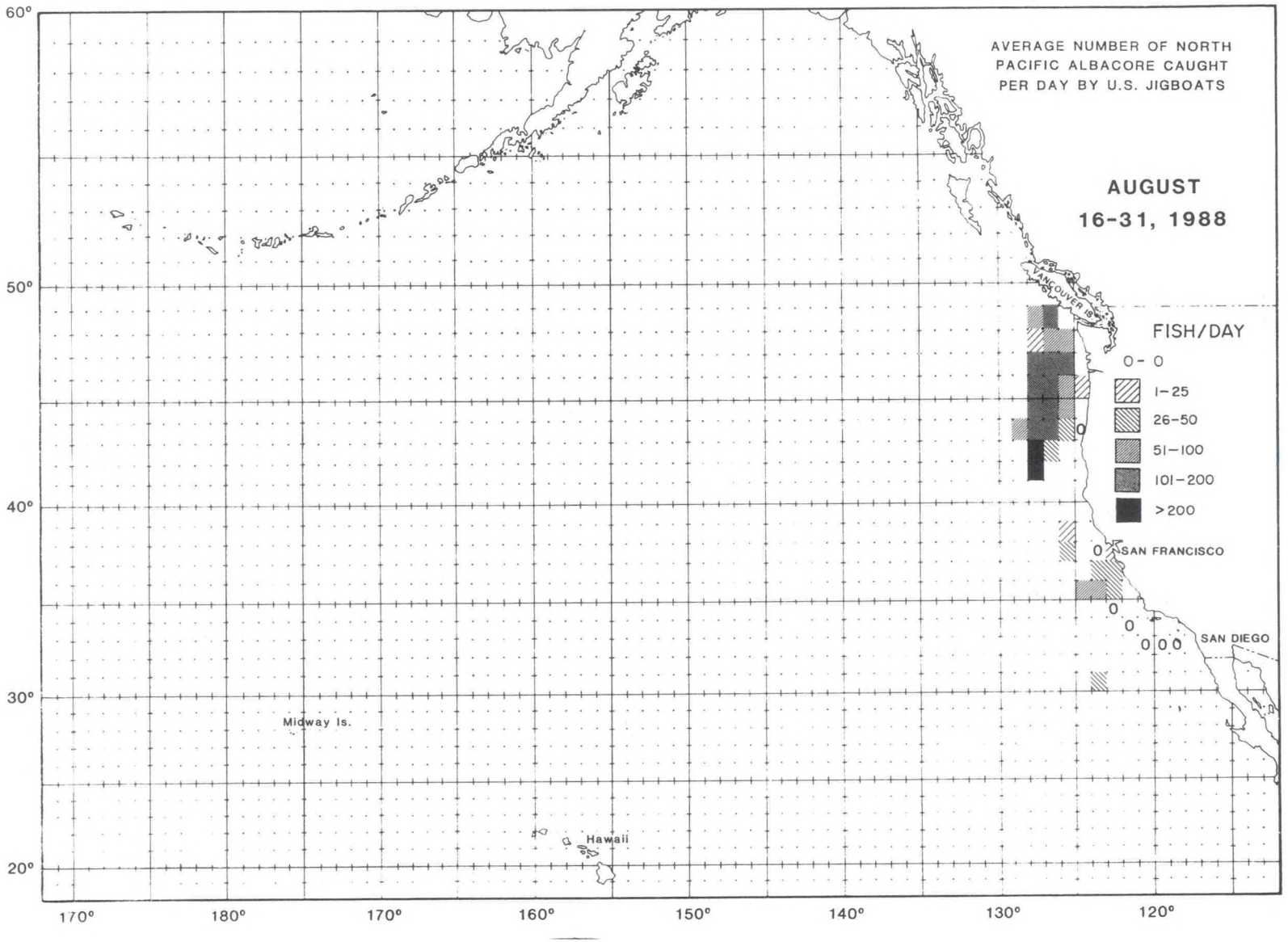

Figure 9e. Jigboat catch-per-standard-day fishing by 1° quadrangle for August 16 - 31, 1988.

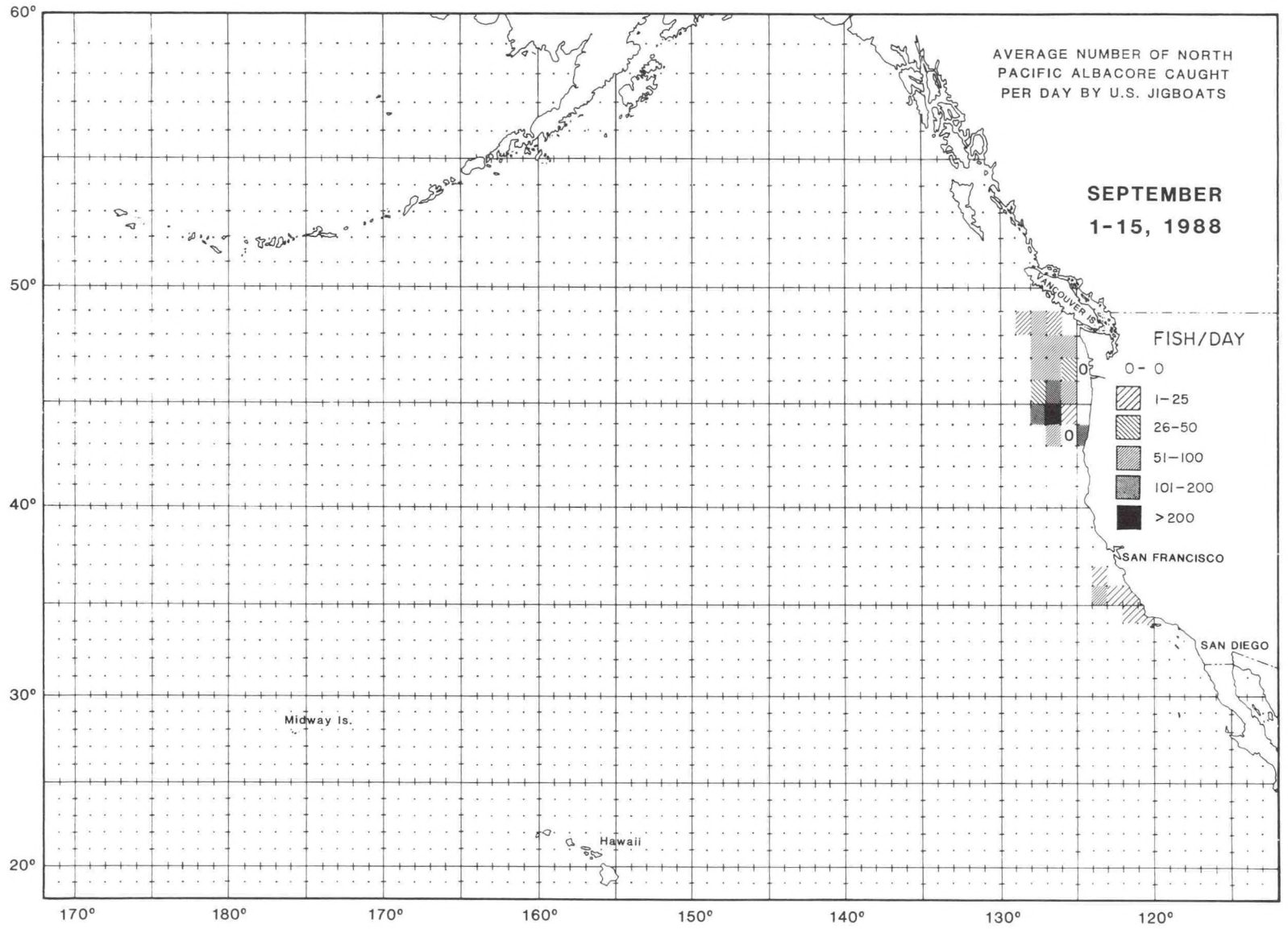

Figure 9f. Jigboat catch-per-standard-day fishing by 1^{o} quadrangle for September 1 - 15, 1988.

