SOUTHWEST FISHERIES SCIENCE CENTER

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SUMMARY OF THE 1995 U.S. NORTH AND SOUTH PACIFIC ALBACORE TROLL FISHERIES

By

John Childers and Forrest R. Miller

ADMINISTRATIVE REPORT LJ-96-07

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INTRODUCTION

Each year U.S. troll vessels that fish for albacore (*Thunnus alalunga*) in the North Pacific catch 4% to 40% of the total reported amount of albacore landed by all North Pacific fisheries (Table 1). The season begins as early as April, in areas northwest of Hawaii between latitudes 30°N and 40°N; vessels fish eastward as the season progresses. In 1995, U.S. albacore landings were approximately 20% of total landings. During the past 40 years, the distribution of the fishery has shifted farther north, larger troll vessels with increased carrying capacity and increased range have joined the fleet, and the fishing area has expanded to include areas west of the international dateline.

Exploratory troll fishing in areas east of New Zealand in 1986 resulted in the development of a U.S. South Pacific albacore troll fishery that began in 1987 (Laurs et. al., 1987). This fishery takes place during the austral summer months (December through April). The fishery annually takes less than 10% of the total amount of albacore reported caught by all South Pacific fisheries (Table 2). U.S. landings from the 1994-95 season represent approximately 6% of the total tonnage of albacore caught in the South Pacific in 1995. U.S. troll vessels that are capable of reaching the South Pacific fishing areas depart the U.S. west coast or Hawaii after the end of the North Pacific season and travel to American Samoa or French Polynesia to prepare for the South Pacific season. The fishing areas extend from the west coast of New Zealand to approximately 110°W between 25°S and 45°S. Most vessels unload in Pago Pago, American Samoa and travel to Hawaii or the U.S. west coast in March or April to prepare for the North Pacific fishing season.

The Southwest Fisheries Science Center (SWFSC) of the National Marine Fisheries Service (NMFS), in cooperation with American Fishermen's Research Foundation (AFRF), Western Fishboat Owners Association (WFOA), Pacific States Marine Fisheries Commission (PSMFC), and the state fisheries agencies of California, Oregon, and Washington, maintains a program for collecting landings, logbook and length-frequency information from the albacore troll fisheries. Catch and effort data are obtained from completed copies of the *U.S. Pacific Albacore Logbook*, that are voluntarily submitted by fishermen, or completed by port samplers who collect information from cooperating fishermen. Over five hundred logbooks were distributed to albacore fishermen prior to, and during the 1995 North Pacific and the 1994-95 South Pacific albacore seasons by NMFS and cooperating agencies. Length-frequency data were collected by

samplers at major landing ports. Landings data were collected from landings receipts. A biologist collected logbook, length-frequency, and related fishing information aboard two fishing vessels during the 1995 North Pacific season.

This report summarizes the catch, effort, landings and length-frequency information collected from the 1995 North Pacific and the 1994-95 South Pacific albacore seasons. Data from the 1994 North Pacific season, 1993-94 South Pacific season, and from foreign albacore fisheries (where available) are included for comparison.

LOGBOOK SAMPLING COVERAGE

The method used for computing logbook sampling coverage rates was modified in 1996 to allow consistent comparisons between early years' and recent years' coverage rates. Logbook sampling coverage rates are the ratio of landings from sampled trips (those trips from which logbook data were received) to the total landings. Landings from sampled trips are estimated by multiplying numbers of fish caught (recorded in logbooks) by the average weight of those fish and summing these estimates from sampled logbooks.

A total of 348 trips (of approximately 907 total trips completed during the 1995 North Pacific season) were sampled for logbook information. Sampled trips caught 4,963 metric tons (t) of albacore, resulting in a logbook sampling coverage rate of 52%, compared to 42% for 1994 (Table 3).

Logbook information for the 1994-95 South Pacific season were collected from 22 trips of the 47 trips completed. These 22 trips caught a total of 1,223 t of albacore. The logbook sampling coverage rate was 53% compared to 52% for the 1993-94 season (Table 4). More at-sea transshipments of catches in recent years have hampered efforts to collect logbook information from troll vessels fishing in the South Pacific.

LENGTH-FREQUENCY SAMPLING COVERAGE

Length-frequency sampling coverage rates are calculated as the ratio of the number of fish sampled (measured) to the total number of fish landed for the season (total number of fish landed for the season is estimated by dividing total landings by average weight). More than 24,000 albacore were measured during the 1995 North Pacific season compared to 18,533 fish measured (mostly by biologists accompanying troll vessels) in 1994. Length-frequency sampling coverage for the 1995 North Pacific season is 1.7% compared to 1.2% coverage in 1994 (Table 3). Port sampling for length-frequency data was re-instated in 1995 after being suspended during the 1993 and 1994 North Pacific seasons.

Length-frequency data for the 1994-95 South Pacific albacore fishery were collected by port samplers in Pago Pago, American Samoa. Port samplers measured 1,460 albacore during the season, resulting in a length-frequency sampling coverage rate of 0.4%. The length-frequency coverage rate for the 1993-94 season was 1.1% (Table 4). The collection of length-frequency data from South Pacific albacore catches (as with the logbook data collection) was hampered by the frequent transshipment of catches and few direct landings available to be sampled.

TOTAL CATCH AND EFFORT

Total fishing effort for the Pacific albacore troll fisheries is estimated by dividing total landings (in pounds) by catch-per-unit effort (CPUE in numbers of fish per day) then dividing by average weight (in pounds). More than 500 troll vessels fished approximately 28,560 days during the 1995 North Pacific albacore season, a 33% increase from 21,489 days fished during the 1994 season (Table 3). Total landings from the 1995 North Pacific albacore season were 9,486 t compared to 10,978 t landed in 1994. In comparison the Japanese pole-and-line fleet in the North Pacific landed approximately 23,700 t of albacore in 1995, slightly less than 26,391 t reported for 1994.

Twenty-one troll vessels participated in the 1994-95 South Pacific albacore fishery. These vessels fished more than 1,900 days compared to 916 days by 12 U.S. vessels in 1993-94 (Table 4). Total U.S. landings for 1994-95 increased 338% to 2,319 t from 530 t landed in 1993-94. The 1994-95 total is the highest since the 1990-91 season. Estimates of albacore landings by foreign fisheries operating in the South Pacific are listed in Table 2.

DISTRIBUTION OF CATCHES

The areas of highest reported catches from the 1995 North Pacific season were near 35°N, 177°W, near 41°N, 151°W, and near 44°N, 145°W (Figure 1a). The 1995 North Pacific albacore season began in April when troll vessels fished in areas north of Midway Island. Catch locations in April ranged from 169°E to 165°W, between 29°N and 33°N (Figure 1b). The fishery expanded in May as more troll vessels entered the fishery and fished in areas north of Midway. Most catches occurred between 166°E and 166°W from 30°N to 37°N (Figure 1c). Catches in June were centered between 174°E and 168°W from 34°N to 39°N (Figure 1d) although scattered catches were reported between 135°W and 144°W from 35°N to 43°N. Much of July's catches were distributed east of 160°W (Figure 1e). Catches were best between 145°W and 152°W from 41°N to 43°N. Catch locations in August extended from the West Coast to 155°W (Figure 1f). Catches greater than 24,000 fish for the month were made between 43°N and 46°N and 144°W and 150°W. Catches in September were more widely disbursed but most fishing again occurred between the West Coast and 145°W (Figure 1g). The highest reported catches in September were located near 46°N, 143°W and 49°N, 128°W (west of Vancouver Island). Poor weather predominated in October and catches were widely disbursed (Figure 1h).

The highest catches recorded by troll vessels during the 1994-95 South Pacific season were made between 160°W and 170°W and between 35°S and 40°S (Figure 2a). The 1994-95 South Pacific albacore season began in December 1994. During this month, catches were reported between 155°W and 175°W from 30°S to 40°S (Figure 2b). Catches in January occurred between 145°W and the International Dateline with the highest catches recorded between 160°W and 165°W from 35°S to 40°S (Figure 2c). Catches in February were located between 150°W and 180° from 35°S to 40°S, but the highest catches occurred between 165°W and 170°W (Figure 2d). Catches were more widely disbursed in March extending from 145°W to 180° and from 25°S to 45°S (Figure 2e). The only catches recorded in April were located between 150°W and 155°W from 35°S to 40°S (Figure 2f).

CATCH-PER-UNIT EFFORT

Catch-Per-Unit Effort (CPUE) for Pacific albacore troll fisheries is expressed as numbers of fish caught per day of fishing. CPUE is used as an indication of relative abundance of albacore available to troll gear and an indicator of fishing success. Catch (in numbers of fish) and effort (in days fished) were summarized by 10-day, 1°-square strata in which there was at least one day of fishing effort (Kleiber and Perrin, 1991). CPUE values for each month of the North Pacific season were calculated by averaging the CPUE values of all strata within a respective month. The general equation for the calculation of CPUE is:

$$Average\ CPUE = \frac{1}{n} \sum \left(\frac{\sum C_i}{\sum E_i}\right)$$

Where C_i is the total sampled catch in the i^{th} strata, E_i is the total sampled effort in the i^{th} strata, and n is the total number of strata.

CPUE averaged for the 1995 North Pacific season is 49 fish/day. This is a decrease from 70 fish/day computed for the 1994 season[2] (Table 3). The average CPUE for the 1994-95 South Pacific season increased to 170 fish per day from 98 fish per day in 1993-94 (Table 4).

DISTRIBUTION OF CPUE

Average CPUE's for the 1995 North Pacific season were highest between 141°W and 153°W from 41°N to 48°N and in a smaller area between 156°W and 162°W from 40°N to 43°N (Figure 3a). CPUE's for North Pacific troll vessels in April were less than 150 fish per day in the areas north of Midway Island (Figure 3b). CPUE's remained below 150 fish/day in May, except at 34°N, 177°E where they ranged from 151 to 300 fish/day (Figure 3c). CPUE's between 151 fish/day and 300 fish/day were located at 33°N , 180° and near 174°E between 35°N and 39°N in June (Figure 3d). CPUE's again increased in July as vessels fished farther east. The highest CPUE's were distributed between 140°W and 160°W from 40°N to 51°N (Figure 3e). High CPUE's in August were concentrated between 143°W and 153°W from 40°N to 48°N (Figure 3f). CPUE's decreased in September, only exceeding 150 fish per day between 142°W and 151°W from 44°N to 48°N (Figure 3g). CPUE's averaged less than 150 fish per day in all the sampled areas in October (Figure 3h).

The highest average CPUE's for the 1994-95 South Pacific season (greater than 174 fish/day) were distributed between 160°W and 170°W from 35°S to 40°S (Figure 4a). CPUE's for troll vessels that fished in the South Pacific in December 1994 ranged from 90 to 177 fish/day between 160°W and 175°W from 35°S to 40°S (Figure 4b). CPUE's greater than 267 fish/day were distributed between 160°W and 165°W from 35°S to 40°S in January 1995 (Figure 4c) but averaged less than 90 fish/day in most of the sampled areas. CPUE's increased in February, exceeding 267 fish/day between 165°W and 170°W and between 150°W and 155°W from 35°S

[2] CPUE values for past seasons may differ from previously published values due to updates in catch/effort data and refined computational methods.

to 40°S (Figure 4d). The highest CPUE's in March averaged between 90 and 177 fish/day and were distributed between 150°W and 170°W from 25°S to 45°S (Figure 4e). Average CPUE's in April were between 1 and 89 fish/day and were distributed between 150°W and 155°W from 35°S to 40°S (Figure 4f).

LENGTH-FREQUENCIES

Length-frequency data from the 1995 North Pacific season were collected by port samplers in the ports of Westport, Ilwaco, Astoria, Newport, Crescent City, Eureka, Terminal Island, and Pago Pago, and by a biologist aboard two troll vessels. Nearly 16,000 albacore were measured by port samplers and 8,460 by a NMFS biologist at sea during the 1995 North Pacific season. The average fork length of albacore caught during the 1995 North Pacific season was 69 cm (15 lbs or 6.7 kg) compared to an average fork length of 71 cm (16 lbs or 7.3 kg) for the 1994 season (length-weight conversions from Bartoo and Foreman, 1993). Fork lengths of albacore sampled from North Pacific catches range from 48 cm to 102 cm. Three modes are evident in the length-frequency histogram of measured fish (Figure 5): a smaller mode is centered at 58 cm fork length, the most prominent mode is centered at 64 cm and a third, distinct mode is centered at 79 cm. These modes correspond to approximately 2, 3, and 4 year-old fish, respectively (Length-age conversions from Bartoo and Foreman, 1993).

Port samplers in American Samoa measured 1,460 albacore from troll vessel landings during the 1994-95 South Pacific season. The low number of vessels participating in the 1994-95 fishery and the large number of at-sea transshipments limited the amount of fish available to be measured. The average fork length of sampled albacore from 1994-95 landings is 70 cm (15.5 lbs or 7.0 kg) compared to an average fork length of 66 cm (13 lbs or 5.9 kg) for albacore measured during 1993-94 (length-weight conversions from Bartoo and Foreman, 1993). Fork lengths of albacore that were measured in 1994-95 ranged from 47 cm to 103 cm. Several modes appear in the length-frequency histogram of sampled fish, but two are distinct: one centered at 62 cm and another centered at 73 cm (Figure 6). These modes correspond, approximately, to 3 year-old fish and 5 year-old fish, respectively (length-age conversion from Labelle, et. al. 1993).

DISTRIBUTION OF LENGTH-FREQUENCIES

Length-frequencies from the 1995 North Pacific season and 1994-95 South Pacific season were summarized by 5°x10° quadrangles. Three size modes are equally represented in fish caught along the U.S. West Coast during the 1995 North Pacific season (Figure 7). Larger fish are more abundant in samples from areas off Vancouver Island. Two size modes centered at 64 cm and 77 cm are evident in the histograms of fish caught in the offshore area between 140°W and 160°W. Smaller fish are most abundant in samples from 45°N, 140°W, 40°N, 150°W, and 35°N, 170°E while larger fish are most abundant in samples from 45°N, 150°W.

Fish measured during the 1994-95 South Pacific season were caught between 140°W and 170°W from 30°S to 35°S (Figure 8). Two modes, centered near 63 cm and 73 cm, are equally represented in the three areas that were summarized.

SEA SURFACE TEMPERATURES AND SAMPLED CATCHES

North Pacific sea surface temperatures (SST's) recorded from commercial transport ships, fishing vessels and research vessels, were compiled into monthly means and computer-analyzed. Contours of SST's were drawn with 1° latitude and longitude resolution. Analysis of the mean SST's show the distribution of isotherms and the locations of ocean fronts (Figures 9a through 9g). Catch areas recorded by the North Pacific albacore fleet each month are shaded on the corresponding SST charts to show the relationship between areas of fishing, ocean fronts and SST isotherms. SST information from the 1994-95 South Pacific fishery is not available.

In April 1995 the North Pacific albacore season began north of Midway Island (Figure 9a) between 170°E and 165°W where near normal SST's were 15°C to 18°C (59°F to 64°F). During May fishing activity expanded markedly to a large region from 30°N to 37°N between 150°E and 140°W (Figure 9b). In this elongated, mid-Pacific region SST's were, on average, 15°C to 18°C (59°F to 64°F). These temperatures were 1°C to 2°C (1.8°F to 3.6°F) below normal. In June fishing activity was concentrated from 35°N to 40°N between 175°E and 160°W with some fishing around 140°W (Figure 9c). Here fishing was most active, as in May, along the southern edge of the subarctic front between the 15°C and 18°C (59°F and 64°F) isotherms which again were 1°C to 2°C (1.8°F to 3.6°F) below normal and were displaced further south than usual. During July the albacore fishing areas shifted northward to regions between 37°N and 45°N, from the international dateline to the West Coast, between California and Washington (Figure 9d). West of 140°W, fishing continued to be concentrated along the southern edge of the subarctic ocean front in 14°C to 17°C (57°F to 63°F) waters that were 2°C to 3°C (3.6°F to 5.4°F) below normal in July. During this period, some of the fleet began fishing in the areas west of Washington and Oregon in 15°C to 17°C (59°F to 63°F) waters that were 1°C to 2°C (1.8°F to 3.6°F) above normal. In August 1995 the albacore fleet was distributed east of 155°W from 42°N to 47°N and along the West Coast from Oregon to Vancouver Island (Figure 9e). At this time coastal fishing occurred in near-normal SST's of 13°C to 15°C (55°F to 59°F) and was distributed along strong frontal boundaries that extended northward from the inshore areas of central California to the waters off Vancouver Island. The tight packing of isotherms that ran North-South was associated with coastal upwelling of colder, nutrient-rich subsurface water. The most concentrated fishing continued about 1,500 miles west of the Pacific Coast between 145°W and 155°W where SST's remained 1°C above normal. During September most of the fleet were fishing in the coastal area from central California to Vancouver Island where SST's ranged from 15°C to 18°C (59°F to 64°F) about 1°C above normal (Figure 9f). Some fishing activity continued in the offshore area north of 43°N between 140°W and 130°W in 15°C to 18°C (59°F and 64°F) water that was 1°C below normal. By October the ocean frontal boundaries had weakened off the West Coast and the fleet was scattered offshore from Oregon to Vancouver Island in waters with slightly above-normal SST's of 15°C to 18°C (59°F and 64°F) (Figure 9g).

SUMMARY

The 1995 North Pacific U.S. troll fishery caught approximately 20% of the albacore landings reported by all North Pacific albacore fisheries. Logbook sampling coverage and length-frequency sampling coverage for the 1995 North Pacific albacore fishery increased to 52% and 1.7%, respectively. More than 500 U.S. troll vessels expended 28,560 days of effort and landed a total of 9,486 t during the 1995 North Pacific season. The 1995 North Pacific albacore season

began in April north of Midway Island and ended in October off the West Coast. Troll vessel catch locations ranged from the West Coast to areas west of the International Dateline. The highest sampled catches during the season were centered near 44°N, 145°W, near 41°N, 151°W and near 35°N, 177°W. The average CPUE for the 1995 season decreased to 49 fish/day from 70 fish/day during the 1994 season. The highest CPUE values were distributed between 140°W and 160°W and between 41°N and 48°W. More than 24,000 albacore were measured during the season. The average fork length of fish caught by troll vessels was 69 cm (15 lbs or 6.8 kg) and they ranged from 48 cm to 102 cm. Well-defined modes were centered at 64 cm and 79 cm with a weaker mode at 58 cm. Areas of concentrated fishing were along the southern edge of the subarctic ocean front where isotherms were between 15°C and 18°C (59°F and 64°F).

The 1994-95 South Pacific U.S. troll fishery caught approximately 6% of the albacore landed by all South Pacific albacore fisheries. Logbook sampling coverage and length-frequency sampling coverage were 53% and 0.4%, respectively. The fishery was composed of 21 troll vessels that expended 1,941 days of effort and landed 2,319 t of albacore. The season began in December 1994 and ended in April 1995. Catches were distributed between 145°W and 180° and between 25°S and 45°S with highest catches reported between 160°W and 170°W from 35°S to 40°S. The average CPUE for the 1994-95 season increased to 170 fish/day from 98 fish/day in 1993-94. The highest CPUE values were located between 160°W and 170°W from 35°S to 40°S. A total of 1,460 albacore were measured during the season. Fork lengths of measured fish range from 47 cm to 103 cm fork length, and average 70 cm (15.5 lbs or 7.0 kg). Two length-frequency modes, centered at 62 cm and 73 cm, were prominent in the samples.

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Table 1. Landings of North Pacific albacore in metric tons by fisheries, 1952-1995. Provisional estimates are given in parentheses. -- indicates data not available. (0) indicates less than 1 metric ton.

