

RESTRICTED

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SOUTH PACIFIC COMMISSION

FISHERIES TECHNICAL MEETING

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THE FISHERIES OF TONGA

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A. INTRODUCTION

The chief activity of the Fisheries Service is in connection with experimental longlining for tuna. "ALAIMOANA", a 20-ton vessel powered with an 88 HP diesel engine and equipped with two-way radio, is used for these experiments.

Small scale subsistence fishing is carried out by the population in inshore waters. In this category we can mention: coastal whaling with sailing boats, handlining, fixed fish traps, trolling and underwater spear-fishing.

B. LONGLINING TRIALS WITH "ALAIMOANA"

From June 1957 to March 1960, operations were conducted by Mr. I. NAOI, Fisheries Officer. Records show that "ALAIMOANA" made her first fishing trip on 21st January 1958, with a crew of 13 under Mr. NAOI. Approximately 80-90 baskets of longline were used.

Although records are scarce for this period, a few points are worth mentioning.

a) In 1958 and 1959 the proportion of sharks caught was approximately 49% in weight of the total catch, and about 36 to 40% in number.

b) For the same period tuna caught represented approximately 29% and the marlin about 17% of the total catch, by weight.

c) Shrinkage of the fish sold at the market (fins, tails, guts, etc.) was approximately 10% by weight.

d) In 1958 the fish, other than shark, caught in the months of January, February, July, September, October, November, and December, represented over

50% of the total catch and even exceeded 60% in February, October and November. In January, February, March, April, July and December 1959, the proportion was again over 50% and exceeded 60% in February, March, April and December.

e) Mr. NAOI left Tonga from April 1959 to March 1960 to supervise the construction of a wooden longliner of approximately 95 tons, equipped with a 320 HP diesel engine, in Japan. This vessel was built by the "GOROKI" ship-building yard in Japan and arrived in Tonga in March 1960. Unfortunately she was lost with all hands on her first fishing trip.

Details of longline operations from November 1960 to December 1961 will be found in Tables 1 to 4 and Annexes I to III attached to this paper. Points of particular interest with regard to longlining operations during this latter period are:

1. Good catches were made both in fair and cloudy weather. I feel that there is no important relation between the weather and the rate of catch, although good catches sometimes occur after heavy rain.

2. It seems that easterly winds are better for fishing than westerlies.

3. Catches seem to improve during spring tides.

4. Currents of over two knots seem to make for poor catches. In the majority of cases, our operations were carried out with Westerly currents of about one knot.

5. Collecting data on water temperature is one of our major problems. A study of the vertical distribution of temperatures will be made when the necessary equipment becomes available. During the cool season (April-November) surface temperatures were from 23°C. to 26°C. (73°F.- 79°F.) with a mode of 24°C. (75°F.). During the warm months (December to March) the temperatures were 25°C. (77°F.) to 28°C. (83°F.) and the mode was between 26°C. and 27°C. (79°F.-80°F.).

6. Good fishing grounds produce catch rates of over 5 fish per hundred hooks, excluding sharks.

Generally speaking, the grounds off the West coast of Tongatapu appear to be much better than those off the East Coast. However, no conclusions should be drawn yet, as 4 trips only have taken place on the Eastern grounds.

A definite relationship between the productivity of fishing grounds and the conformation of the sea floor is apparent, especially in the case of reefs less than 50 fathoms deep rising from depths of 800 fathoms. This is shown in Annex III.

With the exception of the fishing grounds lying closest to Hakautapu, all the good fishing areas are in 800 fathoms depths, and are in many cases located where the curves of the 800 fathoms line lie close together.

The currents generally flow from the West or South West and, when these currents hit reef banks, the deep layers of water are forced upwards and often create good fishing grounds.

7. Monthly catches and catch rates are shown in Annexes IV and V. The best season for Tuna longlining extends from November to February, with the highest catch rates in January.

8. Thresher shark and blue shark are caught more often on the grounds within 10 miles of Hakautapu than anywhere else.

Summary

1. The best season for yellowfin tuna, Albacore and marlin extends from November to February.
2. Reef banks rising out of 800 fathoms depths deserve attention, especially in relation to deep flowing currents.
3. Quantities of thresher shark and blue shark are believed to exist inside a ten miles belt around the coasts.
4. Good catches can be expected during spring tides, as well as after heavy rains when the sea is moderate.
5. A moderate sea (Beaufort 3) is preferable to a calm sea for longlining.

