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Review of IOTC-2011-WPTmT03-16 – Standardized CPUE of Indian albacore (Thunnus alalunga) based on Taiwanese longline catch and effort statistics dating from 1980 to 2010. By Feng-Chen Chang, Liang-Kang Lee, Chiee-Young Chen, and Shean-Ya Yeh.

Simon Hoyle

This paper presents standardized indices of Indian ocean albacore based on TW catch and effort data aggregated by month and 5 degree square. The model used is

$$\log(CPUE_{ijklmn}+const) = \mu + YEAR_i + QUARTER_j + SUBAREA_k + CODEBET_l + CODEYFT_m + CODESWO_n + \xi_{ijklmn}$$

One of the main issues affecting albacore catch rates is target switching between albacore and bigeye/yellowfin. The paper identifies two vessel classes, traditional longliners targeting mainly albacore and deep longliners targeting bigeye/yellowfin. This is useful information and matches information presented by Chang et al (2011). It would be important to separate these effort types and analyze them independently. I believe information is available in the Taiwanese operational data, and also in the licensing information for individual vessels, which would allow the different vessel classes to be separated. Without this separation, analyses of pooled data representing different targeting strategies are unlikely to provide useful CPUE indices, since the year effect trends are likely to be substantially affected by target change.

The paper names the data as 'task2 data series' – can task2 be defined?

In the aggregated data, coded categories are included to represent catch rate of other species, bigeye, yellowfin, and swordfish. This approach can be problematic when abundances of the other species change through time or spatially, or when data are aggregated across target types; and all of these issues apply in this analysis. Including these factors can result in a more flat, stable CPUE trend, independent of the abundance trend.

It would be very informative to investigate and present the effect of including each factor in the model on the albacore CPUE trend. This would help us to understand the relationships described by the model terms. Similarly, it would be useful to present the parameter estimates both numerically and graphically, rather than just presenting the Anova outputs which give quite limited information.

Each model includes the entire spatial extent, which assumes the same error distributions apply across the whole spatial and temporal domain. This differs from the approach used for WCPO and EPO analyses (e.g. Bigelow and Hoyle 2009, Hoyle 2010) – we find that analyzing subareas independently gives more consistent results. See Chang et al (2011) for a comparison of the two approaches. Error distributions are likely to vary in space, particularly between areas with very different albacore catch rates and targeting practices. Gear effects are also likely to vary spatially, but this is not included in the model.

It is useful to stratify the Indian Ocean into subareas with different catch rates. However, this stratification is then used only as a factor in the overall model, whereas it would be more useful to analyze subareas separately. A better approach for spatial variation within the model domain would be to use 5 degree square as an explanatory factor. It is often one of the most important explanatory variables in albacore CPUE standardization (e.g. Bigelow and Hoyle 2008, 2009) as well as for other species (e.g. Hoyle 2010, Chang et al 2011, Kiyofuji et al 2011). Including 5 degree square can significantly change the year effect. Examination of CPUE patterns by eye (figures 1 and 2) suggests large differences within subareas which could be accounted for in models by using 5x5 squares.

An issue that is specific to aggregated data analyses is the additive constant used to avoid taking the log of zero catch rates. In this case the additive constant used was used 10% of the mean CPUE. The choice of the added value can affect the result. It is useful to follow a rule of thumb, but various rules of thumb are available (see Maunder and Punt 2004 for several) and it seems likely that analyses of different datasets will perform best with different rules – objective methods for choosing the best value are available. However, a better approach may be to avoid this choice altogether by using an alternative statistical method such as a delta lognormal model (e.g. Lo et al 1992).

The paper states that the Q-Q plot shows mild abnormality, but I can't really agree with that. It looks quite non-normal which I suspect may result from combining several different distributions in one model.

The model explains 70% of the variation, but this is not unusually high give the aggregation of the data. Analysts should not base their perception of the reliability of their abundance index on the amount of variation explained (Maunder and Punt 2004).

Although HPB may be informative about fishing strategy (final paragraph) it is not a foolproof targeting indicator. There is far more useful information about fishing strategy in operational CPUE data, and I think analyses of these data would be the most productive way to move forward.

In summary I agree with the authors that the indices are unlikely to accurately represent the albacore abundance trend.

References

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