THE 1999 U.S. CENTRAL-WESTERN PACIFIC TROPICAL TUNA PURSE SEINE FISHERY[1]

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[1] Document prepared for the annual meeting of parties to the South Pacific Regional Tuna Treaty, 3-10 March 2000, Niue

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INTRODUCTION

This report summarizes and reviews fisheries data collected from the 1999, U.S. tuna purse seine fishery in the central-western Pacific. At the time of preparing this report, processing of landing statistics and observer data for the 1999 season was not fully completed. Approximately 86% of the landings, port size and species composition samples and logbook data, 59% of the observer records and 73% of the size composition samples collected by observers had been processed. Available landings data were adjusted to represent a preliminary estimate of the year's total landing.

VESSEL OPERATIONS

During the 1999 fishing season, 36 licensed purse seiners fished in the central-western Pacific, under the South Pacific Tuna Treaty (SPTT), and made 175 trips (Table 1). This was 3 vessels and 25 trips less than in 1998. The number of trips per vessel was approximately 5, and similar to those recorded for the last nine years. The average number of days per trip was 41.5 and sets per trip, 20.8, a decrease of 11% and 24% respectively from 1998 levels. Overall catch rate (all species combined) in 1999 was 38.3 t/day fished, and is the highest recorded for the fishery (Table 2). This exceptional catch rate is largely attributed to increased use of Fish Aggregation Devices (FADs)[2].

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[1] Document prepared for the annual meeting of parties to the South Pacific Regional Tuna Treaty, 6-10 March 2000, Alofi, Niue.

[2] The majority of FADs used by the U.S. fleet are drifting FADs. A few anchored FADs are occasionally used.

Distribution of fishing effort

In 1999, the fleet conducted 4,758 days of fishing. This effort was concentrated mostly in the area between Kiribati and Tuvalu (Figure 1). Over 64% of the fishing effort was in areas west of the International Date Line (IDL). The fleet made approximately 3,478 sets during 1999. Of these, 90% were sets on FADs, 6% on logs and 4% on free-swimming schools (Figure 2).

In comparison, 1998 fishing effort was distributed very similar to the 1999 pattern, but with 21% more days fished than in 1999. Total number of sets was 4,856 and only 25% was on FADs, 29% on logs and 46% on free-swimming schools.

Fleet Carrying Capacity

The number of U.S. purse seiners fishing under the SPTT has fluctuated between 35 and 39 since 1996. The average carrying capacity per vessel, however, increased steadily from 1,122 t/vessel in 1996 to 1,184 t/vessel in 1999, an increase of approximately 6% (Table 1). Available records indicate that 2 vessels in both 1998 and 1999 underwent capacity modification. This trend of increased carrying capacity is continuing into 2000.

CATCH AND CATCH COMPOSITION

The U.S. purse seine fleet in the central-western Pacific caught about 182,000 t of yellowfin, skipjack and bigeye tunas in 1999 (Table 2). About 72% of the catch was skipjack tuna, 19% yellowfin tuna and 9% bigeye tuna. The 1999 catch is 4% higher than the 1998 catch and would have been higher yet, if low prices in the second semester did not discourage vessels from operating. The 1999 bigeye tuna catch is the highest recorded for the fishery, up by over 200% from the 1998 level. This increase is attributed to the substantial increase in FAD sets in 1999.

Seventy-eight percent of the catch was landed in American Samoa in 1999, a decrease from the 89% landed there in 1998 (Figure 3). The rest of the landings were in the Philippines (11%); Fiji (5%), Solomon Islands (3%) and others (~3%). 1999 was the first year of substantial landings in the Philippines.

Size Composition

NMFS port samplers in American Samoa and FFA observers onboard purse seiners measured the catch for fish sizes. Port samplers measured approximately 26,000 yellowfin tuna, 22,400 skipjack tuna and 15,600 bigeye tuna in 1999. Skipjack tuna ranged from 31 to 79 cm fork length (FL) and averaged 54 cm FL (Figure 4), yellowfin tuna ranged from 36 to 142 cm FL and averaged 67 cm FL (Figure 5), and bigeye tuna ranged from 35 to 120 cm FL and averaged 64 cm FL (Figure 6). In general, fish caught in floating object sets were smaller than fish caught in free-swimming school sets.

FFA observers measured 15,100 yellowfin tuna, 34,111 skipjack tuna and 3,552 bigeye tuna from single sets in 1999. The observers randomly drew and measured five fish from each brail. Skipjack tuna

ranged between 20 and 100 cm FL and averaged 56 cm FL (Figure 4), yellowfin tuna ranged between 24 and 153 cm FL and averaged 74 cm FL (Figure 5), and bigeye tuna ranged between 30 and 155 cm FL and averaged 70 cm FL (Figure 6). The ranges of fish sizes and the average lengths of fish sampled by observers were greater than those obtained by port samplers. Most of this difference can be explained by observers having access to sampling of undersized fish before they are discarded at sea and to large fish that may be more easily selected from single sets.