C. LOCAL FISHING (WHALING, FISH TRAPS, ETC...)

1) Whaling

This activity is regulated by the Fisheries Regulation (Amendment) Act, No. 5 of 1957. Whaling is practised by licence holders, who are allowed to take a specified number of whales each season.

The species usually captured is the Humpback, but a few sperm whales are also taken. Most of the whales caught are from 20 to 48 feet long. The whaling season is from June to November.

In 1960, 53 humpback whales were taken by 16 licenced whalers, while in 1961, only 31 were taken by 15 whalers.

2) Fish fences (fixed traps)

Numbers of fish fences have been erected by the Tongan population along the North Coast of Tongatapu.

These traps produce annually an average of 44,800 lbs. of fish, mostly mullet with a few other species. The mullet season extends from May to July. The traps are inspected at low tide.

WEIGHTS AND PERCENTAGES OF SPECIES FOR NOVEMBER & DECEMBER 1960

Table 3.

Month	Tuna		Marlin		Dolphin		Barracuds		Shark		Liver		Total
	lbs	%	lbs.	%	lbs.	%	lbs.	%	lbs.	%	lbs.	%	
November	2074	15.7	4208	31.8	147	1.2	10	.1	6299	47.6	475	3.6	13,212
December	980	16.7	3212	54.3	83	1.4	53	.8	1511	25.5	77	1.3	5,916
Total	3,054	16.0	7420	38.8	230	1.2	63	.3	7810	40.8	552	2.9	19,128

SUMMARY OF LONGLINE BASKETS USED PER TRIP

Table 4.

No. of trip	Date	Baskets used (5 hooks each)	Fishing ground Course & distance from 'Atata	Total Catch	Excluding Shark	Caught per Hundred hooks	Excluding Shark	Remarks
				(Weight in lbs & number)				
No. 1	8-9th Nov.	70	W/N - 20	3,591 $\frac{1}{4}$ 32	1,348 $\frac{1}{4}$ 13	10.3 9.1%	3.9 3.7%	
No. 2	11-12th Nov.	70	NW/W - 20	2,550 $\frac{1}{2}$ 20	1,254 11	7.3 5.7%	3.6 3.1%	
No. 3	15-16th Nov.	70	NW - 20	3,932 38	1,943 $\frac{1}{2}$ 23	11.2 10.9%	5.6 6.6%	16 baskets lost.
No. 4	24th Nov.	40	NNW - 15	1,461 $\frac{1}{2}$ 12	691 $\frac{1}{2}$ 9	7.3 6.0%	3.5 4.5%	daytime fishing
No. 5	28th Nov.	40	N - 15	1,307 $\frac{3}{4}$ 13	1,011 $\frac{1}{2}$ 10	6.5 6.5%	5.1 5%	daytime fishing
No. 6	29th Nov.	40	NNE - 15	368 4	189 $\frac{1}{2}$ 2	1.8 2%	0.9 1%	daytime fishing Engine out of order

Table 4 (cont.)

No. of trip	Date	Baskets used (5 hooks each)	Fishing ground Course & distance from 'Atata	Total Catch	Excluding Shark	Caught per Hundred hooks	Excluding Shark	Remarks
				(Weight in lbs & number)				
No. 7	13th Dec.	40	NNE - 15	949½ 8	698½ 6	4.7 4%	3.5 3%	daytime fishing Engine out of order
No. 8	15-16th Dec.	70	NW - 18	2,051 27	1,569½ 21	5.9 7.7%	4.5 6.0%	Lights used
No. 9	19-20th Dec.	70	NW/N - 20	1,537½ 17	1,110½ 14	4.4 4.8%	3.2 4.0%	daytime fishing.
No. 10	21st. Dec.	40	NNW - 15	1,377½ 8	950 5	6.9 4.0%	4.8 2.5%	daytime fishing.
Average of 10 trips.		55		1,912 179	1,076 114	6.95 6.5%	3.91 4.1%	

WEIGHT AND PERCENTAGES OF SPECIES (1961)

