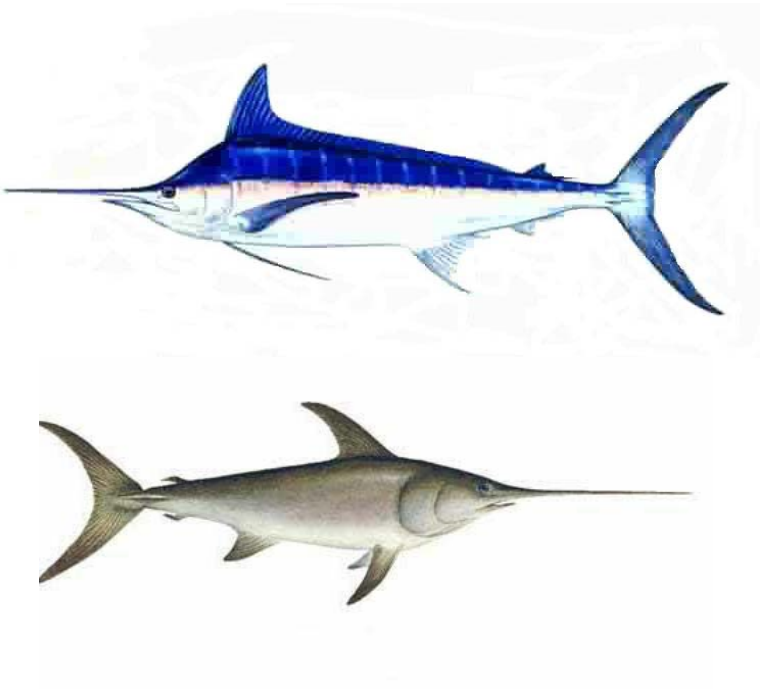
Analysis of area separation to standardize CPUE of striped marlin in the North Pacific Ocean

Minoru Kanaiwa
Tokyo University of Agriculture
196 Yasaka, Abashiri, Hokkaido, Japan 099-2493

Kotaro Yokawa
National Research Institute of Far Seas Fisheries
5-7-1 Orido, Shimizu, Shizuoka, Japan 424-8633



Working document submitted to the ISC Billfish Working Group Workshop, 19-27 January 2011, Honolulu, Hawaii, USA. Document not to be cited without author's written permission.

Introduction

Area separation is one of most important issue to analyze fishery data for stock assessment. Area separations by several assumptions are provided to clarify the robustness for MLS stock in the western and central North Pacific Ocean.

Data set

Catch and effort data used in this analysis was provided from the Japanese longline fishery statics compiled at the National Research Institute of Far Seas Fisheries for 1975-2009. The focused area is west side of 140W and north side of 0N. This data has the information of catch number and number of hooks and aggregated by month, 5x5 degree blocks area and gear configuration, i.e. the number of branch lines between floats (hooks par baskets: HPB).

Method

1) Area separation by GLM tree method conducted by Ichinokawa & Brodziak 2010. Because of consideration on historical change of HPB, several data selection was tried.

The followed equation is used as GLM,

log(cpue+Constant) ~ year*area + year*s(hpb)+quarter*area+nominal error

Here, s() means spline equation using GAM library in R 2.12.0.

All settings of used data for sub-scenarios are followed.

1-a) all possible data

1-b) data which hooks per basket (HPB) is larger than 7

1-c) data which hooks per basket (HPB) is larger than 12

1-d) data which hooks per basket (HPB) is smaller than 8

1-e) data between 1982 and 1986

2) Area separation by Kanaiwa & Yokawa 2010

Result and Discussion

For method 1, the results which area divided to 2 - 10 areas are shown. For method 2, only the results which area divided to 2 areas are shown (Fig. 1-6). The trends of area separations are similar among all scenarios. Especially, there are two features in common among all scenarios. First is that the line between 10 and 15N sever the area north from south. Second is that the line between 150 and 170E sever northern area east from west. These two separation lines are considered robust separators regardless of the assumption of CPUE standardization. Scenario 1-a

include more number of data than other scenarios and less assumption. Therefore, separation with 5areas by 1-a is recommended as the 1st step of the CPUE analysis of striped marlin caught by Japanese offshore and distant-water longline.

