SOUTHWEST FISHERIES SCIENCE CENTER

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

JULY 1992

SUMMARY OF THE 1991 NORTH PACIFIC ALBACORE FISHERIES DATA

By

Gary M. Rensink and Forrest R. Miller

ADMINISTRATIVE REPORT LJ-92-30

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INTRODUCTION

During the 1991 north Pacific fishing season (May-October), over 350 logbooks were distributed by the Western Fishboat Owners Association (WFOA) and port samplers throughout California, Oregon, and Washington to U.S. albacore fishermen for voluntary record keeping. Logbooks were collected, or information from vessel logbooks were abstracted, from almost 200 fishing trips, by representatives from the California Department of Fish and Game (CDFG), Washington Department of Fisheries (WDF), and the Oregon Department of Fish and Wildlife (ODFW). Landings were also sampled for sizes of fish. National Marine Fisheries Service (NMFS) observers on board albacore vessels also filled out logbooks and measured fish landed.

This report is a summary of data for the 1991 fishing season. Available data from foreign fisheries are also presented for comparison.

COVERAGE RATES

Samplers collected catch and fishing effort statistics from vessels who completed U.S. Pacific albacore logbooks or abstracted fishing information from vessel logbooks, and measured lengths of individual fish (fork length) from landed catches. Coverage rates for catch and effort and length-frequency statistics were calculated as the ratio of sampled landings in weight to total landings.

Catch-and-effort and length-frequency statistics from the U.S. north Pacific albacore fishery were collected at landing ports throughout California, Oregon and Washington. NMFS observers on board four U.S. troll vessels (jigboats) also completed U.S. Pacific

albacore logbooks, and recorded length-frequency, gillnet damage, and various other data[1]. The majority of the landings were from jigboats, with lesser quantities from baitboats, gillnet boats, and vessels using a combination of bait and jig fishing gears (Table 1). The overall sampling coverage for catch-and-effort information was 62% in 1991 (Table 2), an increase from 57% in 1990[2]. Length-frequency sampling coverage was 61% in 1991, an increase from 56% in 1990. Sampling coverage increased for most individual ports as well.

TOTAL CATCH AND EFFORT

The 1991 U.S. north Pacific albacore fishery started in mid-May and continued through mid-October. The 200+ vessels participating in the fishery expended an estimated 3,866 days fishing (sampled days fishing/coverage rate) compared to 5,523 days fishing in 1990. In 1991, catches were highest in August, roughly 900 to 1,300 miles west of southern Oregon, and about 50-150 miles south of Cape St. James (Queen Charlotte Islands) (Figures 1a-g). Catches from the commercial fishery were a new record low of 1,845 mt for 1991, compared to 2,818 mt in 1990 (Table 3), a decrease of 35%. Sport catches in 1991 were estimated at 6 mt, caught in areas off the California coast from San Diego to San Francisco Bay. In May 1991, U.S. troll vessels fished for the first time in areas near Japan, where fishing success was spotty. Incidental amounts of other species recorded in the catch for the north Pacific albacore troll fishery included skipjack tuna (*Katsuwonis pelamis*), yellowfin tuna (*Thunnus albacares*), short-billed spearfish (*Tetrapturus angustirostris*), striped marlin (*Tetrapturus audax*), rainbow runner (*Elagatis bipinnulata*), and mahi mahi (*Coryphaena hippurus*).

Data from most of the foreign north Pacific albacore fisheries are available only through 1990 (Table 3). Japanese longline and gillnet catches of albacore have remained stable since 1986 (Figure 2). Japanese baitboat catches of albacore increased for the second straight year after a dramatic drop in 1988, and were 12,500 mt in 1990.

CATCH PER EFFORT

Estimates of catch per effort (number of fish landed per day fished) for U.S. jigboats in the north Pacific are independent of vessel size and are the ratio of catch to effort in each 1° square and month. Annual estimates are an average of all months and 1° squares where fishing occurred. The overall catch rate in 1991 (36 fish/day) was the same as that in 1990 (Figure 3). The highest nominal catch rates in 1991 occurred roughly 1,300 miles west of central Oregon in July (155 to 220 fish/day), and 1,250 miles west of central Oregon in August (205 to 260 fish/day) (Figures 4a-g). This area was farther offshore than where some of the highest catch rates (190-225 fish/day) were recorded in 1990.

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[1] Bartoo, N., D. Holts, and L. Halko. 1992. Report on the 1991 Cooperative north Pacific albacore observer project. SWFSC Admin. Rep., La Jolla, LJ-92-07. 14p.

[2] Rensink, Gary M. and Forrest R. Miller. 1991. Summary of the 1990 north Pacific albacore fisheries data. SWFSC Admin. Rpt., La Jolla, LJ-91-21. 33p.

LENGTH FREQUENCY

Over 24,000 albacore were measured for fork length (tip of snout to fork of the tail) from the landings of vessels participating in the 1991 U.S. north Pacific fishery (Table 1). Length-frequency data were summarized by gear and 5-degree latitudinal bands for inshore (east of 140°W) and offshore (west of 140°W) areas. The average fork length of fish measured decreased considerably from 16.4 lbs. (71.0 cm) in 1990 to 12.6 lbs. (65.1 cm) in 1991 (Figure 5). Fish ranged in size from 41 to 117 cm (Figure 6 and 7).

U.S. troll landings in 1990 consisted primarily of albacore with modes centered around 62 and 76 cm (Figures 7 and 8a; probably 3- and 4-year- old fish), as opposed to modes centered around 65 and 80 cm in 1990 though the data may be biased due to the small sample size. Landings from vessels using a combination of bait and jig gears also consisted primarily of 3- and 4-year-old fish (Figures 7 and 8b). Catch from vessels using gillnet gear consisted primarily of 2-year-old fish, with a mode centered around 56 cm (Figures 7 and 8c). The gillnet size distribution may be biased due to the small sample size. The U.S. north Pacific albacore fleet caught more of the larger fish (>70 cm) in the inshore areas (east of 140°W longitude) and between 40°N and 45°N latitude (Figures 8a-c). These bigger fish were also caught in large numbers in 1990.

SEA SURFACE TEMPERATURE

Sea-surface temperatures (SST's) recorded by commercial transport ships, fishing boats and research vessels were compiled into monthly means and analyzed by computer. SST contours (isotherms) were drawn by computer on charts with 1° latitude-longitude resolution. Analyses of the mean SST's (Figures 9a-f) show the distribution of isotherms and the location of surface ocean fronts. Areas where albacore catch was recorded in 1991 by the U.S. north Pacific albacore fleet are cross-hatched on the SST charts to show the relationship among areas of fishing, surface ocean fronts (close, horizontal packing of isotherms), and SST isotherm patterns.

The 1991 albacore season began in the western Pacific between 150°E and 170°E near 35°N where SST's were 1° to 2°C (1.8°-3.6°F) above normal along the northern edge of the subtropical ocean front. During June 1991 albacore fishing activity was stretched out along a fairly strong subtropical ocean frontal edge between 165°E and 160°W where SST's were from 1° to 2°C (1.8°-3.6°F) above normal. Some fishing had progressed eastward to 130°W in June where SST's were near normal and the ocean frontal edge was weak. During July fishing activity increased between 160°W and 130°W where SST's were 1° to 2°C (1.8°-3.6°F) above normal along the subtropical frontal edge which had weakened since June and moved north of 40°N. In July albacore fishing became active along the western edge of the SST frontal edge formed by coastal upwelling between Cape Blanco and Monterey Bay.

From August and into September fishing became concentrated in the offshore SST ridge where isotherms bulged northward toward Vancouver Island, and also in the coastal region from Vancouver Island to northern California where strong coastal upwelling had

formed numerous SST frontal edges. SST's were slightly above normal west of 130°W and were 1° to 3°C (1.8°-5.4°F) below normal in upwelled water east of 130°W. During October fishing was confined primarily to the offshore area between 40°N and 45°N where SST's were 1°C below normal in the only active SST frontal edges remaining.

NMFS OBSERVED TRIPS

National Marine Fisheries Service observers accompanied four U.S. troll vessels on four trips, starting in early July and finishing in late September 1991 (see Footnote 1). The observers recorded daily catches, gillnet inflicted damage on albacore in the catch, and fish lengths and weights over a wide fishing area of the north Pacific Ocean.

A total of 12,466 albacore were examined and measured in 1991. Overall, 3.1 % (1.9 % recent damage, 1.2 % healed scars from earlier net encounters) of the catch examined showed evidence of net related damage, compared to 12.4% (7.2% recent damage, 5.2% healed scars from earlier net encounters) for observed trips in 1990. The highest incidence of injuries from recent encounters with drift nets, up to 3.7 %, occurred east of 140°W and south of 50°N where there were lower proportions of smaller fish. Statistical analysis of condition factor, RNA to DNA ratio (a measure of recent stress), and lymphocyte/red blood cell ratio found no significant difference between damaged and undamaged fish.

SUMMARY

The 1991 U.S. north Pacific albacore fishery landings (1,845 mt) represented a 35% decrease from landings in 1990, and the lowest total landings ever recorded. Overall catch rates were 36 fish/day for both the 1990 and 1991 seasons. A larger number of smaller fish in the catch resulted in a 23 % decrease in the average size of albacore caught (16.4 lbs. in 1990; 12.6 lbs. in 1991). U.S. north Pacific albacore sampling coverage increased from 57% and 56% in 1990 to 62% and 61% in 1991 for catch and effort and length-frequency respectively. Data collected during the 1991 NMFS observed trips showed that 3.1 % of the albacore caught had been damaged by previous encounters with gillnets, compared to 12.4% in 1990.

ACKNOWLEDGEMENTS

We thank the captains and crews of the U.S. north Pacific albacore fishing fleet, and William Perkins of the Western Fishboat Owners Association for their cooperation and continuing support of this program. We also thank Mary Larson of CDFG, Larry Hreha of ODFW, Brian Culver of WDF, and Russ Porter of Pacific States Marine Fisheries Commission, and members of their staffs for distributing logbooks and collecting albacore fishing information during the fishing seasons.

Atilio Coan Jr., Norman Bartoo, and Gary Sakagawa received drafts of this report and provided useful comments. Henry Orr illustrated the maps, and Karen Handschuh prepared figures and typed the final draft of the manuscript.

Table 1. Sampling results of the U.S. North Pacific albacore fishery by gear for 1990 and 1991.

Gear-type	Effort (days)	Catch (number)	No. of Fish Measured
1990			
Bait	71	8,609	107
Jig	2,849	198,469	40,341
Bait & Jig	135	15,580	2,884
Gillnet	41	16	11
Purse Seine	19	7,292	327
Unknown	33	0	0
TOTAL	3,148	229,966	43,670
1991			
Bait	2	185	0
Jig	2,353	191,831	22,857
Bait & Jig	42	5,439	1,087
Gillnet	0*	0*	181
Purse Seine	0	0	0
Unknown	0	0	0
TOTAL	2,397	197,455	24,125

* No catch/effort information was obtained from gillnet vessels, even though some gillnet-caught fish were measured.

Table 2. Sampling coverage for the U.S. North Pacific albacore fishery by state for 1990 and 1991

State Where Fish Landed	Landings (mt) Total	Landings (mt) Sampled	Landings (mt) Coverage	Number of Landings Total	Number of Landings Sampled
1990					
Catch-and-Effort:					
California	723.1	575.8	80%	271	54
Oregon	942.3	483.3	51%	325	97
Washington	1,152.9	540.2	47%	163	52
TOTAL	2,818.3	1,599.3	57%	759	203
Length-Frequency:					
California	723.1	497.7	69%	271	56
Oregon	942.3	326.2	35%	325	47
Washington	1,152.9	747.6	65%	163	63
TOTAL	2,818.3	1,571.5	56%	759	166
1991					
Catch-and-Effort:					
California	861.8	499.3	58%	357	84
Oregon	556.1	368.6	66%	105	49
Washington	427.0	279.6	65%	55	57
TOTAL	1,844.9	1,147.5	62%	517	190
Length-Frequency:					
California	861.8	575.7	67%	357	76
Oregon	556.1	225.6	41%	105	26
Washington	427.0	322.5	76%	55	24
TOTAL	1,844.9	1,123.8	61%	517	126

Table 3. Catches of north Pacific albacore in metric tons by fisheries, 1952-1991.

	JAPAN[1]						TAIWAN[4]		KOREA[2]	UNITED STATES[3]						CANADA	
YEAR	BAIT	LONG LINE	GILL NET	PURSE SEINE	OTHER GEAR	TOTAL	LONG LINE	GILL NET	LONG LINE	BAIT	JIG	SPORT	GILL NET	PURSE SEINE	TOTAL	TROLL	GRAND TOTAL
1952	41,786	26,687		154	237	68,864					23,843	1,373			25,216	71	94,151
1953	32,921	27,777		38	132	60,868					15,740	171			15,911	5	76,784
1954	28,069	20,958		23	38	49,088					12,246	147			12,393		61,481
1955	24,236	16,277		8	136	40,657					13,264	577			13,841		54,498
1956	42,810	14,341			57	57,208					18,751	482			19,233	17	76,458
1957	49,500	21,053		83	151	70,787					21,165	304			21,469	8	92,264
1958	22,175	18,432		8	124	40,739					14,855	48			14,903	74	55,716
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		7	268	36,348				2,837	12,061	1,355			16,253	4	52,605
1962	8,729	15,764		53	191	24,737				1,085	19,760	1,681			22,526	1	47,264
1963	26,420	13,464		59	218	40,161				2,432	25,147	1,161			28,740	5	68,906
1964	23,858	15,458		128	319	39,763	26			3,411	18,392	824			22,627	3	62,419
1965	41,491	13,701		11	121	55,324	261			417	16,545	731			17,693	15	73,293
1966	22,830	25,050		111	585	48,576	271			1,600	15,342	588			17,530	44	66,421
1967	30,481	28,869		89	520	59,959	305			4,113	17,826	707			22,646	161	83,071
1968	16,597	23,961		267	1,109	41,934	482			4,906	20,444	951			26,301	1,028	69,745
1969	32,107	18,006		521	1,480	52,114	569			2,996	18,839	358			22,193	1,365	76,241
1970	24,376	15,372		317	794	40,859	1,482			4,416	21,041	822			26,279	354	69,974
1971	53,198	11,035		902	367	65,502	1,739			2,071	20,537	1,175			23,783	1,587	92,611
1972	60,762	12,649	1	277	646	74,335	2,904			3,750	23,608	637			27,995	3,558	108,792
1973	69,811	16,059	39	1,353	533	87,795	128			2,236	15,667	84			17,987	1,270	107,180
1974	73,576	13,053	224	161	959	87,973	84			4,777	20,187	94			25,058	1,207	114,322
1975	52,157	10,060	166	159	254	62,796	254		319	3,243	18,975	640			22,858	101	86,328
1976	85,336	15,896	1,070	1,109	285	103,696	565		971	2,700	15,932	713			19,345	252	124,829
1977	31,934	15,737	688	669	379	49,407	301		65	1,497	10,005	537			12,039	53	61,865
1978	59,877	13,061	4,029	1,115	2,097	80,179	278		174	950	16,682	810			18,442	23	99,096
1979	44,662	14,249	2,856	125	1,158	63,050	106		27	303	6,801	74			7,178	521	70,882
1980	46,743	14,743	2,986	329	1,209	66,010	39		15	382	7,574	168			8,124	212	74,400
1981	27,426	18,020	10,348	252	904	56,950	163		600	748	12,694	195			13,637	200	71,550
1982	29,615	16,762	12,511	561	732	60,181	521		1,070	425	6,661	257			7,343	104	69,219
1983	21,098	15,103	6,852	350	125	43,528	512		1,233	607	9,512	87			10,206	225	55,704
1984	26,015	15,111	8,988	3,380	518	54,012	471		1,041	1,030	9,378	1,427		3,728	15,563	50	71,137
1985	20,714	14,320	11,204	1,533	407	48,178	109		2,169	1,498	6,431	1,176	2		9,107	56	59,619
1986	16,096	12,945	7,813	1,542	650	39,046				432	4,708	196	3		5,339	30	44,414
1987	19,091	14,642	6,698	1,205	189	41,825		7,700		158	2,766	74	5		3,003	104	52,632
1988	6,216	13,904	9,074	1,208	177	30,579	38	11,366		598	4,212	64	15		4,889	155	47,027
1989	8,629	12,899	7,437	2,521	1,421	32,907	504	4,200		54	1,860	160	4		2,078	200	39,889
1990	12,500			2,315		14,815				115	2,603	24	29	71	2,842	305	17,962
1991										0	1,828	6	17	0	1,851		

[1] Japanese baitboat catches include fish caught by research vessels. Longline catches for 1952-60 exclude minor amounts taken by vessels under 20 tons; catches from 1958-68 were readjusted in 1988; catches are estimated by multiplying annual number of fish caught by average weight statistics. Gillnet catches for 1983-88 include south Pacific catches and are for the directed fishery.

