

U.S. SOUTH PACIFIC ALBACORE FISHERY, 1986-1995¹

John Childers and Atilio L. Coan, Jr.

National Marine Fisheries Service
Southwest Fisheries Science Center
La Jolla, California USA

MARCH 1996

¹ Document prepared for the Sixth meeting of the South Pacific Albacore Research (SPAR) Workshop, 5-8 March 1996, Rarotonga, Cook Islands.

U.S. SOUTH PACIFIC ALBACORE FISHERY, 1986-1995

John Childers and Atilio L. Coan, Jr.

National Marine Fisheries Service
Southwest Fisheries Science Center
La Jolla, California USA

INTRODUCTION

U.S. troll vessels have fished for albacore in the North Pacific since the 1950's. During February and March of 1986, two U.S. troll vessels conducted exploratory fishing operations in the South Pacific (Laurs 1986) in search of new fishing areas. That year they demonstrated that albacore could be commercially exploited with troll gear in the southern hemisphere. Since 1986, U.S. troll vessels fished in the South Pacific albacore fishery from December through March and in the North Pacific fishery from April to October. The vessels would usually refuel and reprovision in American Samoa, Tahiti or New Zealand when travelling to and from the fishing grounds and home ports in Hawaii and the U.S. west coast. During the past 10 years, participation in the South Pacific fishery has fluctuated in response to economic factors and fishing success which was influenced by environmental conditions (notably El Niño-type conditions).

Three types of data are collected from the U.S. South Pacific troll fishery: landings data, logbook information, and length-frequency data of fish caught. The Southwest Regional Office of the National Marine Fisheries Service (NMFS-SWR) in Pago Pago, American Samoa is responsible for collecting the data and the Southwest Fisheries Science Center (SWFSC) of NMFS in La Jolla, California is responsible for compiling the data.

This paper reviews data collected from the U.S. South Pacific troll fishery for the period 1986 to 1995. Data from all fishing seasons are reviewed and compared and an outlook for the 1995-96 season is presented.

VESSELS

U.S. vessels fishing for albacore in the South Pacific usually ranged in size from 16.5 - 30 meters long with a carrying capacities ranging from 23 to 136 metric tons (t). These vessels are the larger vessels of the U.S. troll fleet that are suitably equipped to make the long journey from U.S. home ports to the fishing grounds in the southern hemisphere. They are capable of withstanding the adverse weather conditions encountered during extended offshore trips. The vessels are equipped with state of

the art navigation and fish-locating equipment to successfully fish for albacore. They usually make 1 to 4 trips each season with each trip lasting up to two months. The final trip of a season in the South Pacific fishery usually ends in American Samoa with unloading of the catch.

Participation in the U.S. South Pacific albacore troll fishery increased from the two vessels in 1986 to a high of 58 vessels in 1990-91 (Table 1). Reduced fishing success between 1990-91 and 1993-94 resulted in decreased participation. In 1994-95 only 12 vessels participated in the fishery.

LANDINGS DATA

Landings data collected from the U.S. troll fishery between 1986-87 and 1994-95 included total tonnages unloaded, number of vessels in the fishery, and number of trips or unloadings. The data were collected by NMFS port samplers in Pago Pago, American Samoa and fisheries scientists in Fiji, French Polynesia and New Zealand, where U.S. vessels occasionally landed their catches. The landed tonnages were usually obtained from cannery receipts and were verified through the Western Fishboat Owners Association (WFOA). Some landings were from carrier vessels that loaded troll vessel catches at sea and transported them to canneries in American Samoa.

Seasonal landings for the U.S. South Pacific albacore fishery increased from 751 t in 1986-87 to a peak of 5,540 t in 1990-91 (Table 1). Landings then decreased each season to a low of 603 t in 1993-94. Landings in 1994-95 increased significantly to 2,916 t.

The marked decrease in seasonal landings between 1990-91 and 1993-94 coincided with a period of strong El Niño-type conditions in the South Pacific (Figure 1). During that period, surface waters warmed sufficiently to change the oceanography of the fishing area.

LOGBOOK DATA

Information recorded in the logbooks included daily positions, numbers of fish caught, numbers of lines trolled, numbers of hours fished, sea surface temperatures, and various other environmental conditions as well as comments and observations pertaining to fishing conditions. Fishermen's participation in the logbook program is completely voluntary. Logbook data were collected from U.S. and foreign troll vessels in U.S. ports by NMFS port samplers and in foreign ports by fisheries scientists of New Zealand, French Polynesia, and Fiji. The data were forwarded to the SWFSC of NMFS in La Jolla, California where they were processed.

Logbook sampling coverage rates were calculated as landings from sampled trips divided by total landings of albacore for a season. Coverage rates fluctuated between 18% in 1992-93 and 69% in 1991-92 (Figure 2). The major factor influencing the large differences in coverage rates was inconsistent participation by fishermen in the logbook sampling program. More at-sea transshipments and less frequent port calls in recent years also influenced coverage rates as vessels transshipping their catches at sea were less available to samplers who monitored vessels and collected logbook information at landing ports. Low logbook coverage rates in 1987-88 and 1992-93 may reduce the reliability of these data for use in analysis of trends.

Relative fishing success was represented by catch-per-unit-effort (CPUE) expressed in numbers of fish caught per day of fishing. Standardized CPUE was computed by a method described by Kleiber and Perrin (1991). The method sums catch and effort for 10-day, 1-degree square strata and then calculates CPUE for each stratum. The CPUE's for these strata are then averaged to produce monthly and seasonal CPUE's (Figures 3 to 12).

CPUE's for the South Pacific troll fishery ranged between 43 fish/day in 1992-93 to 178 fish/day in 1987-88 (Figure 12). CPUE decreased markedly between 1989-90 and 1992-93. Reduced participation in the fishery and abnormally warm surface waters made it difficult for troll vessels to find significant concentrations of albacore during this period.

El Niño events can be detected using the Southern Oscillation Index (SOI). SOI values below approximately -1.0 indicate strong El Niño-type conditions while values above +1.0 indicate strong anti-El Niño-type conditions (Miller, pers. comm.²). Strong El Niño-type conditions cause abnormally warm surface waters, extremely weak sea surface temperature gradients, and fewer concentrations of bait fish. These conditions reduce the concentrations of albacore in the surface waters of South Pacific troll fishing areas. CPUE's and total landings are therefore expected to be highest during strong anti-El Niño periods and lowest during strong El Niño periods. This appears to be the general pattern in the South Pacific troll fishery between 1987-88 and 1994-95 (Figures 1 and 13). During a strong anti-El Niño period between July 1988 and September 1989, landings and CPUE were generally high. During a strong El Niño period between March 1991 and December 1994 landings and CPUE were generally low. Since December 1994 El Niño-type conditions weakened and seasonal landings and CPUE's increased.

² Forrest Miller (Inter-American Tropical Tuna Commission) La Jolla, CA.

The fishing area of the South Pacific albacore fishery is generally located between 30°S and 42°S latitude and 135°W to 180° longitude (the international dateline) (Figures 3 to 11). The highest CPUE is usually made between 35°S and 40°S latitude and 140°W to 170°W longitude. The temporal-spatial distributions of CPUE's follow an east-west progression in each season.

LENGTH-FREQUENCY DATA

Total numbers of fish from which fork lengths (FL) were measured each season varied from 996 fish in 1993-94 to 17,582 fish in 1988-89 (Figure 14). Average fork lengths ranged between 63 cm (6 kg) in 1992-93 to 74 cm (9.2 kg) in 1990-91.

One to three general size modes (60 cm, 67 cm, and 72 cm FL) are evident in length-frequency samples of albacore that were measured each season (Figure 14). The distribution and dominance of these modes varied from season to season.

SUMMARY AND OUTLOOK FOR 1995-96

The U.S. South Pacific albacore fishery began in 1986 when exploratory efforts indicated that the resource could support a commercial troll fishery. Vessels that participated in the fishery were the largest and best equipped troll vessels that also fished for albacore in the North Pacific. The NMFS collected landings, logbook, and length-frequency of catches data for the fishery.

Logbook sampling coverage rates varied between 18% in 1992-93 and 69% in 1991-92. Sampling coverage rates dropped substantially in 1987-88 and 1992-93. The fishery reached its peak in 1990-91 when 58 U.S. troll vessels fished in the South Pacific. Participation decreased between 1990-91 and 1994-95.