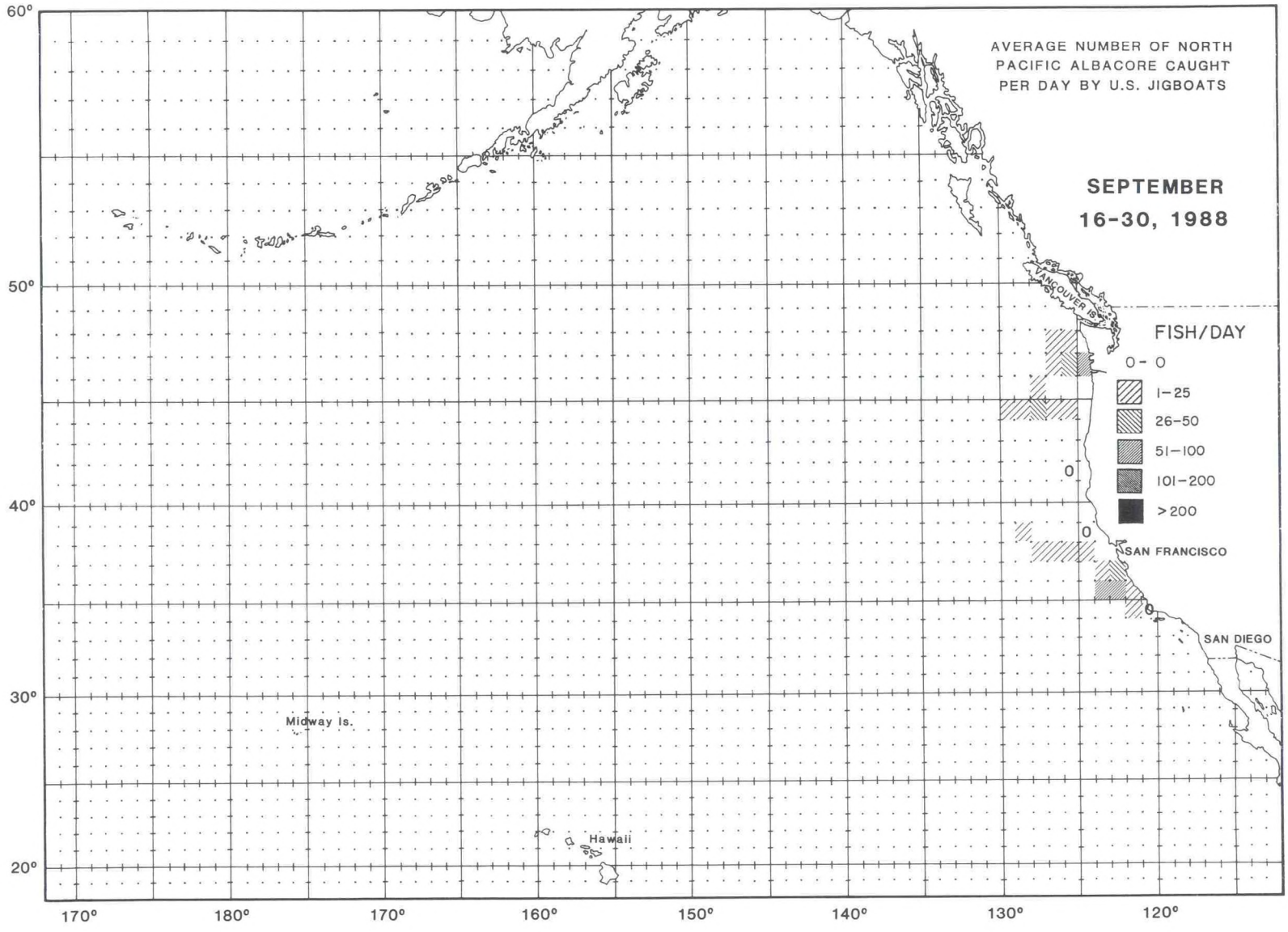

Figure 9g. Jigboat catch-per-standard-day fishing by 1^{o} quadrangle for September 16 - 30, 1988.

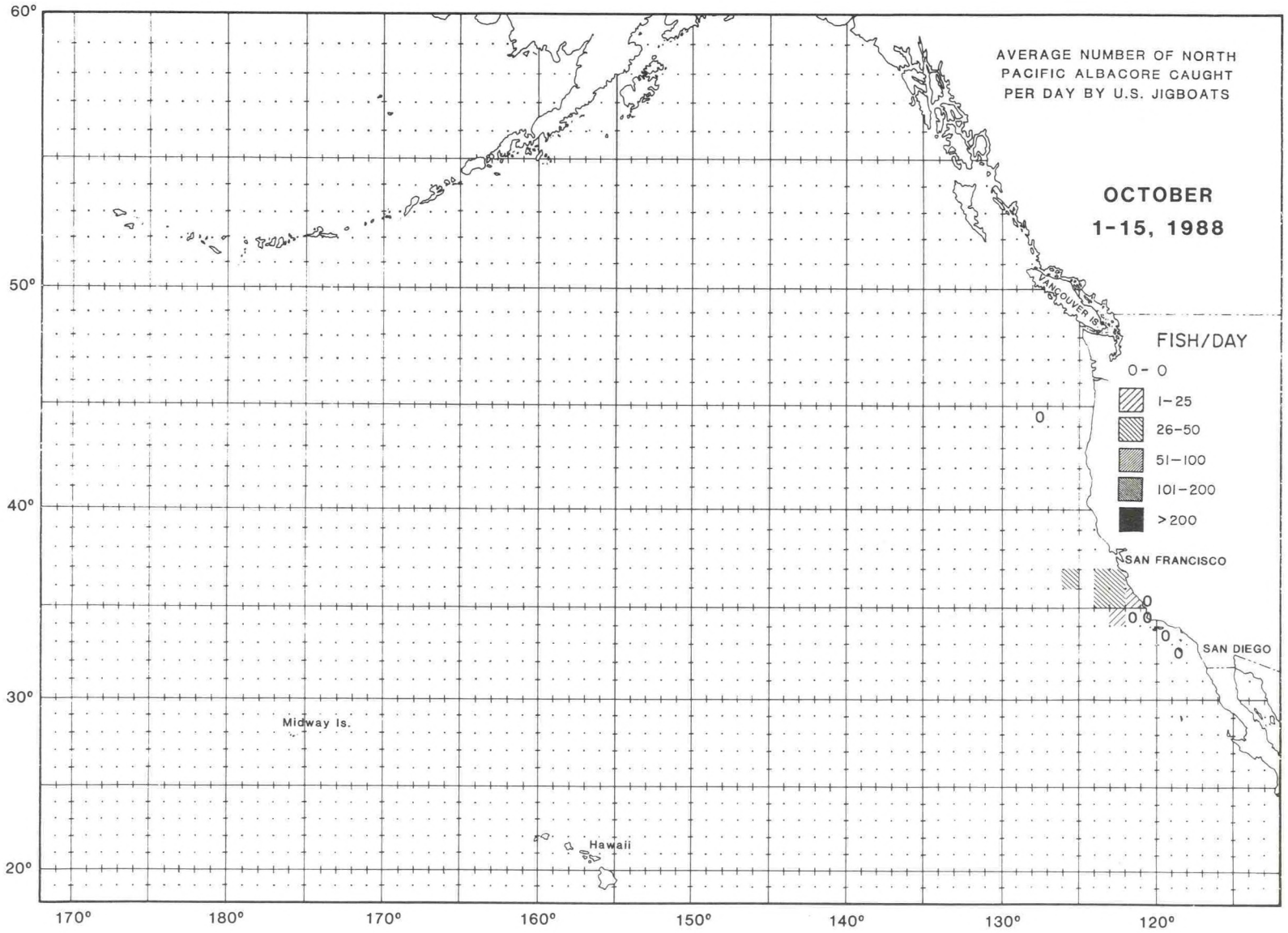

Figure 9h. Jigboat catch-per-standard-day fishing by 1^{o} quadrangle for October 1 - 15, 1988.

