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ASPECTS OF FISHING EFFORT OF KOREAN TUNA LONGLINE FISHERY EXERTED TO THE ATLANTIC YELLOWFIN AND BIGEYE TUNA

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SUMMARY

The catch per unit of effort and the effective fishing intensity for both yellowfin and bigeye by size of vessel in gross tonnage and horsepower facilities of Korean tuna longliners were compared to infer the fishing efficiency from one another.

It was found that Korean tuna longliners equipped with 200-300 gross tonnage and/or 650-850 horsepower have exerted their efforts to hook mainly for yellowfin and the vessels, 400-500 gross tonnage and/or 1,000-1,350 horsepower to hook for bigeye.

It was suggested, therefore, that the small size of vessels in tonnage and horsepower classes have operated for yellowfin and the large size of vessels in these classes for bigeye.

RESUME

Une étude a été menée à bien en comparant la prise par unité d'effort et l'intensité de pêche effective aussi bien pour l'albacore que pour le thon obèse par capacité, en termes de tonnage-brute et de force motrice des palangriers coréens qui pêchent des thonidés pour étudier l'efficacité de la pêche pour chacune de ces espèces.

On a constaté que les palangriers thoniers coréens d'un tonnage brute de 200-300 et/ou de force motrice de 650-850 ont déployé leurs efforts pour pêcher à l'hameçon surtout de l'albacore et les bateaux d'un tonnage brute de 400-500 et de 1.000-1.350 de force motrice visaient le thon obèse.

Il a néanmoins été noté que les bateaux de faible tonnage et de force motrice avaient capturé de l'albacore alors que les bateaux de plus grande taille avaient visé le thon obèse.

RESUMEN

Se establece una comparación entre la captura por unidad de esfuerzo y la intensidad de pesca efectiva del rabil y patudo por capacidad, en términos de tonelaje bruto y caballos de vapor, de los palangreros atuneros coreanos, para deducir la diferencia de eficacia entre una otra clasificación.

Se halló que los palangreros coreanos de 200-300 toneladas brutas y/o 650-850 C.V. habían empleado su empeño en pescar rabil, y los barcos de 400-500 toneladas brutas y/o 1.000-1.350 C.V., perseguían patudo.

Se sugirió, por tanto, que los barcos de pequeño tonelaje y menor cantidad de caballos de vapor, se habían dedicado al rabil, y los de gran tamaño, al patudo.

INTRODUCTION

In general, the accurate information on the commercial catch and effort statistics are basically very important in constructing the relative stock abundance such as catch per unit of effort (Beverton and Holt, 1957; Robson, 1966), and real relative abundance are always requistie for the analysis and assessment of the exploited fish populations.

The commercial fishing vessels are composed of various fishing types and sizes even in a fishery as well as the same kinds of gear in multi-fisheries for single or multi-species. Accordingly, the unit and amount of fishing effort by these fisheries are so different that standardization of fishing effort is required to achieve better knowledge of the populations.

Korean tuna longliners which initiated their fishing activities for the Atlantic tunas, mainly for yellowfin and bigeye, and its related fishes in 1964 have been classified to several size classes in gross-tonnage and horsepower facilities including their age of vessel.

Taking account of the facts mentioned above, author in this report dealt with the fishing efficiency in comparison with catch per unit of effort and also effective fishing intensity by size of vessel in gross-tonnage and horsepower based on the catch and fishing effort data for yellowfin and bigeye tuna as main target fishes of Korean tuna longline fishery in the Atlantic. The aim of this report is to outline the general fishing activities and to provide basic imformation for standardization on fishing effort of Korean tuna longline fishery.

