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JUNE 2002

SUMMARY OF THE 2001 U.S. NORTH AND SOUTH PACIFIC ALBACORE TROLL FISHERIES

by

John Childers

ADMINISTRATIVE REPORT LJ-02-05



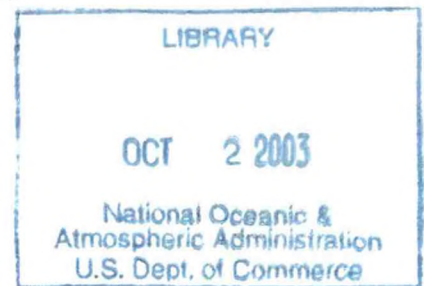
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INTRODUCTION

Albacore (*Thunnus alalunga*) are commercially harvested in the North Pacific by fisheries from various nations (Table 1). Japan harvests the greatest amount, annually taking 74% (since 1952) of the total amount of North Pacific albacore landed by all nations; the U.S. annually harvests less than 20%. U.S. vessels fish for albacore in the Pacific primarily with troll (also called jig) gear (artificial lures with barbless hooks towed behind a vessel). U.S. troll vessels have fished for albacore in the North Pacific since the early 1900's (Clemens and Craig, 1965). The collection of voluntary logbook data from the U.S. North Pacific albacore troll fishery began in 1954 (Laurs et al., 1975a). The collection of length-frequency data from the U.S. North Pacific albacore troll fishery began in 1951. The agencies currently involved in the collection of voluntary logbook, length-frequency, and catch information from the U.S. Pacific albacore troll fisheries are the Southwest Fisheries Science Center (SWFSC, La Jolla and Honolulu Laboratories) of the National Marine Fisheries Service (NMFS), Western Fishboat Owners Association (WFOA), American Fishermen's Research Foundation (AFRF), Pacific States Marine Fisheries Commission (PSMFC), and the state fisheries agencies of California, Oregon, and Washington.

Beginning in 1971, cooperative surveys between NMFS and AFRF led to the expansion of areas fished by U.S. troll vessels to areas north of Hawaii and west of the International Dateline (Laurs, et al., 1975b). In recent years, the North Pacific albacore troll season has begun as early as mid-April in areas northwest of Midway Island. In July and August, fishing effort expands to the east (130°W to 160°W, and 40°N to 45°N), and along the west coast of North America. Fishing areas along the west coast of North America extend from Vancouver Island through southern California. Fishing can continue into November if weather permits and sufficient amounts of albacore remain available to troll gear.

Albacore are also harvested in the South Pacific by a variety of nations (Table 2). Taiwan currently harvests the largest proportion of albacore caught annually in the South Pacific (43% on average since 1990). The annual U.S. portion of the South Pacific albacore catch has averaged 6% since 1990. In 2001 nine troll vessels changed gear types and began fishing for South Pacific albacore within the EEZ of American Samoa using longline gear (G. Yamasaki, pers. comm.)

Exploratory fishing for albacore with troll gear in areas east of New Zealand in 1986 resulted in the expansion of the U.S. albacore troll fishery to the South Pacific (Laurs et al., 1987). The collection of logbook and catch data from the fishery began in 1986, while length-frequency data has been collected since 1987. The fishery takes place during the austral summer months

(November through April). U.S. troll vessels that participate in the South Pacific fishery depart from 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. South Pacific albacore fishing areas extend from the Tasman Sea to approximately 110°W between 25°S and 45°S. At the end of the season (March or April), most troll vessels unload in American Samoa, Fiji, or Tahiti and then travel to Hawaii or the U.S. west coast to prepare for the next North Pacific fishing season.

This report presents summaries of the logbook (daily catch and effort), catch, and length-frequency information collected from the U.S. fleet during the 2001 North Pacific and the 2000-2001 South Pacific albacore seasons. Data from the 2000 North Pacific season, 1999-2000 South Pacific season, and from other fisheries (where available) are included for comparison.

DATA COLLECTED

Total annual catch data from the various fisheries that harvest albacore in the Pacific Ocean are available from 1952 to 2001 (Tables 1 and 2). Total catch estimates from U.S. troll vessels and from at-sea transshipments are provided by WFOA. Catch data from state landing receipts that are submitted by fish buyers and canneries are obtained from the state fisheries agencies of California, Oregon, and Washington and from the Pacific Coast Fisheries Information Network (PacFIN). Daily catch and effort data are obtained from completed copies of the *U.S. Pacific Albacore Logbook*. The logbooks are voluntarily submitted by fishermen, transcribed by port samplers who collect the information from cooperating fishermen, or mailed to the SWFSC. In addition to the voluntary logbook program, U.S. troll vessels that fish for albacore outside the U.S. exclusive economic zone (EEZ) are required by the High Seas Fisheries Compliance Act (HSFCA) to mail their logbook data to SWFSC for the time they fished outside the U.S. EEZ. Approximately 1,000 logbooks were distributed to fishermen for the 2001 North Pacific and the 2000-2001 South Pacific albacore seasons. Samplers in the ports of Ilwaco, Washington; Newport, Astoria, and Charleston Oregon; Terminal Island, California; and Pago Pago, American Samoa collected voluntary logbook, length-frequency, and landings (catch) data during the 2001 North Pacific season. Samplers in Pago Pago collected voluntary and mandatory logbook, length-frequency, and catch data during the 2000-2001 South Pacific season.

North Pacific sea surface temperature (SST) data are recorded from commercial transport ships, fishing vessels, and research vessels. These data are collected by the National Weather Service's National Centers for Environmental Prediction (NCEP). These data are summarized by month and archived at the Climate Diagnostics Center (CDC). The SST data from each month of the North Pacific albacore troll season were compiled and computer-analyzed at the SWFSC La Jolla laboratory. Contours of SSTs (isotherms) were produced with a resolution of 1° of latitude and longitude and are displayed with the general catch areas of North Pacific troll-caught albacore in figures 2a through 2f. Analysis of SSTs shows the distribution of isotherms and the locations of temperature fronts (areas of closely-spaced isotherms). Albacore tend to congregate along these fronts in the North Pacific transition zone (Laurs and Lynn, 1977). Currently, there is insufficient SST information available from the areas of the South Pacific

albacore troll fishery (east of New Zealand to 110°W and south of 30°S) to make a similar analysis possible.

TOTAL CATCH AND EFFORT

Total catch from the 2001 U.S. North Pacific albacore troll fishery increased to 11,170 metric tons (t) from 9,645 t landed in 2000. A total of 311 t were unloaded from U.S. troll vessels at sea and transshipped to American Samoa canneries by carrier vessels in 2001 compared to 953 t transshipped in 2000. An estimated 870 U.S. troll vessels fished in the 2001 North Pacific fishery (Table 3), a 32% increase from 659 troll vessels that fished in 2000. Fishing effort in the albacore troll fisheries is measured in number of fishing days. The total number of fishing days is estimated by the following equation:

$$Effort(days) = Catch(pounds) \div [CPUE(\frac{fish}{day}) \div AverageWeight(\frac{pounds}{fish})]$$

U.S. troll vessels fished 24,883 days during the 2001 North Pacific albacore season, a 33% decrease from 37,073 days fished in 2000 (Table 3). The average price paid for albacore caught by troll vessels in 2001 was \$1,710 USD per short ton (86 cents per pound). This is an 8% decrease from the average price of \$1,870 USD per short ton (94 cents per pound) paid in 2000.

The South Pacific albacore troll fishery begins in November or December and continues into March or April of the following year. As a result, season totals differ slightly from annual totals. The season catches of South Pacific albacore caught by troll gear (Table 4) are converted to annual totals and listed in table 2. The 2000-2001 season catch by U.S. troll vessels decreased to 2,128 t from 2,562 t landed in the 1999-2000 season. Thirty-three U.S. troll vessels participated in the 2000-2001 South Pacific season compared to 36 vessels that fished in the 1999-2000 season. Total fishing effort for the 2000-2001 South Pacific albacore season is estimated to be 6,017 days, an increase of 29% from 4,663 days fished in the 1999-2000 season (Table 4). The average price paid for albacore caught by troll vessels in the South Pacific in the 2000-2001 season was \$1,920 USD per short ton (96 cents per pound), a 6% increase from the average price of \$1,813 USD per short ton (91 cents per pound) paid in the 1999-2000 season.

Albacore may be discarded during a fishing trip because they are damaged or have become spoiled due to refrigeration problems. However, the primary reason for discarding albacore is because they are under-sized (less than 58 cm fork length or 9 pounds). Forty-eight trips (of 410 sampled trips) recorded a total of 4,561 albacore discarded during the 2001 North Pacific troll season. Four trips (of 28 sampled trips) recorded 55 albacore discarded during the 2000-2001 South Pacific troll season. Albacore troll vessels catch minor amounts of other fish species, usually while in transit to or from the fishing grounds. The most common species caught incidentally include skipjack tuna (*Katsuwonus pelamis*), yellowtail (*Seriola lalandi*), mahi mahi (*Coryphaena hippurus*), bluefin tuna (*Thunnus thynnus*), billfish, and sharks.

DISTRIBUTION OF CATCHES AND SSTs

Albacore catches recorded during the 2001 North Pacific albacore troll season extend from 167°E to the west coast of the U.S. and Canada, between approximately 35°N and 49°N (Figure 1). Areas of high catch indicate productive regions where albacore are available to troll

gear. Based on sampled logbook data, the most productive offshore areas were scattered between 145°W and 168°E from 35°N to 45°N. The highest catch areas along the west coast were off Washington and Oregon from 41°N to 49°N, out to 128°W.

Figures 2a through 2f show the relationship between catch areas, SST fronts, and isotherm distribution patterns. The areas of highest catch in May were in SSTs ranging from 11°C to 19°C (52°F to 66°F; Figure 2a) between 168°E and 180°. High catch areas in June ranged from 168°E to the Columbia River and were also in SSTs between 11°C and 19°C (52°F and 66°F, respectively; Figure 2b). During July, high catches were spread widely throughout the North Pacific transition zone in SSTs that ranged from 12°C to 19°C (54°F to 66°F; Figure 2c). High catch areas in August were again widely spread throughout the North Pacific transition zone and were in SSTs ranging from 13°C to 19°C (55°F to 66°F; Figure 2d). In September, high catch areas were spread from 162°W to the west coast, and were in SSTs ranging between 14°C and 20°C (57°F and 68°F, respectively; Figure 2e). High catch areas offshore in October were distributed between 150°W and 162°W in SSTs ranging from 14°C to 19°C (57°F to 66°F; Figure 2f). October catches along the west coast were still high in SSTs between 13°C and 17°C (55°F and 63°F, respectively).

Albacore catches recorded during the 2000-2001 South Pacific season were summarized by season and month in 5° squares of latitude and longitude (Figures 3a through 3f). The highest albacore catches of the season were made between 160°W and 150°W, from 40°S to 45°S (Figure 3a). The highest catches in December were less than 3,883 fish and were in the area between 170°W and 145°W from 35°S to 40°S (Figure 3b). January's highest catch areas ranged between 155°W and 140°W from 35°S to 40°S (Figure 3c). Catches in February were highest between 160°W and 155°W from 40°S to 45°S (Figure 3d). The highest catches in March were confined to the area between 155°W and 150°W, from 40°S to 45°S (Figure 3e). The highest catches in April were less than 3,883 fish and extended between 155°W and 145°W, from 35°S to 45°S (Figure 3f).

CATCH-PER-UNIT EFFORT

Catch-Per-Unit Effort (CPUE) is used as an indication of relative abundance of albacore available to troll gear, or a measure of fishing success, and is expressed in numbers of fish caught per day fished. Catch (in numbers of fish) and effort (in days fished) were summarized from logbook data by 10-day and 1°-square strata in which there was at least one day of fishing effort (Kleiber and Perrin, 1991). Average CPUE is calculated as follows:

$$\text{Average CPUE} = \frac{\sum_{i=1}^n \frac{C_i}{E_i}}{n}$$

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

The CPUE for the North Pacific albacore troll fishery declined by approximately 68% between 1962 and 1977, then remained relatively stable between 1977 and 1991 (Figure 4). The

CPUE increased from 1991 to 1998 with large fluctuations between 1995 and 1999. The average CPUE for the 2001 North Pacific season is 68 fish per day, a large increase from 39 fish per day in the 2000 season (Table 3). The ten-year average from 1991 through 2001 is 59 fish per day.

The CPUE for the U.S. South Pacific albacore troll fishery declined between 1987 and 1993 (Figure 4). The CPUE then peaked at 150 fish per day in 1995 and remained relatively stable at 70 fish per day since 1996. The CPUE for the 2000-2001 South Pacific season is 48 fish per day, a 31% decrease from 70 fish per day in the 1999-2000 season (Table 4). The ten-year average for CPUE in the South Pacific from 1991 through 2001 is 78 fish per day.

The CPUEs from the 2001 North Pacific season were averaged by season, month, and 1° squares of latitude and longitude. The general distributions of season and monthly CPUEs in 2001 were very similar to the distributions in 2000. The highest CPUEs for the 2001 North Pacific season ranged from 148 to 546 fish per day and were scattered between 168°E and 145°W, from 34°N to 45°N, (Figure 5a). CPUEs in May were highest between 170°E and 178°E, from 35°N to 39°N (Figure 5b). In June, the highest CPUEs offshore were distributed between 168°E and 161°W, from 36°N to 41°N (Figure 5c). The highest CPUEs in June along the coast were distributed between 127°W and 125°W, from 41°N to 46°N. High CPUEs offshore in July were scattered between 169°E and 161°W from 38°N to 44°N (Figure 5d). The highest CPUEs along the coast in July were confined to the area between 127°W and 125°W, from 43°N to 44°N. In August, CPUEs in the offshore areas (similar to July) were scattered between 170°E and 145°W, from 40°N to 45°N (Figure 5e). The highest CPUEs along the coast were distributed between 128°W and 125°W, from 42°N to 44°N. In September, high CPUEs in the offshore region extended between 165°W and 147°W, from 41°N to 45°N. The highest CPUEs along the coast were scattered between 126°W and 123°W, from 37°N to 43°N (Figure 5f). In October, the highest CPUEs were only found offshore between 154°W and 150°W, from 40°N to 45°N (Figure 5g).

The CPUEs from the 2000-2001 South Pacific season were averaged by season, month, and 5° squares of latitude and longitude. The distributions of CPUEs in the 2000-2001 season were similar to those in the 1999-2000 season, but extended somewhat further north and south. The highest CPUEs for the 2000-2001 season ranged from 86 fish per day to 137 fish per day and were distributed between 165°W and 140°W, from 40°S to 50°S (Figure 6a). CPUEs in December 2000 did not exceed 81 fish per day and the highest CPUEs were scattered between 170°W and 145°W, from 35°S to 40°S (Figure 6b). CPUEs in January 2001 were highest between 165°W and 160°W, from 40°S to 50°S (Figure 6c). In February, the highest CPUEs were distributed between 165°W and 150°W, from 40°S to 45°S (Figure 6d). The highest CPUEs in March were located between 145°W and 140°W, from 40°S to 45°S (Figure 6e). CPUEs in April did not exceed 81 fish per day and were distributed between 155°W and 145°W, from 40°S to 45°S (Figure 6f).

LOGBOOK SAMPLING COVERAGE

Logbook sampling coverage is expressed as the ratio of catches from sampled trips (those trips from which logbook data were received) to total catches. Not all catches from sampled trips are available. For consistent comparison of sampling coverage between seasons, sampled

catches 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 414 trips (of 3,114 total trips) were sampled for logbook information during the 2001 North Pacific albacore troll season. Sampled catches totaled 3,080 t, resulting in a logbook sampling coverage rate of 28 %, a substantial decrease from 41% in 2000 (Table 3).

Logbook data from the 2000-2001 South Pacific albacore troll season were collected from 28 of the 37 trips made by U.S. vessels. The sampled catch from these trips is 1,371 t, resulting in a logbook sampling coverage of 64%, slightly higher than the logbook sampling coverage (61%) in the 1999-2000 season (Table 4).

LENGTH-FREQUENCIES

Port samplers measured 14,105 albacore during the 2001 North Pacific season. Fork lengths of albacore measured during the 2001 North Pacific season ranged from 42 cm (3.4 lb or 1.5 kg) to 101 cm (46.4 lb or 21.0 kg) and averaged 68.5 cm (14.5 lb or 6.6 kg). The average fork length of albacore measured during the 2000 season is 68.9 cm (14.8 lb or 6.7 kg). The histogram of length-frequency samples from the 2001 North Pacific season shows two prominent modes centered at 64 cm (11.9 lb or 5.4 kg; Figure 7) and 75 cm (19.0 lb or 8.6 kg). The majority of albacore that are taken in both the North and South Pacific troll fisheries range from three to five years old. Length-age and length-weight relationships for North Pacific albacore are taken from Bartoo and Forman, 1993.

Small albacore (less than 58 cm fork length or 8.8 lb (4.0 kg)) may not be adequately represented in the length-frequency data collected from the North Pacific fishery. Vessels that sell most of their catch to canneries or buying stations (which may pay less for small fish) might discard small fish when they are abundant in the catches. Troll vessels that sell their fish to markets where small fish are preferred might retain more small fish. These fish are usually not available to port samplers for measuring.

Port samplers measured 3,670 albacore during the 2000-2001 South Pacific troll season. Sampled (measured) albacore ranged from 49 cm (5.3 lb or 2.4 kg) to 100 cm (45.0 lb or 20.4 kg) and averaged 71.0 cm (16.2 lb or 7.3 kg). The average fork length of sampled albacore from the 1999-2000 season is 72.6 cm (17.3 lb or 7.8 kg). A single distinct mode, centered at 71 cm (16.2 lb or 7.3 kg) is apparent in the histogram of fish sampled in the 2000-2001 season (Figure 8). Length-age relationships for South Pacific albacore are taken from Labelle et al., 1993.

LENGTH-FREQUENCY SAMPLING COVERAGE

Length-frequency sampling coverage is expressed as the ratio of the number of fish sampled (measured) to the total number of fish landed for the season. The total number of fish landed for the season is estimated by dividing total catch by the average weight of fish landed. During the 2001 North Pacific season 14,105 albacore were measured, resulting in a length-frequency sampling coverage of 0.8%, very similar to the 1999 sampling coverage of 0.9% (Table 3).

Port samplers in Pago Pago, American Samoa measured 3,670 of the estimated 290,127 albacore landed during the 2000-2001 South Pacific albacore fishery. The length-frequency sampling coverage rate for the 2000-2001 season is 1.3%, compared to 0.4% in the 1999-2000 season (Table 4).

SUMMARY

The 2001 U.S. North Pacific albacore troll fishery was slightly more productive than the 2000 fishery. Approximately 870 vessels landed 11,170 t during the 2001 season compared to 659 vessels that landed 9,645 t in 2000, a 16% increase in total catch. Total effort declined 33% from the 2000 fishing season. The highest catches of albacore in the North Pacific generally are distributed between the 11°C (52°F) and 19°C (66°F) isotherms. The average CPUE for the 2001 North Pacific season increased substantially from 39 fish per day in 2000 to 68 fish per day. Productive catch areas (areas with high CPUEs) ranged between 168°E and the West Coast, from 34°N to 49°N. The average fork length of sampled albacore from the 2001 season is 68.5 cm (14 lb or 6.6 kg). The average fork length of albacore measured during the 2000 season is 68.9 cm (15 lb or 6.7 kg). Fish less than 58 cm fork length (9 lb or 4.0 kg) may not be adequately represented in the North Pacific length-frequency samples due to discarding of small fish or marketing practices that prohibited sampling them. Logbook sampling coverage for the North Pacific albacore fishery dropped from 41% in the 2000 season to 28% in 2001. Length-frequency sampling coverage was nearly the same as the 2000 season at 0.8%. Port sampling of the U.S. North Pacific fishery continues to be hampered by funding constraints.

