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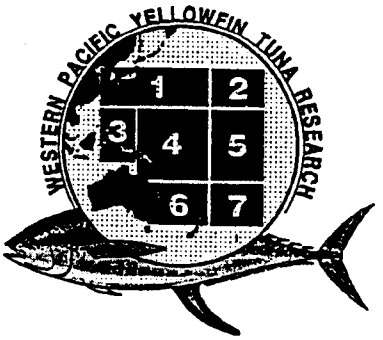

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On Log-School Fishery of the Korean Tuna Purse Seine in the Western Pacific Ocean

by

Jang-Uk Lee, Dae-Yeon MOON and Jong-Bin KIM
National Fisheries Research and Development Agency
Republic of Korea

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Jang-Uk LEE, Dae-Yeon MOON and Jong-Bin KIM
National Fisheries Research and Development Agency
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Abstract

This paper presents some results obtained from log-school fishery of Korean tuna purse seine including information on free-school fishery. Species composition of both log-associated and free-school catches showed that skipjack accounted highest proportion to the total catch and yellowtail kingfish was the most abundant by-catch species. Sharks occurred together with tunas in all sets. From the size distribution it was found that small yellowfin less than 70 cm are distributing around floating objects.

Introduction

Korean tuna purse seine fishery started mainly targeting skipjack and yellowfin tunas with two vessels for the first time in the western Pacific Ocean in 1980. Since then, Korea has extended this fishery gradually by deploying more fishing fleets every year and the number of purse seiners was peaked at 39 vessels in 1990. In recent years, more than 30 Korean purse seiners have been active in the western and central Pacific area. As in the case of other major fishing nations in this region, the catches of the Korean purse seine fishery consisted of small skipjack and yellowfin tunas plus a minor by-catch of bigeye at times. In general, these species are fished from two major school

types which are dubbed free-school gathering around preys at the surface and log-school under floating objects (logs). Despite common uses of logs from commercial fishing fleets to catch the target species, there are little information available on log-associated school.

This paper describes the tendency of the log-school catch distribution and changes in species composition of log-school catches from Korean purse seine fishing vessels in the western Pacific area in recent years. Some additional results obtained from a scientific observation aboard a Korean purse seiner are also presented here.

Data Collection

Fishery data on catch and fishing effort statistics for Korean tuna purse seiners of the Pacific tunas have been collected by the National Fisheries Research and Development Agency (NFRDA) of Korea. The data have been also collected through the scientific observation work on board Korean tuna fishing vessels every year, which is running by NFRDA. Historical data on log-school statistics have been accumulated since the early 1980s. Until 1991, however, the data were not classified for each school type. Log-school catch analyses in this report were based on the data collected during the years from 1992 to June 1995. Regardless of vessel size, seven fishing vessels were chosen randomly each year during the study period.

In addition, log-school catch and species composition data were collected by the NFRDA scientist placed aboard a Korean tuna purse seiner fishing in the high seas between the Papua New Guinea and Micronesia during the late May through the mid-June 1995. During the observer trip, skipjack and yellowfin tunas were measured for fork length and the length compositions were compared with those obtained at local landing sites in Korea.

Results and Discussion

Log-School Catches and Species Composition

During the period of 1992~1995, log-school fishery contributed to commercial catch each year from a minimum of 19% to a maximum of 42% with an average of 31% of the total Korean purse seine catch in the western Pacific region (Fig. 1a). The 1993 and 1995 catches from log-associated school showed much lower proportion relatively than those of 1992 and 1994 which accounted for about 40% of the total catches, respectively. This percentage value was low compared with that of the Indian Ocean, about 50% estimated by Hallier (1994), but higher than that of the Atlantic, 15% reported by Ariz et al. (1993). Log-school catch composition averaged 83%, 16% and 1% for skipjack, yellowfin, and other species including bigeye, respectively (Fig. 1b). It is, however, noteworthy that the proportion of skipjack tuna tended to increase from 74% in 1992 to 89% in 1995 (up to June) and yellowfin decreased from 26% in 1992 to 11% in 1995. From free-school catch figure (Fig. 1c), yearly proportion of yellowfin to total catch was higher than that from log-associated school for the first three years. In fact, it in 1993 accounted for about 45% of the total catch. But overall trend in catch proportion observed from free-school showed a decreasing pattern.

