DEVELOPMENT OF TUNA LONGLINE FISHERY AND TUNA RESEARCH IN TAIWAN

by

R. T. Yang and P. W. Yuan

SUMMARY

Tuna longline fishery in Taiwan is traditionally classified according to type of fishing craft and gear used and relative distance of fishing areas into two categories, viz., deep-sea and inshore tuna fishery. The former uses longline boats of 50 to 3,400 ton class operating in fishing areas as far out as the southwest Pacific, the Indian and Atlantic Oceans; while the latter operates in the adjacent waters of Taiwan, using longline boats of below 50 ton class with Kaohsiung as the base port. The number of tuna boats has increased steadily in the Atlantic and Indian Oceans since 1967, although there was an apparent decrease in the number of boats in these two areas in 1971. The size of the boats in the Atlantic was larger than those in the Indian Ocean. The number of boats in the Pacific increased appreciably since 1969; most of the boats were medium size of 50 to 200 tons. The total landing in 1971 was 125,197 tons. The landings in the Pacific, Atlantic and Indian Oceans were 30,261, 31,816 and 28,942 tons, respectively. The major species caught in the Pacific and Atlantic is albacore, while in the Indian it is yellowfin. To carry out tuna research, a group consisting of the personnel of universities, research institutes, and Fisheries Bureau was organized and extensive study on the general biology of tunas as well as the analysis of catch statistics have been made since 1968. Catch and effort data of deep-sea boats were collected through the log book system. Tagging and bait experiments were carried out in the Taiwan waters and South China Sea.

DEVELOPPEMENT DES PECHERIES DE THONIDES A LA PALANGRE ET DE LA RECHERCHE SUR LES THONIDES A TAIWAN

par

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RESUME

La pêche palangrière au Taiwan a traditionnellement été considérée en deux catégories (pêche de haute mer et pêche littorale) que se distinguent par le type de bateaux de pêche et d'engins utilisé, et par l'éloignement relatif des zones de pêche. La première catégorie regroupe des palangriers de 50 à 3.400 tonnes de jauge qui manoeuvrent dans des zones de pêche qui vont jusqu'au Pacifique sud-ouest, et les Océans Indien et Atlantique, alors que la deuxième se limite aux eaux proches du Taiwan et se compose de bateaux jaugeant moins de 50 tonnes ayant leur port d'attache à Kaohsiung.

Le nombre de bateaux de pêche manoeuvrant dans les Océans Indien et Atlantique n'a cessé de croitre depuis 1967, bien qu'une diminution apparente du nombre de bateaux dans ces zones ait été observée en 1971. La dimension des bateaux pêchant dans l'Atlantique dépasse celle de ceux de l'Océan Indien. Le nombre de bateaux pêchant dans le Pacifique a augmenté de façon appréciable depuis 1969. La plupart des bateaux étaient des unités moyennes de 50 à 200 tonnes.

L'ensemble des débarquements a atteint 125.197 tonnes en 1971, dont 30.261 provenaient du Pacifique, 31.816 de l'Atlantique, et 28.942 de l'Océan Indien. L'espèce prédominante dans la pêcherie pacifique et atlantique est le germon, et dans l'Océan Indien l'albacore.

Un groupe de chercheurs provenant des universités, des instituts de recherche et de l'Administration de la Pêche a été constitué dans le but d'entreprendre des recherches sur les thonidés. De nombreuses études de la biologie des thonidées ont été faites depuis 1968, ainsi que des analyses de statistiques de capture. Les données de captures et d'effort des bateaux de haute mer ont été recueillies au moyen d'un système de livres de bord. Des expériences de marquage et d'appât ont eu lieu sur le littoral du Taiwan et dans le sud de la Mer de Chine.

DESARROLLO DE LAS PESQUERIAS DE TUNIDOS CON PALANGRE Y DE LA INVESTIGACION SOBRE TUNIDOS EN TAIWAN

por

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RESUMEN

La pesquería con palangre en Taiwan se halla tradicionalmente clasificada en dos categorías, según el tipo de barco o arte de pesca utilizado y la distancia relativa de las zonas de pesca; dichas categorías son: pesca de altura y pesca en el litoral.