	JAPAN[1]					TAIWAN[4]		KOREA[2]		UNITED STATES[3]						CANADA	MEXICO	
YEAR	POLE & LINE	LONG LINE	GILL NET	PURSE SEINE	OTHER GEAR	LONG LINE	GILL NET	LONG LINE	GILL NET	BAIT BOAT	TROLL	SPORT	GILL NET	PURSE SEINE	OTHER GEAR	TROLL	OTHER GEAR	GRAND TOTAL
1952	41,786	26,687		154	237						23,843	1,373				71		94,151
1953	32,921	27,777		38	132						15,740	171				5		76,784
1954	28,069	20,958		23	38						12,246	147						61,481
1955	24,236	16,277		8	136						13,264	577						54,498
1956	42,810	14,341			57						18,751	482				17		76,458
1957	49,500	21,053		83	151						21,165	304				8		92,264
1958	22,175	18,432		8	124						14,855	48				74		55,716
1959	14,252	15,802			67						20,990	0			5	212		51,328
1960	25,156	17,369			76						20,100	557			4	5		63,267
1961	18,636	17,437		7	268					2,837	12,055	1,355			6	4		52,605
1962	8,729	15,764		53	191					1,085	19,752	1,681			8	1		47,264
1963	26,420	13,464		59	218					2,432	25,140	1,161			7	5		68,906
1964	23,858	15,458		128	319	26				3,411	18,388	824			4	3		62,419
1965	41,491	13,701		11	121	261				417	16,542	731			3	15		73,293
1966	22,830	25,050		111	585	271				1,600	15,333	588			9	44		66,421
1967	30,481	28,869		89	520	635				4,113	17,814	707			12	161		83,401
1968	16,597	23,961		267	1,109	698				4,906	20,434	951			10	1,028		69,961
1969	32,107	18,006		521	1,480	634				2,996	18,827	358			12	1,365		76,306
1970	24,376	15,372		317	794	1,516				4,416	21,032	822			9	354		69,008
1971	53,198	11,035		902	367	1,759				2,071	20,526	1,175			11	1,587		92,631
1972	60,762	12,649	1	277	646	3,091				3,750	23,600	637			8	3,558	100	109,079
1973	69,811	16,059	39	1,353	533	128				2,236	15,653	84			14	1,270	0	107,180
1974	73,576	13,053	224	161	959	570				4,777	20,178	94			9	1,207	1	114,809
1975	52,157	10,060	166	159	254	1,494		2,463		3,243	18,932	640			43	101	1	89,713
1976	85,336	15,896	1,070	1,109	285	1,251		859		2,700	15,905	713			27	252	36	125,439
1977	31,934	15,737	688	669	379	873		792		1,497	9,969	537			36	53	0	63,164
1978	59,877	13,061	4,029	1,115	2,097	284		228		950	16,613	810			69	23	1	99,157
1979	44,662	14,249	2,856	125	1,158	187		259	(0)	303	6,781	74			31	521	1	(71,207)
1980	46,743	14,743	2,986	329	1,209	318	--	597	(6)	382	7,556	168			24	212	31	(75,304)
1981	27,426	18,020	10,348	252	904	339	--	459	(16)	748	12,637	195			60	200	8	(71,612)
1982	29,615	16,762	12,511	561	732	559	--	387	(113)	425	6,609	257			84	104	7	(68,726)
1983	21,098	15,103	6,852	350	125	520	--	454	(233)	607	9,359	87			213	225	33	(55,259)
1984	26,015	15,111	8,988	3,380	518	471	--	136	(516)	1,030	9,304	1,427		3,728	138	50	113	(70,925)
1985	20,714	14,320	11,204	1,533	407	109	--	291	(576)	1,498	6,415	1,176	2		83	56	49	(58,433)
1986	16,096	12,945	7,813	1,542	650	--	--	241	(726)	432	4,708	196	3		106	30	3	(45,491)
1987	19,091	14,642	6,698	1,205	189	--	2,514	182	(817)	158	2,766	74	5		136	104	7	(48,588)
1988	6,216	13,904	9,074	1,208	177	38	7,389	109	(1,016)	598	4,212	64	15		318	155	15	(44,508)
1989	8,629	13,194	7,437	2,521	466	544	8,350	81	(1,023)	54	1,860	160	4		272	200	2	(44,797)

Table 1. (continued)

YEAR	JAPAN[1]					TAIWAN[4]		KOREA[2]		UNITED STATES[3]						CANADA	MEXICO	GRAND TOTAL
	POLE & LINE	LONG LINE	GILL NET	PURSE SEINE	OTHER GEAR	LONG LINE	GILL NET	LONG LINE	GILL NET	BAIT BOAT	TROLL	SPORT	GILL NET	PURSE SEINE	OTHER GEAR	TROLL	OTHER GEAR	
1990	8,532	15,928	6,064	1,995	253	287	16,701	20	(1,016)	115	2,603	24	29	71	181	302	2	(54,123)
1991	7,103	10,379	3,401	2,652	399	353	3,398	3	(852)	0	1,845	6	17	0	384	139	--	(30,931)
1992	13,888	19,149	2,721	4,104	1,534	300	7,866	43	(271)	0	4,572	2	0	0	408	363	--	(55,221)
1993	23,700	19,730	287	2,889	896	300	0	43	0	--	6,254	25	0	--	331	329	--	(54,784)
1994	26,391	10,200	263	2,026	834	300	0	43	0	0	10,978	106	38	--	712	68	--	(51,959)
1995	(23,700)	(10,200)	(263)	(2,026)	(834)	(300)	(0)	(43)	(0)	(0)	(9,486)	(102)	(40)	--	(1,096)	(68)	--	(48,465)

1 Japanese pole & line landings include fish caught by research vessels. Longline landings for 1952-1960 exclude minor amounts taken by vessels under 20 tons; landings are estimated by multiplying annual number of fish caught by average weight statistics. Pole & line, longline, driftnet, purse seine and other gear data for 1952-1991 from Y. Uozumi, et.al. Pole & line and purse seine data for 1992, 1993 from Y. Warashina, et.al.

2 Korean longline landings calculated from Y. Gong using the ratio of landings, in numbers, from the north Pacific. Gillnet landings for 1979-1990 are calculated by multiplying the 1991 CPUE (# fish per pok) by effort (# poks) then multiplying by average weight (1991, 1992: 4.13 kg/fish).

3 U.S. troll boat landings for 1952-1960 include fish caught by bait boats. U.S. troll boat landings for 1984-1988 include gillnet landings. Other gear include landings from Hawaii (mostly longline). Other gear landings for 1979-1986 are raised from data with very low coverage rates.

4 Data provided by H. Liu.

Table 2. Landings of South Pacific albacore in metric tons by fisheries, 1952-1995. Provisional estimates are given in parentheses. -- indicates data not available. (0) indicates less than 1 metric ton.

YEAR	JAPAN			TAIWAN		KOREA		UNITED STATES	NEW ZEALAND		FRENCH POLYNESIA		FIJI	AUSTRALIA		NEW CALEDONIA	TONGA	OTHER		GRAND TOTAL
	POLE& LINE	LONG[1] LINE	GILL NET	LONG LINE	GILL NET	LONG LINE	GILL NET	TROLL[2]	TROLL[3]	LONG[4] LINE	TROLL	LONG LINE	LONG LINE	LONG[5] LINE	TROLL	LONG LINE	LONG LINE	TROLL[6]	LONG[7] LINE	
1952		154																		154
1953		803																		803
1954		9,578																		9,578
1955		8,625																		8,625
1956		7,281																		7,281
1957		8,757																		8,757
1958		18,490				146														18,636
1959		17,385				456														17,841
1960	45	21,638				610														22,293
1961		23,412				330														23,742
1962		34,620				599														35,219
1963	16	29,120				1,367														30,503
1964		19,390				2,911														22,301
1965		17,793				6,405														24,198
1966		21,627				10,817														32,444
1967		15,104		11,723		13,717			5											40,549
1968		6,659		12,375		10,138			14											29,186
1969		4,894		9,557		9,963			--											24,414
1970		5,297		14,682		11,599			50			(0)			100					31,728
1971		3,472		15,880		14,482			--			(0)			100					33,934
1972		3,027		16,780		14,439			268			(0)			100					34,614
1973		2,550		17,742		17,452			484			(0)			100				4	38,332
1974		1,868		17,246		12,194			898			(0)			100					32,306
1975		1,333		16,939		9,015			646			(0)			100					28,033
1976		2,054		13,653		12,212			25			(0)			100				6	28,050
1977		2,328		21,452		13,176			621			(0)			100				9	37,686
1978		2,845		20,935		10,989			1,686			(0)			100				9	36,564
1979		2,274		14,952		8,682			814			(0)			100				21	26,843
1980	19	2,216		25,579		10,852			1,468			(0)			100				25	40,259
1981	8	4,203		14,367		14,793			2,085			(0)			5				2	35,463
1982	1	4,899		12,644		12,586			2,434			(0)			6		106		8	32,684
1983	2	5,723	32	12,106		6,669			744			(0)			7	12	143		19	25,457
1984		3,804	1,581	11,155		5,730			2,773			(0)			8	112	135		19	25,317
1985		3,868	1,928	9,601		14,267			3,253			(0)			9	131	174		12	33,243
1986		4,426	1,936	11,913		18,799		89	1,911			(0)		40	10	179	206			39,509
1987		4,490	919	15,009		8,646		751	1,227			(0)		131	11	563	252			31,999
1988		7,469	4,271	17,120	1,000	5,600		3,253	330			(0)		107	12	584	242	140		40,128
1989		5,839	13,263	10,867	8,520	3,997	172	3,068	5,161	19	90	100	5	93	13	566	195	162		52,130

Table 2. (continued)

YEAR	JAPAN			TAIWAN		KOREA		UNITED STATES	NEW ZEALAND		FRENCH POLYNESIA		FIJI	AUSTRALIA		NEW CALEDONIA	TONGA	OTHER		GRAND TOTAL
	POLE& LINE	LONG[1] LINE	GILL NET	LONG LINE	GILL NET	LONG LINE	GILL NET	TROLL[2]	TROLL[3]	LONG[4] LINE	TROLL	LONG LINE	LONG LINE	LONG[5] LINE	TROLL	LONG LINE	LONG LINE	TROLL[6]	LONG[7] LINE	
1990		6,574	5,667	9,689	1,859	2,586		3,898	2,525	249	327	156	263	125	15	1,053	152	--		35,138
1991		4,468		11,235	821	1,225		5,540	2,464	325	326	146	416	170	20	909	174	103		28,342
1992	49	3,914		18,989		1,556		3,016	3,856	706	72	174	310	207	70	520	199	0		33,638
1993	5	8,384		12,986		2,600		1,028	3,856	539	45	714	463	185	55	755	232	0	1	31,848
1994		8,147		13,802		1,283		530	4,400	245	0	913	562	355	70	840	599	--		31,793
1995	--	(8,147)		(15,201)		(1,283)		2,319	(6,000)	(245)	184	(121)	(562)	(355)	(25)	(840)	(599)	(0)		(35,881)

All data are from SPAR 6, March 1996, except as noted.

1 Japanese Longline landings include landings from Australian-Japanese joint venture landings.
2 United States landings are listed for seasons which may include landings from December of previous year.
3 New Zealand Troll data for 1967 to 1973 from SPAR4, working paper 11, November 1991.
4 New Zealand Longline landings for 1989 from SPAR4 Report, November 1991.
5 Australian Longline landings include only domestic landings, not joint venture landings.
6 Other Troll includes Canada and Fiji.
7 Other Longline includes Solomon Islands and Peoples Republic of China.

Table 3. Fishery statistics for the 1994 and 1995 U.S.* North Pacific albacore troll fisheries.

FISHING SEASON	NO. OF VESSEL TRIPS		METRIC TONS LANDED		NO. FISH LANDED		AVG FORK LENGTH (cm)	TOTAL DAYS OF EFFORT	CPUE (fish/day)	SAMPLING COVERAGE RATE	
	TOTAL	SAMPLED	TOTAL	SAMPLED	TOTAL	SAMPLED (MEASURED)				LOGBOOK	LENGTH-FREQUENCY
1994	2,348	409	10,978	4,603	1,493,916	18,533	71	21,489	70	42%	1.2%
1995	907	348	9,486	4,963	1,413,039	24,350	69	28,560	49	52%	1.7%

* Includes some foreign-registered vessels (Tonga, Canada, and Cook Islands) and vessels of unknown registry for logbook sampling coverage rate.

Table 4. Fishery statistics for the 1993-94 and 1994-95 U.S.* South Pacific albacore troll fisheries.

FISHING SEASON	NO. OF VESSEL TRIPS		METRIC TONS LANDED		NO. FISH LANDED		AVG FORK LENGTH (cm)	TOTAL DAYS OF EFFORT	CPUE (fish/day)	SAMPLING COVERAGE RATE	
	TOTAL	SAMPLED	TOTAL	SAMPLED	TOTAL	SAMPLED (MEASURED)				LOGBOOK	LENGTH-FREQUENCY
1993-94	17	7	530	278	89,880	996	66	916	98	52%	1.1%
1994-95	47	22	2,319	1,223	329,785	1,460	70	1,941	170	53%	0.4%

* Includes some vessels of unknown registry for logbook sampling coverage rate.

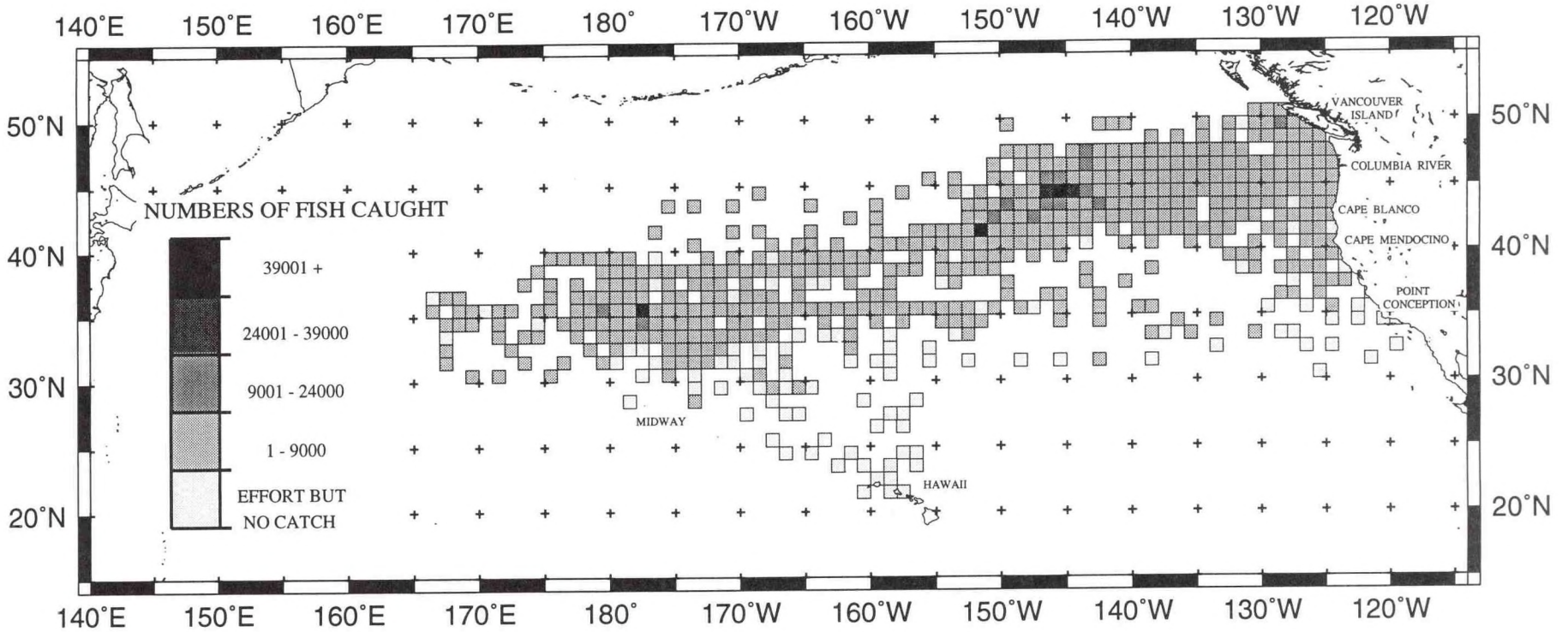

Figure 1a. Catches of albacore in the North Pacific for the 1995 season.

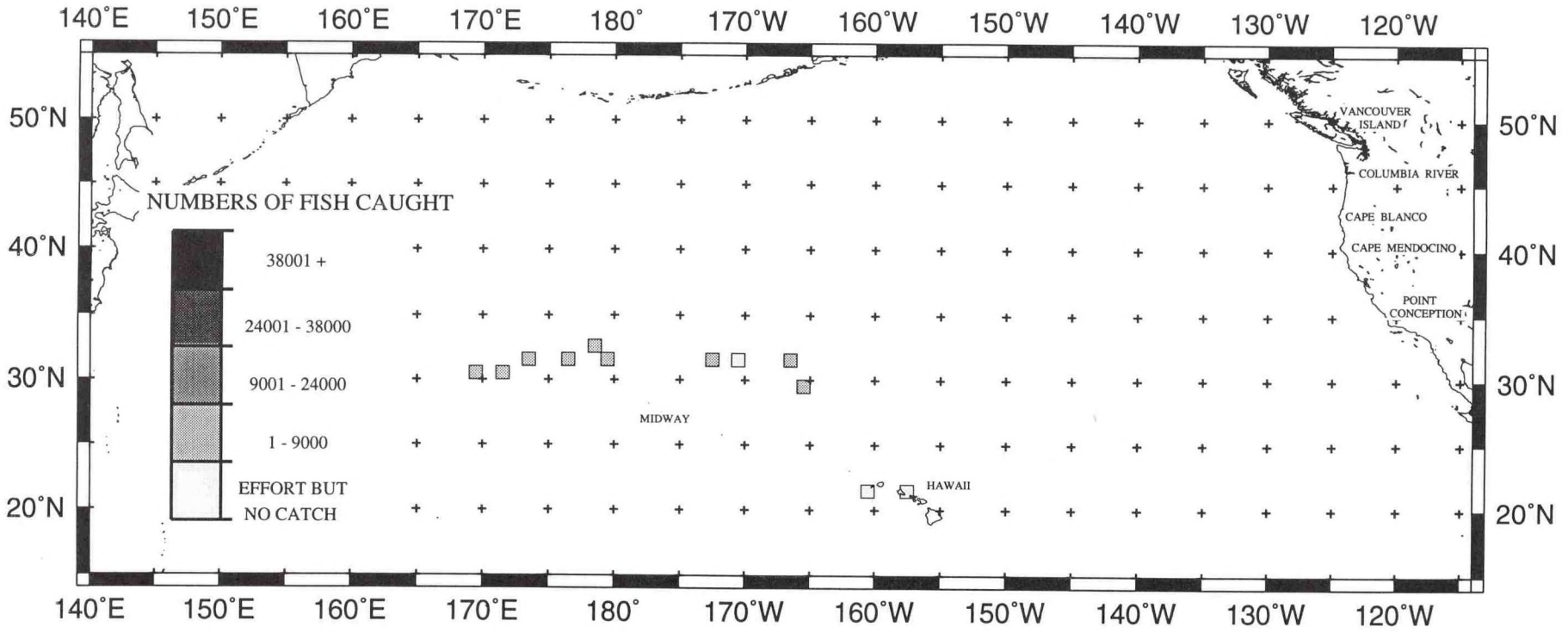

Figure 1b. Catches of albacore in the North Pacific for April 1995.

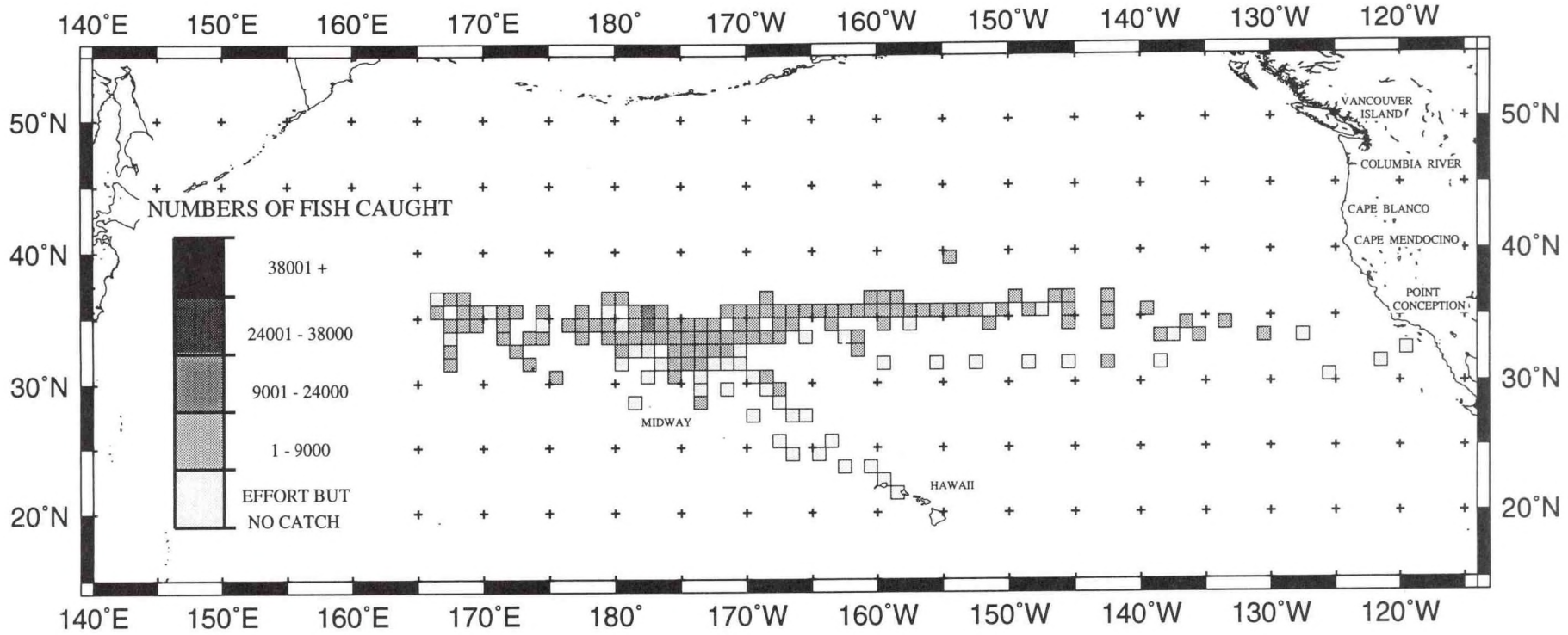

Figure 1c. Catches of albacore in the North Pacific for May 1995.