Species Composition

Species composition samples were also collected by NMFS port samplers in American Samoa. The sampling was largely geared for sorting out bigeye tuna in landings labeled as yellowfin tuna. In 1999, landings labeled as skipjack tuna were observed to contain a significant mixture of species. Sampling was, therefore, modified to pay closer attention to species composition sampling of skipjack tuna landings.

A total of 34,100 fish were examined for species identification in 1999. About 33% of the overall landing labeled as yellowfin tuna was actually bigeye tuna. This was a significant increase from the 12% recorded in 1998 and is related to increased fishing with FADs (Table 3a).

In landings labeled skipjack tuna, about 4.9% was yellowfin tuna and 2.2% bigeye tuna (Table 3b). The presence of other species in skipjack tuna landings appeared to be more pronounced for landings containing fish less than 1.4 kg.

By-catch and discards

Vessel captains reported by-catch in purse seine sets for 73% of the trips and tuna discards for 45% of the trips. Approximately 164 t of by-catch species and 683 t of tuna were reported as discarded at sea (Table 4). The most frequently reported by-catch species were rainbow runner (*Elagatis bipinnulata*) followed by baitfish, sharks and marlin. Small skipjack tuna was the most frequently discarded tuna species.

By-catch information for 1999 from FFA observer trips is preliminary. Information from 24 trips or 59% coverage indicate that 128 t of by-catch and 568 t of tuna was discarded at sea (Table 5, 6). As with logbook data, floating object sets accounted for the majority of this by-catch. The most frequently discarded tuna species was skipjack tuna. Rainbow runner was the most common by-catch species. Whereas 100% of the by-catch is reported as discarded at sea in logbooks, only 75% is reported by observers as discarded at sea.

A better picture of tuna discards and by-catch can be gained from observer records for 1998 (Table 7, 8). Data for all 35 observer trips have been processed and extrapolated to the entire U.S. fleet for 1998. Tuna discards amounted to an estimated 6,500 t of which about 58% was attributed to FAD sets, and 31% to log sets. By-catch discards amounted to an estimated 3,300 t of which about 25% was in FAD sets and 72% in log sets.

FISHERY ANALYSIS

In 1999, fishing effort for the U.S. fleet was largely concentrated west of the IDL and distributed in a spatial pattern characteristic of non-El Niño conditions in the central-western Pacific. Virtually all of the effort was with FADs (90% of sets), unlike past years when FAD sets did not exceed 35%. This heavy dependence on FADs is believed to be related to efficiency advantages. Sets on FADs are about 95% successful whereas sets on free-swimming schools are only 50% successful. Yields of successful sets of both set types are about the same. Also, search time for FADs is minimal owing to use of radio location devices on the FADs, whereas it is considerable for locating free-swimming schools. Performance indicators (Tables 1 and 2) for 1999 reflect these advantages—high total catch (182,100 t), highest catch rate on record (38 t/day fished), shortest fishing trips on record (41.5 days/trip), and fewest sets per trip to date (20.8 sets/trip).

While fishing was exceptionally good in 1999, market conditions created havoc for the fleet. Supplies of tuna were plentiful world-wide and prices fell to record lows in the second half of the year. The oversupply caused exceptionally long delays in unloading of vessels in American Samoa and poor returns for vessel owners. A number of vessels opted to unload their catches (22% or 40,000 t) in ports to the west, such as in the Philippines, Fiji and Solomon Islands, and scheduled early and extended tie-ups for maintenance and other vessel services to by-pass delays in American Samoa and to wait for improved prices. As a result, the number of days fished per vessel fell to the lowest on record for the fleet.

The increased 1999 landings in foreign ports are of special concern because the landings were not sampled for size and species composition. A comparison of cannery receipts from landings in foreign ports and American Samoa landings for 1999 (Figures 7-9) was made to explore the impact. Landings by cannery size categories indicate that similar sizes of fish were landed in American Samoa and in foreign ports, although foreign ports received a higher proportion of large-sized fish (Figure 7). A majority of landings made in foreign ports, separated by NMFS sampling area (Figure 10) and month of catch, had counterpart landings in American Samoa, except for Area 1 (Figures 8 and 9). Area 1 is a westerly fishing area for the fleet and is the farthest from American Samoa. Because it is closer to the foreign ports than American Samoa, proximity may have played a large role in the decision to land in foreign ports. If landings in foreign ports continue, modification of the sampling design, to include sampling of these landings, should be considered.

Tuna and by-catch discard rates reported by observers for floating object sets in 1999 were 1.52 t/set for undersize tuna and 0.34 t/set for by-catch (Table 5). In comparison, the 1998 rates were higher, 2.41 t/set for tuna and 1.13 t/set for by-catch (Table 7). The reason for this significant difference is unclear and needs to be examined further when all 1999 observer data have been processed.