Total landings increased from 751 t in 1986-87 to 5,540 t in 1990-91 then declined sharply to 603 t in 1993-94. Landings then increased to 2,916 t in 1994-95. The highest CPUE's were distributed in the area between 35°S and 40°S latitude and 140°W to 170°W longitude. CPUE's decreased significantly between 1989-90 and 1992-93 then increased to 143 fish/day in 1994-95. The decrease in landings and CPUE between 1990-91 and 1992-93 was probably due to strong El Niño-type conditions in the South Pacific troll fishing areas during that time period or decreased fleet size.

The total number of fish from which fork lengths were measured ranged from 996 fish in 1993-94 to 17,582 fish in 1988-89. One to three size modes (centered at 60 cm, 67 cm, and 72 cm FL) were prominent in albacore catches measured between 1986-87 and 1994-95.

The presence of these modes varied from season to season. Average fork lengths of measured albacore ranged from 63 cm (6 kg) in 1992-93 to 74 cm (9.2 kg) in 1990-91.

The 1995-96 South Pacific season began in December 1995. Approximately 45 U.S. troll vessels are currently fishing in the South Pacific. Fishing success has been poor with daily CPUE's ranging between 58 and 87 fish/day. Vessels report that sea surface temperature gradients are weak and surface waters are murky. An estimated 900 t have been landed so far. The size composition of the catch is expected to be similar to that of past years'.

ACKNOWLEDGEMENTS

We thank Gordon Yamasaki (NMFS-SWR) and his staff in Pago Pago, American Samoa and the Fisheries Scientists of French Polynesia (Etablissement pour la Valorisation des Activités Aquacoles et Maritimes), Fiji (Fiji Fisheries Department), and New Zealand (Ministry of Agriculture and Fisheries) for collecting the data. We also thank all participating fishermen, WFOA and U.S. canneries for providing data.

LITERATURE CITED

Laurs, R. Michael 1986. U.S. albacore trolling exploration conducted in the South Pacific during February-March, 1986. Southwest Fisheries Science Center, La Jolla, California. NOAA-TM-NMFS-SWFSC-66. 30p.

Kleiber, Pierre and Christina 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.

Table 1. Albacore landings and number of vessels in the U.S. South Pacific albacore fishery by calendar year and fishing season.

YEAR	METRIC TONNES LANDED	FISHING SEASON	METRIC TONNES	NUMBER OF VESSELS
1986	89	--	--	2
1987	835	1986-87	751	7
1988	3,384	1987-88	3,253	43
1989	3,520	1988-89	3,068	37
1990	3,849	1989-90	3,898	38
1991	5,113	1990-91	5,540	58
1992	2,869	1991-92	3,016	55
1993	989	1992-93	1,028	47
1994	697	1993-94	603	14
1995.	2,817	1994-95	2,916	12

* December 1995 landings are not included.

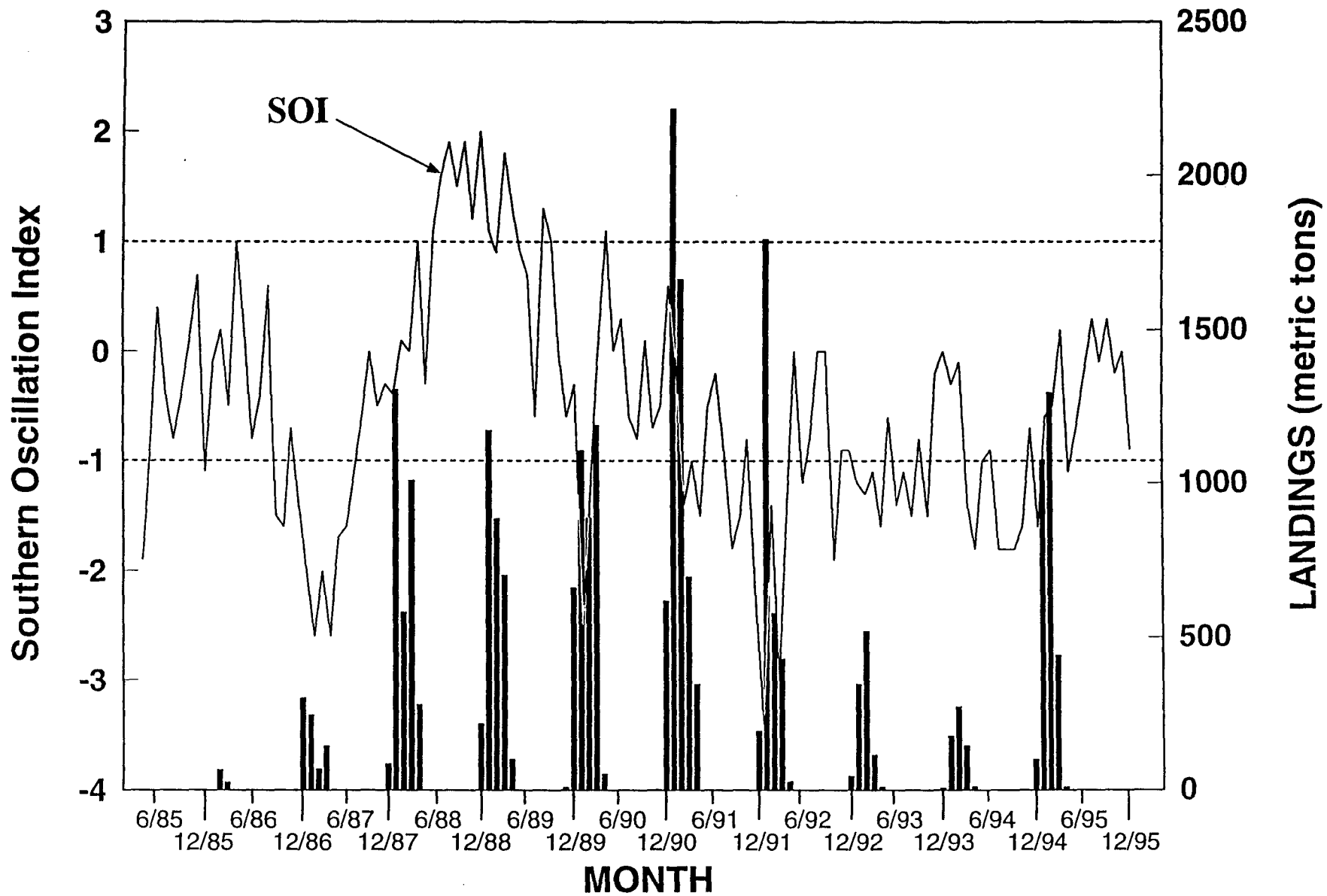


Figure 1. U.S South Pacific albacore landings and the Southern Oscillation Index (SOI). SOI values less than -1.0 indicate strong El Niño-type conditions. SOI values greater than +1.0 indicate strong anti-El Niño-type conditions.