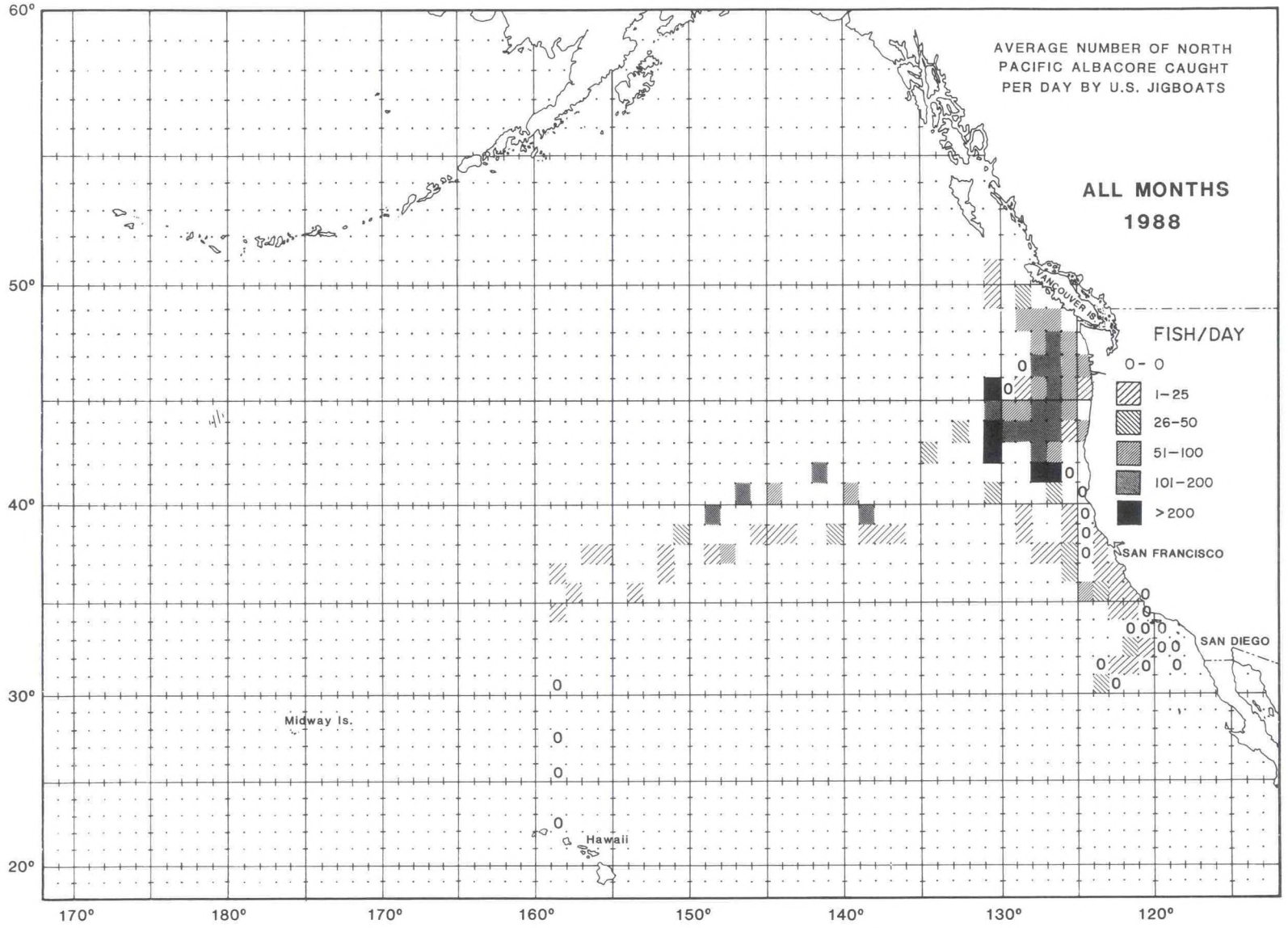

Figure 10. Jigboat catch-per-standard-day fishing by 1^{o} quadrangle and year, 1988.

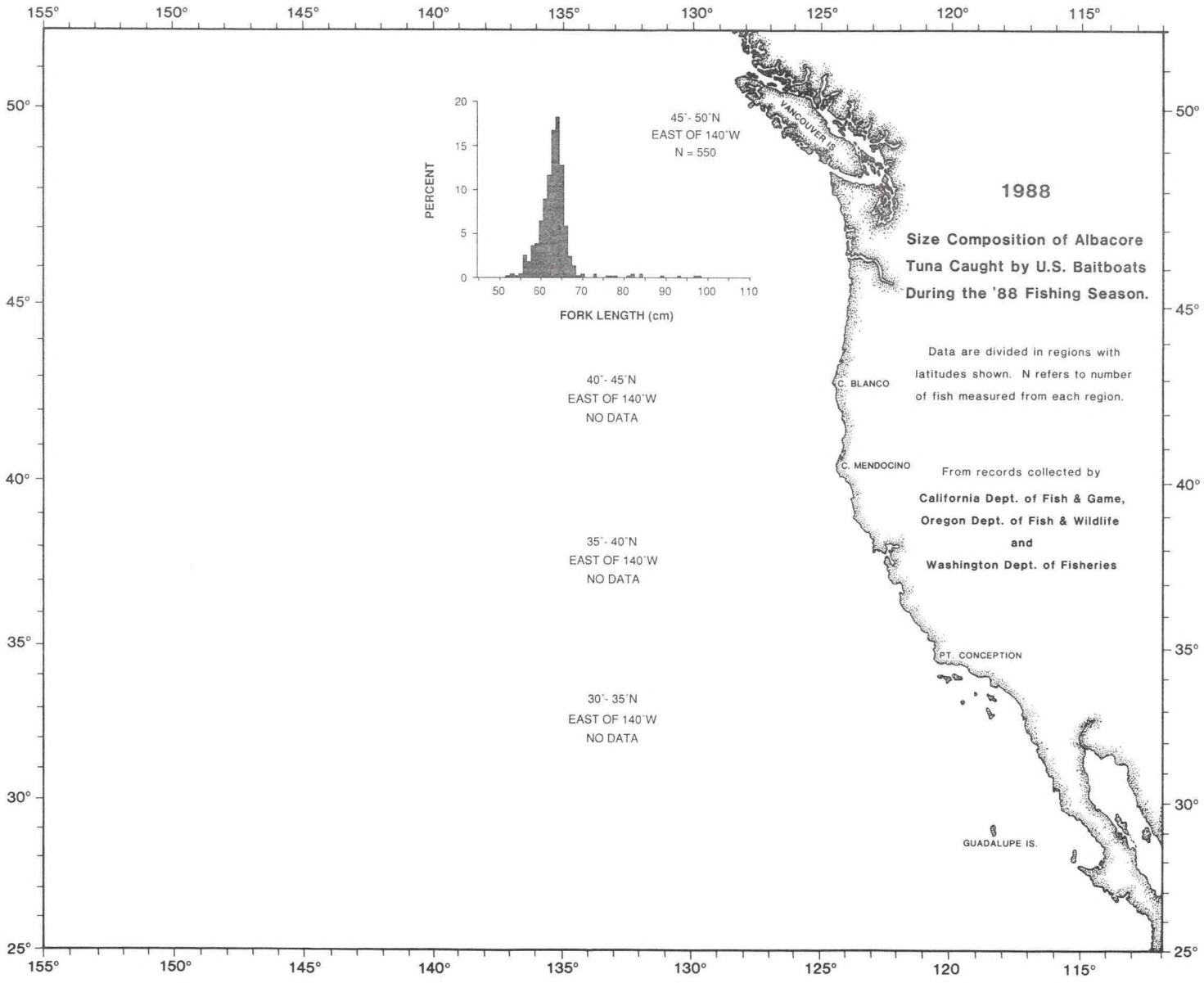

Figure 11a. Length-frequency histograms of albacore caught by the U.S. baitboat fishery in the North Pacific, 1988.

