

UPDATES ON THE SCAL ASSESSMENTS OF EASTERN AND WESTERN ATLANTIC BLUEFIN TUNA

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SUMMARY

SCAL assessment results presented in Butterworth and Rademeyer, 2015a and 2015b are refined to allow, in particular, for an improved treatment of catch-at-length data to avoid needing to deal with a large number of zero proportions for certain length groups. For both east and west assessments, the primary results is to change results in a direction that brings them into closer agreement with the VPA results.

RÉSUMÉ

Les résultats de l'évaluation SCAL présentés dans Butterworth et Rademeyer, 2015a et 2015b été perfectionnés afin de permettre, en particulier, d'améliorer le traitement des données de prise par taille en vue d'éviter de devoir travailler avec un grand nombre de proportions nulles pour certains groupes de taille. Tant dans le cas de l'évaluation de l'Est que de l'Ouest, les principaux résultats changeront le cap des résultats dans un sens qui les rapprochera davantage des résultats de la VPA.

RESUMEN

Se refinan los resultados de la evaluación SCAL presentados en Butterworth y Rademeyer, 2015a y 2015b para permitir, en particular, un mejor tratamiento de los datos de captura por talla con el fin de evitar la necesidad de tratar con un gran número de proporciones cero para ciertos grupos de tallas. Para ambas evaluaciones, del este y del oeste, el resultado principal es cambiar los resultados en una dirección que los acerca a los resultados del VPA.

KEYWORDS

Bluefin tuna, Stock assessment, Assessment models, Catch at length

1. Introduction

This document updates results presented in papers SCRS/2014/169 and 188. The primary purpose is to implement an improved treatment for fitting to the catch-at-length data which avoids having to deal with a large number of zero proportions for certain length groups.

2. Results and Discussion

2.1 Eastern Atlantic bluefin tuna

The changes to the SCAL assessment presented in document SCRS-14-169 (thereafter BFTE-SCAL0) are:

- a) The minus groups l_{minus} are increased to avoid zeros in fitting to the catch-at-length data. This change is implemented in the updated assessment BFTE-SCAL1.
- b) The biomass is not estimated to be at pre-exploitation equilibrium in 1950. The initial numbers-at-age are estimated directly for ages 1 to 6 and a parameter ϕ is estimated which mimics average fishing mortality for ages above 6 (see equations B11-B13 in SCRS/2014/188).

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Changes a) and b) are implemented in the updated assessment BFTE-SCAL2.

Results for the updated SCAL are shown in **Figures 1 to 4**.

The increase in the minus groups results in a spawning biomass trajectory much closer to that from VPA, but there is little difference arising from relaxing the assumption that the resource is at carrying capacity at the start of the catch series in 1950.

The only other appreciable changes from the BFTE-SCAL0 results are to the fit to the Norwegian purse-seine CPUE (**Figure 3**) and some of the estimated selectivity curves for the “Other” fisheries (**Figure 4**). Further the recruitment estimates do now show an appreciable increase over time (**Figure 2**).

2.2 Western Atlantic bluefin tuna

Similarly, the changes to the SCAL assessment presented in document SCRS-14-188 (thereafter BFTW-SCAL0) are:

- a) Some minus groups (a_{minus} and l_{minus}) are increased, while some plus groups (a_{plus} and l_{plus}) to avoid zeros in fitting to the catch-at-age and catch-at-length data.
- b) Further changes in selectivity are included to allow better fit to the catch-at-age and -length data, including in particular changes in selectivity for the longline fleet in recent years.
- c) The biomass is not estimated to be at pre-exploitation equilibrium in 1970. The initial numbers-at-age are estimated directly for ages 1 to 9 and a parameter ϕ is estimated which mimics average fishing mortality for ages above 6 (see equations B11-B13 in SCRS/2014/188).

These changes are implemented in the updated assessment BFTW-SCAL1.

Results for the updated SCAL are shown in **Figures 5 to 9**.

The results are yet closer to those for the VPA (**Figure 5**), with recruitments for recent years still relatively low, but not as low as estimated for BFTW-SCAL0 (**Figure 6**).

