

FISHING OF LIVE BAIT FOR THE KOREAN POLE-AND-LINE FISHERY

by

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SUMMARY

The Korean Atlantic pole-and-line fishing boats fished in the waters near Tema, Ghana, using that port as the fishing base. The boats catch live bait for their own use. This paper abstracts some experience about bait resources, particularly in Ghanaian waters, and also describes how to catch live bait. The main species of bait fish are: Sardinella aurita, Sardinella eba and Anchoa guineensis. The Korean data obtained in 1975 show that the range of the live bait fishing ground is limited within 180 nautical miles from Tema. The length of the bait fish ranges between 2 and 10 cm. The bait fishing ground is not deeper than 28 m. The total bait fish catch by Korean boats in 1975 was calculated to be 318 metric tons. It seems that the supply of bait is not a limiting factor pertaining to the pole-and-line fishery, as the bait is provided all year round in the Ghanaian waters.

RESUME

Les canneurs coréens qui pêchent dans l'Atlantique travaillent dans les eaux proches de Tema (Ghana) qu'ils utilisent comme port d'attache. Ces bateaux pêchent leur propre appât. Le présent document résume quelques observations concernant les ressources en poisson-appât, en particulier dans les eaux ghanéennes, et décrit également la façon de les capturer. Les principales espèces sont la Sardinella aurita, la Sardinella eba et l'Anchoa guineensis. Les données coréennes de 1975 indiquent que l'étendue de la zone de pêche au poisson-appât est limitée à un rayon de 180 milles marins à partir de Tema. La composition de taille va de 2 à 10 cm. La profondeur pêchée ne dépasse pas 28 m. La prise totale de poisson-appât des bateaux coréens en 1975 a été calculée à 318 TM. Il semblerait que l'appât ne soit pas un facteur limitant pour la pêche à la canne, du fait qu'il se présente toute l'année dans les eaux ghanéennes.

RESUMEN

Los barcos de caña-liña coreanos operan en el Océano Atlántico, las aguas próximas a Tema, Ghana, que es su puerto de base. Dichos barcos pescan su propio cebo vivo. Este documento resume información ya conocida sobre los recursos de cebo, concretamente en aguas de Ghana, y describe las operaciones necesarias para su captura. Las principales especies incluyen Sardinella aurita, Sardinella eba y Anchoa guineensis. Los datos coreanos del año 1975 indican que la zona de pesca de cebo está dentro de los límites de 180 millas marinas, a partir de Tema. La composición por talla del cebo, oscila entre 2 y 10 cm. y se encuentra a una profundidad límite de 28 metros. Se calcula que el total de captura de cebo de los barcos coreanos en 1975 fue de 318 TM. No parece ser factor limitativo de la pesca de caña-liña, ya que es posible obtenerlo durante todo el año en aguas de Ghana.

INTRODUCTION

Since the Korean pole-and-line fishery started in the Atlantic Ocean from 1972, it has developed progressively. In 1975, the total landing of tunas amounted 7,653 metric tons from 8 vessels.

Korean pole-and-line boats operating in the Atlantic have adopted the fishing method which consists of two stages: first for baiting; then tuna catching. In other words, the boats supply their live bait from their own catch. This self-supply method requires an operating ground where both live bait and tuna resources are abundant. All the Korean pole-and-line boats are based at Tema, Ghana, and carry out fishing operations near the Ghanaian waters. In 1975, ICCAT set up a new program to study skipjack resources. The program includes several items in which bait resources are included (ICCAT Proceedings, 1976).

The paper deals with the bait fishing of the Korean pole-and-line fishery in the eastern tropical Atlantic. Even though the scopes are limited owing to the shortage of data, it is hoped that the present study can give some concepts pertaining to the bait resources.

Known facts about bait resources

1. Oceanographic conditions

Kensah (1973) briefly describes the oceanographic conditions of the Ghanaian waters. There is a fall in sea surface temperature from about 30°C in May to as low as 18.5°C in August, and there are generally low temperatures (below 25°C) between late June and the end of September or early October. The intensity of cooling and its duration vary from year to year. In some years, there is a short period of a smaller temperature drop in January, February,

or March. During the rest of the year the surface temperature is always above 25°C. The temperature drop is caused by upwelling. The upwelling in the Ghanaian waters is linked more closely to local meteorological effects than to global oceanographic changes. The rest of the upwelling season is characterized by the occurrence of the strong thermocline. The water temperature of the upper part of the thermocline is high, and restricts the abundance of plankton as well as shoaling of Sardinella.

