Guidelines for SWG-11-JM

The following recommendations given in the SWG October 2010 and September 2011 reports and provides guidance for the SWG-11 activities. Specifically, these reports note thatwhere possible and appropriate, the stock assessment should incorporate:

- The most up to date information on ageing, growth rates and size at maturity, including associated uncertainties ;
- Standardized catch-per-unit-effort data to be used in the model as abundance indices. The standardizations should account for historical changes in vessels, fishing areas and seasons, environmental factors and other relevant factors. Standardised CPUE indices will need to be provided by participants;
- All fishery and biological data available for 2011, and 2012 at the time of the assessment.

Further development of the model should consider:

- Further development of the preliminary analysis conducted in 2011 on biological and management reference points, including the evaluation of a range of alternative and appropriate targets and limits for fishing mortality and biomass levels.
- Evaluation of stock status under alternative stock structure assumptions.attempted
- The explicit modelling of length composition data;
- Evaluation of possible improvements to existing acoustic abundance indices;
- Sensitivity to alternative plausible levels of natural mortality and to age-variable natural mortality;
- Evaluation of the effect of minimum size limits and minimum fishery specific net mesh sizes on jack mackerel stock restoration.
- Investigation of changes in the geographical distribution of catches observed between 2010 to 2011 and the possible causes, such as changing environmental or other conditions, that would influence the distribution of the stock.
- The link between concentrations of juvenile fish observed in 2009 and 2010 by several fleets fishing in the high seas and the higher catches of young fish observed in coastal shelf areas in 2011.

Whereas the WG was unable to address each of these exhaustively, a number of these have been completed and are reflected in the following section.

Progression of models from last year

To bridge the developments and changes made in the past year, the WG took a stepwise approach to developing the baseline assessment model to be considered for management during the meeting. This begins with last year's Model 2 (SWG-10-JM-XX) which is compared with the same structure and only updated catch, age composition, Chinese and Chilean CPUE indices and is labeled 0.0. These data were classified as having been "routine" updates of indices considered at SWG-10 and hence were considered as a group for clarity. Model 0.1 is the same as 0.0 but incorporates the maturity work presented in SWG-11-JM-XX).

As noted above one request to develop the ability to use length frequency data within the model and in doing so it was recognized that the model structure would be more appropriate to start accounting from age 1 jack mackerel instead of age 2 (previous models). This change is evaluated in Model 0.2. With the length composition included and based on evidence provided at the meeting (SWG-11-8, SWG-11-8a) an

updated growth curve was considered more appropriate to apply to the length frequency data in the FarNorth fleet and this was the change made in Model 0.3. Similarly, new data provided by Peru were incorporated and shown in Models 0.4 and 0.5. Table 1 lists the set of models intended to bridge the gap between years.

Results from these changes indicate the impact on spawning biomass and fishing mortality estimates with the expected change in spawning biomass increasing with the younger age at maturity assumed and switching to the model which included age one jack mackerel resulted in lower fishing mortality estimates in recent years (Fig. 1). Comparing the recruitment between these models showed greater variability between these incremental model changes (Fig. 2).

Baseline model and alternatives

Given these model specification changes, the WG proceeded to accept a baseline from which to conduct more extensive evaluation of alternative specifications. An initial set is listed in Table 2.

For the baseline (model 1), the sensitivity to using the revised acoustic survey data from the Peruvian survey changes the estimates in recent years but is essentially the same for the period prior to 2007 whereas increasing natural mortality to 0.28 increased the spawning biomass (and decreased fishing mortality) historically but gave similar estimates in the near term (Fig. 3).Recruitment variability was shifted accordingly but had a similar pattern (Fig. 4). Model 4 (estimated natural mortality) resulted in a value of 0.46 and peak biomass more than treble models 1 and 2.

Table 1. Incremental changes to the jack mackerel model in an attempt to illustrate the impact of changes relative to the 2011 model.

