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Standardizations of CPUE of striped marlin caught by Japanese coastal longliners in the northwest Pacific[1]

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Introduction

Japan Fishery Agency started to collect the log book of Japanese coastal longliners (defined as the longliners less than 20 tons) in 1994. Yokawa and Yamada (2002) standardized CPUE of Pacific bluefin tuna caught by Japanese coastal longliners using this log book data, and suggested that this fishery should be treated as separate from Japanese offshore and distant-water longliners, because they used different fishing strategy, different gear configuration, and many log book not reported the number of hooks per basket. Following this recommendation, CPUE of striped marlin caught by Japanese coast longliners standardized separately from Japanese offshore and distant-water longliners in this study, for an input to the stock assessment.

Materials and Methods

Japan Fishery Agency started to collect the log book of Japanese coastal longliners (defined as the longliners less than 20 tons) in 1994. Though the coverage of log book is not precisely known, it is roughly estimated to be between 80 – 95 %. Set by set data is used in this study for the analysis of CPUE because no aggregation of data is conducted.

Standardization of CPUE of striped marlin is conducted by the catch model with Negative Binominal error structure, because generally striped marlin is caught as by-catch and ration of 0 catch observation is larger than 50 %. Actual model used in the analysis is as follows;

E[Catch]=Effort x exp(Intercept + YR + QT + AR + INTER)

where ln: natural logarithm, Catch: catch in number, YR: effect of year, QT: effect of quarter, AR: effect of area, INTER: interaction terms between YR*AR, YR*QT and AR*QT. Analysis was made though the GLM procedure of computer software, "SAS Ver. 9.1".

Though fisherman should reports the number of hooks per basket (HPB) used in the each set, more than half of log books were not reported HPB. Because most of reported HPB information comes from the tropical area where fisherman uses more than 10 HPB and striped marlin were not so abundant, available information of HPB was considered not informative one to estimate the effect the gear configuration in the CPUE standardizations. Area stratification used in the analysis (Fig. 5) was decided in subject way based on the yearly and quarterly CPUE distribution pattern (Figs. 1 -3).

Results and Discussions

Figures 1 and 2 show the yearly CPUE distribution pattern of striped marlin caught by Japanese coastal longliners. Majority of catches were obtained in area north of 15N. High CPUEs were observed in around the front of Kuroshio Current as well as around Okinawa, Izu and Ogasawara Islands. Quarterly distribution pattern of CPUE indicates that seasonal north - south and east – west migration pattern of striped marlin.

Nominal CPUE of striped marlin (Fig. 4) decreased form 1998 to 2000, and increased slightly thereafter. Highest nominal CPUE was recorded in 2nd quarter and lowest CPUE recorded in 4th quarter. Ratio of non-zero catch set to the total showed gradual decreasing trends since 1998, and highest values were often observed in 2nd quarter. Standardized CPUE by area is shown in Figure 6. General trends of CPUE were not different between areas in temperate waters (areas 1 and 2) and tropical waters (area 4), which different from the standardized CPUE of Japanese offshore and distant-water obtained reverse trends between temperate and tropical areas. Estimated abundance index is shown in Fig. 7. General deceasing trends was obtained in the period between 1995 – 2004 and

average level of 2003 – 2004 is about 50 % of the average of 1995 – 1998.

In the present study, effect of gear configuration were not introduced in the model of the CPUE analysis. This would, however, affect on the results, but not serious as the case for the offshore and distant-water longliners because the periods of analyzed is rather short in this study. The beginning year of analysis 1994 is the time when deep longline set already becomes popular style, and no significant change of operation style (change of target species and depth of set hook) were occurred in Japanese coastal longliners. Further detailed analysis of data would enable to confirm this issue.

Reference

Yokawa, K. and H. Yamada. 2002. Preliminary analysis of CPUE of Pacific Bluefin Tuna Caught by Japanese coastal longliners in the spawning ground. ISC/BWG/02/12. 10p.

Yokawa, K. 2003. Preliminary results of study on the effect of gear configuration in CPUE standardization by GLM methods. ICCAT SCRS DOC, SCRS/2003/035, 19pp.

