

TRENDS IN THE JAPANESE SAILFISH/SPEARFISH CATCHES IN THE ATLANTIC OCEAN-AS APPORTIONED INTO SEPARATE SPECIES

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SUMMARY

Non-commercial Japanese tuna exploratory cruises from 1957 through 1971 provide information on the distributional patterns of sailfish, *Istiophorus platypterus*, and longbill spearfish, *Tetrapturus pfluegeri*, in the Atlantic Ocean between 40°N and 40°S latitude. From these cruise records, areas of their occurrence are divided into sub-areas rather arbitrarily for which sailfish versus spearfish ratios by 5° square roughly approximate. The historical Japanese sailfish/spearfish catch, which is in one category is apportioned into catches of separate species using the sailfish versus spearfish ratios representing each sub-area. Catches of both species thus apportioned are treated for consideration.

RESUME

Les croisières japonaises de recherche non commerciales menées de 1957 à 1971 fournissent des informations sur les modes de distribution du voilier *Istiophorus platypterus*, et du "long-bill spearfish", *Tetrapturus pfluegeri*, dans l'océan Atlantique entre 40°N et 40°S de latitude. D'après les registres de ces croisières, les zones de présence de ces poissons sont séparées

de façon assez arbitraire en sous-zones dans lesquelles le pourcentage de voilier/"spearfish" par carrés de 5x5° est plus ou moins le même. Les prises historiques japonaises de voilier/"spearfish" qui figuraient dans une même catégorie sont ventilées par espèces en utilisant le taux de sailfish/"spearfish" correspondant à chacune des sous-zones. Les prises ainsi ventilées sont prises en considération.

RESUMEN

Cruceros de exploración japoneses, de índole no comercial, efectuados de 1957 a 1971, facilitan información sobre los esquemas de distribución del pez vela, *Istiophorus platypterus*, y el *Tetrapturus pfluegeri* en el Atlántico entre 40° N y 40° S de latitud. En base a los registros de estos cruceros, sus zonas de aparición se dividen en subzonas, en forma un tanto arbitraria, por lo que la tasa de pez vela en relación con el *Tetrapturus* y cuadrículas de 5° es sólo aproximativa. Las capturas históricas japonesas de pez vela/*Tetrapturus pfluegeri* - que se encuentran en una sólo categoría - se dividen por especies aplicando la proporción pez vela/*Tetrapturus* de cada una de las subzonas. Las capturas de ambas especies, una vez divididas, son examinadas.

Introduction

The lumped sailfish/spearfish record, an only defect in the Japanese catch reporting system on the tuna longline fishery, has made it impossible to use commercial data on these two species. Although this system may be subject to future improvement, historical data can not be improved. So, this report does not intend to monitor the status of stocks of sailfish and spearfish, but to simply observe how historical catch changes when they are apportioned into two species separately. To give this partition more or less biological ground, data from the Japanese survey cruises carried out in earlier years were used. These survey data, part of which was treated by Ueyanagi et al. (1970), are the only reliable source for the general distribution of sailfish, Istiophorus platypterus, and longbill spearfish, Tetrapturus piluegeri, in the Atlantic Ocean as seen through the longline operations.

Method

Partition of the lumped historical catch into catches of separate species was made on the basis of average sailfish or spearfish catch percentage to their total by 5° squares. For this purpose, data from 17 survey cruises conducted between 1957 and 1970 were available, 6 cruises in 1966, 3 each in 1957 and 1965, and 1 each in 1959, 1960, 1968, 1969 and 1970. They covered almost the entire ranges of sailfish and spearfish over the longline grounds and provided necessary information for this partition.

The sailfish percentage distribution by 5° squares from the result of all these cruises is shown in Fig.1. Based on this pattern of distribution, the Atlantic Ocean between 40°N and 40°S was subdivided into 10 Areas rather arbitrarily, as shown in Fig.2. Over this range, there are many 5° squares lacking survey data. To such squares included in each Area, the mean value from available squares in it was equally assigned. For Area 2 where no sailfish nor spearfish happened to occur in our past survey cruises, a sailfish percentage of 24.1 was used, the 4-year average from 1978 to 1981 based on the Japanese captain's report on billfishes within the U.S. FCZ. Comparing to the commercial data, the coverage of the survey data is so limited tempo-spatially that the percentage distributional pattern for separate species by 5° squares is available only when it is on

the year-round basis. On computer processing, this key pattern was applied equally to the lumped catch on the quarterly basis from 1956 to 1980, assuming that it will remain nearly constant even if the level of abundance changes.