La primera utiliza palangreros de 50 a 3.400 toneladas, que operan en zonas de pesca llegando hasta el Sudoeste del Pacífico, los Océanos Indico y Atlántico, mientras que la segunda opera en aguas adyacentes a Taiwan, empleando palangreros de una capacidad inferior a las 50 toneladas y tiene Kaohsiung como puerto base.

El número de barcos ha ido en aumento constante en los Océanos Indico y Atlántico desde 1967, aunque hubo un aparente descenso en el número de barcos en estas dos zonas en 1971. La capacidad de los barcos que operan en el Atlántico fué mayor que la de los barcos del Océano Indico. El número de barcos en el Pacífico aumentó considerablemente desde 1969; la mayoría de los mismos eran de un tonelaje medio de 50 a 200 toneladas. El desembarco total en 1971 alcanzó la cifra de 125.197 toneladas. El desembarco en los Océanos Pacífico, Atlántico e Indico fué de 30.261, 31.816 y 28.942 toneladas, respectivamente. La principal especie capturada en el Pacífico y en el Atlántico es la albacora, y en el Indico, el rabil.

Para ocuparse de la investigación, se ha creado un grupo compuesto de personal procedente de universidades, institutos de investigación y Oficina de Pesca y se ha efectuado un estudio profundo sobre la biología en general de los túnidos, así como el análisis de las estadísticas de capturas desde 1968. Se obtuvieron los datos de capturas y esfuerzo de los libros de bitácora de los barcos de gran altura. Se han llevado a cabo experimentos sobre marcado y sobre cebo en aguas de Taiwan y sur del mar de China.

Development of Tuna Longline Fishery and Tuna Research in Taiwan

by

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1. Development of tuna longline fishery

(1) Expansion of fishing grounds

Tuna longlining was introduced into Taiwan in 1913 (JCRR 1970). At the beginning, fishing was limited only to the coastal waters off the southern part of the island with Kaohsiung as the base port. Gradually its fishing ground was expanded and extended to the waters west of Luzon Island and the South China Sea, along with the increase in the number and tonnage of tuna boats (Table 1). In 1954 tuna operations were extended to the Banda and Flores Seas, and in 1956 to the Indian Ocean, reaching as far as the Mediterranean Sea and the Atlantic in 1960. To meet the requirements of distant water operations, supply bases at many foreign ports were set up since 1960 (Table 3) close to the fishing grounds frequented by Taiwan's tuna fishing boats. At these bases, the fishing boats replenish their supplies, take care of repairs and have their catch sold locally or transhipped for export.

(2) Size, number and distribution of boats

The tuna longline fishery in Taiwan has been traditionally classified according to type of fishing craft and gear used and relative distance of fishing areas, into two categories, viz., deep-sea and inshore fishery. The former uses longliners of the 50 to 3,400-ton class operating in fishing areas as far as the southwest Pacific, the Indian and Atlantic Oceans; while the latter operates in the adjacent waters of Taiwan, extending from the Bashi Channel through the Sulu, Celebes and Banda Seas, using longline boats of below 50-ton class with Kaohsiung as the base port.

In 1971 the total number of tuna boats increased to 1,325 with a gross tonnage of 117,614, of which 863 were small boats of less than 50 tons and 462 medium and large-sized boats of 50 to 3,300 tons. The number, size and distribution of deep-sea tuna boats in the different oceans are listed in Table 2. The number of tuna vessels has increased steadily in the Atlantic and Indian Oceans since 1967, although there was an apparent decrease in the number of boats in these two areas in 1971. Table 2 shows that the size of the boats in the Atlantic was larger than those in the Indian Ocean. Contrary to the decrease in the number of boats in the Atlantic and Indian Oceans in 1971, the number of boats in the Pacific increased appreciably since 1969. As a result, in 1971 the Pacific ranked first in the number of boats with 192 boats accounting for 42% of the total; the Indian Ocean came next with 157 boats or 34%; and the Atlantic Ocean with only 108 or 24%. In the Pacific, most of the boats (80 to 90%) were medium size of 50 to 200 tons. The number of boats and fishing trips made from overseas base ports, from 1969 to 1971, are shown in Table 3.

