REVIEW OF DATA COLLECTION SYSTEM FOR THE JAPANESE LONGLINE FISHERY AND PROBLEMS ABOUT STANDARDIZATION OF CPUE

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ABSTRACT

The history and data collection system of the Japanese distant water longline fishery is reviewed. Japanese distant water longline fishery has several historical events including fishing ground change with the shift of target species and the developments of new fishing gear and methods. The Japanese longline fleet started deep longline operations from the late 1970s and has been developing nylon longline in the past two or three years. The Japanese data collection system was changed or revised according to the historical changes in the fishery. Such events and new factors affecting fishing efficiency should be included in the standardization of CPUE.

RESUME

Le présent document examine l'évolution et le système de collecte de données de la pêcherie palangrière japonaise en eaux lointaines. L'évolution de cette pêche comporte plusieurs faits historiques comme le changement de lieux de pêche suite au changement d'espèces cibles, et l'essor de nouveaux engins et méthodes de pêche. La flottille palangrière japonaise a commencé à utiliser la palangre de profondeur à la fin des années soixante-dix, et a élaboré ces dernières années une palangre en nylon. Le système japonais de collecte de données a été modifié ou actualisé au fur et à mesure de ces changements de la pêcherie. Il convient d'inclure ces faits, ainsi que les nouveaux facteurs affectant l'efficacité de pêche, dans la standardisation de la CPUE.

RESUMEN

Se examina la historia y el sistema de recogida de datos de la pesquería palangrera japonesa de altura. Esta pesquería cuenta con varios eventos en su historia, como el cambio de caladero con el cambio de especie-objetivo y el desarrollo de nuevos métodos y artes de pesca. La flota japonesa de palangre empezó a emplear el palangre de profundidad a partir de finales de la década de los años 70 y en los últimos dos o tres años emplea el palangre de nilón. El sistema japonés de recogida de datos fue cambiado o revisado de acuerdo con estos cambios históricos en la pesquería. Aquellos eventos y nuevos factores que hayan afectado la eficacia de la pesca deberían tenerse en cuenta en la estandarización de la CPUE.

1. HISTORY OF JAPANESE LONGLINE FISHERY

Japan has a long history of longline fishery that has been in operation since before World War II. Japanese distant water longline fishery has developed since 1952 and the catch has been rapidly increased. The fishing ground had been expanded to the Pacific, Atlantic, and Indian Oceans by the mid 1960s. The Japanese longline operations began in 1956 in the Atlantic and increased rapidly in the 1960s.

Yellowfin tuna were the main target species in the early stages. The Japanese longline fishery shifted the target species from yellowfin tuna to albacore around 1962 (Figure 1). Then the fishery changed its target to bigeye and bluefin tunas which were supplied for the Japanese "sashimi" market since the development of super cold freezers, (below minus 50°C) as, from the early 1970s onward, these made it possible to keep the fresh "sashimi" quality of fish (Nakano *et al.* 1990).

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According to the shift of the target species, the fishing method was also improved from conventional longline gears to "deep" longline, targeting bigeye in the equatorial waters since 1977 (Koido and Yonemori 1987). The number of hooks between floats increased in the case of deep longlining. The number of hooks between floats is from 4 to 6 in conventional longline, whereas in recent years the maximum number of hooks between floats in deep longline has been over 20 (Figure 2; Uozumi 1996). The maximum depth of hooks is about 120 m in conventional longline fisheries with 4-6 hooks between floats, while in deep longline it is about 250 m with 10 or more hooks (Suzuki *et al.* 1977).

Furthermore, nylon is now used as the material of longline gears in an attempt to increase fishing efficiency for tunas. This new type, so called "nylon longline" is improving and expanding rapidly, especially in the Pacific Ocean.

2. DATA COLLECTION SYSTEM OF FISHERY STATISTICS

The Japanese Government has a license entry system by vessel size for the longline fishery. Longline fishing vessels of over 20 gross tons (GT) have to be licensed and submit logbook reports to the Government, mandatorily. All long distance tuna longline vessels are over 20 GT. The submitted logbook reports are checked and summarized by the National Research Institute of Far Seas Fisheries (NRIFSF). Logbook reports include information on fishing date, location, effort and catch in number by species of tunas and billfishes. The logbook errors are checked and corrected by the staff of the NRIFSF. The logbook reports are checked carefully and any false or incorrect entries detected are deleted from the data set. The coverage of logbook reports is calculated by the number of licensed vessels on the list and the number of logbook reports submitted. It is usually over 90 % and the catch numbers are raised up to 100 % by the coverage rates. ICCAT Task II data, monthly catch in number by species, is summarized on a 5°x 5° basis from this data.

The length measurement data for tunas and billfishes are collected from the fishing ports, research, and commercial vessels by NRIFSF. Average weight by 10°x 20° area, quarter, and species is estimated from average length using the length-weight relationship of each species. Annual catch weight by species, ICCAT Task I data, is calculated by multiplying catch number by species by average weight.

As deep longline operations have expanded, another statistical item, the number of hooks between floats, has been collected by NRIFSF since 1975. Furthermore, the Japanese Government revised the format of logbook reports in 1993 to include type of operation (swordfish, shark and other longline), type of main line (nylon and others), type of branch line (nylon and others), catch in weight (gutted) by species, and separated catch of sailfish, shortbill spearfish and sharks (blue, salmon, mako shark and other sharks).