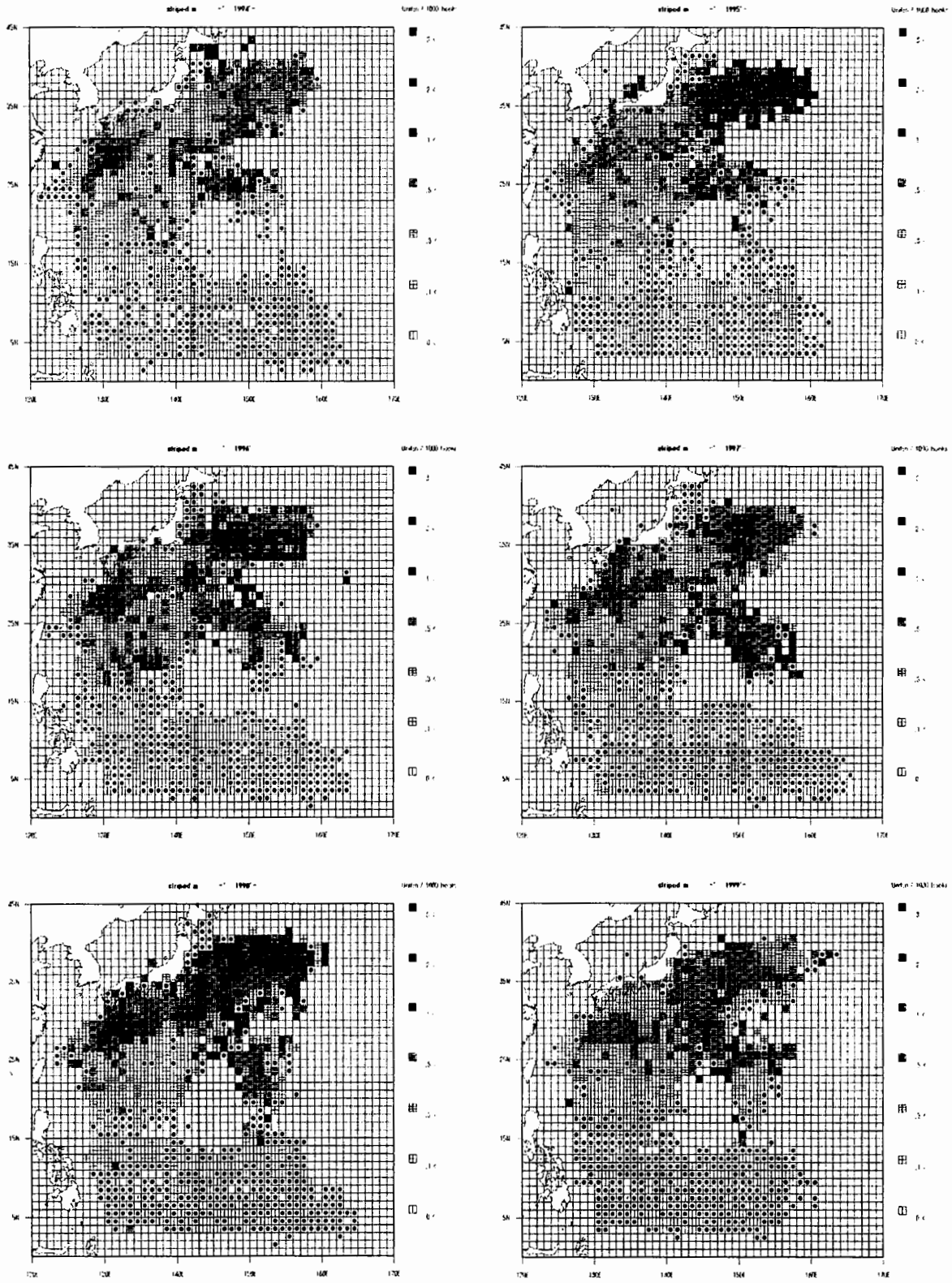


Fig. 1. Distribution of CPUE (number / 1000 hooks) of striped marlin caught by Japanese coastal longliners in the northwest Pacific for 1994 – 1999.