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(3) Annual production

As shown in Table 1, the total production increased rapidly in recent years due to the increase of medium and large size boats, an increase of from 14,032 m/t in 1955 to 125,197 m/t in 1971. The total landing and species composition in the different oceans caught by deep-sea tuna boats from 1969 to 1971 at overseas bases are shown in Table 4. The total landing in the Pacific increased from 15,183 m/t in 1969 to 30,261 m/t in 1971; while that in the Atlantic and Indian Oceans decreased from 33,266 and 41,848 m/t in 1969 to 31,816 and 28,942 m/t in 1971, respectively. From Table 4, it is apparent that the major species caught in the Pacific and Atlantic is albacore, while in the Indian yellowfin.

2. Tuna research activities

(1) Tuna research group

In the past, little progress on tuna research was made in Taiwan, mainly due to the shortage of qualified research personnel and insufficient research funds. It was not until 1968 that active recruitment of research staffs and strengthening of research equipment and facilities were made with continuous government support as well as the technical and financial assistance from the Chinese-American Joint Commission on Rural Reconstruction.

To carry out the work, a tuna research group consisting of personnel of the Institute of Oceanography of the National Taiwan University, the Provincial Taiwan Fisheries Research Institute, the Institute of Fishery Biology and the Taiwan Fisheries Bureau was organized to conduct intensive research work. The research group center is located on the university campus sharing the building and facilities of the Institute of Oceanography. The collection of fishing information and biological samplings are made at the Tungkang and Kaohsiung field stations established for that purpose, as well as aboard the tuna clippers operating from overseas base ports.

(2) Catch statistics

Since 1969, the Fifth Division of the Taiwan Fisheries Bureau has been responsible for the collection of catch and effort statistics of Taiwan's tuna boats using the log book system. Electronic computer data processing has been done since 1971. Yearly catch statistics, by species, of the preceding year, corresponding to the Task 1 statistics of ICCAT format 1972, is published. Processing and compilation of the monthly catch and effort statistics by species in smaller areas of 5° longitude and 5° latitude have been made for the data of the year before last, corresponding to the Task 2 statistics of ICCAT format 1972. So far, the yearly coverage of catches for the Task 2 data was quite low at about 30%.

(3) Biological studies

The major items of research carried out up to the present are summarized as follows:

1) Population study of yellowfin tuna in the waters adjacent to Taiwan

Morphometric measurements were collected and studied along with catch statistics for the purpose of ascertaining whether the yellowfin caught by the inshore tuna longline fishery in the adjacent waters of Taiwan were supported by a distant stock or merely a portion of the single population which ranged far to the south and

eastward covering the entire western Equatorial Pacific region. The results obtained reveal that (1) the yellowfin in the adjacent waters of Taiwan are quite different from those in the Indian Ocean; (2) as for the relationship with the yellowfin in Equatorial Pacific, the differences discovered between the two regions are rather complicated; and from the examination of the results by geographical distribution of high hooking rate of yellowfin in the western Pacific, it is surmised that there is a "group" of yellowfin distributed in the waters covering the Philippines, the Sulu Sea and the Celebes Sea, which is different from the population distributed in the waters around New Guinea and the Solomon Islands.

2) Stomach contents of tunas in the waters southwest of Taiwan

Stomachs of yellowfin tuna, longtail tuna and skipjack tuna in the waters southwest of Taiwan were collected and the contents examined. The results obtained reveal that: (1) most of the SCWI values are quite small; based on tuna feeding patterns, they are typically omnivorous fishes; (2) the variety of food items is great, from planktonic crustaceans to large fish and squids; (3) stomatopoda of family Squillidae (mostly in larval stage), squid and various kinds of fish dominate the food eaten; (4) pelagic tunicates (Salpeidae) are found in the stomachs of yellowfin tuna, but not in those of longtail and skipjack tuna; (5) there is no significant difference in the food eaten by the male and female; (6) it appears that longtail tuna prefer to feed on crab larvae; and (7) on the whole, there is not much difference in the stomach contents among the three species in the same area.

