

COMPARISON OF STANDARDIZED LONGLINE CPUE OF ALBACORE AMONG THE OCEANS AND COUNTRIES

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ABSTRACT

The Japanese and Taiwanese albacore CPUEs caught by longline fisheries are compared. For both countries CPUEs are at almost the same level in all oceans, although the levels between countries are quite different. The similarity of CPUE trends between the south Atlantic and Indian Oceans leads to some possibilities for inter-migration.

RESUME

La CPUE du germon capturé par les flottilles palangrières japonaise et taïwanaise est comparée. Les CPUE se situent presque au même niveau dans tous les océans pour chaque pays, mais le niveau diffère sensiblement entre les pays. La similarité des tendances de la CPUE entre l'Atlantique Sud et l'Océan Indien suggère la possibilité d'un inter-migration.

RESUMEN

Se compararon las CPUEs del atún blanco capturado por las pesquerías palangreras de Japón y Taiwán. Las CPUEs correspondientes al mismo país están prácticamente al mismo nivel en todos los océanos, si bien, estos niveles difieren según los países. La similitud de las tendencias de la CPUE en el Atlántico sur y el Indico sugiere la posibilidad de una intermigración.

1. INTRODUCTION

Japan and Taiwan have long histories of distant water longline fishing operations and have caught albacore in the various oceans. The status of the albacore stock has been examined using CPUEs. The CPUEs in the oceans were standardized by each country and submitted to the various organizations. In this report, the comparison of these standardized CPUE series among the oceans and countries are discussed.

2. MATERIALS AND METHODS

The CPUEs of albacore caught by Japanese and Taiwanese longline fisheries were standardized by GLM model (procedure of SAS, SAS Inc.) or Honma's methods (Hsu and Chang 1993, Uosaki 1994, Hsu 1993, Uozumi 1993a 1993b, Wang 1993). These standardized CPUEs in the south Atlantic, Indian, and south Pacific Oceans, are used for this analysis. Standardized deviations (Z) are calculated from 1975 to 1991 for Japanese indices and from 1975 to 1990 for Taiwanese. These are also compared among the Oceans and the countries.

3. RESULTS AND DISCUSSION

The standardized albacore CPUEs for the Japanese and Taiwanese longline fisheries in the south Atlantic, Indian, and south Pacific Oceans are shown in Figures 1 and 2 respectively. The Taiwanese CPUE in the Indian Ocean is expressed by catch in weight (100 kg) per 1,000 hooks, and the other indices are albacore catch in number per 1,000 hooks for the Japanese and catch in number per 100 hooks for the Taiwanese. Both Japanese and Taiwanese CPUEs show the same level for the three oceans, though Taiwanese CPUE for the Indian Ocean is weight per effort. Japanese albacore CPUEs are about 3% of the Taiwanese from 1975 to 1987, because they did not target albacore after the early 1970s. Japanese CPUEs show stability with small fluctuations, while Taiwanese CPUEs were stable until 1986, with large fluctuations and a clearly decreasing trend in the south Atlantic and Indian Ocean after 1986 and in the south Pacific from 1987.

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The standardized deviations (Z) are calculated for each *CPUE* series to compare the *CPUE* trends among oceans and countries, because the fluctuation level of *CPUEs* is different due to the different *CPUE* level. The Japanese standardized deviations of *CPUE* for the three oceans are shown in Figure 3. The upward and downward fluctuations of *CPUEs* in the south Atlantic and Indian Ocean resembled each other. The trend for the south Pacific was different from the other two series. There was no clear trend in *CPUE* levels over the past 18 years, though some fluctuations were observed in the three oceans. The values of Z for Taiwanese *CPUEs* showed different trends from the Japanese *CPUE* series, though the *CPUEs* in the south Atlantic and Indian Ocean were also similar when compared with that of the south Pacific (Figure 4). All three *CPUEs* showed similar trends that were relatively high until 1979, then decreased and were stable at around zero, and decreased sharply in the south Atlantic and Indian Ocean from 1986 and from 1987 in the south Pacific.

The comparisons of *CPUEs* showed that the trends in each country were basically similar to each other among the oceans, but they were different between the countries. A major difference between the countries is that there was no clear historical trend in the Japanese *CPUE* series, while there was gradual declining trend in the Taiwanese one, with a marked decrease in recent years.