Table 5

Month	Tuna		Marlin		Dolphin		Barracuda		Other species		Sharks		Liver		Total catch
	Lbs.	%	Lbs.	%	Lbs.	%	Lbs.	%	Lbs.	%	Lbs.	%	Lbs.	%	Lbs.
January	3065	= 29.6	3382	= 32.9	158	= 1.5	29	= .2			3220	= 31.3	432	= 4.2	10286
February	4851	= 51.4	1262	= 13.4	54	= .5	30	= .3			2955	= 31.3	281	= 2.9	9433
March	438	= 15.0	954	= 32.7	52	= 1.6	28	= .9			1346	= 46.5	99	= 3.4	2917
April	-		-		-		-				-		-		-
May	4492	= 45.5	2252	= 21.7	-		-				2931	= 29.5	222	= 2.2	9897
June	2992	= 27.2	2372	= 25.5	59	= .5	-		2	= .1	5125	= 46.6	447	= 4.1	10997
July	1991	= 17.4	505	= 4.8	23	= .2	-				8490	= 74.3	424	= 3.7	11433
August	1698	= 14.2	763	= 6.4	-		-				9045	= 75.6	460	= 3.8	11966
September	1197	= 9.0	1325	= 9.9	66	= .5	-		511	= .3	9671	= 72.9	490	= 3.7	13260
October	2398	= 26.7	887	= 6.8	-		-				9162	= 71.8	291	= 2.3	12738
November	3795	= 29.4	824	= 6.4	75	= .6	-		102	= .7	7874	= 60.2	222	= 1.7	12892
December	1937	= 20.9	2505	= 27.0	70	= .8	-				4593	= 49.6	152	= 1.6	9257
	28854	= 25.7	17031	= 14.8	557	= .4	87	= .1	615	= .5	64412	= 55.5	3520	= 3.0	115076

EXAMPLES OF GOOD CATCHES AND CORRELATED CONDITIONS (NOV. 1960-DEC. 1961)

Table 6

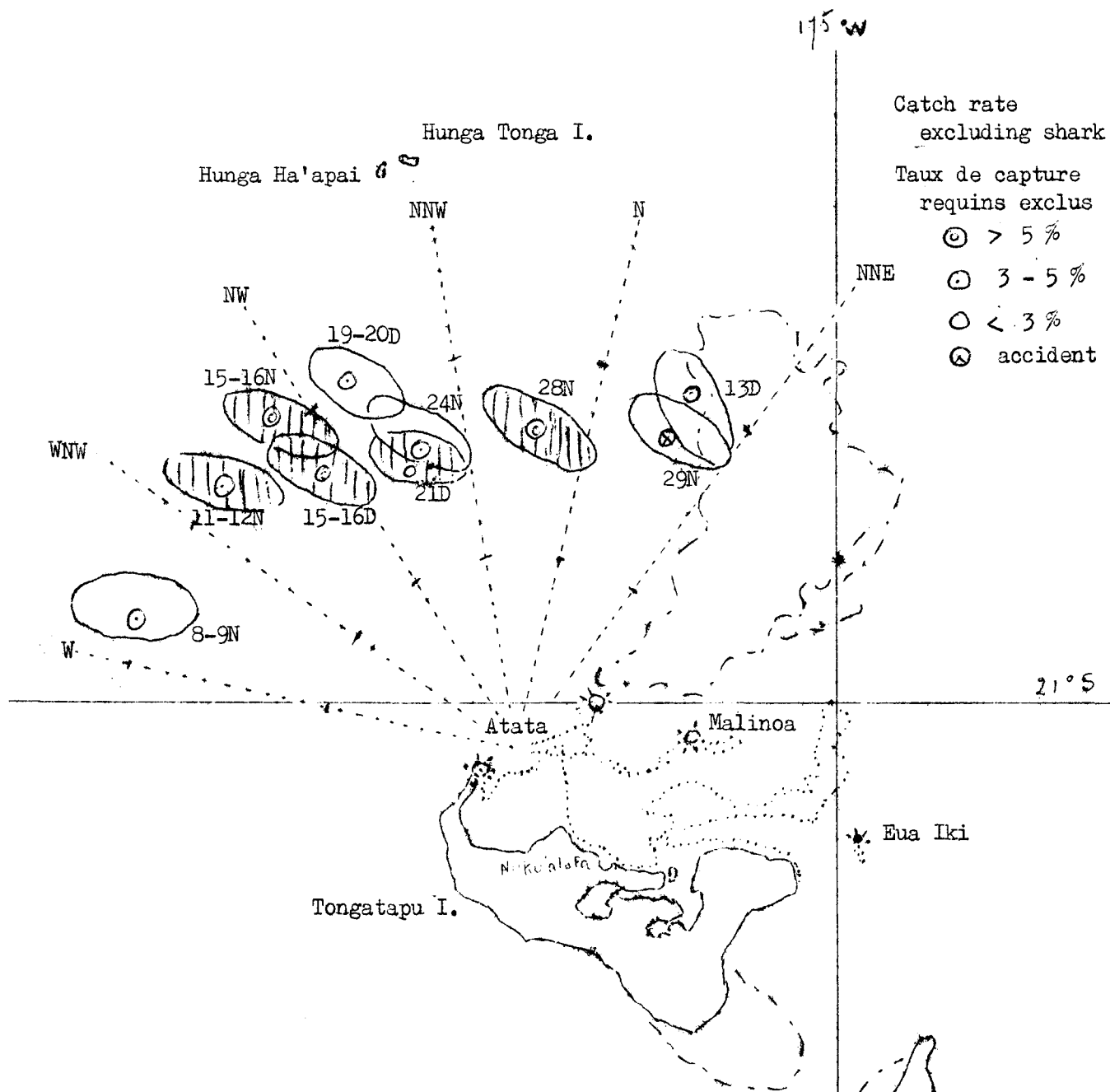
(Catch rates of over 3 fish per 100 hooks, excluding sharks)