In recent years, fishermen have started to use several kinds of new nylon longline gear and the technique is still developing. Fishermen use nylon for the main line or both main and branch lines. Two types of nylon, mono-filament and multi-strand, are used in nylon longlining. Various types of nylon gears are developing and fishing masters can choose from them. Thus, NRIFSF is investigating what kind of data have to be collected for the analysis of *CPUE*.

3. PROBLEMS OF STANDARDIZATION OF CPUE

There are several problems relating to the standardization of longline *CPUE*. The four major problems closely related to the fishing operations are as follows. First is the change of target species. For example, Japanese longline fishermen targeted yellowfin and albacore in the early stages of Atlantic operations, but have changed their target species to bigeye and bluefin tunas since the early 1970s. The fishing grounds were changed from the temperate waters to the cold and the equatorial waters with the shift of target species from albacore to bluefin and bigeye tunas. Therefore, Japanese longline fishing grounds do not continue to cover the high density area of each species throughout the history (Uozumi 1996). Therefore, *CPUE* should be used carefully or should be separated by period when there has been a major change in the coverage of a fishing ground.

Second is the change of fishing operation with the shift of target species. When fishermen change their target, they also change the location of the longline set for the new target to adjust to the relevant sea surface temperature, current, etc., even when operating in the same fishing grounds as before. This minor change of location probably affects the *CPUE*. Thus effect of target species should be included in the GLM model.

Third is the improvement of fishing gear and methods. As deep longline operations develop, hook depth is getting deeper and so changes fishing efficiency for each species. The distribution of deep longline operation depends on the year and area (Uozumi and Nakano, 1994). Furthermore, it is hard to compare, because the distribution of deep

longline operations and conventional ones are quite segregated by area. Even between the deep longline operations, fishing efficiencies are different among the areas (Suzuki *et al.* 1977, Koido and Yonemori 1987). Thus the information of deep longlining by year and area is necessary for the standardization of *CPUE*.

The last problem is concerned with the development of new longline fishing gears. The use of new nylon longline has been expanding in the Pacific Ocean over the past two or three years. There are various types of nylon gear as mentioned above and this technique is still developing. It is, therefore, still unknown what the key factors affecting the *CPUE* are in relation to this type of gear, and thus it is not clear what kind of information should be collected for the standardization of longline *CPUE*.

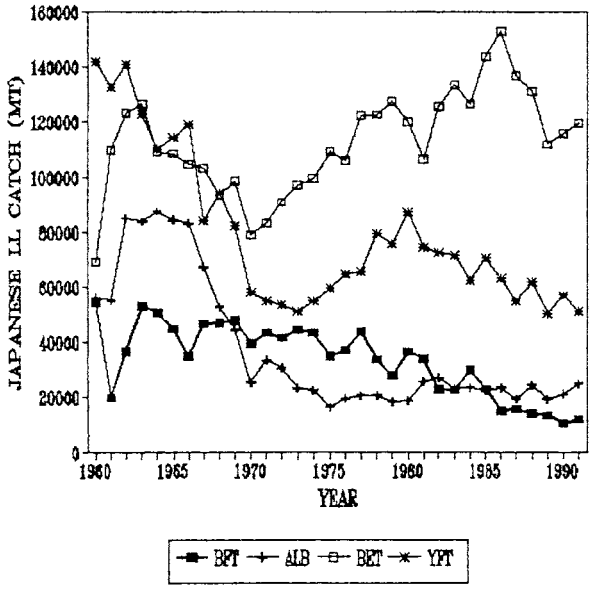

Fig. 1. **Historical change of Japanese tuna longline catches for four major species.**

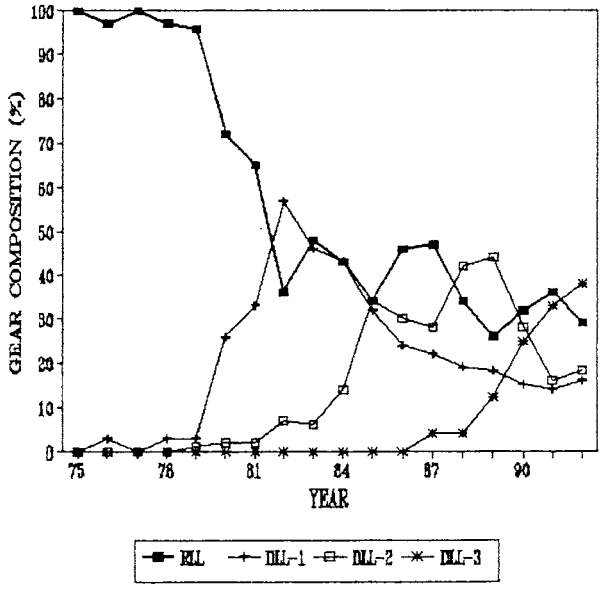

Fig. 2. **Historical change of gear composition for the Japanese longline fishery in the Atlantic. Gears were classified into four groups of RLL, DLL-1, DLL-2, and DLL-3 which have 1-7, 8-11, 12 and 16-20 branch lines between floats, respectively.**