[2] Korean longline catches calculated from FAO statistics and Korean catch/effort data. Gillnet catches are missing.

[3] U.S. jigboat catches for 1952-60 include fish caught by baitboats, for 1961-85 include fish landed in Hawaii, for 1984-88 include gillnet catches. Figures for 1991 are preliminary, the jigboat catch includes fish caught by trawl and unknown gears. Figures from 1959-1990 may not include local landings in Hawaii, which range up to 175 mt.

[4] Taiwanese gillnet catches are preliminary figures via personal communications from Institute of Oceanography, National Taiwan University.

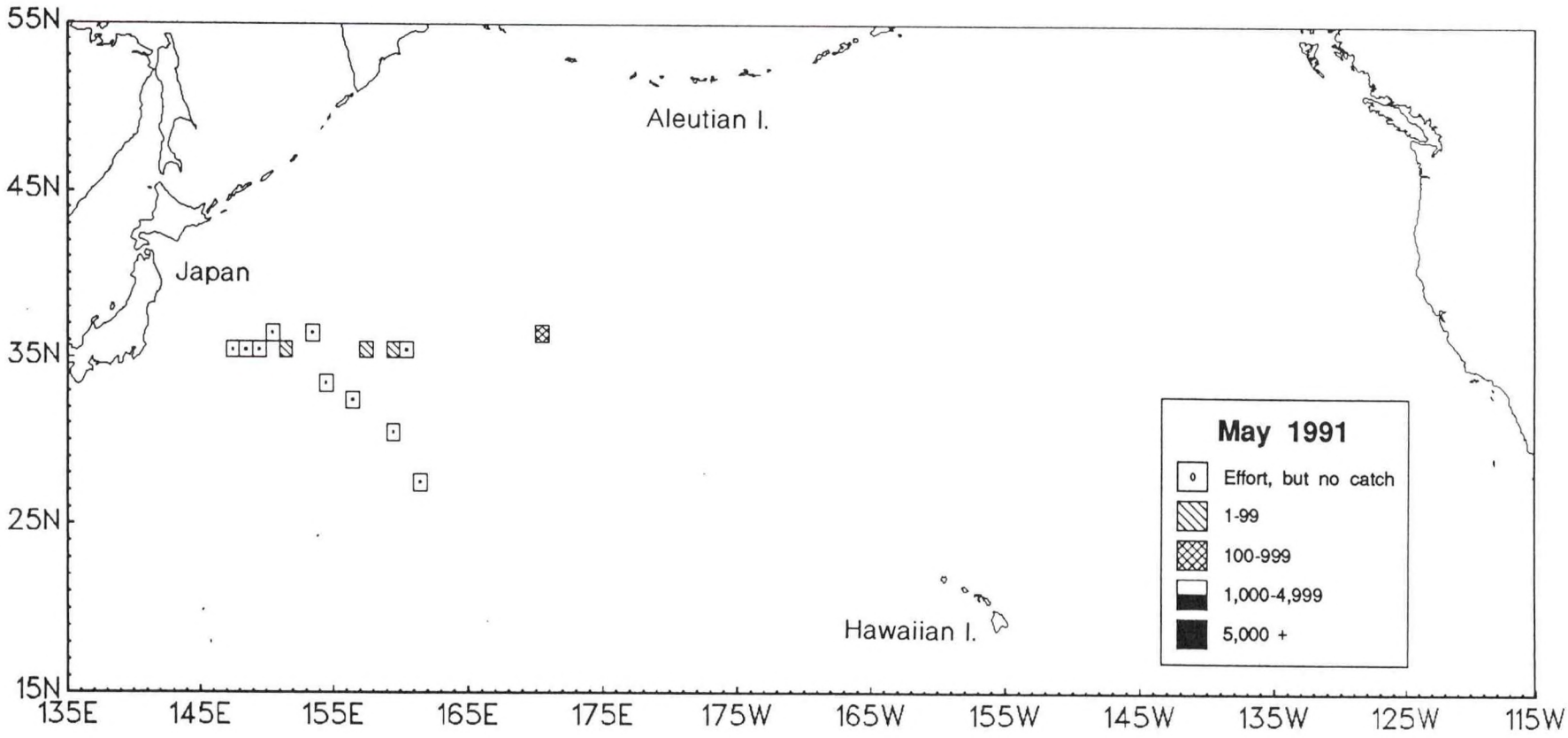

Figure 1a. U.S. albacore catch (numbers of fish) by 1° quadrangle in the north Pacific, May 1991.

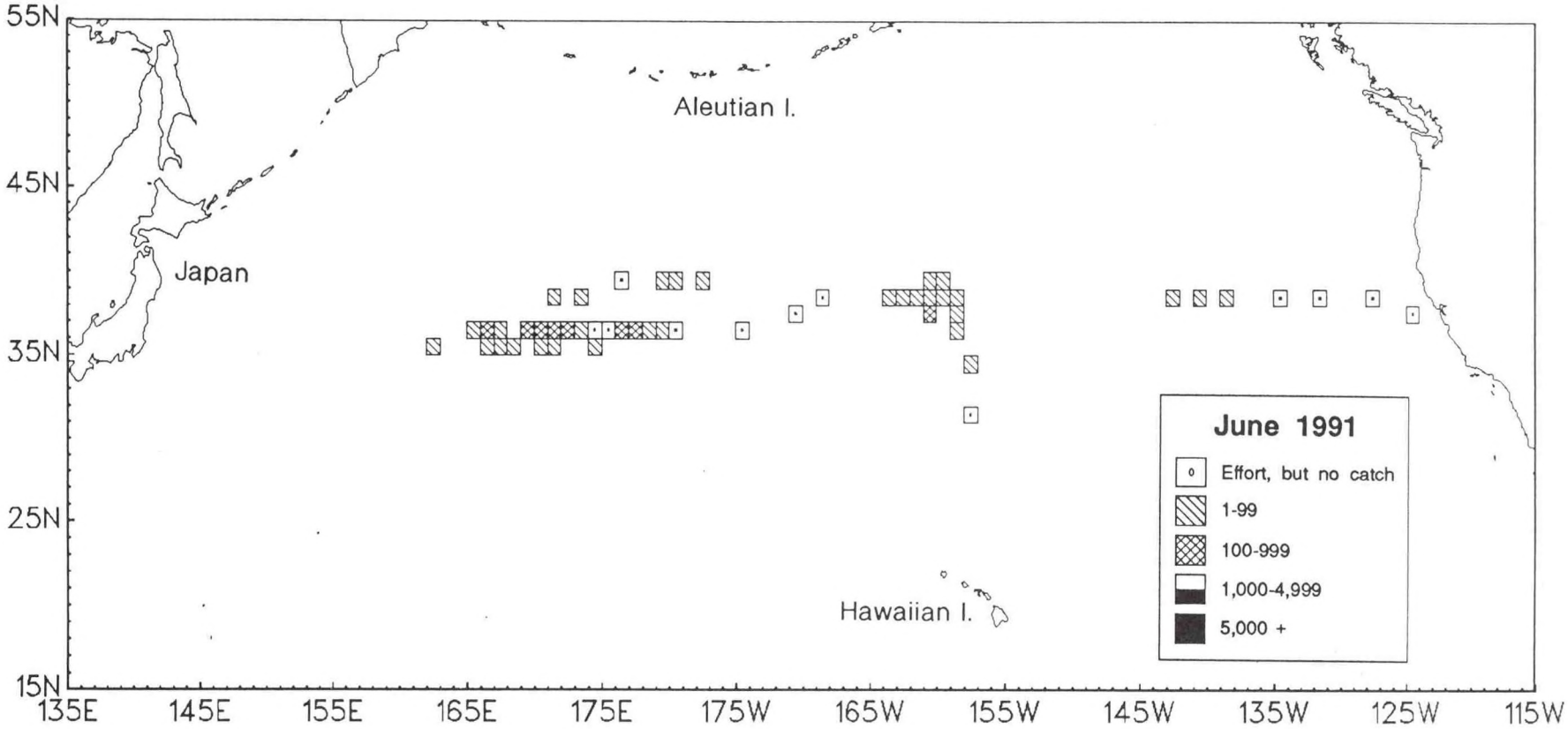

Figure 1b. U.S. albacore catch (numbers of fish) by 1° quadrangle in the north Pacific, June 1991.

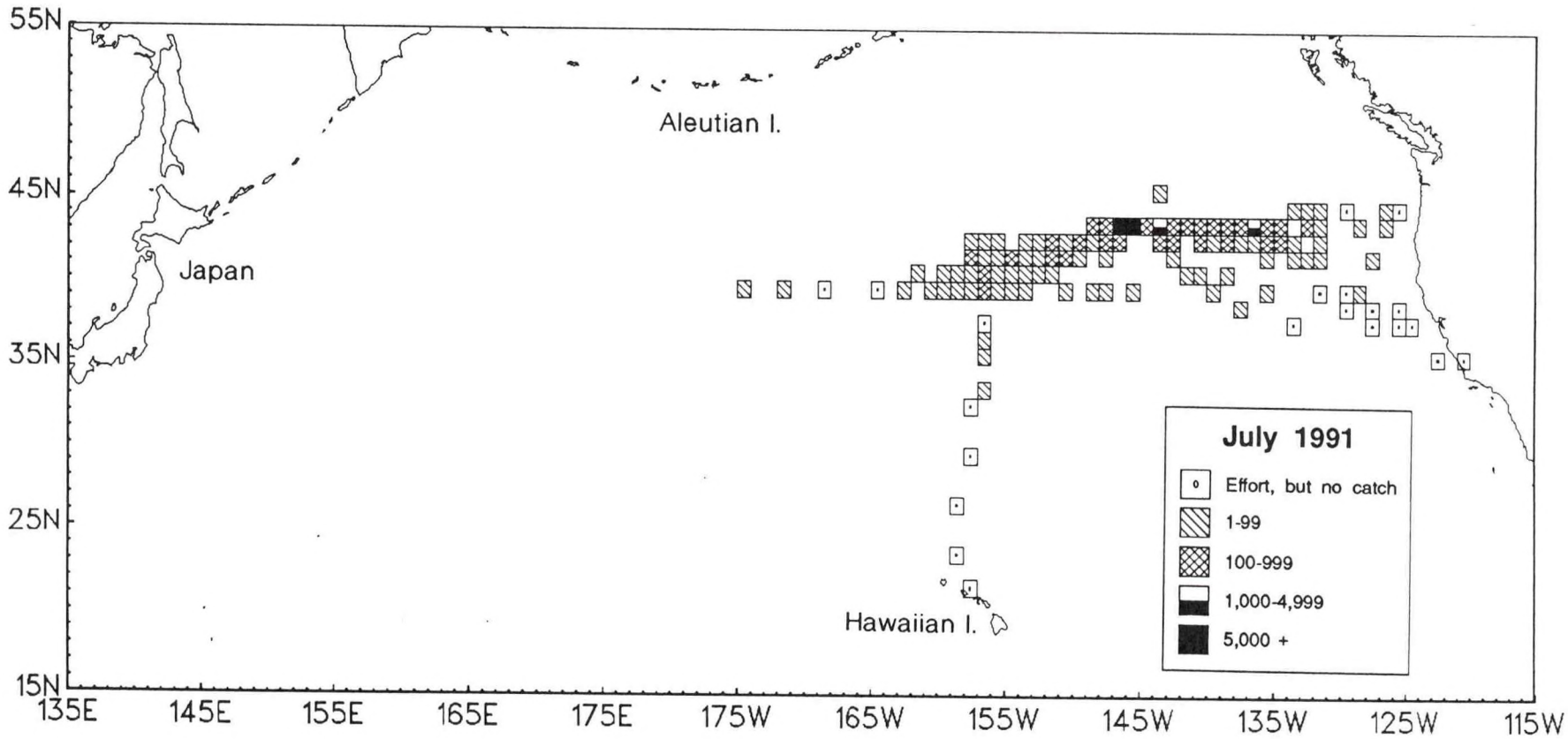

Figure 1c. U.S. albacore catch (numbers of fish) by 1° quadrangle in the north Pacific, July 1991.

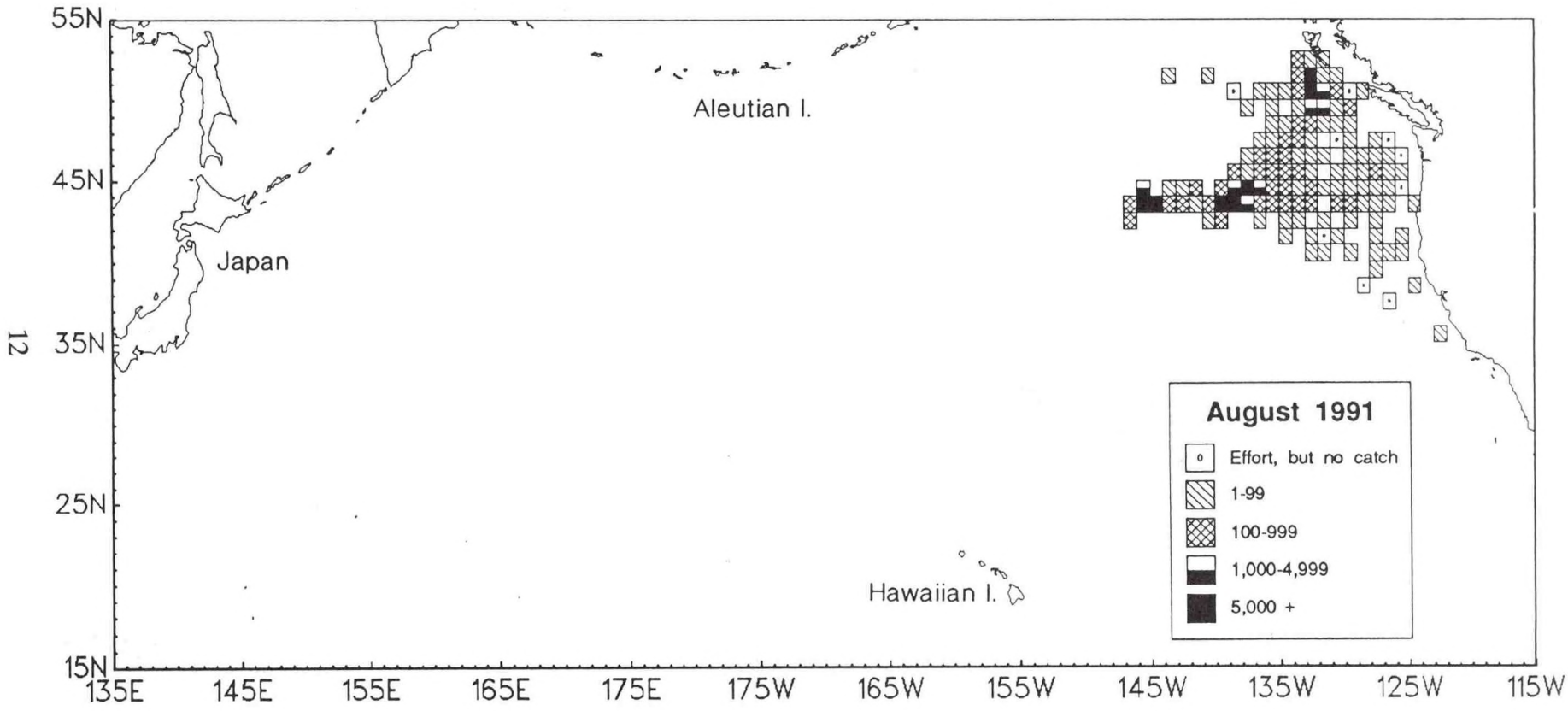

Figure 1d. U.S. albacore catch (numbers of fish) by 1° quadrangle in the north Pacific, August 1991.