3) Sexual maturity and fecundity of skipjack tuna

The size of gonads, spawning season, sex ratio and fecundity of skipjack tuna in the waters southwest of Taiwan were investigated. The preliminary results obtained reveal that: (1) in a pair of gonads, the left gonad is longer and heavier than the right one and there is significant correlation between the right and left gonad length (weight); (2) the spawning season of skipjack tuna in the waters southwest of Taiwan may last, at least, from March to October; (3) the most advanced mode of oval diameter varies with increasing GI value by 0.3 - 0.6 mm; (4) the sex ratio in different fork length classes (40-69 cm) is approximately 1:1; and (5) estimated fecundity ranges from 3.1×10^4 - 4.1×10^5.

4) Morphometric study on skipjack tuna of Taiwan and those of the Indian Ocean

As a part of the Pacific-wide study of the population structure of skipjack tuna (Katsuwonus pelamis), eight samples - three from the waters southwest of Hsiao-Ryukyu and five from the eastern Indian Ocean - were collected and compared. It is concluded that: (1) there is significant difference in morphometric measurements between the samples from the waters southwest of Hsiao-Ryukyu and those from the eastern Indian Ocean; and (2) two morphometric measurements, i.e., head length and snout to insertion of anal fin, are sufficient for morphometric study of skipjack tuna.

5) Parasites of tunas in the waters southwest of Taiwan

Study of parasites of frigate mackerel, bullet mackerel, oceanic bonito, skipjack tuna, yellowfin tuna and longtail tuna in the waters southwest of Taiwan was undertaken with the following objectives: (1) to make a preliminary identification of parasites; (2) to estimate the incidence of infection in hosts and on habitats; (3) to compare the data among the six species. So far, the results obtained reveal that: (1) there are six kinds of acanthocephala, three cestodes, two

nematodes and one trematoda found in tunas in the waters southwest of Taiwan; (2) each species of parasite infects several hosts, and in each host it inhabits several organs, although it appears that each parasite has its habitat of preference; (3) the difference in fishing areas does not seem to exert much influence on the kinds of parasites of those fishes in the region; and (4) along with the increase of fish size, there is a corresponding increase in the kinds of parasite and infection rate.

6) Maturity and spawning activity of yellowfin tuna in waters southwest of Taiwan

Gonads of yellowfin tuna (50.3-175.5 cm in fork length, collected from the Tungkang fish market) were examined during the period from April 1970 to August 1971. Gonad weight relative to fork length was used as an index of modal oval diameter. Sex ratio and group maturity were also investigated. It is surmised that the spawning season in this area is from March to September with intensive spawning occurring from April through June. The estimated fecundity ranges from 1.2-5.7 million.

7) Effect of freezing on morphometric characteristics of skipjack tuna

Morphometric measurements were made on the specimens of skipjack tuna under different conditions, viz., fresh, frozen and thawed. Variations of different characters were calculated in percentages and compared under different conditions. Analysis of variance and t-test were used to test the difference in variance ratios and mean values respectively, before applying co-variance analysis. The conversion factors for various characters under different conditions were estimated.

8) Distribution of tuna larvae in Taiwan waters

Study on the distribution of tuna larvae in the waters surrounding Taiwan has been carried out since 1970. Specimens were collected by both commercial fishing boats and R/V Chiu-Lien. A total of seven species of tuna larvae was found in this area, i.e., Thunnus albacares, Katsuwonus pelamis, Euthynnus affinis, E. alleteratus, Auxis thazard (Type I), Auxis sp. (Type II) and Auxis sp. (Type III).