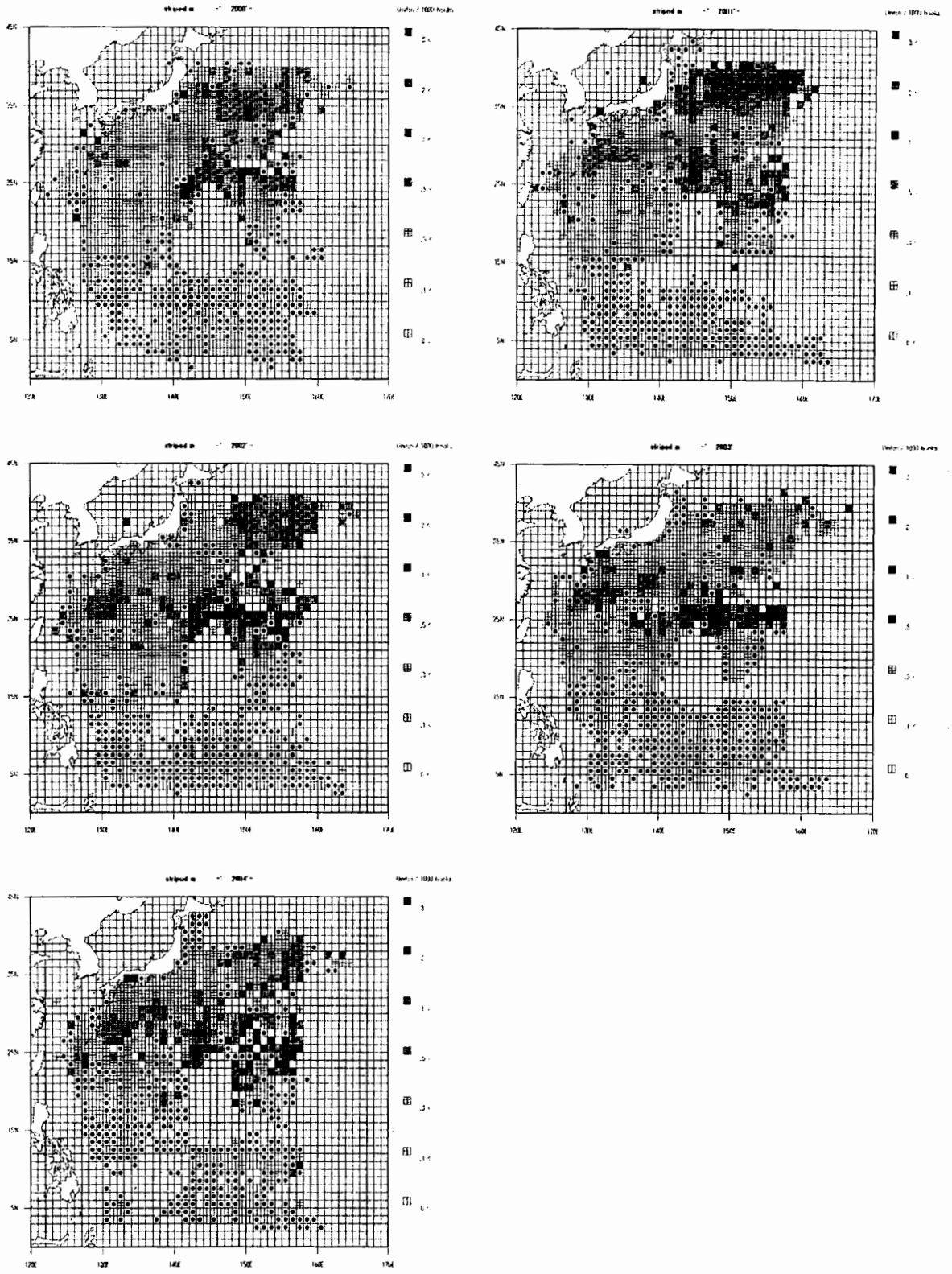


Fig. 2. Distribution of CPUE (number / 1000 hooks) of striped marlin caught by Japanese coastal longliners in the northwest Pacific for 2000 – 2004.

