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A NOTE ON JAPANESE LONGLINE FISHERIES IN THE ATLANTIC OCEAN

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Description of swordfish fisheries:

1. COUNTRY

Japan

2. FISHING METHOD

Longline

3. IS IT A DIRECT SWORDFISH FISHERY? (If not, what is the target species?)

No, however, the fishery catches swordfish in fair amount as by-product while targeting other tunas in some areas and seasons.

Target species of the fishery have been changing, and now main target species is bigeye tuna as reflected by more than 2/3 of the catches are composed of this species (Table 1).

4. BRIEF HISTORY OF THE FISHERY (since when is it operating, is it in expansion or decline, etc.)

The Japanese longline fishery in Atlantic started its operation in 1956 targeting tunas, and covered almost entire Atlantic by late 1960's. During this time period, the fishery experienced the best catch (137,000 tons) in the history (Table 1). Since then, the annual catch decreased to lower level with up and down fluctuation. Recently annual catch of tunas and billfishes by the fishery ranged between 25-50 thousand tons. Historically, main target species have changed: yellowfin in the initial stage of the fishery, then albacore was aimed together and recently bigeye tuna as mentioned in the previous section. In the period of late 1960's and early 1970's, the fishery caught significant amount of swordfish in specific and limited area such as off southern South America. Since the fishery is multi-species gear, the main fishing area chainges by target speciest. It is noted that the fishery introduced deep longline operation which is more efficient to catch bigeye tuna in the tropical area and may be more efficient for swordfish, as well. This method now prevailes in the equatorial Atlantic (about 90 % level).

a) In case it is declining, indicate the causes.

5. FISHING AREA (traditional fishing areas, changes during the development of the fishery)

In the course of the development of the longline fishery, the fishing ground has changed according to main target species. In brief, major fishing ground was located, aiming yellowfin tuna, in the tropical areas in the initial stage of the fishery, and then expanded poleward into temperate waters where albacore is abundant. Now the main fishing ground is formed in the temperate and tropical waters where bigeye tuna is abundant. As to swordfish which is distributed almost entire Atlantic, local concentration, such as in the areas of South America and off Angola contributes major share of longline catch. Relative abundance of swordfish, in terms of longline catch rate, in the Atlantic is shown quarterly in Fig. 1A before the declaration of the 200'-EEZ by the coastal countries and in Fig. 1B after.

6. FISHING SEASON

a) Is it a seasonal fishery? What is the duration of the fishing season?

In general, fishing season of the longline fishery is all the year round on Atlantic-wide basis, but it varies locally depending upon target species. In the case of swordfish, relatively good catches can be achieved as follows:

North-western Atlantic	Sep.- Feb.
North-eastern Atlantic	Mar.- July
South-western Atlantic	Apr.- Aug.
South-eastern Atlantic	Mar.- Oct.

b) Month of maximum catch

7. FLEET

a) Estimate of size of fleet (number of boats)

See table 1.

b) Distribution by tonnage or length or other parameter

200 to 400 GT

c) Methods used to locate fish

By experience of fishing masters.

8. RELATIONSHIP OR INTERACTION WITH OTHER FISHERIES

There is no other Japanese tuna fishery for swordfish in Atlantic Ocean except longline, so that it can be said that there is no relation and interaction within Japanese fisheries. However, there would be some interaction with other countrier's longliners because some fishing grounds are often shared internationally.

9. CATCHES

a) Changes and trends of the catches during the history of the fishery

Table 1 shows the catches by the Japanese longline in the Atlantic by major tuna species and swordfish from 1962 to 1985. The trends of the catch are different according to the species. Albacore and yellowfin are decreasing, but bigeye and swordfish are increasing with some fluctuation.

Fig. 3 shows the catch of swordfish by quarter of year by area shown in Fig.2. In area 1, the catch is recently increasing, while in area 2 decreasing. The catch in area 3 fluctuates with the period of nearly 10 years, but in area 4 good catch was obtained in early 1960's and and low catch through 1980. Recently the catch is increasing in the eastern tropical Atlantic.

b) Catches associated with the fishery

See Table 1.

c) Processing and storage of the catches on board (dresses, gilled, etc.)

Most of large swordfish are processed into fillet. Smaller ones (<30 kg) are semi-dressed.

d) Conservation methods on board (frozen, on ice, refrigerated, etc.)