9) Osteological and morphological characters of frigate mackerels of Taiwan

Two species of Auxis found in Taiwan, i.e., the wide-corseleted mackerel (also called bullet mackerel, A. rochei) and the narrow-corseleted frigate mackerel (also called frigate mackerel, A. thazard) were compared for osteological character and morphological features. The reports of many previous researchers stating that they had different characteristics were confirmed. Since frigate mackerels have been named A. tapeinosoma and A. hira by some earlier researchers in Taiwan, it is reasonable to consider A. tapeinosoma and A. hira synonymous with A. rochei and A. thazard, respectively.

(4) Bait experiment

1) Discussion of the analytic method of bait experiment of tuna longline fishing was made with particular consideration from the statistical approach. Four different ways of statistical tests were employed for various situations, viz., (a) Chi-square test for goodness of fit, with Yate's correction, (b) t-test of binominal distribution, (c) t-test with angular transformation (Fisher 1922a), and (d) Chi-square heterogeneity test (Snedicor & Irwin 1956). It has been established that there is no significant difference between hooking rates using milkfish and mackerel as bait, but there is

significant difference between those of milkfish and plastic bait.

2) Bait effect for tuna longline should be discussed with particular emphasis on economic returns of the fishery. In this respect, we must consider the species, body weight, unit price of the catch and the bait used, as well as hooking rate. It is recommended that the traditional saury bait may be replaced by milkfish bait, mackerel bait or squid bait for tuna longline, but not by artificial bait, according to available data.

(5) Tagging experiment

The research group is a member of the FAO Working Party on Tuna Tagging, responsible for the tuna tagging program in Taiwan waters and the South China Sea. Three hundred twenty-one (321) tagged troll-caught yellowfin and skipjack were released by the group in adjacent Taiwan waters in July and August 1971; and 37 yellowfin and skipjack were tagged and released in the same area in June 1972. Tags (Floy tag) similar to that shown by Akyuz (1970, page 89) were used.

(6) International cooperative research program

The research group also signed a three-year agreement beginning September 1971, with the Japan Far Seas Fisheries Research Laboratory to jointly conduct a project on (1) age determination of yellowfin tuna in the Indian Ocean, (2) assessment of productivity of tuna longline fishing grounds in the western Pacific and eastern Indian Oceans, and (3) population structure and stock assessment of yellowfin and skipjack tunas in the Indian Ocean.

Bibliography

Yang, R.T. et al
1969. A comparative study on the age and growth of yellowfin tunas from the Pacific and Atlantic Oceans.
Bull. Far Seas Fish. Res. Lab., No. 2, 1-21.

_____1969. Morphometric studies on the Atlantic albacore and yellowfin tuna.
Bull. Far Seas Fish. Res. Lab., No. 2, 22-64.

_____1970. Discussion of analytical method and preliminary conclusions of length-weight relationship.
China Fisheries Monthly, No. 207, 2-14.

_____1970. Relationship between scale radius and fork length of yellowfin tuna from waters around Hsiao-Ryukyu.
China Fisheries Monthly, No. 209, 9-13.

Wang, C.H, and R.T.Yang
1970. Fitting of non-linear regressions to the relationship between fork length and scale radius of yellowfin tuna.
China Fisheries Monthly, No. 211, 3-7.

Yang, R.T.
1970. Studies of age and growth of Atlantic albacore and a critical review on the stock structure.
China Fisheries Monthly, No. 213, 2-16.

Chi, K.S. and R.T.Yang
1971. Stomach contents of tunas in the waters southwest of Taiwan.
China Fisheries Monthly, No. 225, 3-18.

Huang, C.C. and R.T.Yang
1971. Statistical consideration on the bait experiment of tuna longline fishery.
China Fisheries Monthly, No. 223, 8-15.

Yang, R.T.
1971. Population study of yellowfin tuna in the waters adjacent to Taiwan.
Acta Oceanographica Taiwanica, No. 1, 137-155.

Hu, F. and R.T.Yang
1972. A preliminary study on sexual maturity and fecundity of skipjack tuna.
J. Fish. Soc. Taiwan, 1(1):52-61.