Table 1. Fleet performance statistics for U.S. tuna purse seiners fishing in the central-western Pacific

Year	Vessels			Days/ Trip[2]	Sets/Trip[2]	Trips/ Vessel[2]	Capacity[3]/ Vessel (mt)
	Licensed[1]	Fished[1]	Trips[2]				
1988	35	31	71	69.42	46.07	2.29	1,164
1989	35	35	154	58.07	41.88	4.40	1,148
1990	51	43	181	47.32	34.79	4.21	1,131
1991	48	43	229	42.38	40.40	5.33	1,138
1992	44	44	212	46.32	35.11	4.82	1,144
1993	42	42	199	51.92	37.27	4.74	1,144
1994	48	49	241	44.11	35.21	4.88	1,142
1995	47	44	206	49.14	33.38	4.68	1,138
1996	40	39	182	50.09	33.02	4.67	1,122
1997	35	35	177	58.05	35.60	5.06	1,128
1998	39	39	200	46.58	27.48	5.13	1,167
1999[4]	38	36	175	41.54	20.81	4.86	1,184

[1] The number of vessels that fished can be different from the number of licensed vessels because vessels are licensed from June 15 of one year to June 14 of the next year; whereas, a vessel fishing in a calendar year is recorded as fished in that calendar year.

[2] Includes all trips that started or ended in the calendar year.

[3] Average carrying capacity of vessels that fished in the calendar year.

[4] Data are preliminary.

Ocean.

Table 2. Catches (t) and catch-per-unit effort (t/day fished) for the U.S. tuna purse seine fishery in the

Year	Catch[1]				Catch-Per-Unit Effort		
	Yellowfin	Skipjack	Bigeye	Total	Yellowfin[3]	Skipjack	Total
1988	18,832	93,636	1,948[4]	114,416	3.01	15.37	18.38
1989	42,886	95,027	2,421	140,334	7.26	14.59	21.85
1990	52,089	110,044	1,762	163,895	8.91	16.66	25.57
1991	37,330	177,389	1,550	216,269	5.70	24.78	30.48
1992	43,693	155,898	3,480	203,071	6.39	21.48	27.87
1993	46,011	148,419	3,731	198,161	6.46	18.29	24.75
1994	56,426	151,486	1,711	209,623	7.63	18.61	26.24
1995	31,845	132,518	3,190	167,553	4.68	17.39	22.07
1996	19,417	120,127	9,860	149,404	4.13	16.93	21.05
1997	54,638	79,386[2]	10,058	144,082	8.45	12.06	20.51
1998	37,501	131,564[2]	5,561	174,626	6.71	21.62	28.33
1999[5]	34,384	131,000[2]	16,673	182,057	8.16	30.11	38.27

[1] Includes reported discards in logbooks and cannery rejects.

[2] Skipjack tuna species composition samples were used to separate the yellowfin and bigeye tuna from the reported skipjack tuna catch in 1997-1999.

[3] Includes bigeye tuna catch.

[4] Estimated from species composition sampling for 6 months (June to December 1988).

[5] Data are preliminary.

central-western Pacific Ocean.

Table 3a. Percentage of bigeye tuna in yellowfin tuna landings of U.S. tuna purse seiners in the central-western Pacific Ocean from species composition samples. Large fish are greater than 9 kg, or 78 cm fork length.

Year	All Set Types and Sizes	Free-Swimming School Sets		FAD + Log Sets	
		Small Fish	Large Fish	Small Fish	Large Fish
1988	9.39	15.31	0.17	26.72	1.32
1989	5.36	4.01	0.05	17.70	14.10
1990	3.30	8.17	0.16	20.28	7.34
1991	3.99	7.17	0.18	14.52	6.23
1992	7.40	6.51	0.39	22.59	10.09
1993	7.52	5.24	0.51	19.84	7.53
1994	2.95	15.12	0.16	27.20	2.58
1995	9.12	5.01	0.51	26.29	9.13
1996	36.36	14.87	0.84	47.87	46.31
1997	13.68	1.86	1.73	37.32	11.84
1998	12.20	26.69	0.00	49.08	6.51
1999[1]	33.00	0.00	0.00	45.10	25.12

[1] Data are preliminary.

Year	Yellowfin Tuna			Bigeye Tuna		
	All Set Types	Free-Swimming School Sets	FAD + Log Sets	All Set Types	Free-Swimming School Sets	FAD + Log Sets
1997	4.02	2.32	5.03	2.29	0.36	3.43
1998	1.29	0.21	1.90	0.44	0.00	0.69
1999[1]	4.86	10.93	4.74	2.21	2.71	2.20

[1] Data are preliminary.

Table 3b. Percentage of bigeye and yellowfin tuna in skipjack tuna landings of U.S. tuna purse seiners in the central-western Pacific Ocean from species composition samples.

Table 4. Logbook reports[1] of by-catch for U.S. tuna purse seiners fishing in the central-western Pacific Ocean in 1999.