Because the operational pattern and target species seems to be changed even for the operations conducted in the same area and season, further analysis, such as more strict selection of data used in the analysis, would be necessary.

References

Ichinokawa M. and J. Brodziak 2010 Using adaptive area stratification to standardize catch rates with application to North Pacific swordfish (Xiphias gladius) Fisheries Research 106: 249-260

Kanaiwa, M. and K. Yokawa 2010 Preliminary analysis of area boundary to standardize CPUE of stripe marlin in the North Pacific Ocean. ISC10/BILLFISH/2-xx. 15pp.

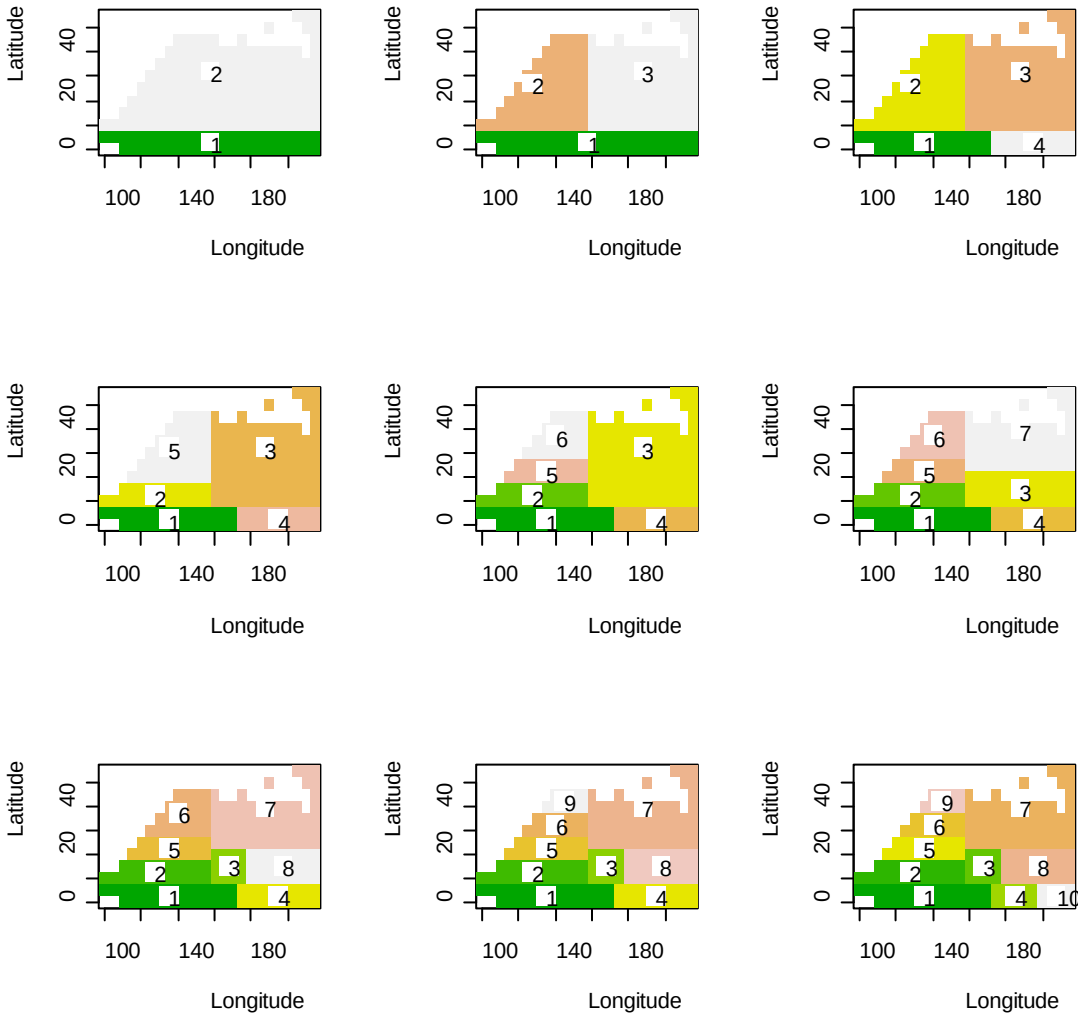


Fig. 1 Area separation using all possible data by GLM-tree (1-a).