Model	Description
0.0	Last year's configuration with updated data (catch, SC Chilean age composition, Chinese and Chilean CPUE)
0.1	As 0.0 with new maturity
0.2	As with 0.1 with model starting at age 1 instead of age 2 and FarNorth length frequency (not cohort-sliced); Gili growth
0.3	As with 0.2 but Peruvian growth curve estimates
0.4	As 0.3 but updated wt-at-age for Peru
0.5	As 0.4 with new Peruvian CPUE (2002-2012)

Table 2. Subsequent model evaluations to the combined jack mackerel model data set.

Model	Description
1	Same as 0.5
2	Use new Peruvian acoustic index
3	M average between regions (0.28)
4	Estimate M
5	Downweight CPUE
6	Downweight Acoustics
7	Include age determination error?
8	Different periods for stock recruitment estimation

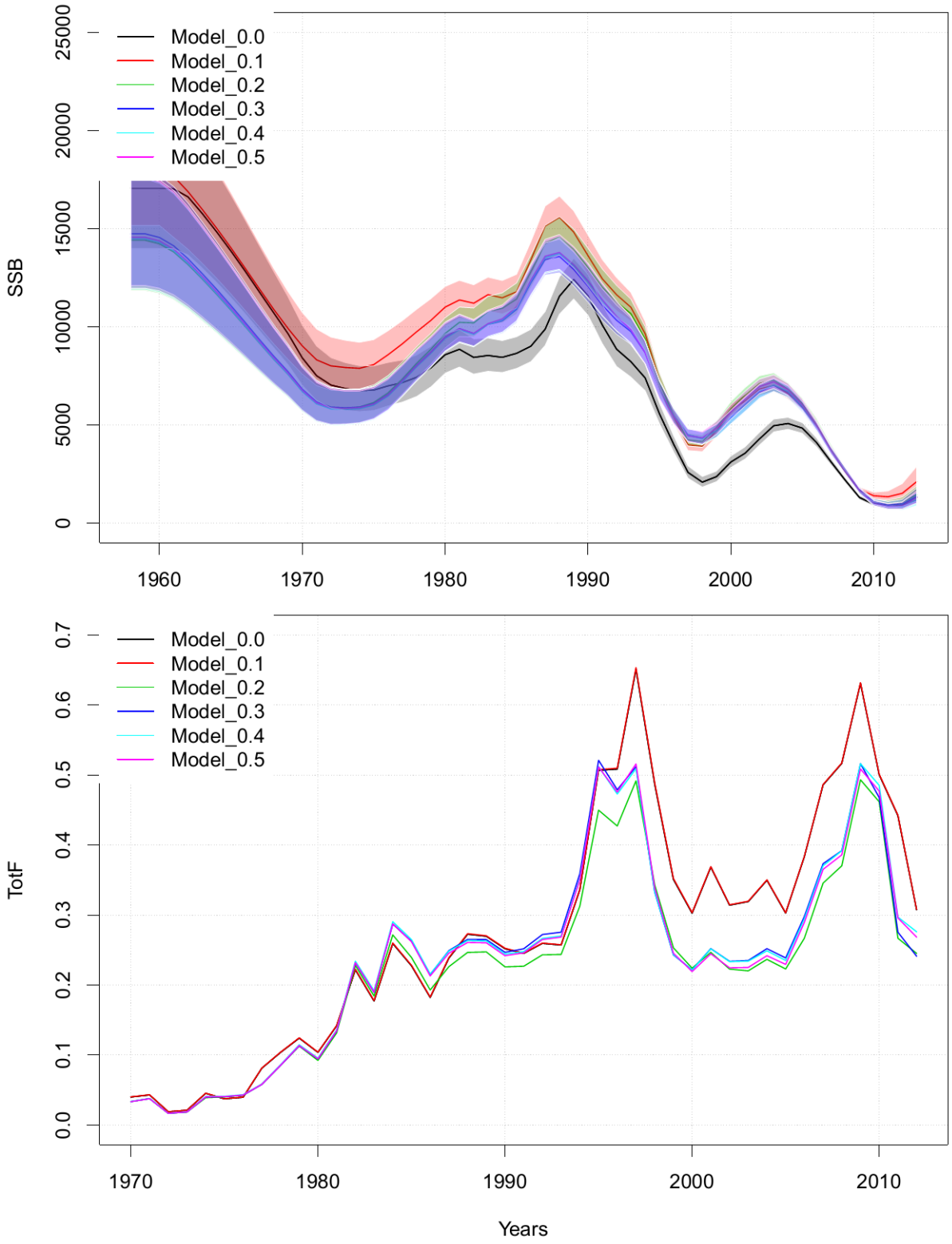

Figure 1. Jack mackerel spawning biomass (top) and fishing mortality (bottom) estimates for the different model modifications reflecting modifications (structural and data based) relative to the model from 2011 (Model_0.0). Shadings represent approximate 90% confidence intervals.

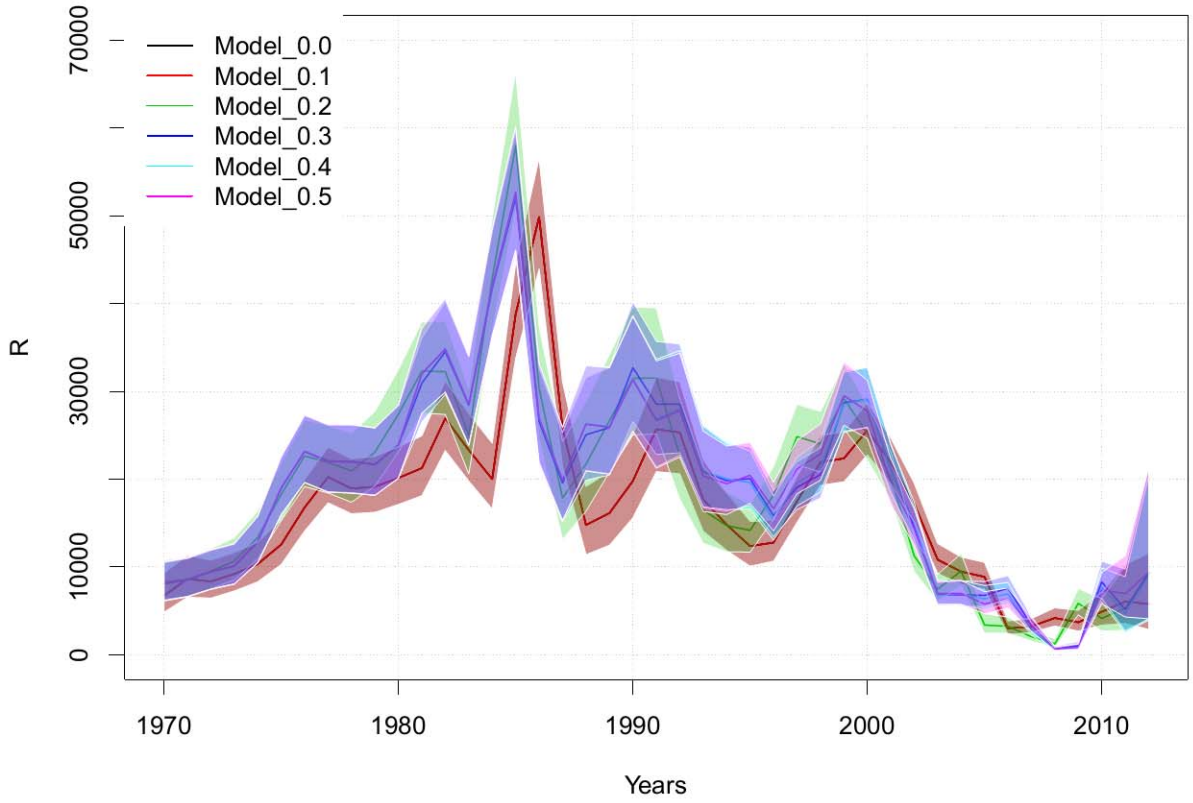

Figure 2. Jack mackerel recruitment estimates for the different model modifications reflecting modifications (structural and data based) relative to the model from 2011 (Model_0.0). Shadings represent approximate 90% confidence intervals.