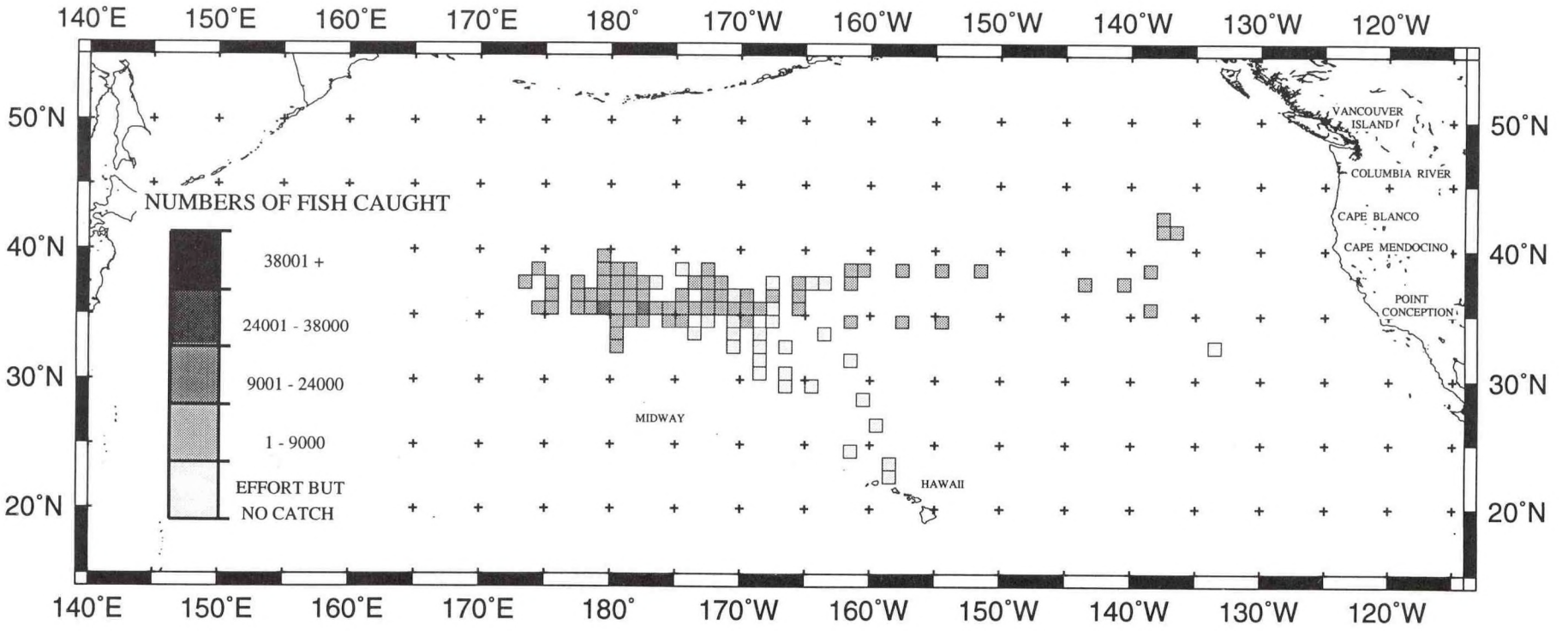

Figure 1d. Catches of albacore in the North Pacific for June 1995.

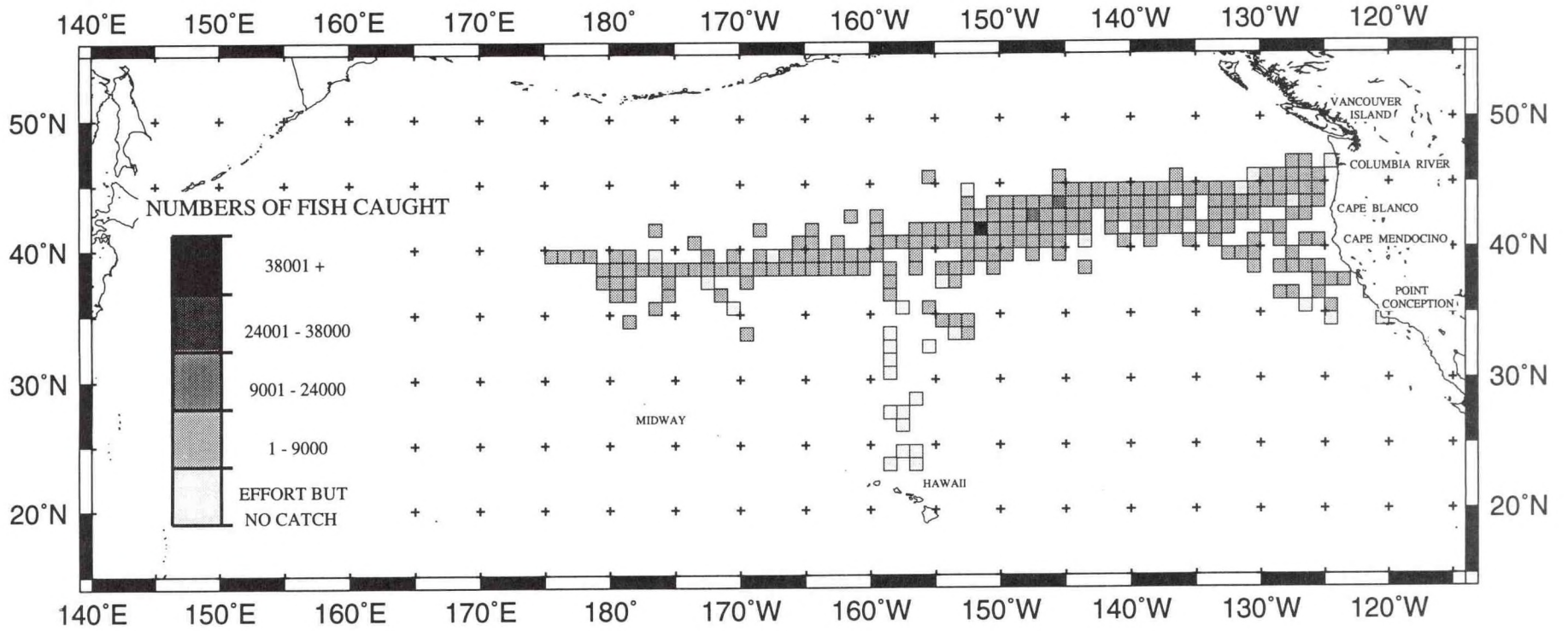

Figure 1e. Catches of albacore in the North Pacific for July 1995.

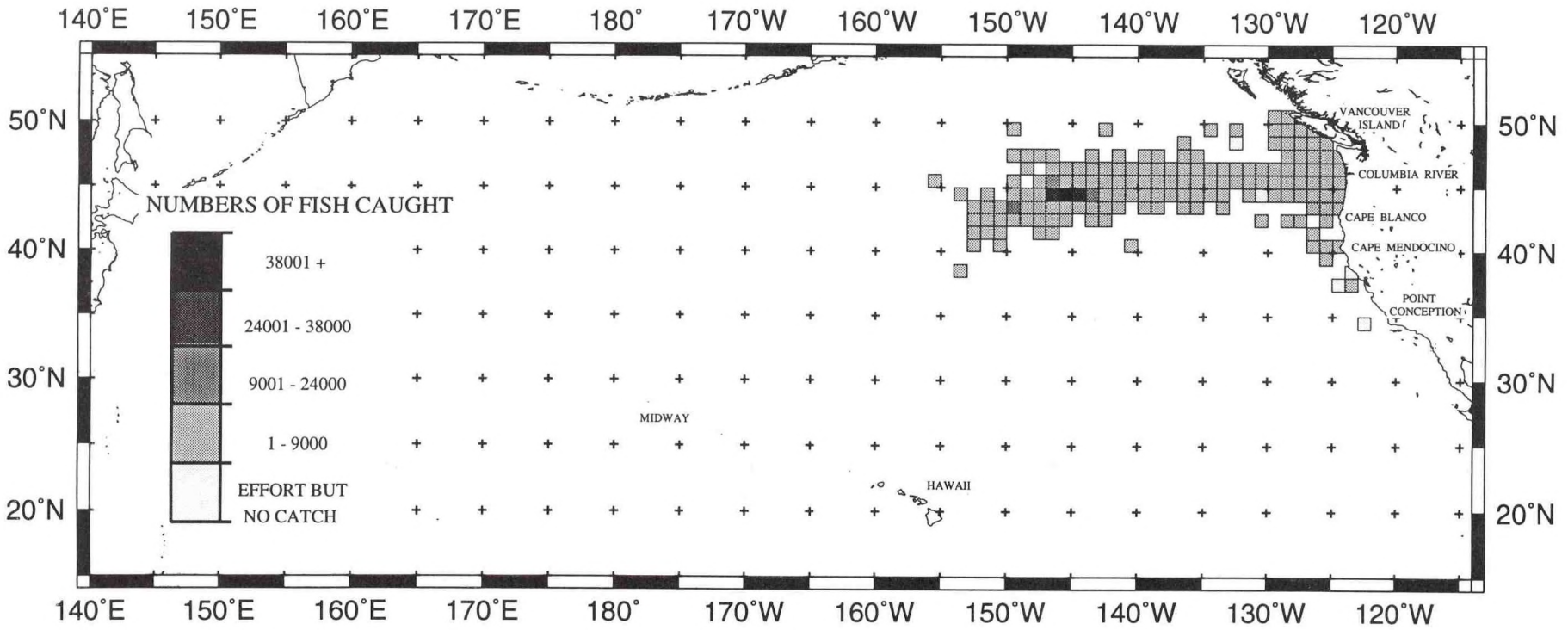

Figure 1f. Catches of albacore in the North Pacific for August 1995.

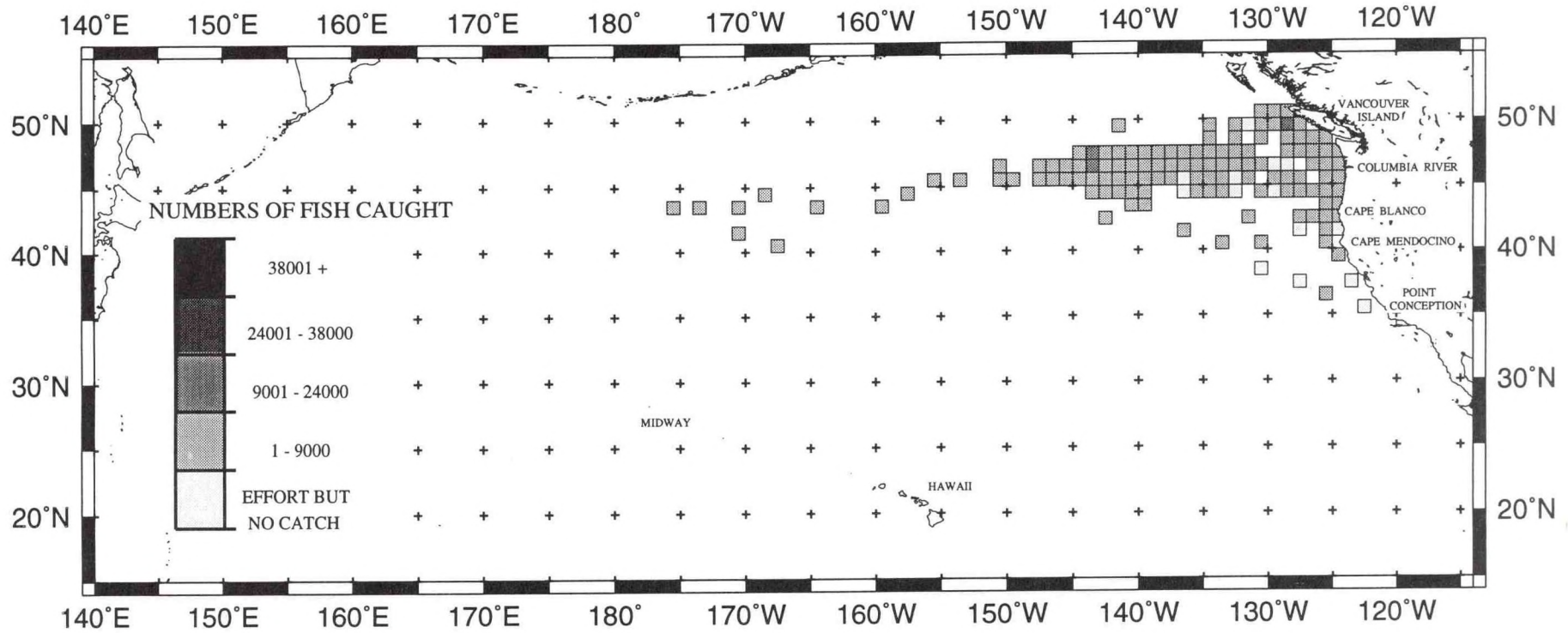

Figure 1g. Catches of albacore in the North Pacific for September 1995.

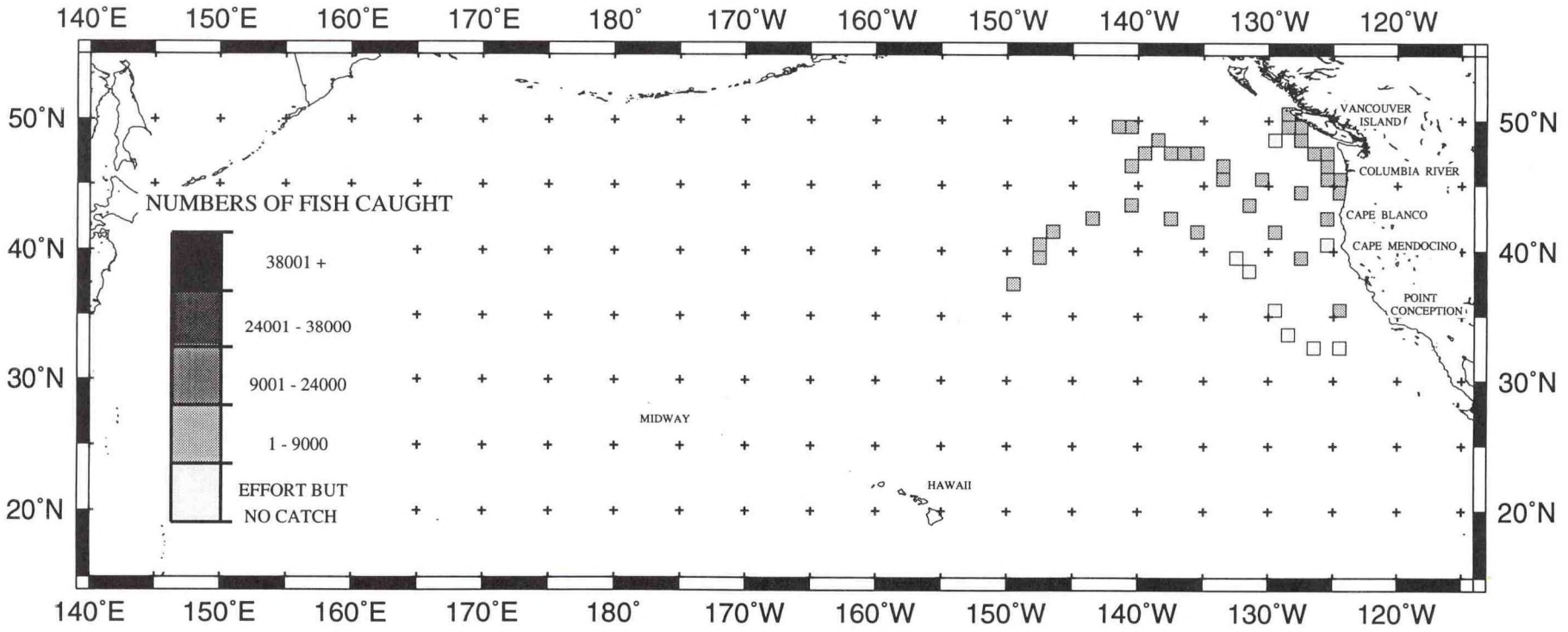

Figure 1h. Catches of albacore in the North Pacific for October 1995.

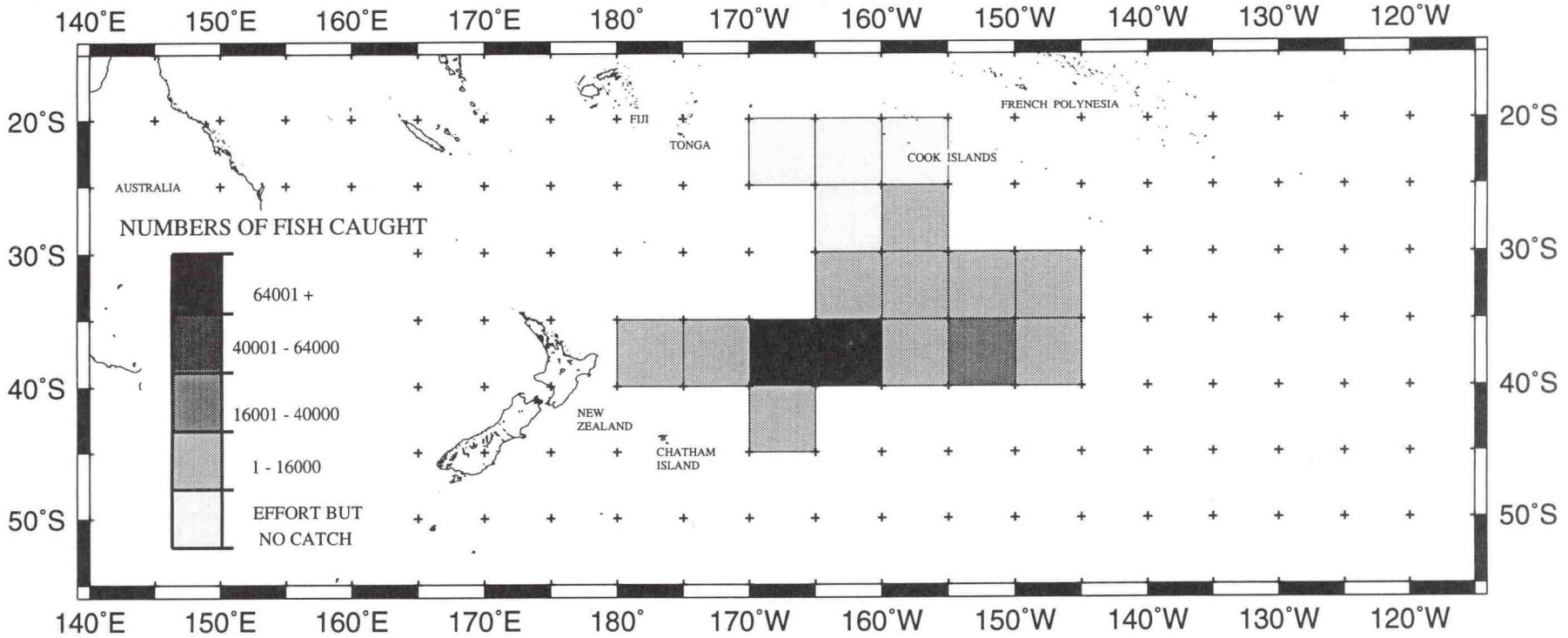

Figure 2a. Catches of albacore in the South Pacific for the 1994-95 season.

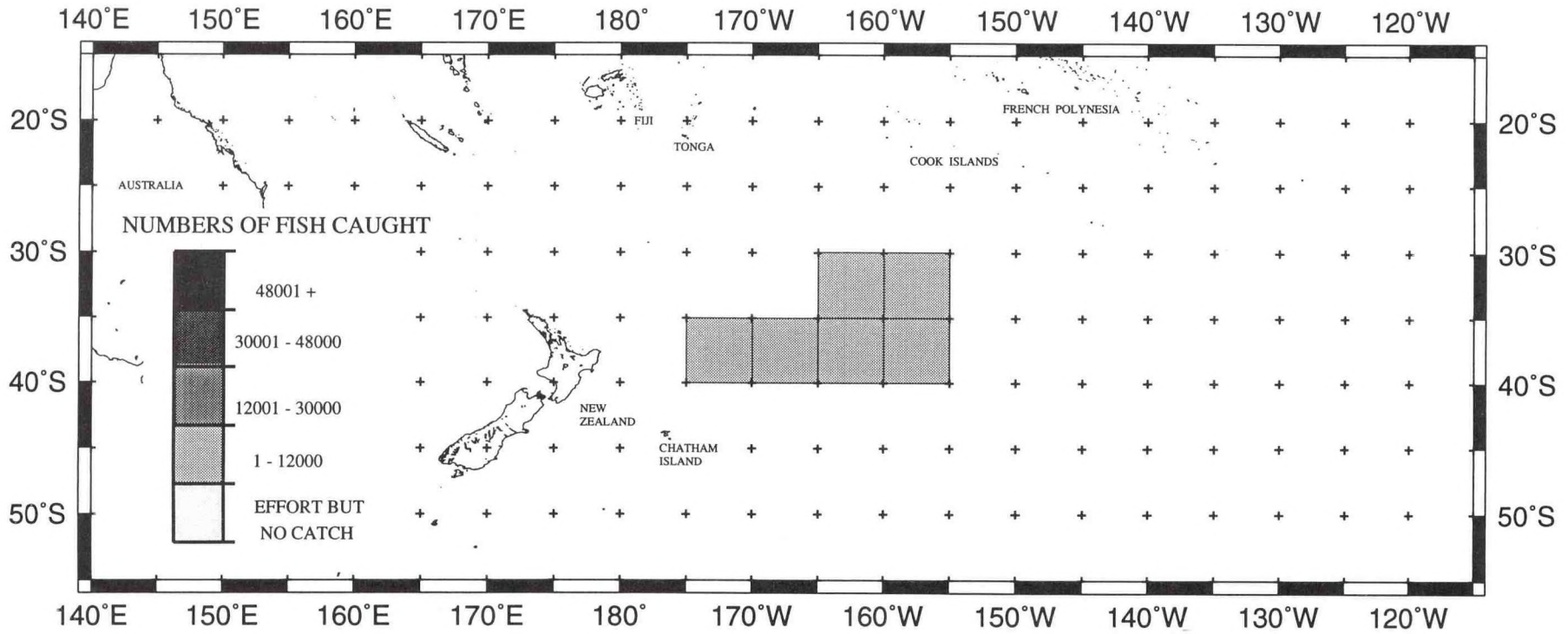

Figure 2b. Catches of albacore in the South Pacific for December 1994.