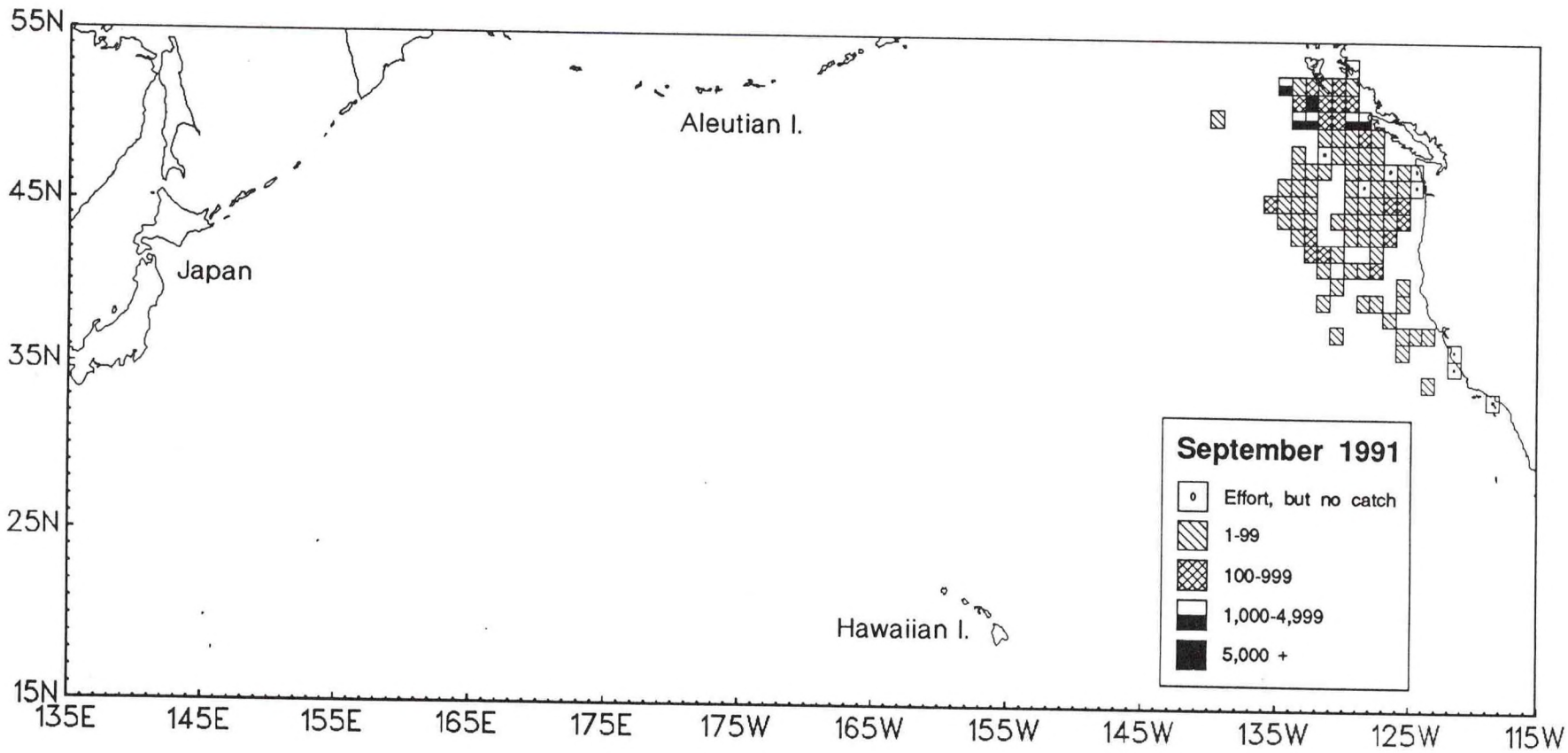

Figure 1e. U.S. albacore catch (numbers of fish) by 1° quadrangle in the north Pacific, September 1991.

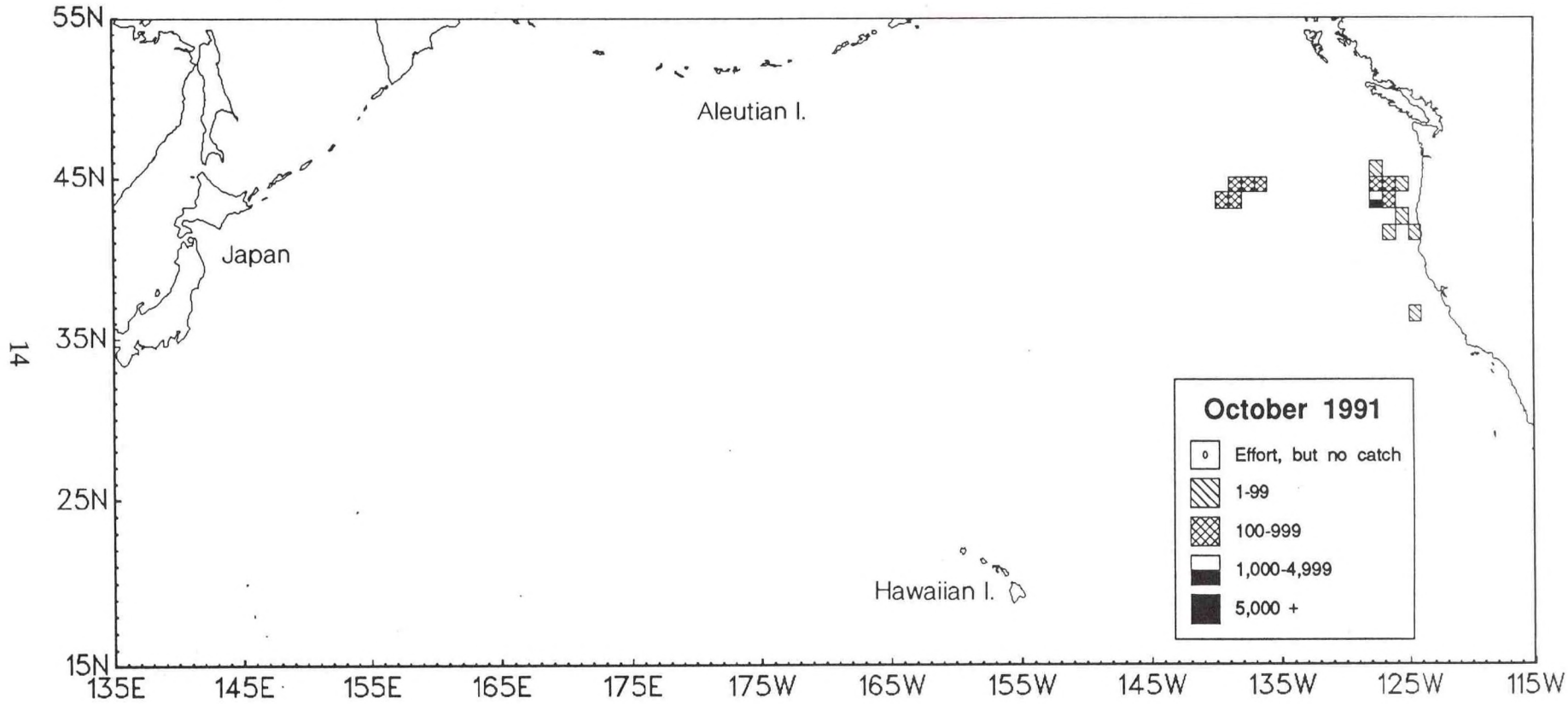

Figure 1f. U.S. albacore catch (numbers of fish) by 1° quadrangle in the north Pacific, October 1991.

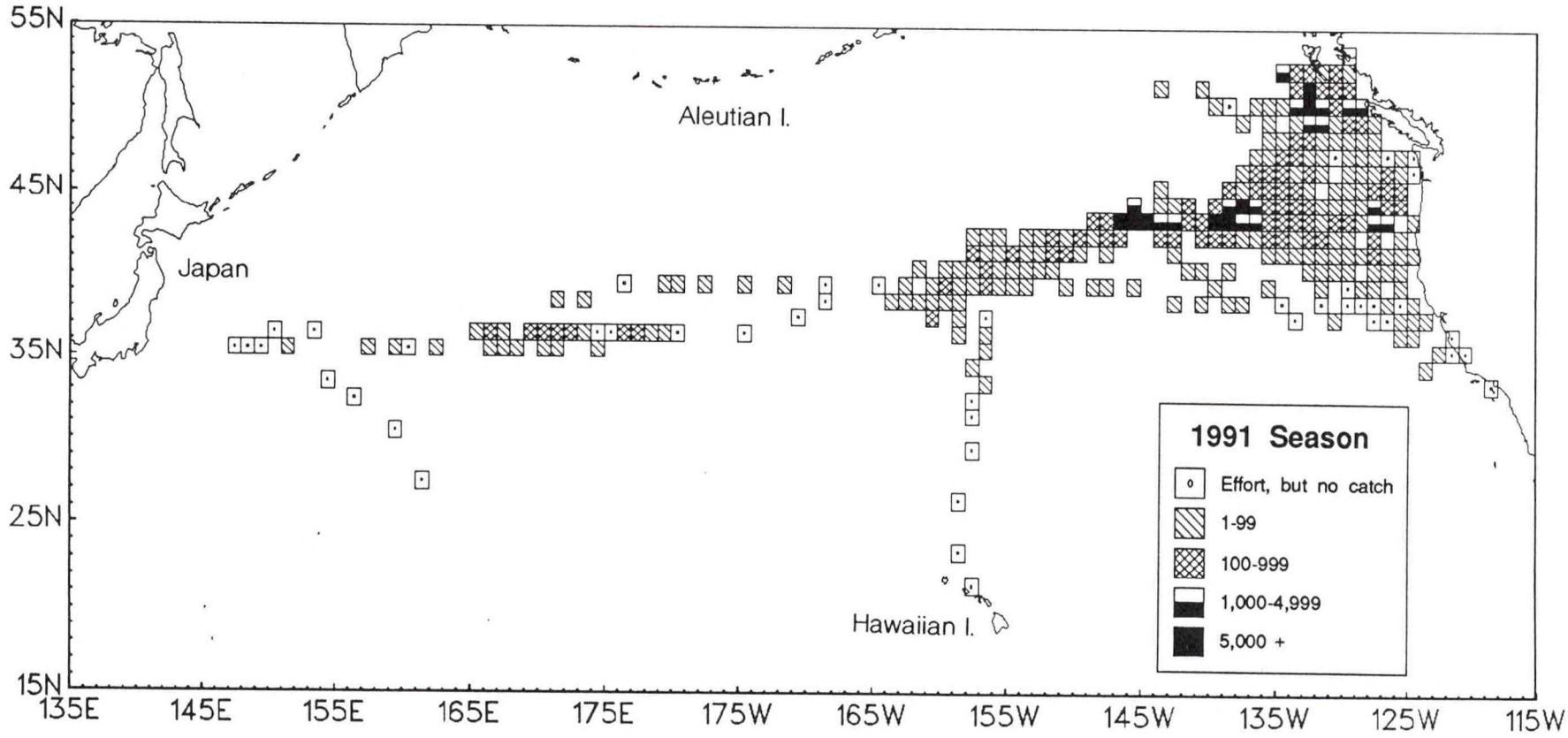

Figure 1g. U.S. albacore catch (numbers of fish) by 1° quadrangle in the north Pacific, 1991 season.

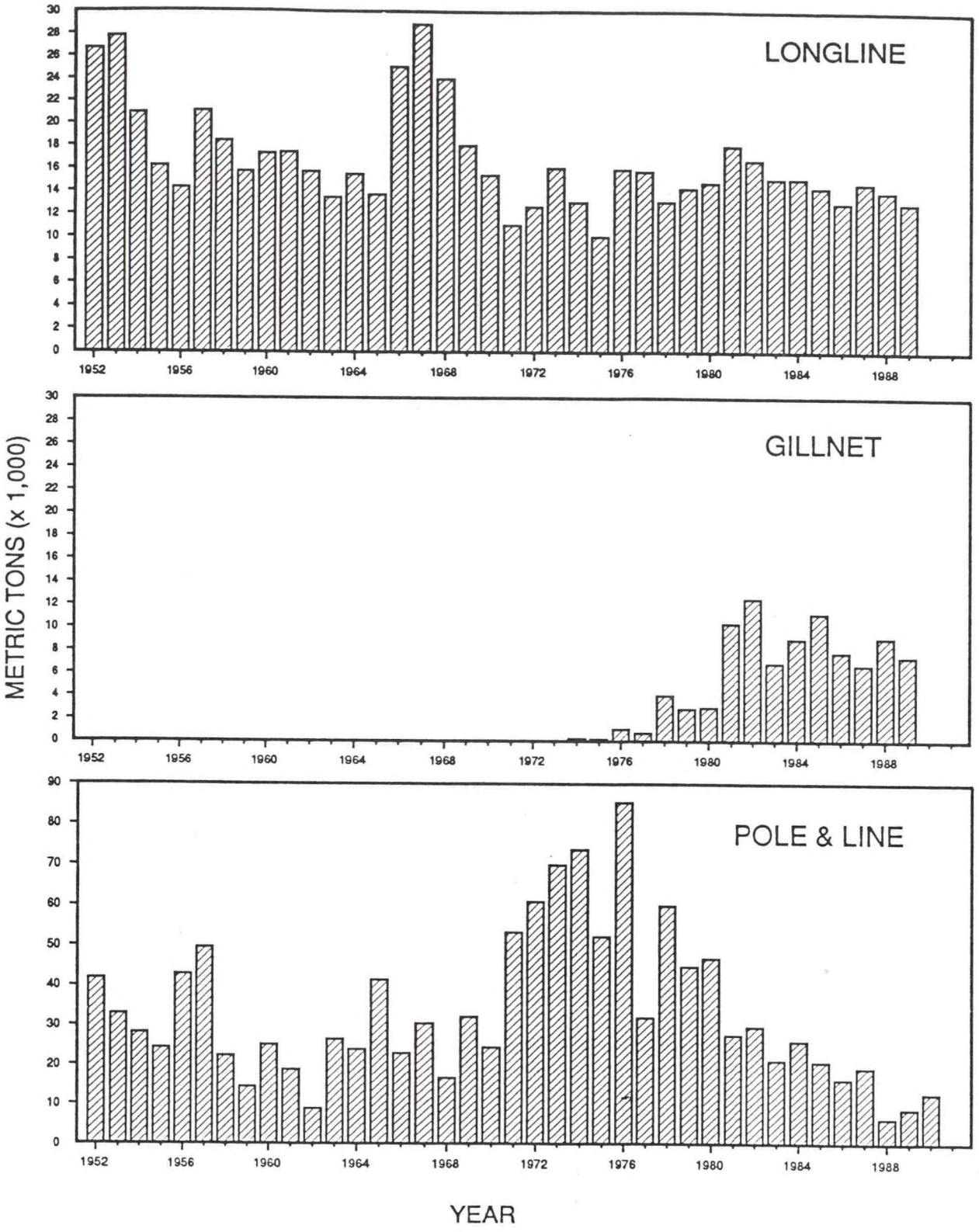

Figure 2. Japanese north Pacific albacore catch (metric tons) by selected fishery, 1952-1991.

