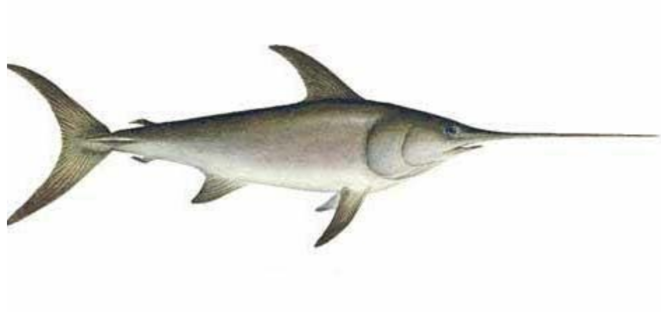
Update of the Standardized of CPUE of striped marlin caught by Japanese coastal longliners in the northwest Pacific

Kotaro Yokawa

National Research Institute of Far Seas Fisheries
5-7-1 Orido, Shimizu-ku, Shizuoka 424-8633, JAPAN

Email: yokawa@fra.affrc.go.jp



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Introduction

Japanese coastal longliners (defined as the longliners less than 20 tons) operated in the northwestern Pacific and their effort covers from the coastal area of Japan to around the 160E, from the equatorial area to the Kuroshio frontal zone (Yokawa, 2005). The striped marlin is exclusively caught by them as by-catch of tunas and swordfish. Yokawa (2005) conducted standardization of CPUE of striped marlin, and it was updated by Yokawa (2006). This document report the results of the update of the standardized CPUE of striped marlin caught by Japanese coastal longliners up to 2009 for its use in the stock assessments.

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 % in the early period and it increased into more than 95% in most recent years. 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 + HPB + INTER)

where ln: natural logarithm, Catch: catch in number, YR: effect of year, QT: effect of quarter, AR: effect of area, HPB: effect of the number of hooks between floats INTER: interaction terms between YR*AR, AR*HPB and AR*QT. Analysis was made though the GLM procedure of computer software, “SAS Ver. 9.2”.

Number of hooks between floats was categorized into 16 – 17, 18 – 20, and 21 – 23. Data of sets with the number of hooks between floats being larger than 23 and smaller than 15 were excluded from the analysis. Same area stratification as in the previous study (Fig. 1) (Yokawa, 2006) was used.

Results and Discussions

The standardized CPUE of striped marlin caught by Japanese coastal longliners in the northwest Pacific showed gradual decreasing trend since 2000 (Fig. 2). The relative wider confidence interval in 2009 would be due to the lower coverage of log-book in this year, which is supposed to be around 70 %. The results of ANOVA analysis indicates that the all factors in the GLM model are significant, and effect of area and quarter have a large influences on the standardization (Table 1). The standardized CPUE shows similar trend as the nominal CPUE (Fig. 3). The residual pattern shows clear binominal pattern, suggesting the incomplete standardization (Fig. 4). This would be due to the fact that part of Japanese coastal longliners uses similar number of hooks between floats for targeting different species such as bigeye tuna and albacore (Okamoto, person. comm..). Usually the change of target species could be accounted by the effect of areas and quarters because the fishing seasons and fishing grounds of different tunas are different, but this would not be the case for the data of Japanese coastal longliners. Collection of further information about operational pattern of Japanese coastal longliners should be necessary. The trend of positive catch ratio decreased in 2001 – 2006 and increased thereafter. In compare with offshore and distant-water longliners, the operation pattern of Japanese coastal longliners is more complicated as they are targeting Japanese fresh and raw tuna market, and the price of raw tuna is generally higher than the one of frozen tuna, and also the differences of prices among tuna species are not so large in the raw tunas than those in the frozen tunas. This condition supposed to cause the complex operational pattern of Japanese coastal longliners.

Reference

Yokawa, K. 2005. Standardizations of CPUE of striped marlin caught by Japanese coastal longliners in the northwest Pacific. ISC/05/MARWG/04. 8p.

Yokawa, K. 2006. Updates of standardized CPUE of swordfish caught by Japanese offshore and distant longliners in the North Pacific. ISC/06/MARWG&SWOWG-1/10. 9p.

Table 1. ANOVA output of SAS.