Date	No. Fish		Weight lbs.		Catch rate		Fishing Ground	Weather	Wind & Forces	Tides (Moon)	Currents	W.T. °C.	No. of baskets used
	Total	Exc.S'K	Total	Exc.sharks	Total	Exc.S'K							
8 Nov. 60	32	13	3591 $\frac{1}{4}$	1348	%	%	'Atata W/N-18'W-7'	fair	NW/N-2		SW/S-1'	27	70
11 " "	20	11	2550 $\frac{1}{2}$	1254	5.7	3.1	NW/W-18'W-7'	cloudy	E-3		W-1'	27	70
15 " "	38	23	3932	1943 $\frac{1}{2}$	10.9	6.6	NW-18'W-7'	"	SE-3-4		NE ?	26	70-54
24 " "	12	9	1461 $\frac{1}{2}$	691 $\frac{1}{2}$	6.0	4.5	NNW-15'W-4'	fair	SE-2-3		NE ?	24	40
28 " "	13	10	1307 $\frac{3}{4}$	1011 $\frac{1}{2}$	6.5	5.0	N-15'W-4'	"	ESE-2-3		WSW-?	24	40
13 Dec. "	8	6	949 $\frac{1}{2}$	698 $\frac{1}{2}$	4.0	3.0	NNE-15'W-4'	"	SW-2-3		S/E-?	27	40
15 " "	27	21	2051	1569 $\frac{1}{2}$	7.7	6.0	NW-15'W-7'	"	S/E-3		W/S-	25.3	70
19 " "	17	14	1537 $\frac{1}{2}$	1110 $\frac{1}{2}$	4.8	4.0	NW/N-18' W-7'	"	W/N-2-3		W/S-	25.2	70
19 Jan 61	36	27	3030	2337	10.0	7.7	WSW-18' W-6'	cloudy	NW-?	19/J 16/J S.T(N.M)	SW-?	26.2	70
24 " "	31	26	2332	1939	8.9	7.4	SW/W-18' W-6'	fine	? -2	23/J (F.Q)	WSW-?	26	70
27 " "	27	19	2750	1675	7.7	5.7	SW-18' W/N-6'	"	E-2	31/J (F.M)	NW-?	27	70

Table 6 (cont.)