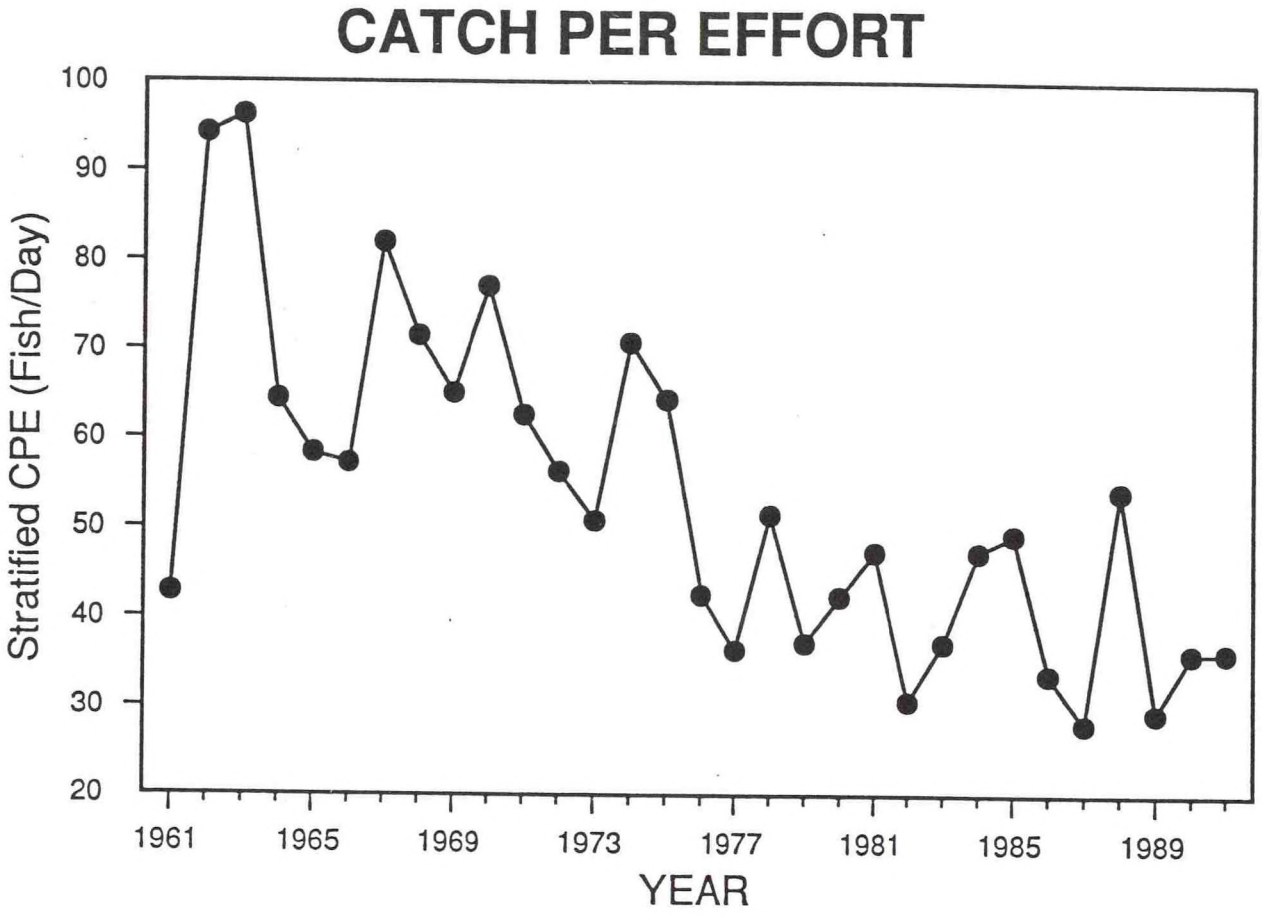

Figure 3. U.S. north Pacific albacore jigboat stratified Catch Per Effort (fish/day) by year, 1961-1991.

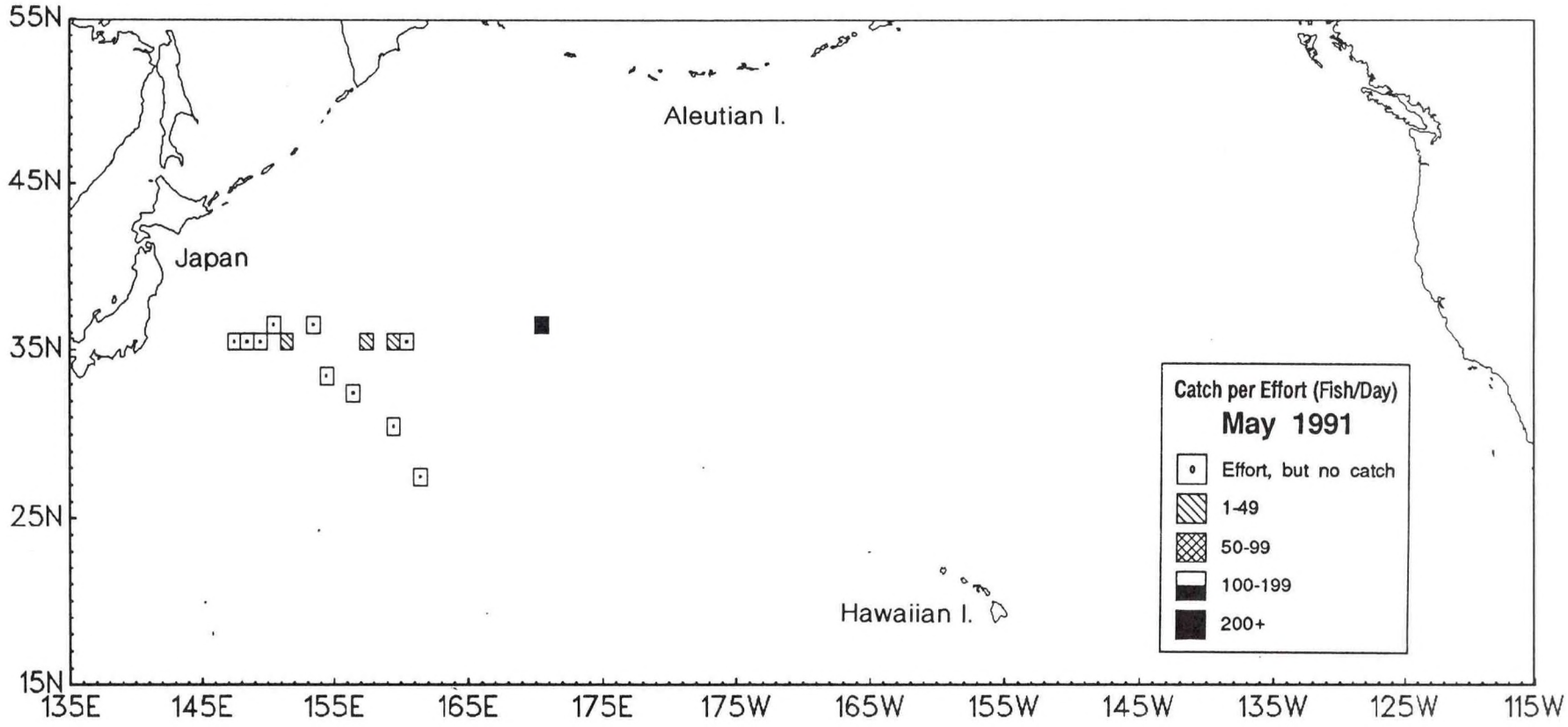

Figure 4a. U.S. albacore jigboat Catch Per Effort (fish/day) by 1° quadrangle in the north Pacific, May 1991.

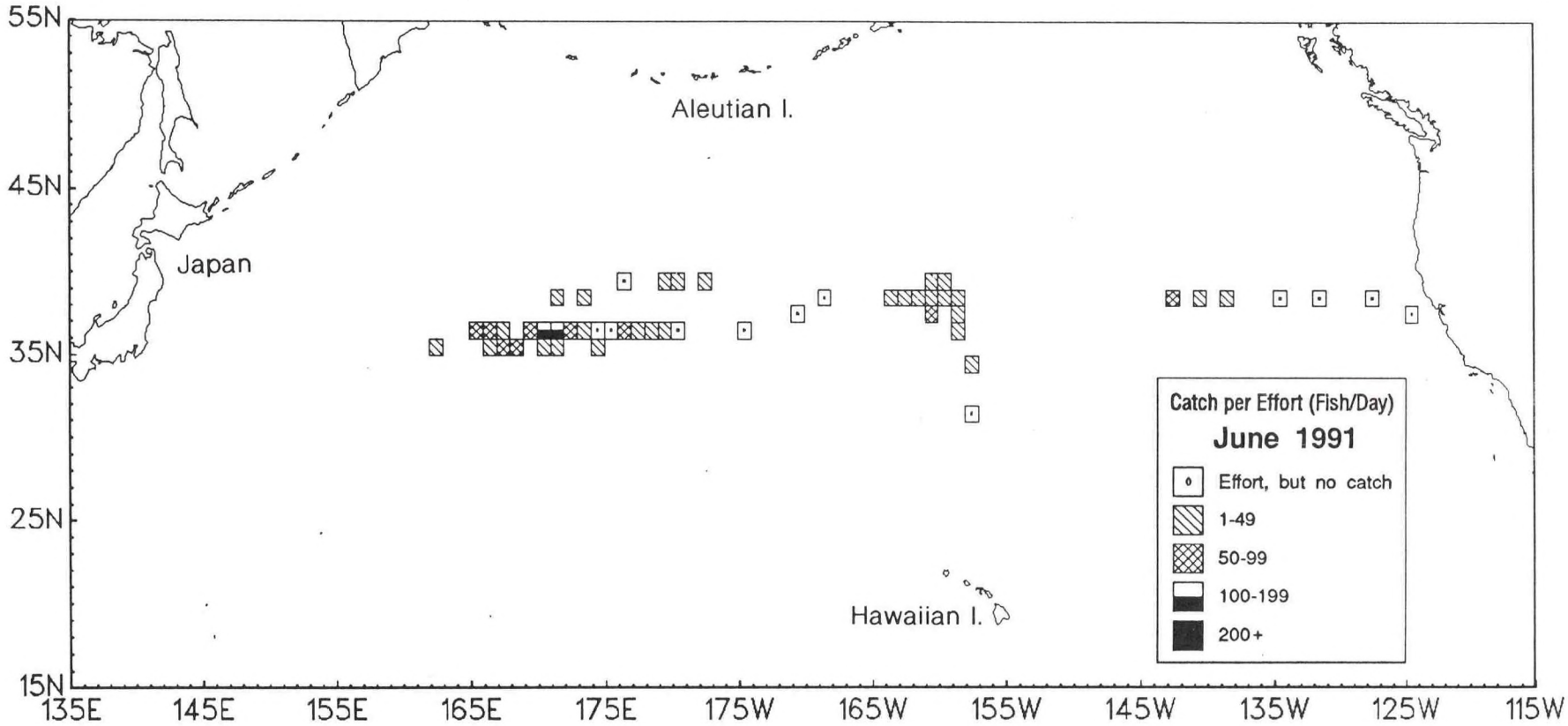

Figure 4b. U.S. albacore jigboat Catch Per Effort (fish/day) by 1° quadrangle in the north Pacific, June 1991.

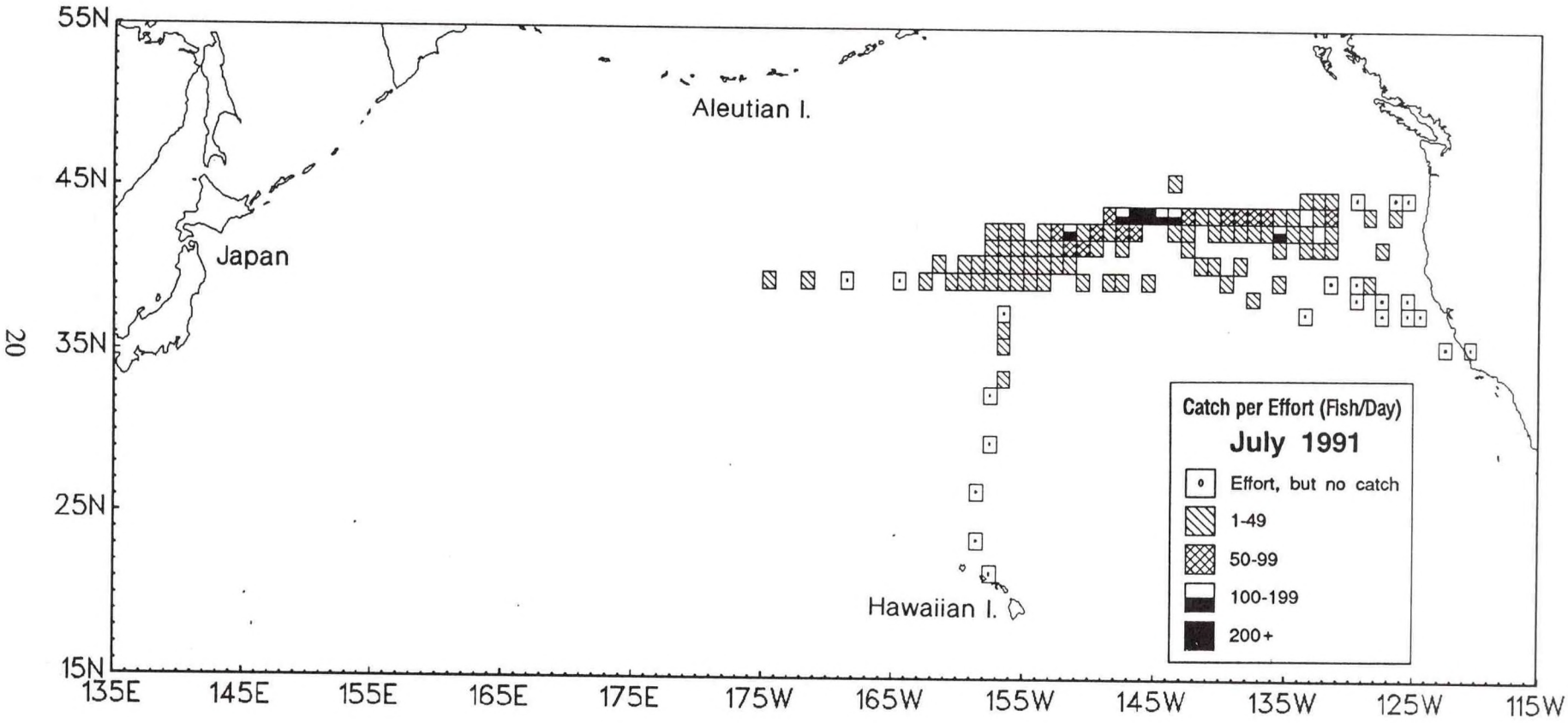

Figure 4c. U.S. albacore jigboat Catch Per Effort (fish/day) by 1° quadrangle in the north Pacific, July 1991.