Total catch from the 2000-2001 South Pacific season decreased slightly to 2,128 t from 2,562 t in the 1999-2000 season. Thirty-three U.S. troll vessels fished 6,017 days in the 2000-2001 season compared to 36 vessels that fished 4,663 days in the 1999-2000 season. The CPUE for the 2000-2001 season decreased substantially to 48 fish per day, from 70 fish per day in the 1999-2000 season. Although total catch and the total number of vessels participating in the 2000-2001 troll season remained roughly the same as the previous season, total days of effort increased substantially, causing catch rates (CPUEs) to decline during the 2000-2001 season. The average fork length of albacore measured during the 2000-2001 season is 71.0 cm (16.2 lb or 7.3 kg), compared to an average fork length of 72.6 cm (17.3 lb or 7.8 kg) in the 1999-2000 season. Logbook sampling coverage for the 2000-2001 South Pacific albacore troll fishery increased slightly from 61% in the 1999-2000 season to 64% in the 2000-2001 season. Length-frequency sampling coverage increased from 0.4% in the 1999-2000 season to 1.3% in the 2000-2001 season.

ACKNOWLEDGMENTS

I thank the albacore fishermen whose participation in the logbook sampling program make this report possible. WFOA and AFRF provided catch data and financial support for data entry of the logbook and length-frequency data. Rhonda Haynes (Oregon Department of Fish & Wildlife), Steve Wertz (California Department of Fish & Game), Wendy Beeghley (Washington Department of Fish & Wildlife), Russell Porter (Pacific States Marine Fisheries Commission), and Gordon Yamasaki (SWR office in Pago Pago, America Samoa) coordinated the collection of logbook, length-frequency, and catch data as well as other fishery-related information. I also

thank the port samplers for their efforts in collecting logbook, length-frequency, and catch information and for distributing the *U.S. Pacific Albacore Logbook*.

I thank William Shaw of the Department of Fisheries & Oceans, Canada; Dr. Yuji Uozumi of National Research Institute of Far Seas Fisheries, Japan; Eric Chang and Shyh-Bin Wang of Oversea Fisheries Development Council, Taiwan, and many other foreign colleagues for providing catch information of albacore fisheries from their respective countries.

Henry Orr (SWFSC) produced the illustrations for this report. Michelle DeLaFuenta formatted the manuscript and tables. Atilio Coan, Jr., Dr. Paul Crone, and Dr. Gary Sakagawa provided helpful directions, comments and critiques of the manuscript.

LITERATURE CITED

- Bartoo, N., and T.J. Foreman. 1993. A review of the biology and fisheries for North Pacific albacore (*Thunnus alalunga*). pp. 173-187. In Shomura, R.S., J. Majkowski, and S. Langi (eds.), *Interactions of Pacific Tuna Fisheries*. Proceedings of the First FAO Expert Consultation on Interactions of Pacific Tuna Fisheries. 3-11 December 1991. Noumea, New Caledonia. FAO Fisheries Technical Paper. No. 336, Vol. 2. Rome, FAO. 439 pp.
- Clemens, H.B., and W.L. Craig. 1965. An analysis of California's albacore fishery. Resources Agency of Calif. Dept. of Fish and Game. Fish Bull. 128. 301 pp.
- Ito, R.Y. and W. A. Machado. 2001. Annual Report of the Hawaii-Based Lonline Fishery For 2000. NMFS-SWFSC Admin. Report H-01-07. 39 pp.
- Kleiber, P., and C. Perrin. 1991. Catch-per-effort and stock status in the U.S. North Pacific albacore fishery: Reappraisal of Both. *Fishery Bulletin*, U.S. 89: 379-386.
- Labelle, M., K. Bailey, D.A. Fournier, and J.R. Sibert. 1993. Determination of age and growth of South Pacific albacore (*Thunnus alalunga*) using three methodologies. *Fishery Bulletin*, U.S. 91: 649-663.
- Laurs, R.M., C. Hooker, L. Hreha, and R. Lincoln. 1975a. A Uniform U.S. West Coast Logbook for Albacore, *Thunnus alalunga* (Bonnaterre), and Coastwide Albacore Fishery Data System. *Marine Fisheries Review*, Vol. 31, No. 11:14-21.
- Laurs, R.M., R.J. Lynn, and R.N. Nishimoto. 1975b. Report of Joint National Marine Fisheries Service – American Fishermen's Research Foundation Albacore Studies Conducted during 1975. NMFS-SWFC Admin. Report LJ-75-84. 49 pp.
- Laurs, R.M. and R.J. Lynn. 1977. Seasonal migration of North Pacific albacore, *Thunnus alalunga*, into North American coastal waters: Distribution, relative abundance, and association with transition zone waters. *Fishery Bulletin*, Vol. 75, No. 4:795-822

- Laurs, R.M., K. Bliss, J. Wetherall, and B. Nishimoto. 1987. South Pacific albacore fishery exploration conducted by U.S. jig boats during early 1987. NMFS-SWFC Admin. Report LJ-87-22. 31 pp.
- Lawson, T.A. 2001. Secretariat of the Pacific Community Tuna Fishery Yearbook 2000. Secretariat of the Pacific Community, Oceanic Fisheries Programme. 162 pp.
- Shaver, J.A. 1962. Purse Seining for Pacific Albacore. California Fish and Game, Vol. 48, No. 1 :81-82
- Shaw, W. 2001. An update for Canadian tuna fisheries in the North and South Pacific Ocean through 2000. Working Paper NFR-2. Fourteenth Meeting of the Standing Committee on Tuna and Billfish, 9-16 August 2001, Nouméa, New Caledonia. Fisheries and Oceans Canada, Nanaimo, British Columbia, Canada. 9 pp.
- Western Pacific Regional Management Council. 2002. Pelagic Fisheries of the Western Pacific Region 2000 Annual Report. Appendix 1, p. 1-16.

Table 1. North Pacific albacore catches (in metric tons) by fisheries, 1952-2000¹. Blank indicates no effort. -- indicates data not available. 0 indicates less than 1 metric ton. Provisional estimates in ().

YEAR	CANADA ²		JAPAN ³				KOREA ⁴		MEXICO ⁵	
	TROLL	PURSE SEINE	GILL NET	LONG LINE	POLE & LINE	PURSE SEINE	UNSP. GEAR	GILL NET	LONG LINE	UNSP. GEAR
1952	71			26,687	41,787	154	237			
1953	5			27,777	32,921	38	132			
1954				20,958	28,069	23	38			
1955				16,277	24,236	8	136			
1956	17			14,341	42,810		57			
1957	8			21,053	49,500	83	151			
1958	74			18,432	22,175	8	124			
1959	212			15,802	14,252		67			
1960	5	136		17,369	25,156		76			
1961	4			17,437	18,639	7	268			0
1962	1			15,764	8,729	53	191			0
1963	5			13,464	26,420	59	218			0
1964	3			15,458	23,858	128	319			0
1965	15			13,701	41,491	11	121			0
1966	44			25,050	22,830	111	585			0
1967	161			28,869	30,481	89	520			
1968	1,028			23,961	16,597	267	1,109			
1969	1,365			18,006	31,912	521	935			0
1970	390			16,283	24,263	317	456			0
1971	1,746			11,524	52,957	902	308			0
1972	3,921		1	13,043	60,569	277	623			100
1973	1,400		39	16,795	68,767	1,353	495			0
1974	1,331		224	13,409	73,564	161	879			1
1975	111		166	10,318	52,152	159	228		2,463	1
1976	278		1,070	15,825	85,336	1,109	272		859	36
1977	53		688	15,696	31,934	669	355		792	0
1978	23		4,029	13,023	59,877	1,115	2,078		228	1
1979	521		2,856	14,215	44,662	125	1,126	0	259	1
1980	212		2,986	14,689	46,742	329	1,179	6	597	31
1981	200		10,348	17,922	27,426	252	663	16	459	8
1982	104		12,511	16,767	29,614	561	440	113	387	7
1983	225		6,852	15,097	21,098	350	118	233	454	33
1984	50		8,988	15,060	26,013	3,380	511	516	136	113
1985	56		11,204	14,351	20,714	1,533	305	576	291	49
1986	30		7,813	12,928	16,096	1,542	626	726	241	3
1987	104		6,698	14,702	19,082	1,205	155	817	182	7
1988	155		9,074	14,731	6,216	1,208	134	1,016	109	15
1989	140		7,437	13,104	8,629	2,521	393	1,023	81	2
1990	302		6,064	15,789	8,532	1,995	249	1,016	20	2
1991	139		3,401	17,046	7,103	2,652	392	852	3	2
1992	363		2,721	19,049	13,888	4,104	1,527	271	43	10
1993	494		287	29,966	12,797	2,889	867		43	11
1994	1,998		263	29,612	26,389	2,026	799		43	6
1995	1,790		282	29,080	20,981	1,177	937		43	5
1996	3,534		116	32,492	20,272	581	932		43	21
1997	2,524		359	38,988	32,238	1,068	1,708		43	53
1998	4,240		206	35,769	22,926	1,554	1,278		43	8
1999	(2,836)		289	33,142	50,369	6,872	1,018		(43)	23
2000	(4,486)		(289)	(33,142)	18,788	(2,537)	(1,018)		(43)	92
2001	(4,486)		(289)	(33,142)	(18,788)	(2,537)	(1,018)		(43)	(92)

¹ Data are from the 17th North Pacific Albacore Workshop, December 6-13, 2000, Taipei, Taiwan except as noted.

² 1960 Canadian purse seine catch from Shaver (1962). 1994 - 2000 troll catches from Shaw, 2001.

³ Japanese pole & line catches include fish caught by research vessels. Longline catches for 1952-1960 exclude minor amounts taken by vessels under 20 metric tons. 1970 - 2000 longline, 1972 - 2000 pole & line, 1999 - 2000 gill net, purse seine, and unspecified gear catches from North Pacific Albacore Workshop Intersessional Meeting, January 2002, Nagasaki, Japan.

⁴ Korean longline catches calculated from Y. Gong (pers. comm.) using the ratio of catches in numbers, from the North Pacific. Gillnet catches 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).

⁵ 1998-2000 Mexico catch from purse seine and bait boats. Catches provided by Inter-American Tropical Tuna Commission (M. Hinton, pers.com.).

Table 1. Continued

YEAR	TAIWAN		U.S.							OTHERS		GRAND TOTAL
	GILL NET	LONG ⁶ LINE	POLE & LINE	GILL NET	LONG ⁷ LINE	PURSE SEINE	SPORT	TROLL ⁸	UNSP. GEAR	LONG ⁹ LINE	TROLL ¹⁰	
1952					46		1,373	23,843				94,198
1953					23		171	15,740				76,807
1954					13		147	12,246				61,494
1955					9		577	13,264				54,507
1956					6		482	18,751				76,464
1957					4		304	21,165				92,268
1958					7		48	14,855				55,723
1959					5		0	20,990	5			51,333
1960					4		557	20,100	4			63,407
1961			2,837		5		1,355	12,055	6			52,613
1962			1,085		7		1,681	19,752	8			47,271
1963			2,432		7		1,161	25,140	7			68,913
1964		26	3,411		4		824	18,388	4			62,423
1965		261	417		3		731	16,542	3			73,296
1966		271	1,600		8		588	15,333	9			66,429
1967		635	4,113		12		707	17,814	12			83,413
1968		698	4,906		11		951	20,434	10			69,972
1969		634	2,996		14		358	18,827	12			75,580
1970		1,516	4,416		9		822	21,032	9			69,513
1971		1,759	2,071		11		1,175	20,526	11			92,989
1972		3,091	3,750		8		637	23,600	8			109,629
1973		128	2,236		14		84	15,653	14			106,978
1974		570	4,777		9		94	20,178	9			115,206
1975		1,494	3,243		33		640	18,932	43			89,983
1976		1,251	2,700		23		713	15,905	27			125,403
1977		873	1,497		37		537	9,969	36			63,136
1978		284	950		54		810	16,613	69			99,154
1979		187	303		--		74	6,781	31			71,141
1980	--	318	382		--		168	7,556	24			75,219
1981	--	339	748		25		195	12,637	60			71,298
1982	--	559	425		105		257	6,609	84			68,544
1983	--	520	607		6		87	9,359	213			55,252
1984	--	471	1,030		2	3,728	1,427	9,304	138			70,867
1985	--	109	1,498	2	0		1,176	6,415	83			58,362
1986	--	--	432	3			196	4,708	106			45,450
1987	2,514	--	158	5	150		74	2,766	136			48,755
1988	7,389	38	598	15	308		64	4,212	318			45,600
1989	8,350	544	54	4	249		160	1,860	272			44,824
1990	16,701	287	115	29	177	71	24	2,603	181			54,157
1991	3,398	353	0	17	313	0	6	1,845	384			37,907
1992	7,866	300	0	0	337	0	2	4,572	408			55,460
1993		494		0	440		25	6,254	331			54,898
1994		586	0	38	548		106	10,978	712			74,104
1995		2,504	80	52	884		102	8,045	1		89	66,051
1996		3,594	24	83	1,187	11	88	17,030	0	1,735	447	(82,190)
1997		4,199	73	60	1,653	2	1,018	14,252	1	2,824	404	(101,466)
1998		4,797	79	80	1,120	33	1,208	14,410	1	5,871	239	(93,862)
1999		4,768	60	149	1,541	48	3,621	10,186	1	(6,307)	(289)	(121,562)
2000		5,866	(69)	(56)	(943)	(4)	(1,798)	(9,645)	(3)	(5,871)	(562)	(85,212)
2001		(5,866)	(306)	(95)	(954)	(51)	(1,635)	(11,170)	(2)	(6,307)	(562)	(87,344)

⁶ 1999 - 2000 Taiwan longline catches from North Pacific Albacore Workshop Intersessional Meeting, January 2002, Nagasaki, Japan.

⁷ U.S. Longline catches for 1981 through 2001 include landings in California and Hawaii. Hawaii longline catches for 1987 through 2000 are from Ito and Machado (2001).

⁸ U.S. troll catches for 1952-1960 include fish caught by pole & line vessels. U.S. troll catches for 1984-1988 include gillnet catches.

⁹ Other longline catches from vessels flying flags of convenience being called back to Taiwan.

¹⁰ Other troll catches from vessels registered in Belize, Cook Islands, Tonga, and Ecuador

Table 2. South Pacific albacore catches (in metric tons) by fisheries, 1952-2001. Blank indicates no effort. -- indicates data not available. 0 indicates less than 1 metric ton. Provisional estimates in ().

YEAR	JAPAN			TAIWAN		KOREA		U.S.		CANADA	NEW ZEALAND		FRENCH POLYNESIA	
	GILL NET	LONG ² LINE	POLE & LINE	GILL NET	LONG LINE	GILL NET	LONG LINE	LONG ³ LINE	TROLL	TROLL	LONG LINE	TROLL	LONG LINE	TROLL
1952		154	--											
1953		803	--											
1954		9,578	--		--									
1955		8,625	--		--									
1956		7,281	--		--									
1957		8,757	--		--									
1958		18,490	--		--		146							
1959		17,385	--		--		456							
1960		21,638	45		--		610							
1961		23,412	0		--		330							
1962		34,620	0		--		599							
1963		29,120	16		608		1,367							
1964		19,390	0		629		2,911							
1965		17,793	0		1,640		6,405							
1966		21,627	0		6,669		10,817							
1967		15,104	0		11,497		13,717					5		
1968		6,659	0		12,254		10,138					14		
1969		4,894	0		9,503		9,963					--		
1970		6,507	0		14,484		11,599					50		
1971		4,355	0		15,871		14,482					--		
1972		2,729	22		16,674		14,439					268		
1973		2,452	41		17,741		17,452					484		
1974		1,934	709		16,857		12,194					898		
1975		1,060	0		16,056		9,015					646		
1976		1,836	0		13,206		9,058					25		
1977		2,182	0		21,429		11,229					621		
1978		2,489	0		20,702		11,658					1,686		
1979		2,320	0		14,987		11,411					814		
1980		2,555	1		17,998		10,449					1,468		
1981		4,898	0		14,390		13,342					2,085		
1982		4,822	1		12,634		10,769					2,434		
1983		32	4,991	0	12,069		7,069					744		
1984	1,581	3,598	2		11,155		5,321					2,773		
1985	1,928	3,676	0		9,601		13,544					3,253		
1986	1,936	4,466	0		11,913		15,877		92			1,911		
1987	919	4,103	9		15,009		6,821		838			1,256		
1988	4,271	6,914	0	1,000	17,120		6,563	1	3,657	235		405		
1989	13,263	5,353	0	8,520	10,867	172	5,151	0	3,664	235	9	4,361		102
1990	5,567	5,466	0	1,859	11,619		3,947		3,886	235	669	2,342	20	299
1991		4,700	0	1,394	16,508		1,866	1	4,894	235	288	2,171	100	326
1992		5,268	0		20,956		2,271		2,956	235	300	3,171	195	72
1993		8,294	12		17,701		1,083	0	1,010	235	909	2,478	714	45
1994		8,883	2		19,731		0	35	2,276	235	1,588	3,729	913	
1995		7,350	0		12,775		8	54	1,944	235	1,625	4,670	772	183
1996		4,538	0		18,454		215	101	1,947	(136)	1,391	4,956	1,463	69
1997		5,094	12		19,524		845	307	1,739	(149)	1,185	2,443	2,595	24
1998		6,955	27		18,416		3,514	491	1,618	(167)	2,179	4,347	3,189	
1999		7,609	--		18,245		1,552	324	1,339	(162)	2,355	1,548	2,580	
2000		(7,609)	--		(20,981)		916	658	2,435	(289)	1,668	2,832	3,473	
2001		(7,609)	--		(20,981)		(916)	(658)	(2,085)	(289)	(1,668)	(2,832)	(3,473)	

¹ Data are from Lawson, 2001 except as noted.

² Japan longline catches include catches from Australia-Japan joint venture vessels.

³ 1988 - 2000 U. S. longline catches include American Samoa catches (Western Pacific Regional Fisheries Management Council, 2002).

Table 2. Continued.