Result

Table 1 shows the average year's hook rate and index of abundance by Areas for sailfish and spearfish separated. Index of abundance here is given by the product of average year's hook rate and area index. Quarterly number of hooks and lumped catch from 1965 to 1980 were used to prepare this table. These quarterly values seem to have less biological ground, as the key pattern is given on the year-round basis. However, as indicated in Fig. 3, the quarterly change in average year's index of abundance for separate species apparently exhibits the trait of the warm water species. In northern waters such as Areas 1 and 2, the index of abundance is much higher during the 2nd and third quarters, viz. April to September, while in southern waters such as Areas 8, 9 and 10, it is much higher during the 1st and 4th quarters, viz. October to March. Such a seasonal change, derived from the change in lumped catch, is reasonable for the separate species.

Figs. 4 and 5 show the change in hook rate on the quarterly basis from 1956 to 1980, allotted for separate sailfish and spearfish. Although we used the fixed key percentage pattern, the distribution of lumped sailfish/spearfish hook rate by 5° squares varies from year to year. Therefore, the changes in hook rate of separate two species in Figs. 4 and 5 are not identical for each Area, though similar ones.

For sailfish, areas of relatively high hook rate include Areas 3, 5, 6, 7 and 9, which cover the western part of the Atlantic from off southern Brazil to the Caribbean Sea and the tropical waters off West Africa. In northern Areas 2 and 3, hook rate is generally stable from the early 1960's to the mid 1970's. In other southerly areas, Areas 5, 6, 7 and 9, it is

relatively stable and much higher prior to the early 1970's. For spearfish, areas of relatively high hook rate include Areas 2, 3, 4, 5, 6, 8 and 10, covering the western North Atlantic from off northern Brazil to off the U.S. east coast through the Gulf of Mexico and the central South Atlantic Ocean. The spearfish range spreads further to off-shore pelagic waters than does the sailfish range. Hook rate in Areas 2 and 3 is generally stable from the early 1960's to the mid 1970's as in sailfish. In other southerly areas, the situation is the same as in the case of sailfish.

If we consider standardization of fishing effort to the separate species, more meaningful result on the trend in hook rate will be obtained. However, it will not necessarily guarantee the appropriateness of the treatment as we employed in this report.

Literature cited

Ueyanagi, S., S. Kikawa, M. Uto and Y. Nishikawa. 1970. Distribution, spawning and relative abundance of billfishes in the Atlantic Ocean. Bull. Far Seas Fish. Res. Lab., 3,15-55.

Table 1 Average hook rate and index of abundance by Areas from 1965 to 1980 for sailfish and spearfish from lumped catch data. Upper, Average hook rate (fish/100 hooks); Middle, Average index of abundance; Lower, No. of available years.

Species	Quarter	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Area 7	Area 8	Area 9	Area 10	
Sailfish	I	0.000	0.003	0.101	0.004	0.058	0.087	0.053	0.012	0.343	0.002	
		0.000	0.020	0.850	0.021	0.535	0.950	1.263	0.154	1.816	0.034	
		16	9	11	13	8	11	14	14	2	13	
	II	0.000	0.011	0.039	0.004	0.025	0.044	0.035	0.035	0.001	0.002	0.000
		0.000	0.317	0.4337	0.030	0.515	0.481	1.776	0.006	0.016	0.002	0.002
		15	13	11	15	10	14	14	13	3	11	
	III	0.000	0.039	0.037	0.004	0.117	0.043	0.043	0.043	0.001	0.046	0.000
		0.000	0.421	0.426	0.029	0.821	0.472	0.472	0.814	0.008	0.219	0.006
		15	14	12	15	12	13	14	14	16	5	10
	IV	0.000	0.004	0.038	0.005	0.038	0.036	0.036	0.086	0.010	0.423	0.002
		0.000	0.020	0.397	0.037	0.423	0.943	1.713	0.155	2.265	0.039	0.039
		12	9	14	11	7	8	14	16	8	11	
Spearfish	I	0.012	0.008	0.101	0.045	0.138	0.064	0.022	0.077	0.090	0.034	
		0.418	0.064	0.706	0.354	1.086	0.705	0.345	1.203	0.325	0.646	
		16	9	9	14	8	11	14	14	7	13	
	II	0.025	0.098	0.089	0.064	0.144	0.048	0.010	0.026	0.004	0.002	0.002
		1.019	1.003	0.921	0.633	1.197	0.522	0.148	0.415	0.008	0.008	0.008
		15	13	11	16	10	14	14	13	3	11	
	III	0.034	0.132	0.055	0.051	0.246	0.046	0.008	0.031	0.113	0.010	
		1.430	1.334	0.699	0.500	1.733	0.500	0.115	0.415	0.343	0.250	
		15	14	12	15	12	13	14	16	4	11	
	IV	0.006	0.012	0.093	0.031	0.121	0.125	0.018	0.106	0.183	0.022	
		0.189	0.062	0.898	0.500	0.892	1.367	0.294	1.944	0.606	2.654	
		12	9	14	12	7	8	14	16	7	11	