Date	No. Fish		Weight lbs.		Catch rate		Fishing Ground	Weather	Wind & Forces	Tides (Moon)	Currents	W.T.	No. of baskets used
	Total	Exc.S'K	Total	Exc.sharks	Total	Exc.S'K							
9 Feb 61	37	30	2750	2243	10.1	8.6	SW-18' W/N-6'	fair	NW-3	1/F 8/F S.T L.Q	SE-1'	27	70
15 " "	23	18	2070	1632	6.6	5.1	W-18' W/S-5' 'Euaiki	"	NE-2	16/F 15/F S.T N.M	SW-1'	28	70
17 " "	34	31	2602	2135	9.7	8.9	ENE-15' E-5'	"	NE-3	18/M 10/M & 3/M	S-1'	28	70
7 Mar. "	22	11	2575	1137	5.9	3.0	SSW-25' W/N-5'	fine	E-2	S.T L.Q 2/M 30/Apr.	W-1'	27	75
2 May 61	16	12	1531	954	4.0	3.0	Hakau Mama'o WNW-20' NW-5'	fair	NE-3	S.T P.M	W-1'	26	80
5 " "	18	13	2300	1805	4.5	3.3	NW $\frac{1}{2}$ W-30' N-6' H.M	"	SSW-2	14/M 14/M S.T N.M	N-1 $\frac{1}{2}$ '	26	80
9 " "	19	17	1542	1411	4.7	4.2	NW $\frac{1}{4}$ W-28' NW-6' A	cloudy	WSW-3	30/M F.M	E-1'	28	80
30 " "	25	21	1906	1315	6.2	5.2	W/N $\frac{1}{2}$ N-21' N-7'	fair	SE-3		W- $\frac{1}{2}$ '	25.7	80
2 June "	19	18	1307	1232	4.7	4.5	W/N-21' N-7'	cloudy	N-4	1/J S.T	W- $\frac{1}{2}$ '	25	80-60
28 " "	23	19	2341	1273	5.7	4.8	NW/W $\frac{1}{2}$ W-21' NW-8' A	"	SE-4	1/J 28/J S.T F.M	W-1'	23	80
7 July "	14	13	1452	1316	3.5	3.2	NW/W-21' SW-7'	fine	S-2	30/J S.T	W- $\frac{1}{2}$ '	24.4	80

Date	No. Fish		Weight lbs.		Catch rate		Fishing Ground	Weather	Wind & Forces	Tides (Moon)	Currents	W.T.	No. of baskets used
	Total	Exc.S'K	Total	Exc.sharks	Total	Exc.S'K							
27 Oct. 61	26	24	1532 $\frac{1}{2}$	1278 $\frac{1}{4}$	10.2	9.4	H.M N $\frac{1}{4}$ W-22'	cloudy	SE-3'	24/0 23/0 S.T. F.M	SW-1'	24	79-51
8 Nov. "	28	15	2767	876 $\frac{1}{2}$	10.0	5.4	Hakau Tapu NW-6' NE-5'	"	E-3	8/N N.M	W-1'	23	56
10 " "	19	9	2317	896 $\frac{1}{4}$	6.8	3.2	H.T WNW-7' NE-5'	"	NE-3	10/N S.T	W-2'	24	56
16 " "	23	15	1917 $\frac{1}{4}$	827	8.2	5.4	H.T W-6'-NNE-5'	"	E-4		W-1'	24	56
21 " "	23	20	1219 $\frac{3}{4}$	933	7.4	6.5	H. Mama'O NNW-20' NNE-5'	"	NW-3	22/N S.T F.M	W-1'	24.5	62
24 " "	25	11	2816	593 $\frac{3}{4}$	7.1	3.1	H.T W-8 NE-5 $\frac{1}{2}$ '	"	SE-4		W-1 $\frac{1}{2}$ '	23	70
8 Dec. 61	16	11	1222 $\frac{3}{4}$	668 $\frac{1}{4}$	4.6	3.1	H.M NW/N-19'NE-5 $\frac{1}{2}$ '	"	N-2	7/D N.M	W-1?	25	70
14 " "	23	21	2567 $\frac{1}{4}$	2231 $\frac{1}{4}$	6.5	5.9	H.T ENE-13'E-5 $\frac{1}{2}$ '	"	E-3	10/D S.T	W-2	26	71
22 " "	20	15	2133	900	5.7	4.3	H.T WNW-4' NNE-5'	"	S-4	20/D 22/D S.T. F.M			70



ANNEX I

FISHING GROUNDS (Nov.-Dec.1960)