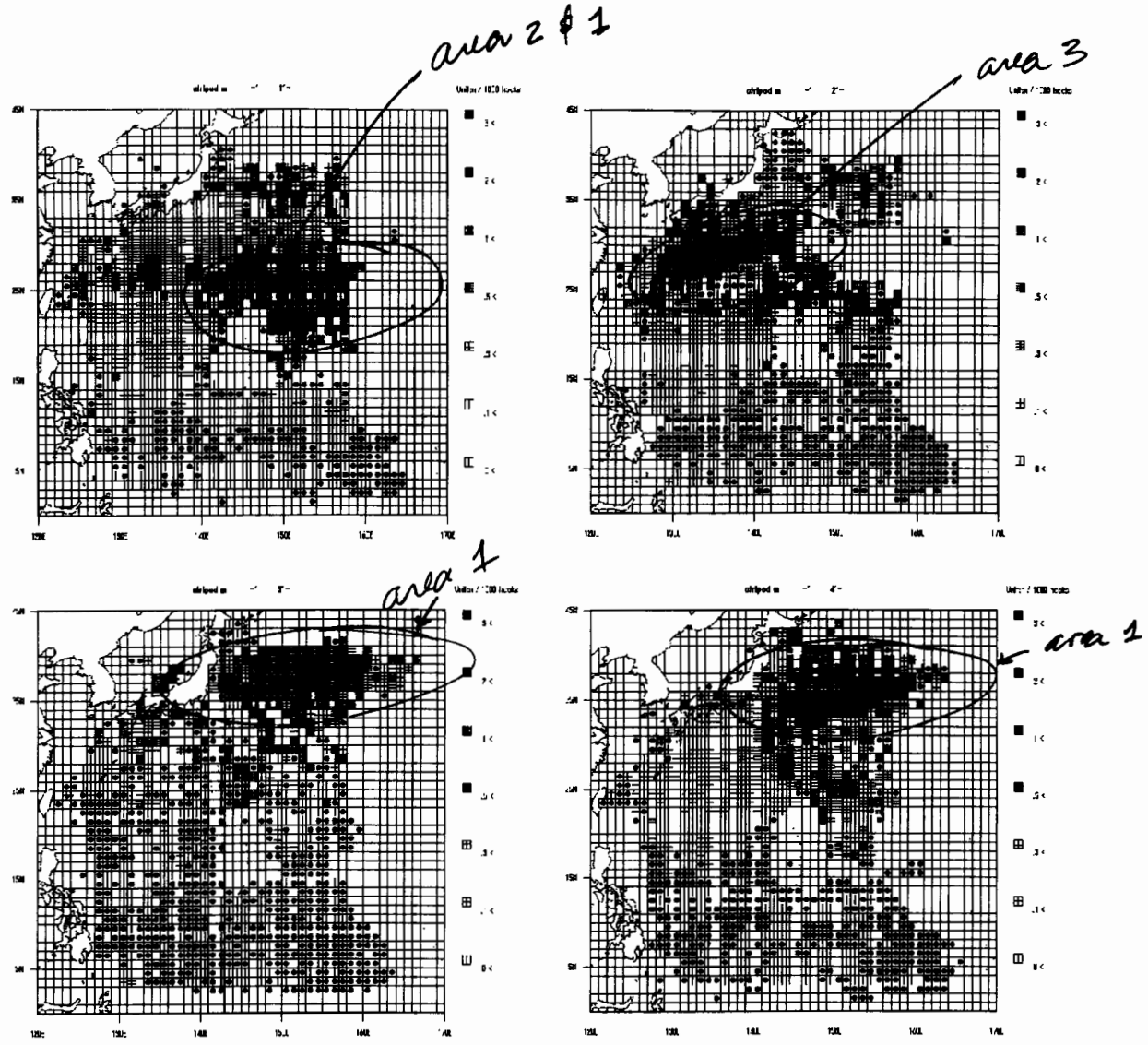


Fig. 3. Quarterly average distribution of CPUE (number / 1000 hooks) of striped marlin caught by Japanese longliners in the northwest Pacific for 1994 – 2004.