YEAR	AUSTRALIA		NEW CALEDONIA	TONGA	FIJI	WESTERN SAMOA	SOLOMON ISLANDS	CHILE ⁵	VANUATU	CHINA	OTHER		GRAND TOTAL
	LONG LINE	TROLL ⁴	LONG LINE	LONG LINE	LONG LINE	LONG LINE	LONG LINE	DRIFT NET	LONG LINE	LONG LINE	LONG ⁶ LINE	TROLL ⁷	
1952													154
1953													803
1954													9,578
1955													8,625
1956													7,281
1957													8,757
1958													18,636
1959													17,841
1960													22,293
1961													23,742
1962													35,219
1963													31,111
1964													22,930
1965													25,838
1966													39,113
1967													40,323
1968													29,065
1969													24,360
1970		100											32,740
1971		100											34,808
1972		100											34,232
1973		100					4						38,274
1974		100											32,692
1975		100											26,877
1976		100					6						24,231
1977		100					9						35,570
1978		100					9						36,644
1979		100					21						29,653
1980		100					25						32,596
1981		5					2						34,722
1982		6		106			8						30,780
1983		7	12	143			19						25,086
1984		8	112	135			19						24,704
1985	0	9	131	174			12						32,328
1986	0	10	179	206									36,590
1987	129	11	563	252									29,910
1988	107	12	584	242						0			41,110
1989	93	13	566	195	3					0			52,567
1990	124	15	1,053	152	68					4			37,326
1991	158	20	909	171	208					0		69	34,018
1992	214	70	692	199	243					0		43	36,885
1993	186	55	755	231	463	213				1		41	34,426
1994	357	70	840	343	842	641				9	21	107	40,622
1995	438	25	332	379	702	1,883	24	15	109	14	32	140	33,709
1996	408	(25)	414	494	1,446	1,775	100	21	192	12	52	276	(38,486)
1997	302	(25)	277	(494)	1,842	4,108	109	0	95	13	99	405	(41,685)
1998	460	(35)	860	(494)	2,121	4,742	370	0	(10)	7	42	405	(50,449)
1999	359	(25)	690	(494)	2,279	4,027	136	0	--	3,473	79	156	(47,433)
2000	381	(25)	(895)	(494)	5,224	4,067	193	0	--	2,056	(26)	(469)	(54,691)
2001	(381)	(25)	(895)	(494)	(5,224)	(4,067)	(193)	(0)	--	(2,056)	(26)	(469)	(54,340)

⁴ Australia troll catches from 1970 to 1980 are incidental catches from pole-and-line vessels targeting southern bluefin tuna. 1981-1998 catches include recreational catches.

⁵ Chile gill net catches are from (R. Serra, pers. comm.).

⁶ Other longline includes catches from Cook Islands and Papua New Guinea.

⁷ Other troll includes catches from Fiji, Cook Islands, Belize, Sweden, Tonga, Ecuador, and French Polynesian Bonitiers and Poti Marara vessels.

Table 3. Fishery statistics for the U.S. North Pacific albacore troll fishery.

FISHING SEASON	NO. TRIPS		CATCH (Metric Tons)		NO. FISH LANDED		AVG FL (cm)	AVG WT (lb)	EFFORT		CPUE (fish/day)	SAMPLING COVERAGE	
	TOTAL	SAMPLED	TOTAL	SAMPLED	TOTAL	MEASURED			NO. DAYS	NO. VESSELS		LOG	L-F
1992	1,590	300	4,572	1,940	864,041	25,053	63.7	11.7	17,032	603	51	42%	2.9%
1993	2,176	174	6,254	1,290	910,470	204	69.5	15.1	23,988	609	38	21%	0.0%
1994	2,281	407	10,978	4,620	1,455,364	1,117	71.7	16.6	23,466	713	62	42%	0.1%
1995	993	354	7,567	4,930	1,114,667	16,221	69.2	15.0	23,630	517	47	65%	1.5%
1996	1,678	413	17,030	7,030	2,950,060	35,069	65.5	12.7	32,011	709	92	41%	1.2%
1997	3,496	492	14,014	5,442	2,015,270	32,071	69.7	15.3	44,787	1,193	45	39%	1.6%
1998	2,105	266	14,138	5,060	2,170,421	16,505	68.2	14.4	20,130	787	108	36%	0.8%
1999	2,348	390	10,141	3,467	1,272,568	15,278	73.0	17.6	34,296	736	37	34%	1.2%
2000	2,043	421	9,645	3,997	1,438,697	13,453	68.9	14.8	37,072	659	39	41%	0.9%
2001	3,114	414	11,170	3,080	1,695,545	14,105	68.5	14.5	24,884	870	68	28%	0.8%

Table 4. Fishery statistics for the U.S. South Pacific albacore troll fishery.¹

FISHING SEASON	NO. TRIPS		CATCH ² (Metric Tons)		NO. FISH LANDED		AVG FL (cm)	AVG WT (lb)	EFFORT		CPUE (fish/day)	SAMPLING COVERAGE	
	TOTAL	SAMPLED	TOTAL	SAMPLED	TOTAL	MEASURED			NO. DAYS	NO. VESSELS		LOG	L-F
1991-92	56	39	3,083	1,702	693,803	5,009	68	14	6,888	54	68	63%	1.1%
1992-93	43	8	1,036	213	469,296	1,720	63	11	4,433	44	45	19%	0.9%
1993-94	12	7	2,477	345	199,519	996	66	13	4,311	13	97	10%	0.2%
1994-95	42	22	1,959	1,142	418,736	1,460	70	15	1,867	21	150	59%	0.5%
1995-96	48	30	2,206	1,101	279,378	2,226	70	15	4,498	53	71	51%	0.7%
1996-97	25	18	1,821	938	318,973	1,558	67	14	3,776	27	78	52%	0.5%
1997-98	39	31	1,749	1,168	295,132	200	67	14	5,353	37	53	63%	0.1%
1998-99	24	12	1,381	525	193,130	790	70	16	2,493	21	77	37%	0.4%
1999-2000	37	26	2,562	1,572	326,783	1,355	73	17	4,663	36	70	61%	0.4%
2000-2001	37	28	2,128	1,371	290,127	3,670	71	16	6,017	33	48	64%	1.3%

¹ Data for seasons before 1996-97 may include non-U.S. vessels.

² Total catches for U.S. South Pacific albacore troll fishery may include catch from November and December of the previous year.

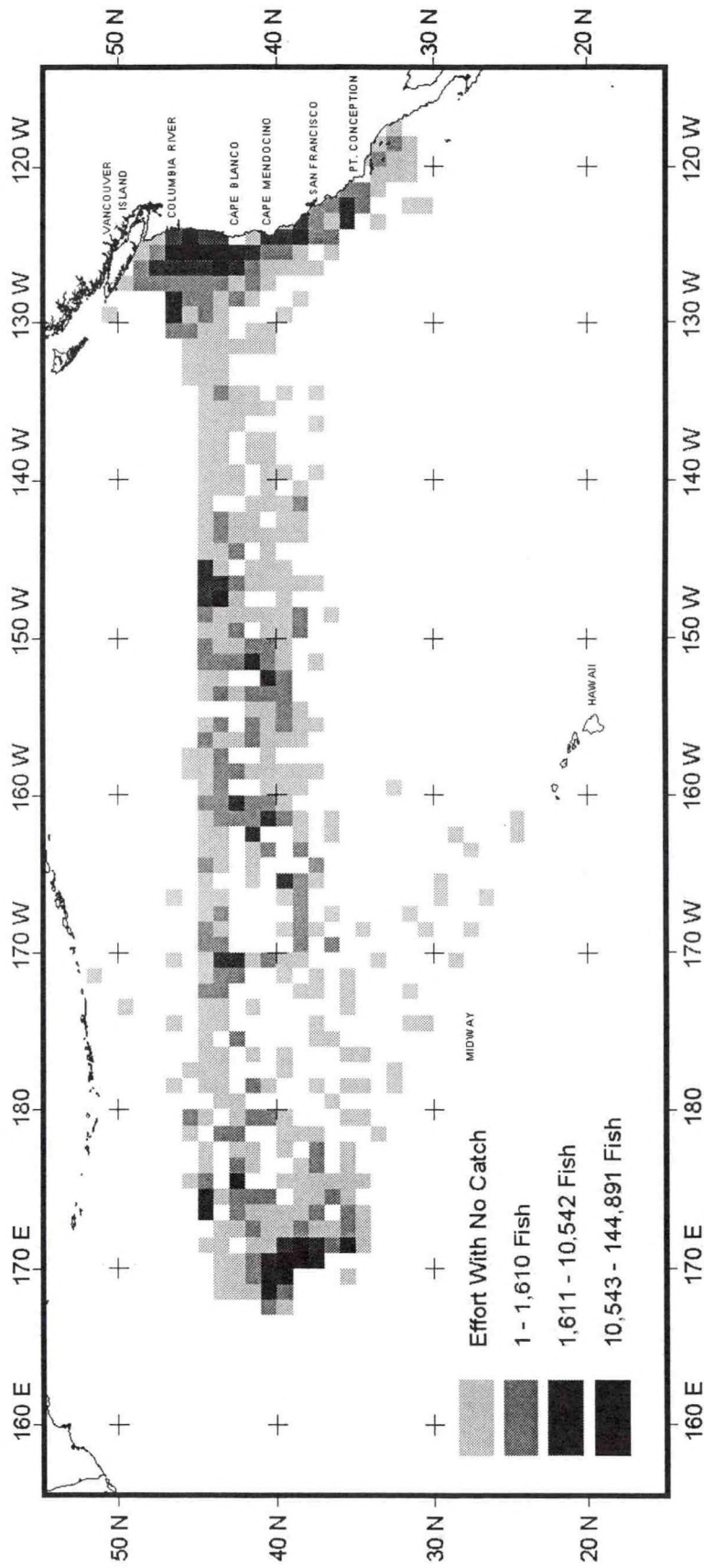


Figure 1. Distribution of albacore catches by U. S. troll vessels in the 2001 North Pacific season.

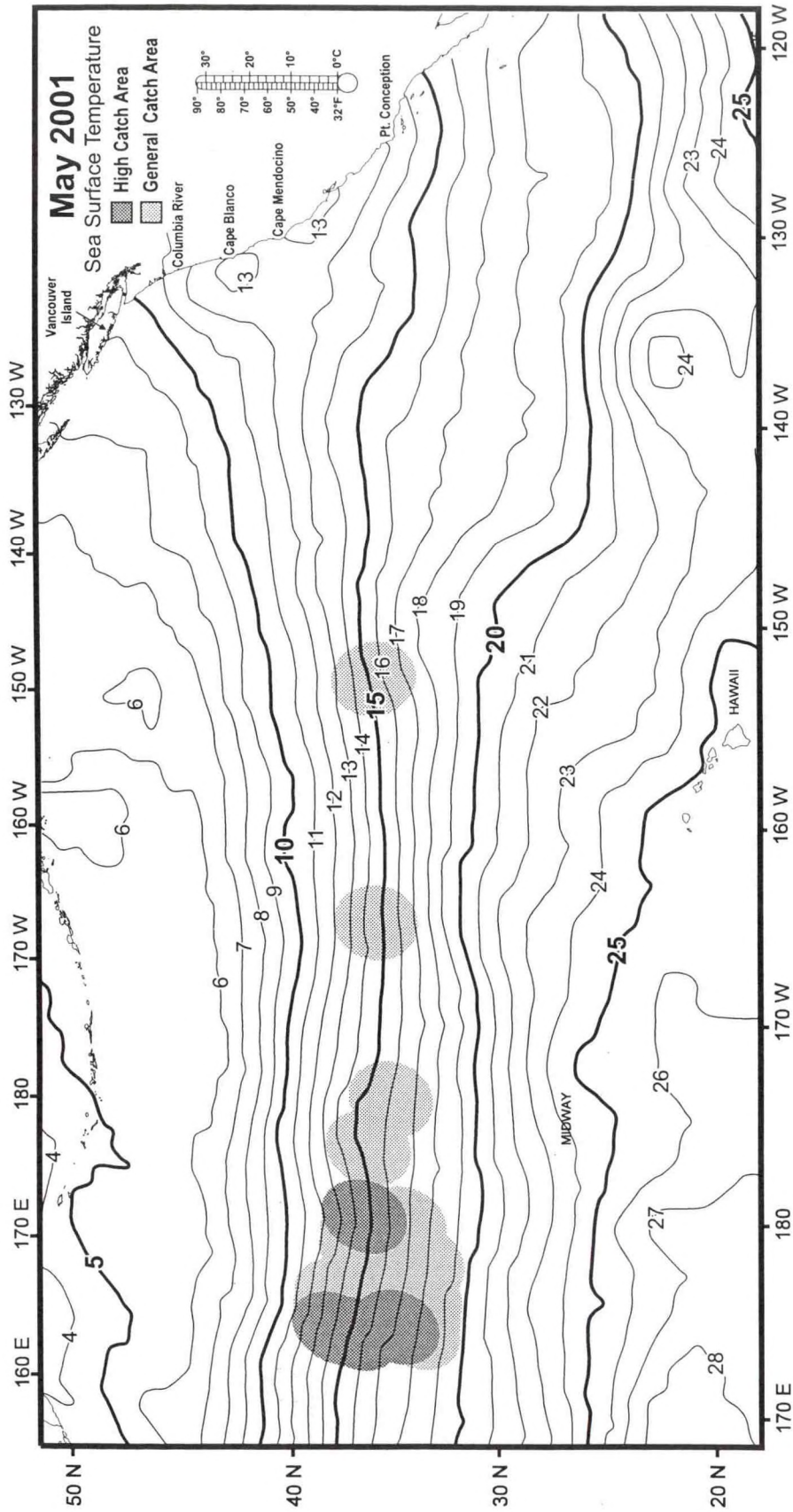


Figure 2a. Distribution of albacore catches and sea surface temperatures in May 2001.

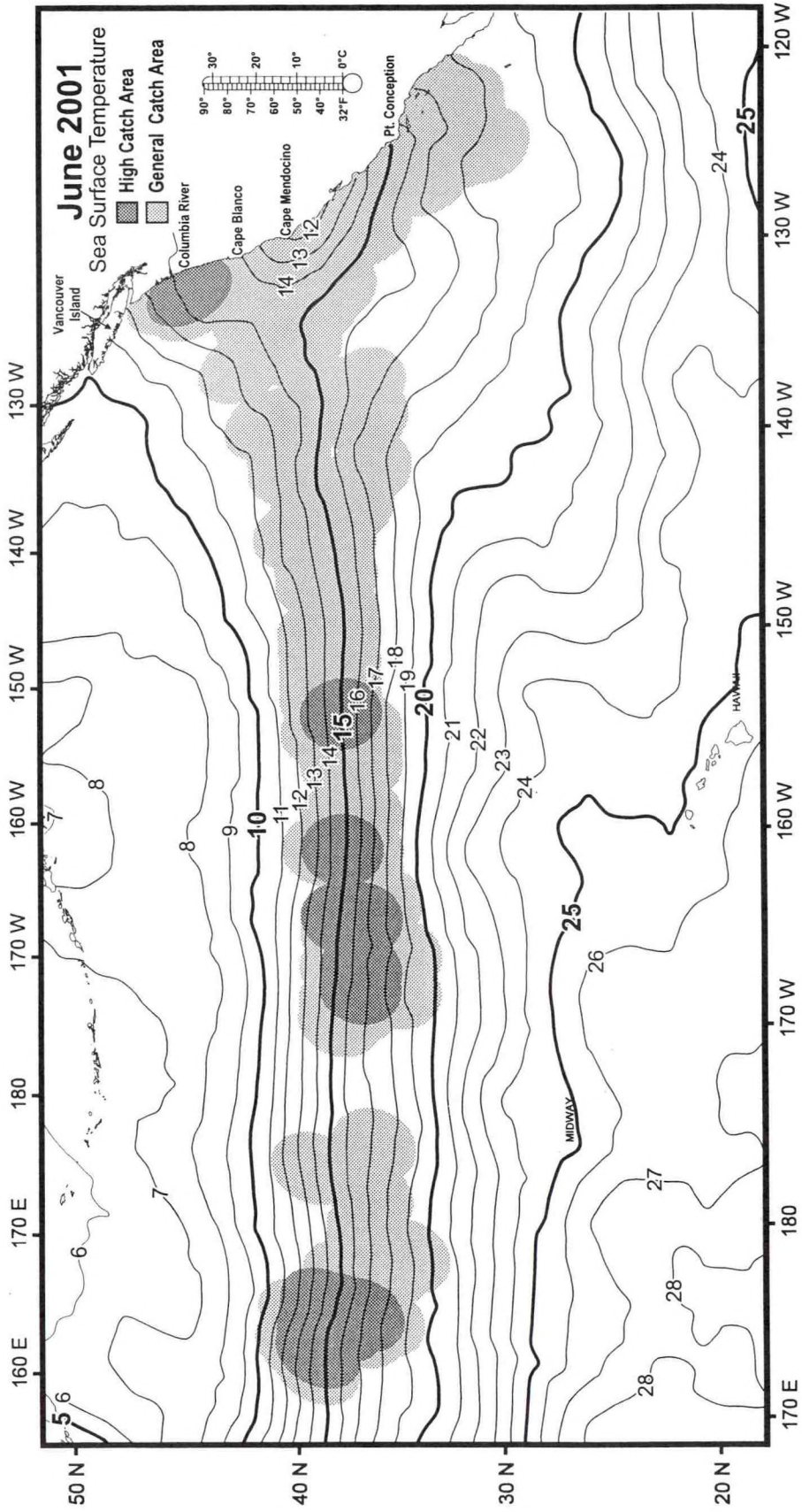


Figure 2b. Distribution of albacore catches and sea surface temperatures in June 2001.

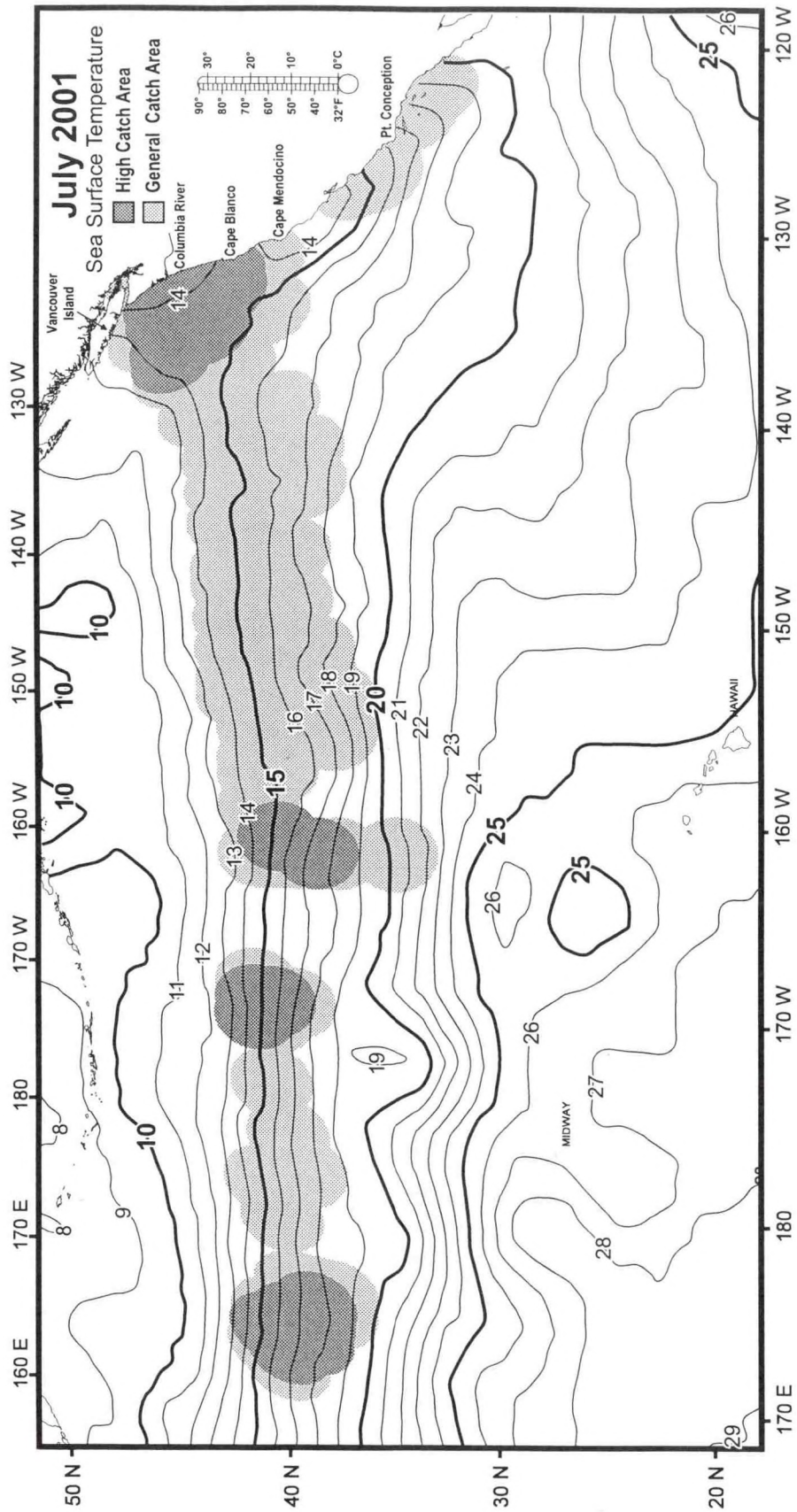


Figure 2c. Distribution of albacore catches and sea surface temperatures in July 2001.