Wang, C.H. and R.T.Yang
1972. Morphometric study on skipjack tunas of Taiwan and those of the Indian Ocean.
J. Fish. Soc. Taiwan, 1(1): 88-98.

Huang, C.C. and R.T.Yang
1972. Economic considerations of some baits used in tuna longlining.
China Fisheries Monthly, No. 238.

Chi, K.S. and R.T.Yang
1972. The osteological and morphological characters of frigate mackerels of Taiwan.
Acta Oceanographica Taiwanica, No. 2 (in press).

Bibliography - continued

Wang, C.H. and R.T.Yang
1972. Effect of freezing on morphometric characteristics of skipjack tuna.
J. Fish. Soc. Taiwan, 1(2) (in press).

Hu, F. and R.T.Yang
1972. Maturity and spawning activity of yellowfin tuna in waters southwest of Taiwan.
(manuscript).

Chen, C.J. and R.T.Yang
1972. A preliminary report on the parasites of tunas in the waters southwest of Taiwan.
(manuscript).

Tan, T.H. and C.C.Chen
1972. On the distribution of tuna larvae in Taiwan waters.
(manuscript).

Chinese-American Joint Commission on Rural Reconstruction (JCRR)
1970. Tuna fishery of Taiwan
(mimeo.).

Yuan, P.W. and R.T.Yang
1971. Taiwan fisheries today.
Sino-American Science Cooperation Colloquium on Ocean Resources, Vol. II, 39-86.

Yuan, P.W. and R.T.Yang
1972. Tuna research program in 1971.
Proceedings Sixth Asian Tuna Conference, 99-118.

Table 1. Number and gross tonnage of boats, and annual production of Taiwan's tuna longline fishery, 1954-1971

Year	No. of boats	Gross tonnage of boats	Annual production in m/t		
			Deep-sea*	Inshore**	Total
1954	417	8,847	-	12,412	12,412
1955	423	9,640	1,118	12,914	14,032
1956	412	9,912	1,943	14,745	16,688
1957	468	12,443	2,375	15,653	18,028
1958	503	14,439	5,779	16,362	22,141
1959	472	13,779	8,815	12,719	21,534
1960	629	15,163	7,507	14,061	21,568
1961	663	15,056	7,862	15,589	23,451
1962	725	16,959	8,701	16,510	25,211
1963	678	19,133	9,607	15,670	25,277
1964	749	20,185	9,476	15,944	25,420
1965	576	26,995	10,277	16,276	26,553
1966	701	38,659	24,353	18,977	43,330
1967	869	61,117	38,861	19,451	58,312
1968	914	84,064	79,573	24,471	104,044
1969	842	100,002	94,470	25,850	120,320
1970	1,263	112,251	93,932	27,552	121,484
1971	1,325	117,614	95,620	29,577	125,197

* Catch of the tuna boats of 50 to 3,400-ton class operating in distant waters at foreign base ports.

** Catch of the tuna boats of below 50-ton class using Kaohsiung as the base port.

Table 2. Number and Size of Taiwan's deep-sea tuna boats in the different oceans, 1967-1971

		Total	Tonnage					
			0-50	50-100	100-200	200-500	500-1,000	1,000-
1967	Total	254	14	25	164	46	2	3
	Pacific*	137	12	20	103	2	0	0
	Indian	105	2	5	56	39	2	1
	Atlantic	12	0	0	5	5	0	2
1968	Total	333	7	31	191	98	2	4
	Pacific	100	6	23	69	2	0	0
	Indian	152	1	7	92	47	2	3
	Atlantic	81	0	1	30	49	0	1
1969	Total	396	12	26	191	161	2	4
	Pacific	105	12	15	73	5	0	0
	Indian	172	0	9	94	68	1	0
	Atlantic	119	0	2	24	88	1	4
1970	Total	418	10	20	188	194	2	4
	Pacific	122	10	16	83	13	0	0
	Indian	171	0	4	88	77	1	1
	Atlantic	125	0	0	17	104	1	3
1971	Total	457	13	28	202	209	1	4
	Pacific	192	13	23	125	31	0	0
	Indian	157	0	5	68	83	0	1
	Atlantic	108	0	0	9	95	1	3

* Excluding boats using Kaohsiung as base port.

