Comparison between “ST windows” index and Core vessels CPUE indices by different Area/month combinations

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To examine differences of trends between the STwindows index and standardized CPUE indices (w0.5 and w0.8 indices) based on the core vessels data, we separately calculated the CPUE indices for the STwindows Area /month combination (i.e., Area 8/September and October plus Area 9/May and June) and for other two Area/month combinations. An overall look of trends of the w0.5/w0.8 indices within the STwindows Area/month were more similar to that of the STwindows index than trends of the w0.5/w0.8 indices outside of the STwindows Area/month were. Further, the trend of the w0.5 index within the STwindows Area/month appeared to be more similar to that of the STwindows index than the trend of the w0.8 within the STwindows Area/month did, suggesting that the STwindows index behaves more like the Variable Square (VS) index than like the Constant Square (CS) index. A large difference of trends between the STwindows index and the overall w0.5/w0.8 indices for Areas 4 to 9/April to September which has been observed in recent years is caused by an upturn of the w0.5/w0.8 indices for Areas 4 to 7/April to September.

STwindows 指数とコア船データを基にした標準化 CPUE 指数（w0.5 及び w0.8 指数）のトレンドの違いを検討するために、STwindows の海区/月の組み合わせ（8 海区/9 月・10 月プラス 9 海区/5 月・6 月）及びその他 2 つの海区/月の組み合わせに対し、CPUE 指数を別々に算出した。STwindows の海区/月内の w0.5/w0.8 指数の全体的なトレンドは、STwindows の海区/月外の w0.5/w0.8 指数のトレンドよりも STwindows 指数のトレンドに似ていた。さらに、STwindows の海区/月内の w0.5 指数のトレンドは、STwindows の海区/月内の w0.8 指数のトレンドよりも STwindows 指数のトレンドに似ているように見えた。これは STwindows 指数がコンスタントスクエア（CS）指数よりもヴァリアブルスクエア（VS）指数に似た挙動をすることを示唆している。STwindows 指数と 4-9 海区/4-9 月に対する全体的な w0.5/w0.8 指数のトレンド間に近年見られる大きな差は、4-7 海区/4-9 月に対する w0.5/w0.8 指数の上昇が原因である。

Introduction

This paper was prepared for responding to the action raised under agenda 5a of the CCSBT Modelling Group Webinar (Anonymous 2012a) to discuss further about existing CPUE models. To examine differences of trends between the STwindows index and standardized CPUE indices (w0.5 and w0.8 indices) based on the core vessels data, we separately calculated the CPUE indices for the STwindows Area[1]/month combination (i.e., Area 8/September and October plus Area 9/May and June) and for other two Area/month combinations. Historical changes in the number of 1x1 degree squares by Area/month were also examined for considering whether a spatiotemporal coverage of the STwindows Area/month combination is still valid to capture the stock dynamics in a region where fishing is consistently occurs from past to future.

Method and Data used

Standardized longline CPUE indices (namely w0.5 and w0.8 indices) were separately calculated for the STwindows Area/month combination (i.e., Area 8/September and October

[1] In this paper, "Area" means the CCSBT Statistical Area.

plus Area 9/May and June) and for other two Area/month combinations (Area 8/September plus Area 9/April and July to September, and Area 4 to 7/April to September) using the same standardization model and data described in Anonymous (2012b) and Itoh (2012). These Area/month combinations were illustrated in Fig. 1.

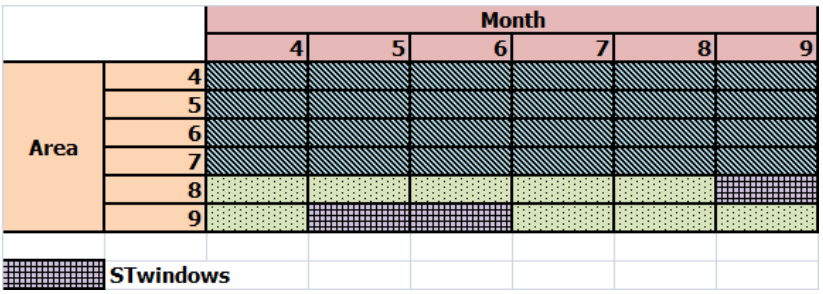

Fig. 1. Schematic illustration of the STwindows Area/month combination and other two Area/month combinations considered.