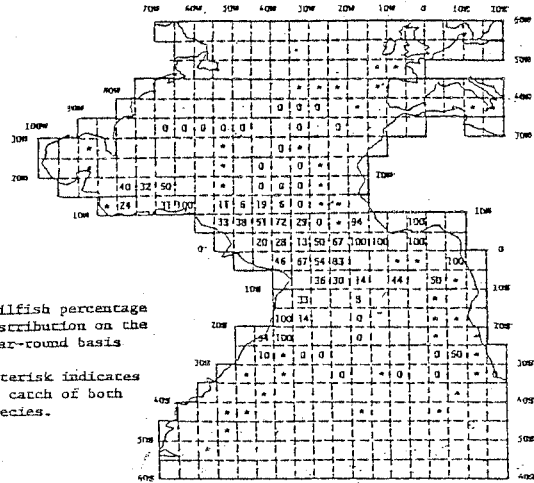


Fig.1 Sailfish percentage distribution on the year-round basis

Asterisk indicates no catch of both species.

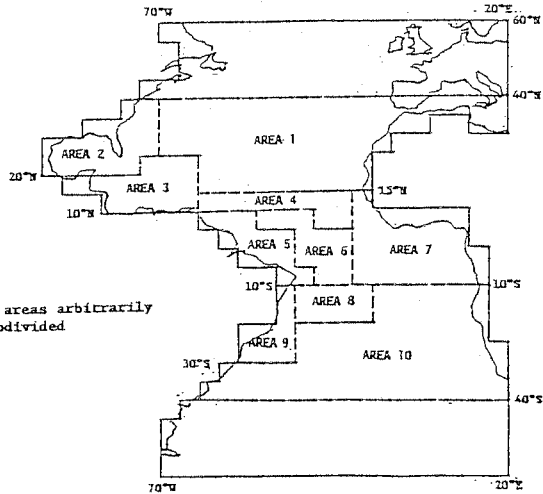


Fig.2 10 areas arbitrarily subdivided

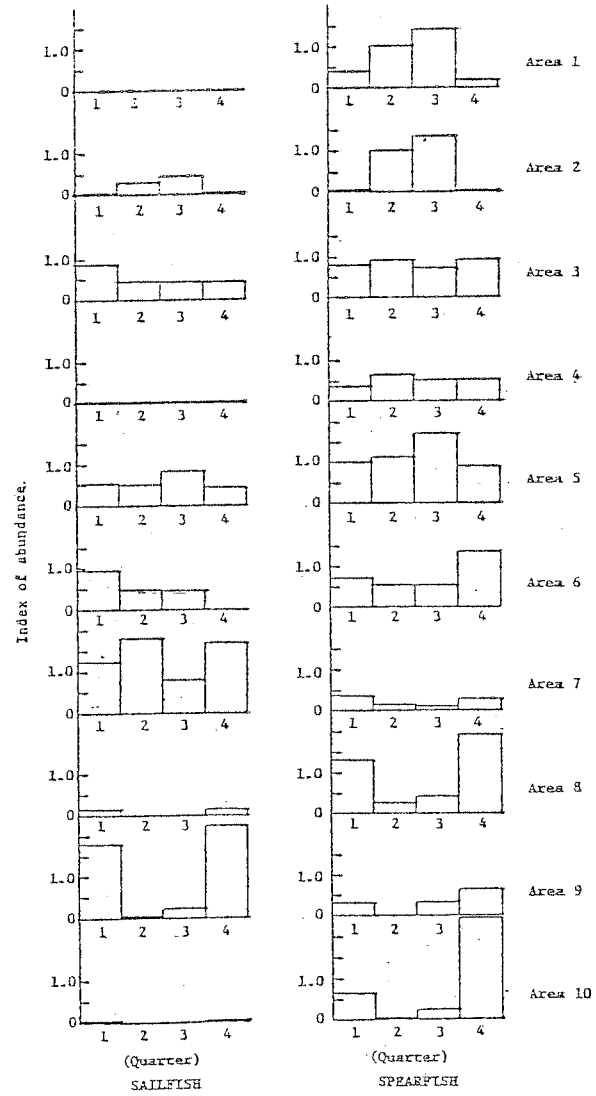