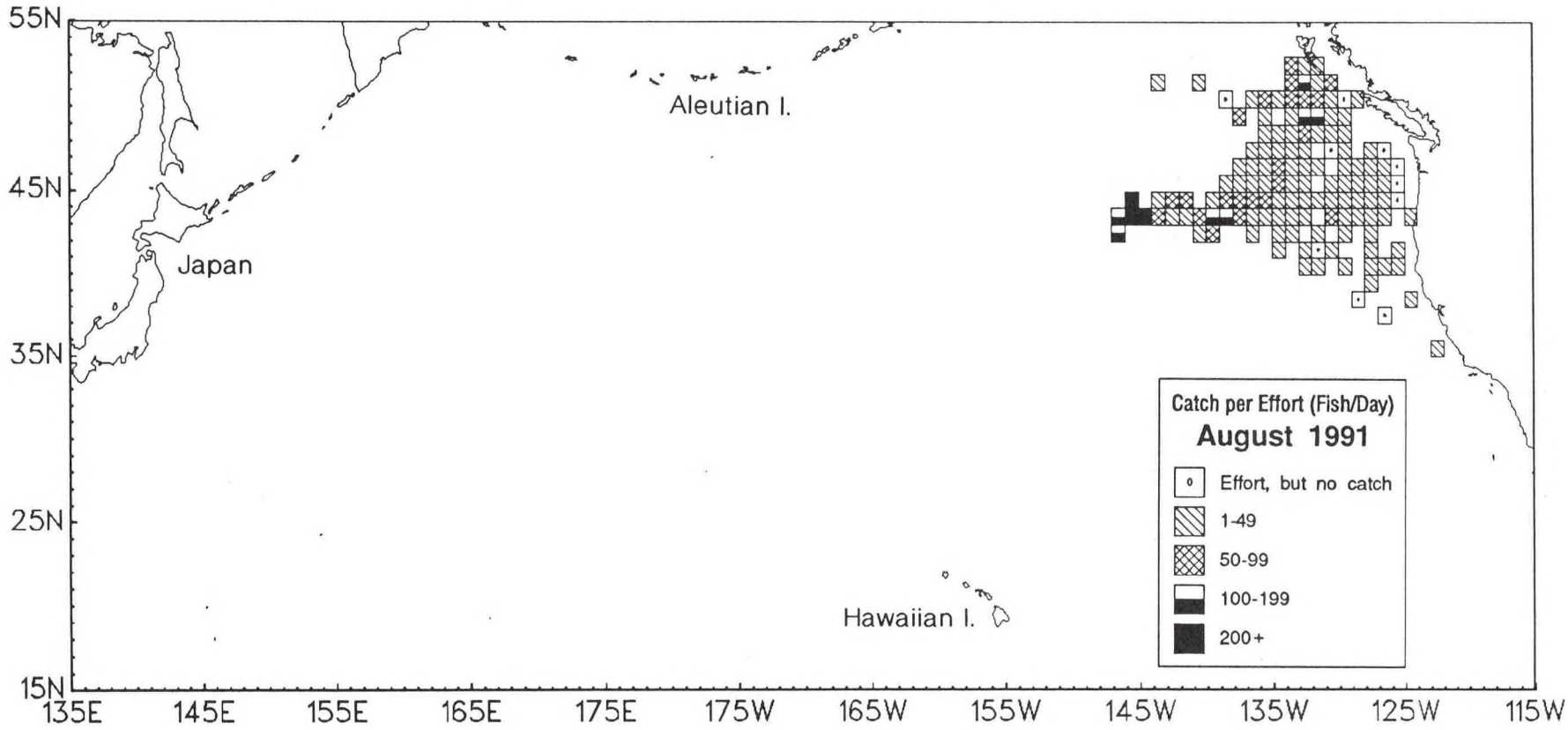

Figure 4d. U.S. albacore jigboat Catch Per Effort (fish/day) by 1° quadrangle in the north Pacific, August 1991.

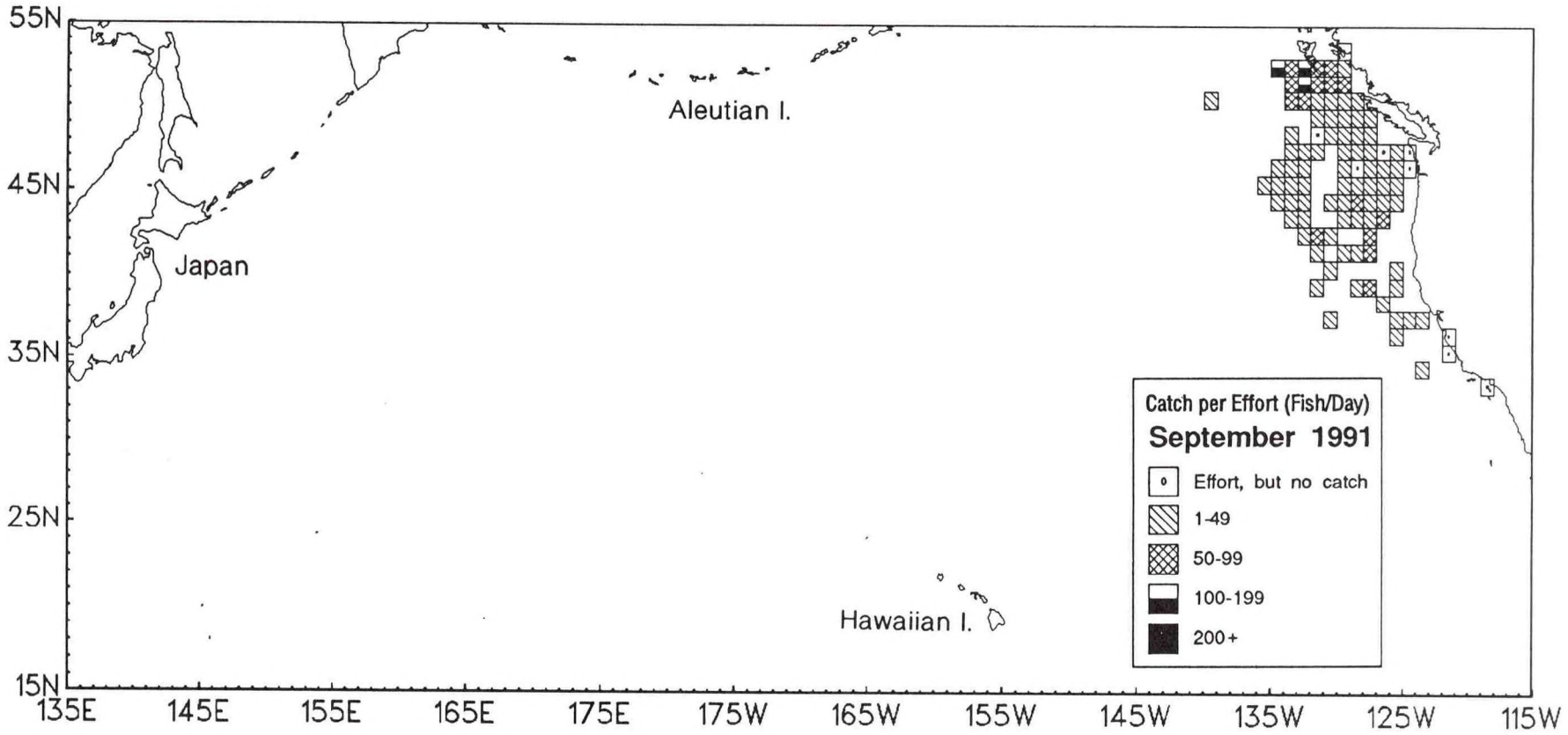

Figure 4e. U.S. albacore jigboat Catch Per Effort (fish/day) by 1° quadrangle in the north Pacific, September 1991.

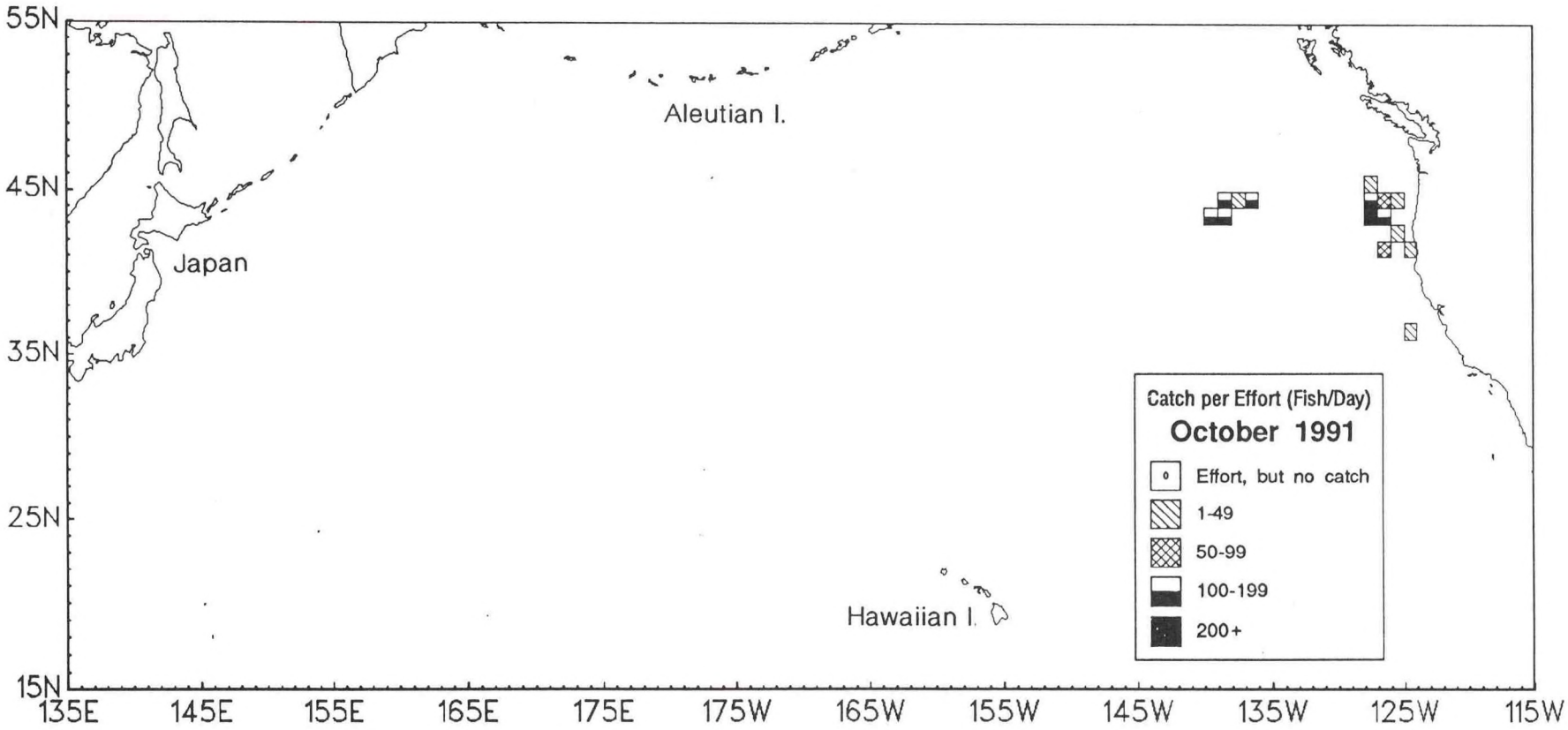

Figure 4f. U.S. albacore jigboat Catch Per Effort (fish/day) by 1° quadrangle in the north Pacific, October 1991.

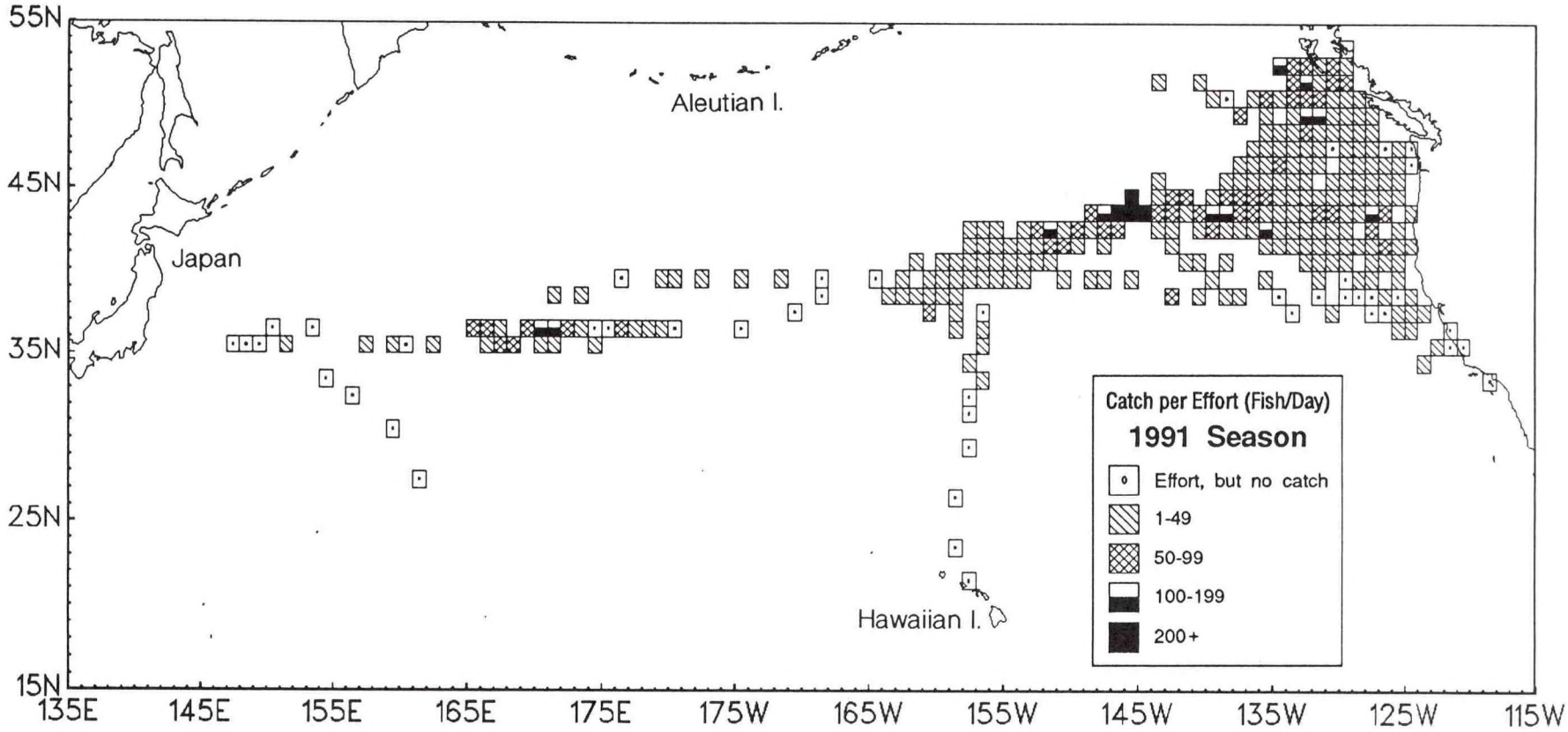

Figure 4g. U.S. albacore jigboat Catch Per Effort (fish/day) by 1° quadrangle in the north Pacific, 1991 season.