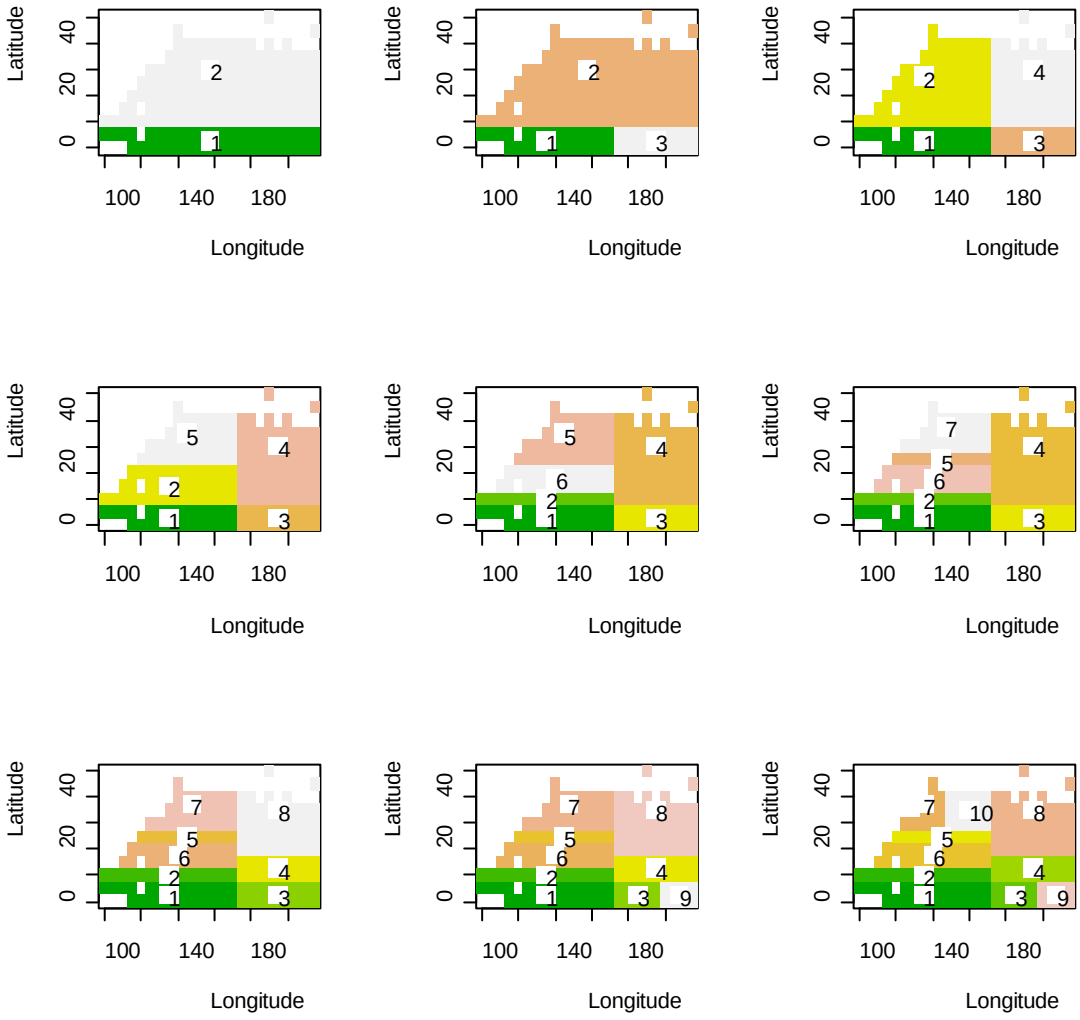


Fig. 2 Area separation using data with HPB > 7 by GLM-tree (1-b).