DATA AND PROCESS

The data used in this report are the catch and fishing effort statistics for the Atlantic yellowfin and bigeye tuna by Korean tuna longline fishery during the 1982 - 1983 period (ICCAT, 1983, 1984). During the period a total of 15 vessels by size were chosen to examine the catch per unit of effort and the effective fishing intensity, which have continued to operate for those fish species throughout the two years:

Horse-power	Tonnage			Total
	200 - 300	300 - 400	400 - 500	
650 - 850	4	4	-	8
1,000 - 1,350	1	1	5	7
Total	5	5	5	15

The calculations of the catch per unit of effort (CPUE) and the effective fishing intensity (f) are as follows :

$$CPUE = C/H \times 100$$

$$f = \hat{X}/A$$

Where C : Catch in Kg, H : Number of hooks used, $\hat{X}$: Overall fishing effort, A: Fishing area in 5 degree squares.

According to the logbook data from Korean tuna longline fishery, the main fishing grounds for both yellowfin and bigeye were centered in the tropical area from 10° N to 10° S as shown in Fig. 1. The fishing area in this report in order to compare the CPUE and the fishing intensity for these two fishes between sizes of vessel was only considered in the above tropical region, based on the fishing ground, 5° X 5° by quarter.

COMPARISON BY TONNAGE

The catch per unit of effort per 100 hooks, CPUE, and the effective fishing intensity for both yellowfin and bigeye by gross-tonnage class in each quarter for 1982 - 1983 are shown in Fig. 2.

The CPUE of yellowfin derived from 200-300 gross-tonnage class was higher than that of two other classes, 300-400 and 400-500, and maintained almost similar trends compared to the mean CPUE. The CPUE's for the higher tonnage vessels showed very low values except for the 3rd and 4th quarters of 1983. The effective fishing intensity was also high at 200-300 class and low in the two others in terms of the mean fishing intensity.

On the other hand, most of CPUE's values for bigeye in gross-tonnage class were much higher compared to those for yellowfin and a marked difference in CPUE for the three classes was appeared. The CPUE extracted from 400-500 gross-tonnage class had the highest figure with an average of about 50 Kg/100 hooks throughout the whole seasons although with a declining tendency. The CPUE's for the two other classes from 200-300 to 300-400 tonnages remained at similar levels. However, the CPUE of the 200-300 class was in an invariable state as a whole and 300-400 class showed a slightly decreased trend, indicating the same pattern as for 400-500 tonnage class at lower level. In the comparison by gross-tonnage class for the effective fishing intensity of bigeye there were some of changes in their tendencies without any constant figures among them but the values from 400-500 class were commonly high.

COMPARISON BY HORSEPOWER

The CPUE and the effective fishing intensity for both fishes by horsepower class during the same periods are shown in Fig. 3.

The CPUE of yellowfin from 650-850 horsepower class was higher than that of 1,000-1,350 class in every season during the two years. In case of CPUE of the fish, the former class showed a decreasing trend from the 1st 3rd quarter of 1982 to the 1st quarter of 1983 and rapidly increased afterward. On the contrary, the latter class continued to stay at lower level to the former without any fluctuations throughout all seasons.

The effective fishing intensity by horsepower for yellowfin has fluctuated much in its trend compared to that by the gross-tonnage class as in Fig. 1. As a matter of fact, these values for 650-850 class in 1982 were higher than those of 1,000-1,350 but those for 1983 showed vice versa.

In case of bigeye there existed a big difference between the CPUE's of the two classes from season to season. The values for 1,000-1,350 class were considerably higher than those for 650-850 horsepower. Similarly, the values of effective fishing intensities between the two classes were quite varied, higher values being obtained for the 1,000-1,350 class compared to those for 650-850 class.

Taking account of the above results, it was recognized that Korean tuna longliners equipped with the 200-300 gross-tonnage and/or the 650-850 horsepower classes tend to hook mainly for yellowfin and the vessels, 400-500 gross-tonnage and/or 1,000-1,350 horsepower classes, to hook for bigeye tuna in the Atlantic. It was suggested, therefore, the small size of vessels in tonnage and horsepower classes have mainly operated for yellowfin and the large size of vessels in these classess for bigeye.