Table 3. Number of deep-sea tuna boats and fishing trips made from overseas base ports

	1969		1970		1971	
Pacific						
Samoa	69*	178**	98*	277**	106*	261**
Santo	32	91	51	135	77	200
Fiji	35	11	5	10	16	26
Rabaul	1	1	-	-	-	-
Tahiti	-	-	-	-	1	1
Sydney	-	-	-	-	1	1
Kaohsiung***	38	40	18	18	6	6
Subtotal	175	321	172	440	207	495
Indian						
Singapore & Penang	127	223	160	353	134	252
Port Louis	85	230	70	133	51	93
Victoria	24	25	5	5	3	3
Tamatave	29	50	18	26	4	4
Diego Suarez	1	1	1	1	2	2
Durban	2	2	4	4	1	1
Mombasa	28	43	19	38	23	30
Reunion	-	-	-	-	19	24
Subtotal	296	574	277	560	237	409
Atlantic						
St. Martin	11	28	8	22	2	7
Abidjan	39	58	23	36	31	39
Capetown	71	112	44	63	43	67
Las Palmas	8	9	26	40	43	64
Sao Vincente	20	40	19	40	25	40
Monrovia	23	29	11	15	-	-
Tema	13	18	31	42	10	13
Dakar	1	1	-	-	-	-
Santa Cruz	1	1	-	-	-	-
Walvis Bay	2	3	-	-	-	-
Buenos Aires	3	3	27	35	29	44
Recife	3	3	-	-	2	3
Montevideo	-	-	7	7	-	-
Paranagua	-	-	1	1	-	-
Tenerife	-	-	-	-	1	1
Subtotal	195	305	197	301	186	278
Total	666+	1,200	646+	1,301	630+	1,182

* Number of boats.
** Number of fishing trips.
***Number of deep-sea boats returning to Kaohsiung for landing during the year.
\+ These figures do not agree with the actual number of deep-sea tuna boats of the year, because individual boats often called at different ports.

Table 4. Total landing and species composition in the different oceans (unit in m/t)

		Tunas									
		Sub-total	Albacore	Big-eye	Yellow-fin	Blue-fin	Young tuna	Skipjack	Marlins	Sharks	Others
1969											
Total	94,470	78,661	28,828	16,851	32,434	371	177	103	8,823	3,863	3,020
Pacific	15,183	14,119	9,595	1,700	2,748	45	31	15	834	33	182
Indian	41,848	33,226	7,490	7,240	18,245	126	125	42	4,309	2,218	2,053
Atlantic	33,266	28,908	11,543	7,185	9,980	200	-	33	2,760	898	667
Kaohsiung*	4,173	2,408	200	726	1,461	-	21	13	920	714	118
1970											
Total	93,932	79,463	34,745	14,463	29,806	281	168	128	8,050	3,380	2,901
Pacific	26,455	25,182	14,689	3,035	7,359	49	50	45	1,039	40	149
Indian	35,637	27,975	7,600	5,335	14,825	107	108	10	3,920	1,996	1,736
Atlantic	28,626	24,539	11,937	5,324	7,156	115	7	25	2,519	830	713
Kaohsiung*	3,214	1,767	519	769	466	10	3	48	582	514	303
1971											
Total	95,620	80,821	40,204	14,169	26,088	164	196	511	8,760	2,631	2,897
Pacific	30,261	27,790	15,877	2,883	8,891	25	114	382	1,568	14	507
Indian	28,942	24,173	4,932	6,120	13,008	43	70	5	2,552	1,169	1,043
Atlantic	31,816	28,133	19,223	4,717	4,087	96	10	11	2,451	558	663
Kaohsiung*	4,601	725	172	449	102	-	2	113	2,189	890	684

* The landings at Kaohsiung were brought back from overseas.