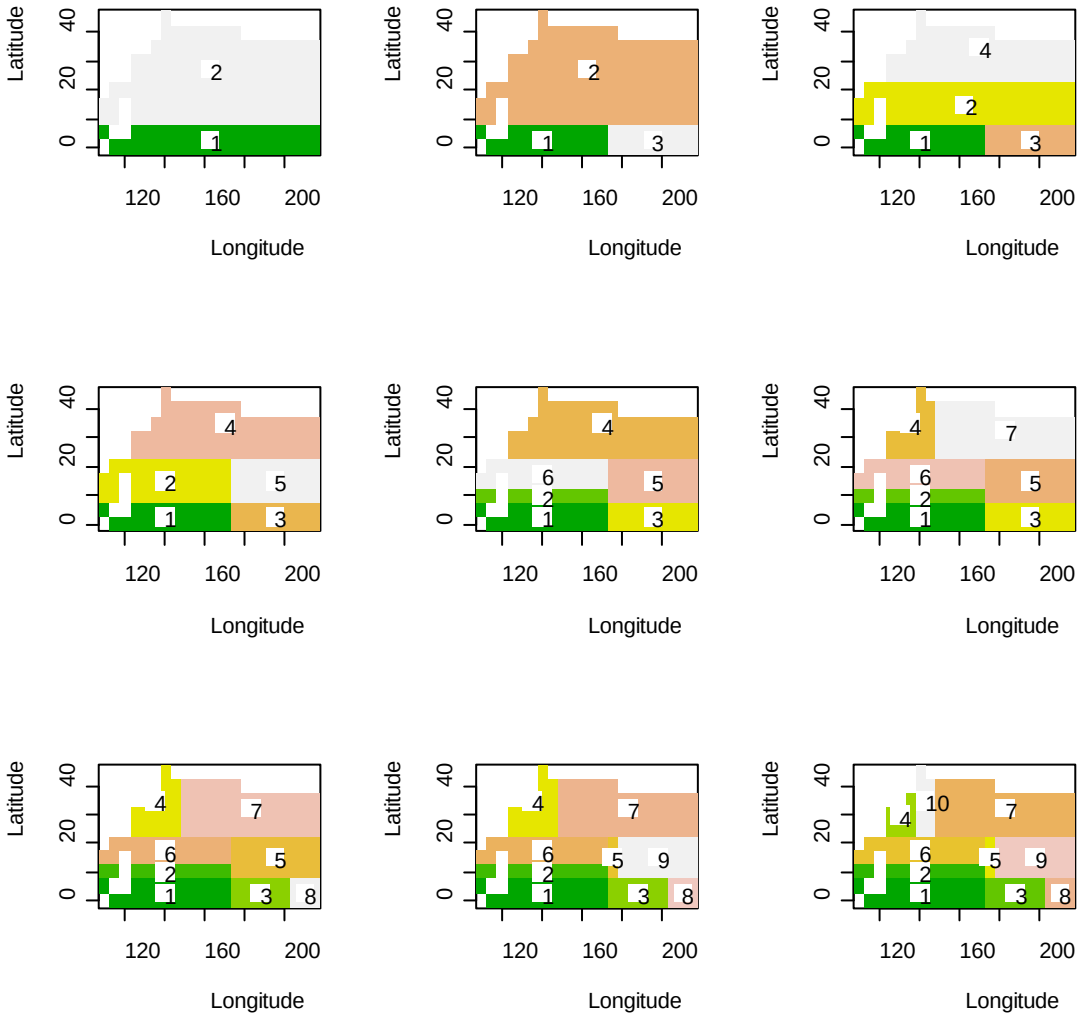


Fig. 3 Area separation using data with HPB > 12 by GLM-tree (1-c).