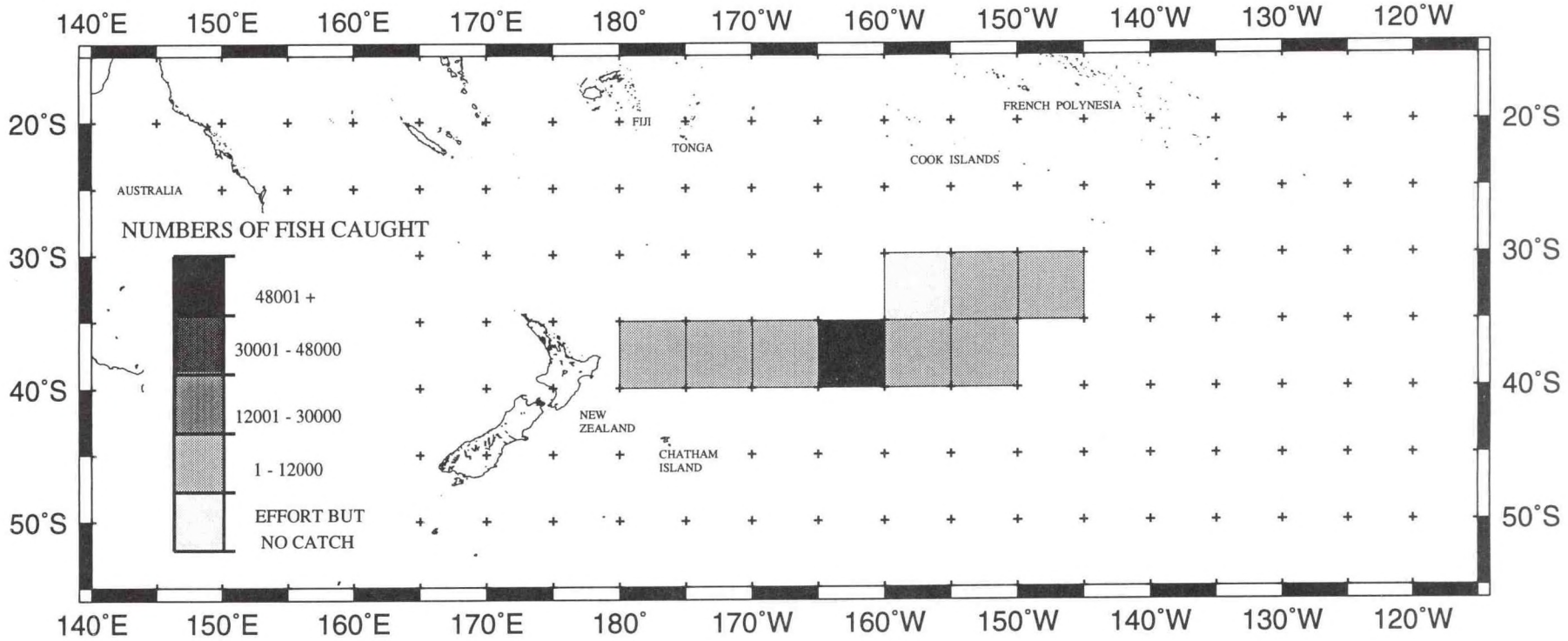

Figure 2c. Catches of albacore in the South Pacific for January 1995.

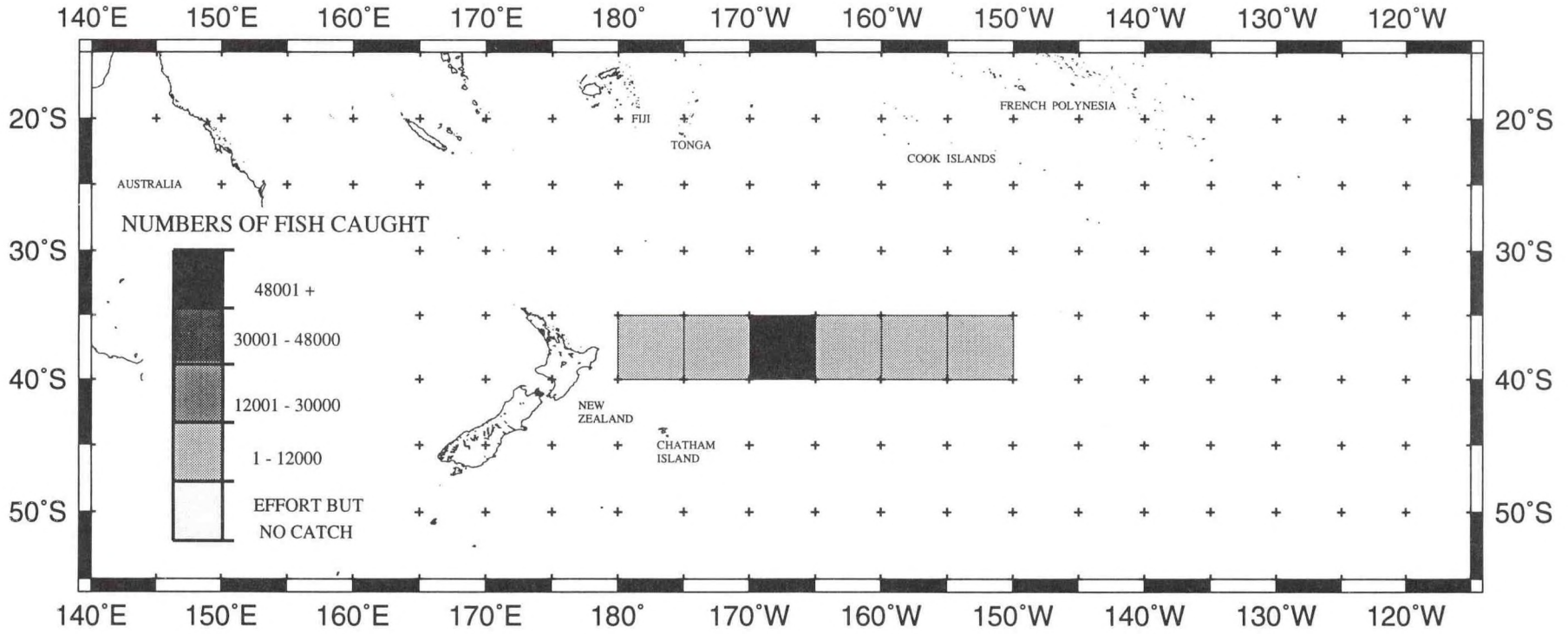

Figure 2d. Catches of albacore in the South Pacific for February 1995.

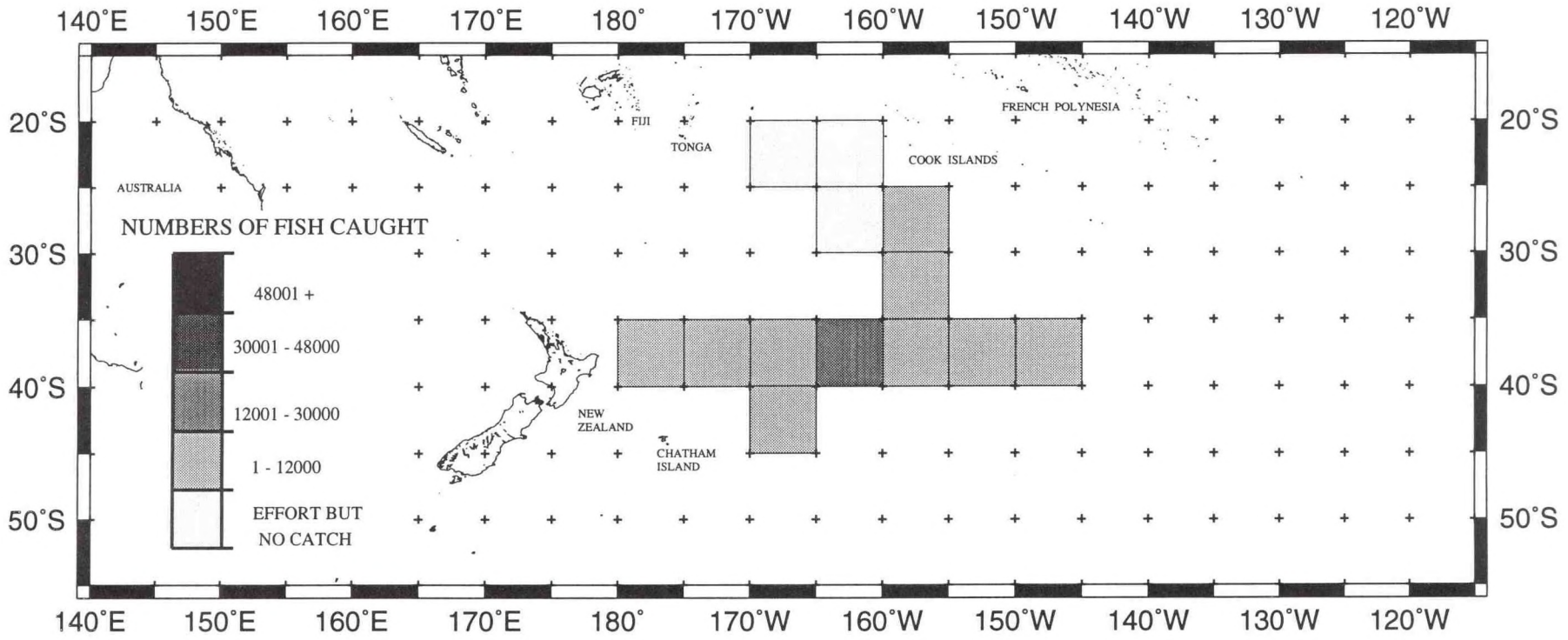

Figure 2e. Catches of albacore in the South Pacific for March 1995.

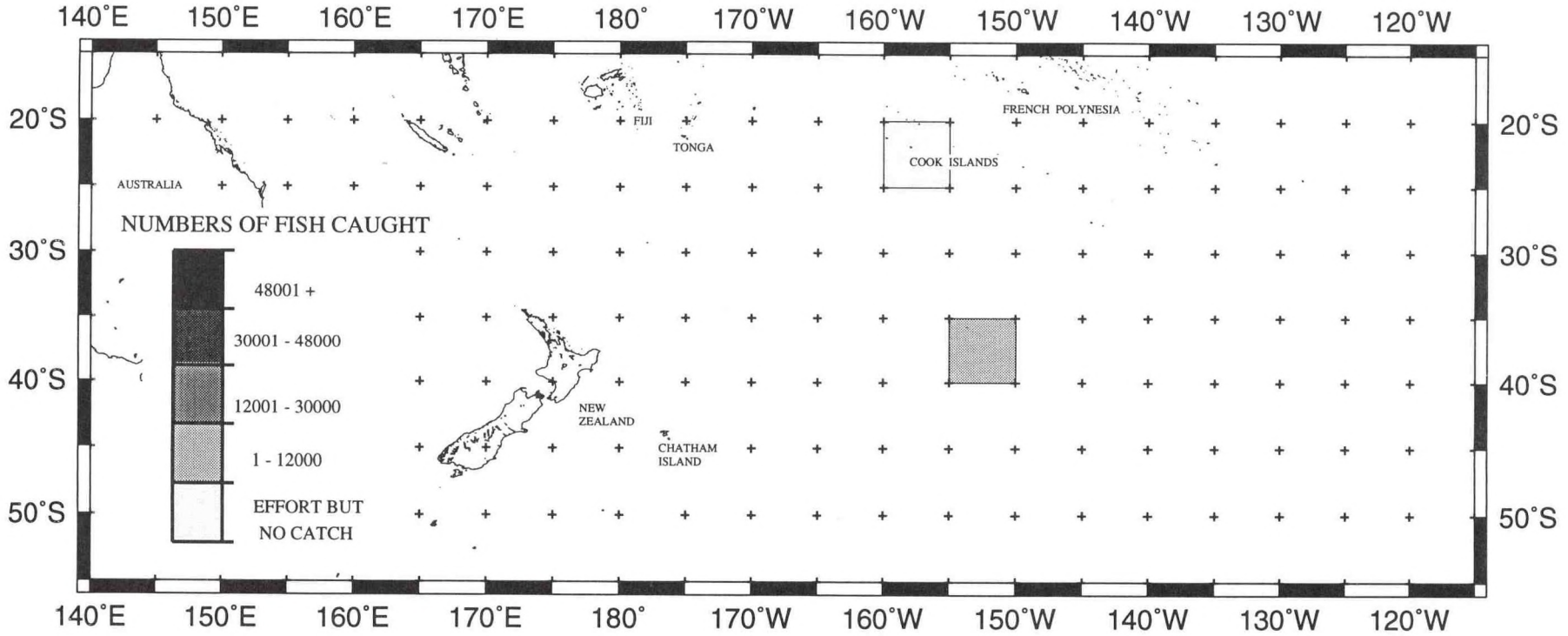

Figure 2f. Catches of albacore in the South Pacific for April 1995.

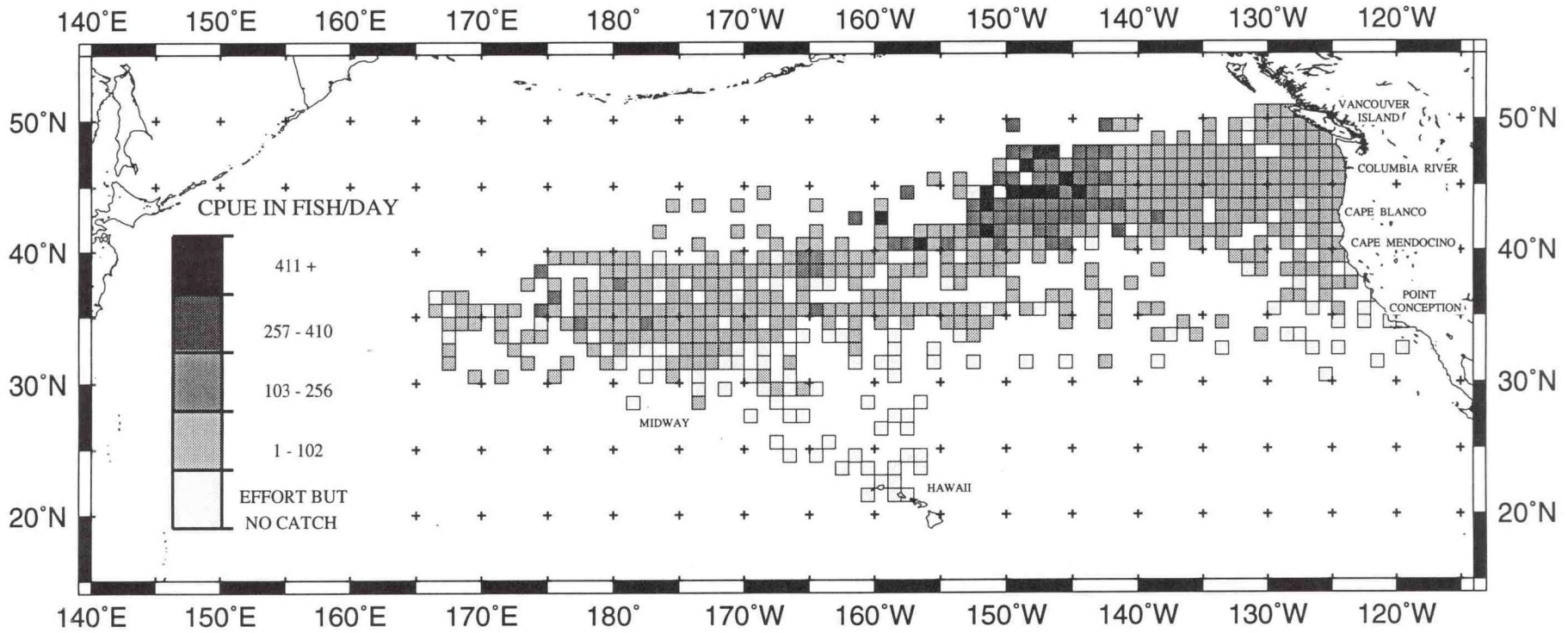

Figure 3a. Albacore CPUE's in the North Pacific for the 1995 season.

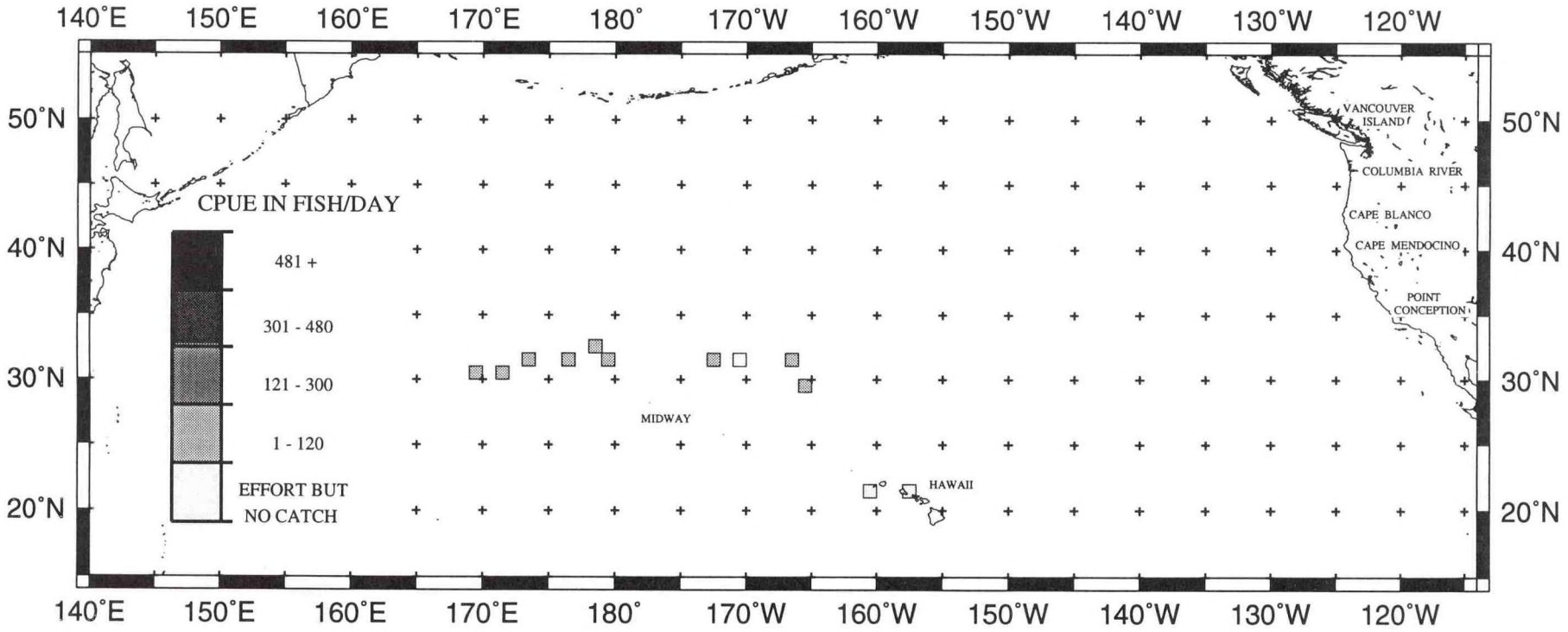

Figure 3b. Albacore CPUE's in the North Pacific for April 1995.