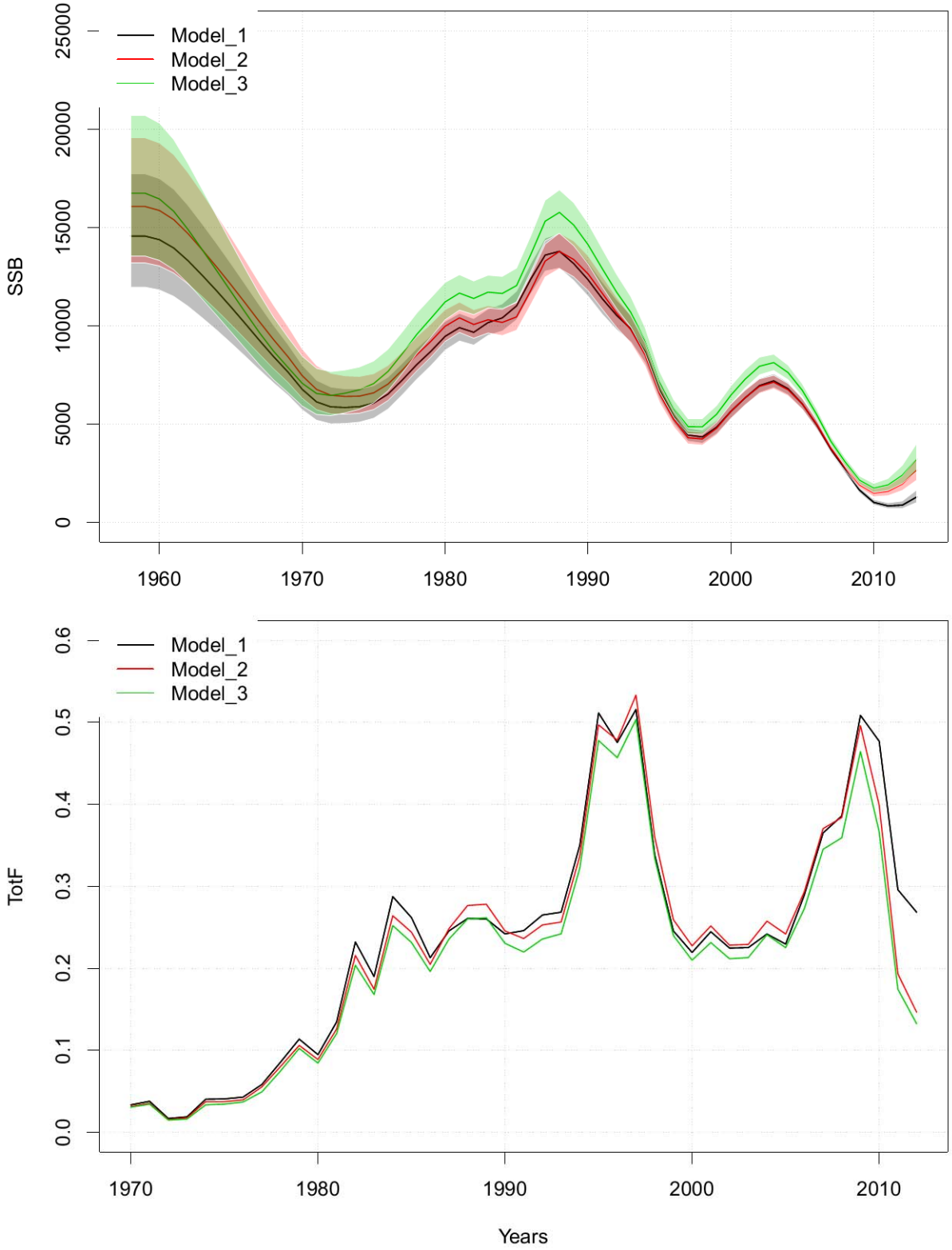

Figure 3. Jack mackerel spawning biomass (top) and fishing mortality (bottom) estimates for the initial set of model sensitivityes. Shadings represent approximate 90% confidence intervals.