Frozen deeply as below as -50° C (all species)

10. DESCRIPTION OF FISHING METHOD (with a graph or figure)

a) Description on the fishing operation

The gear construction of longline and boat are shown in Fig. 4 and 5. The normal operation uses about 2,500 to 2,700 hooks. Mackrel, sardine and squid are commonly used as bait. It takes about 4 to 4.5 hours early morning to set the gear, and after 3 to 4 hours it starts to haul up the gear. It takes about 12 hours. The number of the operation per trip ranges from 250 to 300 sets.

Targeting bigeye tuna, most of the vessels use the deep longline which removes one of two buoys from main line for setting hooks into deep sea layer.

b) Number of fishing operations per day

One time.

c) Duration of trips

2 to 3 months per one leg and 350 to 500 days between leaving from and coming back to Japan.

d) Number of trips per boat and per fishing season

One for 1 year - two for 3 years

e) Effects of the environmental conditions (climatological and hydrological)

Operations are stopped when the sea is very rough.

11. FISHING EFFORT

a) Unit of effort used

Number of hooks

b) Nominal value of effort, changes and trends in fishing effort

The annual number of hooks is shown in Table 1. The range is from 30 million in 1969 to 98 million in 1965. There is no consistent trend.

For the 4 main swordfish fishing grounds above mentioned, the number of hooks by quarter of the year is shown in Fig. 6. In the middle of 1960's these efforts were scattered in areas 2, 3 and 4. In the middle of 1970's main fishing ground

was area 3. Recently the effort in area 4 is increasing.

12. CATCH PER UNIT EFFORT (CPUE) (changes and trends of the CPUE in the historical series known for the fishery) (also expressed graphically)

Fig. 7 shows CPUE of Atlantic swordfish caught by the Japanese longline boats for 4 areas. The catches in area 1 and 2 are small, and the CPUEs fluctuate largely. CPUEs in area 3 and 4 fluctuate but in a long term they are increasing slightly.

As mentioned in section 4, due to the development of deep longline fishing operation, especially in the tropical waters, there is a change in gear efficiency for catching swordfish in some area. For area 4, where the gear efficiency showed significant difference, the CPUE was adjusted with the catch efficiency of the deep longline described by Koido and Yonemori (1987).

13. SIZE AND MATURITY OF THE CAUGHT FISH

Most of fish caught are between 1 and 2 meters in eye fork length. No information for maturity.

14. BRIEF DESCRIPTION OF THE COMMERCIALIZATION SYSTEM

a) Fresh consumption, canned, etc.

Most are for fresh consumption.

b) Average price, maximum and minimum per kg in the port's fish market (in US$)

Year	*1 Yen/kg	*2 Yen/US$	US$/kg
1978	641	211.49	3.03
79	662	220.25	3.01
80	777	227.78	3.42
81	730	221.65	3.29
82	862	246.45	3.50
83	747	239.58	3.12
84	899	238.58	3.77
85	820	239.60	3.42
86	796	169.55	4.69

Information provided by Federation of Japan Tuna Fishermen's Co-operative Associations

*1: Average price of frozen swordfish unloaded in Japan from all Oceans

*2: Exchange rate between Japanese Yen and US$

15. INFRASTRUCTURE OF LANDING SITE

a) The fishing vessels unload directly in the port or transhipto merchant ships at sea

Most of the vessels unload directly in Japan, but recently some vessels transhipp at foreign ports.

b) Main landing ports

Shimizu, Yaizu, Misaki and Tokyo in Japan

c) Description of landing operations (at port's fish market, directly to processing or canning companies, etc.)

Auctioned individually at fish market, or sold directly to buyers in a lump with other species.