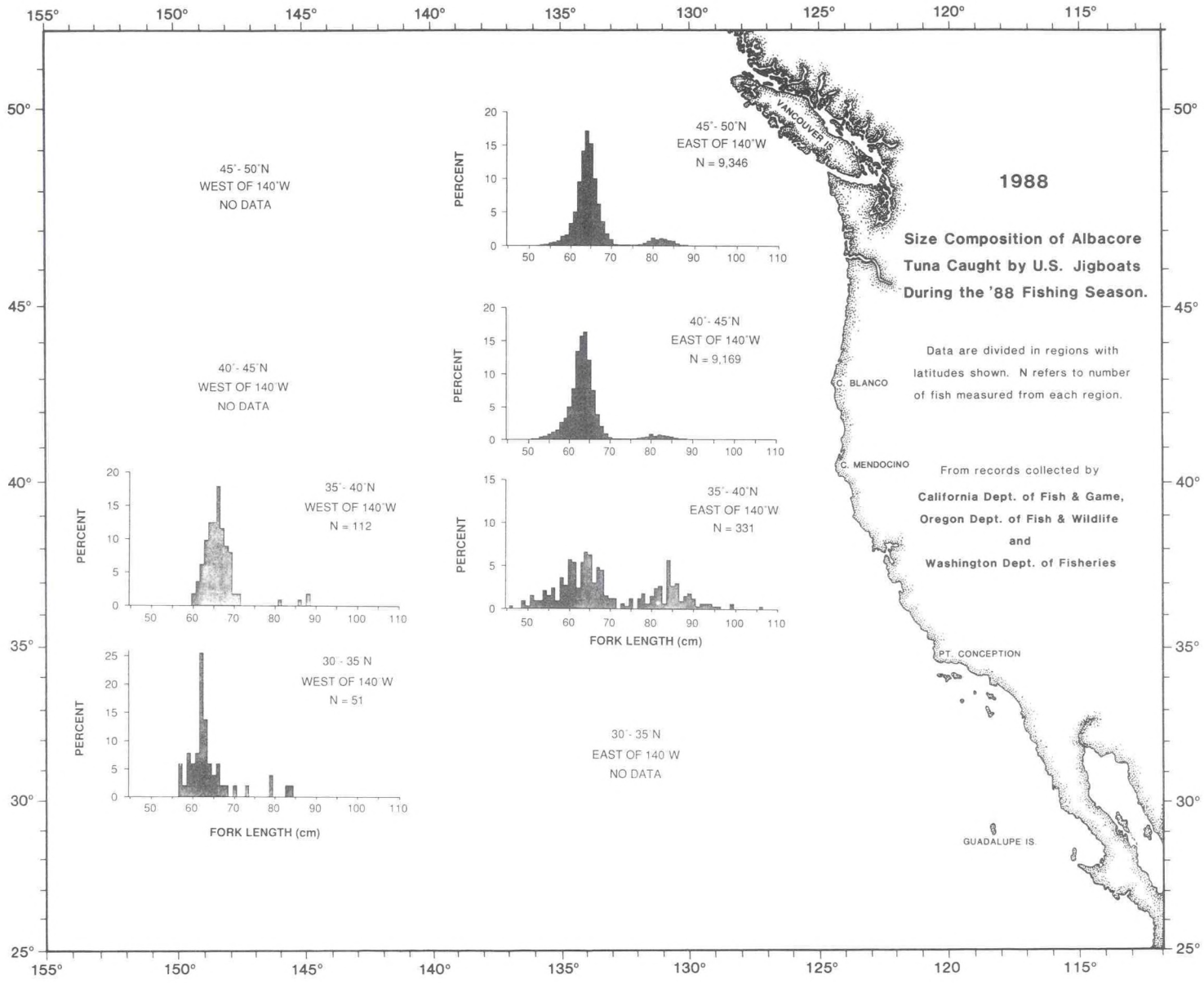

Figure 11b. Length-frequency histograms of albacore caught by the U.S. jigboat fishery in the North Pacific, 1988.

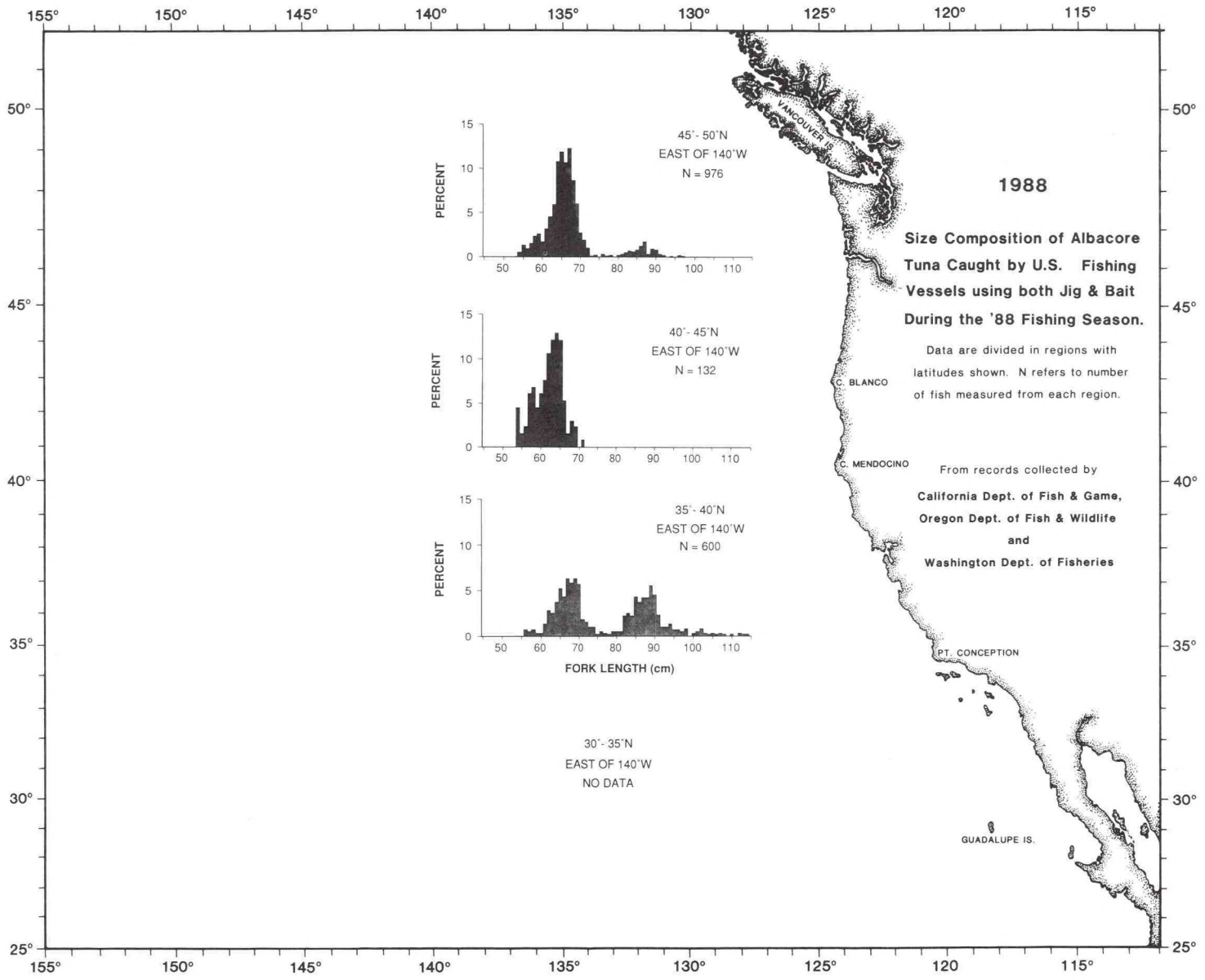

Figure 11c. Length-frequency histograms of albacore caught by U.S. vessels using both bait and jig in the North Pacific, 1988.