DISCUSSION

It is known that vertical swimming depths of tunas are different by species and area in association with thermocline, especially for yellowfin and bigeye. Suzuki and Kume (1982) reported that both fishes above appear to be hooked at all depth ranges of hooks about 90 to 270 m well above and below the thermocline in the Pacific and the Indian Ocean, although there are no information available for this in the Atlantic up to now.

According to the interview with Korean fishermen fishing tuna in the oceans including the Atlantic, most of them have used the hooks from 12 to 14 a basket to set them more deeply than they used to do in the past, regardless of the size of vessel.

However, in this report, the large size of vessel in the gross-tonnage and the horsepower classes appered to exert mainly their fishing efforts for bigeye and the small size of vessel mainly for yellowfin. These were likely to be casued by the facts that major fishing areas for the two fishes caught by Korean tuna longliner fishery were different as shown in Fig. 1. Lee and Yang (1984) described in detail the distributions of fishing grounds on yellowfin and bigeye by Korean Atlantic tuna longline.

From the Fig. 1, in fact, main fishing area of yellowfin was in the north-west equatorial region off north Brazil, and that of bigeye in the centeral region of equator. In addition, it is assumed there are external components beyond the fishing activities directly such as economic point of view as well as the capacity of fish-hold of the individual vessels for carrying the fishes caught.

Author expects that more information on these phenomenon will be gathered together from fishermen for further studies, in particular the data on deep longline.

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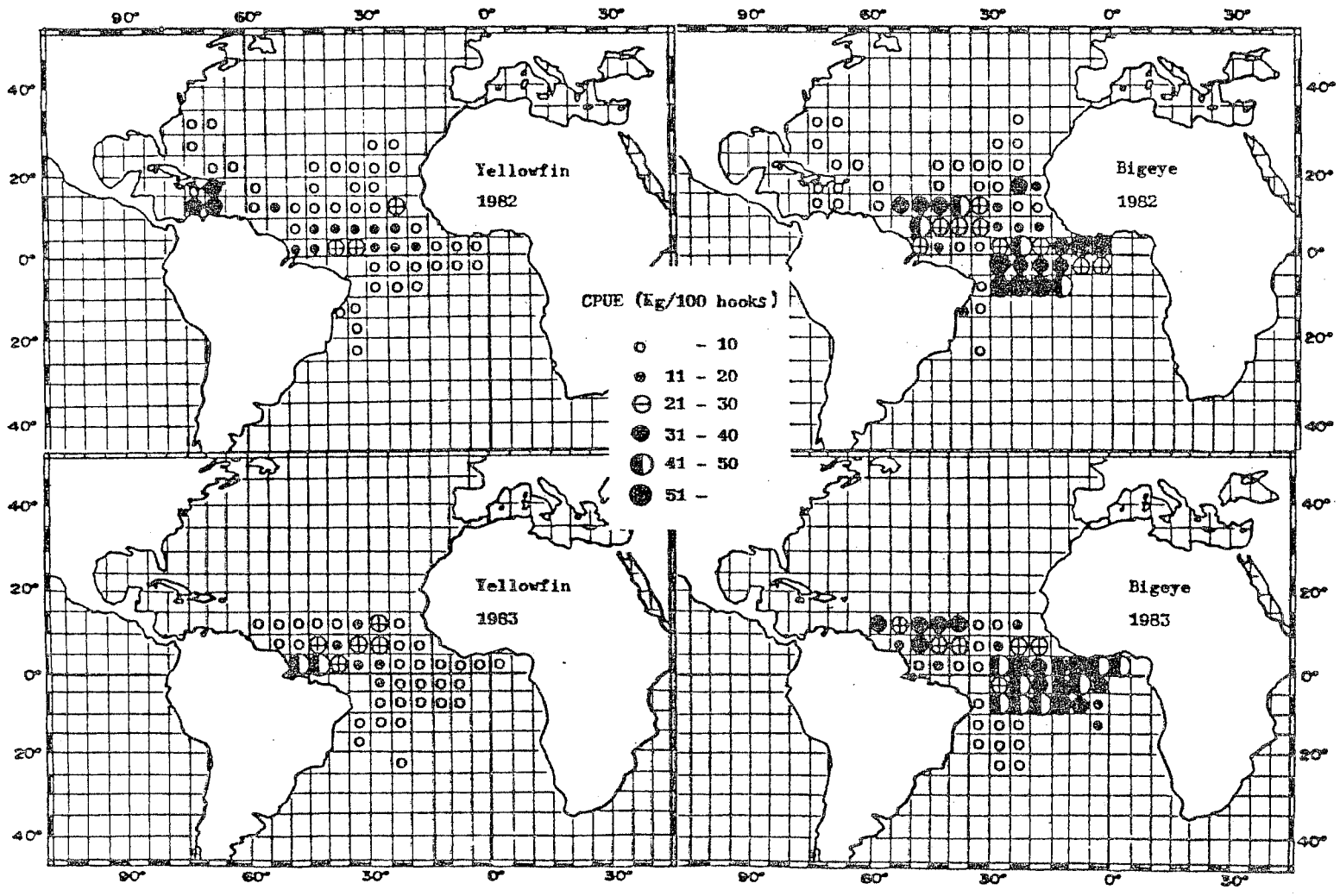