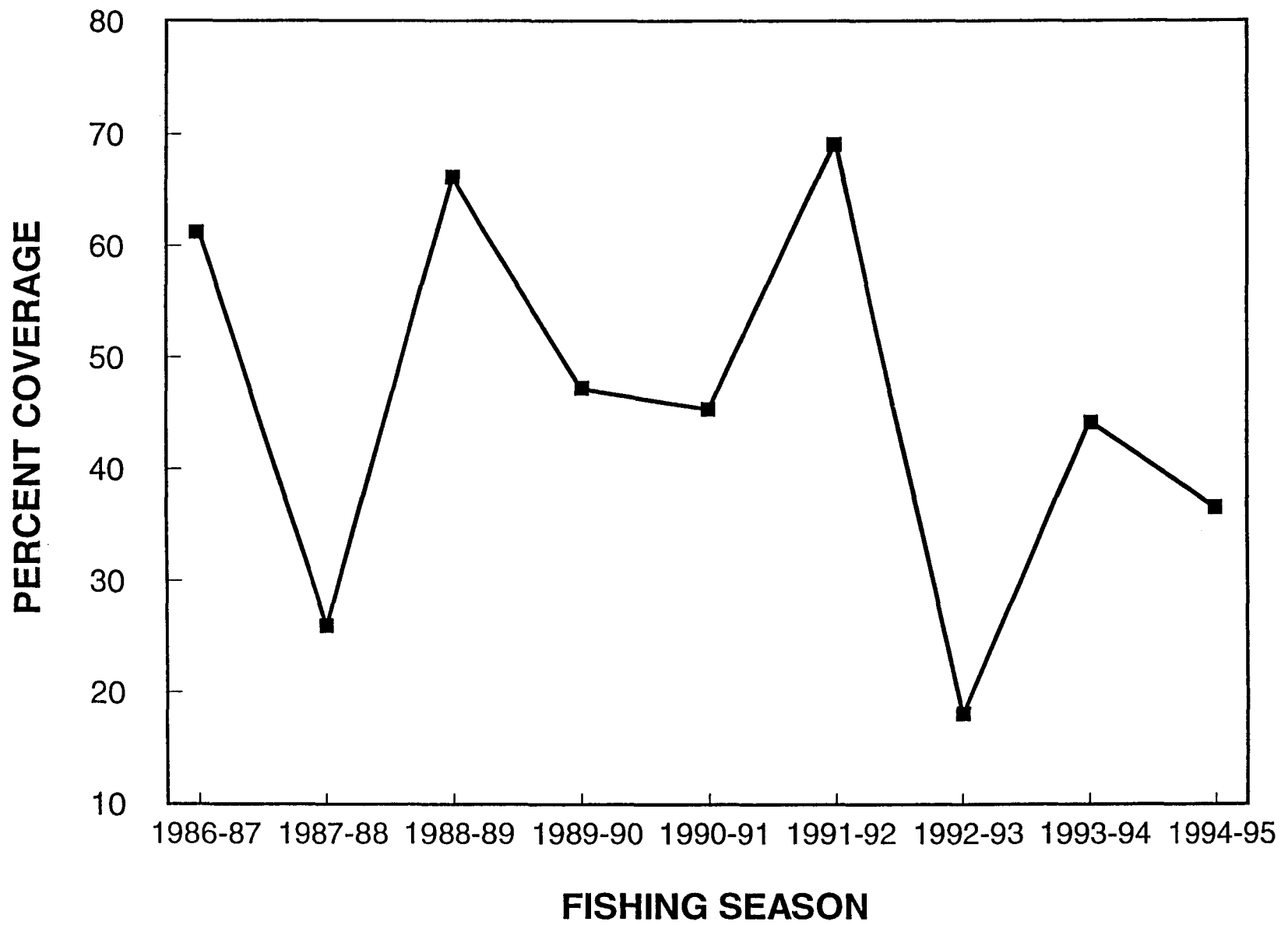


Figure 2. Logbook sampling coverage (based on landings) of South Pacific troll vessels.

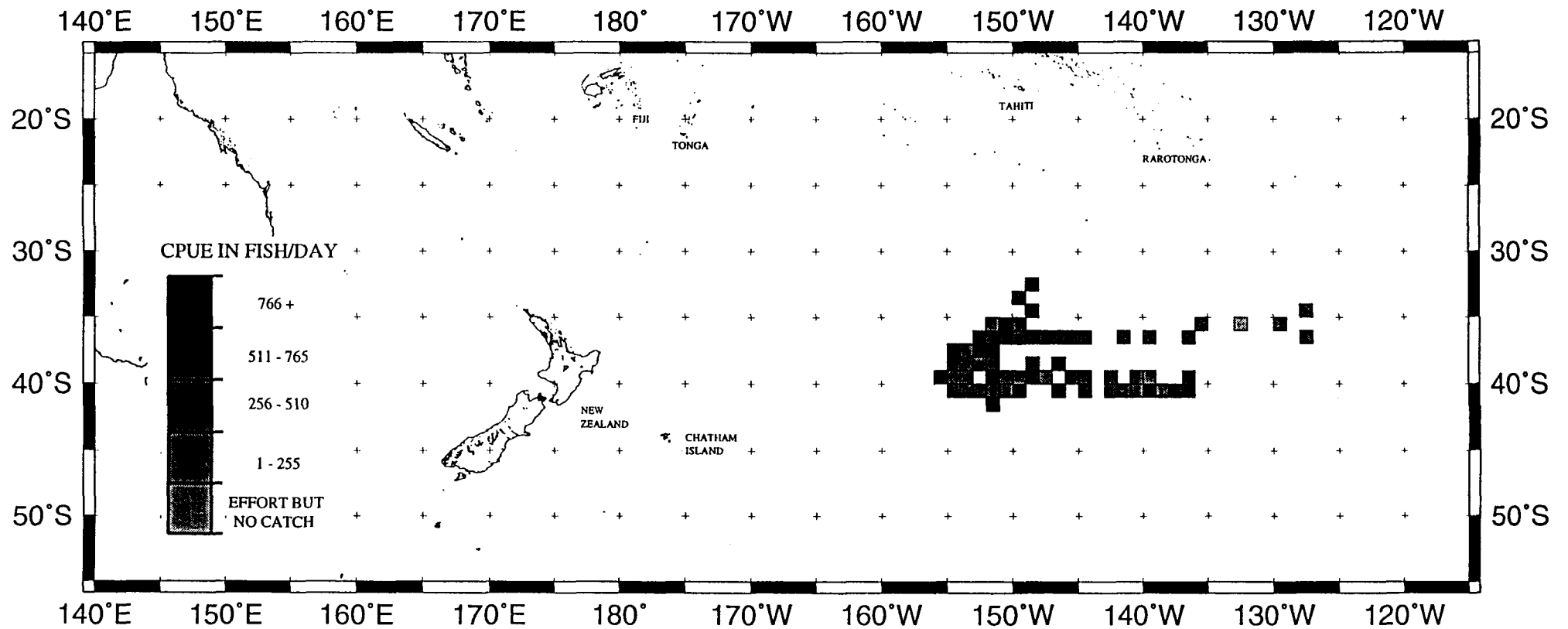


Figure 3. Distribution of CPUE for the 1986-87 South Pacific troll fishery.

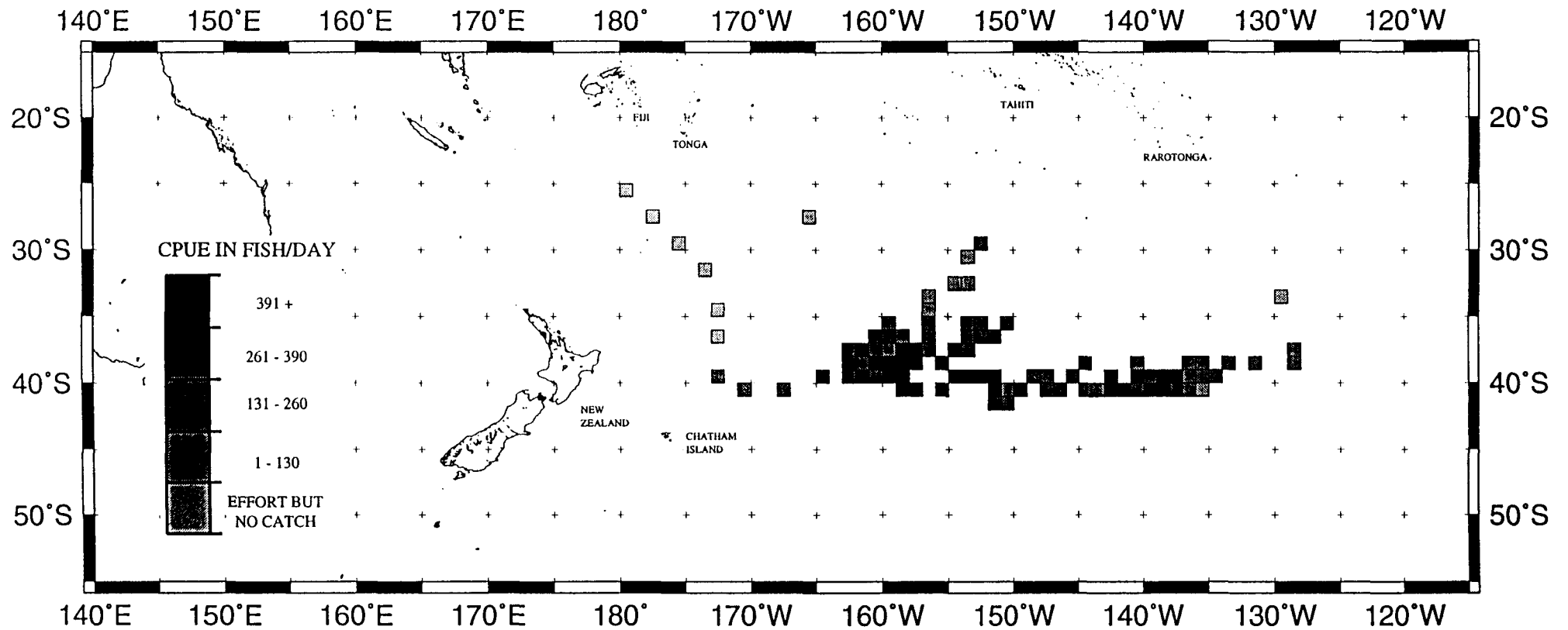


Figure 4. Distribution of CPUE for the 1987-88 South Pacific troll fishery.