Lieu de Pêche



Fishing ground of each trip

Lieu de pêche correspondant à chaque sortie

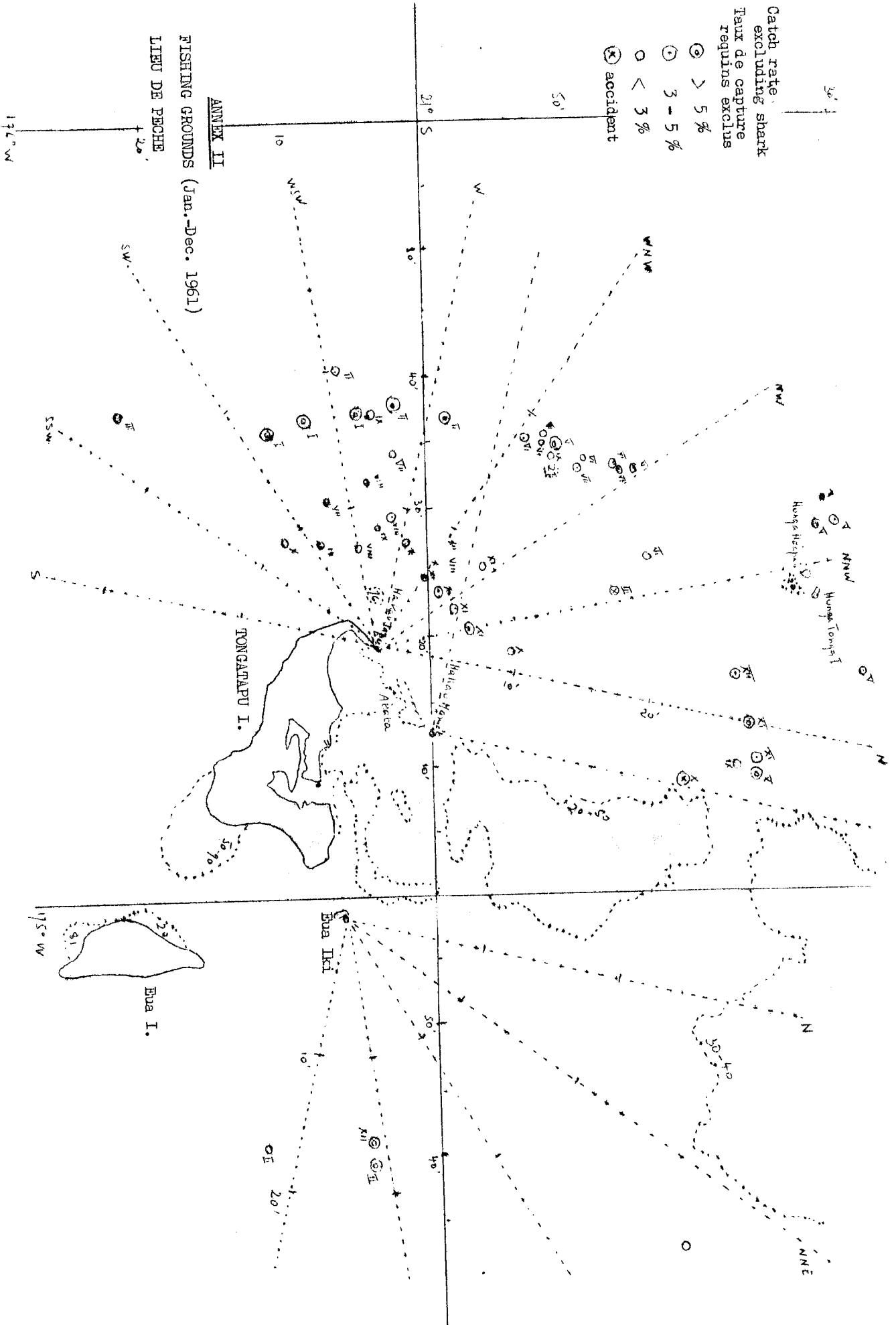


Area of maximum catch rates

Zones les plus riches

Catch rate,
excluding shark
Taux de capture
requins exclus