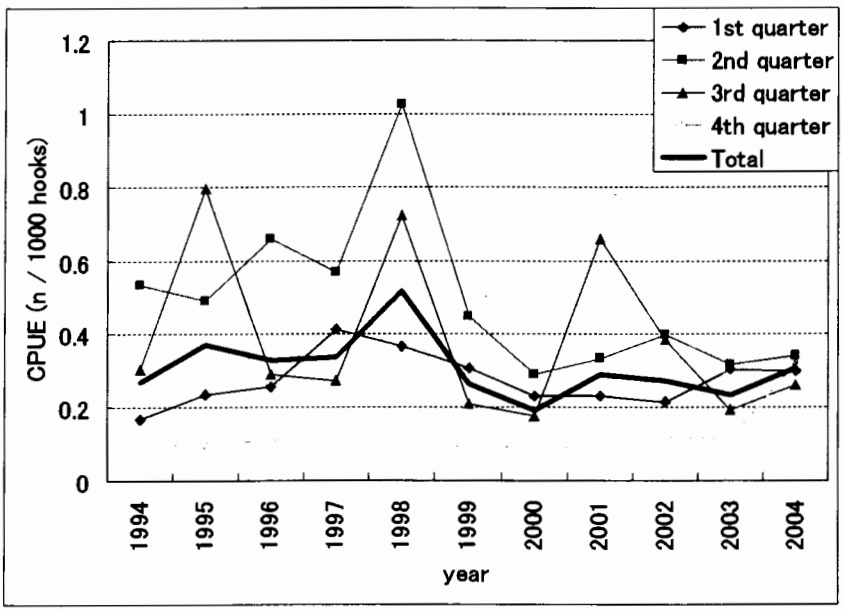


Fig. 4. Nominal CPUE (number / 1000 hooks) of striped marlin caught by Japanese longliners in the northwest Pacific for 1994 – 2004.

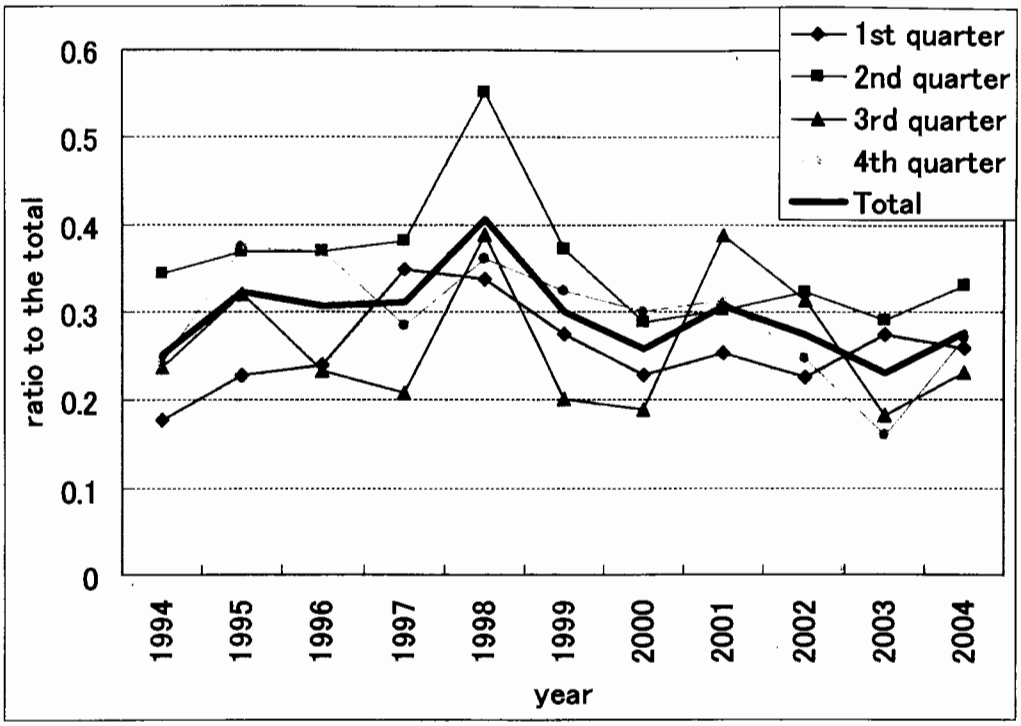


Fig. 5. Ratio of non-zero striped marlin catch to the total number of sets.