Species	Weight (t)
Billfishes	
Black marlin	0.02
Blue marlin	0.07
Marlin	16.67
Sailfish	0.17
Unclassified	0.20
Sharks	
Silky shark	0.02
Hammerhead shark	0.09
Oceanic whitetip shark	0.08
Sharks	48.29
Others	
"Baitfish"[2]	31.06
Barracuda	0.01
Dolphinfish	0.05
Mackerel	0.13
Manta ray	0.03
Marlin/shark[3]	2.41
Marlin/"baitfish"	4.20
Rainbow runner	51.31
Rainbow runner/triggerfish	5.84
Sailfish/shark[3]	0.09
Shark/manta ray[3]	0.23
Shark/rainbow runner[3]	0.07
Shark/rainbow runner/mackerel[3]	1.61
Shark/rainbow runner/triggerfish[3]	1.84
Triggerfish	0.13
Wahoo	0.02

[1] Fishermen are instructed to report by-catch in weight or numbers. Reports in numbers were not used and consisted of 12 marlin, 48 sharks, 70 triggerfish and 498 rainbow runner caught and discarded.

[2] Included mackerel, bonito, and other species.

[3] Sharks were sometimes reported in combination with other species.

Table 5. Preliminary observer report of tuna catch and by-catch by set type from U.S. tuna purse seiners fishing in the central-western Pacific Ocean in 1999. Data represent 59% of the observed trips.

Type of Sets	Number of Sets	Species	Catch		
			Tons	Tons/Set	% Discarded
Anchored FAD	5	Skipjack	225	44.94	0.2%
		Yellowfin	49	9.71	3.2%
		Bigeye	43	8.63	1.0%
		By-catch	12	2.34	12.9%
Drifting log, debris or dead animal	3	Skipjack	105	35.07	0.0%
		Yellowfin	14	4.53	0.0%
		By-catch	1	0.35	97.6%
Drifting FAD	369	Skipjack	15,646	42.40	2.3%
		Yellowfin	4,590	12.44	4.1%
		Bigeye	1,035	2.80	1.7%
		By-catch	158	0.43	80.1%

Table 6. Preliminary observer report of by-catch from U.S. tuna purse seiners fishing in the central-western Pacific Ocean in 1999. Data represent 59% of the observed trips.

Species	Sets		By-catch[1]			
	Freq.	% Freq.	Tons	% Discarded[2]	Number	% Discarded[2]
Billfish						
Blue Marlin	34	9.0%	5.18	75.5%	42	78.5%
Black Marlin	17	4.5%	2.12	84.3%	23	86.9%
Sailfish (Indo-Pacific)	2	0.5%	0.06	50.0%	2	50.0%
Short-billed Spearfish	1	0.2%	0.01	0.0%	1	0.0%
Sharks						
Sharks (Unidentified)	109	28.9%	18.17	94.2%	700	94.8%
Silky Shark	126	33.4%	15.95	99.3%	762	99.2%
Oceanic White-tip Shark	110	29.1%	13.82	99.6%	540	99.6%
Blue Shark	5	1.3%	0.34	100.0%	22	100.0%
Silver-tip Shark	4	1.0%	0.06	100.0%	6	100.0%
Other Tunas, Tuna-like Species						
Albacore	17	4.5%	31.67	1.4%	2,718	2.3%
Wahoo	81	21.4%	2.11	40.0%	287	40.4%
Bullet Tuna	2	0.5%	0.00	100.0%	2	100.0%
Frigate and Bullet Tunas	1	0.2%	0.00	0.0%	1	0.0%
Kawakawa	2	0.5%	0.00	50.0%	2	50.0%
Others						
Rainbow Runner	261	69.2%	68.51	99.5%	21,539	99.5%
Mahi Mahi, Dolphinfish, Dorado	99	26.2%	5.75	7.3%	685	7.8%
Oceanic (Pelagic) Triggerfishes	127	33.6%	5.50	100.0%	7,204	100.0%
Barracudas	56	14.8%	0.72	36.6%	112	17.8%
Great Barracuda	15	3.9%	0.22	19.3%	22	13.6%
Manta Rays	5	1.3%	0.19	100.0%	5	100.0%
Mackerel Scad - Saba	6	1.5%	0.13	97.6%	64	96.8%
Mackerel (Unidentified)	2	0.5%	0.07	100.0%	73	100.0%
Pacific Rudderfish	1	0.2%	0.01	16.6%	40	12.5%
Unspecified	1	0.2%	0.00	100.0%	1	100.0%

[1] Observers were encouraged to record weight of by-catch. However, occasionally numbers of animals were recorded. Data were adjusted to reflect total by-catch in weight or numbers.

[2] Nearly all of the by-catch retained were for crew consumption.

Table 7. Final observer report of tuna catch and by-catch by set type from U.S. tuna purse seiners fishing in the central-western Pacific Ocean in 1998. Data represent 35 observed trips.