First w0.5 and w0.8 for the period of 1986-2011 were separately computed for the three Area/month combinations using the "Base" model and core vessels data. Next w0.5 and w0.8 for 1969-2008 were also calculated for the three spatiotemporal combinations using the "Nishida & Tsuji 1998" model and all vessels (i.e., both core and other vessels) data. Then the core vessels w0.5 and w0.8 indices were calibrated to the historical all vessel w0.5 and w0.8 indices to obtain the entire time series of 1969-2011. For more detail description of the data and method used, see Anonymous (2012b) and Itoh (2012).

Note that w0.5 and w0.8 indices for the STwindows Area/month examined in this paper were actually for Area 8/September plus Area 9/May and June combination (not included Area 8/October which is in the STwindows Area/month). The spatiotemporal coverage of CPUE input data for core and all vessels used in GLM standardization was Areas 4 to 9/April to September, so that Area 8/October could not be included in index calculation.

Bar plots for examining historical change in the number of 1x1 degree squares by Area/month were prepared using catch and effort data for all vessels.

Results and Discussion

Comparisons of trends between the STwindows index and standardized CPUE indices (w0.5 and w0.8 indices) by different Area/month combinations were shown in Fig. 2. Although there were some differences in parts, an overall look of trends of the w0.5/w0.8 indices within the STwindows Area/month (dashed lines) were more similar to that of the STwindows index (blue bold lines) than trends of the w0.5/w0.8 indices outside of the STwindows Area/month were (thin and dotted lines). Further, the trend of the w0.5 index within the STwindows Area/month (dashed line in lower figure) appeared to be more similar to that of the STwindows index than the trend of the w0.8 within the STwindows Area/month did (dashed line in upper figure). This suggests that the STwindows index behaves more like the Variable Square[2] (VS) index than like the Constant Square (CS) index (because the w0.5 is a 0.5/0.5 weighted index of VS and CS while the w0.8 is 0.2/0.8 weighted).

A large difference of trends between the STwindows index and the overall w0.5/w0.8

[2] For explanation of Constant Square and Variable Square CPUE interpretations, see Anonymous (2001)

indices for Areas 4 to 9/April to September which has been observed in recent years is caused by an upturn of the w0.5/w0.8 indices for Areas 4 to 7/April to September (dotted lines in Fig. 2)