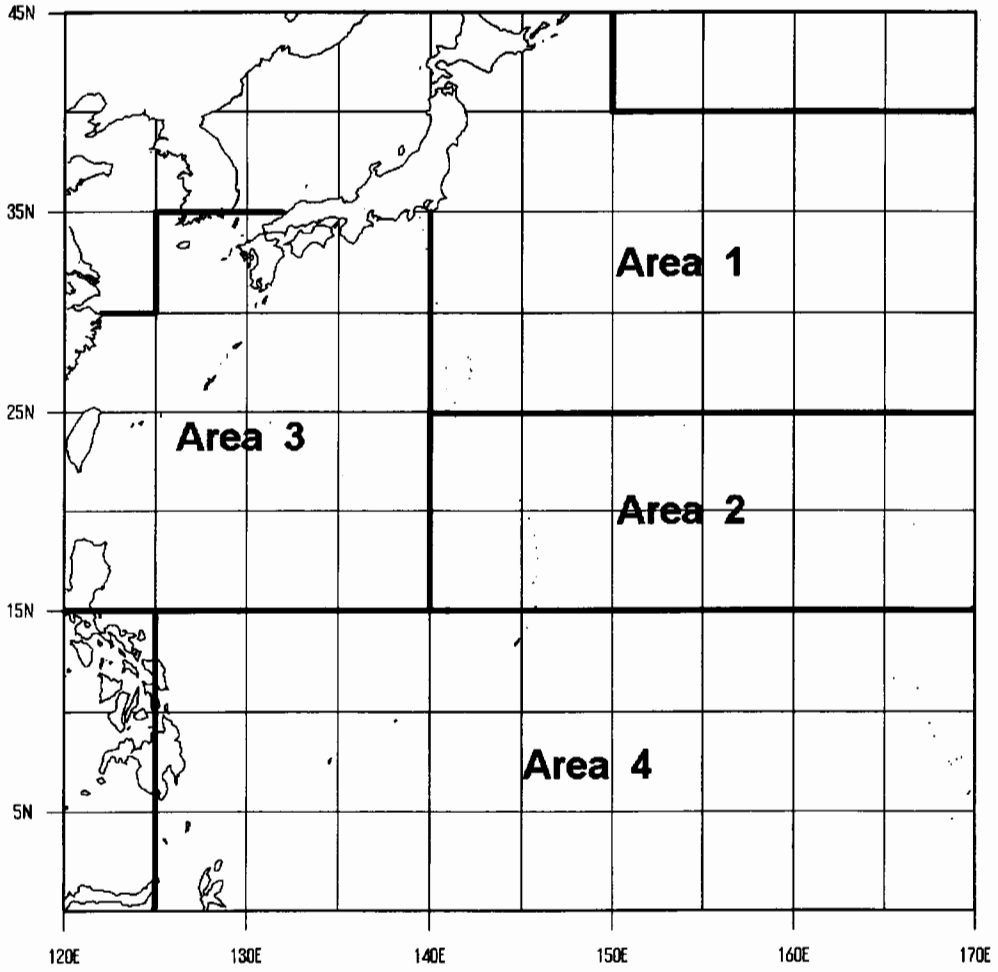
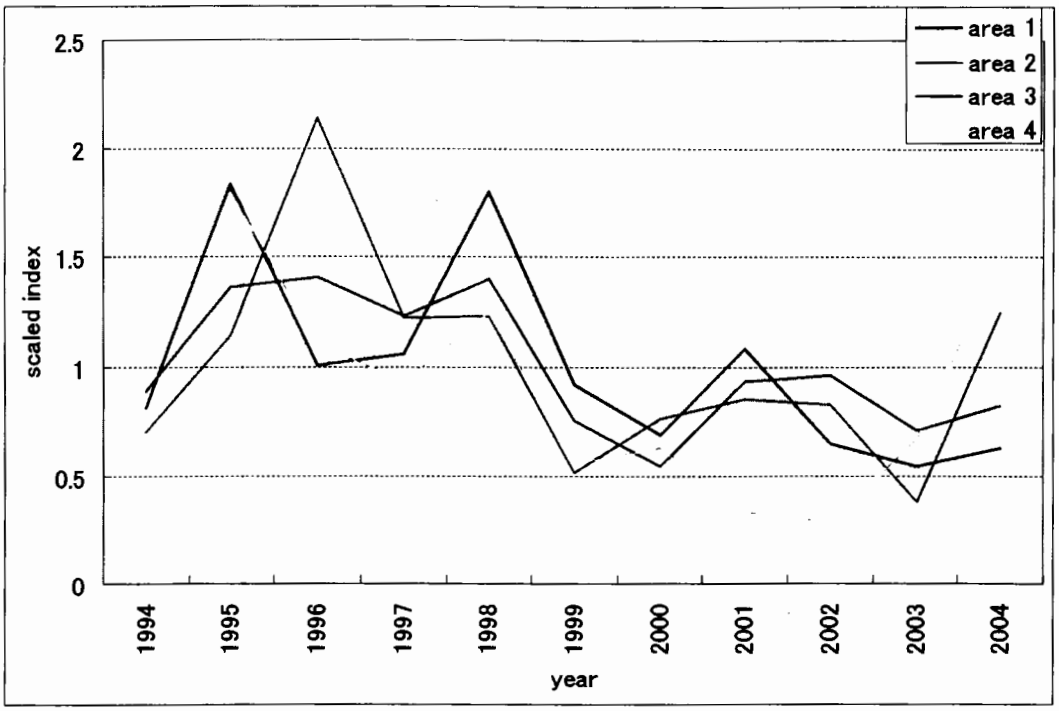