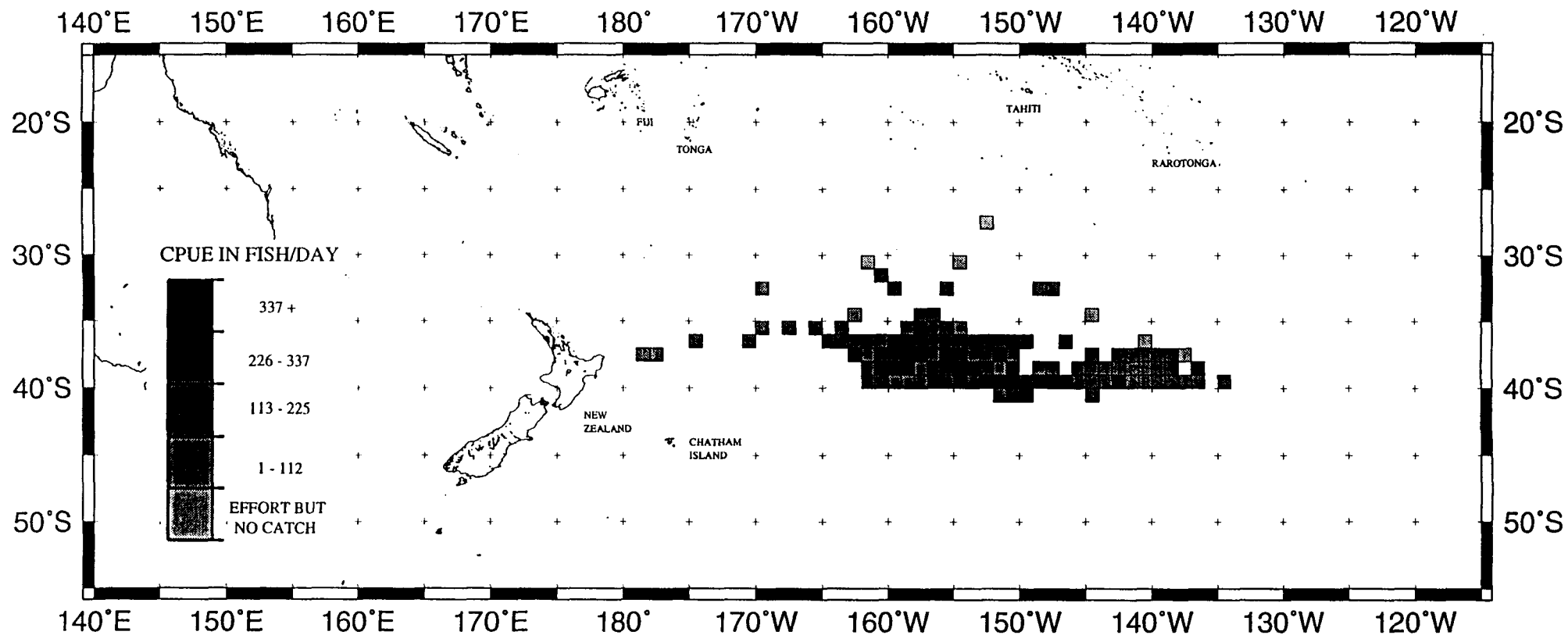


Figure 5. Distribution of CPUE for the 1988-89 South Pacific troll fishery.

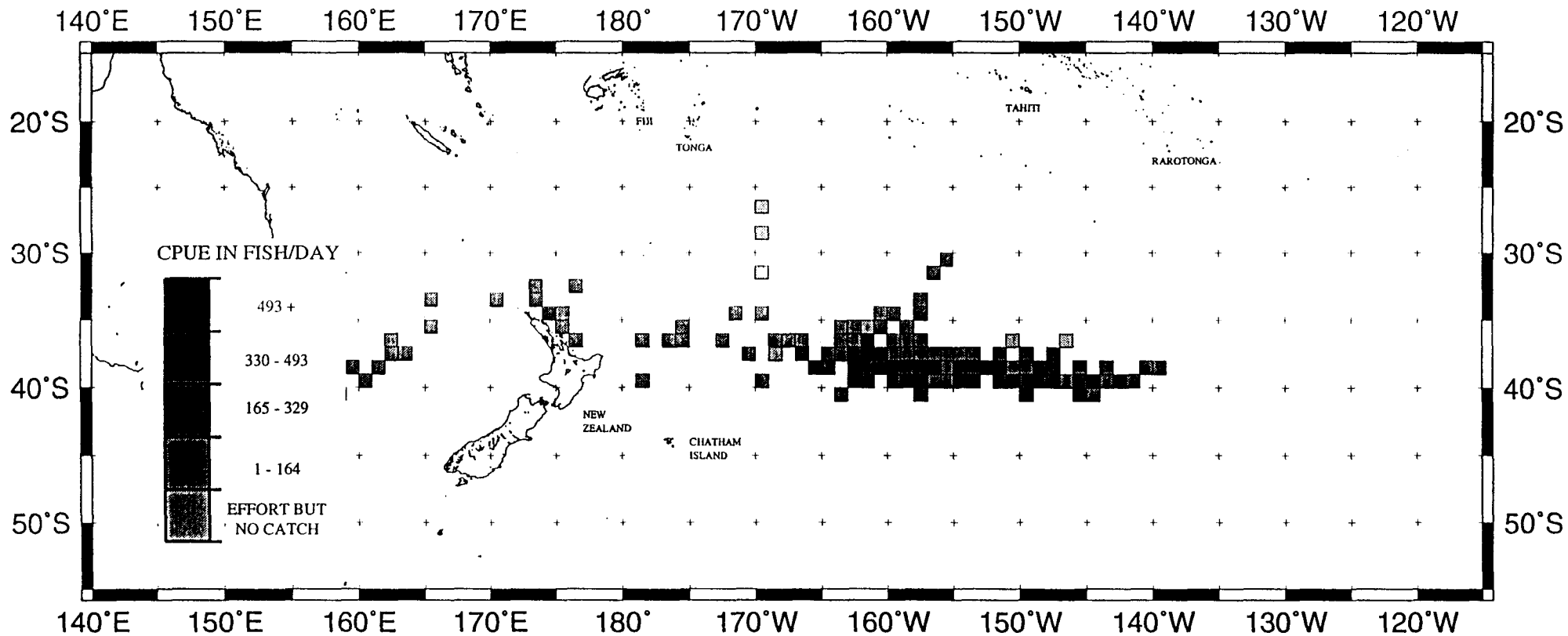


Figure 6. Distribution of CPUE for the 1989-90 South Pacific troll fishery.