Type of Sets	Number of Sets	Species	Tons	Tons/Set	% Discarded
Floating Object Sets					
Anchored FAD	2	Skipjack	38	19.05	0.2%
		Yellowfin	3	1.36	8.0%
		Bigeye	3	1.27	1.8%
		By-catch	1	0.66	99.6%
Drifting log	247	Skipjack	9,040	36.60	3.1%
		Yellowfin	1,304	5.28	6.3%
		Bigeye	228	0.92	0.8%
		By-catch	466	1.89	91.2%
Drifting FAD	339	Skipjack	11,856	34.97	7.8%
		Yellowfin	1,892	5.58	6.8%
		Bigeye	694	2.05	3.6%
		By-catch	286	0.84	83.3%
Live Whale	9	Skipjack	27	3.04	3.8%
		Yellowfin	16	1.79	3.5%
		By-catch	1	0.08	58.0%
Live Whale Shark	2	Skipjack	3	1.32	0.2%
		Yellowfin	2	0.80	0.3%
		Bigeye	0	0.16	0.0%
		By-catch	13	6.27	100.0%
Free Swimming Sets					
Unassociated	160	Skipjack	2,863	17.89	3.9%
		Yellowfin	1,344	8.40	0.0%
		By-catch	3	0.02	86.8%
Feeding on Baitfish	293	Skipjack	4,853	16.56	0.7%
		Yellowfin	2,909	9.93	0.1%
		Bigeye	11	0.04	0.0%
		By-catch	23	0.08	79.7%
Other Sets					
No information	42	Skipjack	903	21.51	0.9%
		Yellowfin	532	12.67	0.3%
		Bigeye	17	0.42	0.2%
		By-catch	39	0.92	96.6%
Other (Please Specify)	3	Skipjack	41	13.70	0.2%
		Yellowfin	1	0.42	13.0%
		Bigeye	1	0.32	5.0%
		By-catch	2	0.51	82.6%

Table 8. Final observer report of by-catch from U.S. tuna purse seiners fishing in the central-western Pacific Ocean in 1998. Data represent 35 observed trips.

Species	Sets		By-Catch[1]			
	Freq.	% Freq.	Tons	% Discarded[2]	Number	% Discarded[2]
Billfish						
Black Marlin	44	4.0%	6.81	62.6%	61	49.1%
Blue Marlin	79	7.2%	49.98	81.3%	146	65.7%
Marlins, Sailfishes, Spearfish	14	1.2%	1.79	42.5%	16	62.5%
Sailfish (Indo-Pacific)	7	0.6%	0.29	74.5%	14	71.4%
Short-billed Spearfish	6	0.5%	0.17	67.6%	16	81.2%
Striped Marlin	10	0.9%	3.59	79.7%	51	78.4%
Swordfish	2	0.1%	0.10	0.0%	2	0.0%
Sharks						
Blue Shark	3	0.2%	0.06	49.1%	4	25.0%
Oceanic White-tip Shark	141	12.8%	26.11	60.2%	1,300	63.0%
Sharks (Unidentified)	237	21.6%	68.84	99.0%	3,369	9.1%
Silky Shark	84	7.6%	12.46	89.3%	729	90.2%
Silver-tip Shark	7	0.6%	0.39	29.9%	30	26.6%
Whale Shark	2	0.1%	14.80	84.4%	2	50.0%
Other Tunas, Tuna-like Species						
Albacore	16	1.4%	1.29	0.0%	52	0.0%
Bullet Tuna	3	0.2%	0.15	39.3%	132	39.3%
Frigate and Bullet Tunas	5	0.4%	0.15	100.0%	46	100.0%
Kawakawa	5	0.4%	0.04	86.3%	15	86.6%
Tuna (Unidentified)	4	0.3%	201.01	100.0%	502,514	100.0%
Wahoo	214	19.5%	9.89	61.0%	1,273	64.8%
Others						
Amberjacks	3	0.2%	0.06	46.5%	45	46.6%
Amberjack (Giant Yellowtail)	2	0.1%	92.50	100.0%	1,000	100.0%
Barracudas	109	9.9%	6.25	16.8%	1,213	15.5%
Mackerel (Unidentified)	47	4.2%	8.12	98.1%	9,261	98.0%
Mackerel Scad - Saba	150	13.6%	20.35	94.5%	10,454	93.9%
Mahi Mahi, Dolphinfish, Dorado	203	18.5%	47.80	22.6%	3,405	34.5%
Manta Rays	17	1.5%	1.14	100.0%	18	100.0%
Oceanic (Pelagic) Triggerfishes	330	30.0%	72.27	98.7%	103,264	98.8%
Rainbow Runner	414	37.7%	135.58	94.3%	46,930	97.5%
Trevallies (Unidentified - Jacks)	18	1.6%	0.39	43.6%	205	44.8%
Unspecified	74	6.7%	49.24	82.1%	2,549	64.9%
Dolphin/Porpoise	7	0.6%	0.98	96.9%	33	96.9%
Loggerhead Turtle	6	0.5%	0.06	100.0%	6	100.0%

[1] Observers were encouraged to record weight of by-catch. However, occeasionally numbers of animals were recorded. Data were adjusted to reflect total by-catch in weight or numbers.

[2] Nearly all of the by-catch retained were for crew consumption.