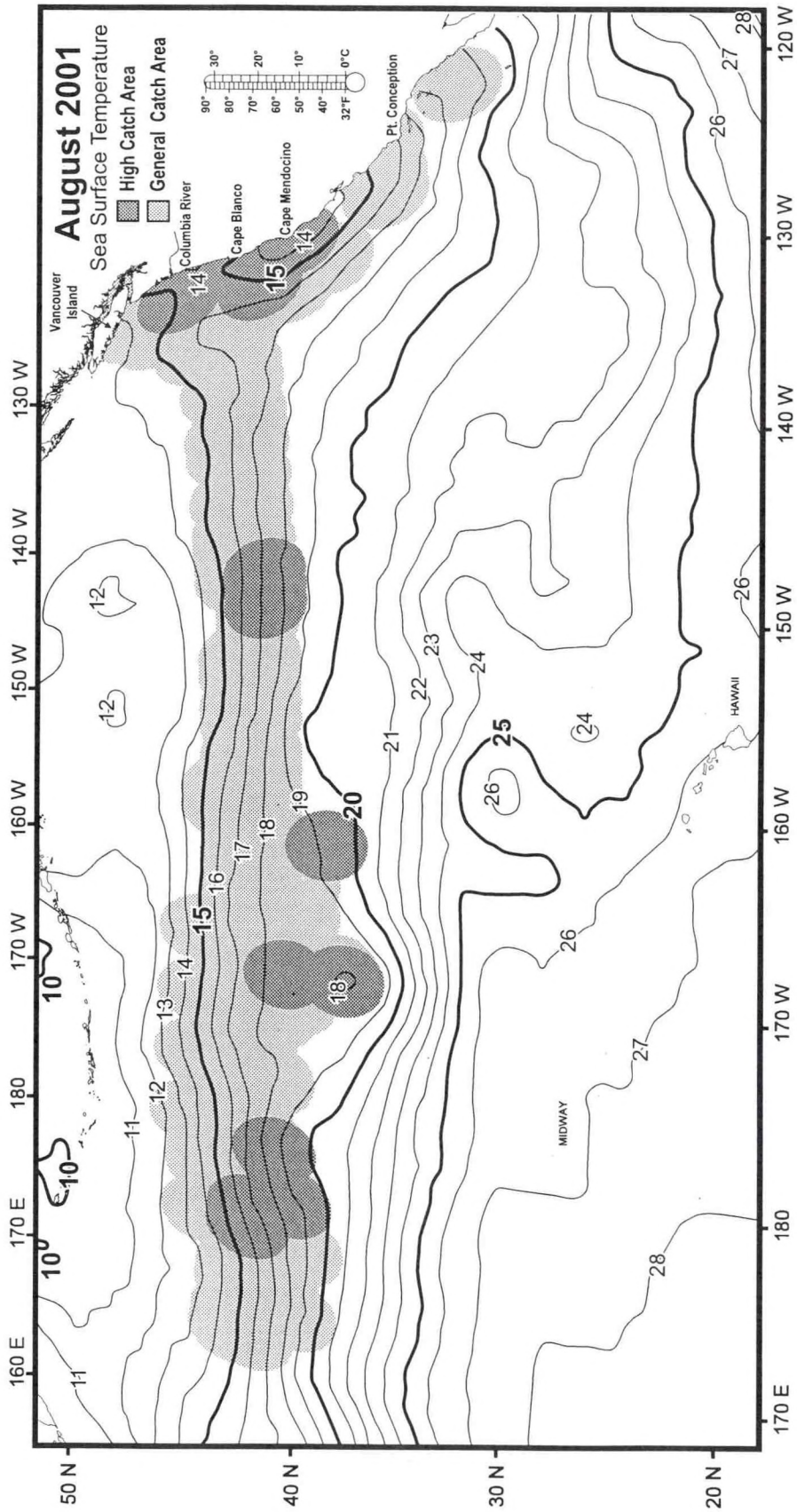


Figure 2d. Distribution of albacore catches and sea surface temperatures in August 2001.

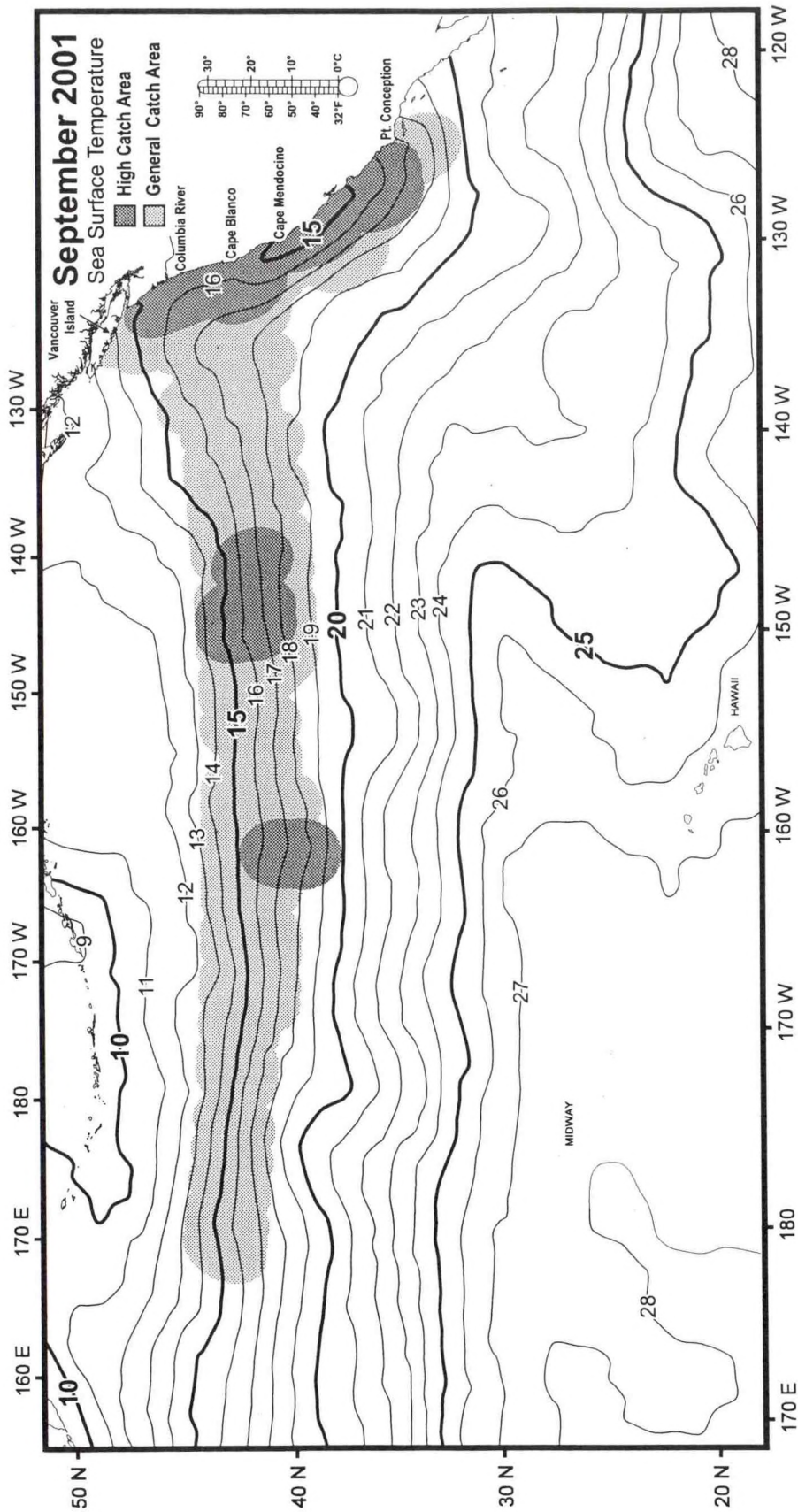


Figure 2e. Distribution of albacore catches and sea surface temperatures in September 2001.

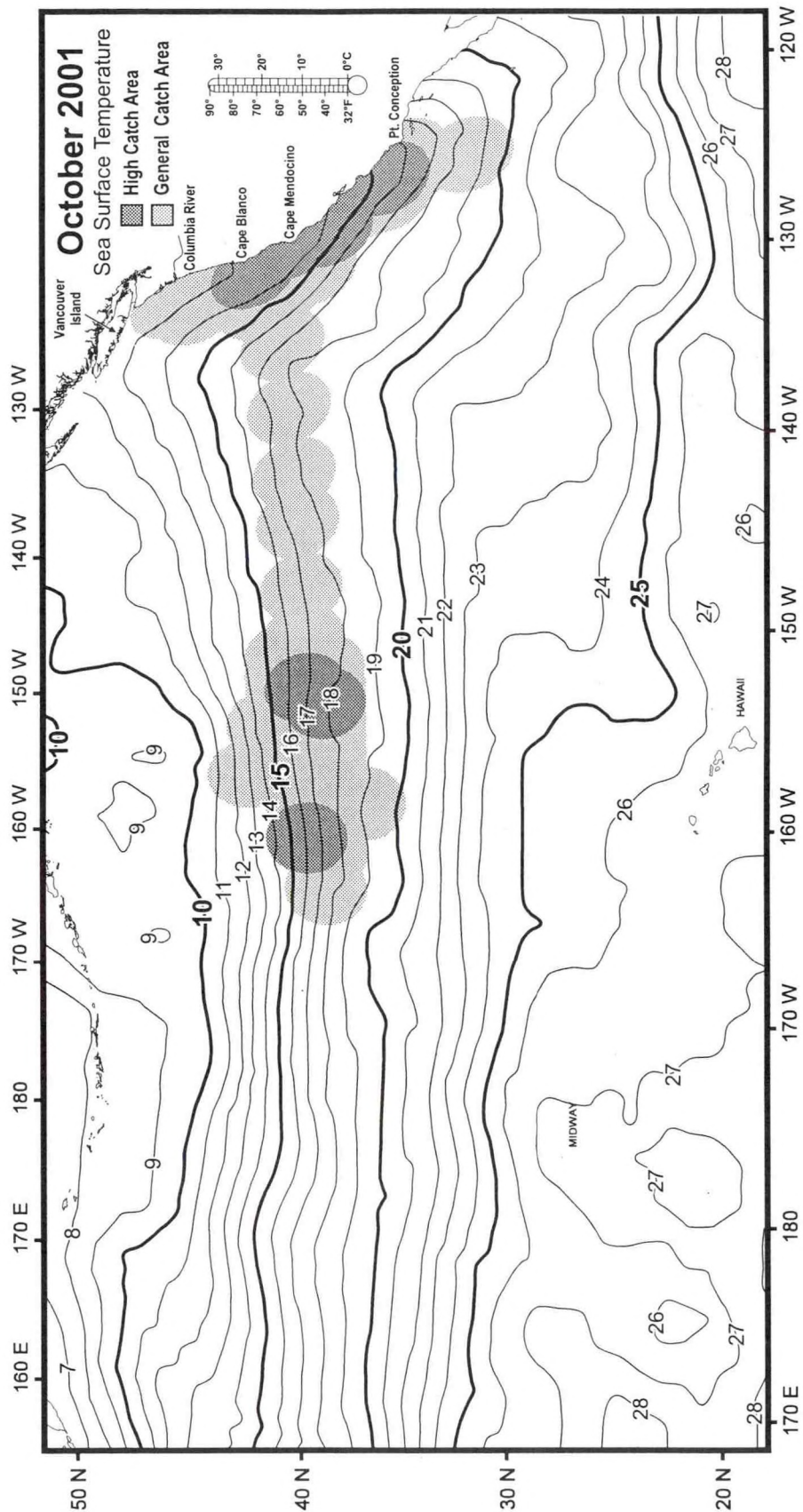


Figure 2f. Distribution of albacore catches and sea surface temperatures in October 2001.

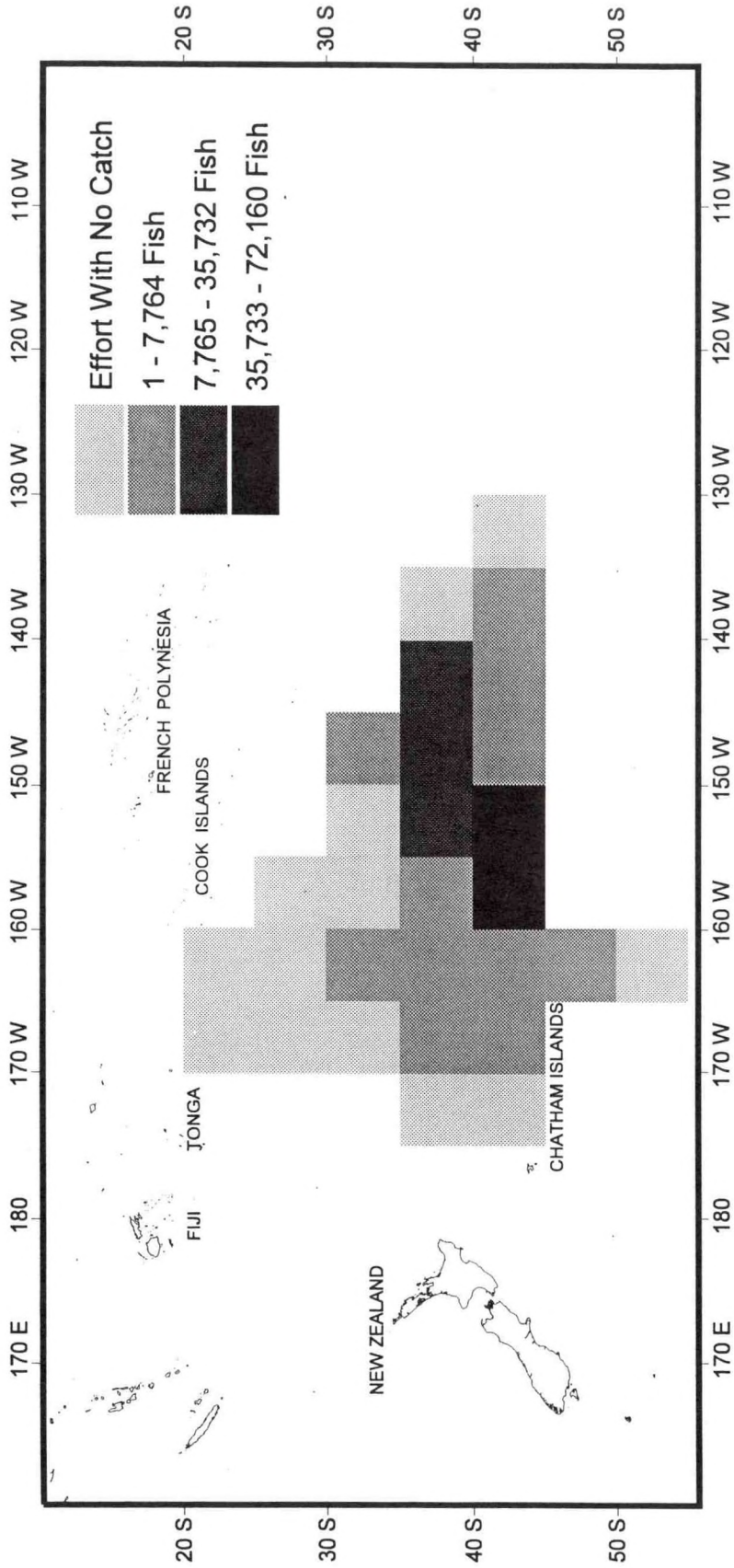


Figure 3a. Distribution of albacore catches by U. S. troll vessels in the 2000-2001 South Pacific season.