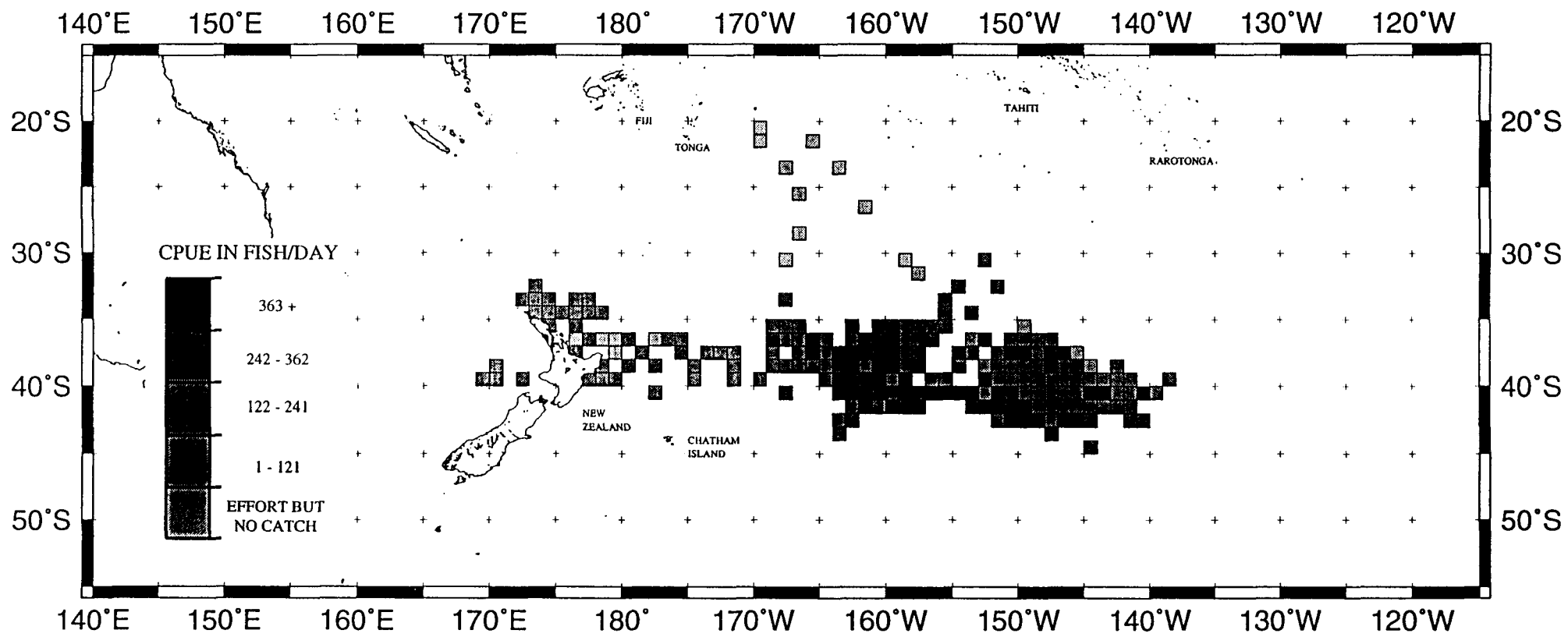


Figure 7. Distribution of CPUE for the 1990-91 South Pacific troll fishery.

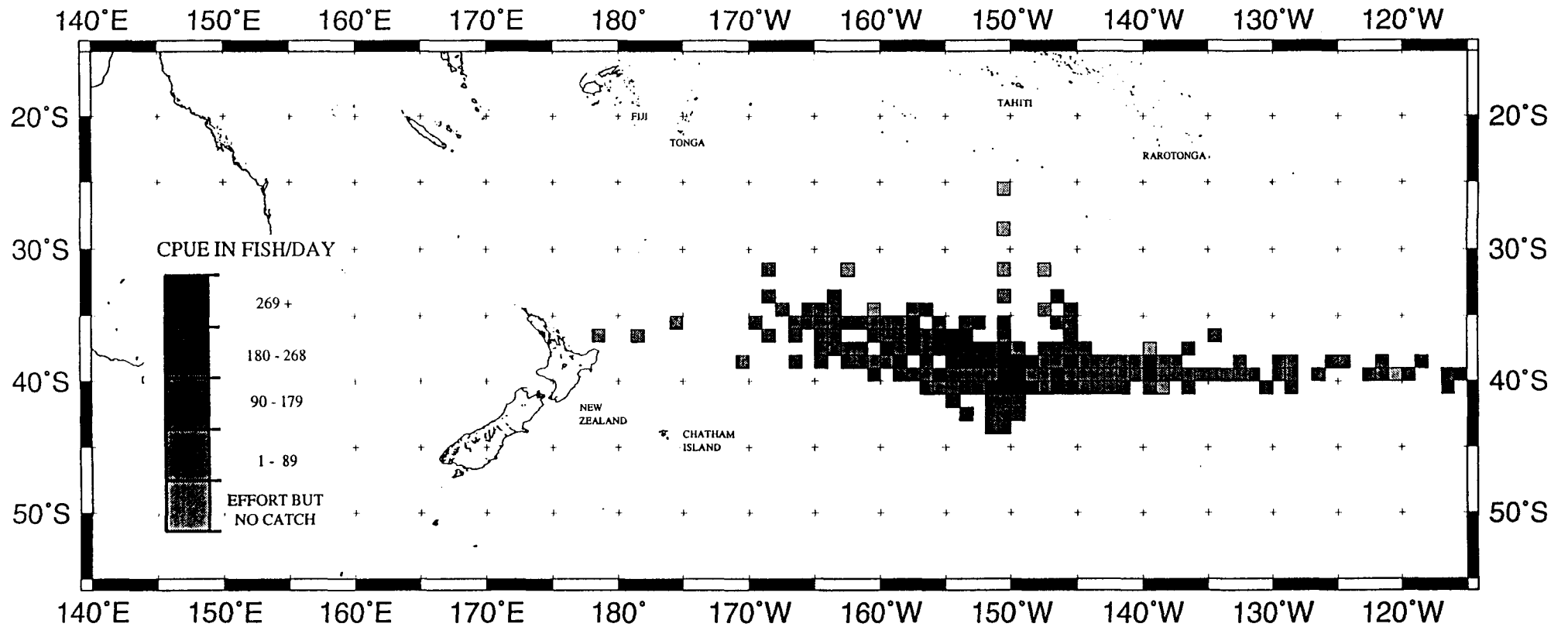


Figure 8. Distribution of CPUE for the 1991-92 South Pacific troll fishery.

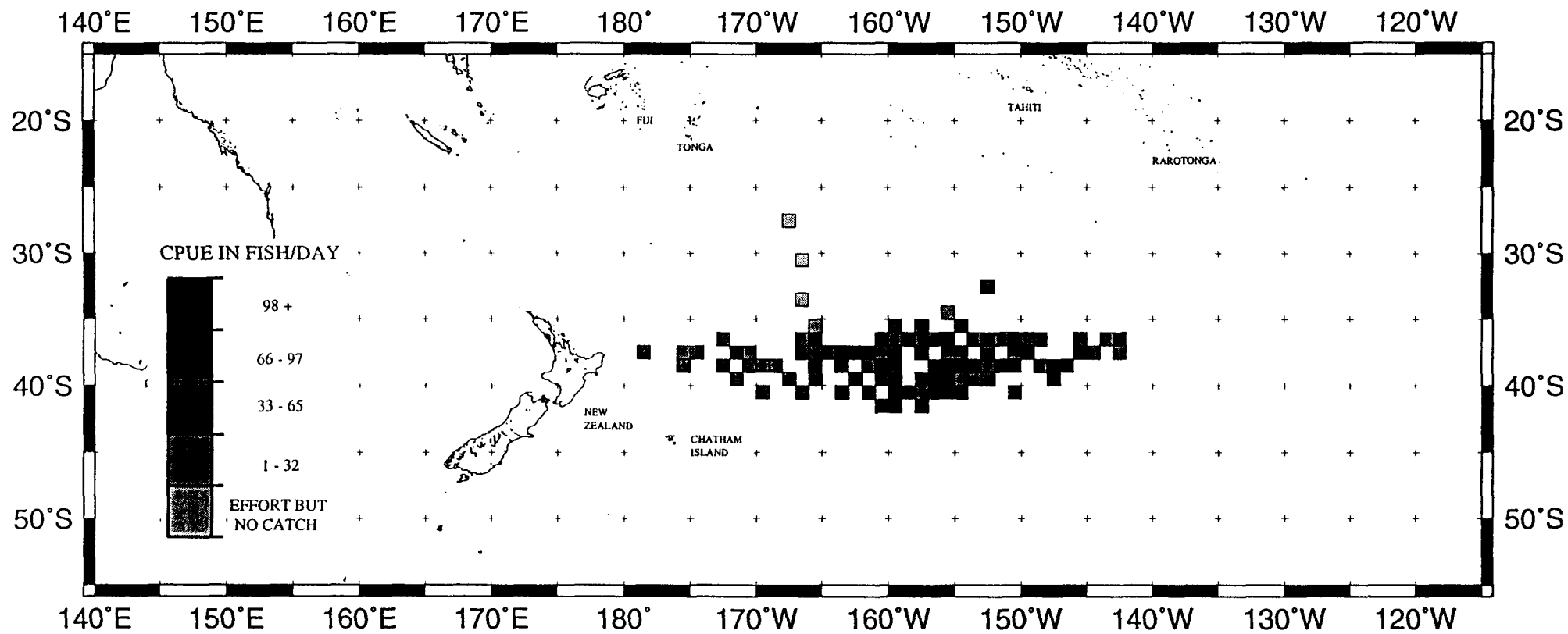


Figure 9. Distribution of CPUE for the 1992-93 South Pacific troll fishery.