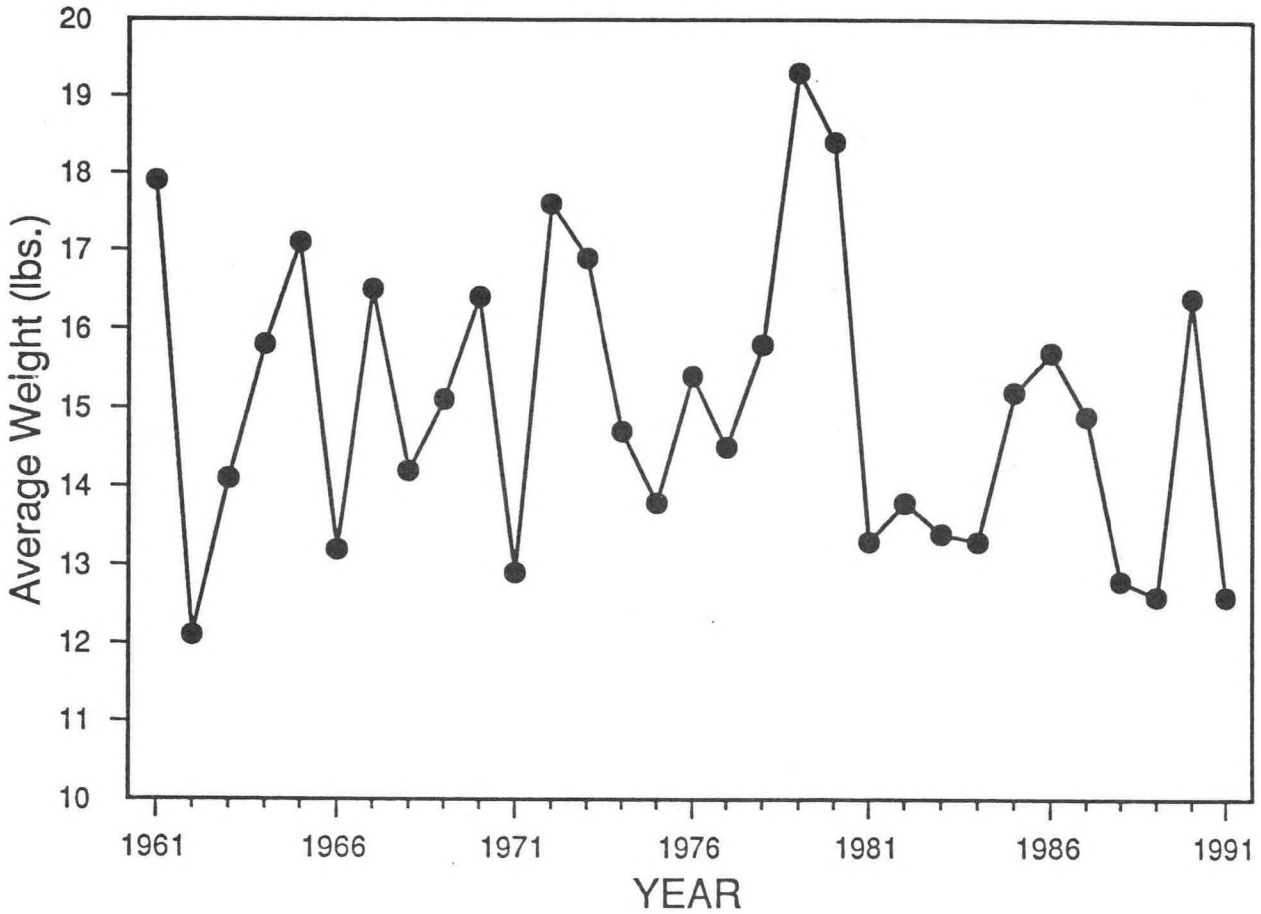

Figure 5. Average weight (lbs.) of north Pacific albacore caught by U.S. vessels by year, 1961-1991.

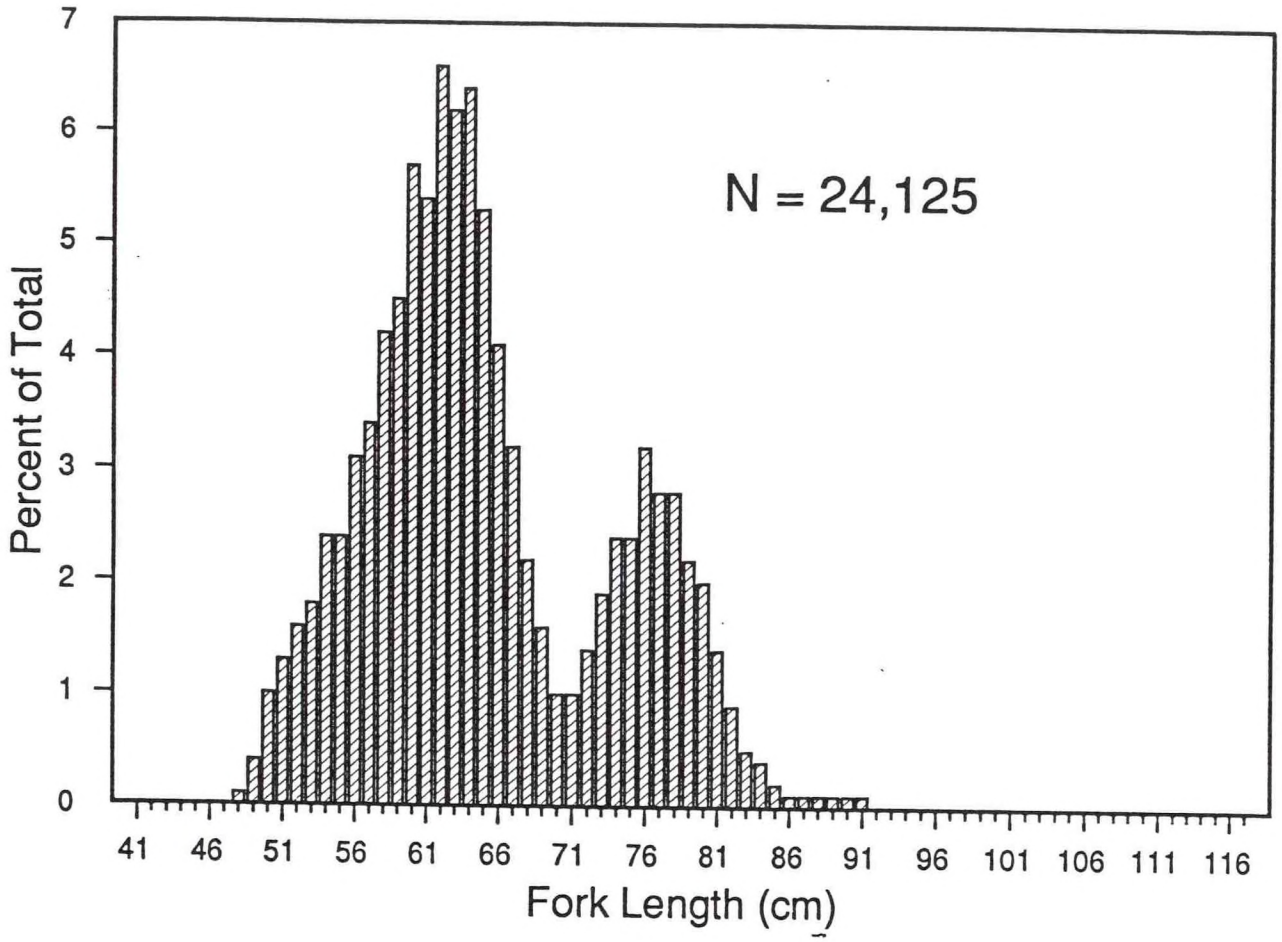

Figure 6. Length-frequency histogram of fish caught by the U.S. north Pacific albacore fleet, 1991 season.

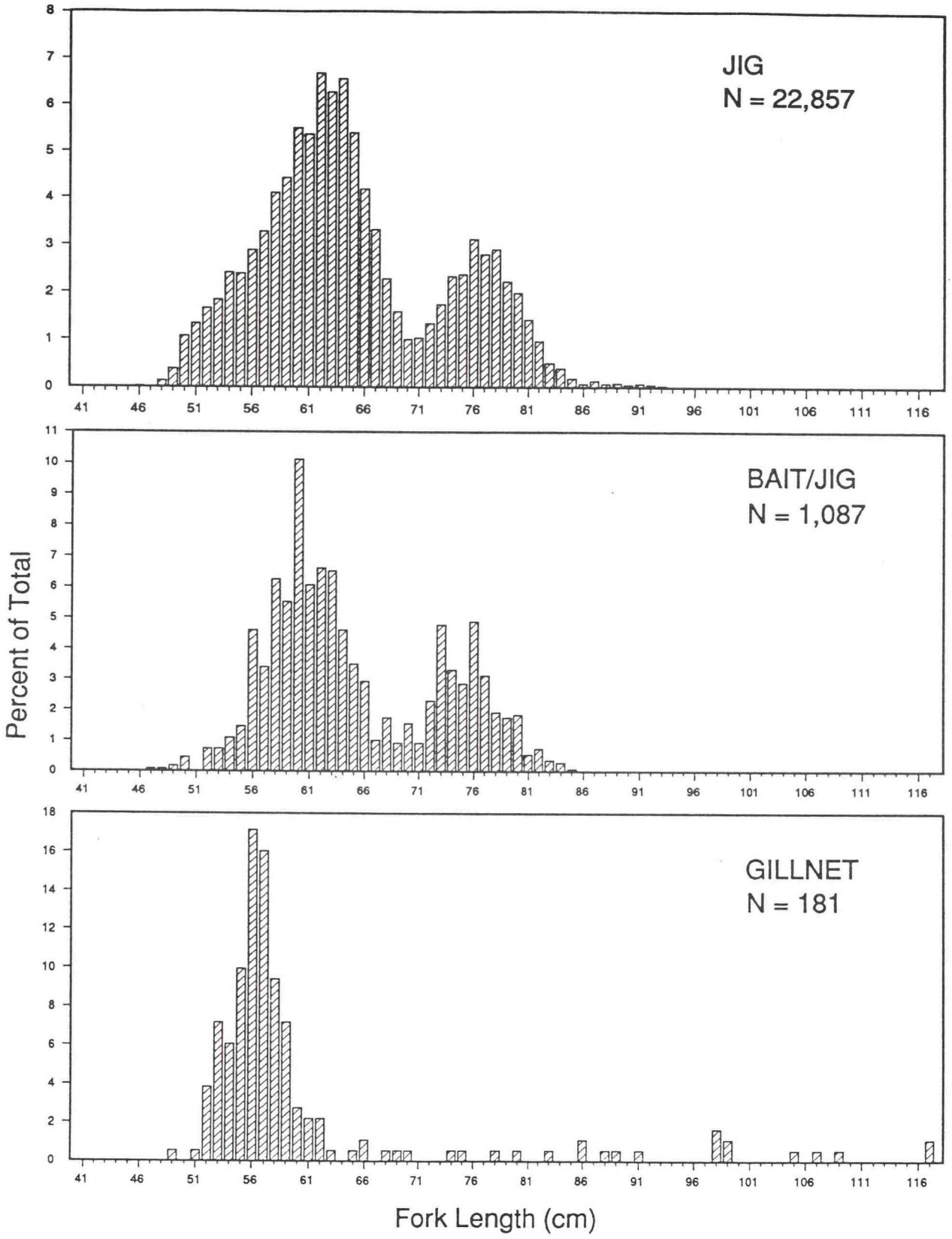

Figure 7. Length-frequency histograms of fish caught by the U.S. north Pacific albacore fleet in 1991 by gear.

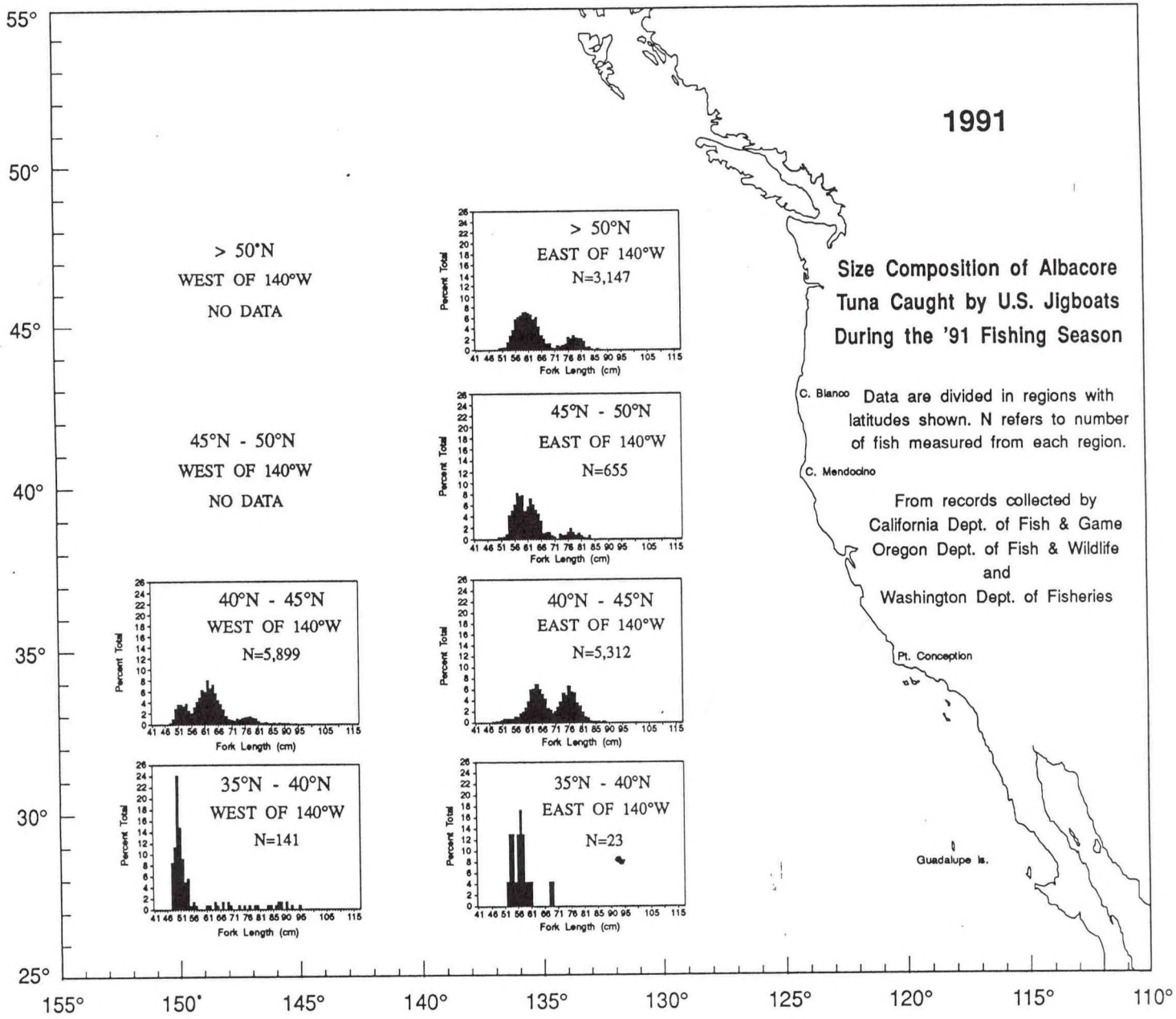

Figure 8a. Length-frequency histograms of albacore caught by U.S. vessels fishing jig in the north Pacific, 1991 season.