Fig. 3 Quarterly change in index of abundance by Area for sailfish and spearfish separated from lumped catch (Average from 1955 to 1980).

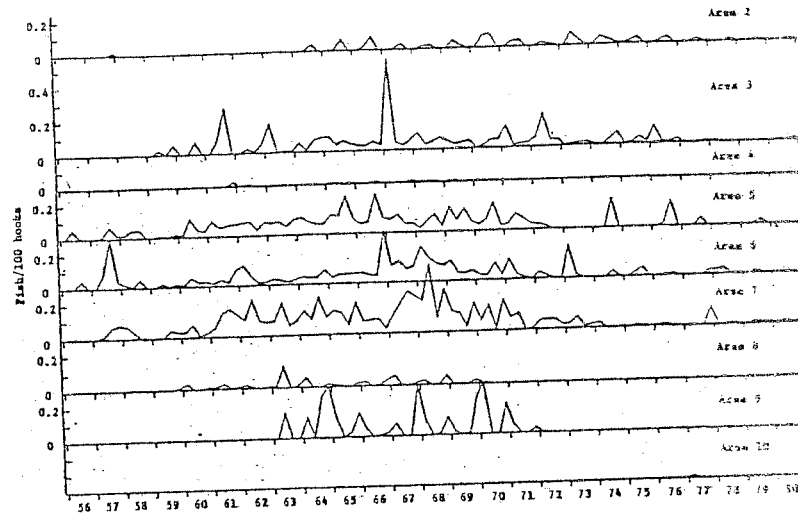


Fig. 4. Change in hook rate of sailfish from lumped catch data, 1956-1980.

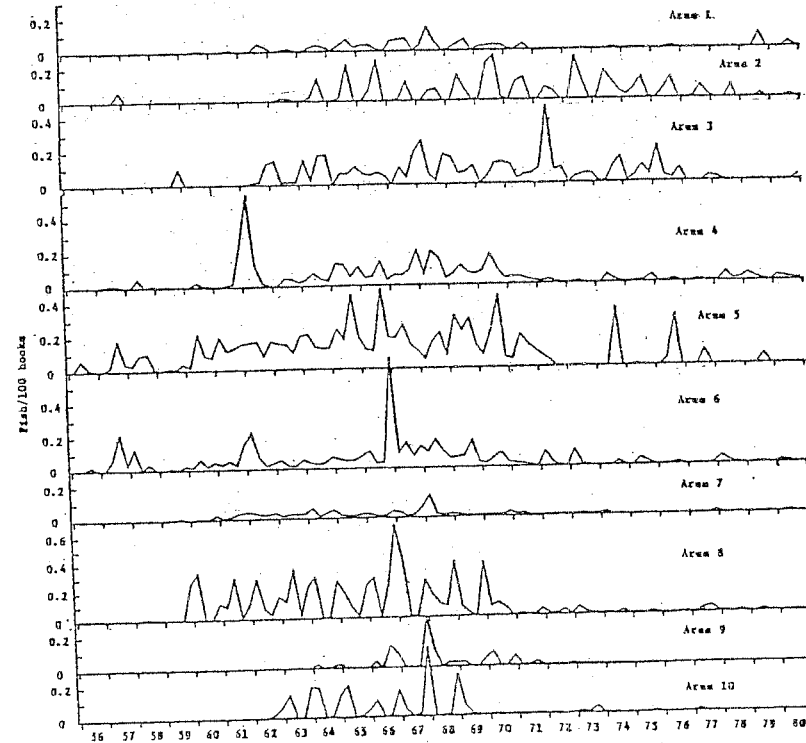


Fig. 5. Change in hook rate of spearfish from lumped catch data, 1956-1980.