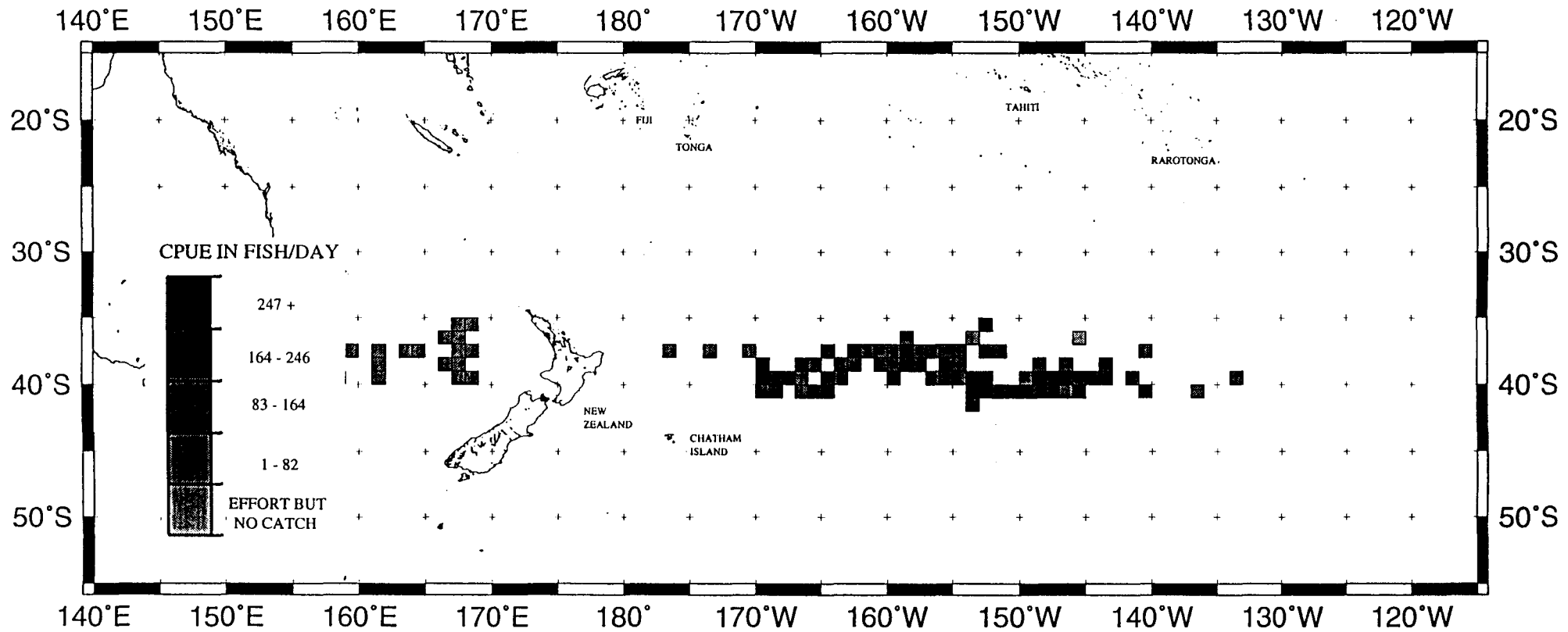


Figure 10. Distribution of CPUE for the 1993-94 South Pacific troll fishery.

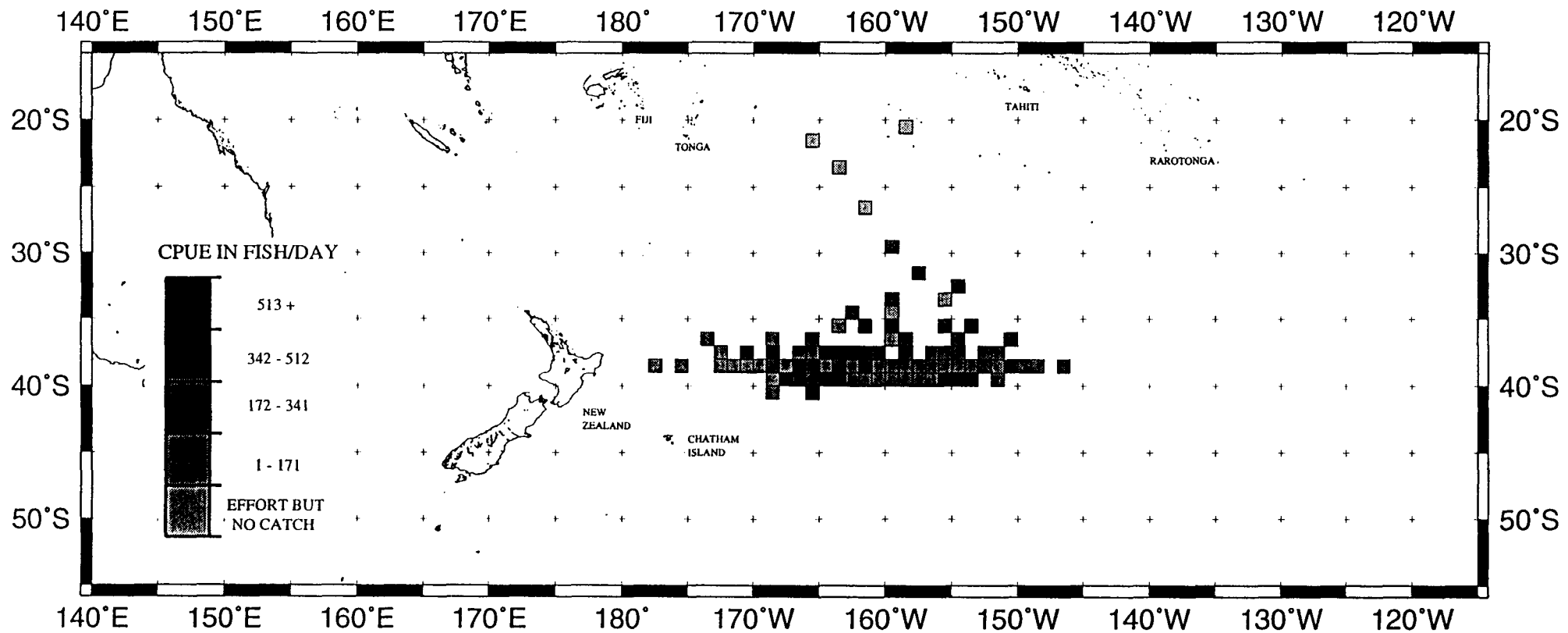


Figure 11. Distribution of CPUE for the 1994-95 South Pacific troll fishery.