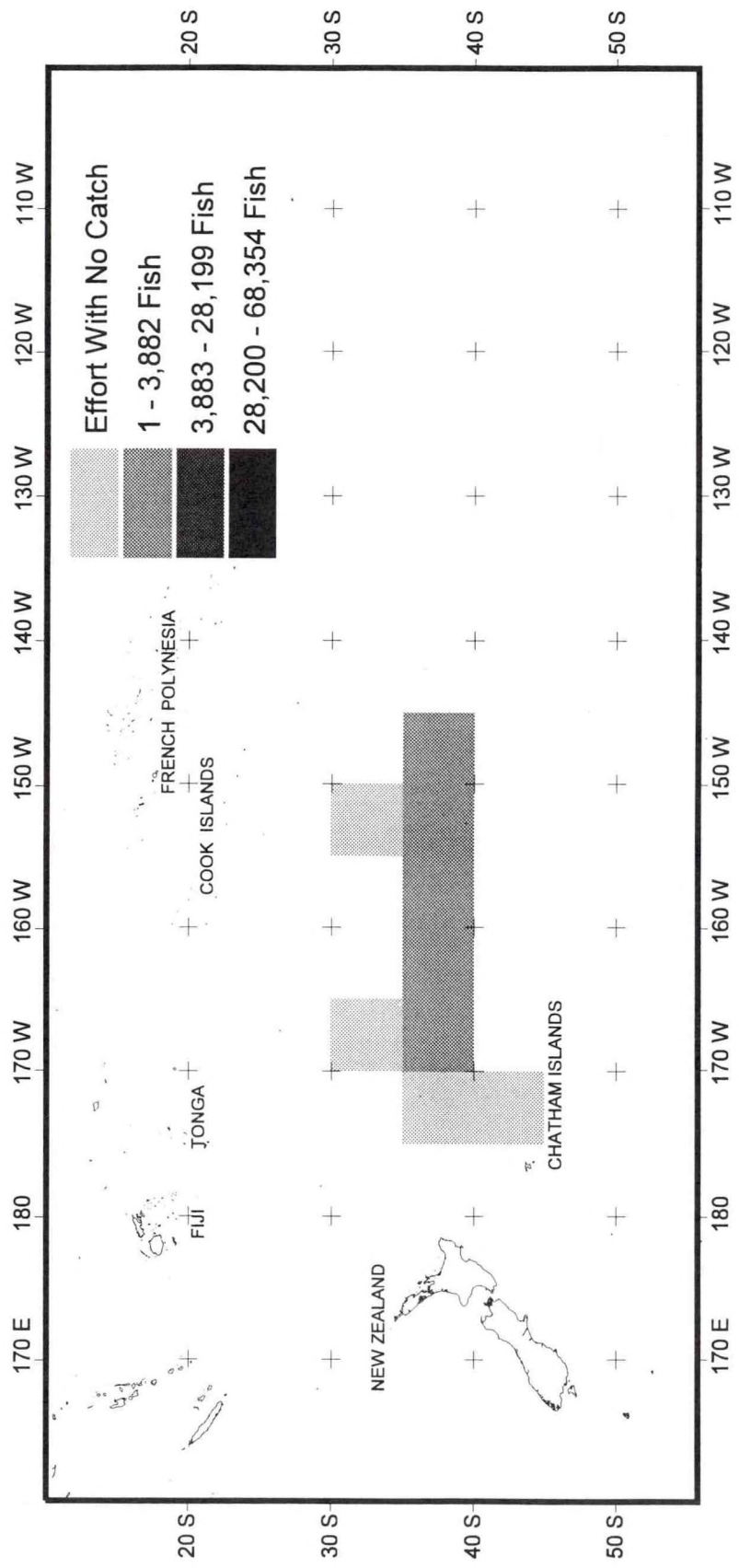


Figure 3b. Distribution of albacore catches by U. S. troll vessels in December 2000.

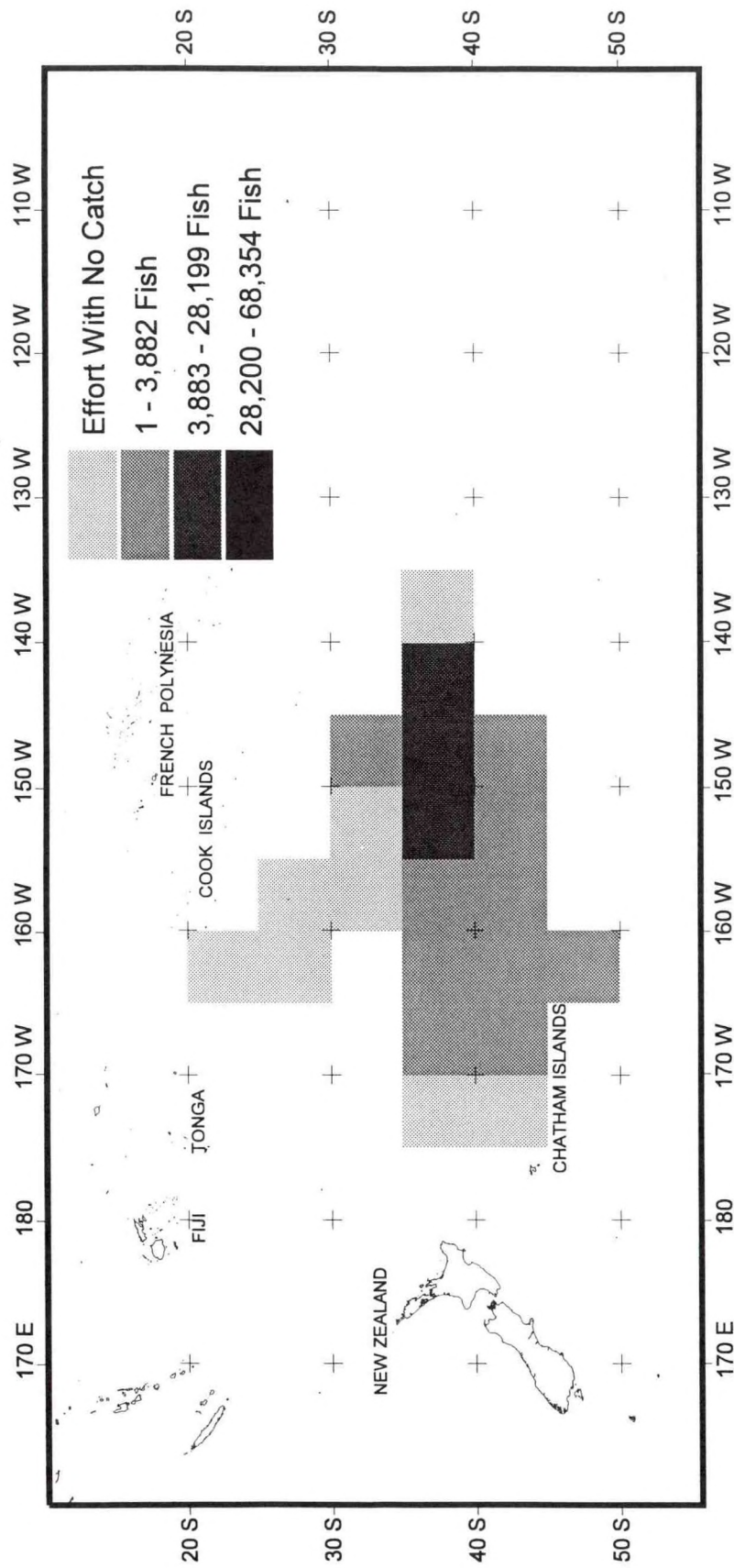


Figure 3c. Distribution of albacore catches by U. S. troll vessels in January 2001.

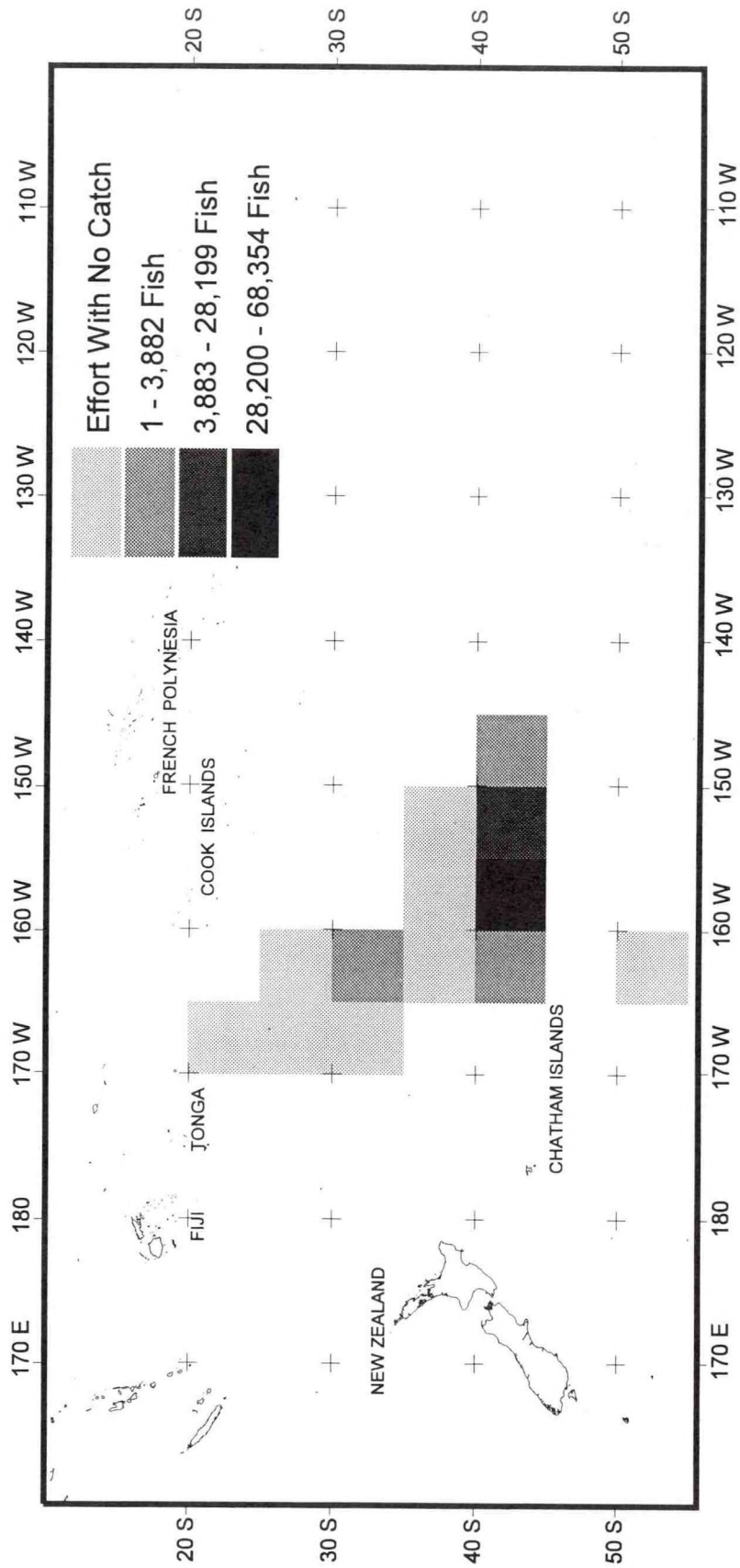


Figure 3d. Distribution of albacore catches by U. S. troll vessels in February 2001.

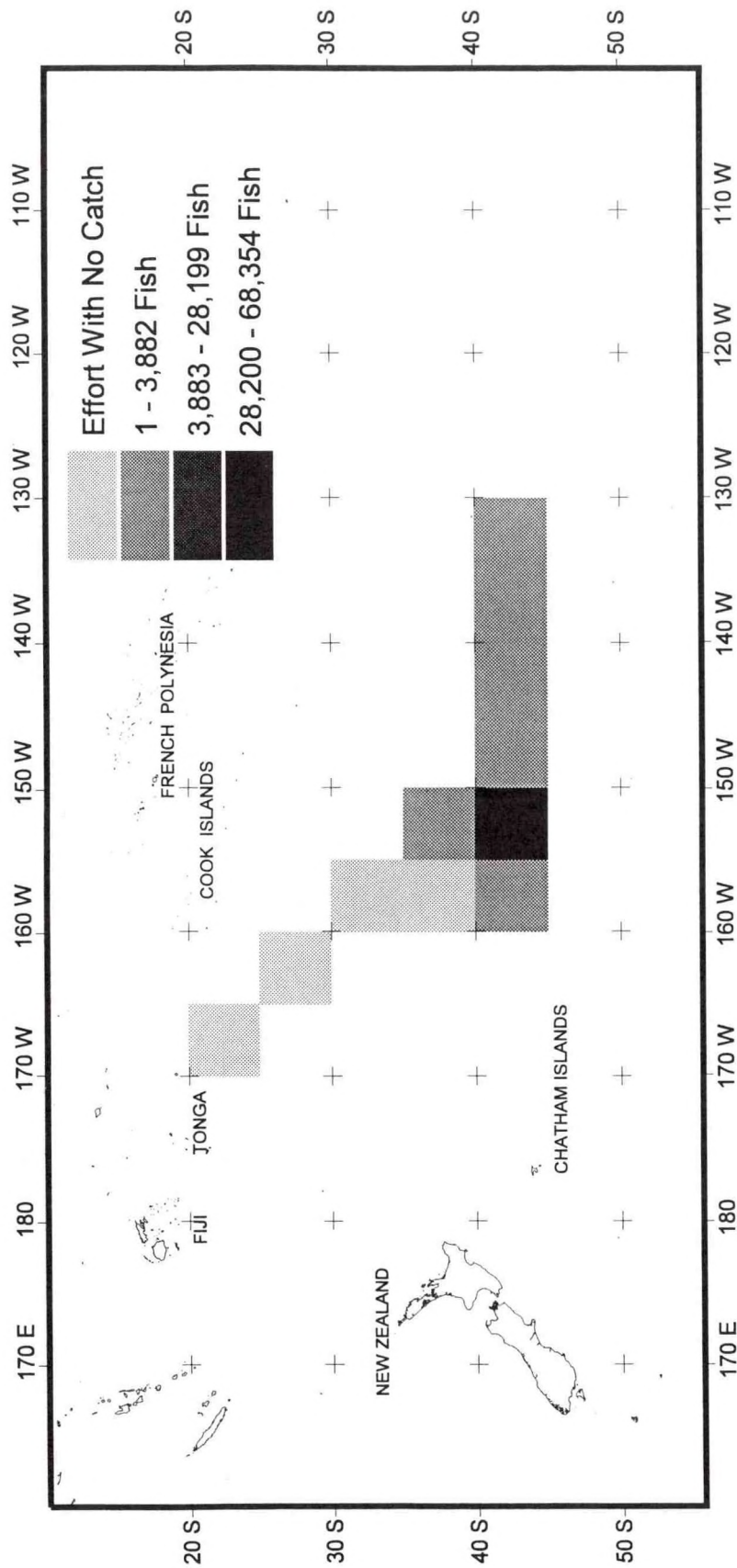


Figure 3e. Distribution of albacore catches by U. S. troll vessels in March 2001.

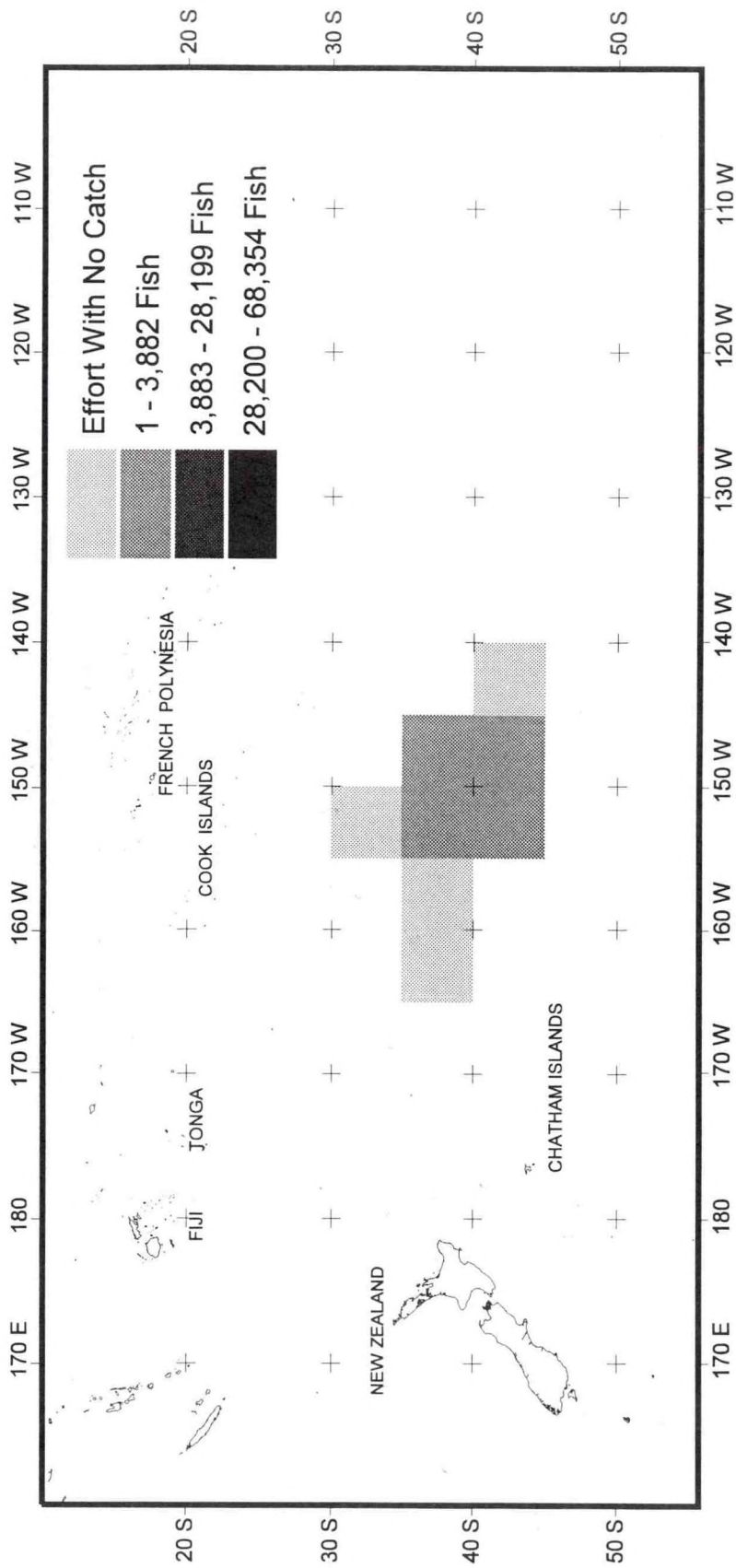


Figure 3f. Distribution of albacore catches by U. S. troll vessels in April 2001.

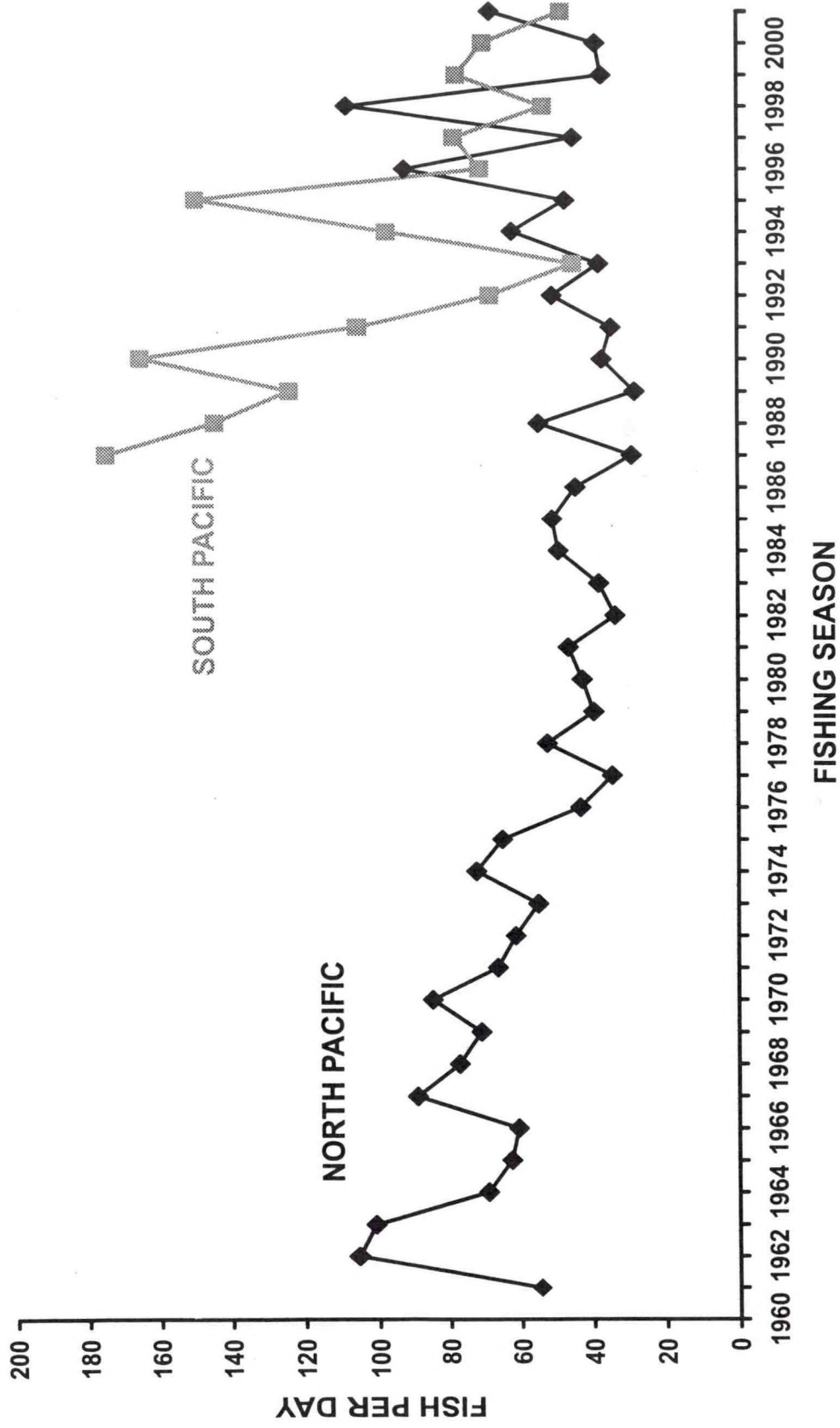


Figure 4. North and South Pacific albacore CPUEs by U. S. troll vessels from 1961 through 2001.