References

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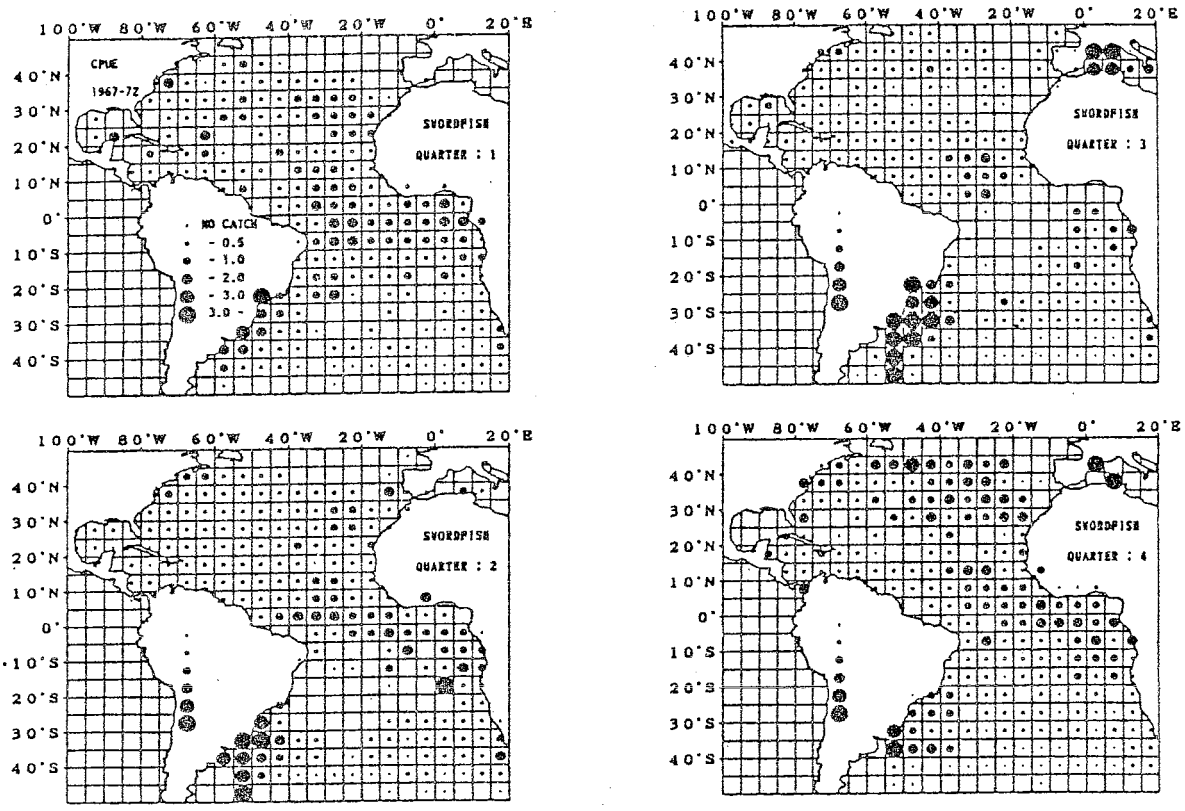

Fig.1A. Quarterly distribution of average hook rate (number of fish/1000 hooks) in Atlantic swordfish caught by Japanese longline boats from 1969 to 1972.

Table 1. Effort and catch of Japanese longline fishery in Atlantic Ocean

Year	*1 Boat	*2 Hooks	Catch in 1,000 tons *3 Total	YFT	ALB	BET	SWO
1962	~	54	94.6	42.0	22.1	15.7	0.4
63	~	55	104.0	37.7	29.7	14.5	1.1
64	~	85	121.5	35.1	39.5	17.3	2.0
65	~	98	137.0	36.9	42.6	28.5	2.9
66	~	54	83.1	22.4	26.9	17.6	2.0
67	~	31	39.7	12.8	12.5	8.5	0.8
68	~	30	44.9	13.9	15.2	10.3	1.1
69	~	30	37.5	10.0	11.0	10.3	2.3
70	~	42	39.0	6.8	11.8	9.0	3.2
71	189	56	49.5	10.6	9.7	20.3	1.6
72	205	44	36.4	5.7	3.4	18.1	1.8
73	202	36	31.7	3.8	1.7	20.0	1.0
74	221	38	36.8	3.5	2.2	20.9	1.4
75	230	59	32.4	4.2	1.6	17.4	1.5
76	146	33	20.7	3.4	1.4	7.3	0.8
77	179	33	21.9	1.5	0.9	9.1	0.8
78	216	45	21.7	1.9	0.7	9.3	0.9
79	249	55	27.6	2.0	1.3	11.0	1.0
80	300	58	35.4	2.8	1.4	20.5	2.1
81	320	72	37.6	4.1	2.3	21.0	2.2
82	269	76	50.8	6.1	1.4	32.9	3.7
83	182	49	25.9	2.1	1.3	15.1	1.9
84	212	65	39.1	4.0	0.8	24.3	3.8
85	208	73	48.9	5.6	1.5	31.5	4.7
86	190	~	~	~	~	~	~