The only qualitative change in the fits to the indices of abundance is that to JLL GOM index for the 1970s (**Figure 7**). Fits to size-related data are generally reasonable (**Figure 8 and 9**).

References

- Butterworth D. S. and Rademeyer R. 2015a. An updated statistical catch-at-length assessment for eastern Atlantic bluefin tuna. Collect. Vol. Sci. Pap. ICCAT, 71. *In this Volume*.
- Butterworth D. S. and Rademeyer R. A. 2015b. An updated statistical catch-at-length assessment for western Atlantic bluefin tuna. Collect. Vol. Sci. Pap. ICCAT, 71. *In this Volume*.

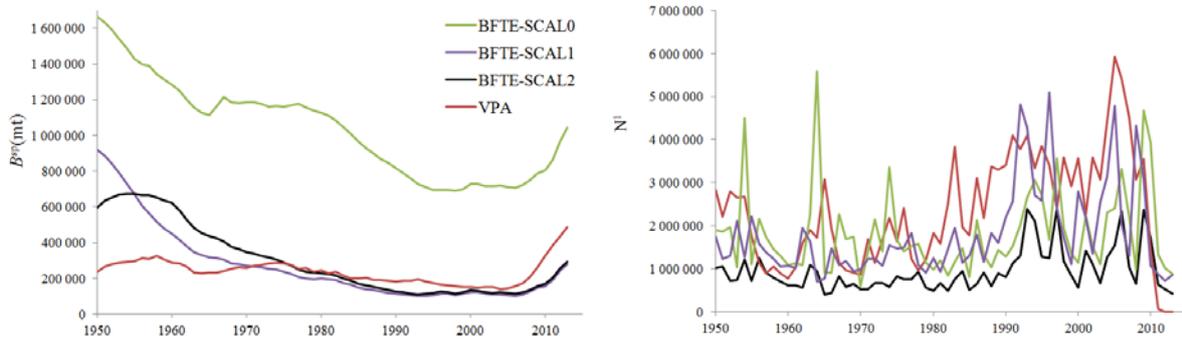


Figure 1. Spawning biomass and recruitment (number of 1-year-olds, N_1) trajectories for the BFTE SCAL0, BFTE-SCAL1, BFTE-SCAL2 and the VPA. VPA refers to Run 7 from Bonhommeau (2014).

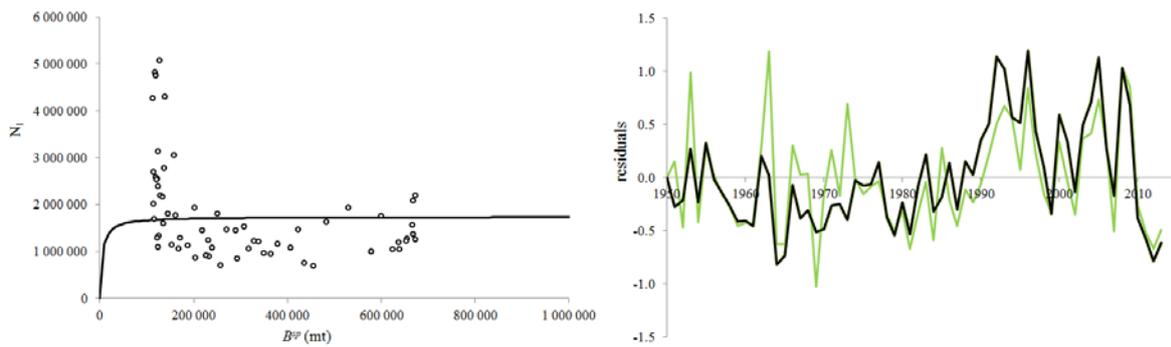


Figure 2. Stock-recruitment relationships (left-hand column) and time series of stock-recruitment residuals for the BFTE-SCAL2. The stock-recruitment residuals are also shown for the BFTE-SCAL0. Spawning stock biomass (SSB) is in mt.