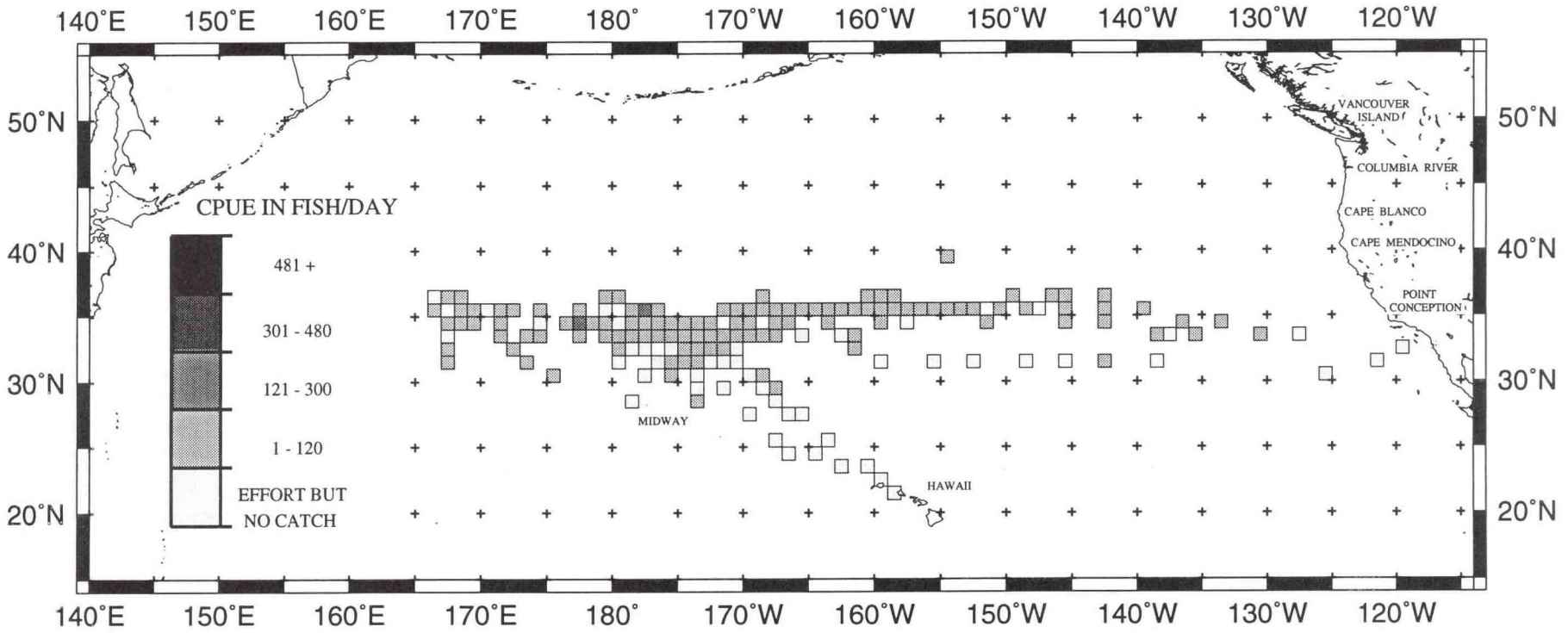

Figure 3c. Albacore CPUE's in the North Pacific for May 1995.

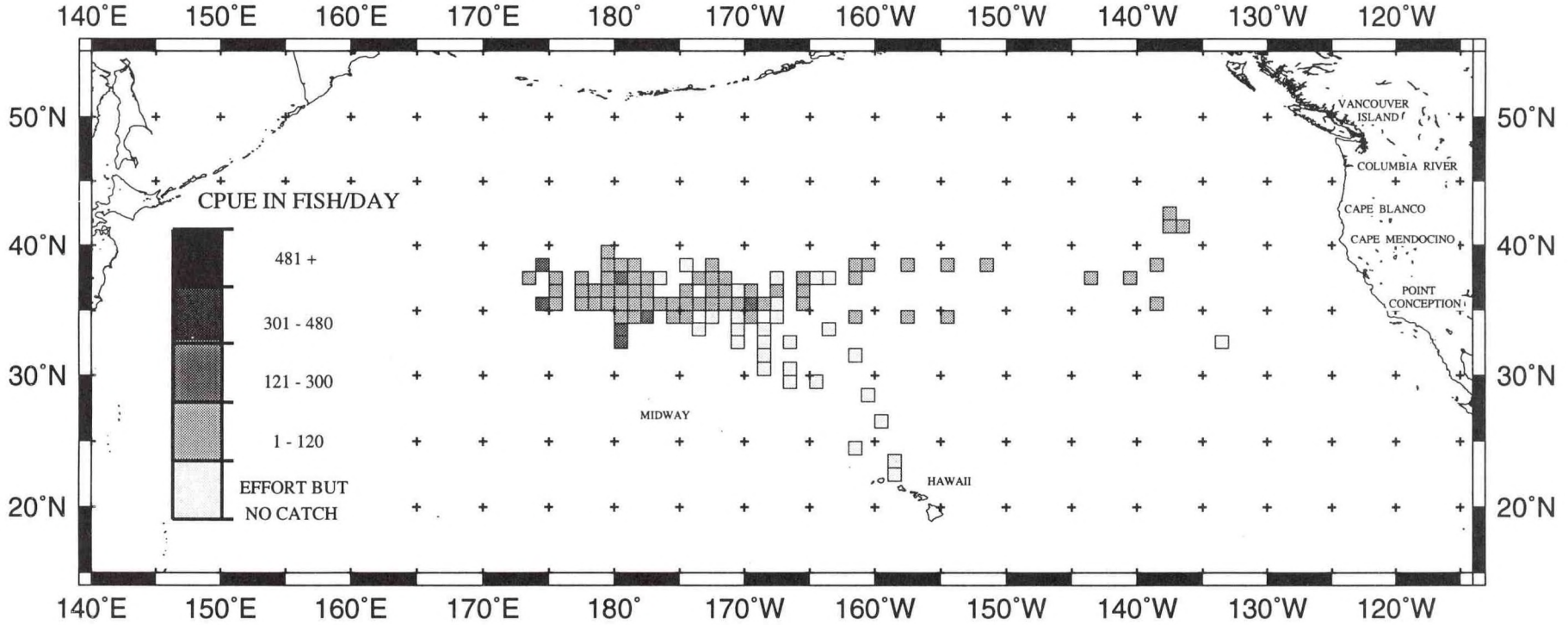

Figure 3d. Albacore CPUE's in the North Pacific for June 1995.

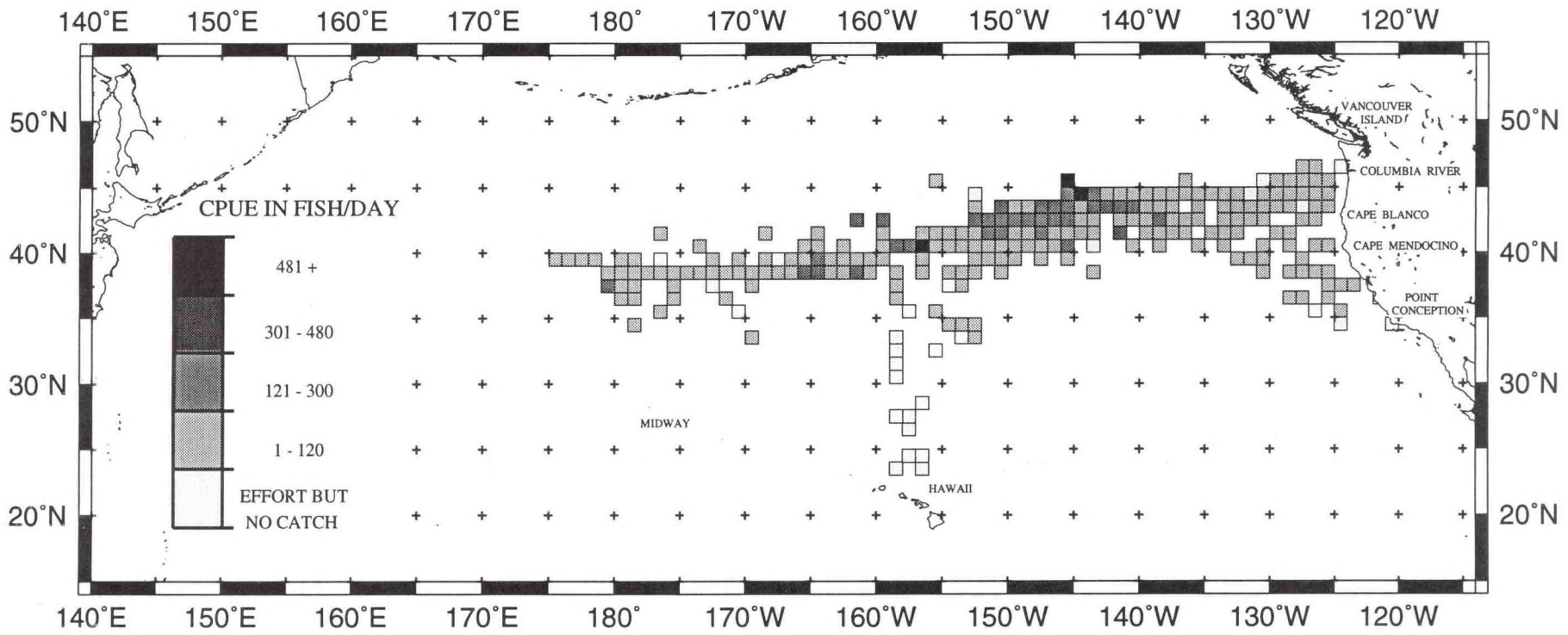

Figure 3e. Albacore CPUE's in the North Pacific for July 1995.

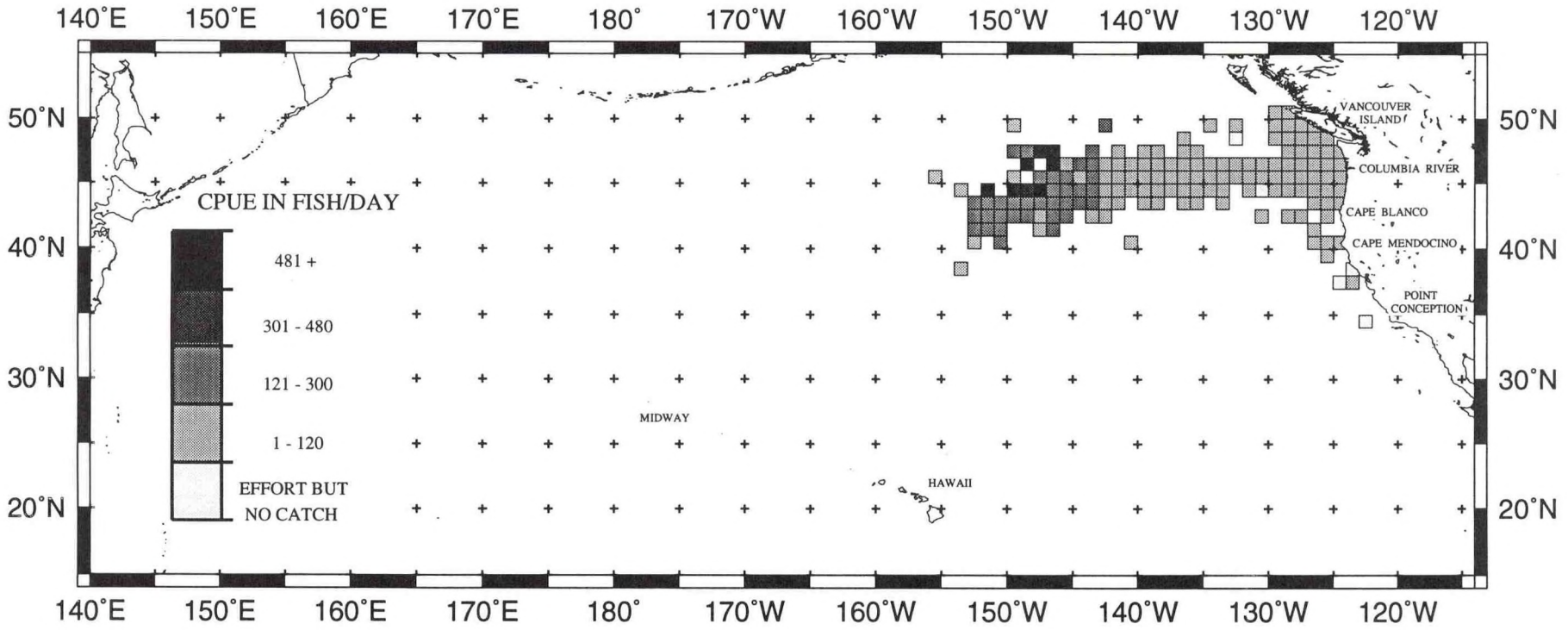

Figure 3f. Albacore CPUE's in the North Pacific for August 1995.

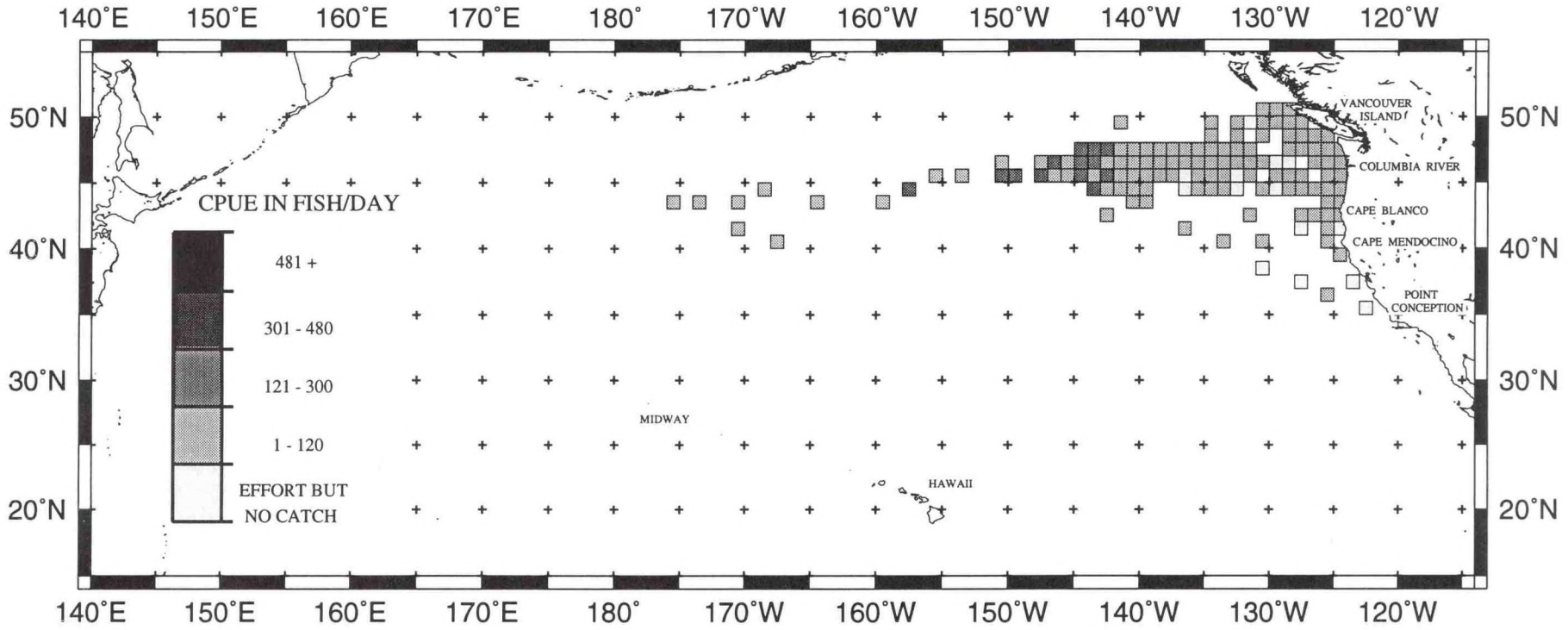

Figure 3g. Albacore CPUE's in the North Pacific for September 1995.

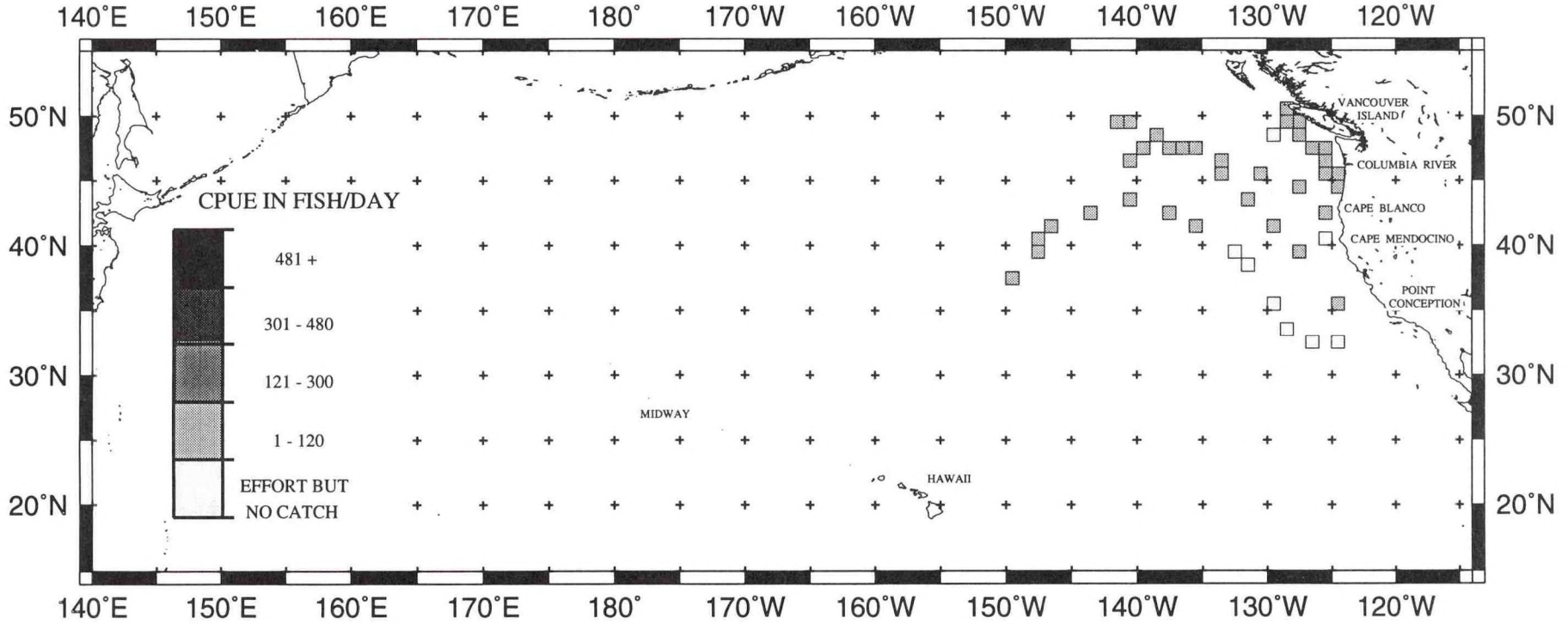

Figure 3h. Albacore CPUE's in the North Pacific for October 1995.

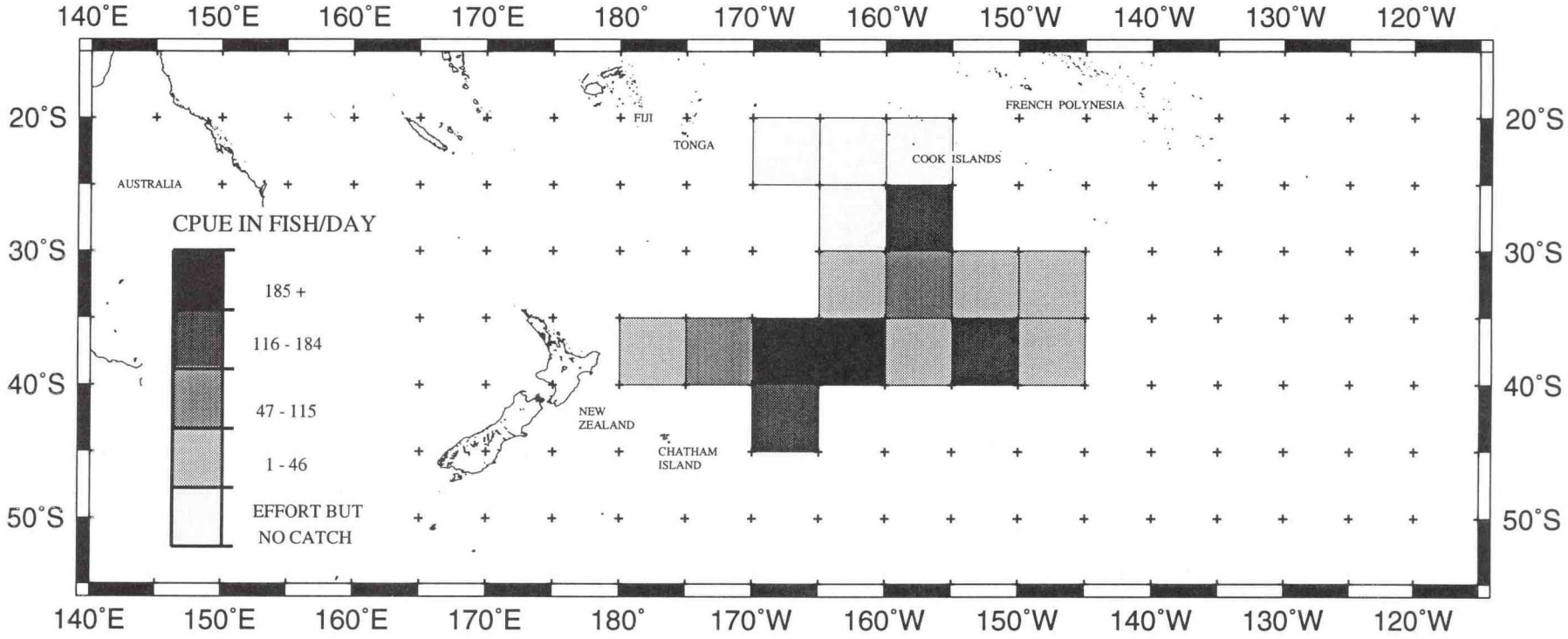

Figure 4a. Albacore CPUE's in the South Pacific for the 1994-95 season.