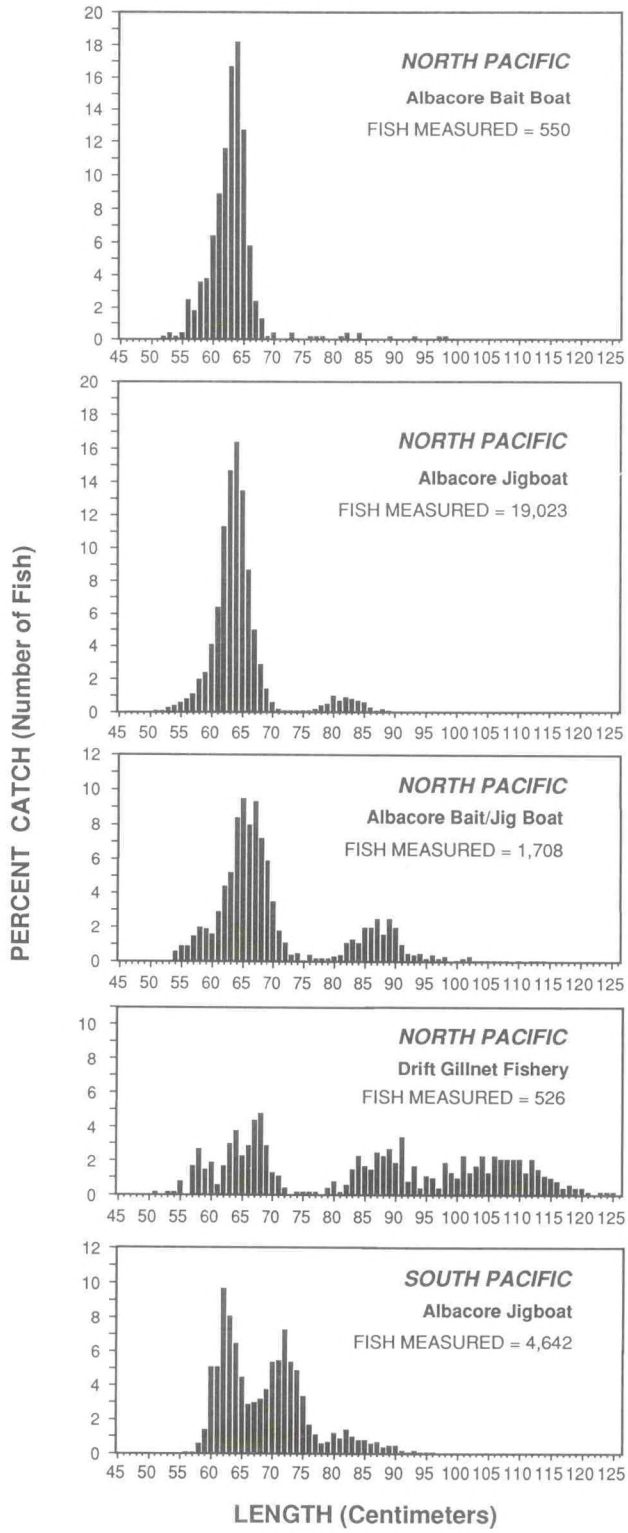

Figure 12. Size compositions of fish caught by the U.S. North and South Pacific albacore fleets in 1988 by gear.

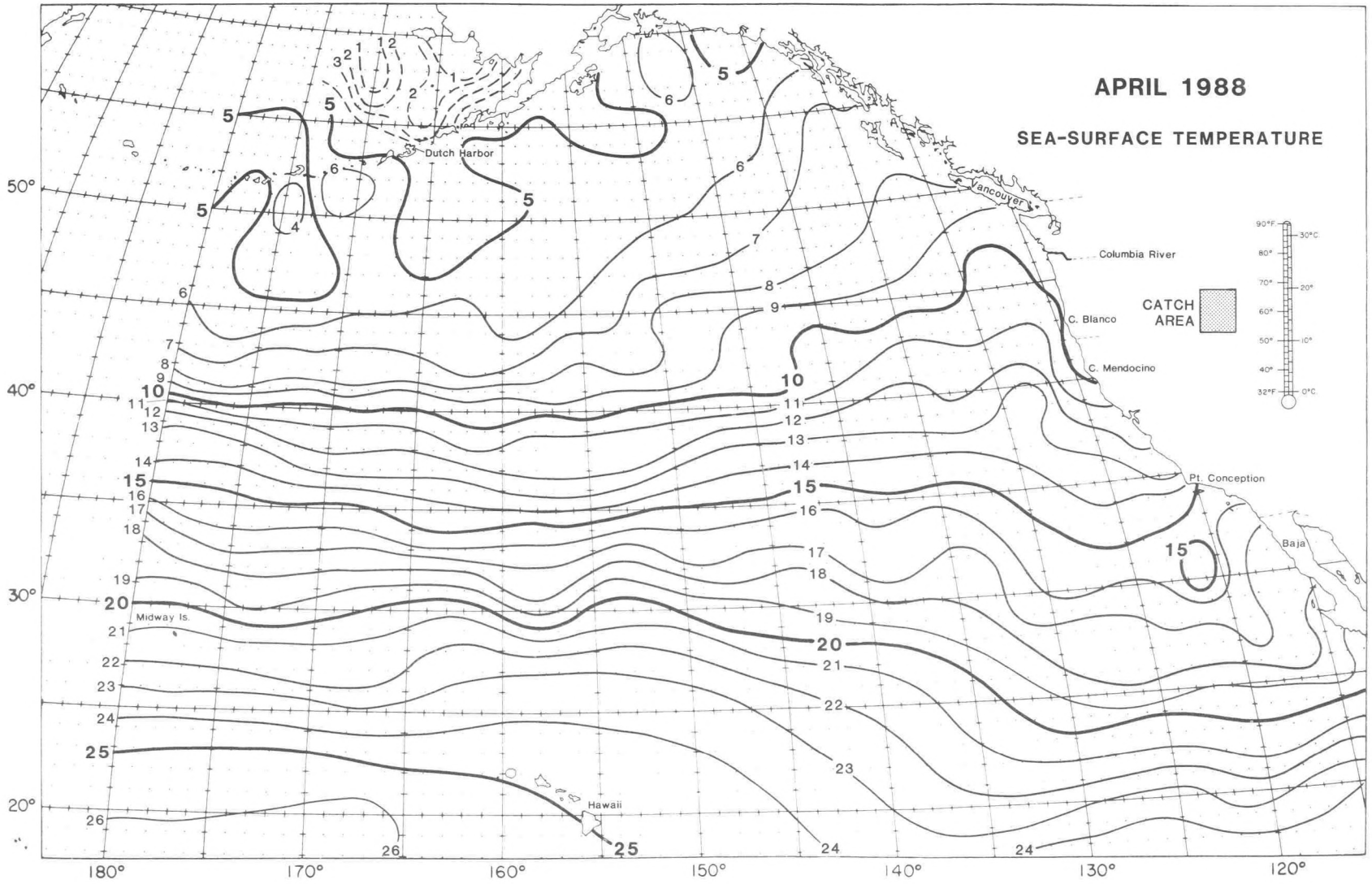

Figure 13a. Average sea-surface temperature (SST) isopleths (^{o}C) and albacore catch area for the North Pacific, April 1988.

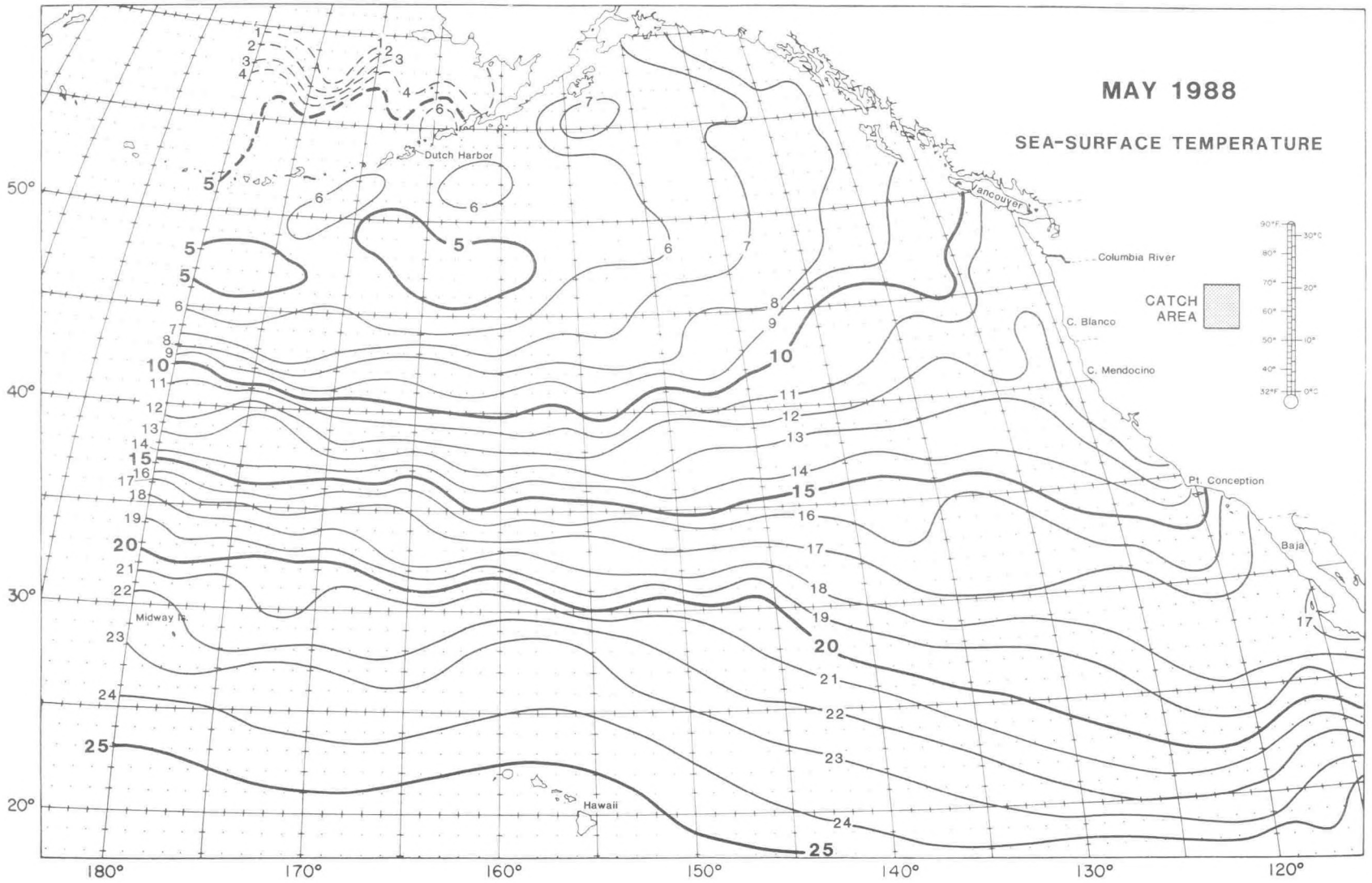

Figure 13b. Average sea-surface temperature (SST) isopleths (°C) and albacore catch area for the North Pacific, May 1988.