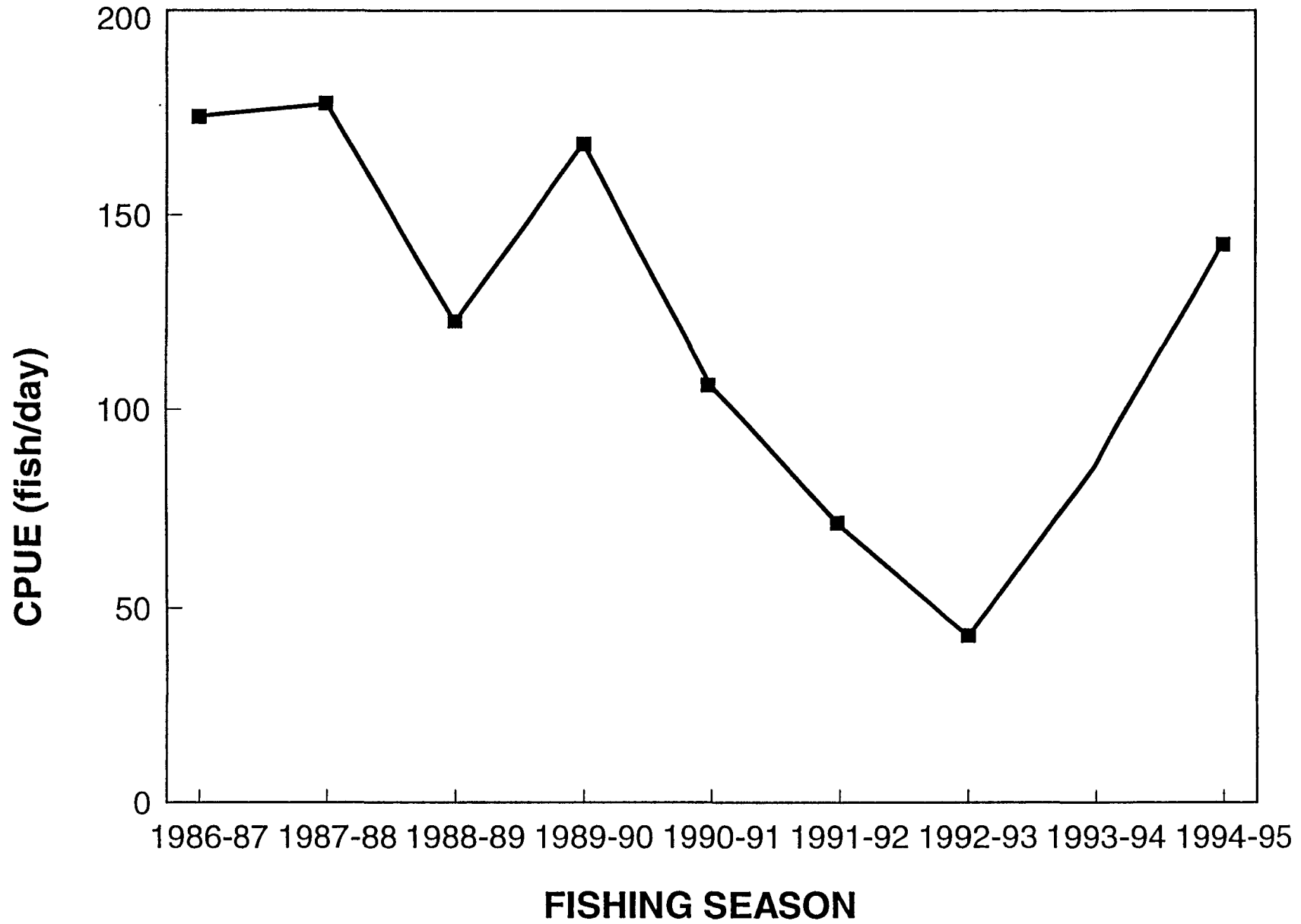


Figure 12. Seasonal CPUE of U.S. South Pacific troll vessels.

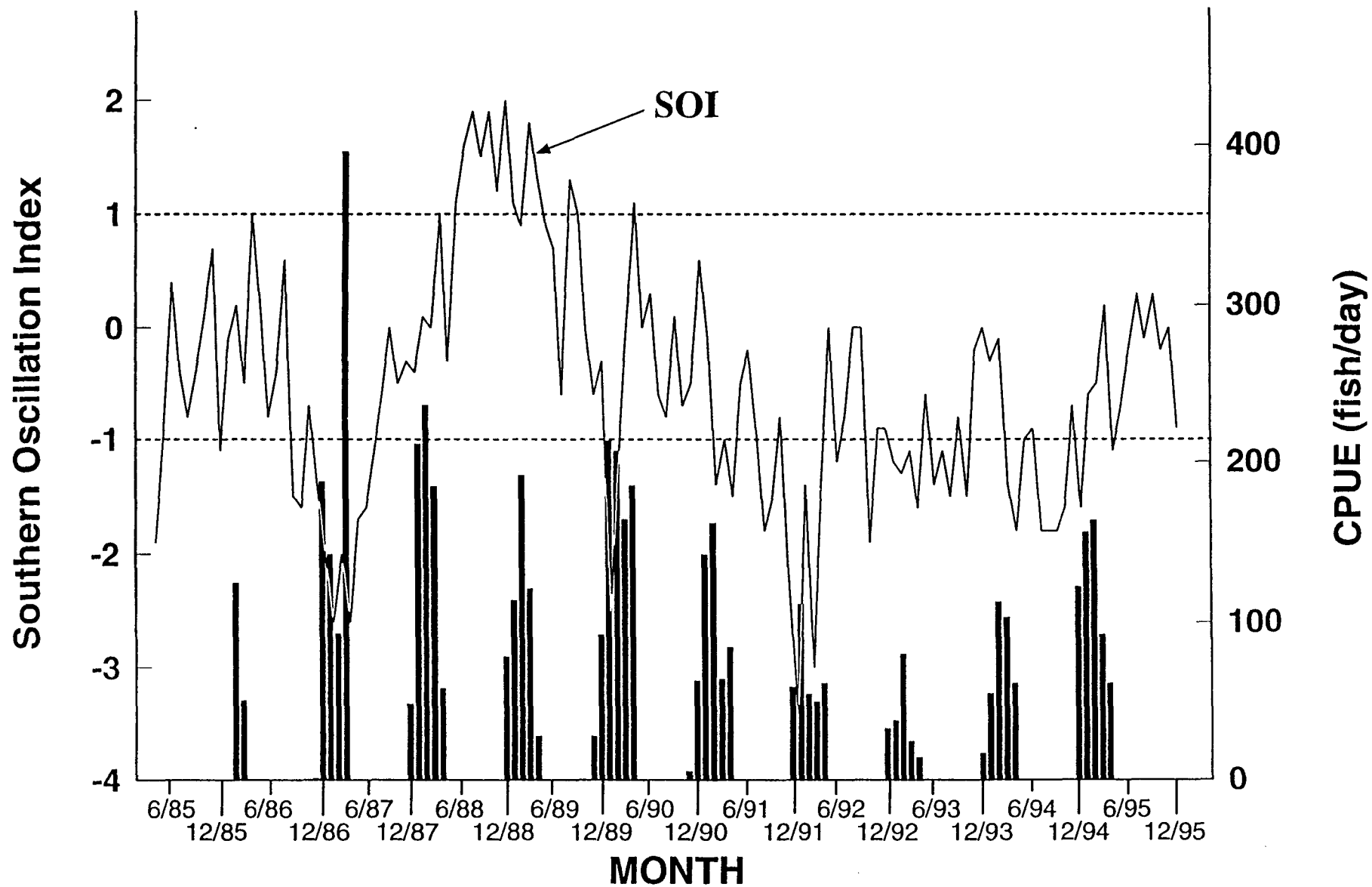
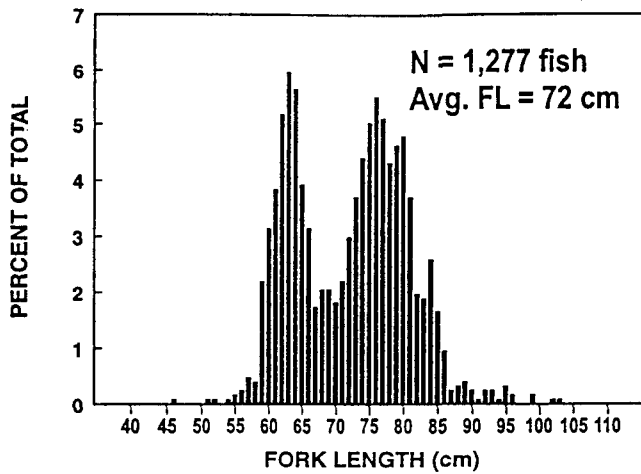
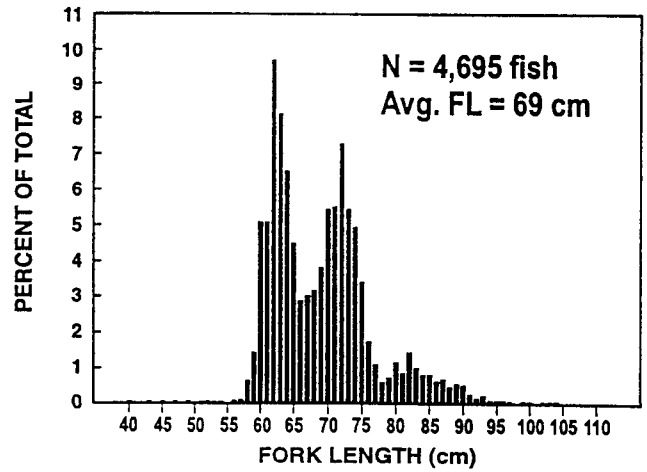