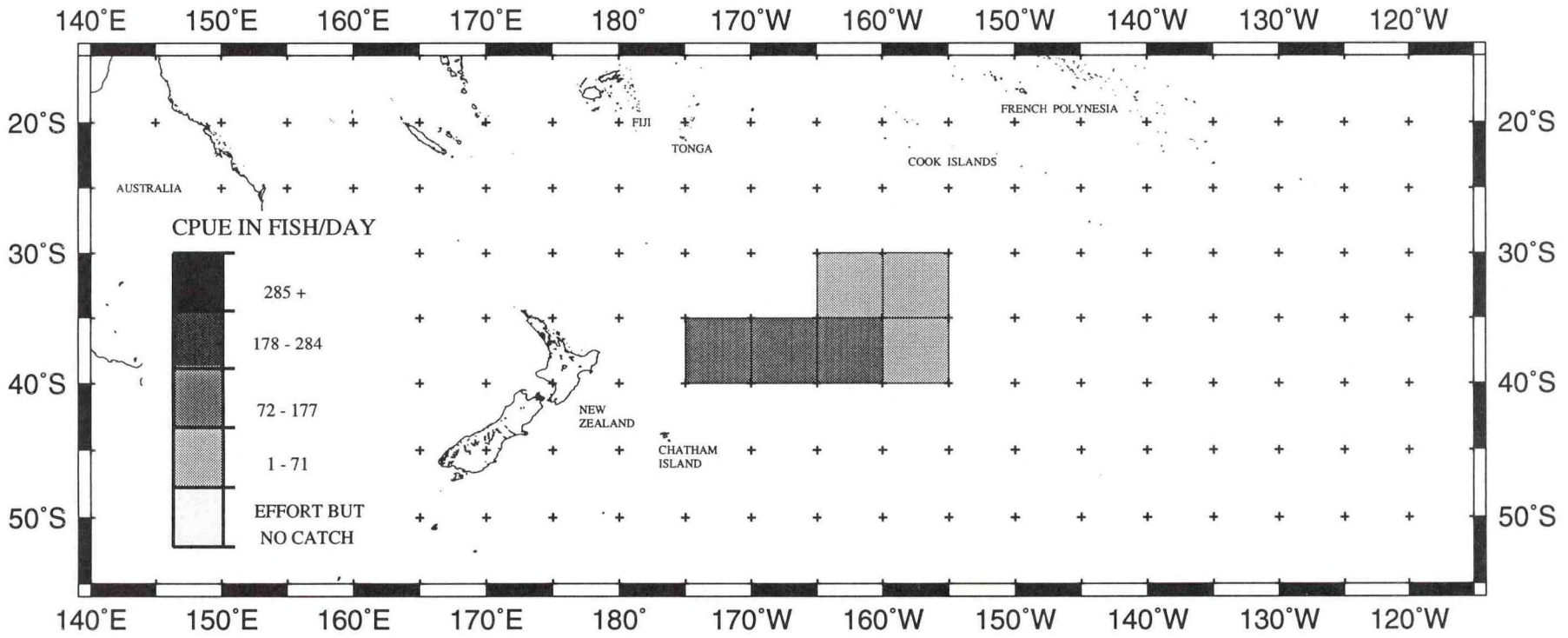

Figure 4b. Albacore CPUE's in the South Pacific for December 1994.

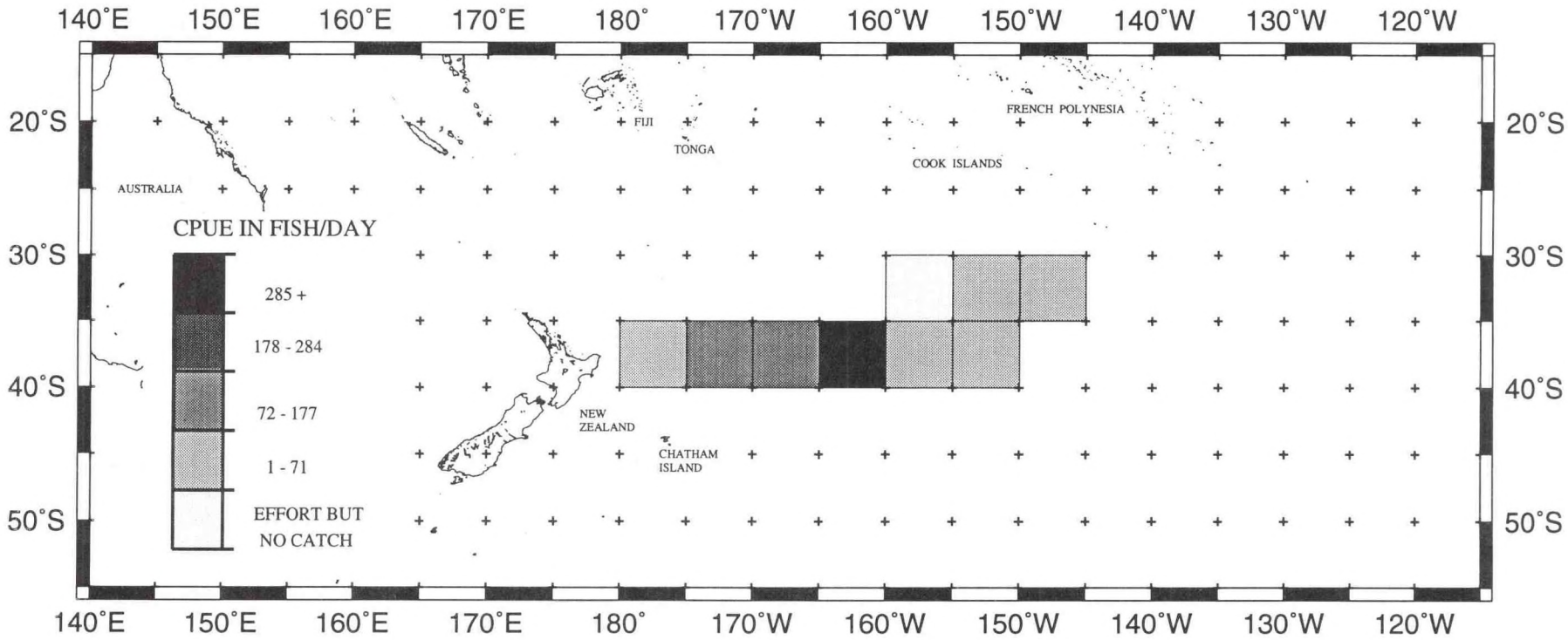

Figure 4c. Albacore CPUE's in the South Pacific for January 1995.

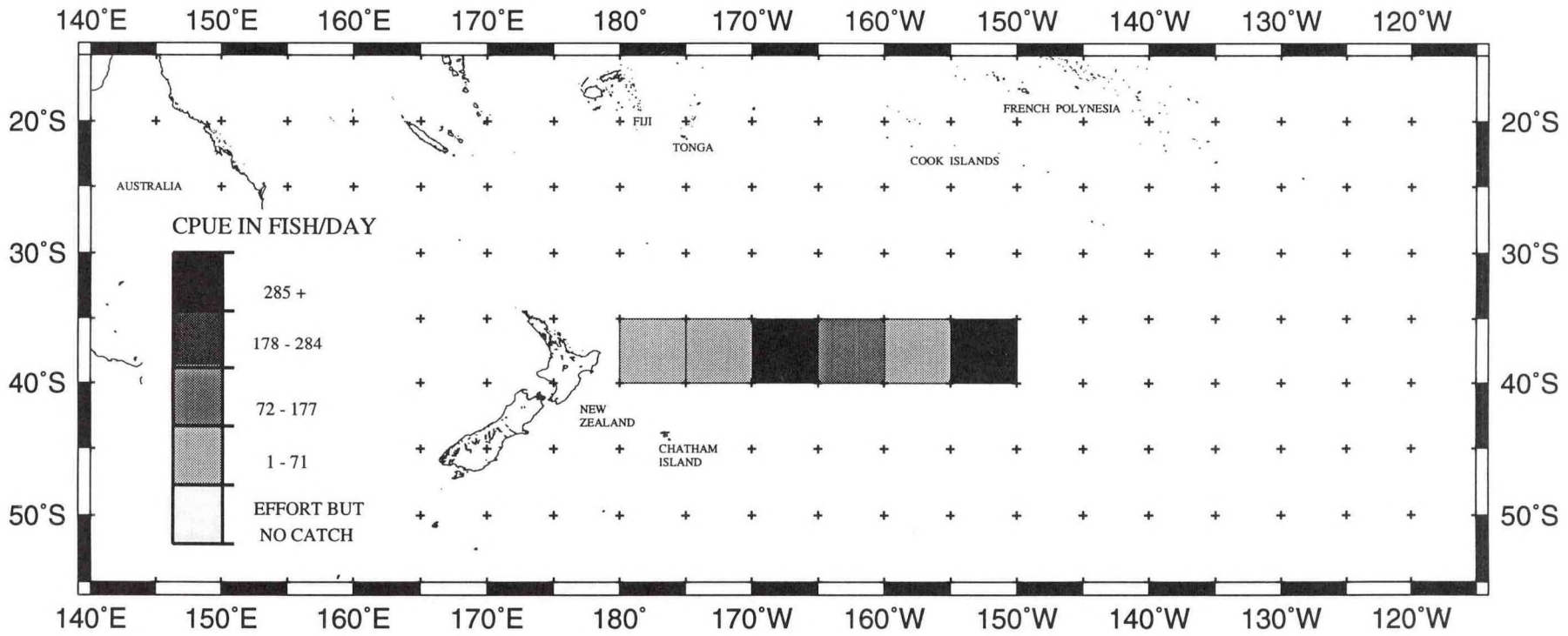

Figure 4d. Albacore CPUE's in the South Pacific for February 1995.

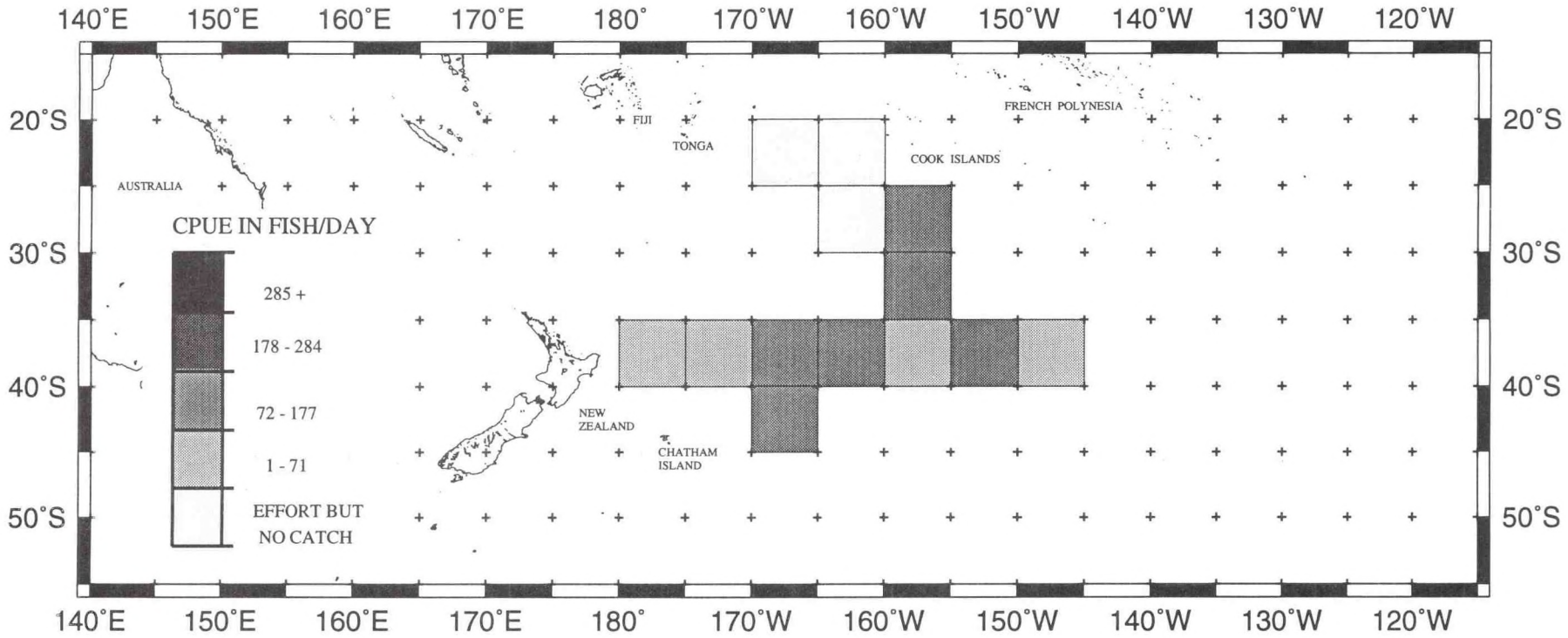

Figure 4e. Albacore CPUE's in the South Pacific for March 1995.

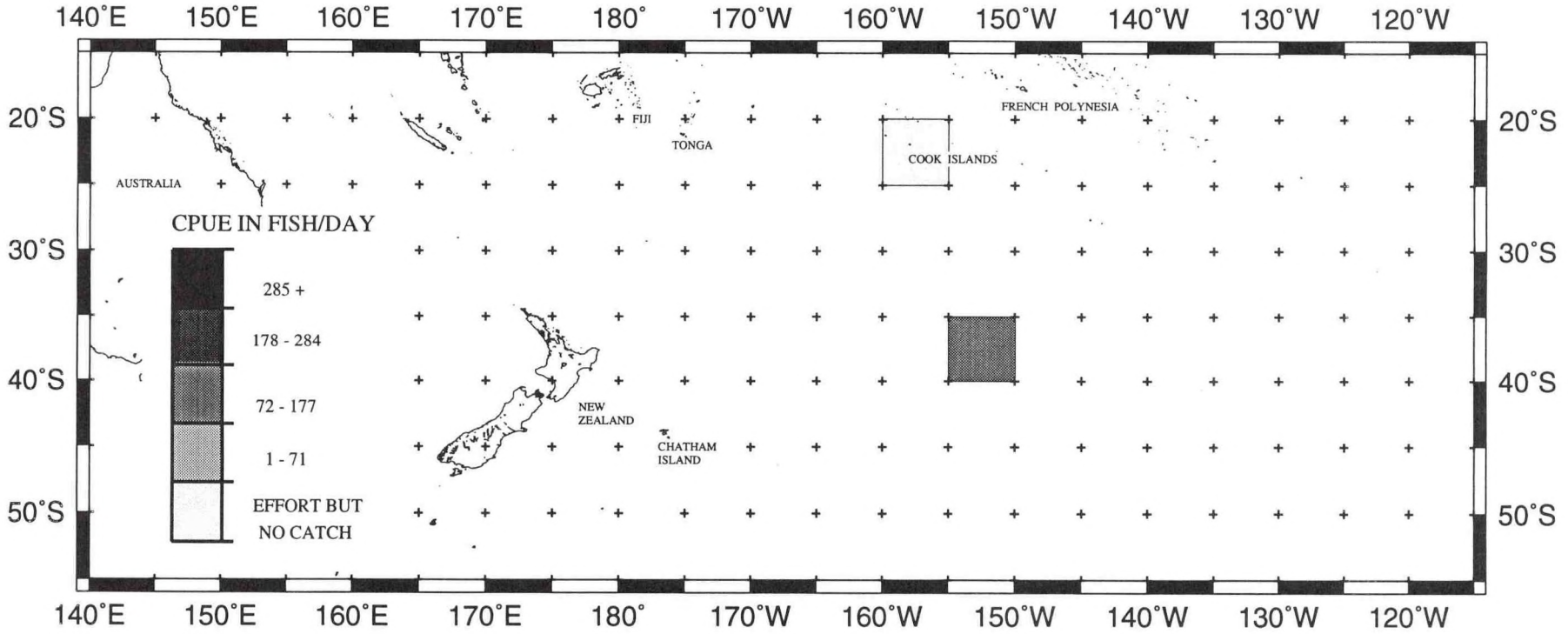

Figure 4f. Albacore CPUE's in the South Pacific for April 1995.

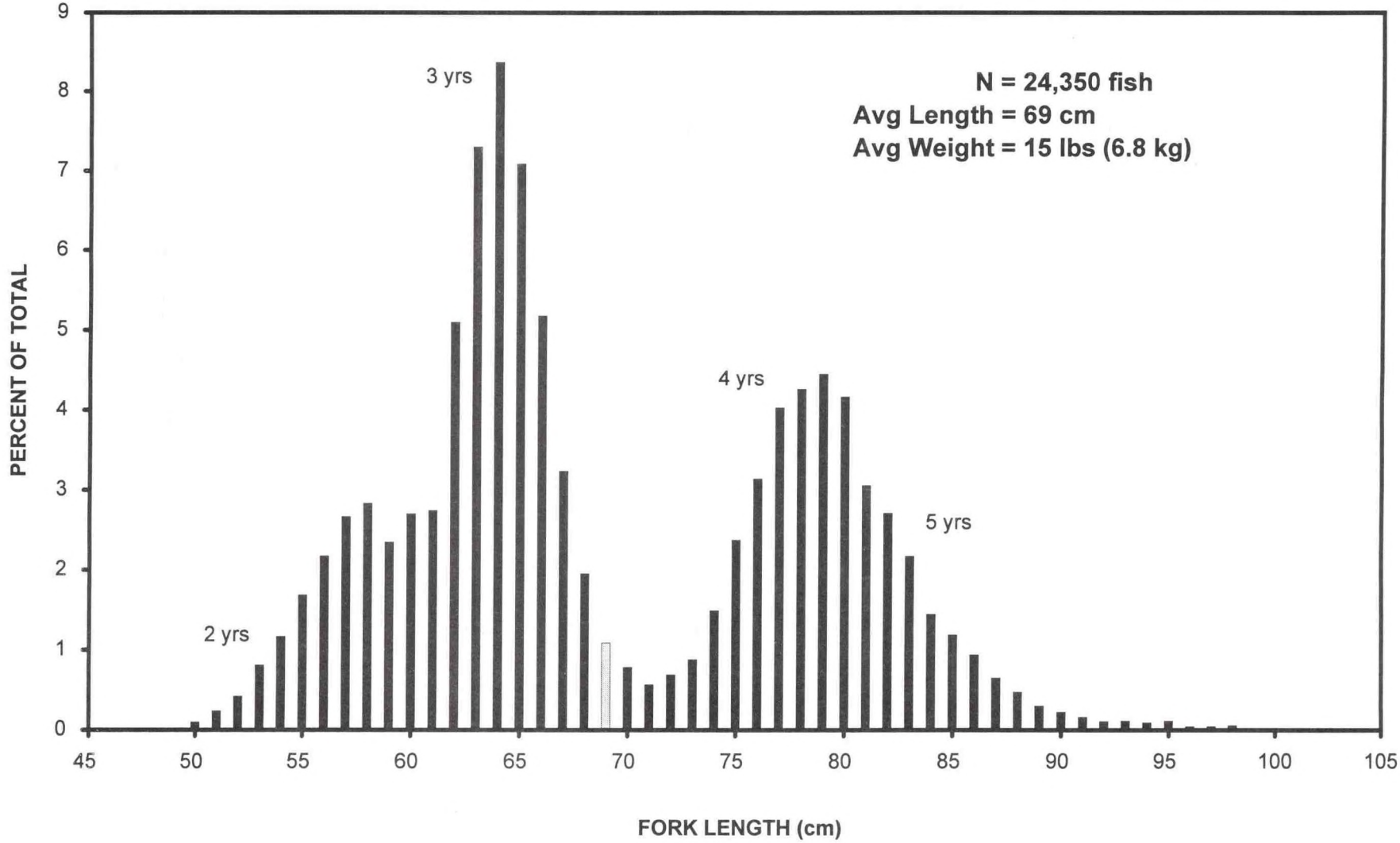

Figure 5. Length-frequencies of albacore sampled from the 1995 North Pacific troll fishery.