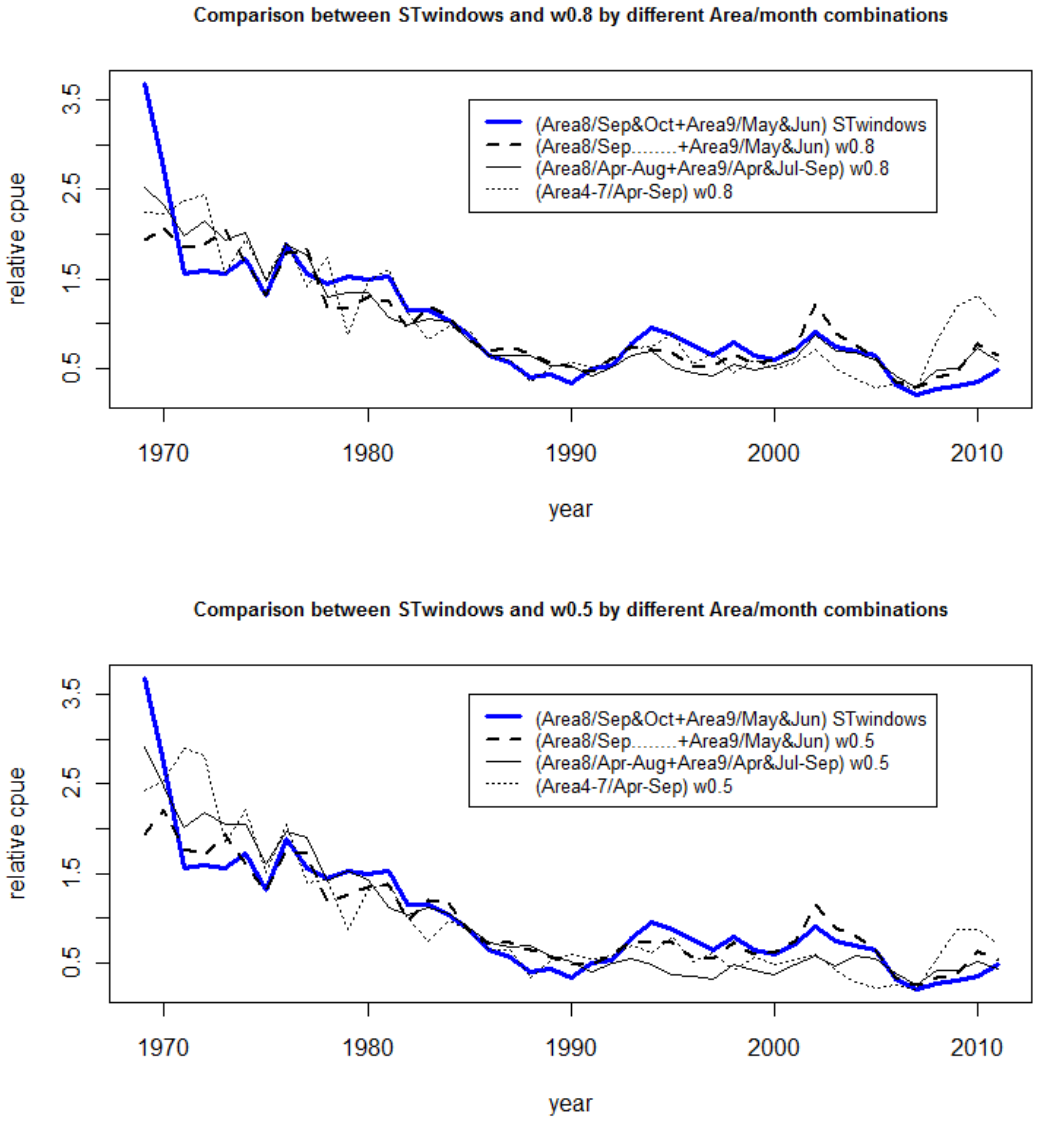

Fig. 2. Comparisons of trends between the STwindows index and standardized CPUE indices (w0.5 and w0.8 indices) by different Area/month combinations.

Historical changes in the number of 1x1 degree squares by Area/month were shown in Fig. 3. Area 9/May and June, one half of the STwindows Area/month combinations, have still consistently been fished by Japanese longliners, although the fished area (the number of fished 1x1 degree squares) in this Area/month combination has decreased to about 50% since the introduction of individual quota (IQ) system into Japanese longline fishery and the quota reduction in 2006. By contrast, in Area 8/September and October, the other half of the STwindows Area/month, the fished area has continued to decline since the mid 2000s. The

numbers of fished 1x1 degree squares counted very low figures in 2010 and 2011. These decreases in the fished area having been observed since the mid 2000s, especially in Area 8/September and October, raise a serious concern about validity of the STwindows appropriately capture the stock dynamics in a region where fishing is consistently occurs from past to future.