Source	DF	Type III SS	Mean Square	F Value	Pr > F
yr	15	1308.973	87.26486	44.96	<.0001
area	3	6695.914	2231.971	1150.06	<.0001
qt	2	1715.126	857.563	441.87	<.0001
gear	2	86.21981	43.10991	22.21	<.0001
yr*area	45	2029.159	45.09243	23.23	<.0001
area*qt	6	7471.808	1245.301	641.66	<.0001
area*gear	6	468.764	78.12733	40.26	<.0001

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	79	39381.47	498.4996	256.86	<.0001
Error	93510	181479.5	1.9407		
Corrected Total	93589	220861			

R-Square	Coeff Var	Root MSE	lcpue Mean
0.178309	-50.3088	1.393108	-2.76911

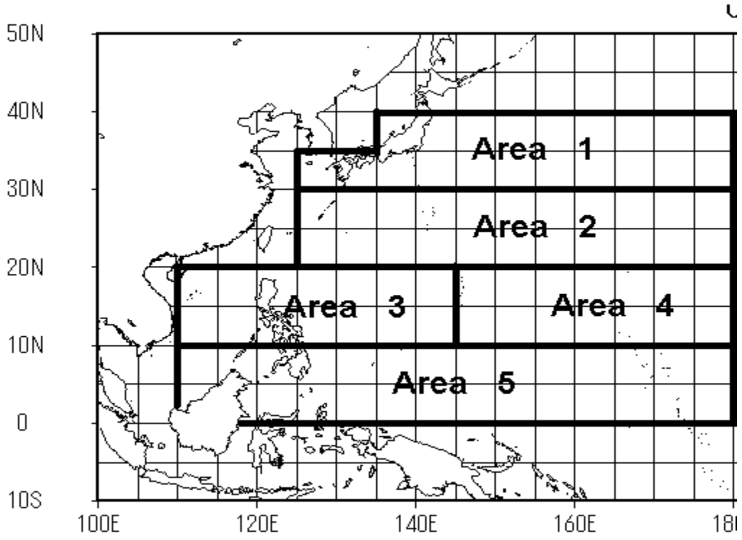

Fig. 1. Area stratification used in the CPUE analysis. Data in the area 5 is not used.

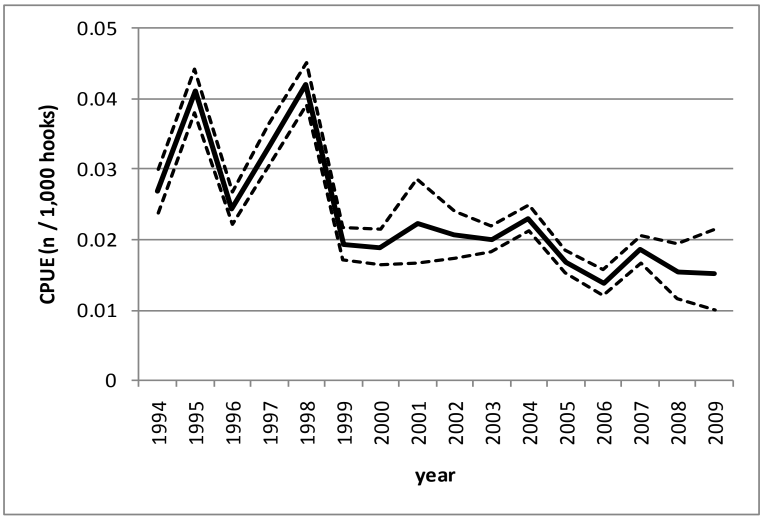

Fig. 2. Standardized CPUE of striped marlin caught by Japanese coastal longliners in the northwest Pacific, and its confidence interval.

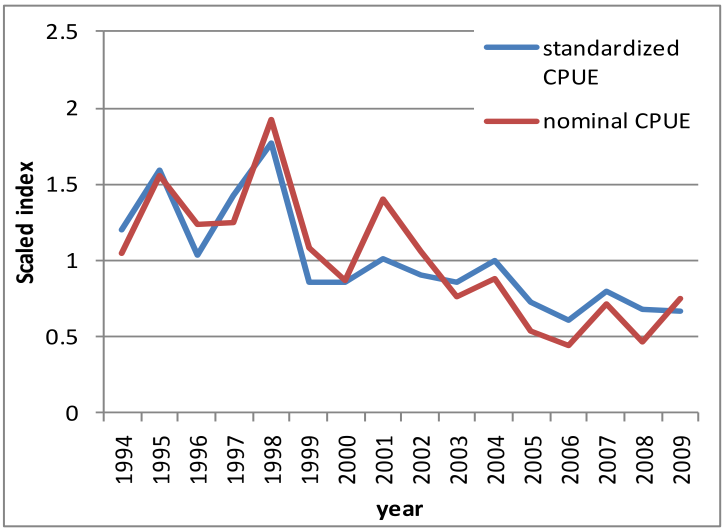

Fig. 3. Comparison between nominal and standardized CPUE. All values are scaled to their average set at 1.0.