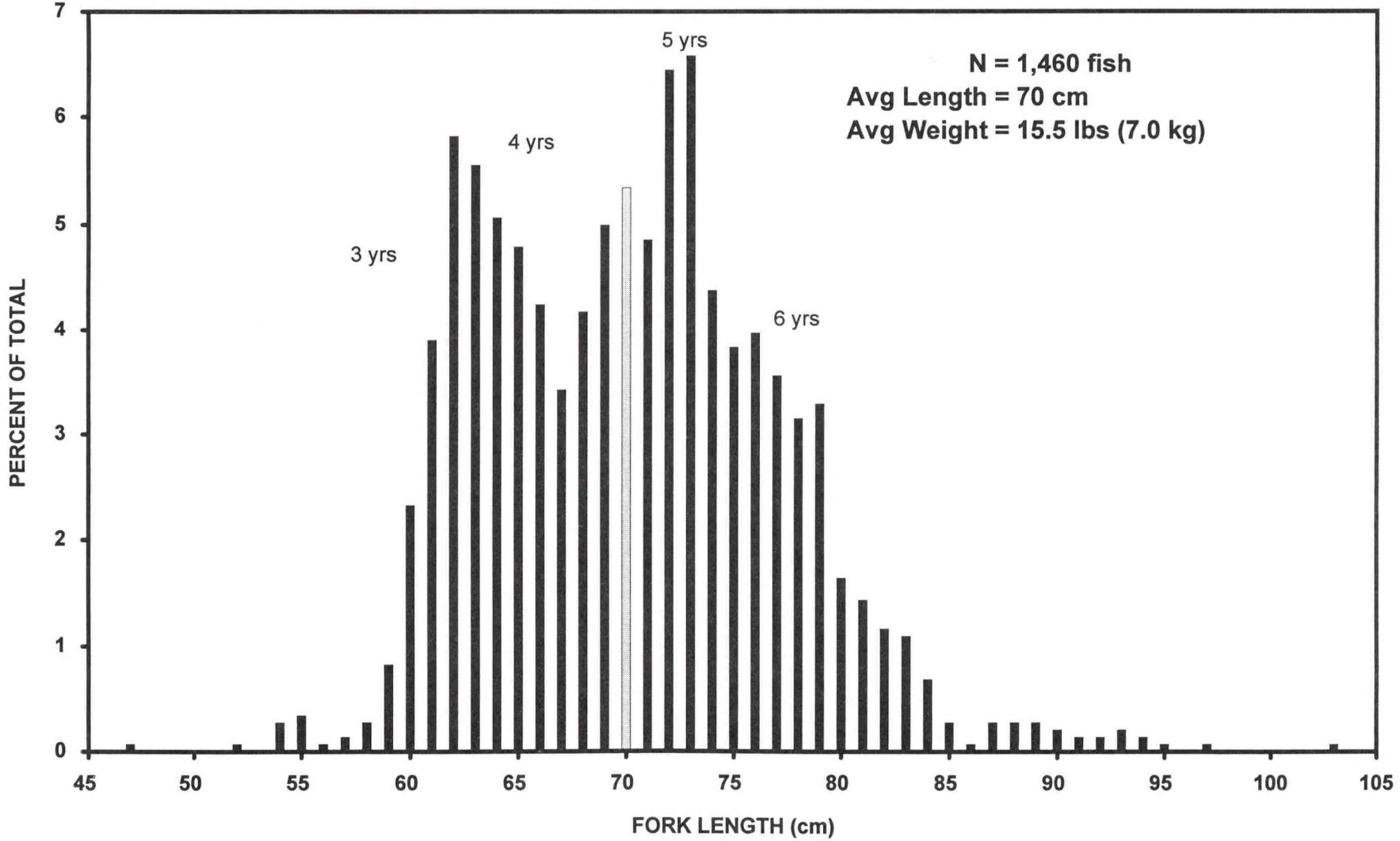

Figure 6. Length-frequencies of albacore sampled from the 1994-95 South Pacific troll fishery.

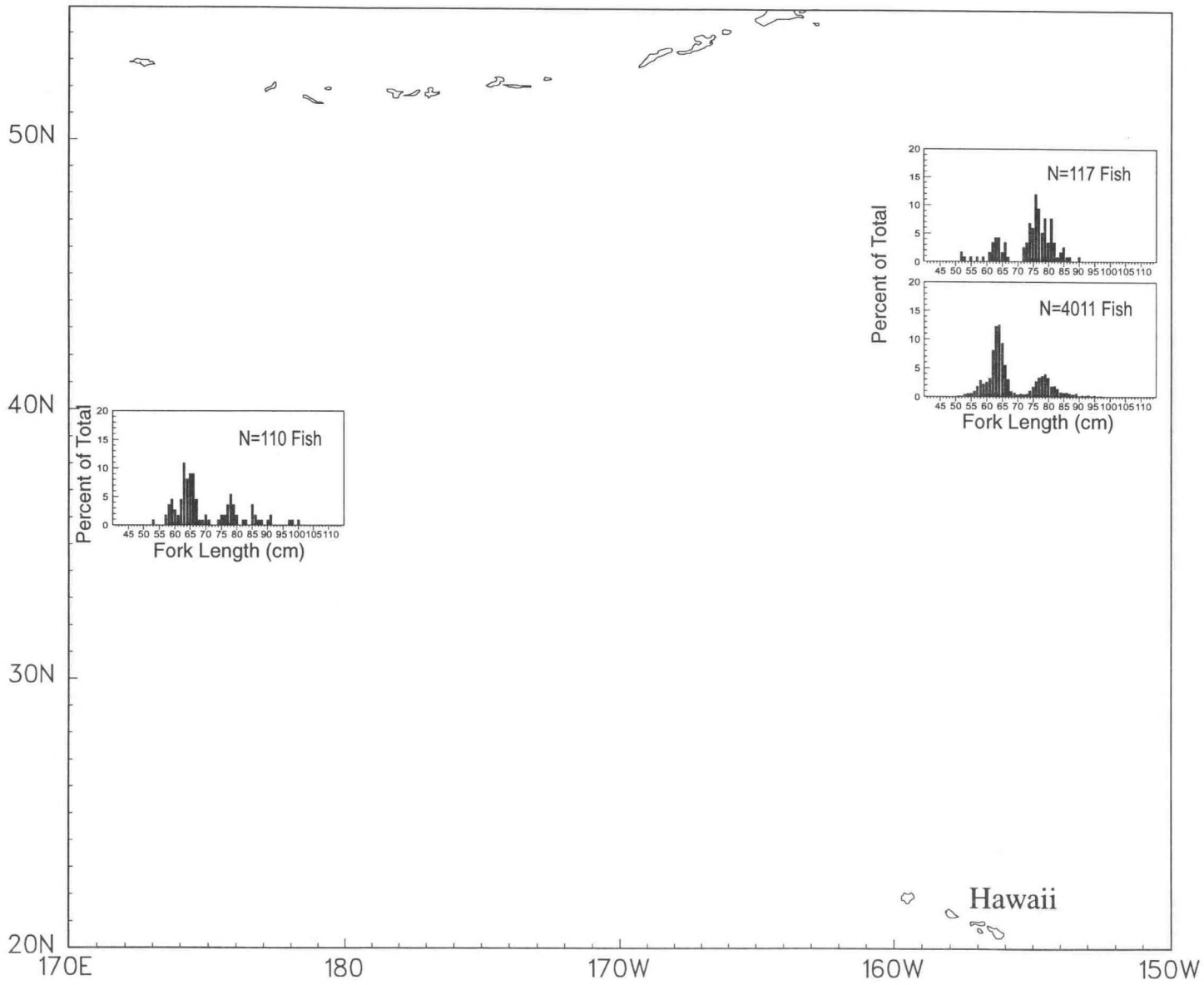

Figure 7. Size distribution of albacore sampled from the 1995 North Pacific troll fishery summarized by 5°x10° quadrangles.

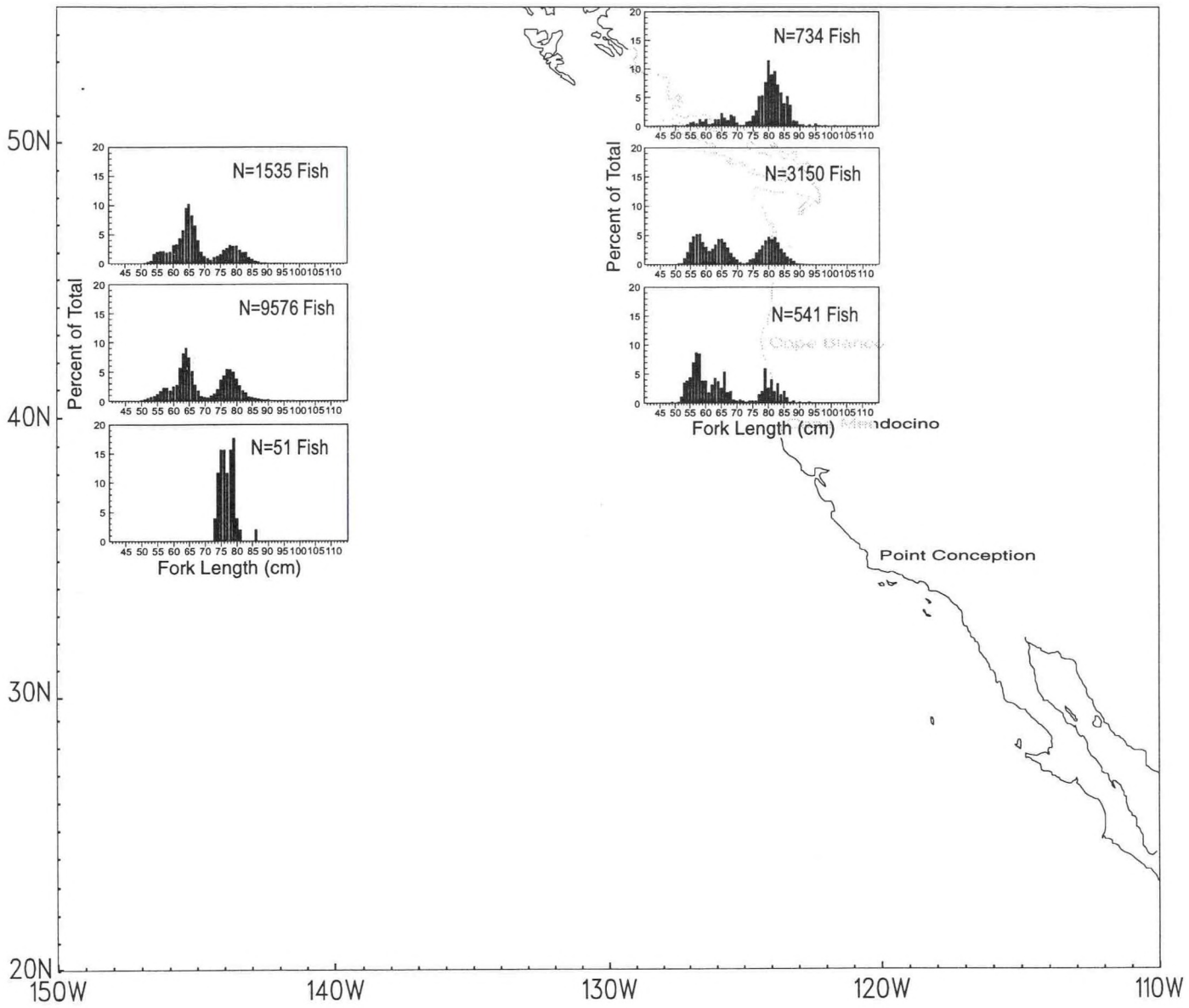

Figure 7. (continued).

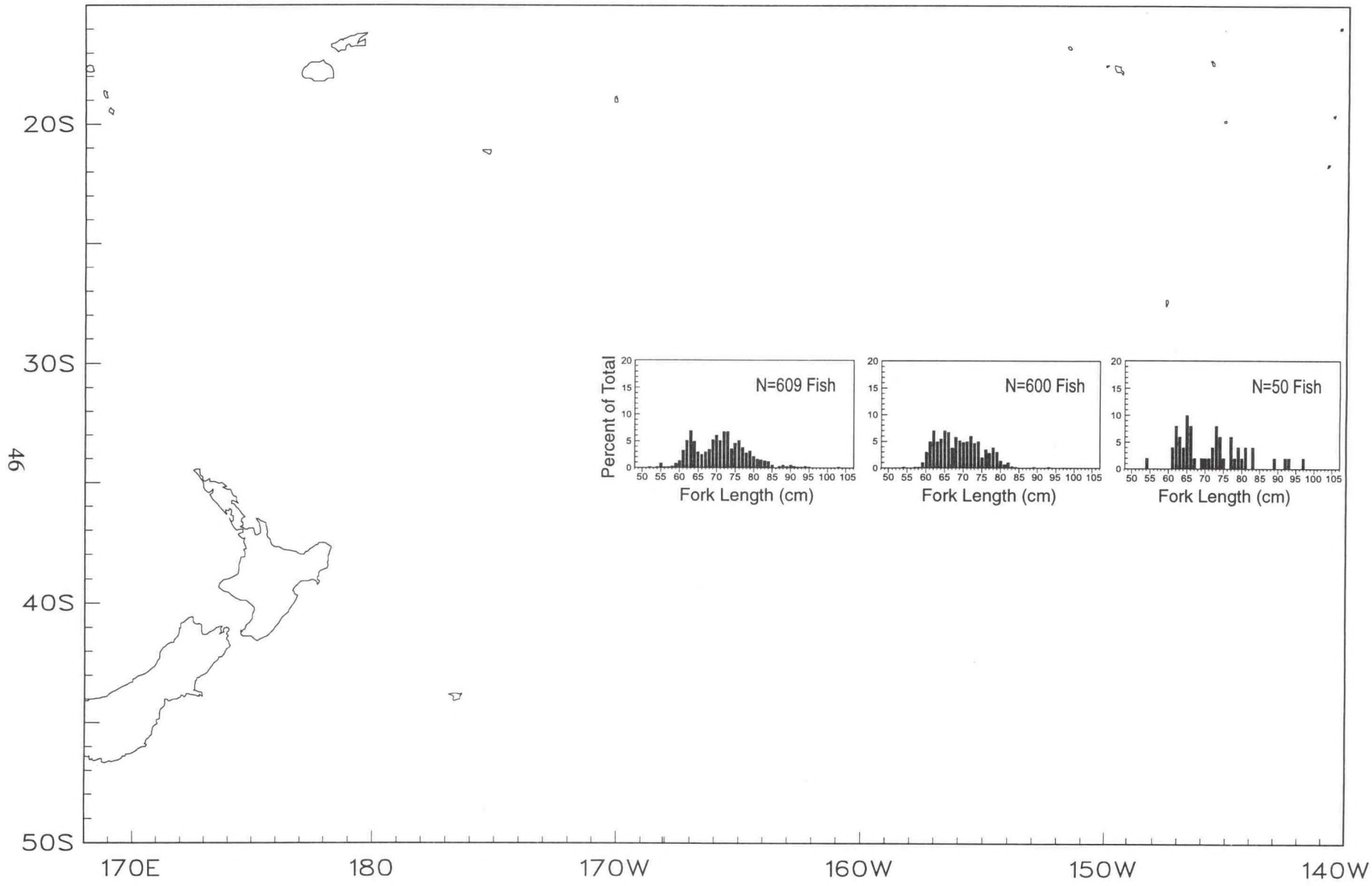

Figure 8. Size distribution of albacore sampled from the 1994-95 South Pacific troll fishery summarized by 5°x10° quadrangles.

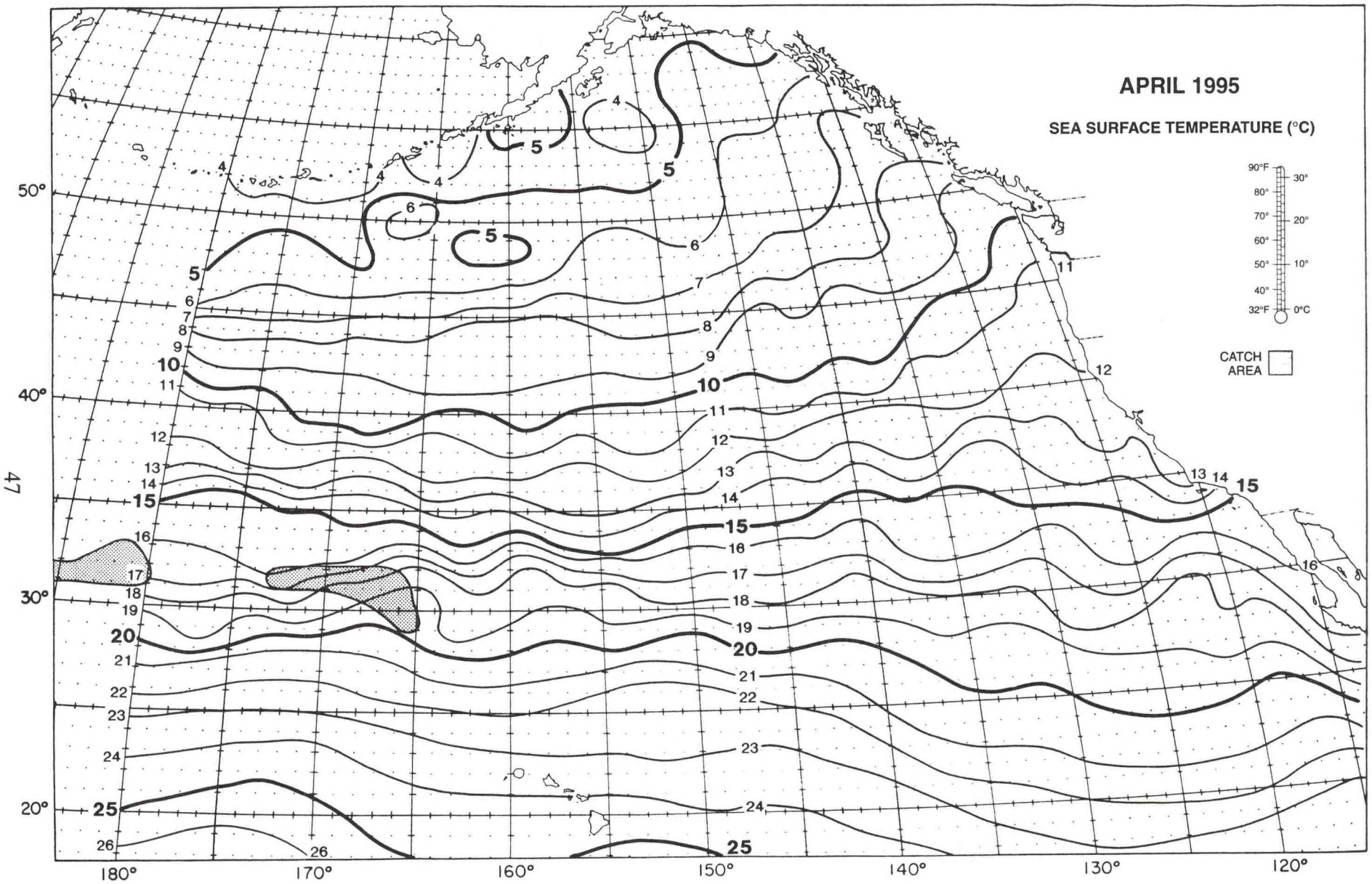

Figure 9a. Average SST isotherms and general catch area of North Pacific albacore troll fleet for April 1995.

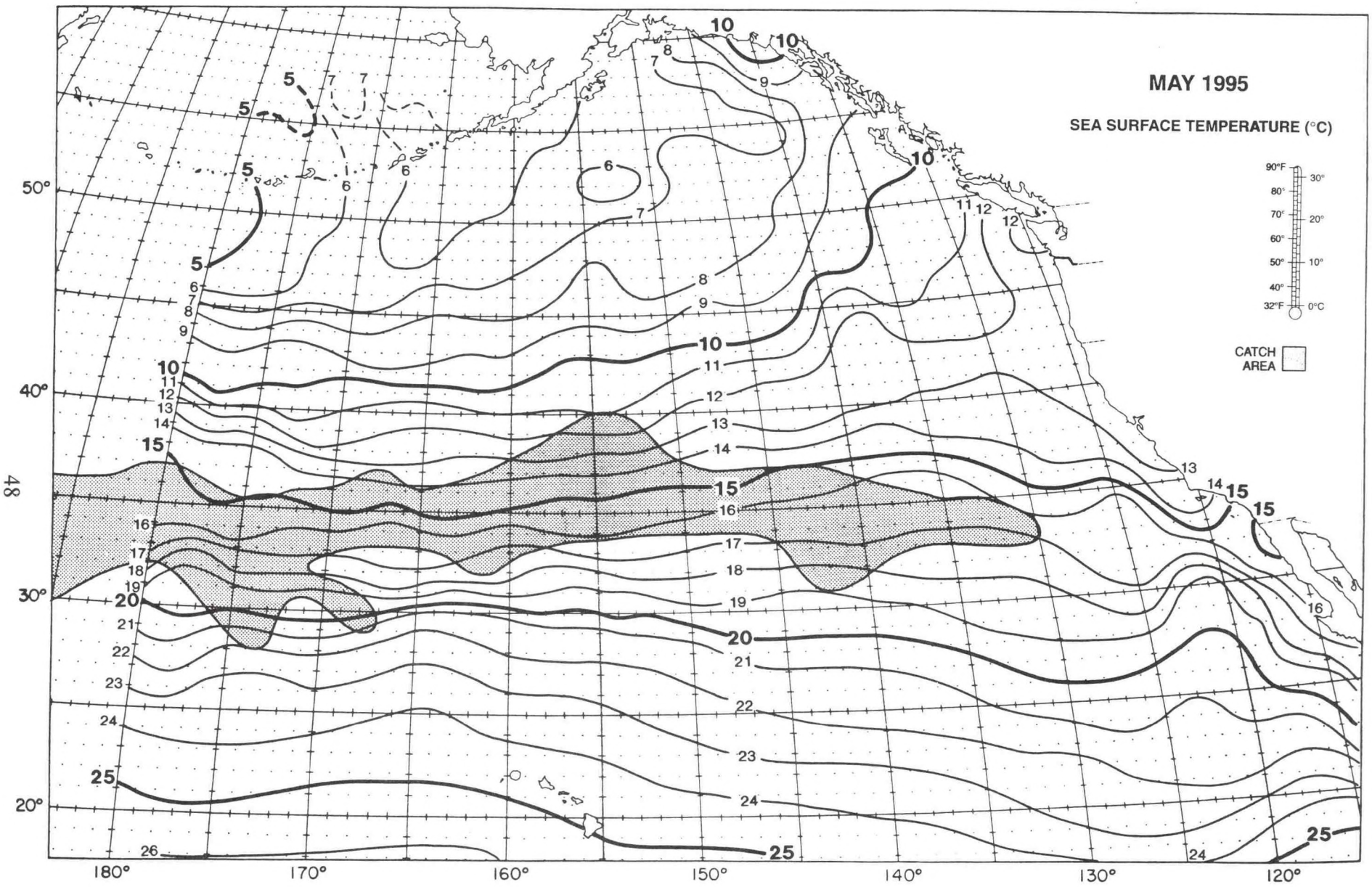

Figure 9b. Average SST isotherms and general catch area of North Pacific albacore troll fleet for May 1995.