Log-School Fishery Observation

During the scientific observation, a total of 6 sets were made for log-school fishing but no sets were tried for free-school of tunas. The floating objects were from natural origin with four different sizes of logs; 3, 5, 8 and 15 m long (Table 1). A total of 14 species comprising skipjack, yellowfin, and bigeye tunas were caught during the scientific observation. Every set was successful with catches ranging from 9.5 to 60.5 t/set. Skipjack and yellowfin were caught together in all sets on log-schools. Catch per set (CPUE) was high from both 3 m and 15 m logs. Re-settings were made on the same logs (both 3 m and 15 m) within 24 hours. The catches from re-settings were poor over the

first sets but it was found that proportion of yellowfin catch was higher than that from the first sets (Table 1). Although catches from re-setting on log-school are lower than the first sets, it is premature to give scientific evidence at present that the catches are from tuna school rebuild around floating objects or from remaining of fish which are not taken at the first set. It is obvious, however, that logs from natural origin become useful fishing gear for purse seine fishery. CPUE of log-school fishing was 31.2 t/set and 11 t/day for all species (Table 2). Catch per set of each tuna species was; 18.8 t/set skipjack, 11.9 t/set yellowfin and 0.5 t/set bigeye. Species composition of log-school catches were made of 60% skipjack, 38% yellowfin and 2% bigeye on an average.

The 11 by-catch species were classified from catches taken at log-school fishing during scientific observation (Table 3). Sharks occurred together with tunas in all sets with 2 to 8 individuals each set, indicating good association with tunas. This seems to suggest possibility that there exists prey-predator relationship between tunas and sharks. In fact, some part of yellowfin are found in shark's stomachs. Yellowtail kingfish was the most abundant by-catch species and followed by trigger fishes. Other by-catch species on logs were black marlin, swordfish, manta ray, stingray and olive ridley sea turtle (Table 3). Besides, hawksbill sea turtle and a few species of sea birds were observed resting or swimming on free-floating logs. Some by-catch species and small tunas were released or discarded by the fishermen whenever these were taken.

Size distributions of yellowfin tuna sampled from log-school catch at scientific observation and from the Korean purse seine catch at domestic landing sites are given in Fig 2. Yellowfin tunas caught from log-school fishing ranged from 30 to 120 cm in fork length (Fig. 2a). Despite small sample size, yellowfin tuna had two distinct modes; one at 58~62 cm ranging between 30 and 70 cm, and another at 100~104 cm ranging from 80 to 120 cm. This pattern went well with the length composition obtained from the sampling study conducted at local landing sites for the Korean purse seine catches during 1993

~1995. As shown in Fig. 2b, yellowfin tuna sampled from local landing sites ranged from 40 to 160 cm, displaying two separated groups as a whole; one at the length of 40~70 cm and another at 70~160 cm. It is clear from both size compositions that small yellowfin tuna less than 70 cm are distributing around floating objects.