2. Species for live bait

Pelagic fishes are classified into 3 groups which are of commercial or potential importance for the fisheries in the Ghanaian waters: small pelagic fish, medium pelagic fish (mackerels, etc.) and large pelagic fish (tunas). Among these groups, small pelagic fish can be considered as bait resources for the pole-and-line fishery.

Principally two clupeids, Sardinella aurita and Sardinella eba and one anchovy, Anchoa guineensis are used for live bait. The following is quoted mainly from the work of Dykhuizen and Zei (1970). Sardinella spp. are abundant and commercially important for direct or indirect consumption in the eastern tropical Atlantic from Mauritania to Angola. Particularly both in Ivory Coast and Ghanaian waters, Sardinella fishery prevails although its paramount position has slightly declined recently.

Sardinella aurita is primarily found in areas with a well formed coastal upwelling. Canoe fishing for this fish is correlated with a surface water temperature below 25°C, corresponding with the main fishing season in general. In fact, more than 80% of the catches were made during the main upwelling season lasting from July till October. But it does not mean that the fish disappears completely from the tropical area. The depth of the thermocline is not so deep that the fish can remain beneath the thermocline where the

favorable temperature for the species sustains, even though the size of shoals are dispersed. Therefore purse-seine fishing with aid by means of acoustic fish finders and artificial attraction lights is not restricted to the coastal upwelling season. On the other hand, Sardinella eba is more tolerant of high temperature. Consequently they can be caught on the surface more or less all year round.

Anchoa guineensis is so far of no economic importance in the tropical area. However, a plankton survey off Ghana showed large concentrations and abundance of eggs and larvae of this fish throughout the year. It is incidentally caught when fishing for small Sardinellas.

3. The result of the statistical survey

Although modern fishing gears such as purse-seine and trawl increasingly add to the catch amount of small pelagic fishes, canoe fishery still takes the bulk proportion of the total catch. By the nature of the canoe fishery, it is very difficult to obtain precise catch statistics.

However, Ansa-Eman (1972) gives statistical survey data for Sardinella and Anchoa spp. in the beach seine and poli net catches from Ghana during 1964-1969. The data are interpreted by the authors.

Sardinella aurita - Length measurements were carried out every year.

The length range falls between 5.5 and 22.4 cm. Small size (less than 10 cm in fork length) fish makes up the dominant group.

Sardinella eba - The fishing season extends throughout the year with the peak month of August. This fish is also caught in large quantities of small size (less than 10 cm in fork length).

Anchoa guineensis - Even though this fish is caught all year round incidentally, two peak fishing seasons can be identified: a minor peak in March and a major peak in August-September. Medium size fish (6-9 cm in fork length) are caught in quantities compared to small and large fishes.

BAITING METHOD OF THE KOREAN POLE-AND-LINE BOAT

The baiting is performed in both day and night irrespectively. In day-time, a bait shoal is detected by means of fish-finder, but at night it is necessary to attract fish with lights.

The main boat always carries on the deck three small boats equipped with outboard engines. After the main boat concentrates a bait shoal, one of the small support boats replaces the position with the light on, then the main boat removes to some distance. The remaining two support boats carrying a purse-seine net half and half simultaneously encircle the light boat to take the bait. The size of the net is generally 100 m in length and 25 m in depth. The mesh sizes are about 4.3 mm in cod-end and 10 mm in wing side. The bait is conveyed using plastic buckets of 18 liter size in the live condition with water into the bait tanks facilitated in the main boat. A bucket carries on the average about 5 kg of bait, which is commonly used as the unit of bait catch in the Korean boats. The sea water is supplied continuously into the tanks, and tank water is over-flowed. A Korean pole-and-line boat has 15 fish-hold wells, among them 5 wells can be used as live bait tanks. The remaining 10 holds are used exclusively for tuna freezing and stock holds. Each bait tank has the capacity to accommodate about 70 buckets of bait. The operations of bait collection are continued until all the tanks are filled with live bait fish, then the boat moves to the expected fishing ground. The live bait is thrown into the sea while fishing for tuna by two crews who are stationed on the front and rear decks respectively.