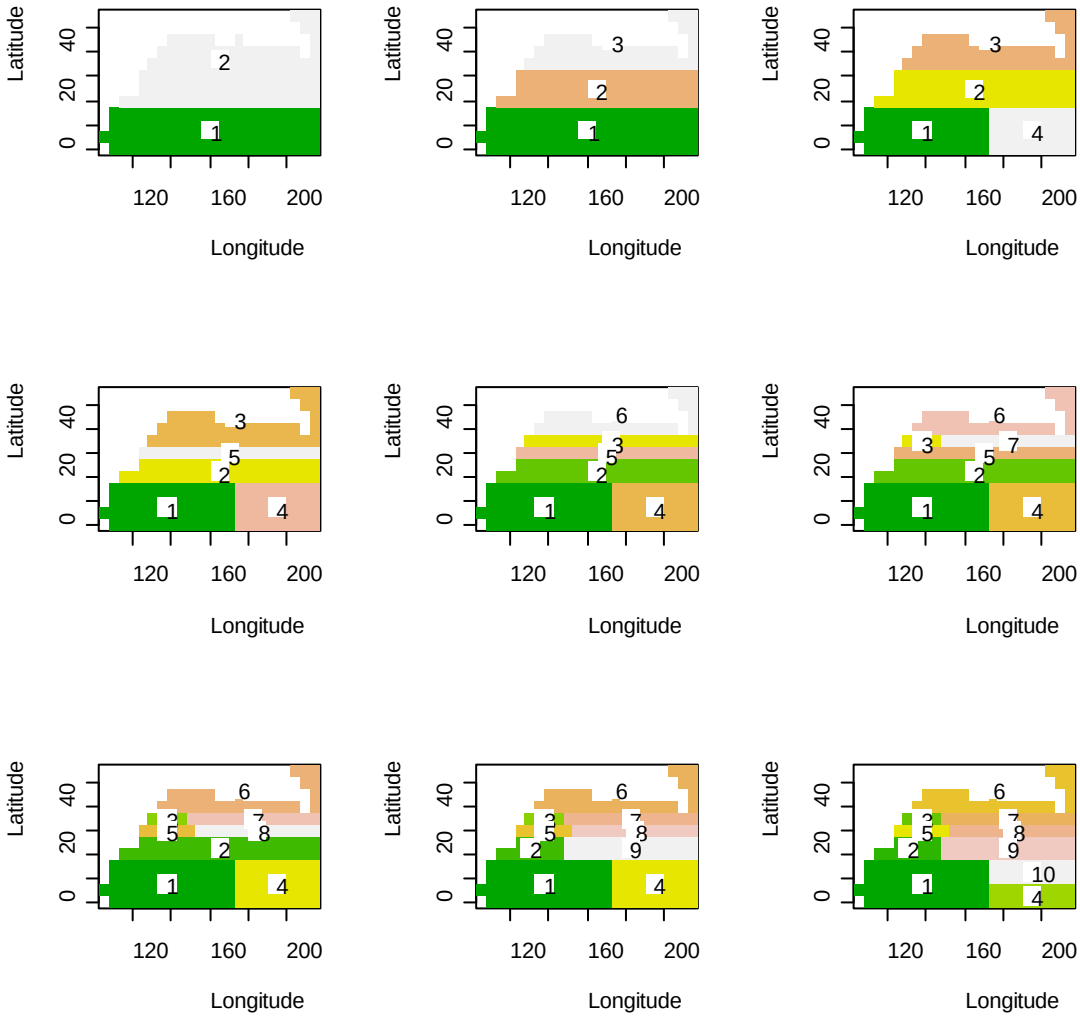


Fig. 4 Area separation using data with HPB < 8 by GLM-tree (1-d).