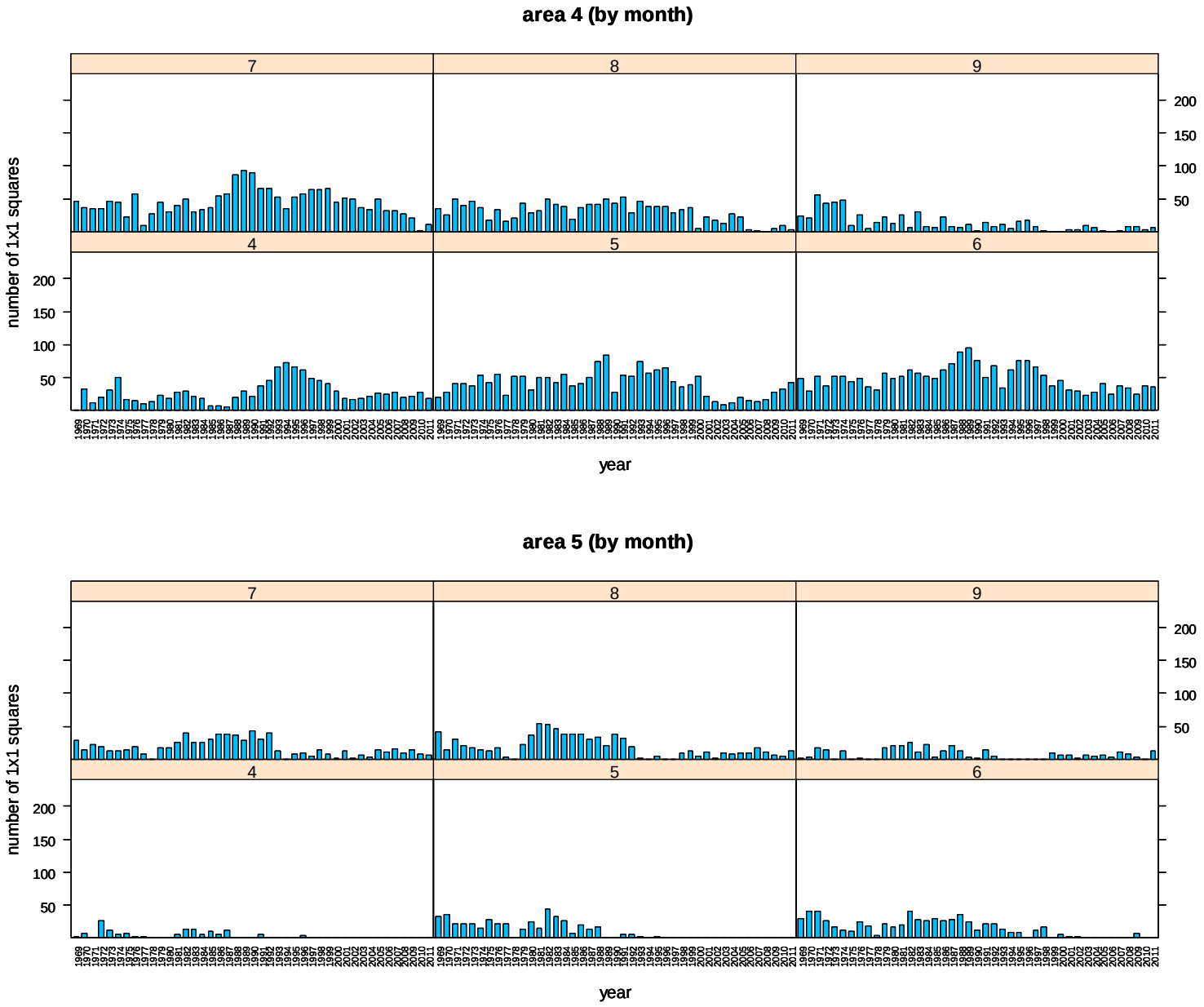

Fig. 3. Historical changes in the number of 1x1 degree squares by Area/month.