SPATIAL DISTRIBUTION OF THE BAITING GROUND

Fig. 1 shows the bait catch per day baiting by quarter and 30'x30' squares for the Korean bait-boat fishery in the eastern tropical

Atlantic in 1975. Baiting can be carried out both on day-time and night-time. On such day, the catches in number of buckets are combined and counted as one day's bait catch. It is noted that all the baiting grounds are located within 180 nautical miles from Tema, the fishing base, that is the distance of a little more than a half day cruise. Generally, in the 3rd quarter, the baiting ground is spatially restricted near the coast as compared with other seasons. It may be correlated to the fact that it is the upwelling season when bait resources are abundant near the coast.

SURFACE WATER TEMPERATURE OF THE BAITING GROUND

The fishing logbook of a Korean bait-boat gives the surface water temperature data of the baiting as well as fishing grounds. The data are assembled to show the monthly average temperature of the baiting ground (Fig. 2). The location of the baiting ground is not taken into account as the grounds are concentrated near the Ghanaian coast. Fig. 2 supports the general oceanographic conditions of the Ghanaian waters. During the upwelling season (July to October) the mean temperatures are always below 25°C. But in other seasons the temperatures range from 27°C to 29°C. The fishing grounds are generally formed in the area outside of the baiting grounds. The monthly water temperatures of the fishing grounds are also given in Fig. 2. The general pattern of the surface temperatures in the fishing grounds follows exactly the same as that of the baiting grounds, but a little higher. The differences are comparatively large during the upwelling months by 3°C, but in the rest months minor differences are noticed. It may mean that the upwelling does not influence the open sea. It is interesting to note here that the temperature of the fishing ground is always above 25°C even during the upwelling season when the temperature drop appears.

DEPTH OF THE BAITING GROUND

Fig. 3 shows the relative bait catches by depth of the baiting ground. As a whole, the depth ranges from 13 to 28 m. Comparatively speaking, day-time baiting is carried out at a shallower depth than night-time one. During the day-time, the baiting seems not to show the depth selectivity, but the night-time baiting shows a significant mode of depth; i.e. about half the night-time bait catch is taken from the preferable depth range of 21 to 23 m.

It is calculated from the sampling data on the Korean bait-boat in 1975 that night-time bait catch is 1.7 times more than the day-time catch. The reason can be attributed to no more than the fact that the baiting operation is generally performed during night-time. In fact, when the bait holds become empty, the bait-boats move to the baiting ground, where they continue fishing for tuna during day-time, and operate baiting exercises mainly at night.

LENGTH FREQUENCIES OF THE BAIT CATCH

There is, in general, the limit of size range of bait fish.

1. The bait has to survive in the bait tank until it returns into the sea as bait. Though the bait is preserved with maximum care, there are always some deaths. Fish either too small or too large tends to die sooner than fish of proper size.
 2. Each size of bait seems to have almost the same effect to chum tunas. Accordingly, if a vessel stocks small bait fish, the number of fish is to be increased at the fixed tank capacity.
- It is said by experience that the group with the mode of 5 cm length fulfils the above conditions.

The data obtained are insufficient and may be biased to illustrate the size frequencies of the bait. Once the baiting is performed, the mode of body length of the bait catch is guessed then recorded on the logbook without actual measurements. Furthermore, they never segregate the bait into species.

Fig. 4 shows the relative length frequencies of bait catch. The fork length of the bait caught by Korean bait-boat in 1975 ranges from 2 to 10 cm. The modes appeared in 4 cm irrespective of baiting time. However, night-time baiting tends to take a smaller size of fish. It may mean that small fish are attracted to the light more easily than the large one.

ESTIMATED CATCH OF LIVE BAIT BY KOREAN BOATS

Tuna fishing is carried out from side platforms attached outside the rail. Generally when fishing is performed, the crew is divided into two groups; one group stationed on the front deck and another the aft deck. A bait thrower belongs to each group. Therefore, there must be individual variation of bait consumption. There should also be some seasonal variation of bait consumption, too. Unfortunately, these factors including the death rate of live bait can not be taken into account due to lack of data.