Japan and Taiwan have caught the same stock of albacore in each ocean, although the *CPUE* level is different mainly due to the different target species and different fishing grounds. However, average lengths of albacore caught by each country are not so different (Uozumi 1993c). If standardized *CPUEs* indicate the change of albacore abundance, the trends of both countries should be similar.

There are some possible reasons for these differences, as follows. 1) Japanese *CPUEs* may not indicate albacore population abundance adequately, because Japanese fishing grounds only cover the edge of the areas of albacore distribution. 2) Some changes in the fishing operations may have occurred in the Taiwanese fishery that cause the decrease of fishing efficiency of albacore. The Taiwanese standardized *CPUE* for the north Atlantic Ocean is shown in Figure 5 with *CPUEs* for the other three oceans. The *CPUE* for the north Atlantic rapidly increased until 1976 and reached the same level as the other *CPUEs*. It then rapidly decreased from 1988 onward. The Taiwanese albacore catch in the north Atlantic increased in the 1970s and decreased from the late 1980s (ICCAT SCRS/92/22). It is possible that a change in the catch level and a probably a change in fishing effort may have affected the change of *CPUE* mainly as a result of a change in fishing efficiency.

The similarity of *CPUEs* between the south Atlantic and Indian Ocean in each country may be explained by the possibility of inter-migration between the oceans. Morita (1978) pointed out the possibility of inter-migration between the south Atlantic and Indian Ocean from length frequency and *CPUE*. The trend of *CPUE* in the south Pacific is not close to those of the other oceans in each country. It is possible that there may be few inter-migrations between the south Pacific and the other oceans as Chow *et al.* (1993) showed genetic distance between the south Atlantic and south Pacific albacore population.

Furthermore, Taiwanese *CPUEs* sharply and simultaneously decreased in all three oceans in recent years. If the drastic change of *CPUEs* in recent years expressed a change in the stocks, there would be some detectable changes in the length frequency, the level of recruitment, etc. Therefore, investigations into variability of recruitment, change of length frequency and change of fishing strategy are necessary to examine whether the synchronized decreases of Taiwanese *CPUEs* in recent years indicate a decrease in population abundance.

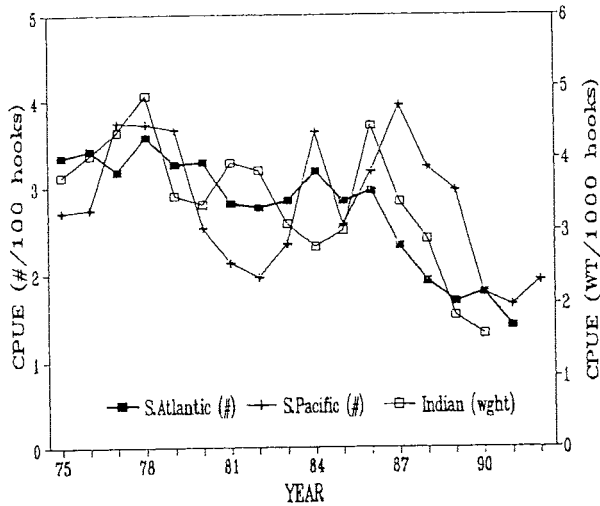


Fig. 1. Albacore standardized CPUE/s caught by Taiwanese longline fishery in the south Atlantic, Indian and south Pacific Oceans. CPUE's indicate catch in number per 100 hooks for the south Atlantic and south Pacific Oceans, and catch in weight(100 kg) per 1000 hooks for the Indian Ocean, respectively. (After Hsu and Chang, 1992; Hsu, 1993; and Wang, 1993.)