- ⊙ > 5 %
- ⊙ 3 - 5 %
- < 3 %
- ⊗ accident



ANNEX III

ANNEX III

Correlation of Fishing Grounds & Sea Floor

Relation entre les Zones riches et la

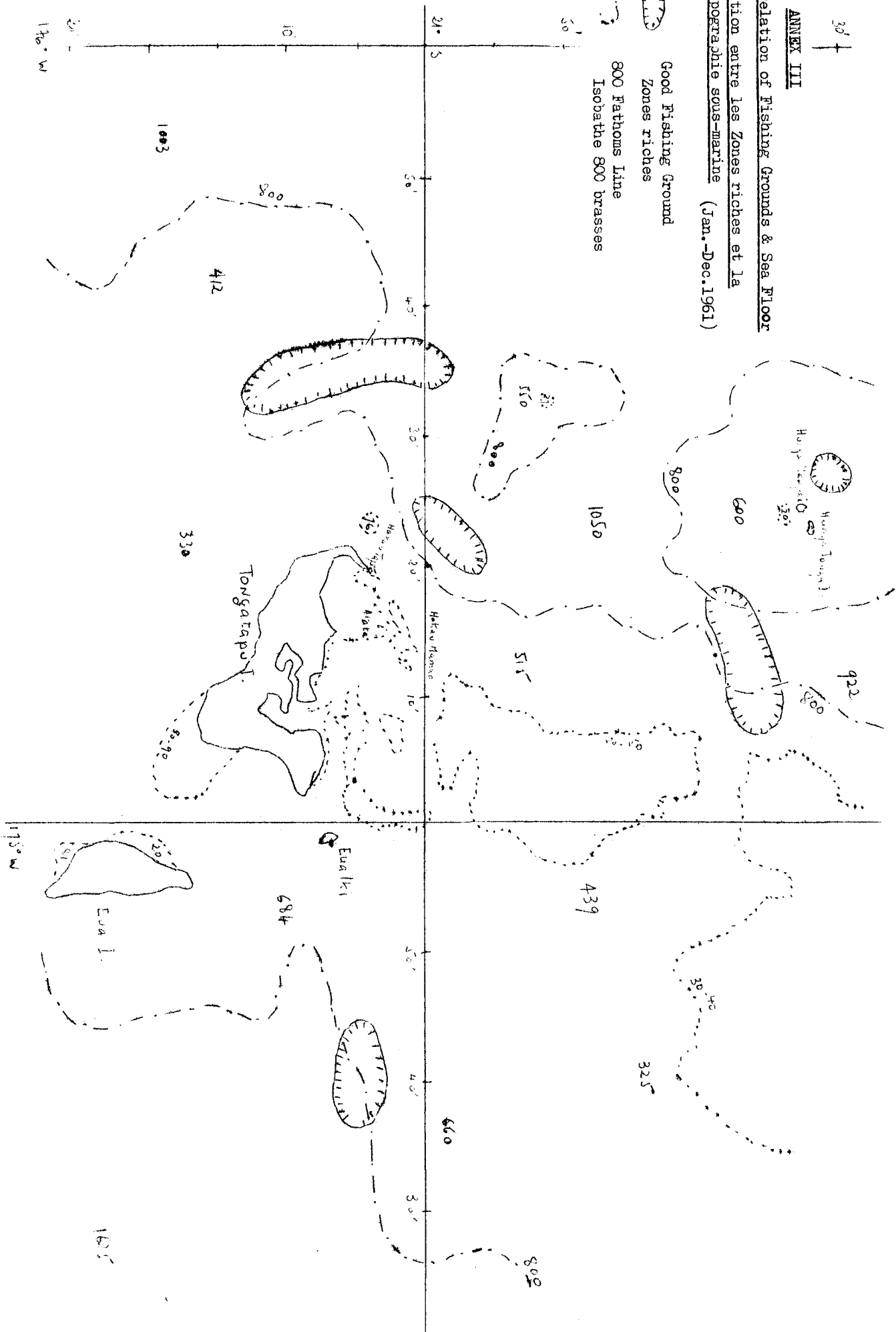
Topographie sous-marine
(Jan.-Dec. 1961)