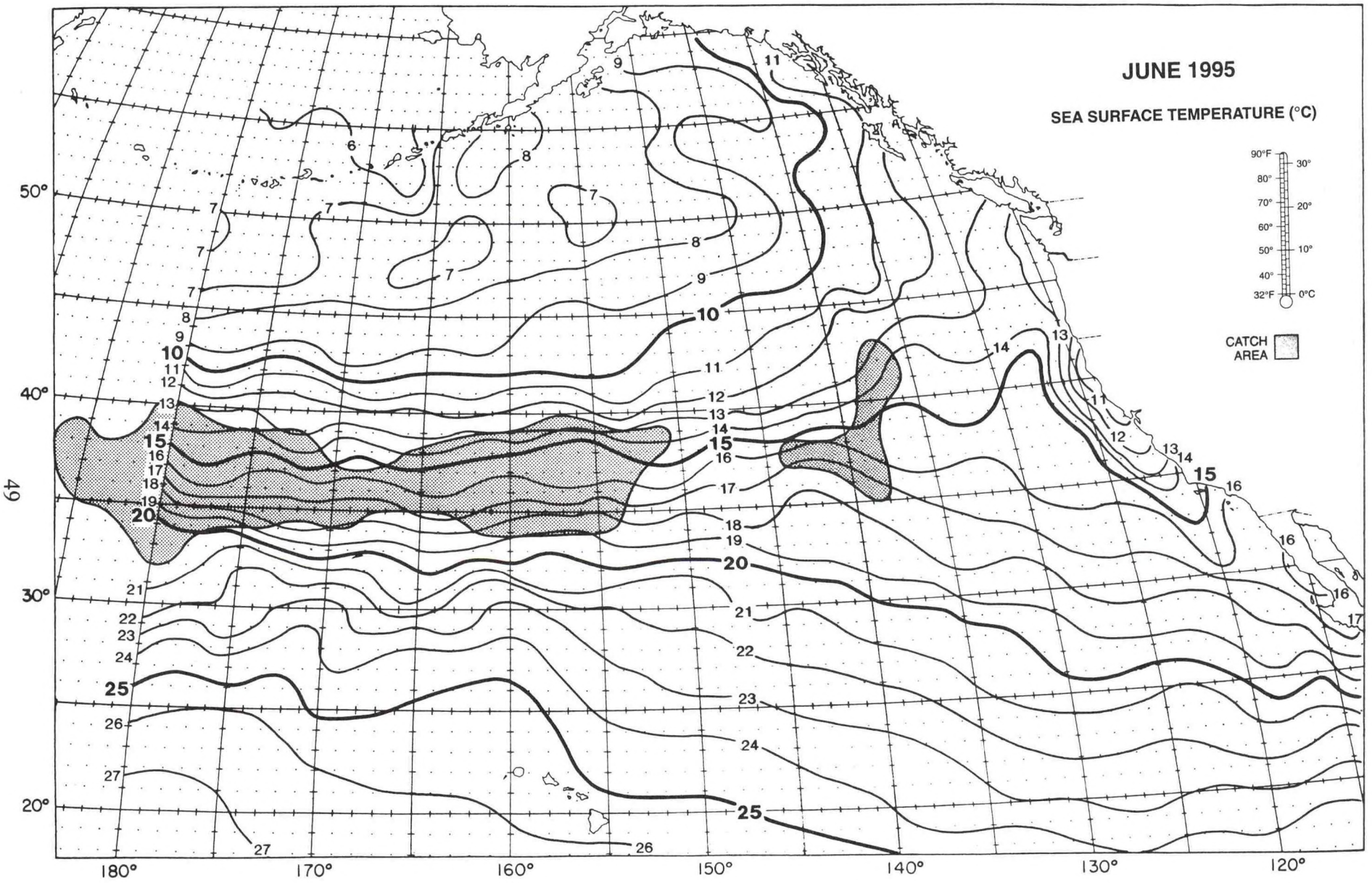

Figure 9c. Average SST isotherms and general catch area of North Pacific albacore troll fleet for June 1995.

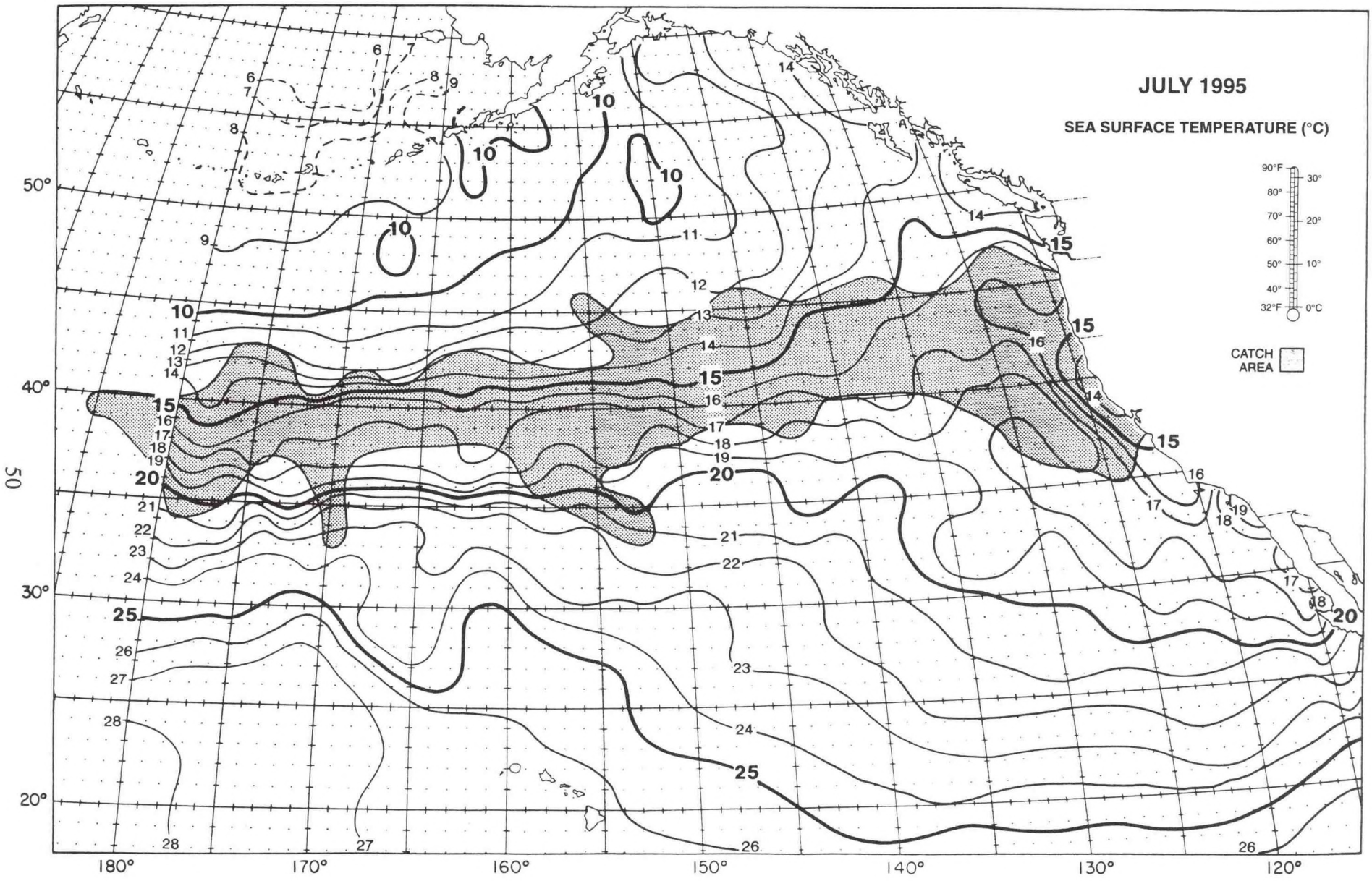

Figure 9d. Average SST isotherms and general catch area of North Pacific albacore troll fleet for July 1995.

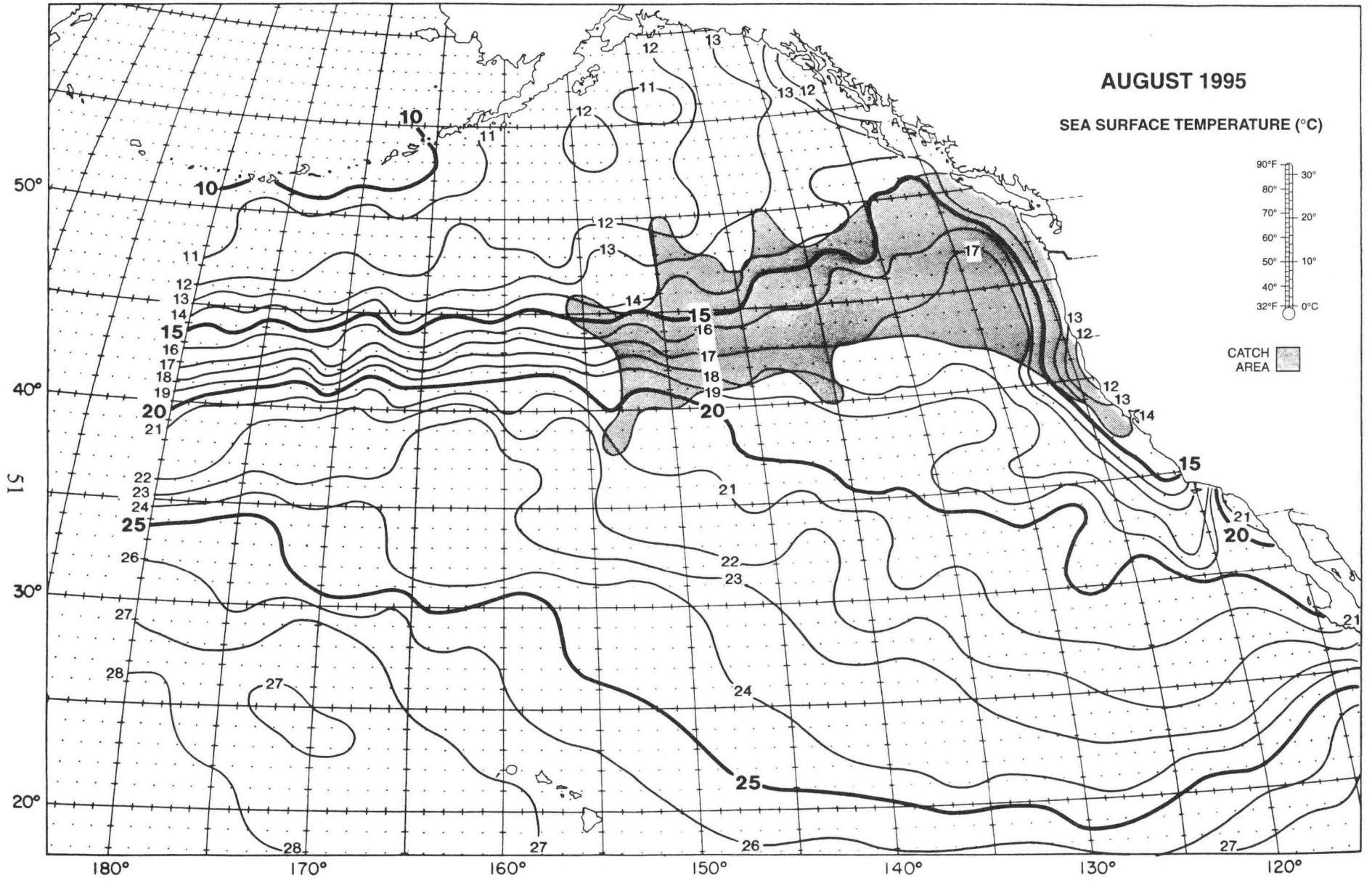

Figure 9e. Average SST isotherms and general catch area of North Pacific albacore troll fleet for August 1995.

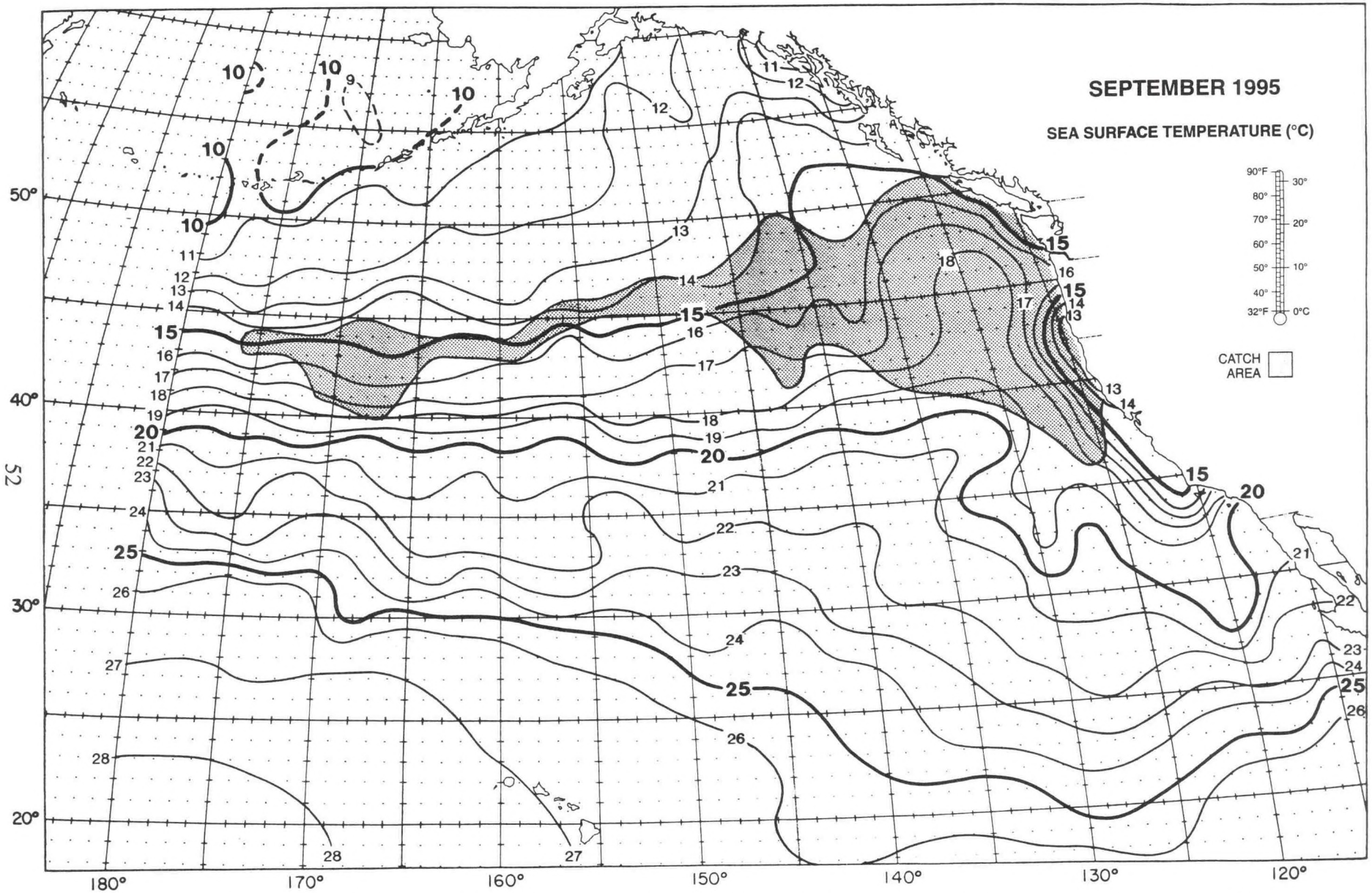

Figure 9f. Average SST isotherms and general catch area of North Pacific albacore troll fleet for September 1995.

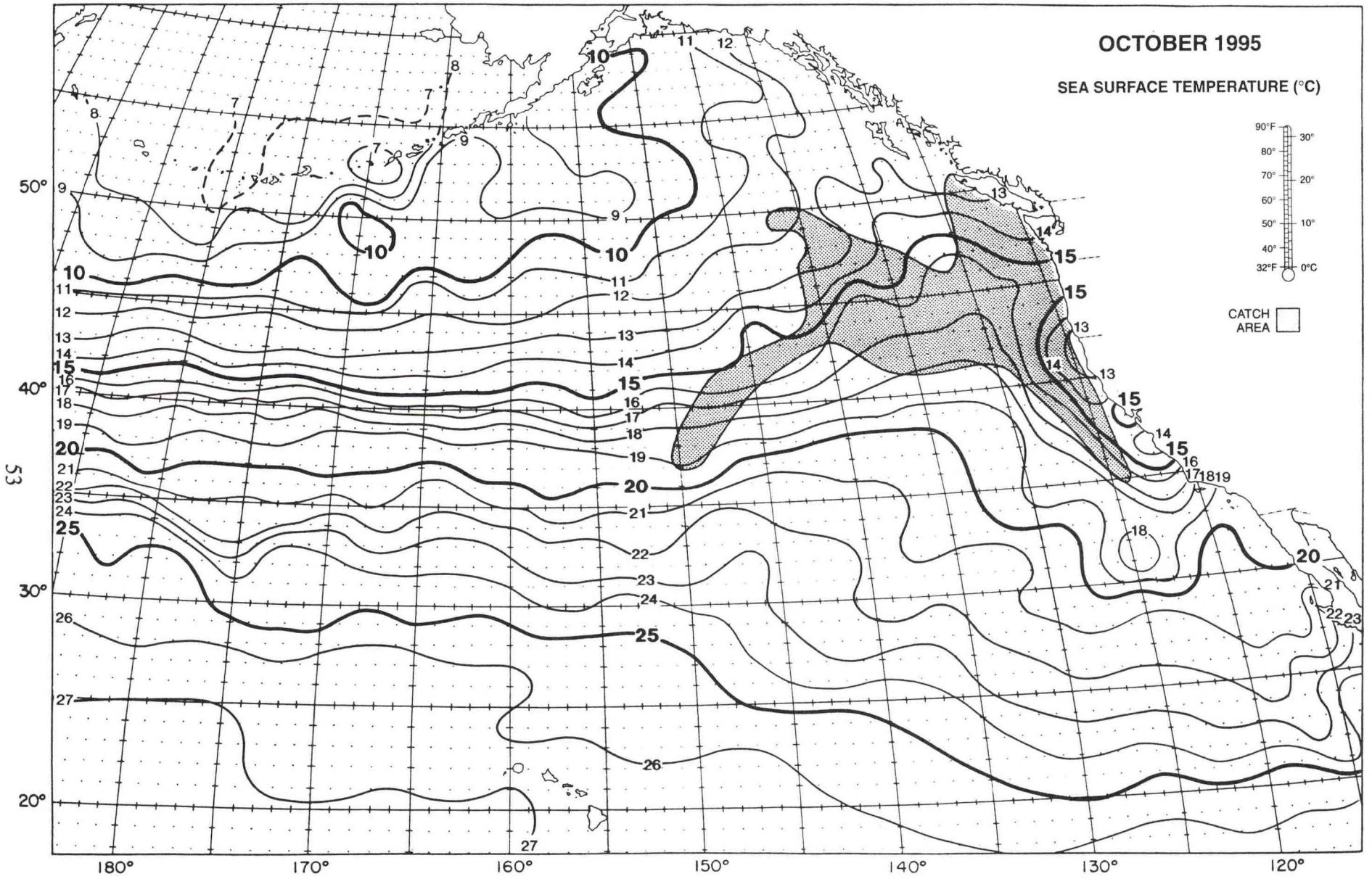

Figure 9g. Average SST isotherms and general catch area of North Pacific albacore troll fleet for October 1995.