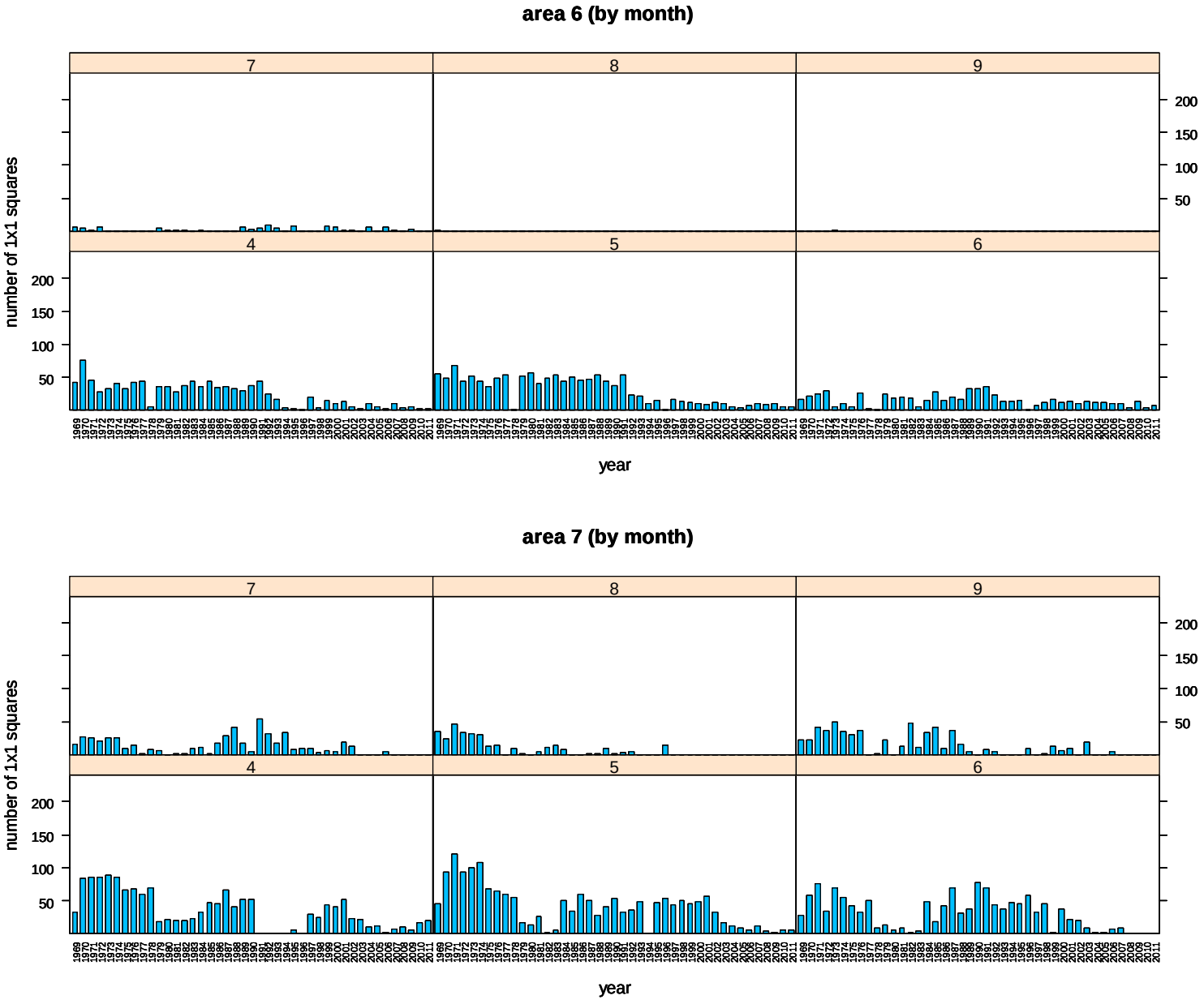

Fig. 3. Historical changes in the number of 1x1 degree squares by Area/month. (cont'd)