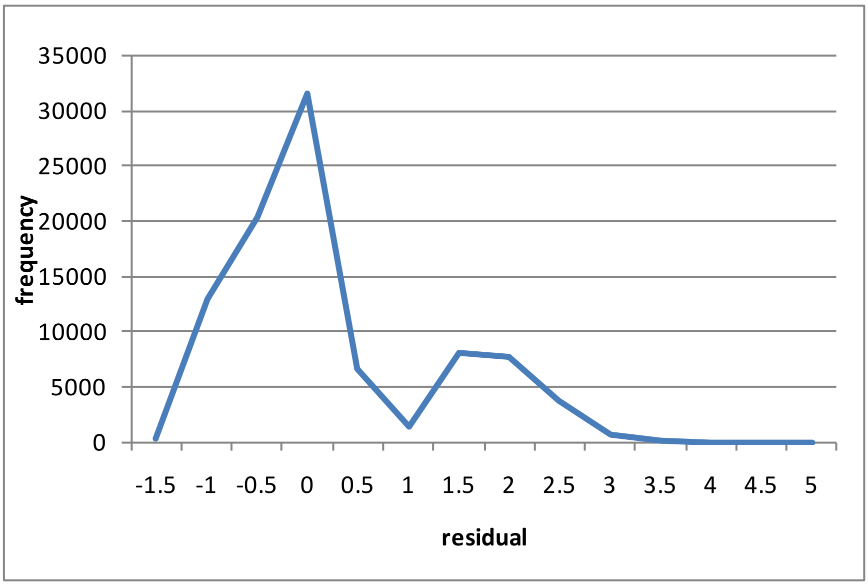

Fig. 4. Distribution pattern of frequency.

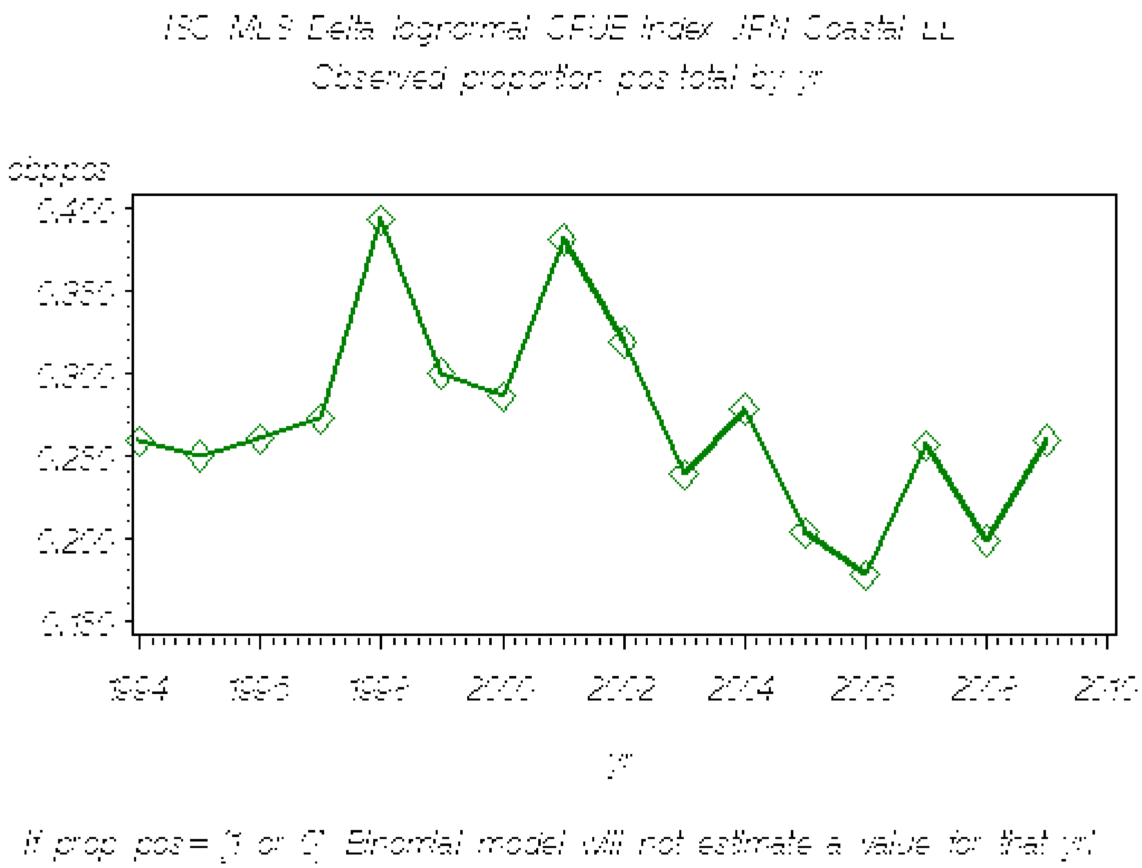

Fig. 4. Trend of positive catch ratio.