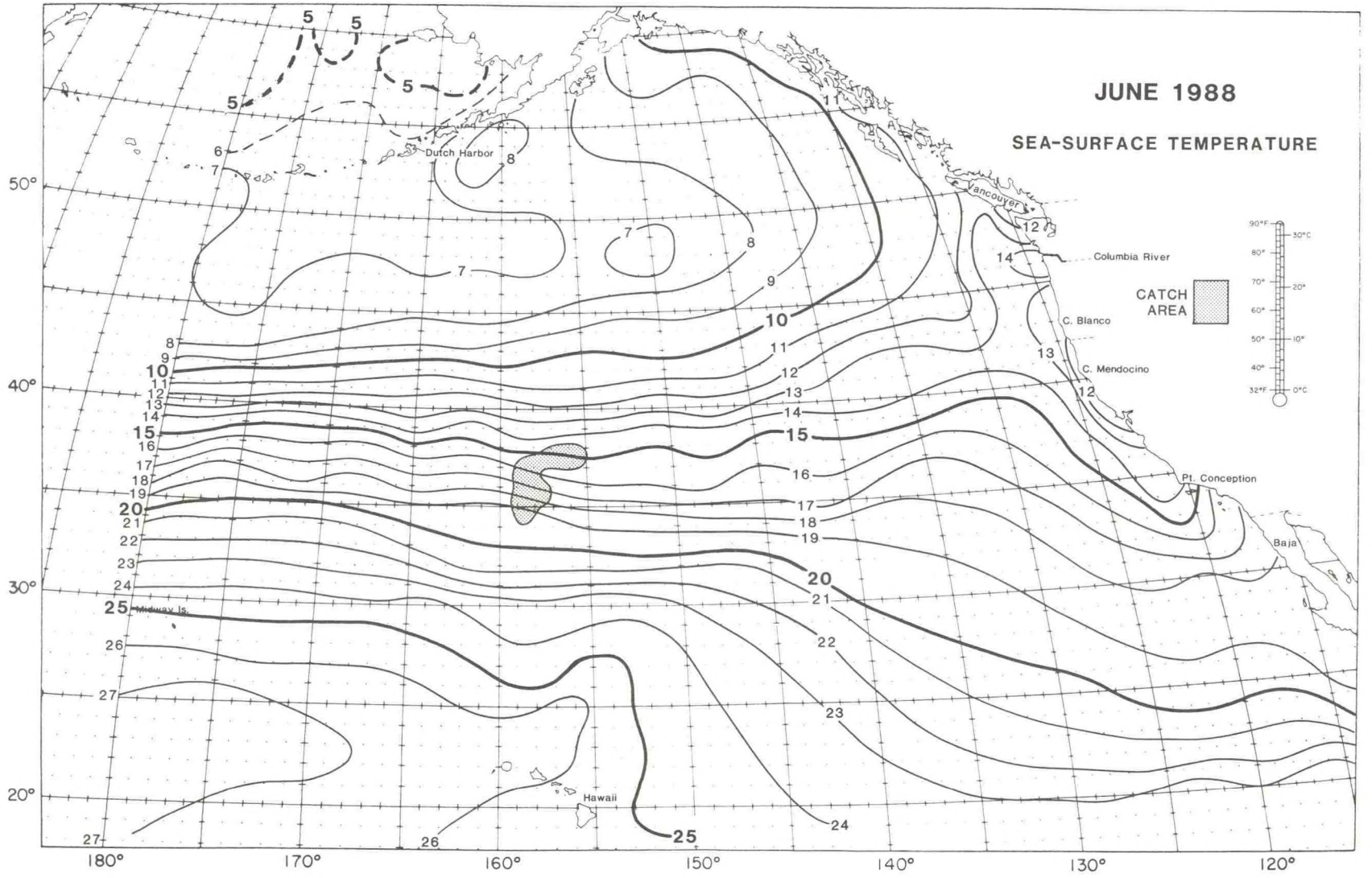

Figure 13c. Average sea-surface temperature (SST) isopleths (^{o}C) and albacore catch area for the North Pacific, June 1988.

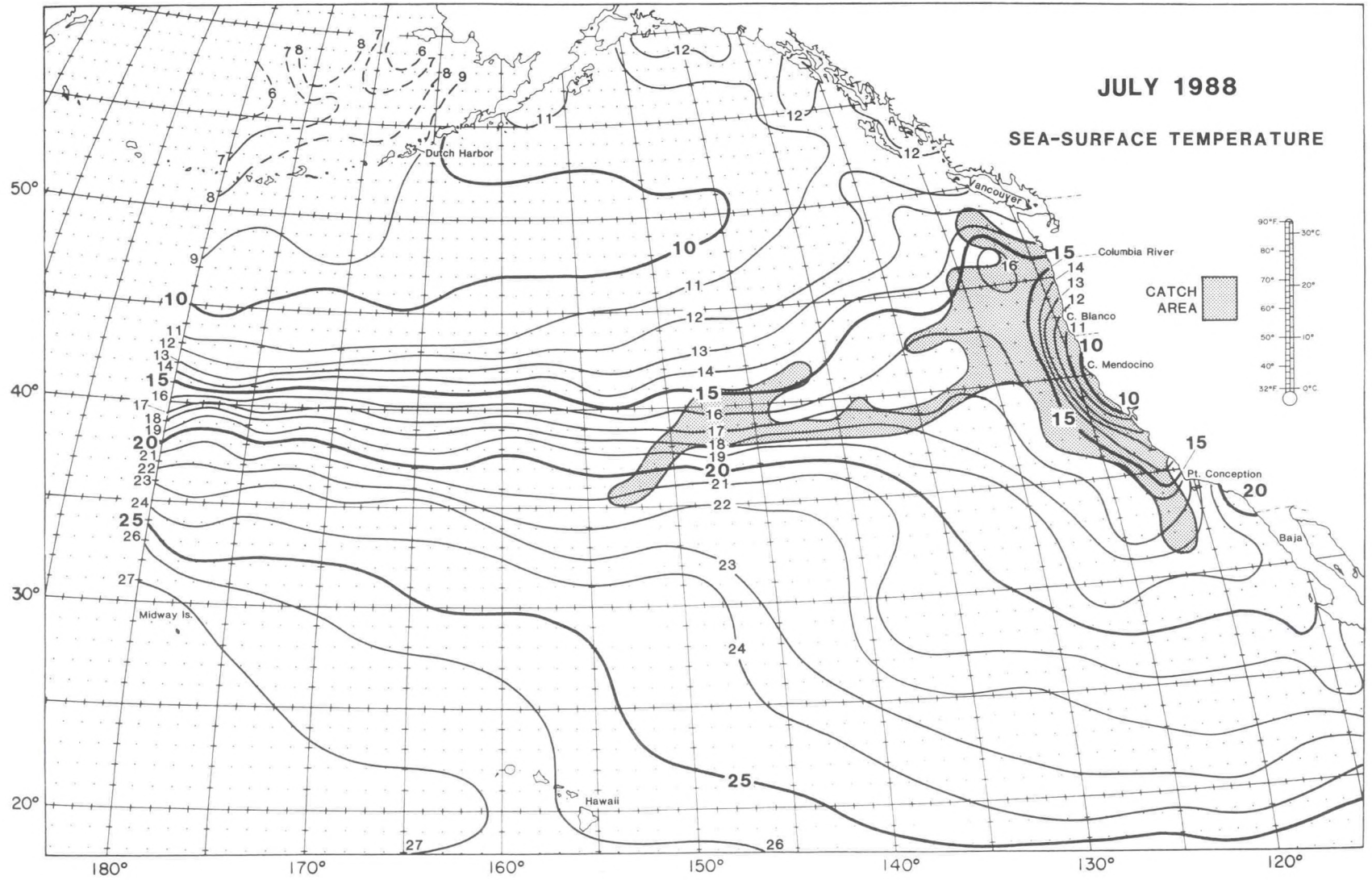

Figure 13d. Average sea-surface temperature (SST) isopleths (^{o}C) and albacore catch area for the North Pacific, July 1988.