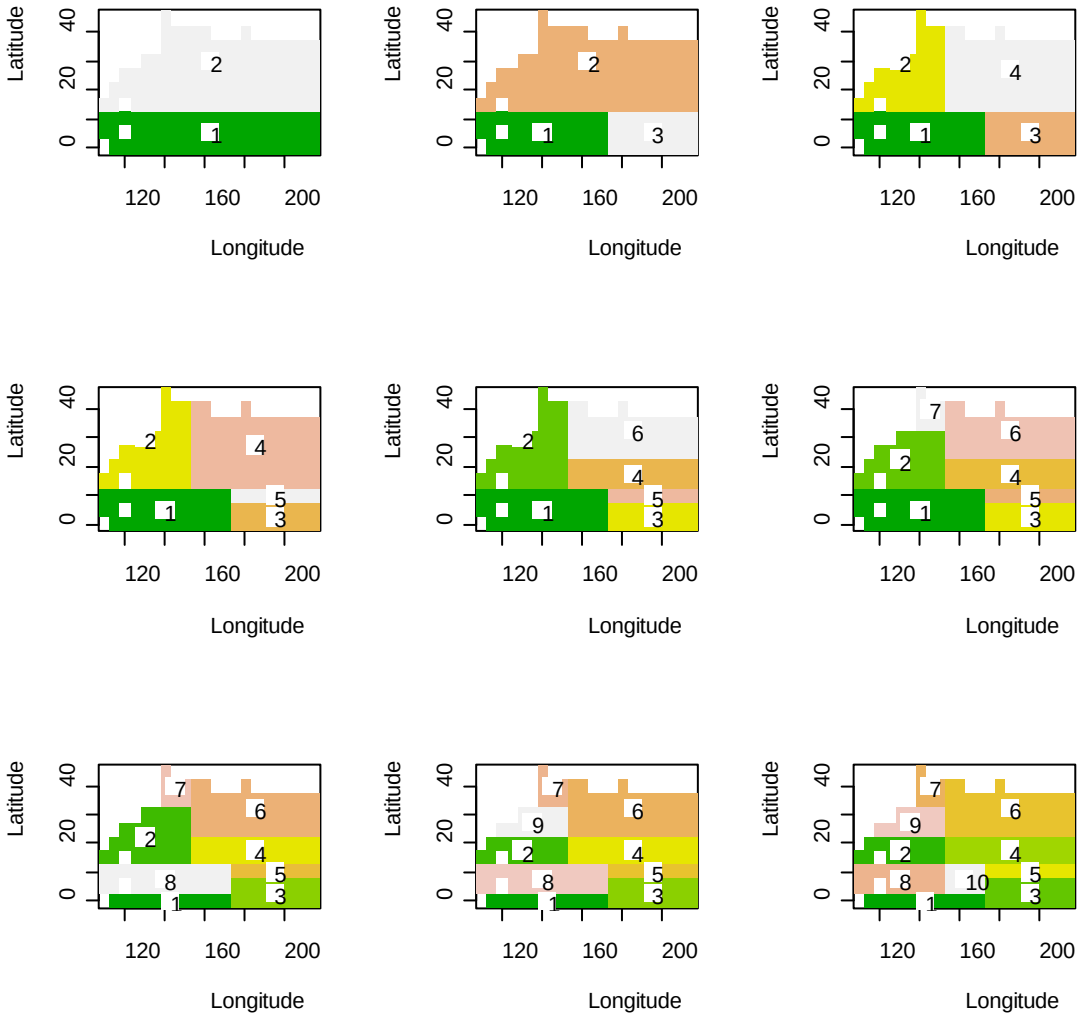


Fig. 5 Area separation using data between 1982 and 1986 by GLM-tree (1-e).

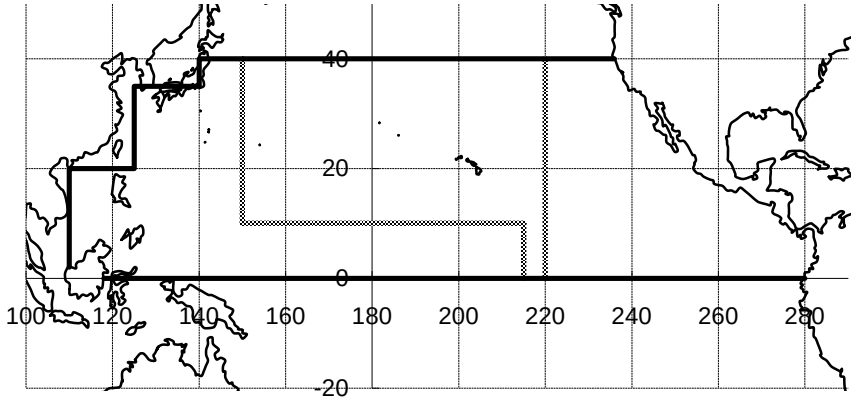


Fig. 6 A rea separation by using data between 1982 and 1986 by Kanaiwa & Yokawa 2010 (2).