*1 Provided by Federation of Japan Tuna Fishermen's Co-operative Associations
*2 in million estimated by FSRL
*3 ICCAT 1981 and 1986, Statiscal bulletin vol 11, 16

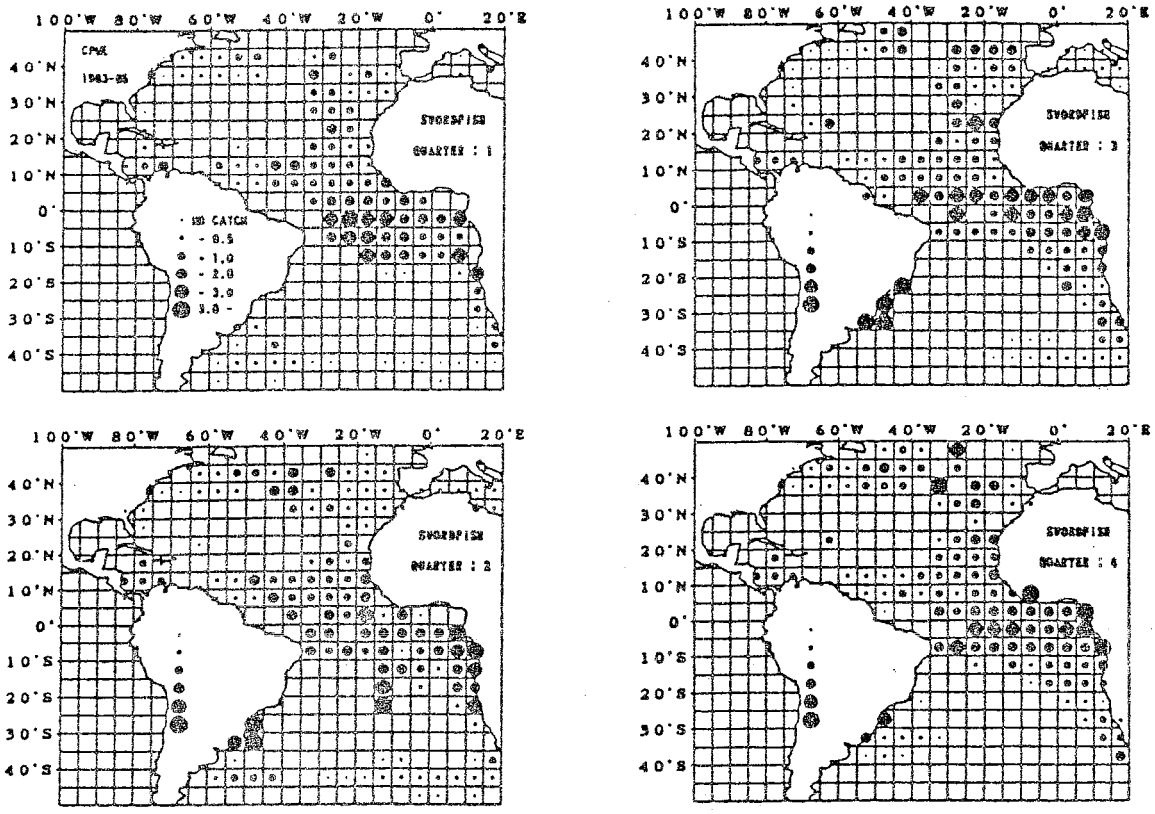

Fig.18. Quarterly distribution of average hook rate (number of fish/1000 hooks) in Atlantic swordfish caught by Japanese longline boats from 1983 to 1985.