Good Fishing Ground

Zones riches

800 Fathoms Line

Isobathe 800 brasses

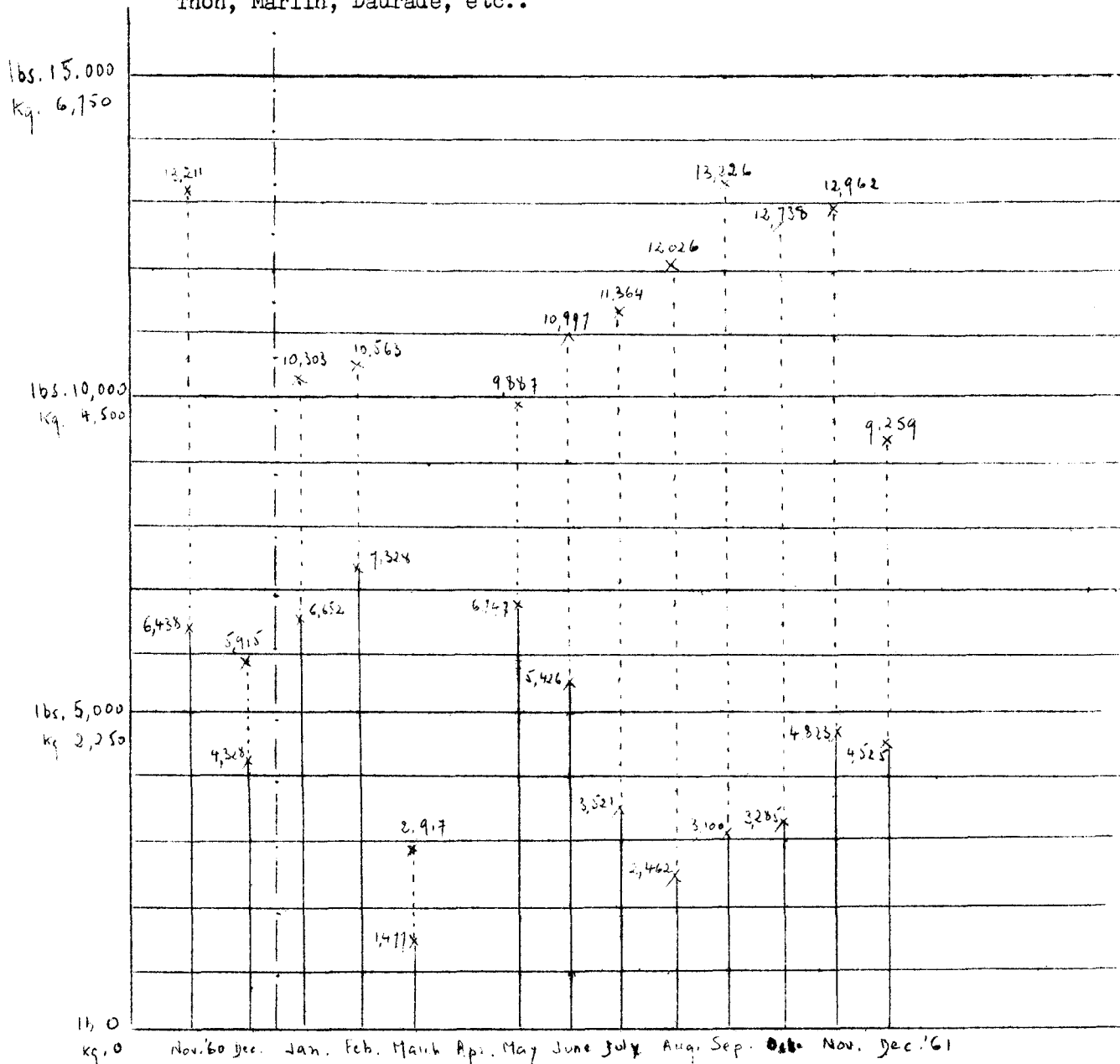


ANNEX IV

Monthly Catch
Prises Mensuelles (Nov.60 - Jan.-Dec.61)

All species of shark (including liver)
Toutes espèces de requins (foie compris)

Tuna, Marlin, Dolphin, etc...
Thon, Marlin, Daurade, etc..



Monthly Average Catch Rate
Taux de capture mensuel moyen (Nov.60 - Jan.-Dec.61)

..... All species of shark
 Toutes espèces de requins
 _____ Tuna, Marlin, Dolphin, etc...
 _____ Thon, Marlin, Daurade, etc...