Fig. 5. Area stratification used in the CPUE analysis.



why signif. increase in areas 2 & 4 in recent years

Fig. 6. Standardized CPUE by area. All values scaled to their average which set at 1.0.

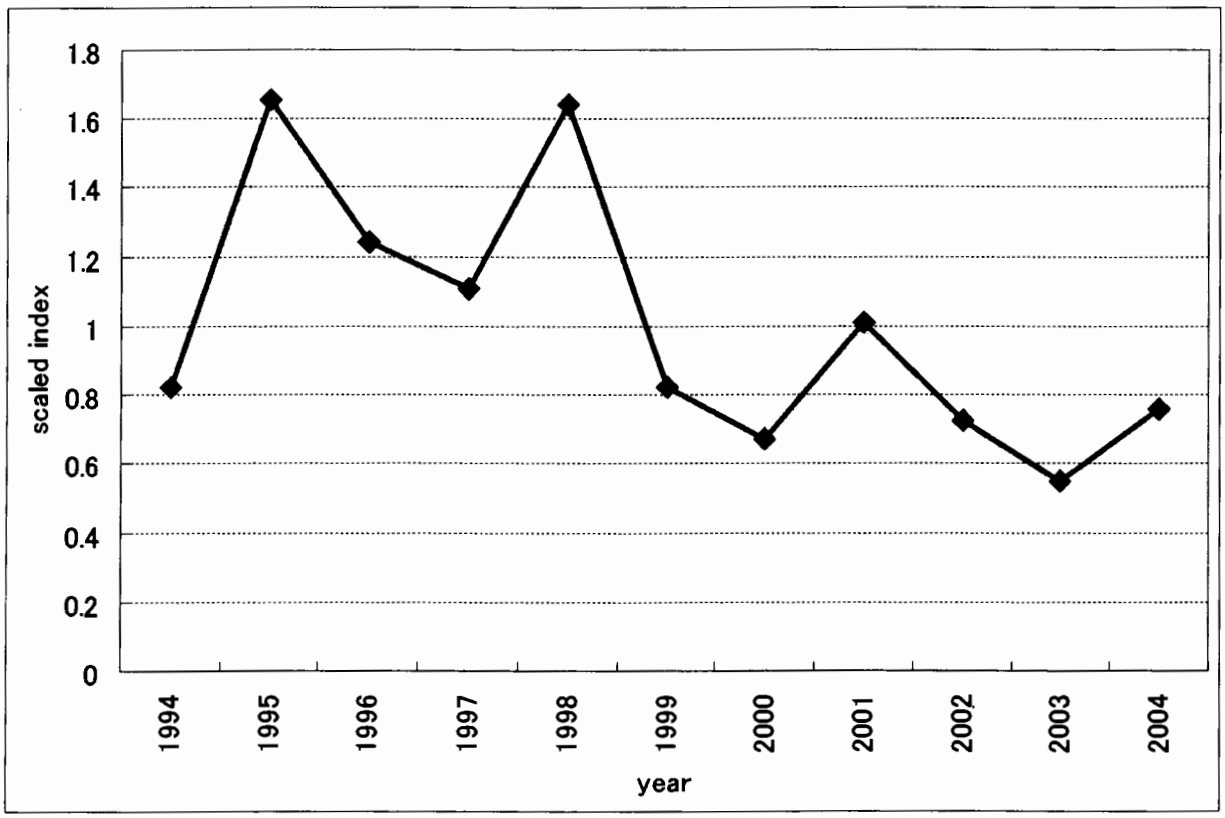


Fig. 7. Standardized CPUE of striped marlin caught by Japanese longliners in the northwest Pacific for 1994 – 2004. Standardized CPUE of each area (shown in Fig. 6) was weighted by size of each area and summed up to obtain total abundance index.