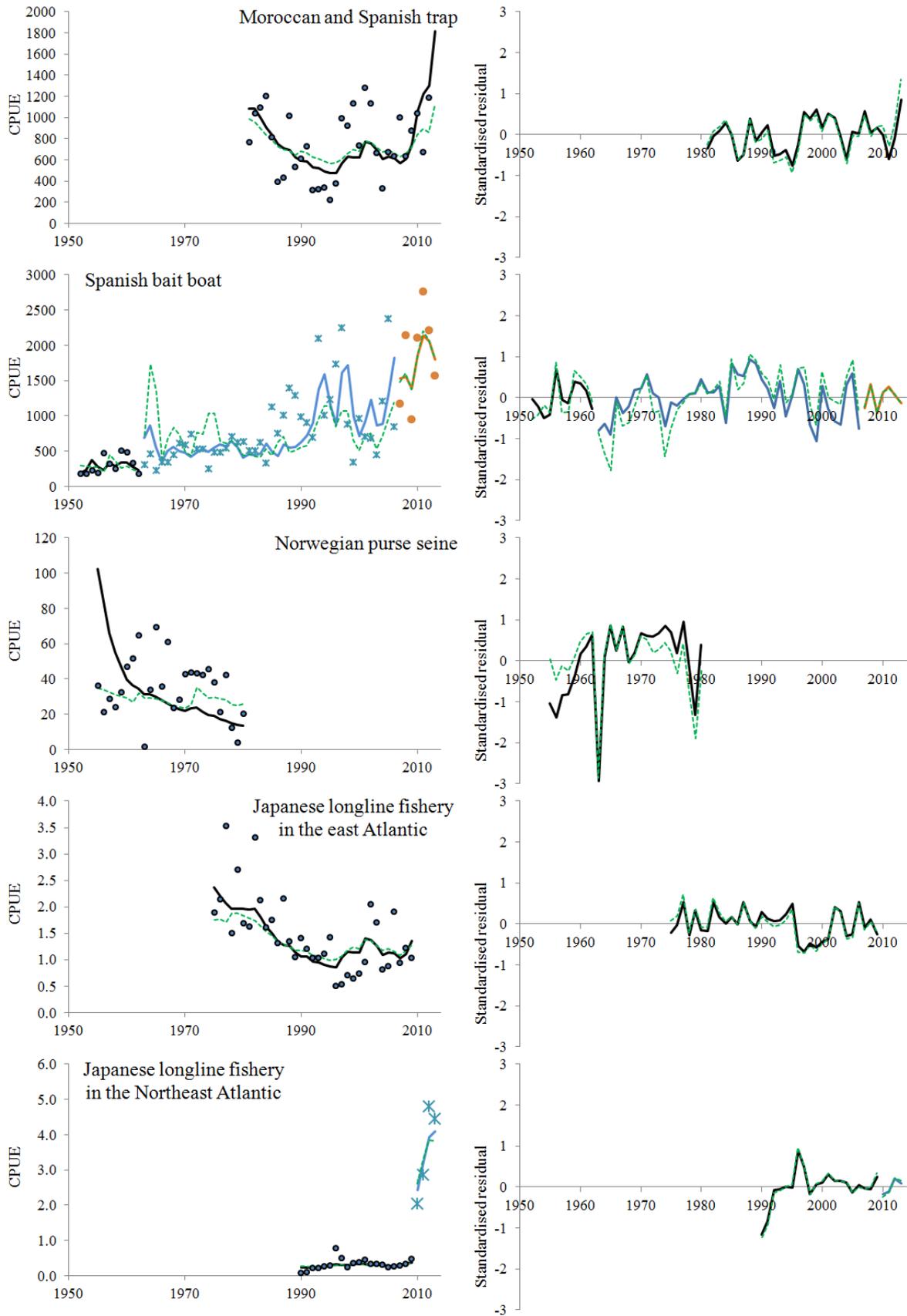


Figure 3. Fits of the BFTE SCAL0 (green lines) and BFTE-SCAL2 to the various CPUE series and the corresponding standardised residuals.

