Suggestion for evaluating statistical models to estimate abundance indices[1]

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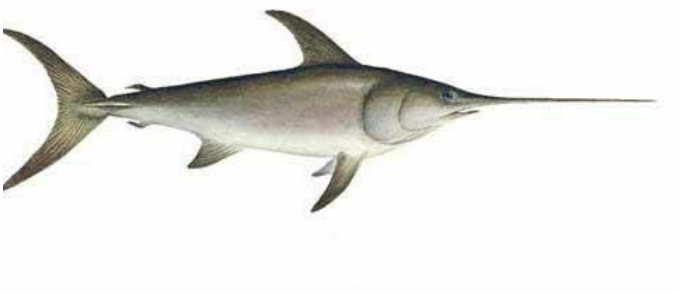

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Abstract

We have many problems in standardizing methods for abundance indices. One of biggest problems is how to evaluate the standardizing method, i.e. GLM, GAM, HBS, statHBS and their mixing methods, as "BEST MODEL" to figure out the real stock abundances. Here we suggest gathering small sets of "good birth data" which fishing area, catenary curve and habitat information are known and analyze them. These analyses must provide how informative usual fishery data are and clarify the limitation of usual fishery data. Then it might be helpful to evaluate the standardizing method for abundance indices.

Introduction and general problems

There are still some technical issues to be solved in standardizing methods for abundance indices. We don't have any basis to decide which methodology is really good. For example, Akaike's Information Criteria (AIC), Bayesian Information Criteria (BIC) or other information criteria are likely to prefer more complex models to simpler ones when there is quite large sample size of catch and effort data sets (Shono 2005). Of course such statistical way can solve a part of the problem but we need a methodology which can better incorporate biological characteristics of the data set. Here we will provide some discussion about these problems in standardizing methods for abundance indices and address future outline to solve them.

Discussion and recommendation

In the case of the statistical habitat based standardization (statHBS), one of the big problems is that we don't know whether currently available information about prior distribution of habitat preference, which is usually determined information of vertical distribution which is obtained from one or more of recovered archival tag, is informative or non-informative for habitat preference information. We may solve it in purely statistical way using Deviance Information Criteria (DIC: Gelman et al. 2004) or Generalized Information Criteria (GIC: Konishi & Kitagawa 1996) and it may be worth to try. In another way, if we include variance of habitat preference as parameter to be estimated, then the difference between predicted and observed variance may be good indicator of how good relation, or how bad conflict is there between catch data and habitat preference.

However these all methods mentioned above are probably not able to incorporate all biological process and may not be acceptable for some biologists. In addition because these information criteria can select the model which fits only to data without considering underlying biological processes, if observed data are skewed in their space-time structure, these methods will select that skew not truly best model. , At this time, we believe it is necessary first to

evaluate performance of difference methods by using a small subset of "good birth data" in which Time Depth Recorder (TDR) or hook timer data can be obtained from surveys by data as research and training vessel (Yokawa et. al. 2005). In same time we need to qualify the available data to analyze and clarify the spatial-time structure of analyze data. When there are not enough data or detail gear configuration information, for instance shallower setting of longline's information and/or traditional longline's information, then we may need to recommend more experimental surveys.

Hooks per basket (HPB) effect is one of the key factors for analyzing by-catch data like marlins, in particular for analyzing fishery data where there was drastic change historically in HPB like Japanese longline fishery. Even if HPB did not change so much, the target species may have changed. This can fail to estimate HPB effect. We don't know whether there is informative data now to detect such an effect. We need to evaluate the data both qualitatively and quantitatively.

Anyway we need to analyze the issues such as how variable the catenary curves of main line by boat by operation variable and affect catch rate, how habitat preference is related to observed depth distribution of the catches, how oceanography variables are related to it and/or what is the good level of the resolution both in oceanographic and fishery data. We may be able to answer such questions by using small set of "good birth data" and then proceed to further analyses with larger data set of commercial boat. We feel that is more realistic ways to go forward, given the uncertainties in the models, biological characteristics and fishery data for stock we are analyzing.

Reference

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