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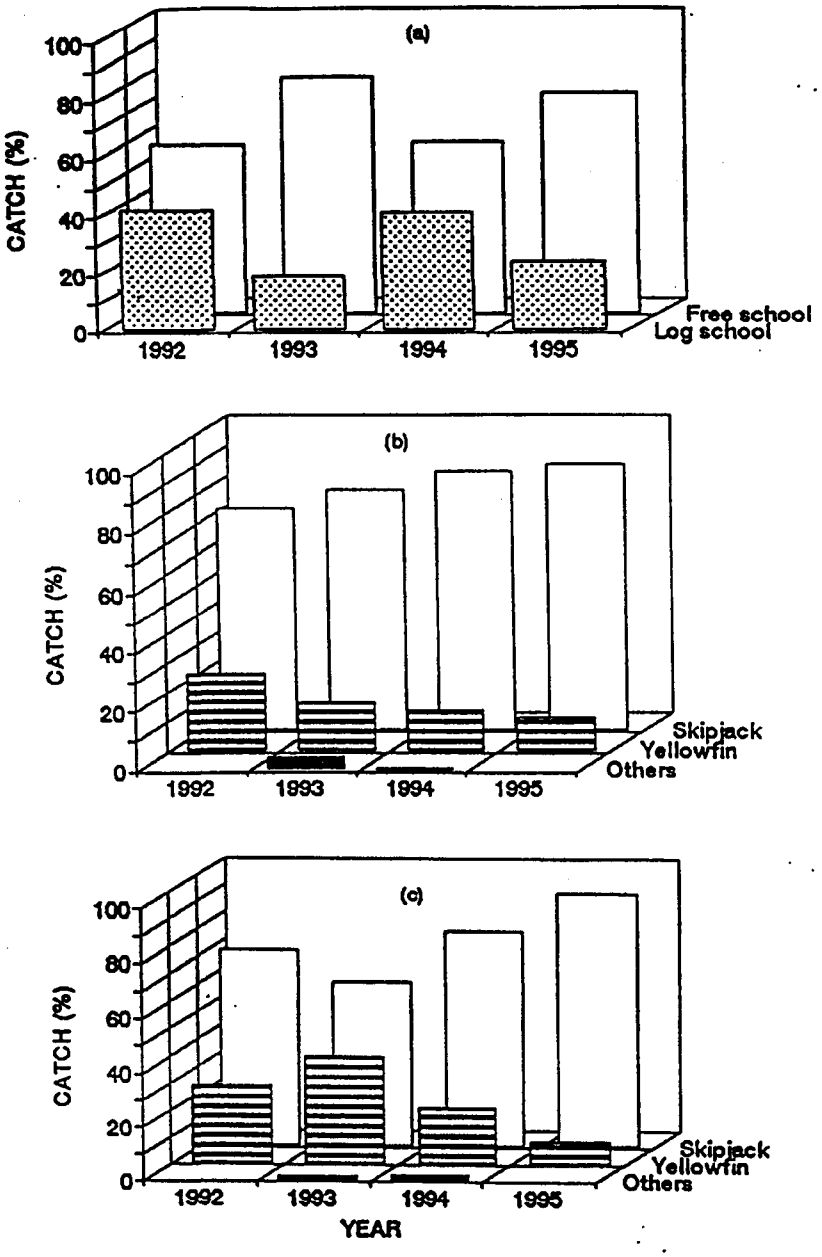

Fig. 1. Comparison of catches between free- and log-school fisheries (a), log-school catch composition (b), free-school catch composition (c) of Korean tuna purse seiners.