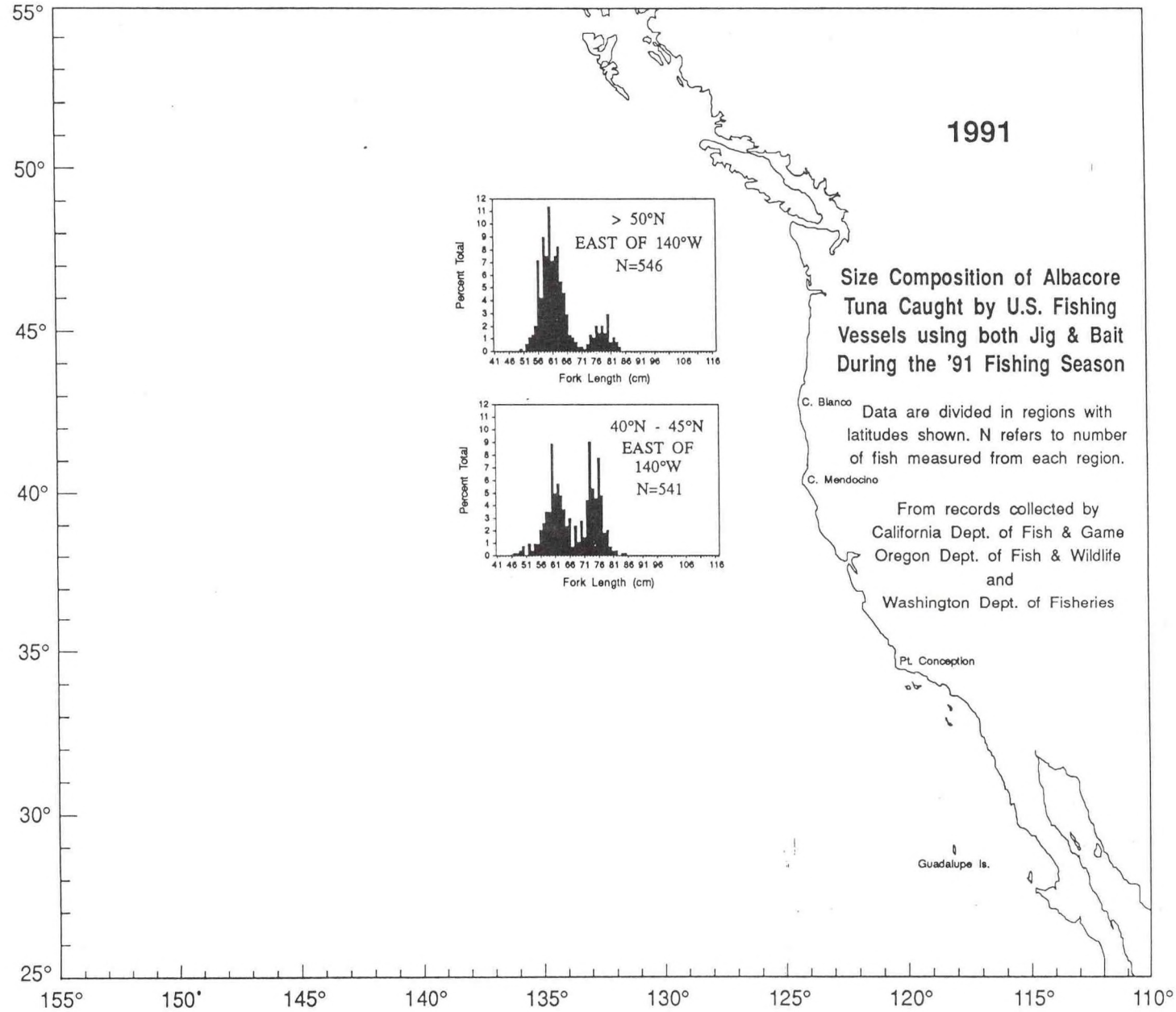

Figure 8b. Length frequency histograms of albacore caught by U.S. vessels fishing bait and jig in the north Pacific, 1991 season.

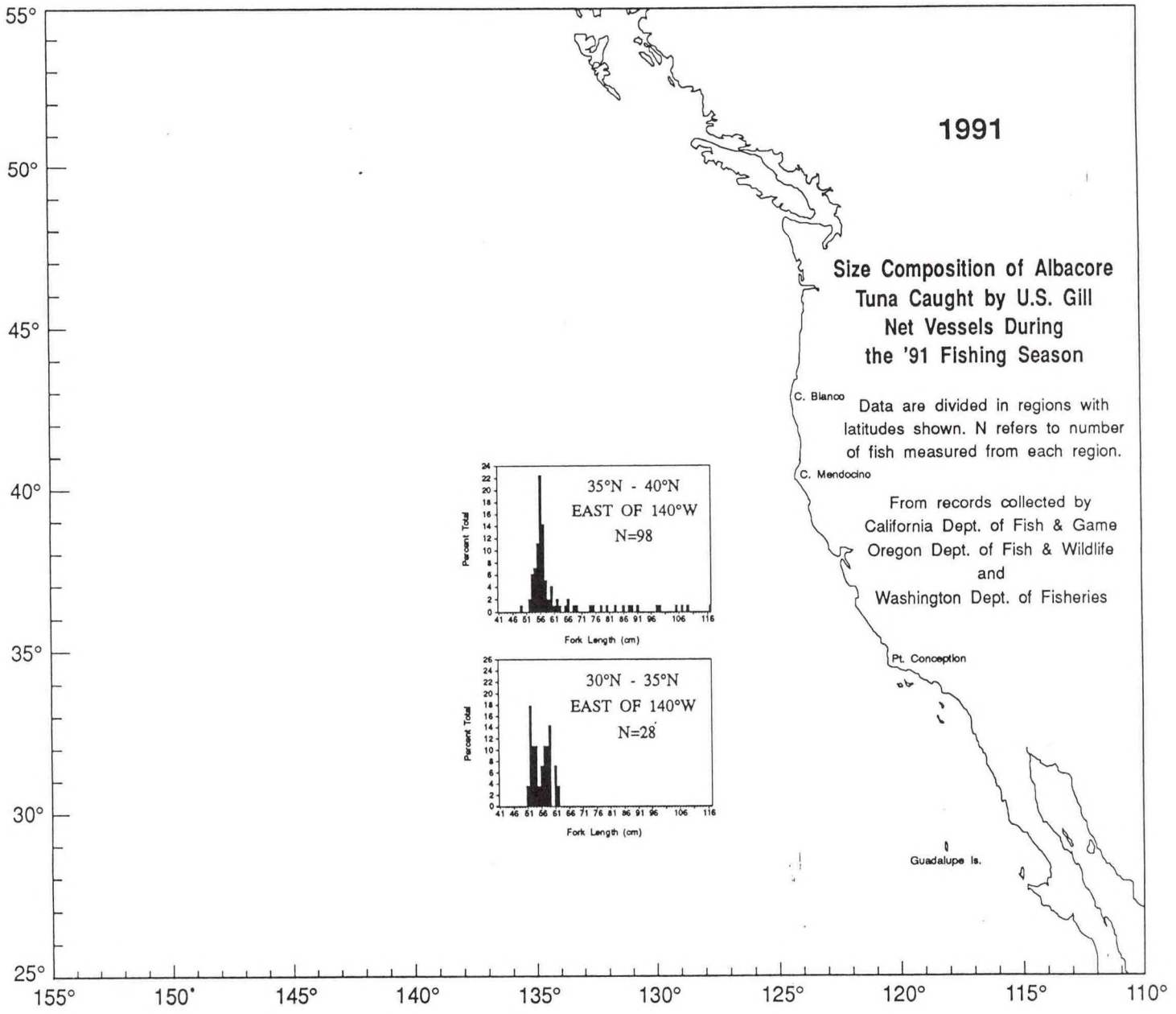

Figure 8c. Length frequency histograms of albacore caught by U.S. vessels fishing gillnet in the north Pacific, 1991 season.

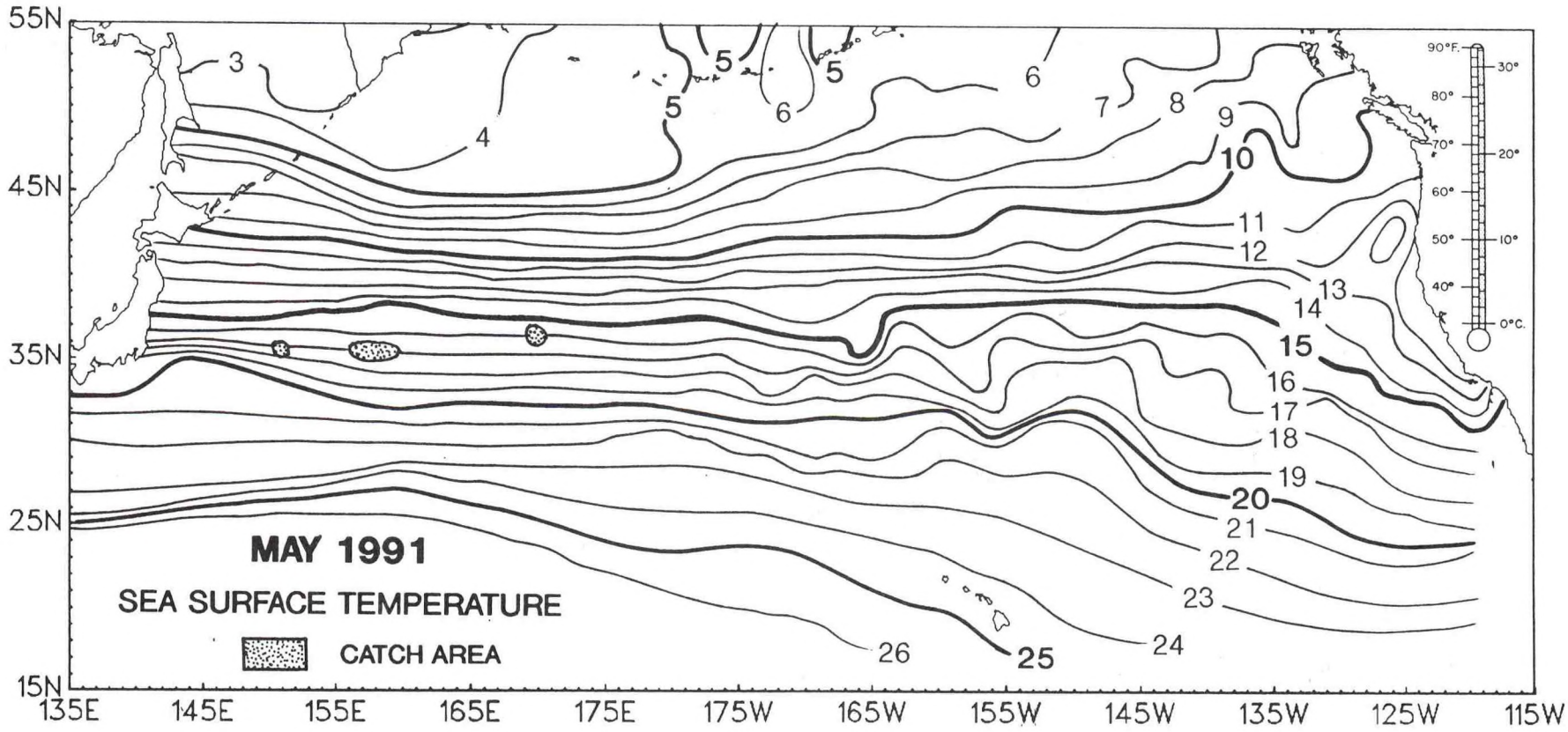

Figure 9a. Average sea-surface temperature (SST) isopleths (°C) and U.S. albacore catch area for the north Pacific, May 1991.

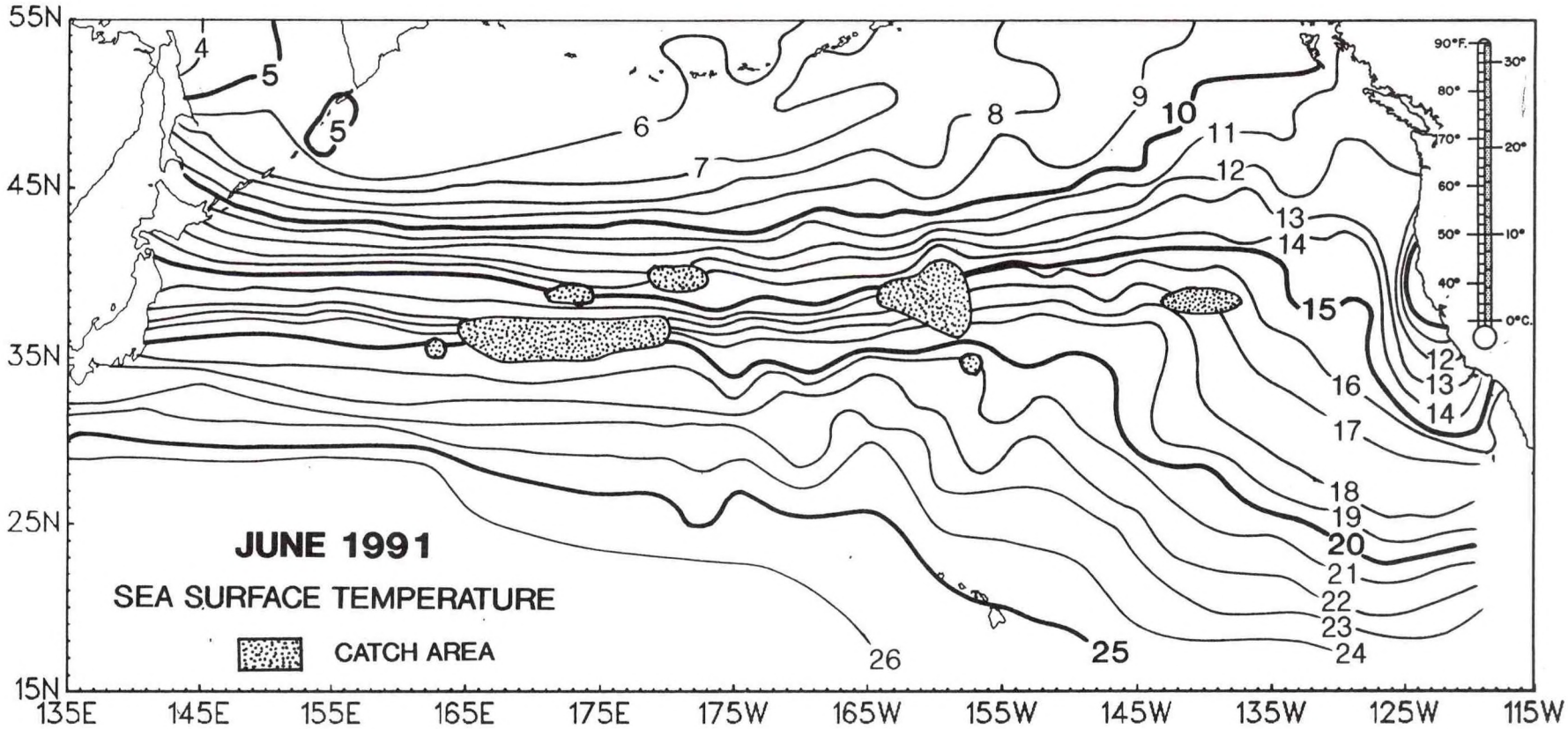

Figure 9b. Average sea-surface temperature (SST) isopleths (°C) and U.S. albacore catch area for the north Pacific, June 1991.