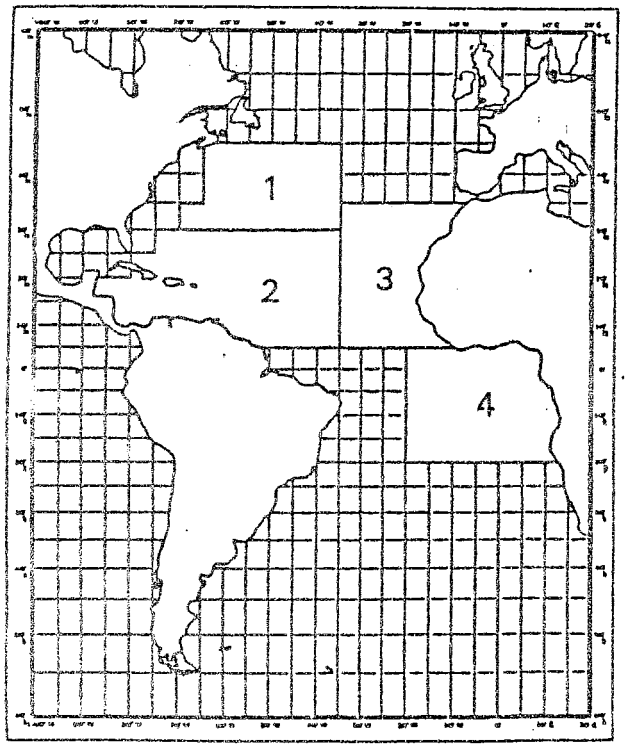

Fig. 2. Division of modal areas used for the present study on the Atlantic swordfish.

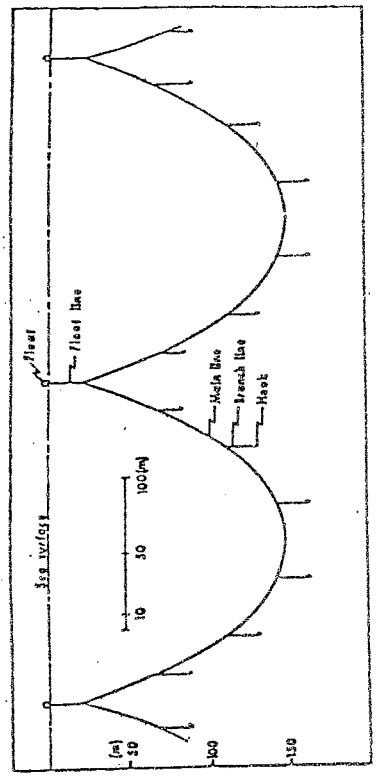

Fig. 4. Basic gear construction with 6-branchline-gear of the longlining method (modified from Suzuki, et al, 1977).

The figure was drawn assuming the mainline hanging in a catenary with float lines 20 m, branch lines 30 m, distance between branch lines 50 m and sagging rate (see text) 0.6.

