Update of standardized CPUE for the main pelagic shark species dominated in the SBT fishery, 1992-2004

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ミナミマグロ漁場で漁獲される主要サメ類の CPUE の経年変化の更新（1992－2004）

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Abstract

To evaluate the stock status of pelagic sharks caught by the SBT longline fishery, we standardized CPUE time-series for blue shark, porbeagle and shortfin mako using the Japanese RTMP and EFP observer data from 1992 to 2004. The standardized CPUEs for the three species fluctuated annually probably due to sampling error, but did not show constant trends of increase or decrease during this period.

RTMP 及び EFP オブザーバープログラムによって 1992 年から 2004 年の 13 年間に収集されたデータに基づいて、ミナミマグロ漁場においてマグロ延縄漁船によって漁獲される主要な外洋性サメ類であるヨシキリザメ、ニシネズミザメ、アオザメの３種について CPUE を標準化し、その経年変化から資源状態の変動を検討した。その結果、何れの種においても CPUE の年変動が見られたが、恐らくその変動はサンプリング誤差によるものであり、一定した増加・減少傾向は認められなかった。従って、この期間において資源状態に大きな変化は無かったもの考えられた。

Introduction

A lot of pelagic sharks mainly blue shark were caught by the tuna longline vessels in the SBT fishery. It was considered that the stock status of these pelagic shark species has been stable in the three Oceans (Nakano 1996, Matsunaga and Nakano 1996). This document estimated the standardized CPUE for the three main shark species (blue shark, porbeagle and shortfin mako) using the observer data obtained in the Japanese observer program since 1992.

Material and Methods

Observer data collected in the RTMP and EFP observer program from 1992 to 2004 were used for the analysis.

In order to standardize CPUE of sharks, generalized linear model was used in this analysis. We

used the CPUE model with log-normal error for blue shark and porbeagle, and CATCH model with negative binominal error for shortfin mako. The calculation was performed through GLM and GEM procedure of SAS/STAT package (Version 8.2). The following forms were assumed as full models respectively.

ln (CPUE + constant) = INTERCEPT + YR + QT + AREA + GEAR + INTERACTION + ERROR, ERROR ~ N $(0,\sigma^2)$

E (CATCH) = (Effort)*EXP(INTERCEPT + YR + QT + AREA + GEAR + INTERACTION) ~ NB (α、β)

where ln: natural logarithm, CPUE: nominal CPUE (catch of sharks in number per 1000 hooks), INTERCEPT: intercept, YR: effect of year (1992-2004), QT: effect of season (1-4), AREA: effect of area (4, 7-9), GEAR: effect of gear type (number of hooks between floats; 1-8, 9-14, 15-29), INTERACTION: two way interactions, CATCH: nominal catch of sharks in number. YR, QT, AREA and GEAR were incorporated as the main effect. The area strata used for the analysis were 4, 7, 8 and 9 (Fig. 1). In order to overcome the problem of zero catch, 1.0 was uniformly added to each value of nominal CPUE as the constant term.

We made the model selection using the stepwise F-test and Chi-square-test (Dobson 1990). As a result of all test about the path that can be considered, the following models with many explanatory variables were finally selected respectively. Significant level was set to be one percentage.

- final model -

Ln (CPUE + 1) = INTERCEPT + YR + QT + AREA + (AREA*GEAR) + ERROR

E (CATCH) = (Effort)*EXP(INTERCEPT + YR + QT + AREA + (AREA*GEAR) + ERROR)

Results and Discussion

Figure 2 shows the standardized CPUE for the three species. The standardized CPUE of blue shark ranged around 0.20 to 2.38. Those in the former period (1992-1995) were low but increased in the middle (1996-2000), and were medium in the latter (2001-2004). Some fluctuations were observed during this 13 years. Nakano (1996) showed the long-term trend of standardized CPUE for blue shark in Indian Ocean with using the logbook data before 1992, which ranged from 1 to 3 and there were not drastic change. So the fluctuations in this analysis may be a part of the long-term ones.

The CPUE of porbeagle was stable (0.05-0.23) from 1992 to 1999 and became high in 2000. Though long term fluctuation was not clear, it is supposed that the stock status of porbeagle

have not changed drastically during this 13 years.

The CPUE of shortfin mako ranged around 0.02 to 0.13 and was slightly low from 1993 to 1995. It seems stable from 1992 to 2004, so the stock status of shortfin mako was not supposed to have changed much during this period.

Continuation of research activities on board, such as RTMP and EFP observer program, is desirable to monitor the stock status for these shark species.

Conclusion

No drastic changes were observed in the standardized CPUEs for blue shark, porbeagle and shortfin mako, which were the main pelagic shark species in the SBT fishery, from 1992 to 2004.