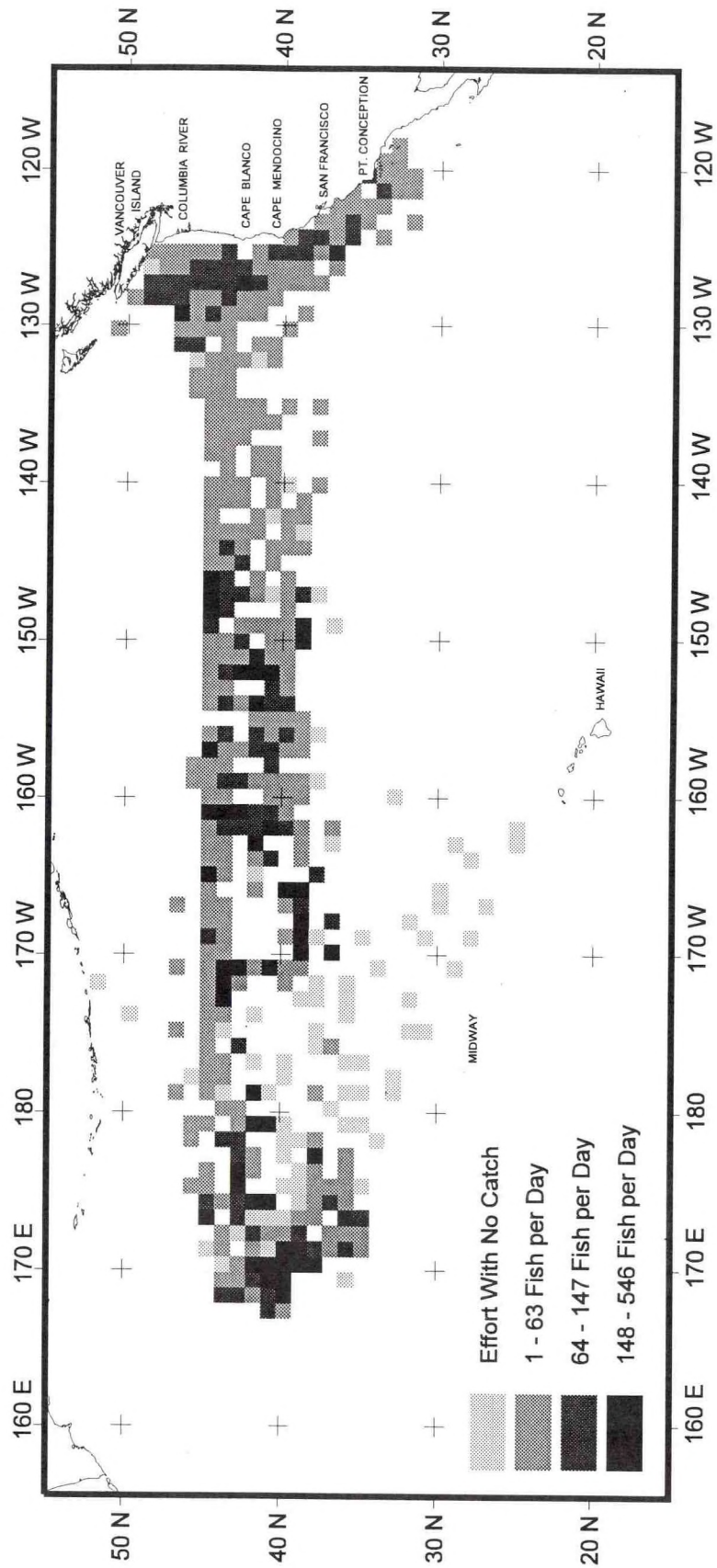


Figure 5a. Distribution of albacore CPUEs by U. S. troll vessels in the 2001North Pacific season.

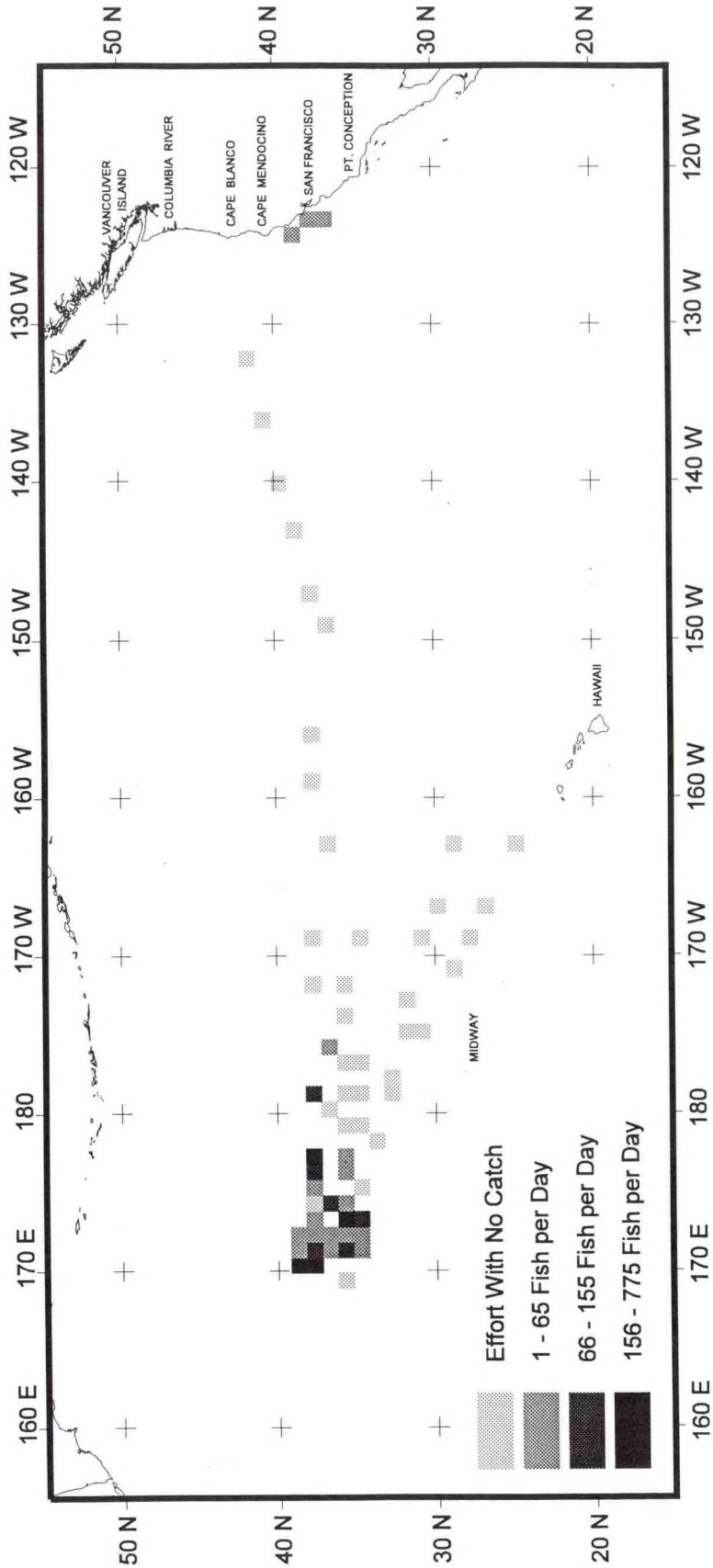


Figure 5b. Distribution of albacore CPUE by U. S. troll vessels in May 2001.

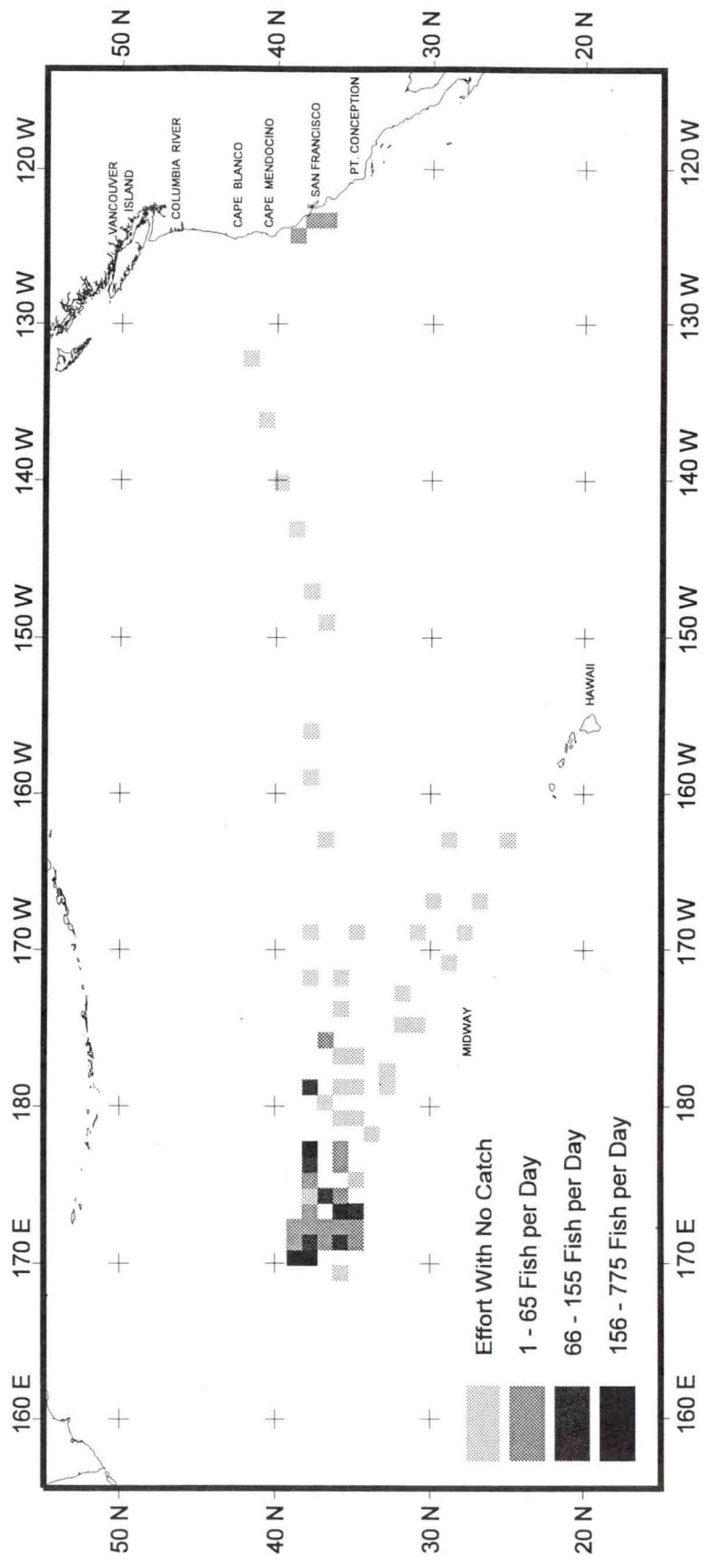


Figure 5c. Distribution of albacore CPUE by U. S. troll vessels in June 2001.

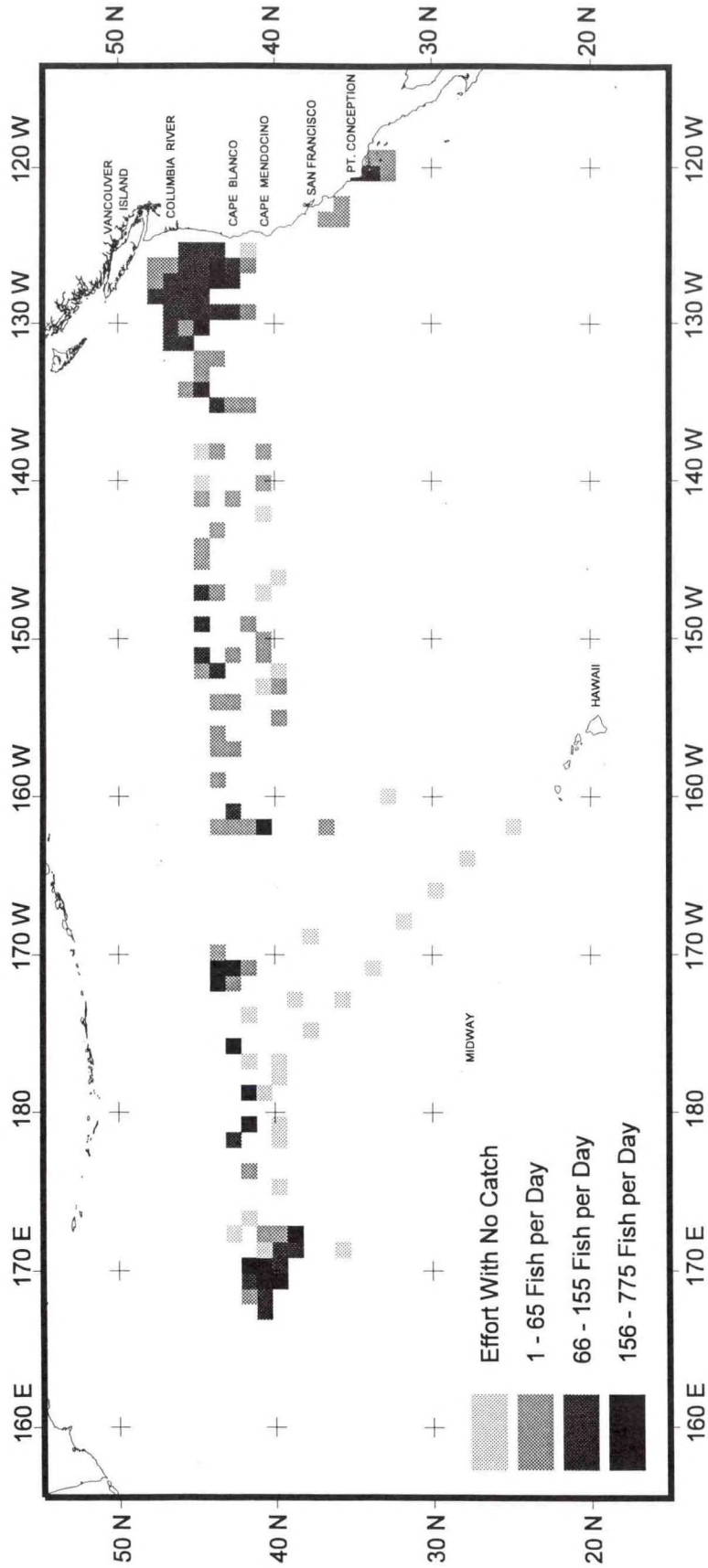


Figure 5d. Distribution of albacore CPUE by U. S. troll vessels in July 2001.

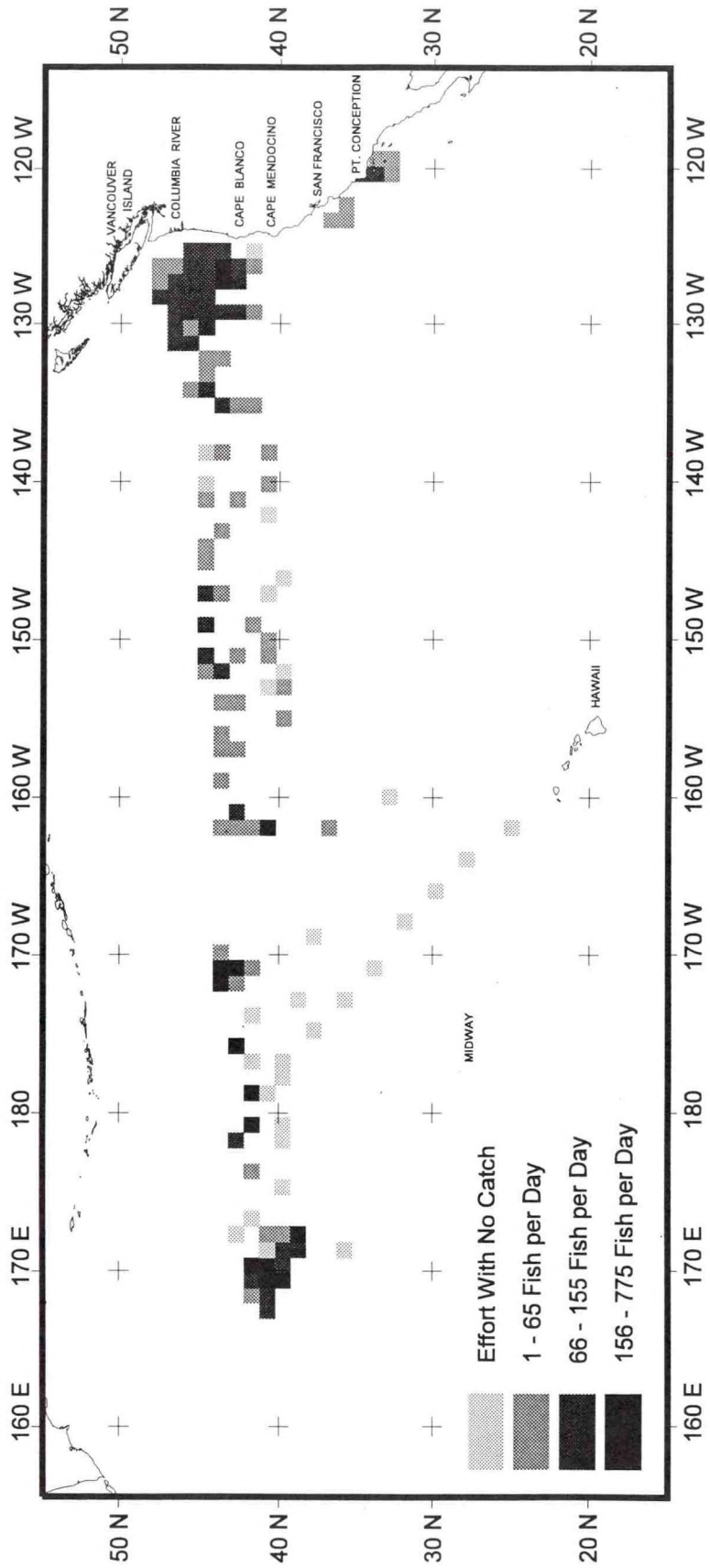


Figure 5e. Distribution of albacore CPUE by U. S. troll vessels in August 2001.