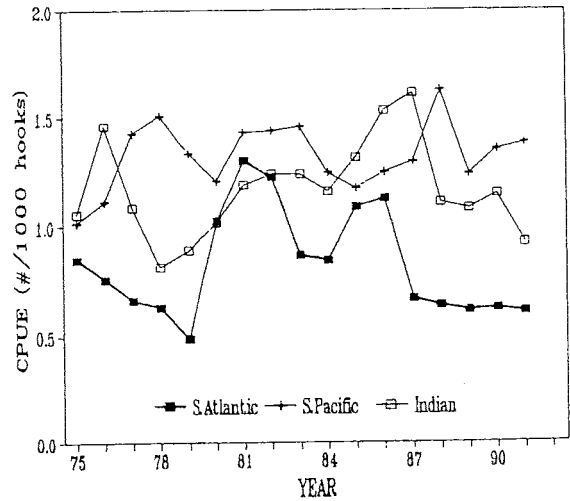


Fig. 2. Albacore standardized CPUE's caught by Japanese longline fishery in the south Atlantic, Indian and south Pacific Oceans. CPUE's indicate catch in number per 1000 hooks. (After Uosaki, 1992; Uozumi, 1993a 1993b.)

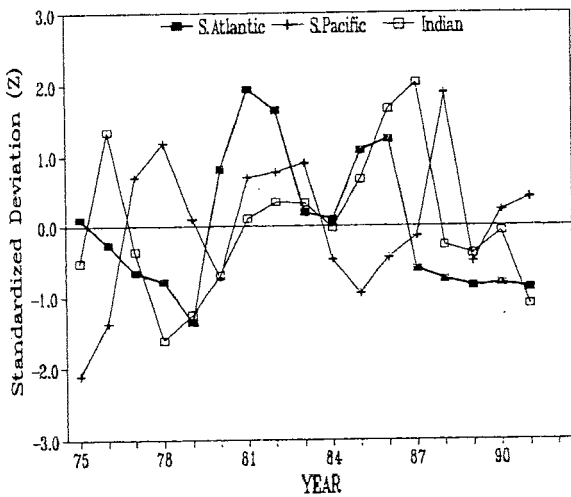


Fig. 3. Standardized deviation (Z) of Japanese longline albacore CPUE.

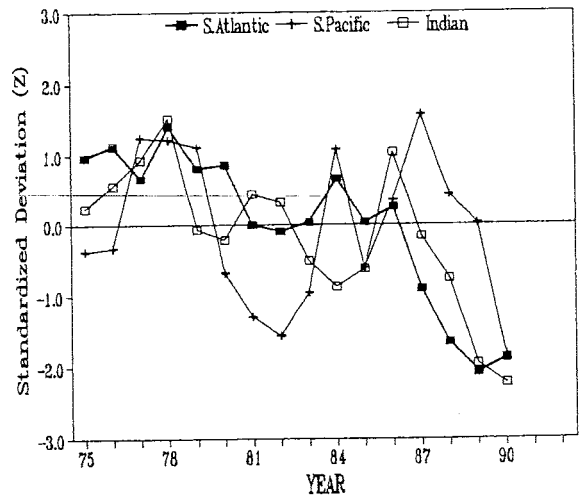


Fig. 4. Standardized deviation (Z) of Taiwanese longline albacore CPUE.

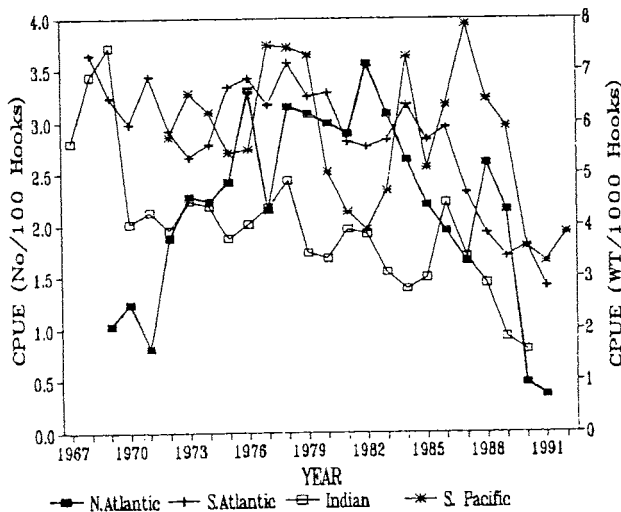


Fig. 5. Taiwanese albacore standardized CPUE caught by longline fishery in the north and south Atlantic, Indian and south Pacific Oceans. CPUE's indicate catch in weight (100 kg) per 1000 hooks for the Indian Ocean and in number per 100 hooks for the other Oceans, respectively. (After Hsu and Chang, 1992; Hsu, 1993; and Wang, 1993.)