Reference

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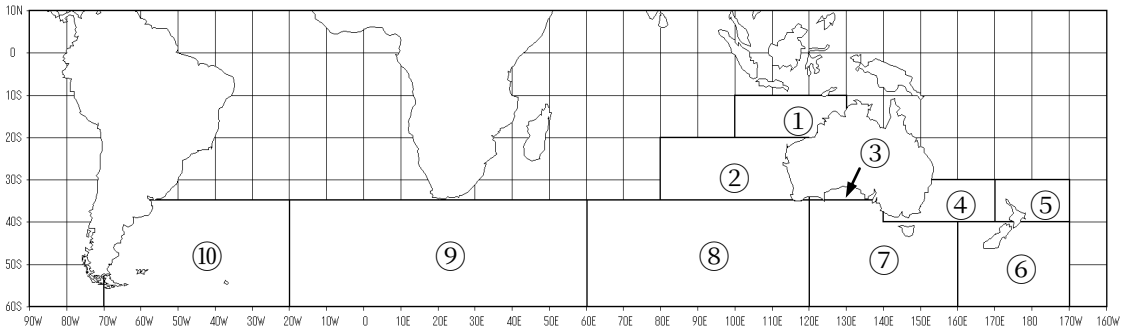

Fig.1 Area classification used for the analysis.

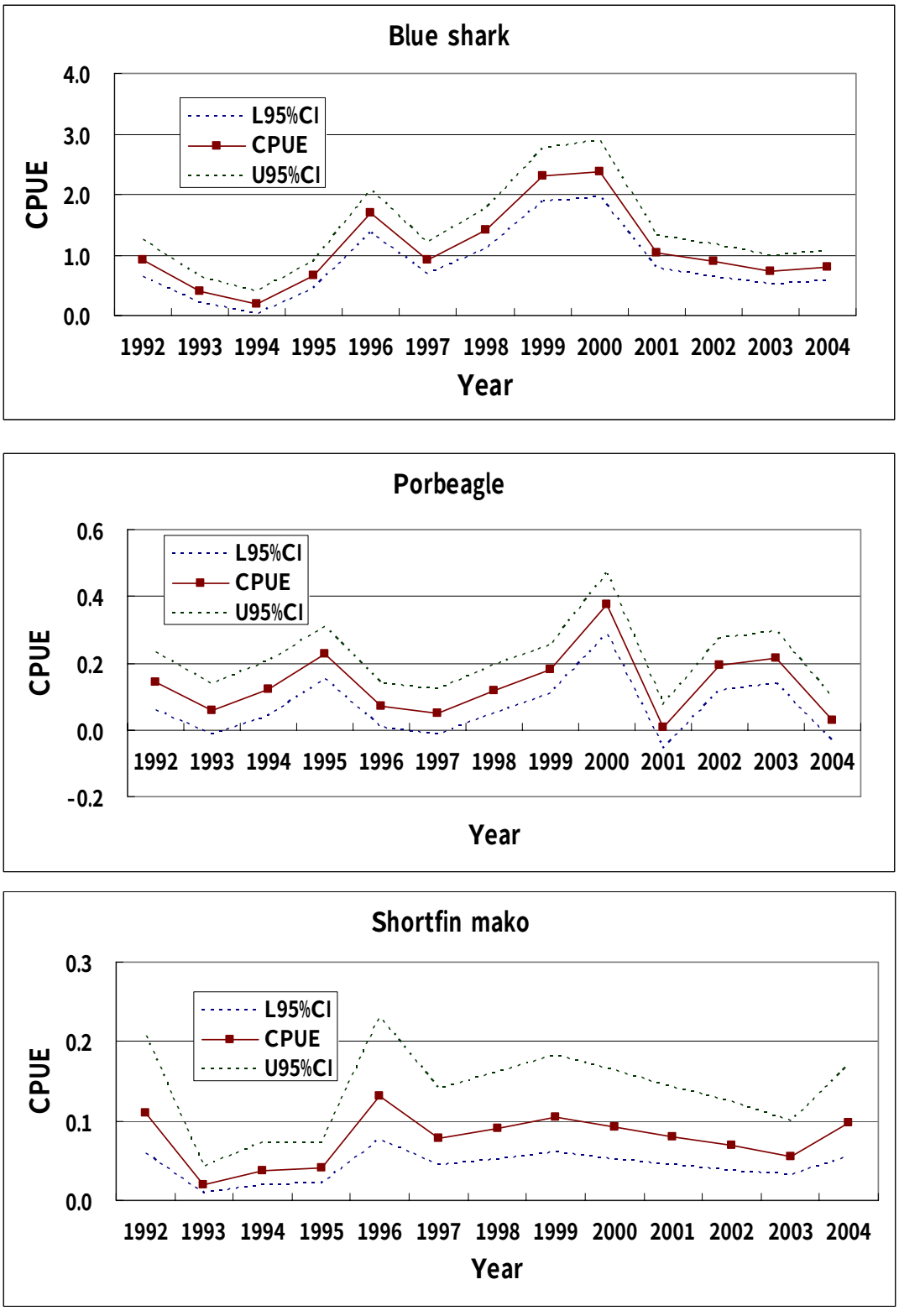

Fig.2 Standardized CPUE and 95% confidence intervals for three shark species obtained using Japanese observer data.