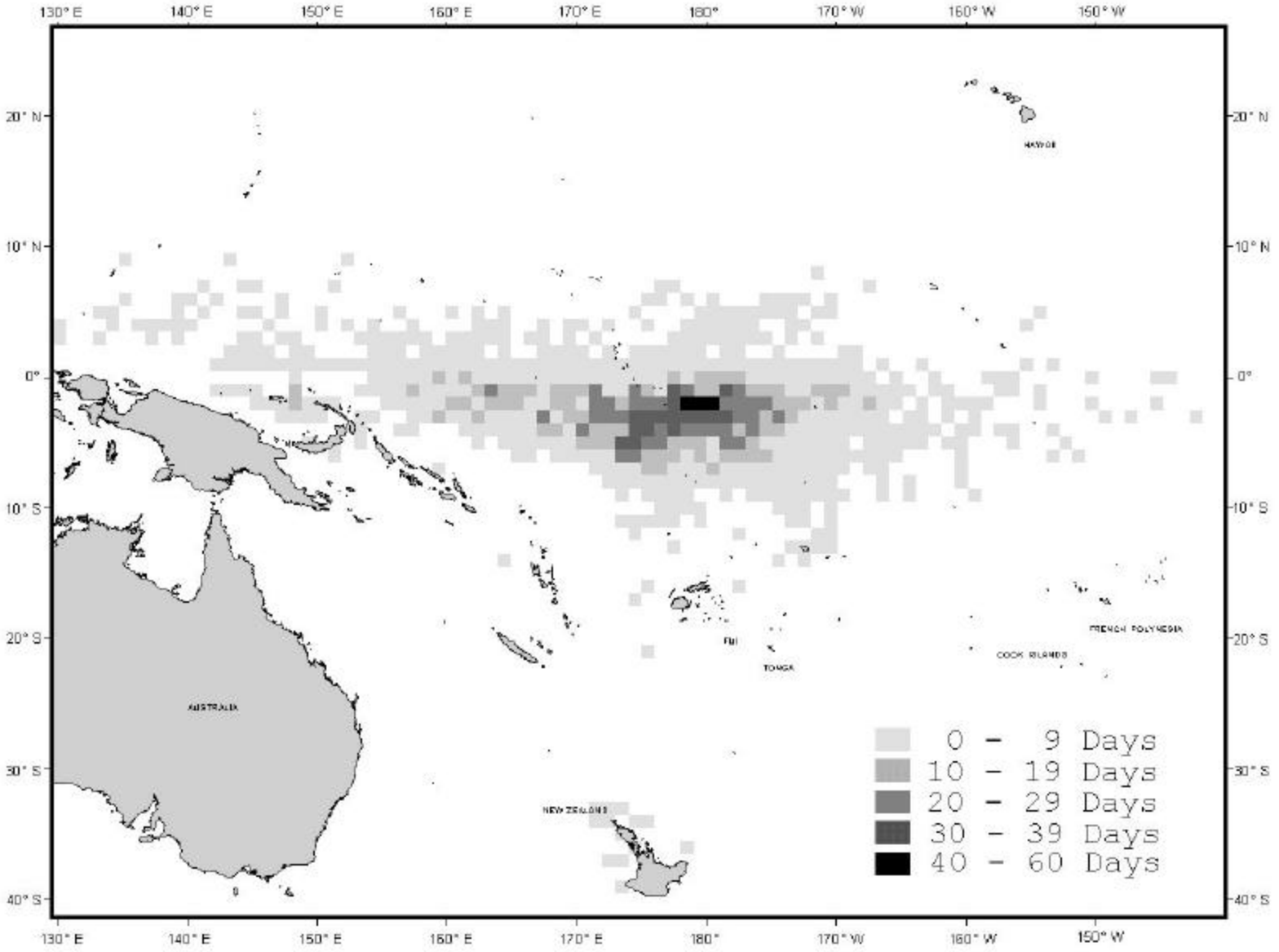

Figure 1. Distribution of fishing effort (days fished) for the 1999 U.S. tuna purse seine fishery in the central-western Pacific Ocean.