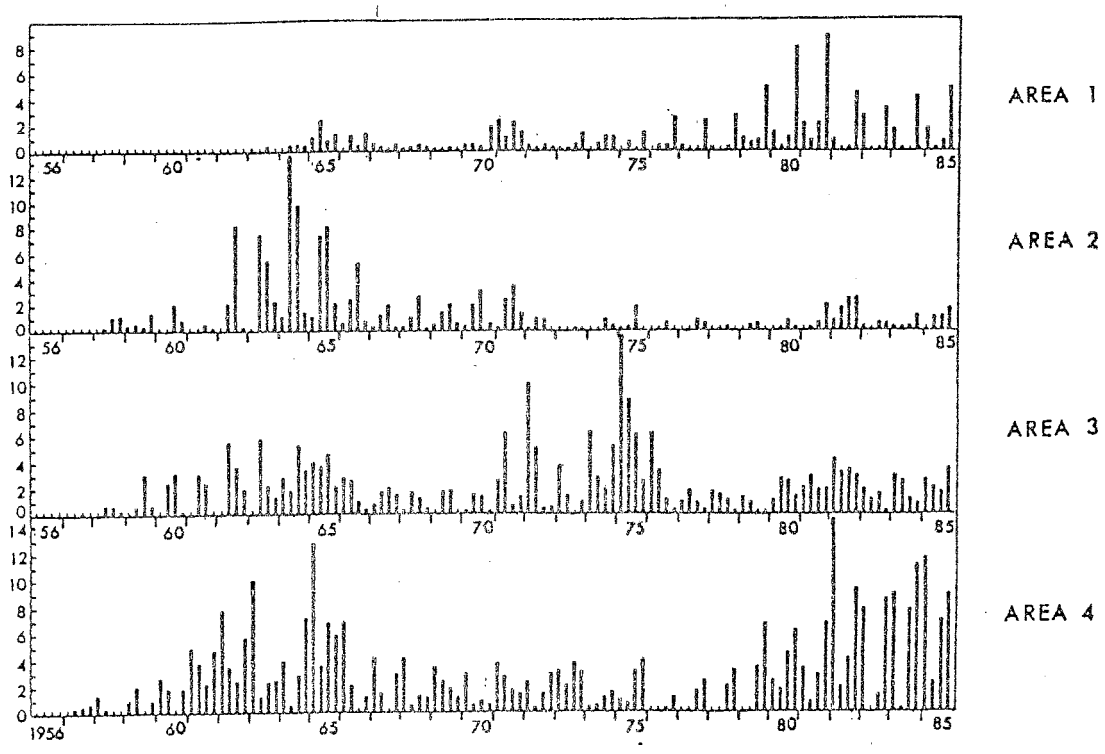

Fig.3. Number of swordfish (1000 fish) by quarter of the year caught by the Japanese longline boats in the model areas.

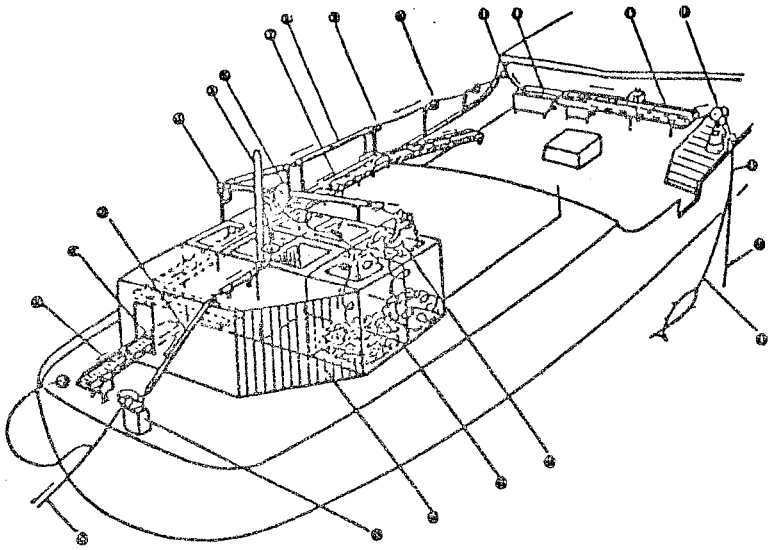

Fig. 5. Schematic representation of fishing equipment and flow of the mainline and branch lines (cited through the courtesy of the author and publisher from Tsudani (1977) in Illustrations of Japanese Fishing Boats published by Seizando-Shoten, Tokyo, Japan).

1	Slow conveyer	9	Guide roller	17	Branchline
2	Branchline	10	Guide ring	18	Line winder
3	Guide pipe	11	Mainline guide block	19	Mainline store
4	Guide roller	12	Unravel water tank	20	Branchline store
5	After mast	13	Slow conveyor	21	Line casting machine (casting speed: 0-660m/min.)
6	Unravel roller	14	Line hauler		
7	Branchline conveyor	15	Line hauling		
8	Guide pipe	16	Mainline	22	Mainline

After Shingu et al. (1980)