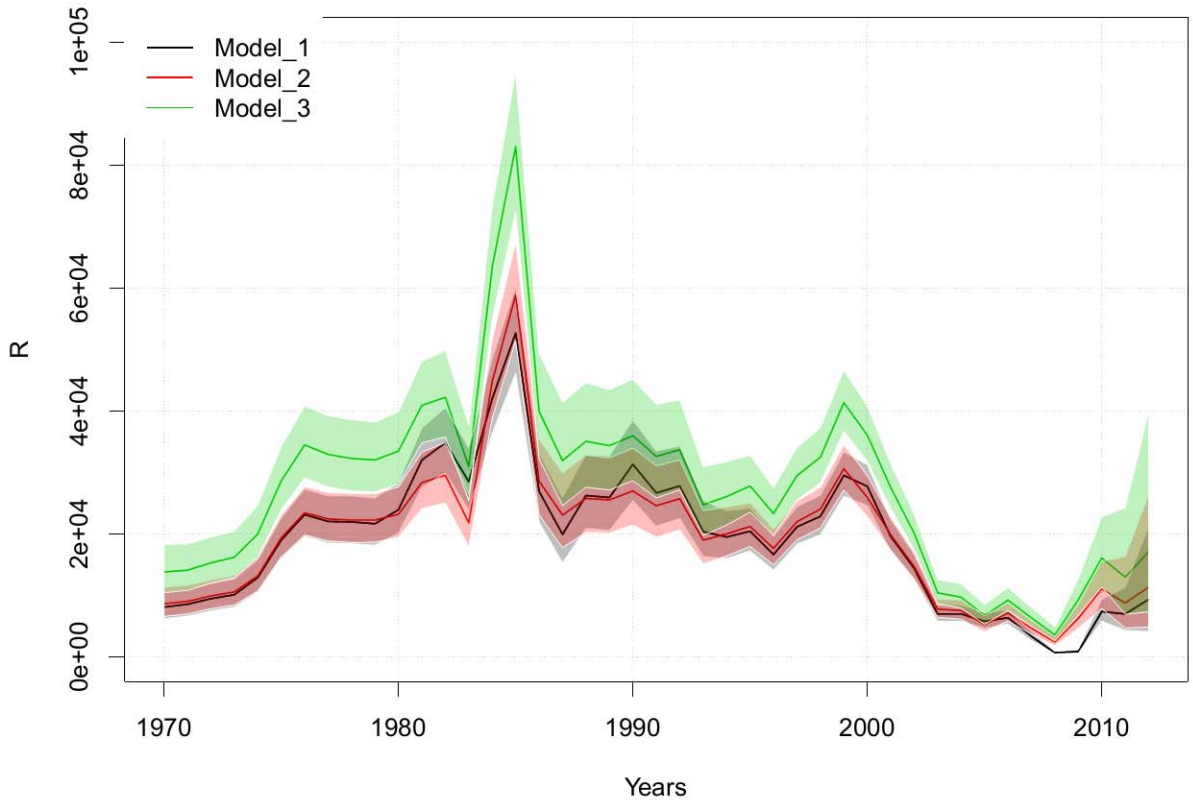

Figure 4. Jack mackerel recruitment estimates for the initial sensitivity analyses requqested. Shadings represent approximate 90% confidence intervals.

Other Notes

Treatment of Peruvian weight at age. The calculation used a single von Bertanlanfy swg 8a and applied different length-weight coefficients by year. Since fish greater than age 6 are rare in the directed purse seine fishery, the mean weight at age 8 was used for older ages (for the FarNorth fleet; Figure 5).

The variability in

Flat selectivity for Peruvian acoustic.:w

Retrospectives?