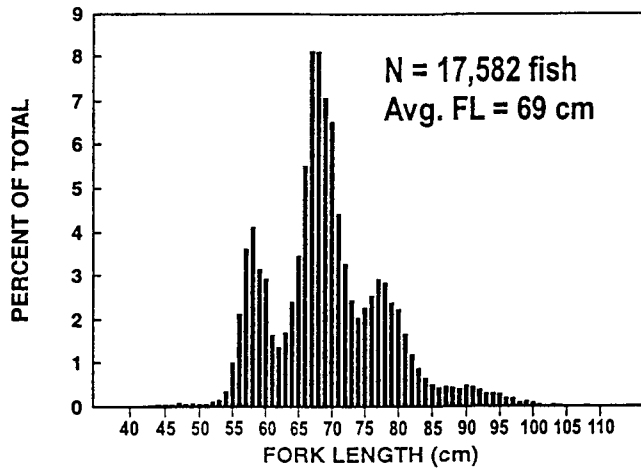
Figure 13. CPUE of South Pacific troll vessels and the Southern Oscillation Index (SOI). SOI values less than -1.0 indicate strong El Niño-type conditions. SOI values greater than +1.0 indicate strong anti-El Niño-type conditions.



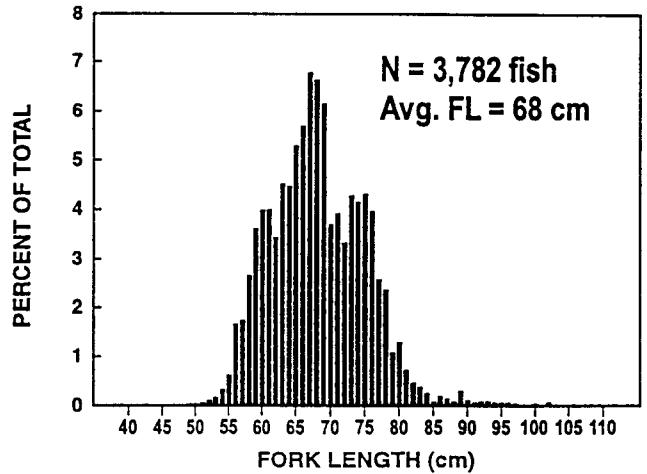
1986-87



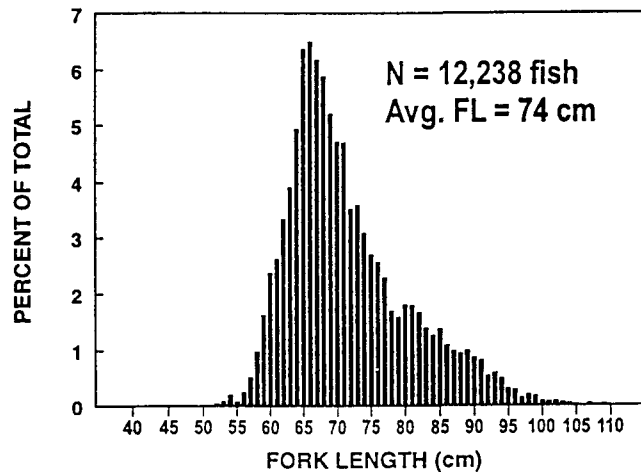
1987-88



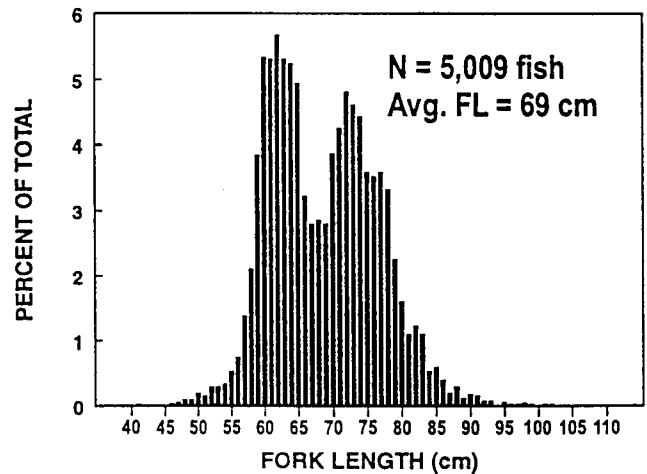
1988-89



1989-90

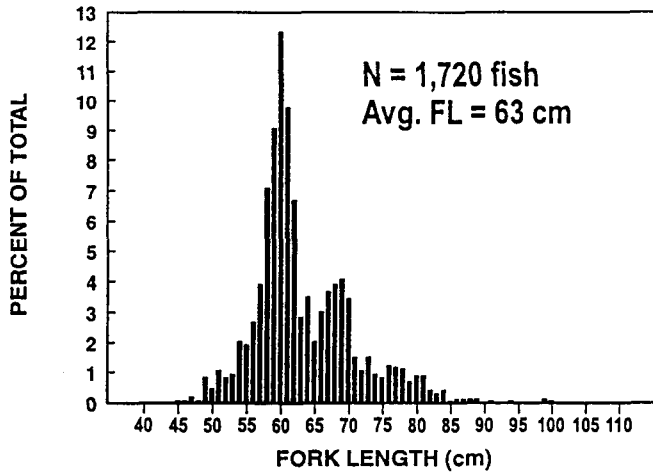


1990-91

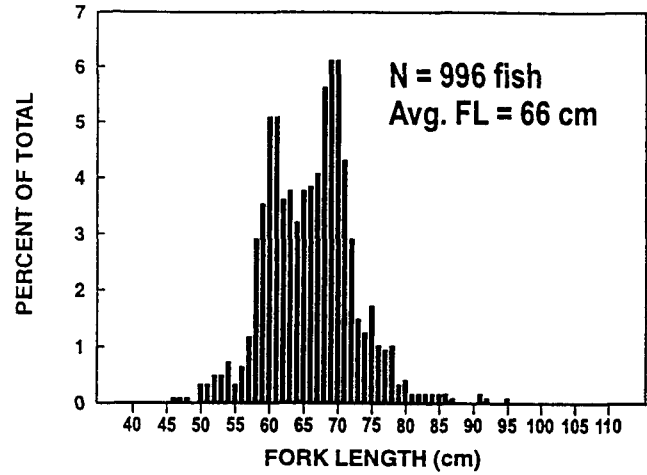


1991-92

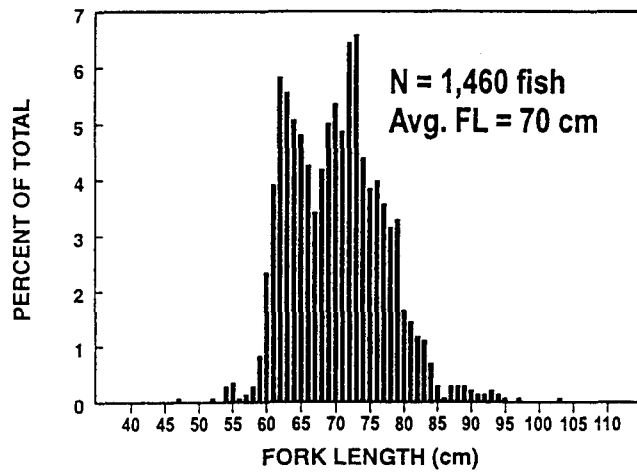
Figure 14. Length-frequencies of albacore sampled from South Pacific troll vessels.



1992-93



1993-94



1994-95

Figure 14 (cont.) Length-frequencies of albacore sampled from South Pacific troll vessels.