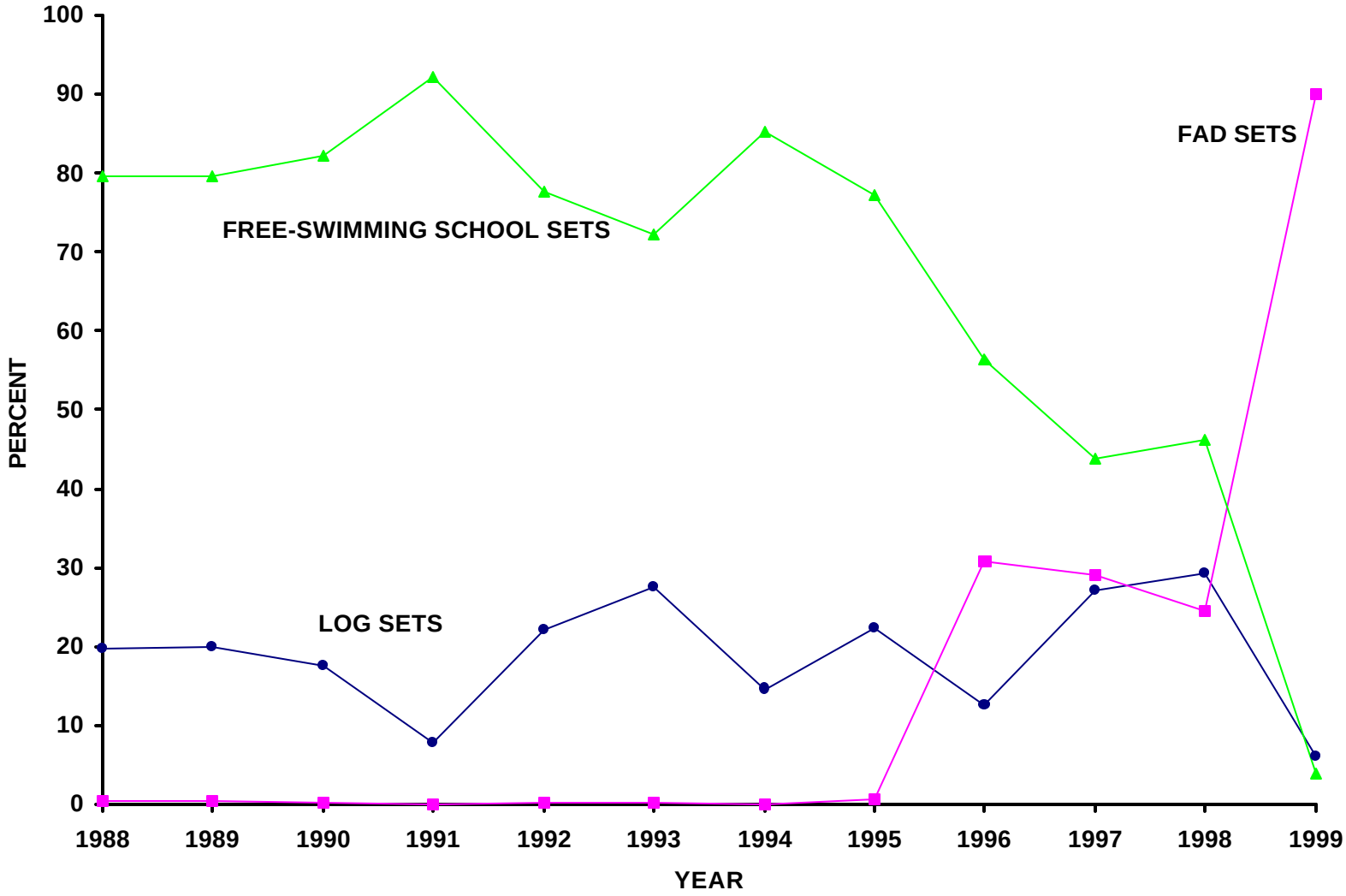

Figure 2. Percentage of sets by set type (free-swimming school, log and fish aggregation device (FAD)) for the U.S. tuna purse seine fishery in the central-western Pacific Ocean.