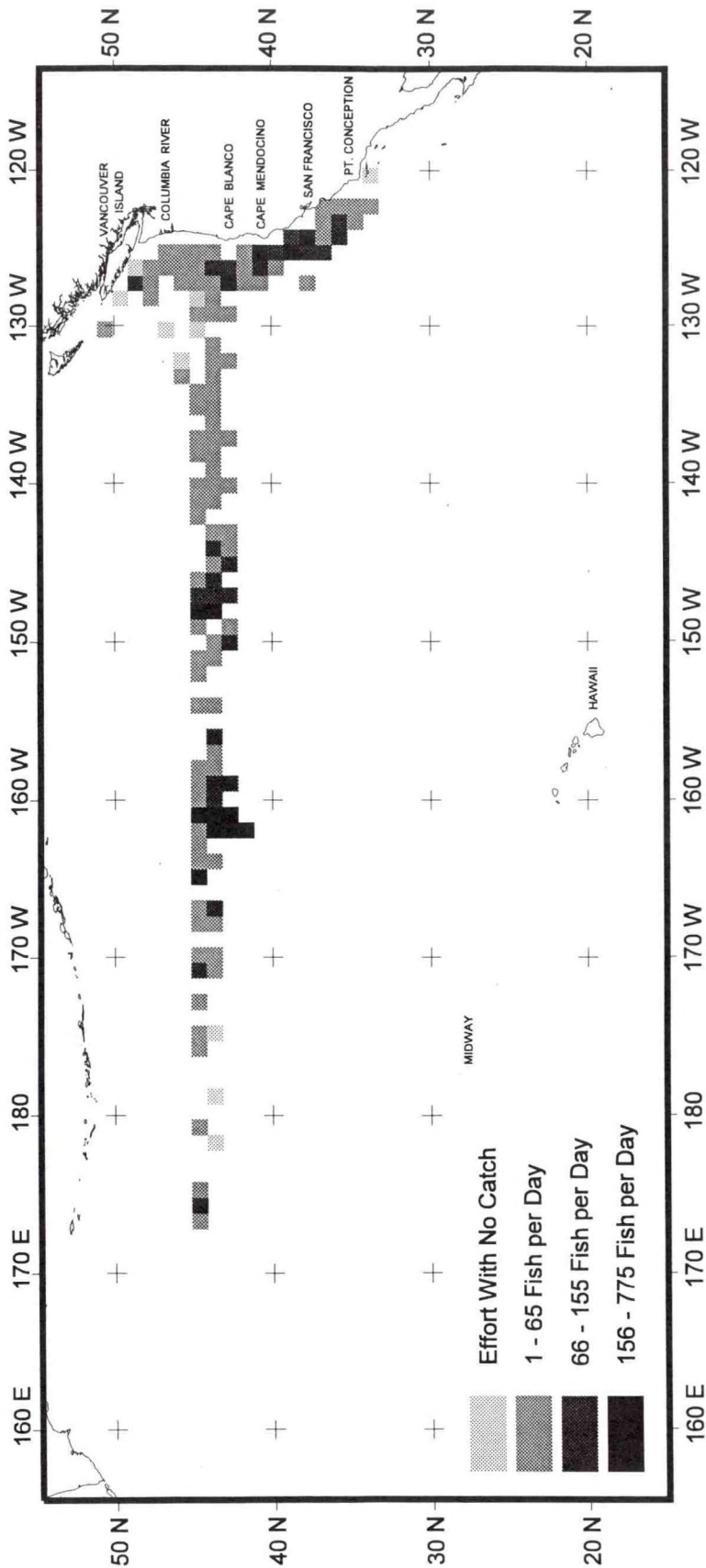


Figure 5f. Distribution of albacore CPUE by U. S. troll vessels in September 2001.

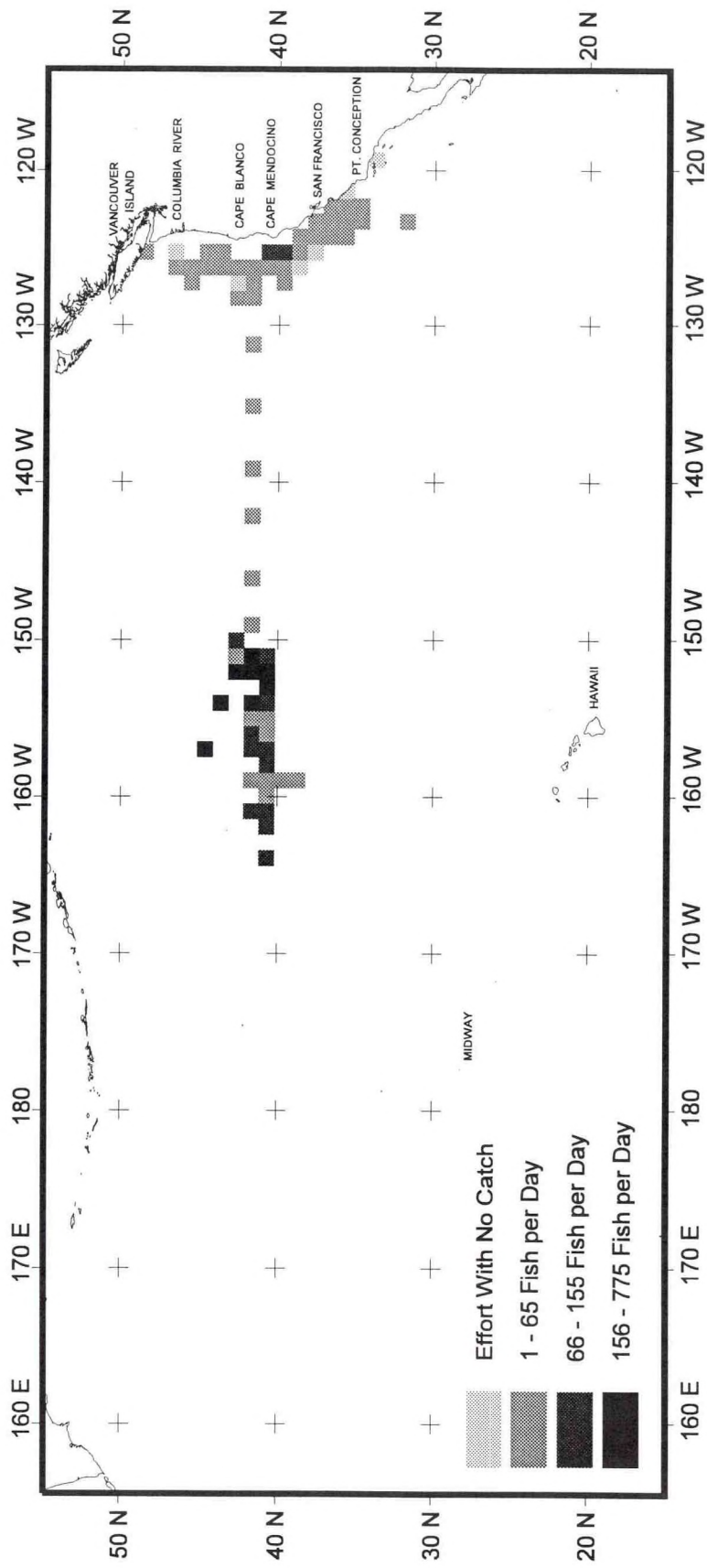


Figure 5g. Distribution of albacore CPUE by U. S. troll vessels in October 2001.

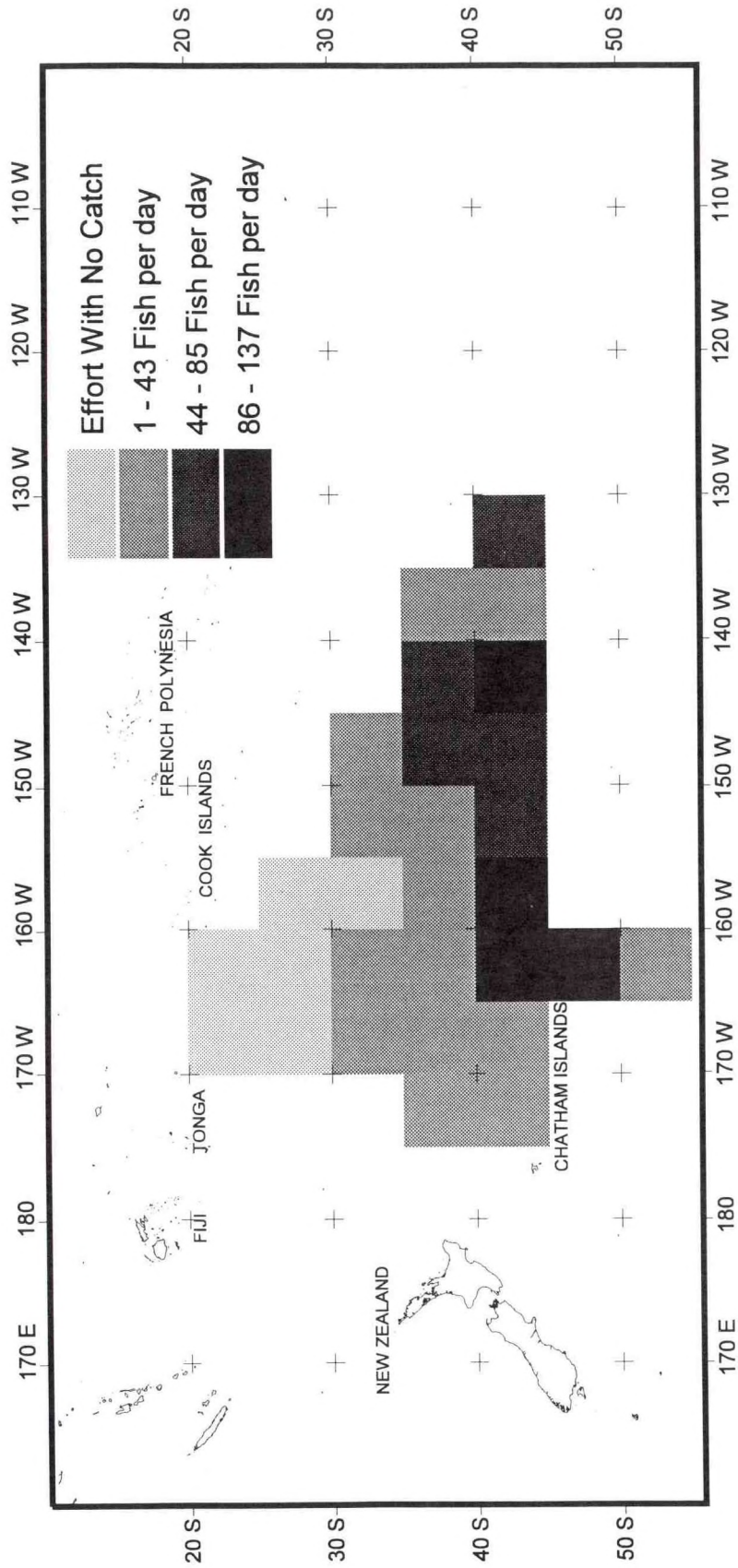


Figure 6a. Distribution of albacore CPUE by U. S. troll vessels in the 2000-2001 South Pacific season.

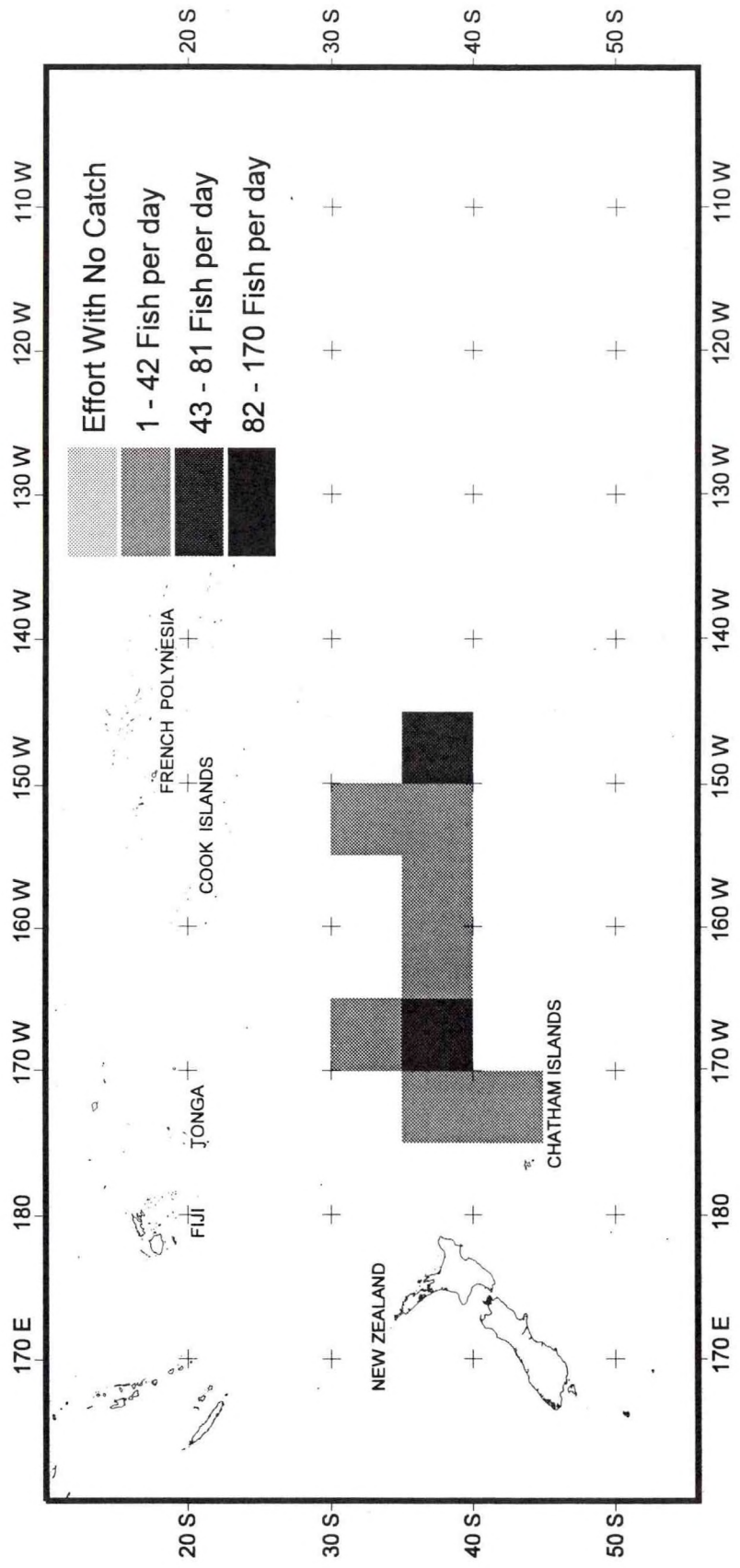


Figure 6b. Distribution of albacore CPUE by U. S. troll vessels in December 2000.

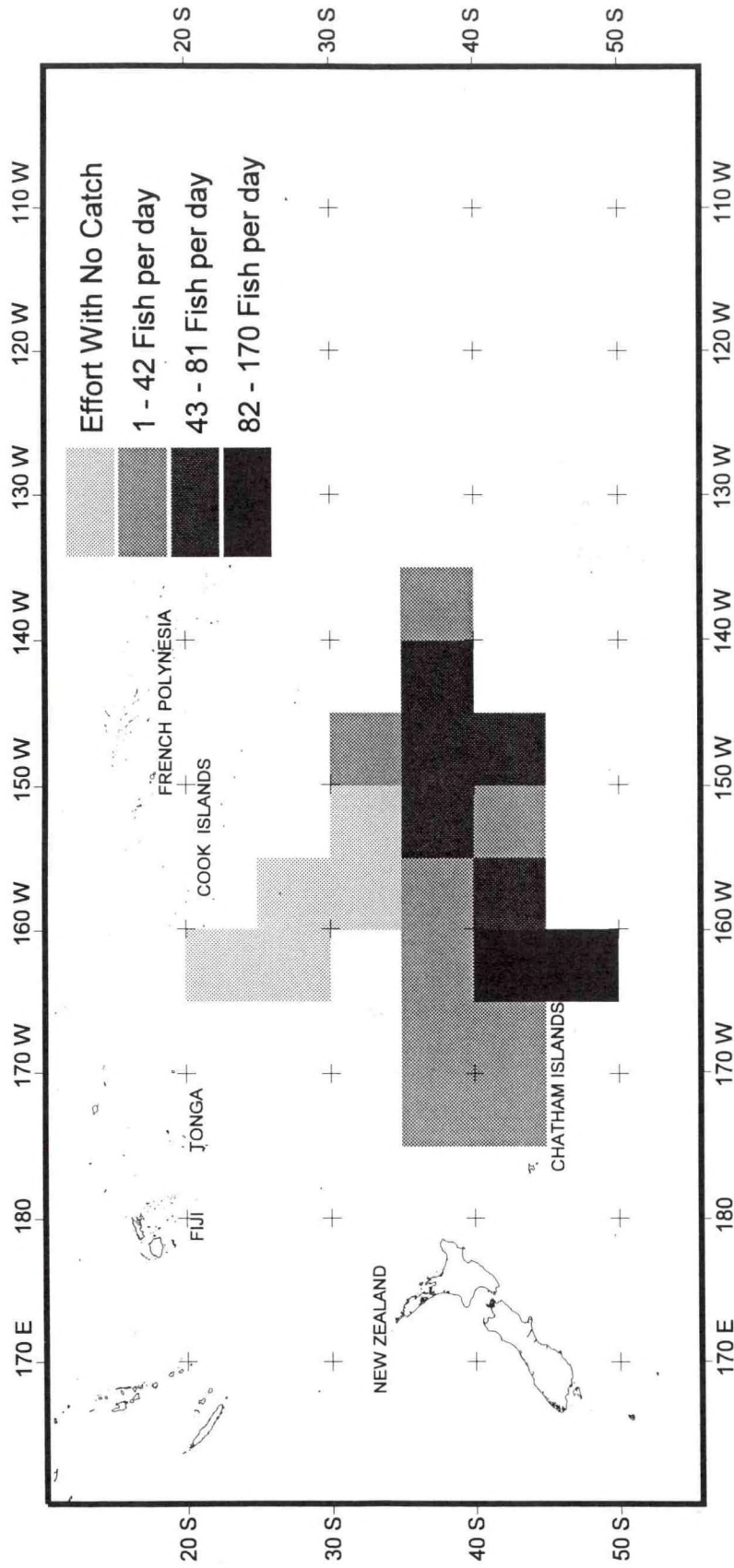


Figure 6c. Distribution of albacore CPUE by U. S. troll vessels in January 2001.