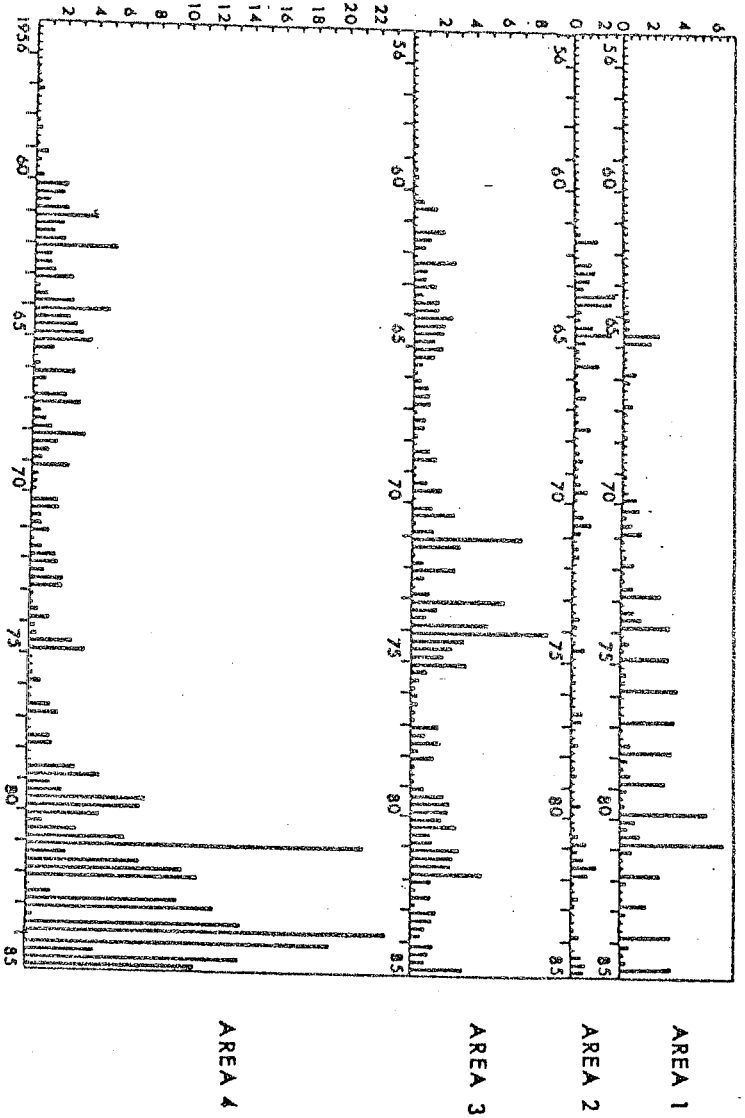

Fig.6. Number of hooks (million hooks) by quarter of the year used by the Japanese longline boats in the model areas.

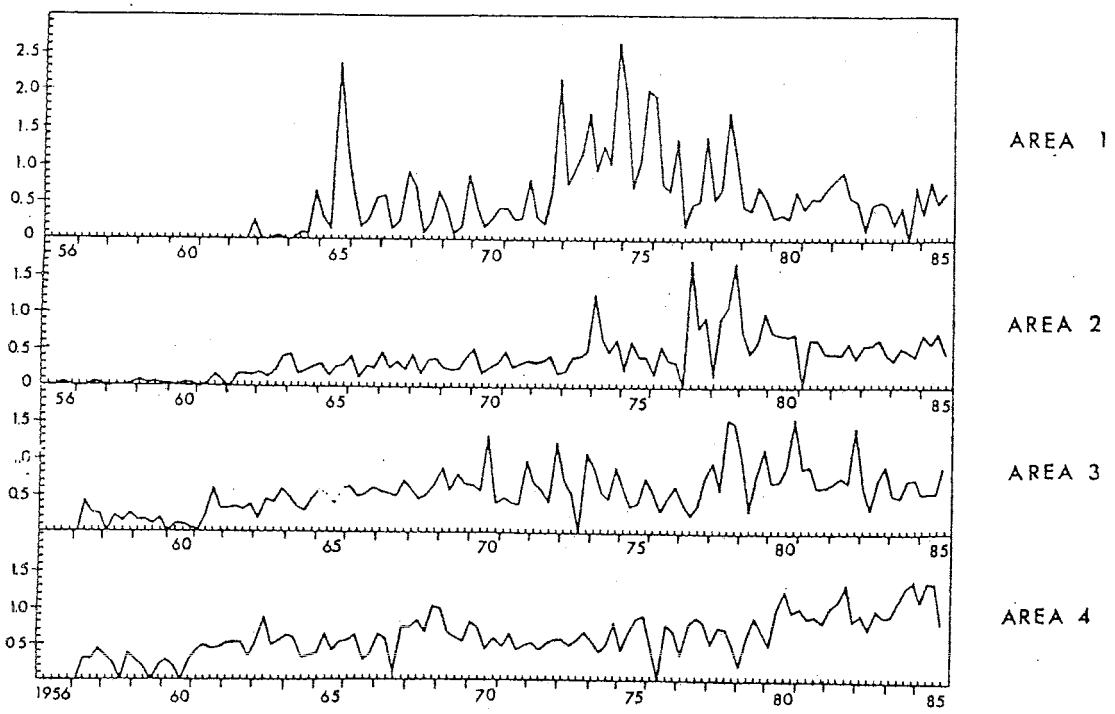

Fig. 7. Trends of hook rates for the Atlantic swordfish by area by quarter of the year.