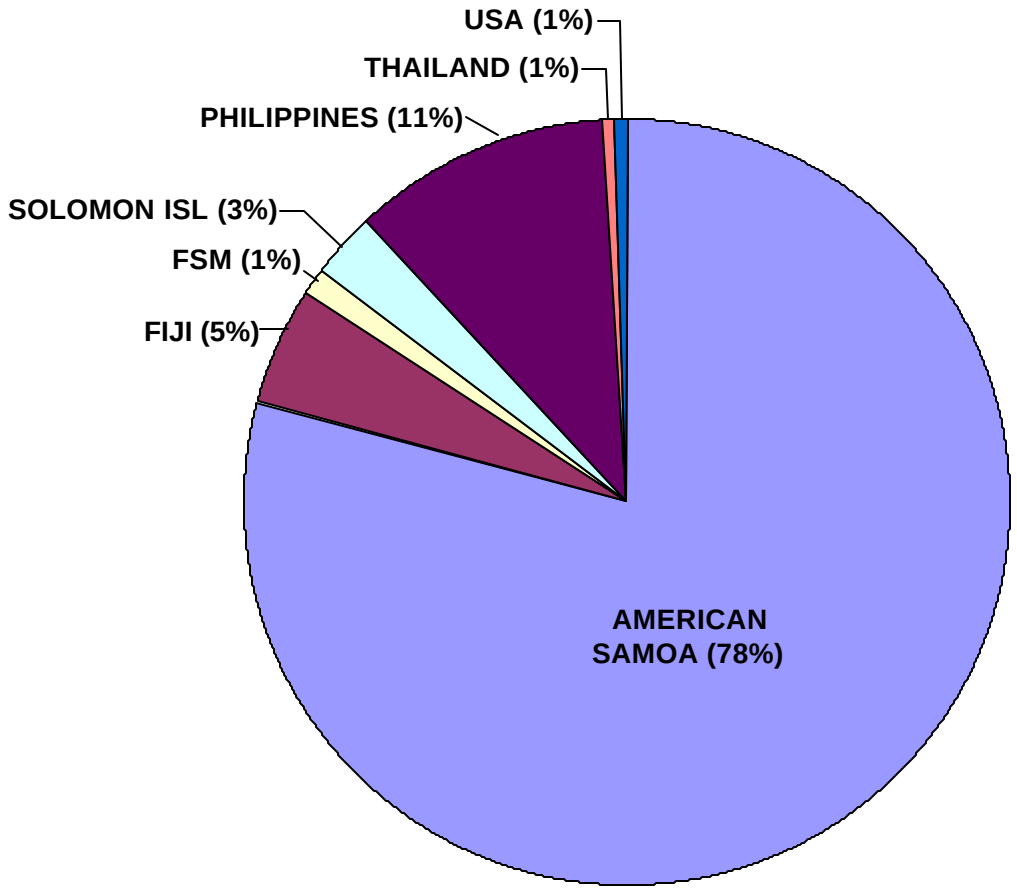

Figure 3. Percentage of 1999 tuna landings by landing port for the U.S. tuna purse seine fishery in the central-western Pacific Ocean.

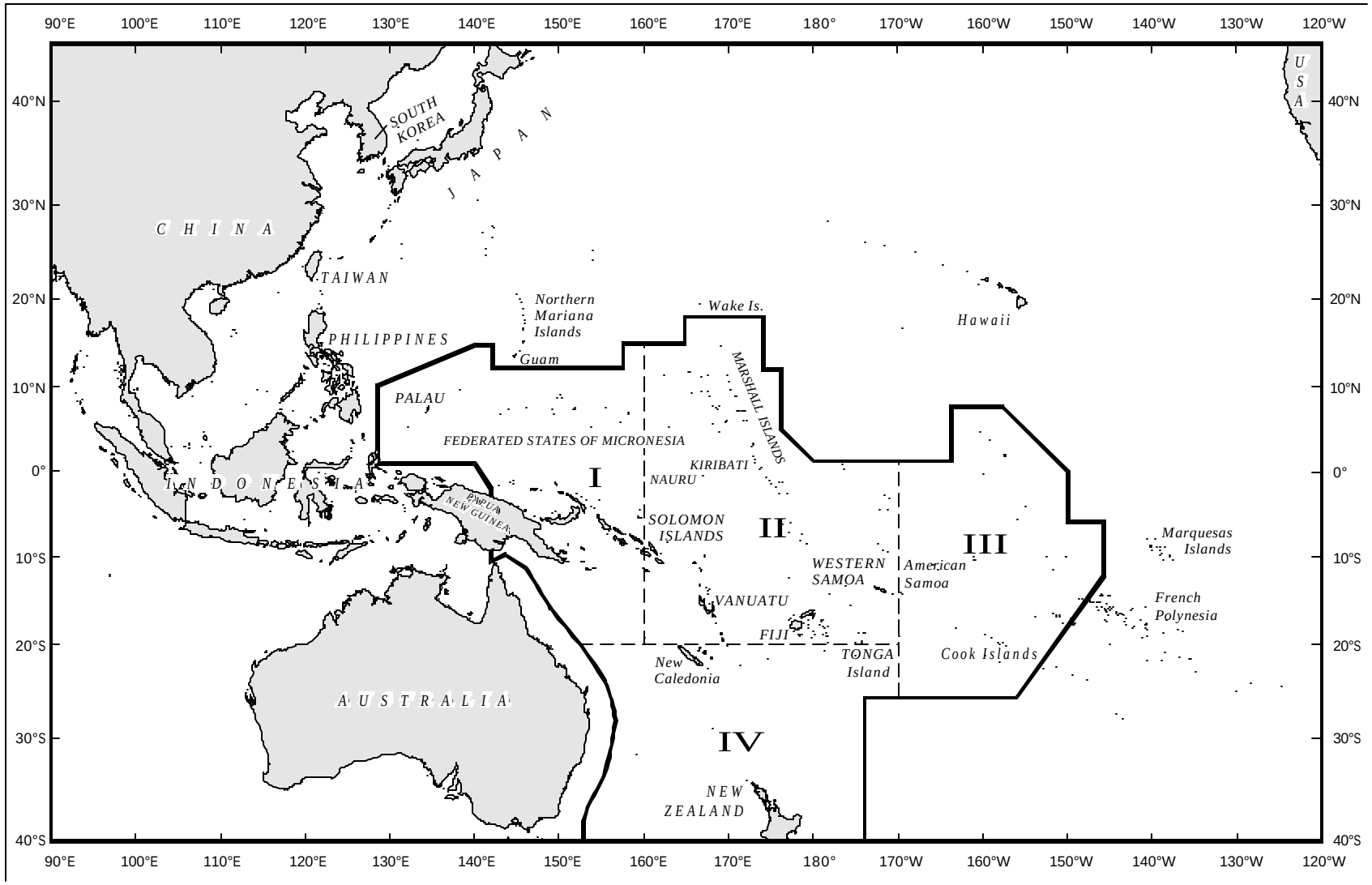

Figure 10. Boundaries of the South Pacific Regional Tuna Treaty Area and the four NMFS Sampling Areas used for length sampling of catches in the Treaty area.