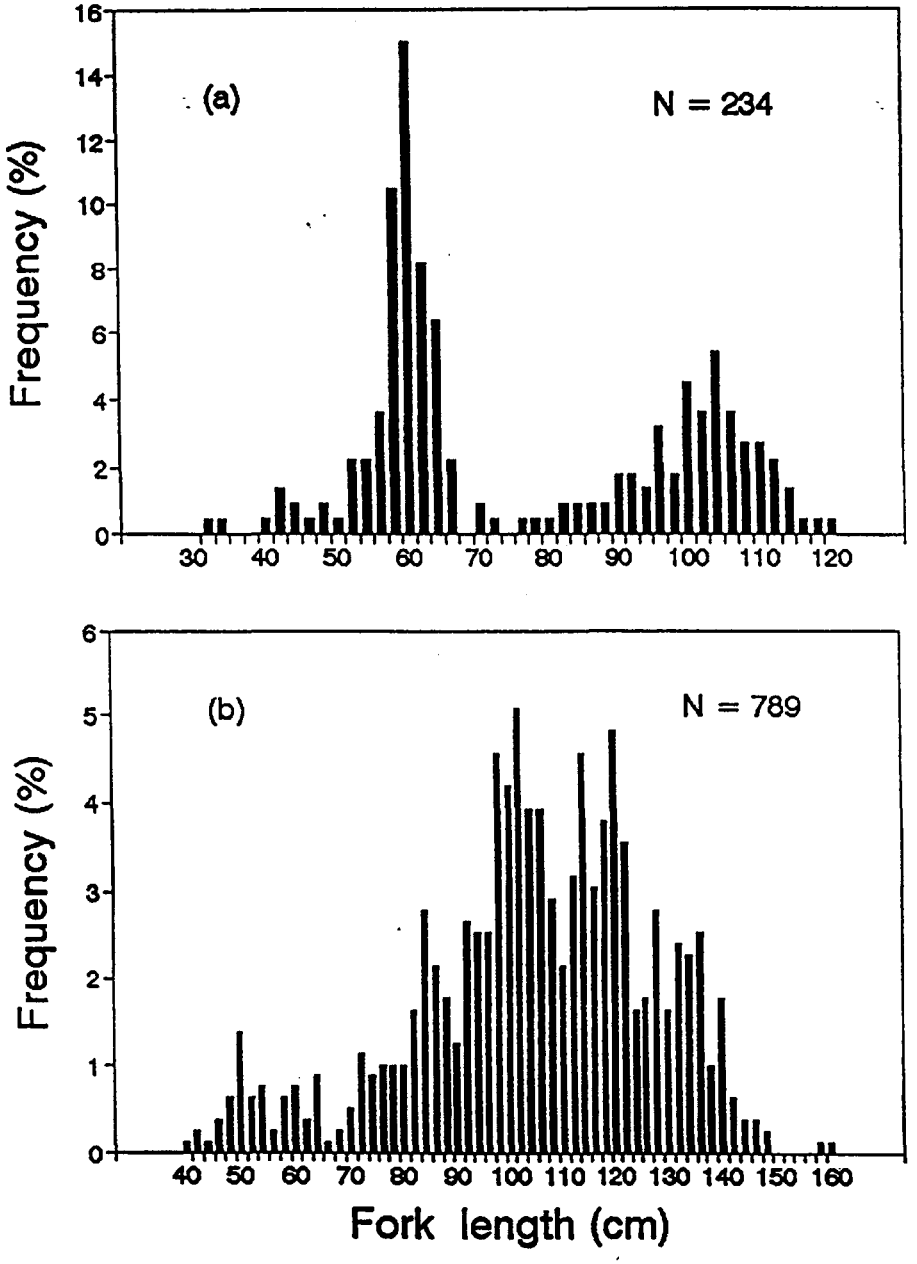

Fig. 2. Size compositions of yellowfin tuna sampled from log-school fishery (a) and from Korean tuna purse seine catch at landing sites (b).

Table 1. Species composition for size of log and number of by-catch species during scientific observation in June 1995.

Size of log(m)	Total catch (t)	Species composition(%)			No. of by-catch species	Remark
		Skipjack	Yellowfin	Bigeye		
15	40	87.5	12.5	-	3	
15	9.5	5.3	94.7	-	5	re-set
3	60.5	47.9	50.4	1.2	9	
3	10.5	47.6	47.6	4.8	4	re-set
5	30.5	59.0	39.3	1.7	6	
8	36.0	69.4	27.8	2.8	6	

Table 2. Catch and CPUE of tunas caught by log-school fishery during scientific observation in June 1995..

Species	Catch (t)	CPUE (t/set)	CPUE (t/day)
Skipjack (*Katswonus pelamis*)	112.5	18.8	6.6
Yellowfin (*Thunnus albacares*)	71.5	11.9	4.2
Bigeye (*Thunnus obesus*)	3.0	0.5	0.2
Total	187	31.2	11

Table 3. Catch in number and appearance in set of by-catch species

Species	Catch in number	Appearance in set
Shark	32	6
Yellowtail kingfish	483	5
Black marlin	5	4
Swordfish	1	1
Manta ray	2	1
Stingray	1	1
Trigger fishes(2)	108	4
Other fishes(3)	35	4
Olive ridley sea turtle	2	1

( ) : Number of species