A simple linear equation of bait catch to tuna catch is calculated, utilizing the monthly sampling data on Korean boats operated in 1975.

$$B = 8.3 T$$

where B = live bait catch in buckets

T = total tuna catch in metric tons

Therefore, if a bait boat catches 85 tons of tuna per trip, the boat consumes about 700 buckets, or 3.5 metric tons of live bait. As the total tuna catch of Korean bait-boat fishery was 7,653 metric tons in 1975, the fishery used 63,520 buckets, or 318 metric tons of live bait.

It seems that the bait resources do not act as a limiting factor pertaining to the pole-and-line fishery until now as the bait is provided all year round in the Ghanaian waters.

LITERATURE CITED

- Ansa-Emmim, M. (1972) Statistical survey for juvenile *Sardinella* and *Anchoviella* in the beach seine and 'poli' net catches 1964 - 1969. Information Report No. 6. Fishery Research Unit, Tema, Ghana.
- Dykhuizen, P. and M. Zei (1970) Clupeid fisheries in the tropical eastern Atlantic. Information Report No. 3. Fishery Research Unit, Tema, Ghana.
- ICCAT (1976) Proceedings of the 4th Regular Meeting of the Commission. Madrid, Nov. 1975 (Provisional).
- Mensah, M. A. (1973) The marine environment and fish production in Ghanaian waters. In the Ghana Fishing Industry, Proceedings of a Symposium held at Tema. May 4-5, 1972, Fishery Research Unit, Tema. p. 25-41.

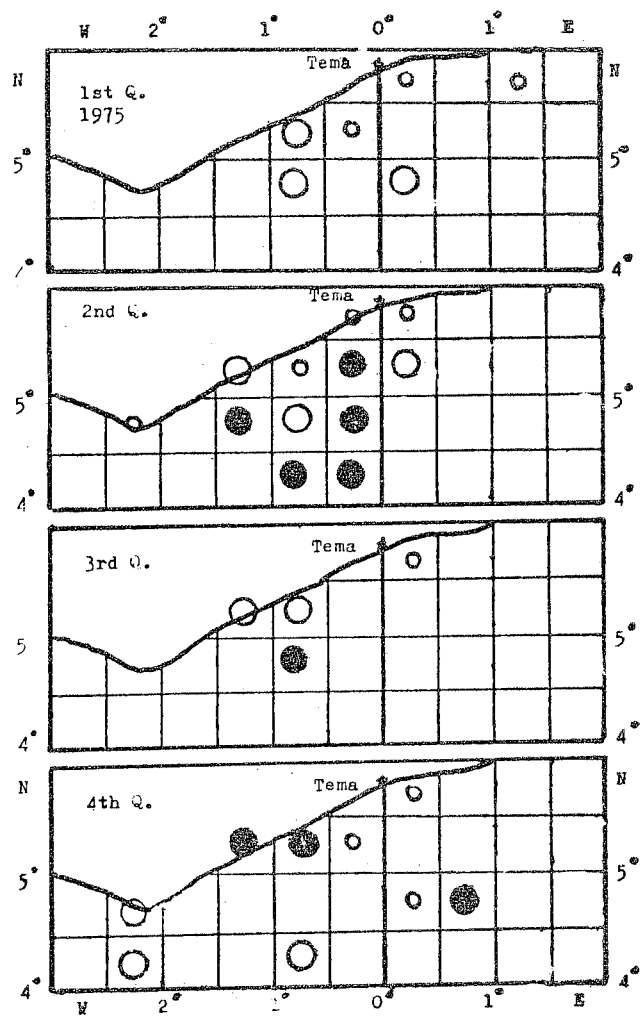


Fig. 1. Bait catch per day baiting by quarter and 30' x 30' square for the Korean bait-boat fishery in the eastern tropical Atlantic in 1975. One bucket of bait is equivalent to about 5 kg.