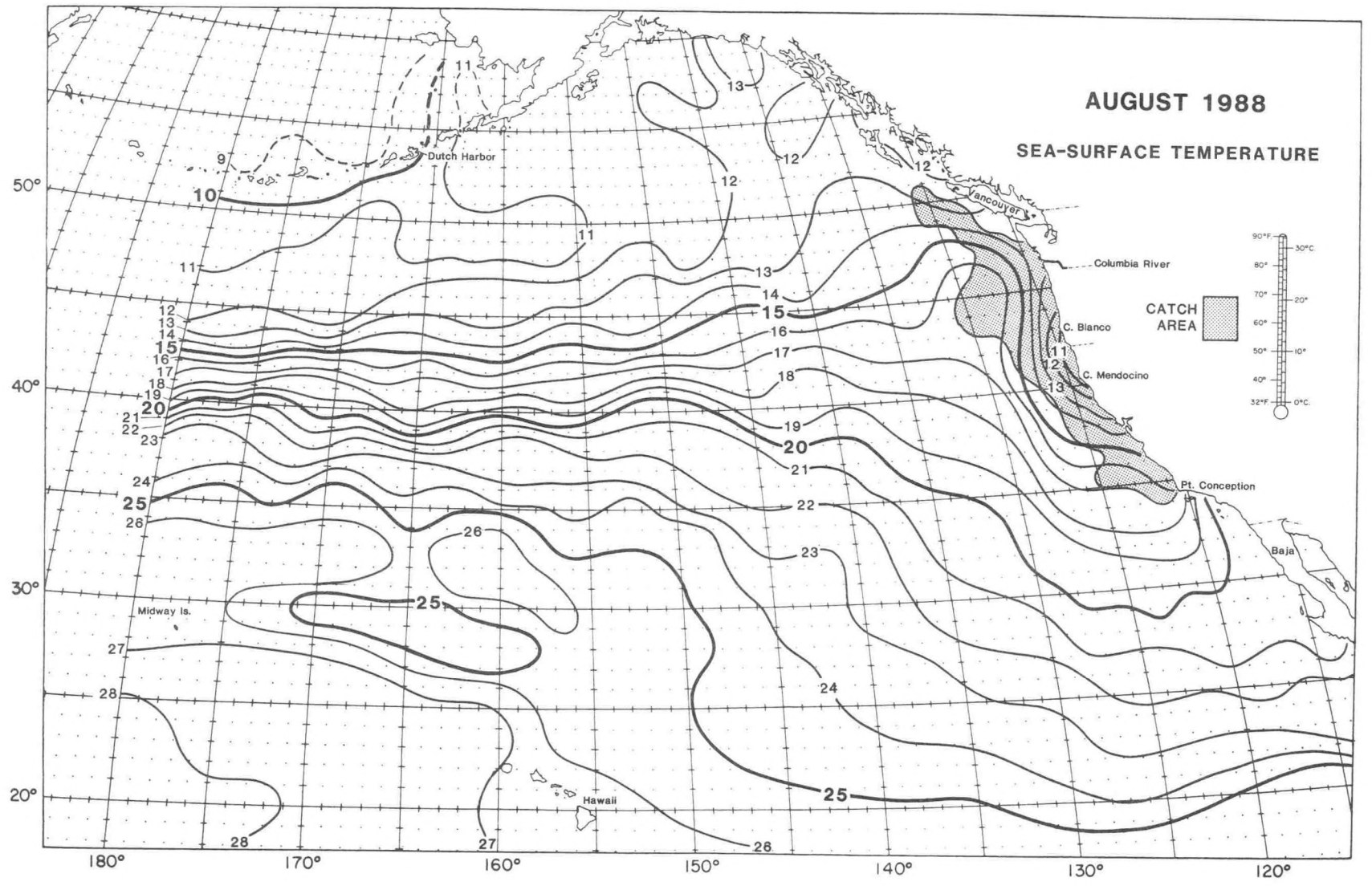

Figure 13e. Average sea-surface temperature (SST) isopleths (^{o}C) and albacore catch area for the North Pacific, August 1988.

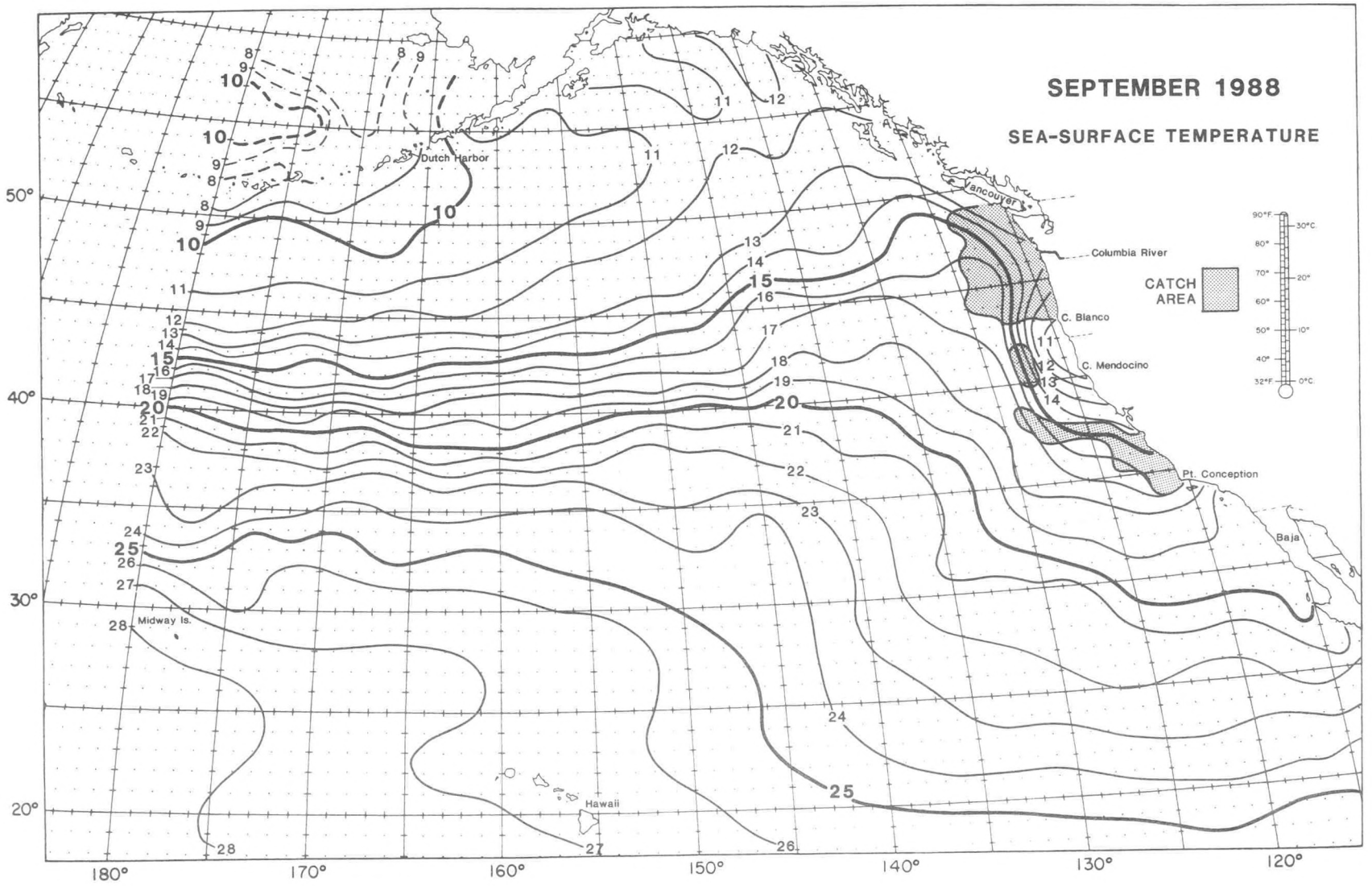

Figure 13f. Average sea-surface temperature (SST) isopleths (^{o}C) and albacore catch area for the North Pacific, September 1988.