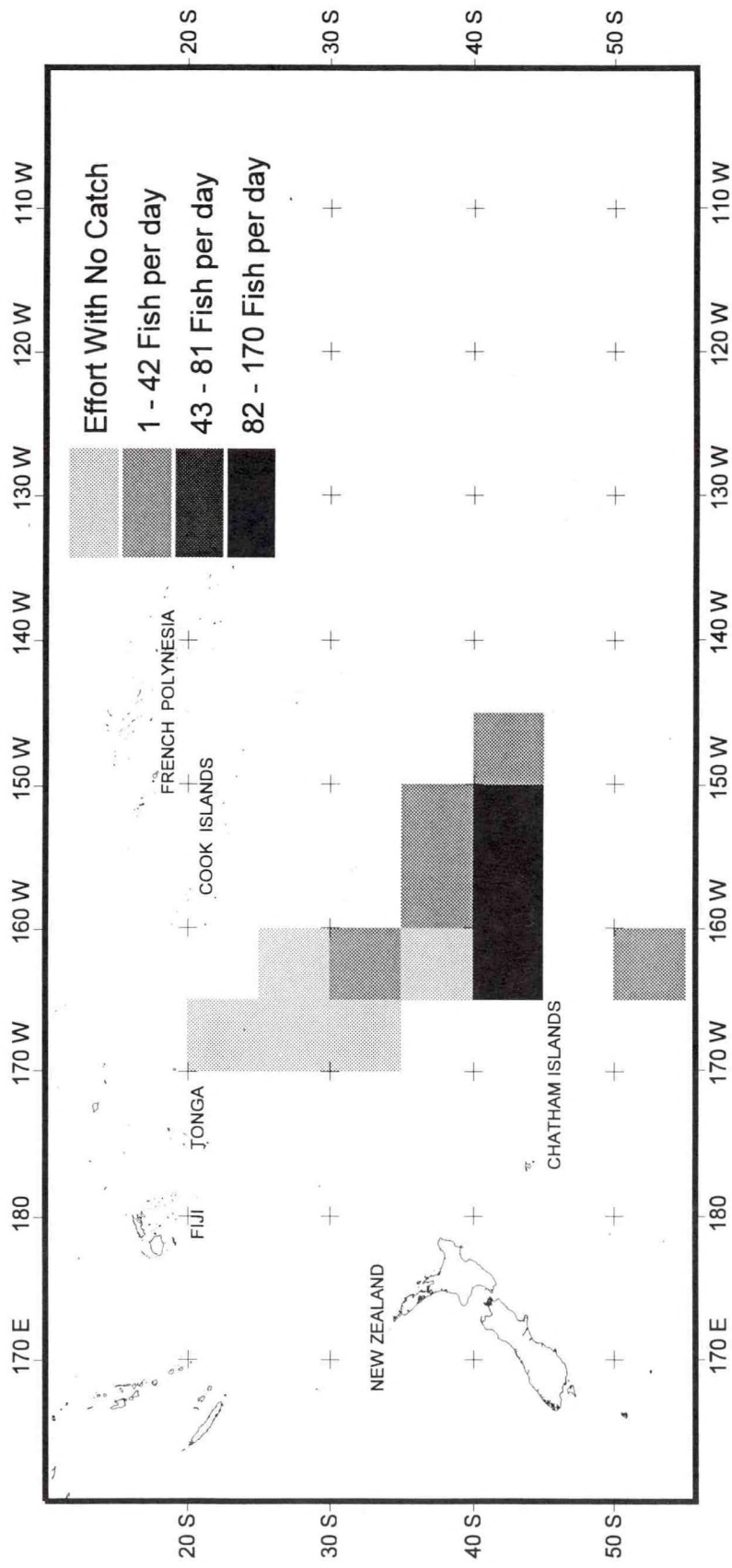


Figure 6d. Distribution of albacore CPUE by U. S. troll vessels in February 2001.

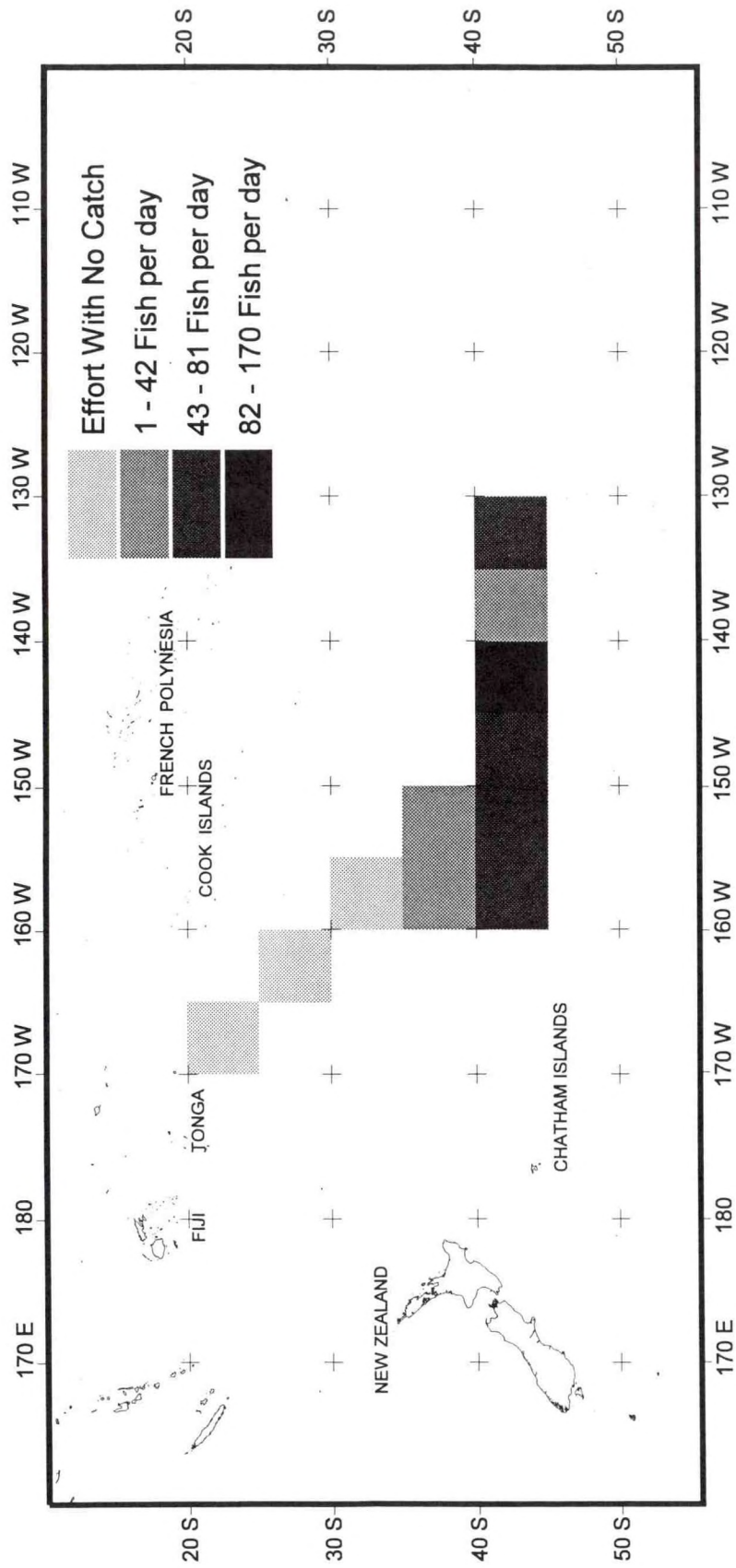


Figure 6e. Distribution of albacore CPUE by U. S. troll vessels in March 2001.

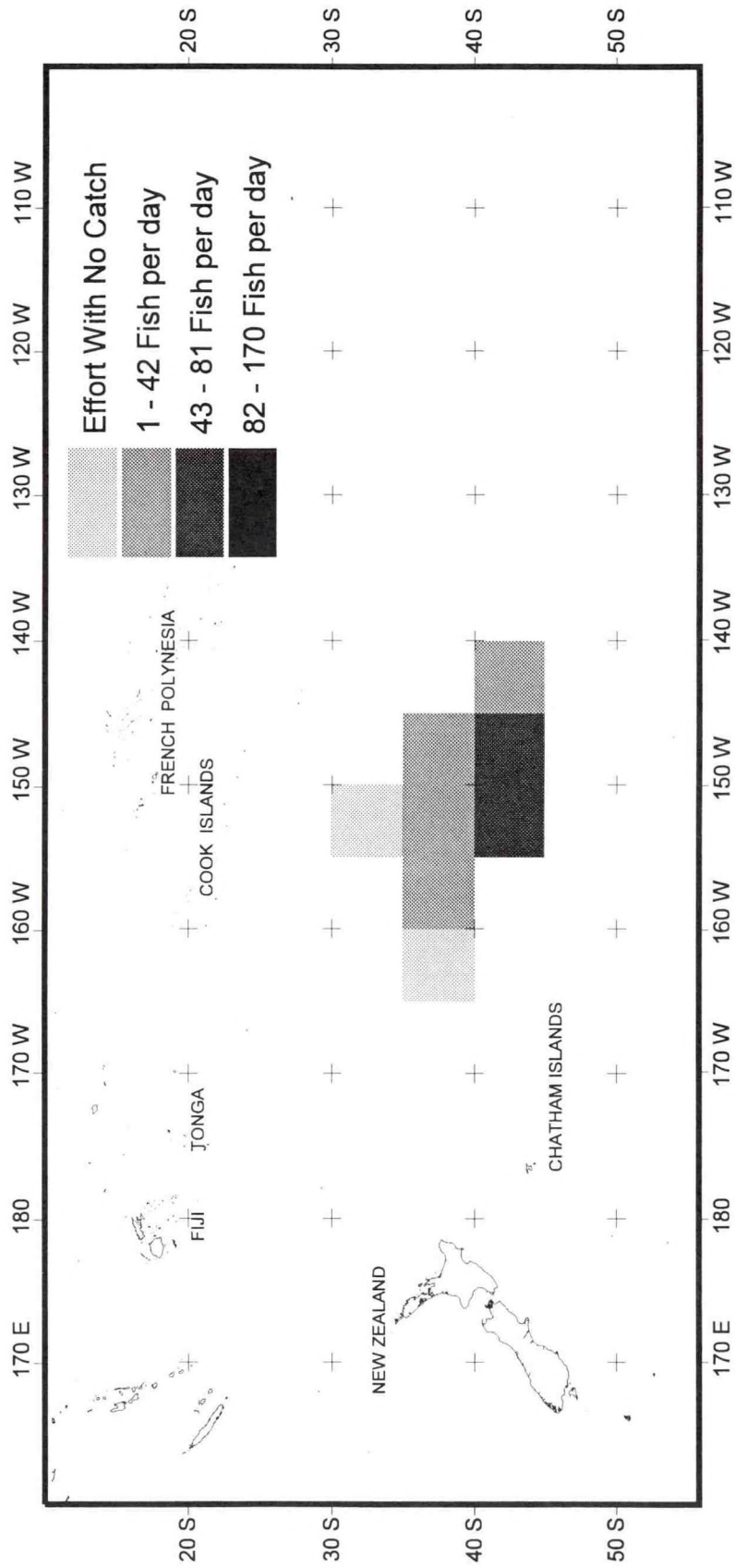


Figure 6f. Distribution of albacore CPUE by U. S. troll vessels in April 2001.

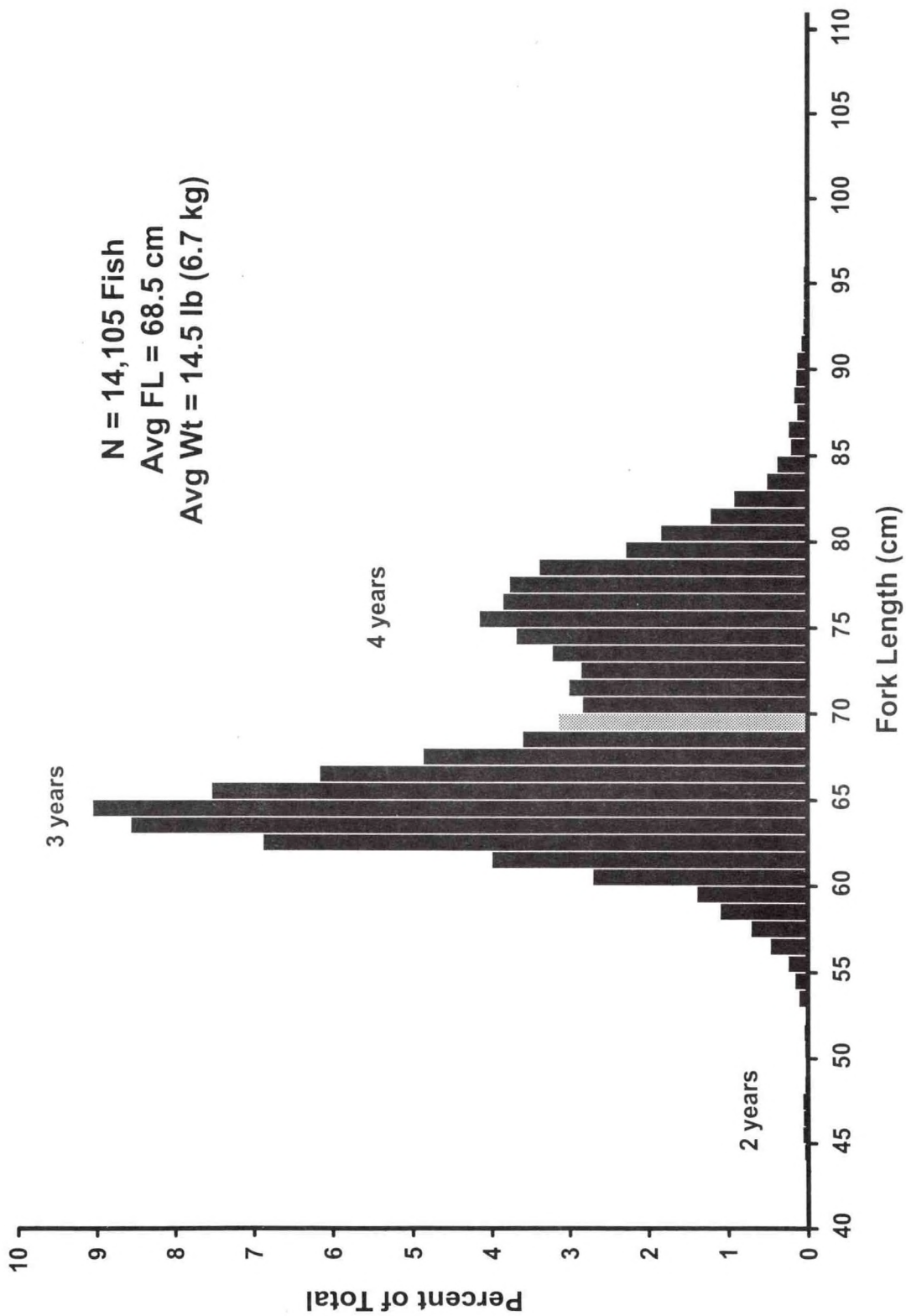


Figure 7. Length-frequency histogram of North Pacific albacore caught by U. S. troll vessels during the 2001 season.

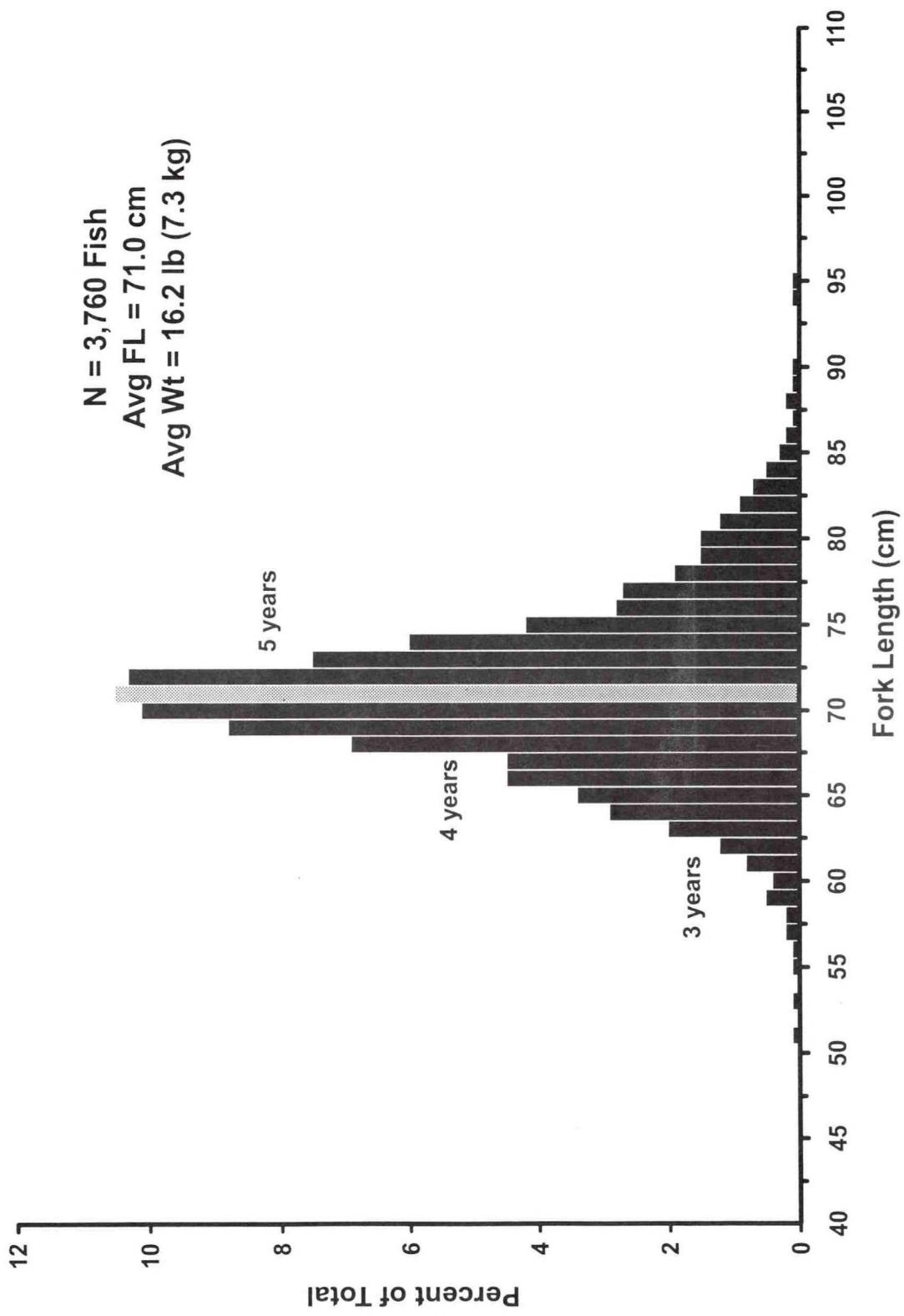


Figure 8. Length-frequency histogram of South Pacific albacore caught by U. S. troll vessels during the 2000-2001 season.