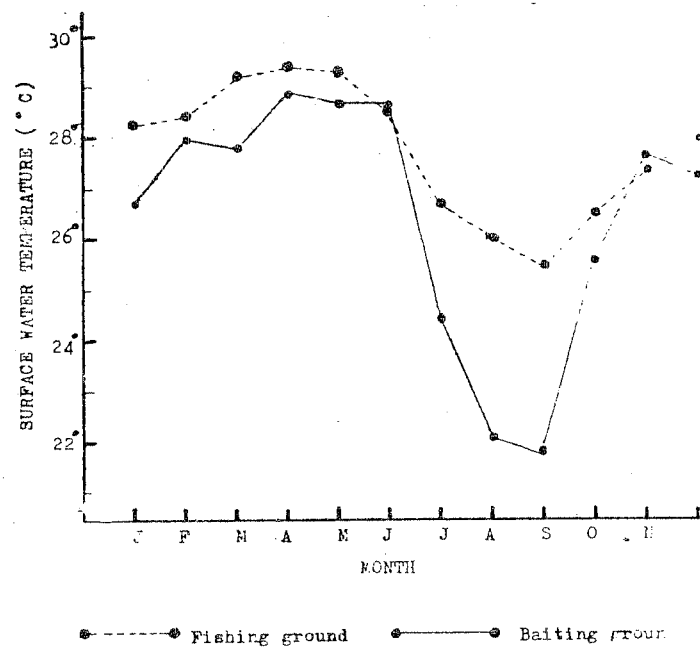


Fig. 2. Monthly average surface water temperature of the baiting and fishing grounds for the Korean bait-boats in 1975.

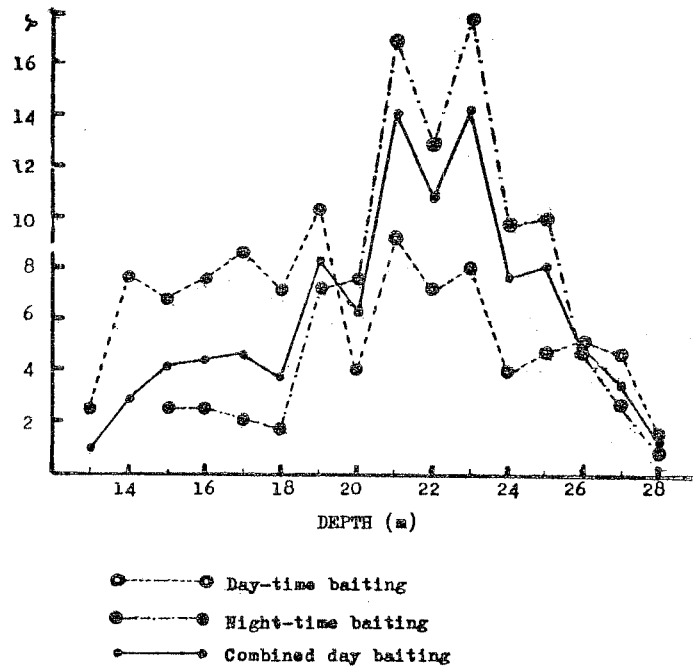


Fig. 3. Relative bait catch by depth of the baiting ground.

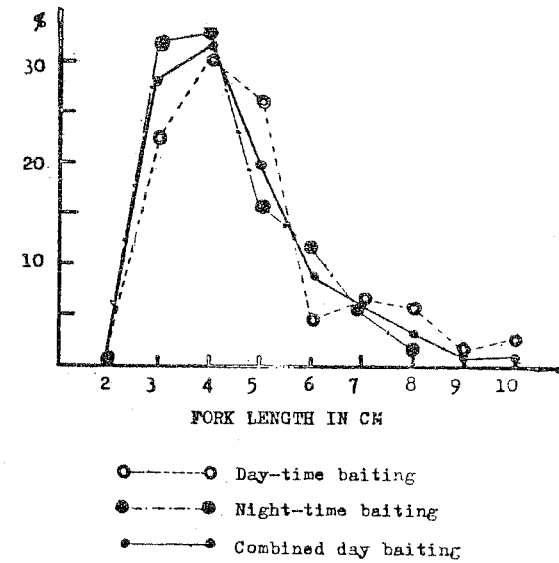


Fig. 4. Length frequencies of the Korean bait catch.