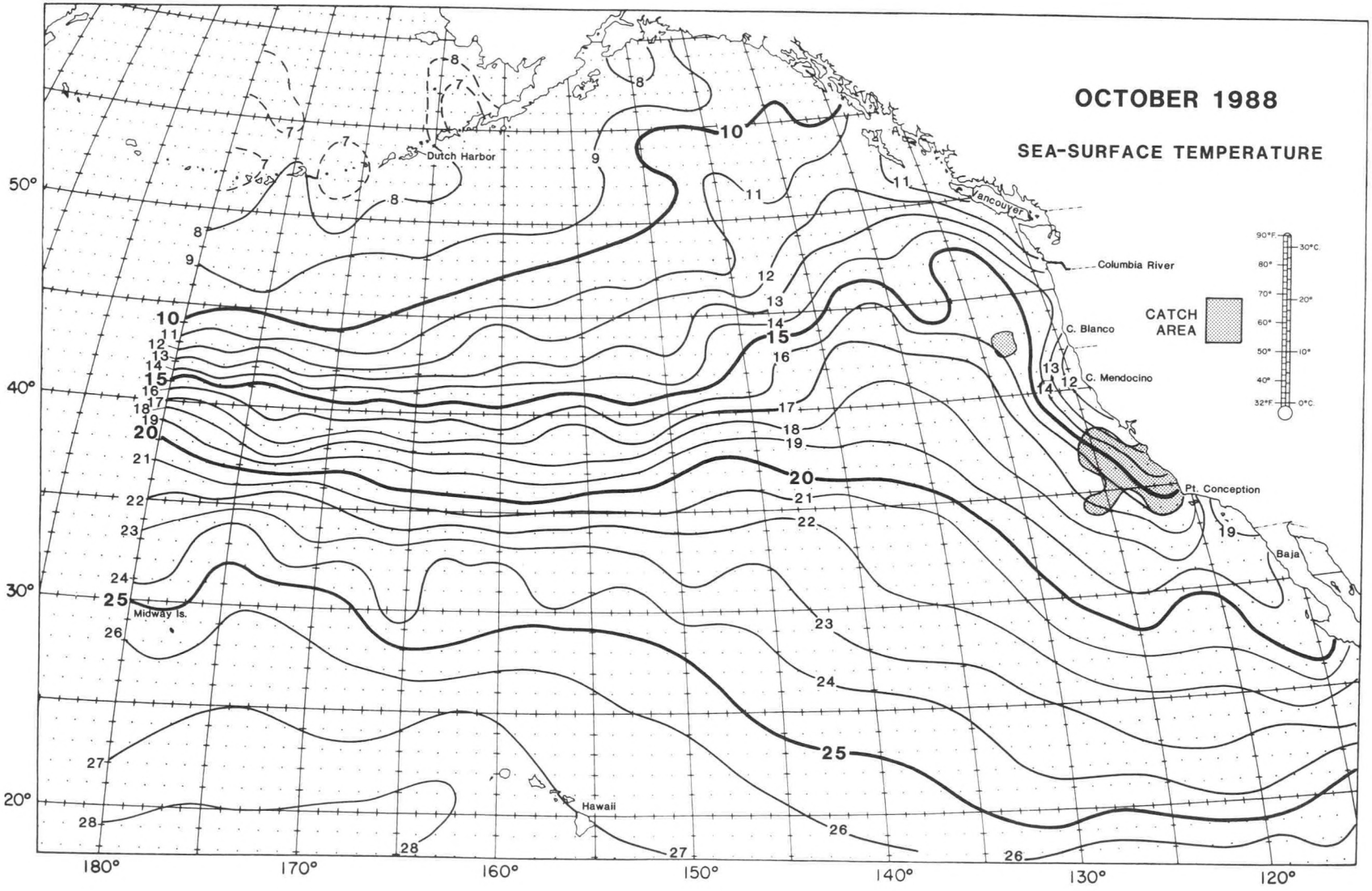

Figure 13g. Average sea-surface temperature (SST) isopleths (^{o}C) and albacore catch area for the North Pacific, October 1988.

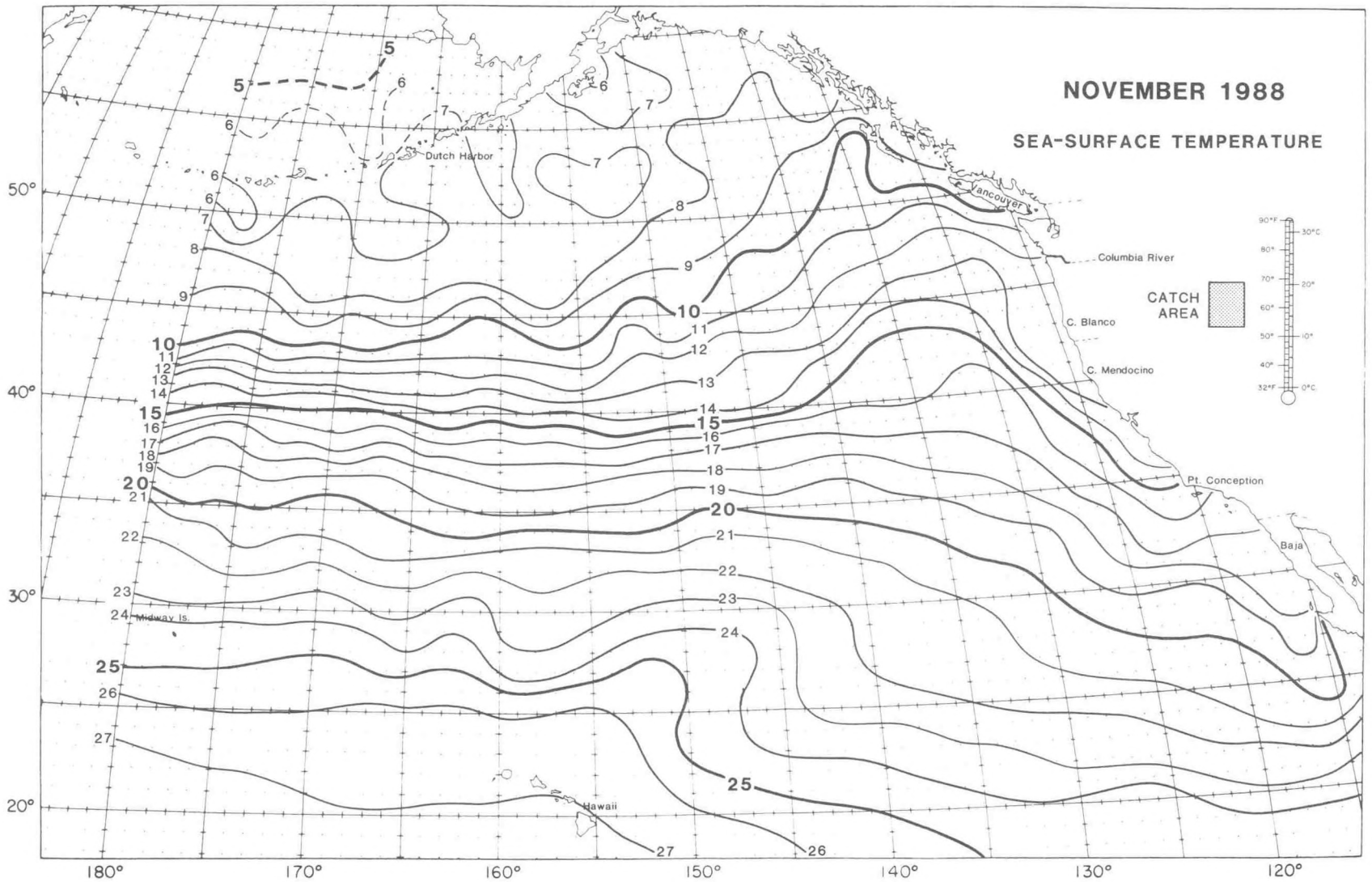

Figure 13h. Average sea-surface temperature (SST) isopleths (^{o}C) and albacore catch area for the North Pacific, November 1988.

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