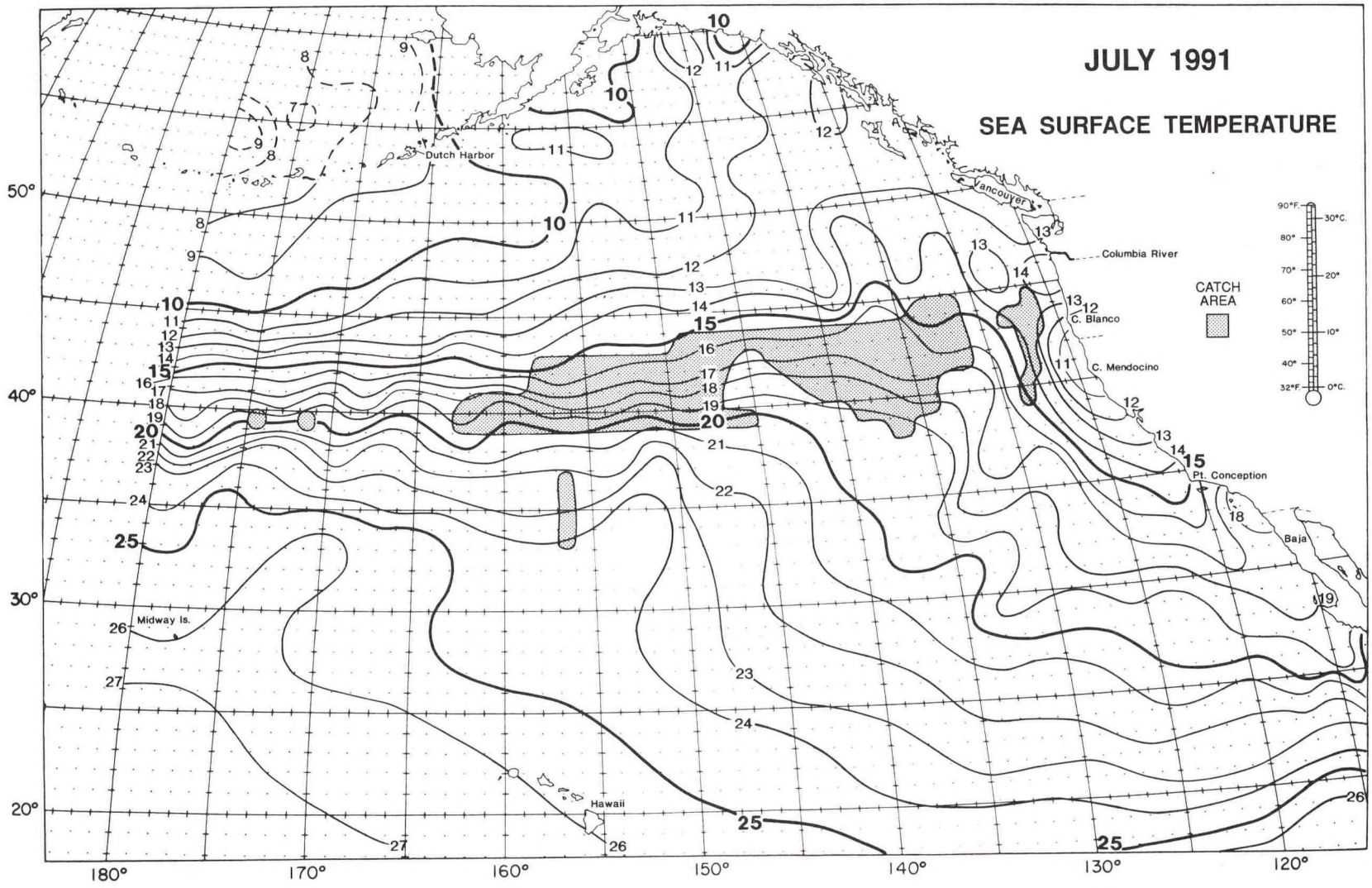

Figure 9c. Average sea-surface temperature (SST) isopleths (°C) and U.S. albacore catch area for the north Pacific, July 1991.

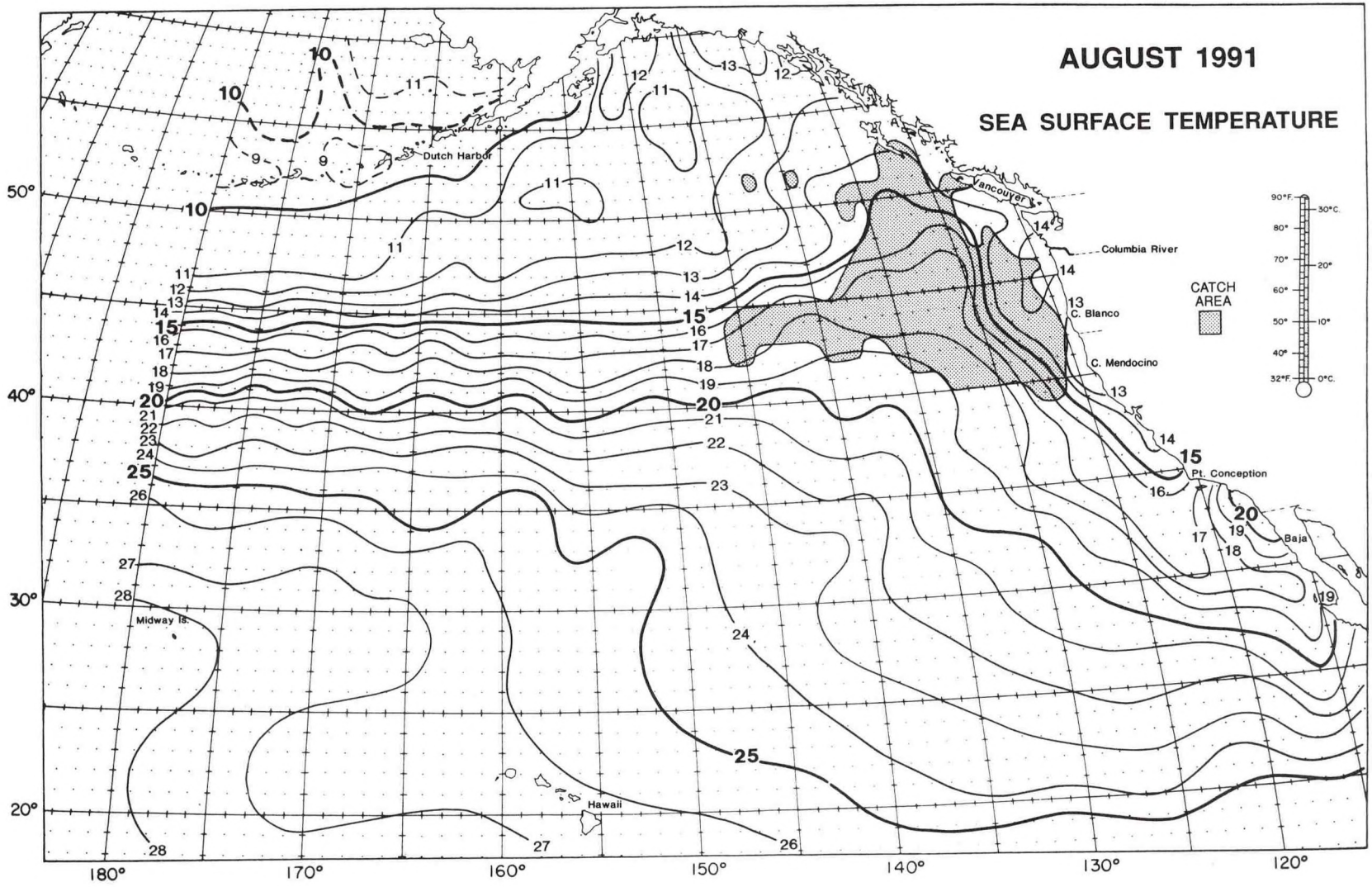

Figure 9d. Average sea-surface temperature (SST) isopleths (°C) and U.S. albacore catch area for the north Pacific, August 1991.

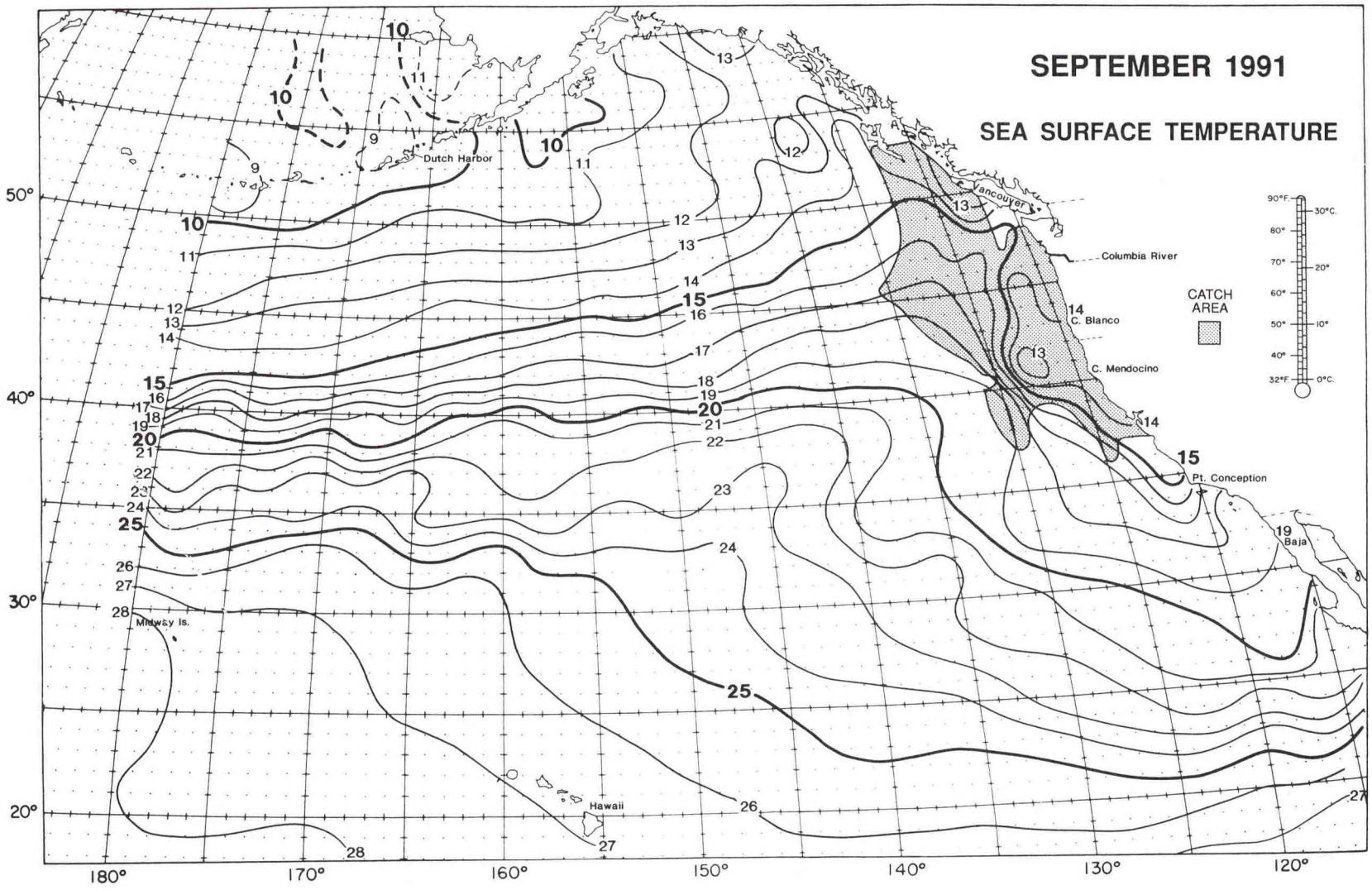

Figure 9e. Average sea-surface temperature (SST) isopleths (°C) and U.S. albacore catch area for the north Pacific, September 1991.

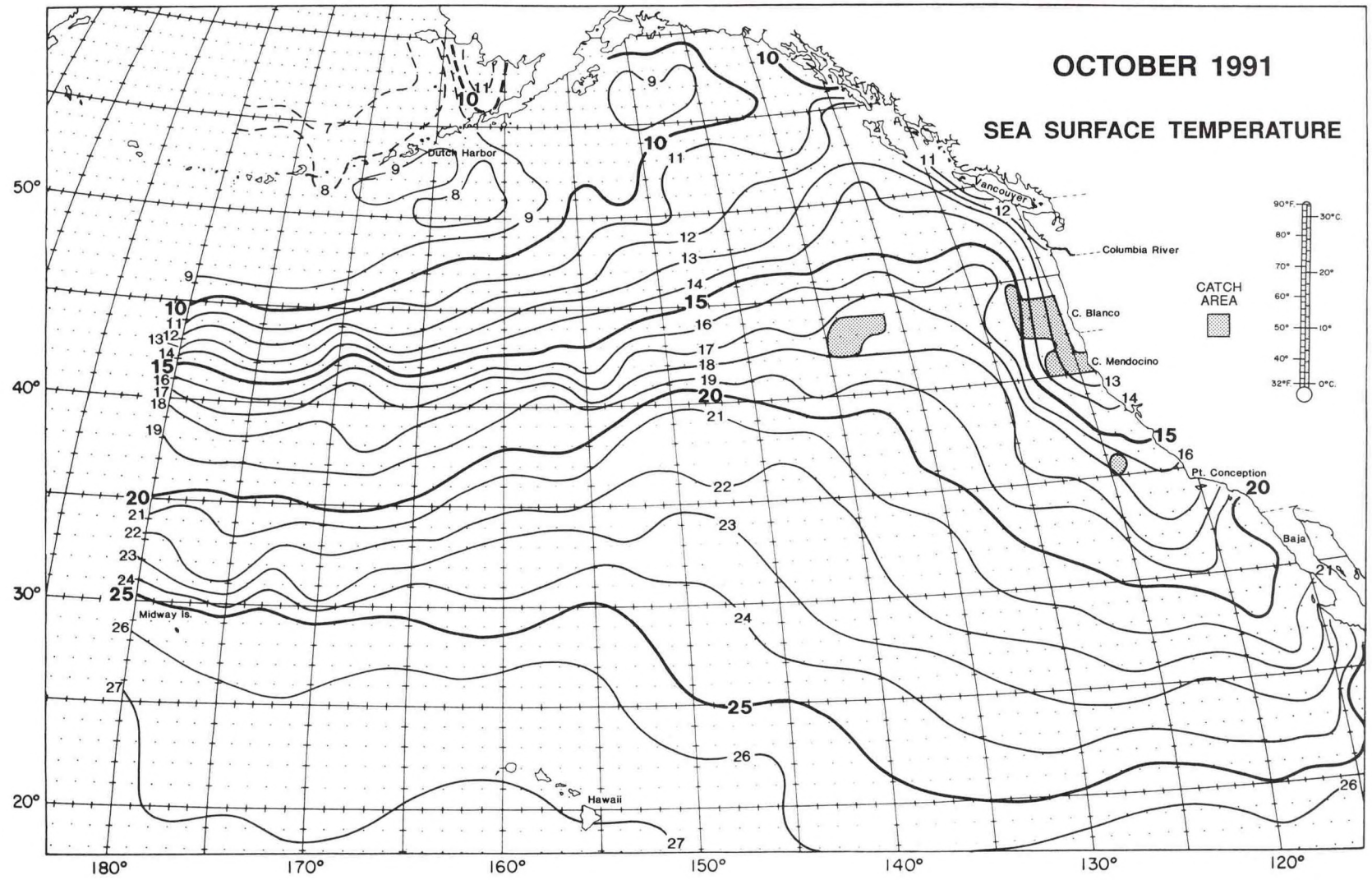

Figure 9f. Average sea-surface temperature (SST) isopleths (°C) and U.S. albacore catch area for the north Pacific, October 1991.