Fig. 1. Geographical distributions of catch per unit of effort (Kg/100 hooks) for yellowfin and bigeye by Korean tuna longline fishery in the Atlantic Ocean, 1982 - 1983.

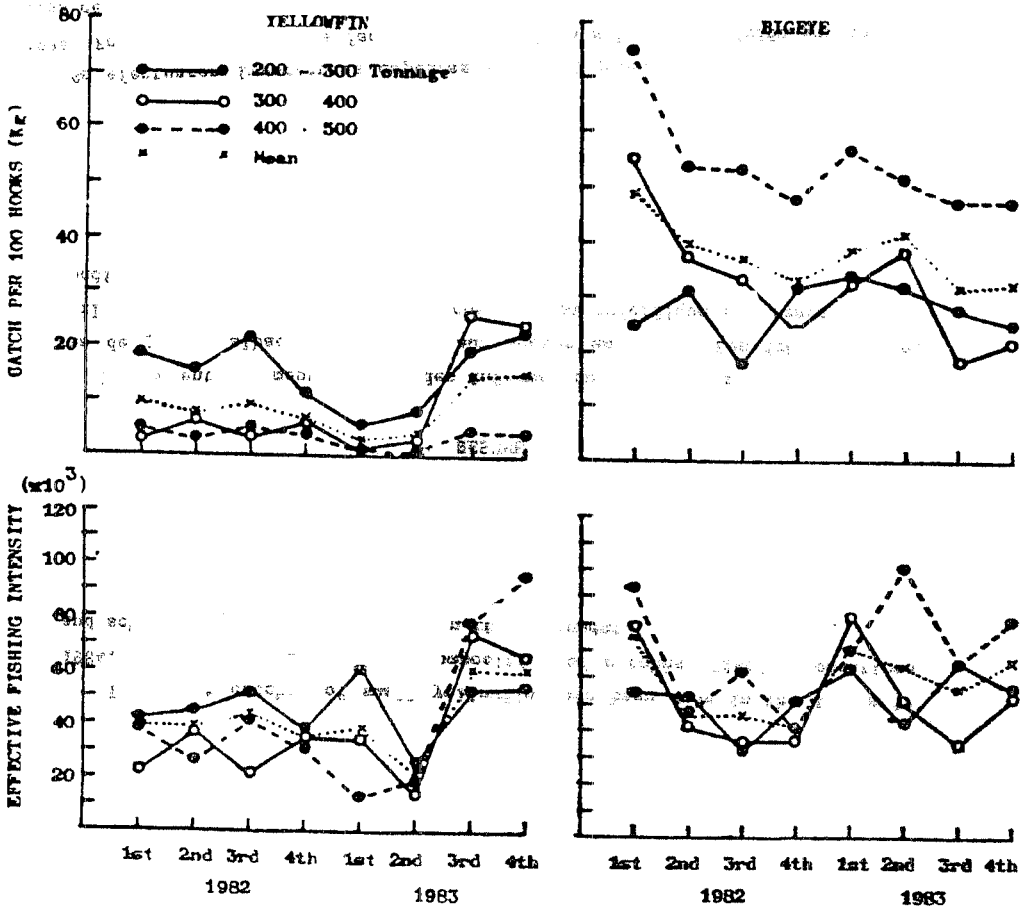

Fig.2 Quarterly changes of catch per unit of effort and effective fishing intensity by gross-tonnage class for yellowfin (left) and bigeye (right) by Korean tuna longline fishery in the Atlantic, 1982 - 1983.

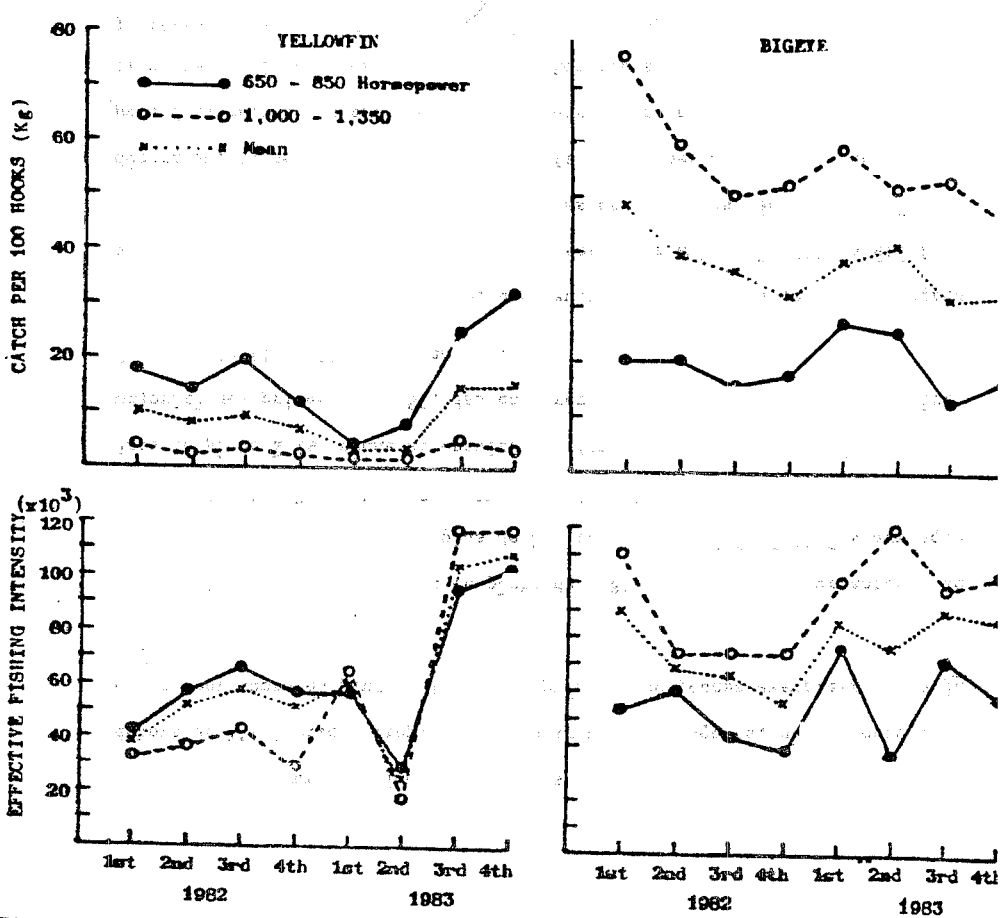

Fig.3. Quarterly changes of catch per unit of effort and effective fishing intensity by horsepower class for yellowfin (left) and bigeye (right) by Korean tuna longline fishery in the Atlantic, 1982 - 1983.