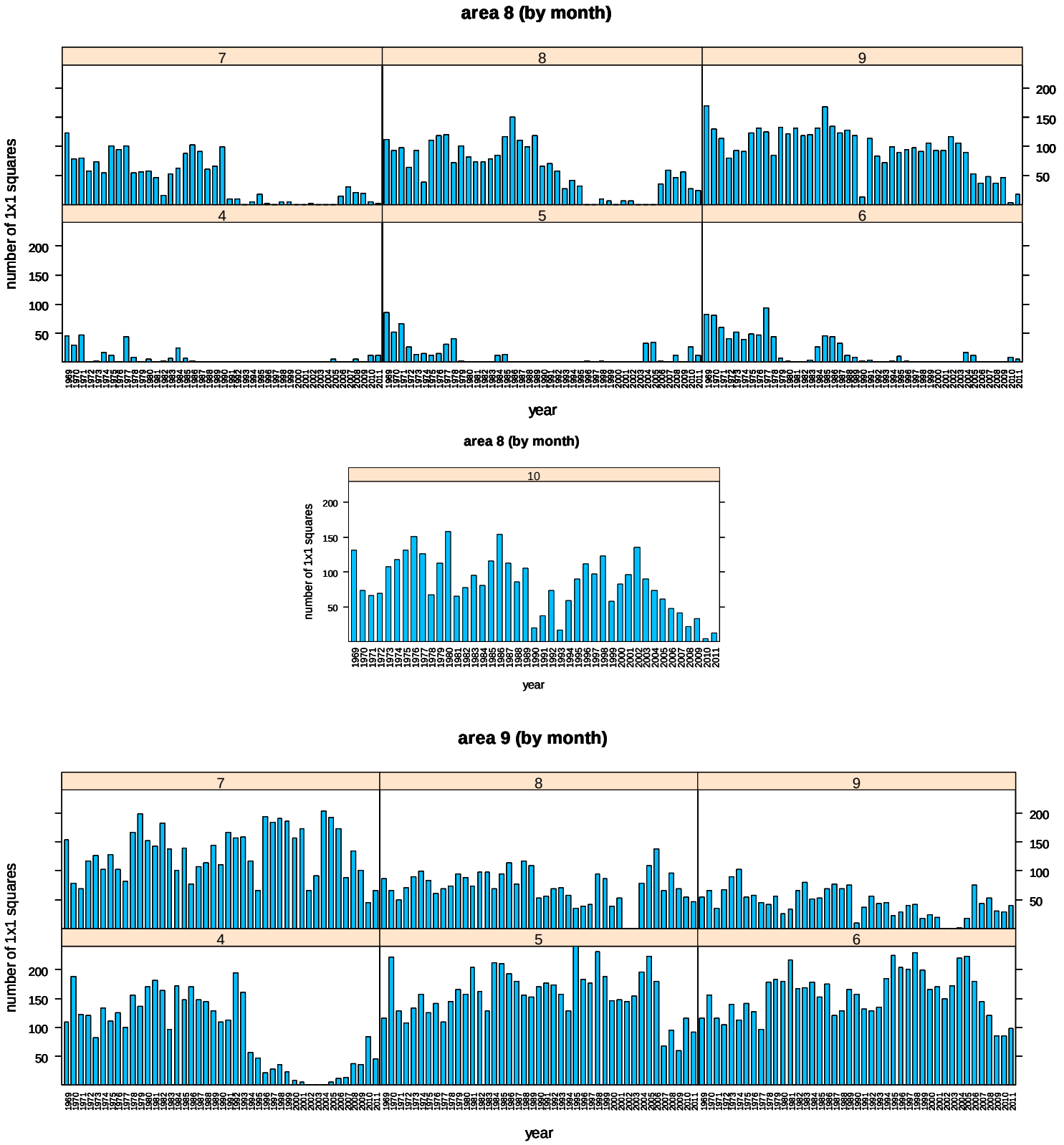

Fig. 3. Historical changes in the number of 1x1 degree squares by Area/month. (cont'd)

References

Anonymous. 2001. Report of the SC to CCSBT on the Scientific Research Program. Attachment D in Report of the Fifth Meeting of the Commission for the Conservation of Southern Bluefin Tuna, Scientific Committee. 19-14 March 2001, Tokyo, Japan.

Anonymous. 2012a. Report of the CCSBT (Commission for the Conservation of Southern Bluefin Tuna) CPUE Modelling Group Webinar (April 2012). CCSBT-ESC/1208/11.

Anonymous. 2012b. DRAFT Specifications of the CCSBT Management Procedure. CCSBT-ESC/1208/06.

Itoh, T. 2012. Description of CPUE calculation from the core vessel data for southern bluefin tuna in 2012. CCSBT-ESC/1208/35.