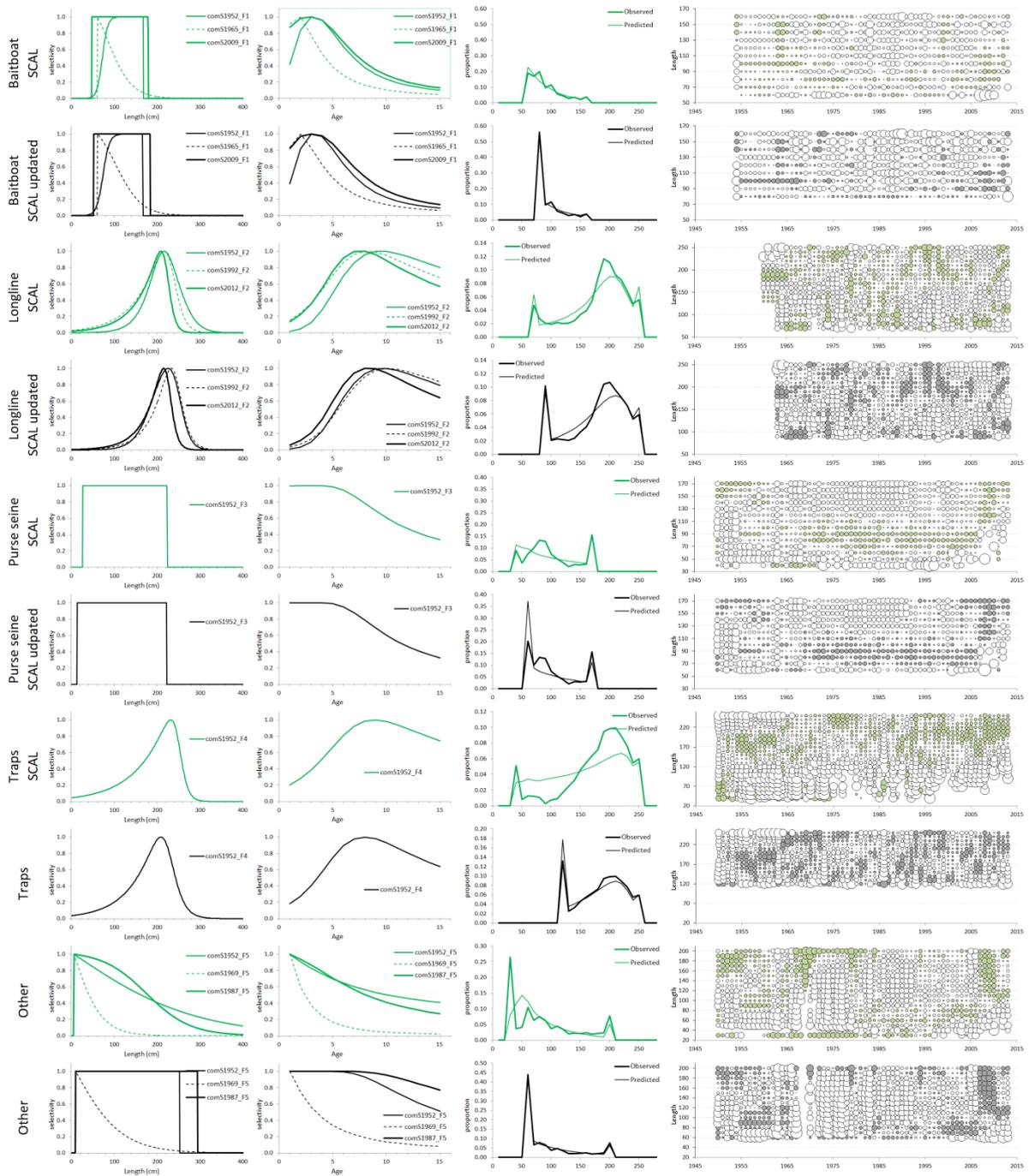


Figure 4. Commercial selectivities-at-length (first column), effective selectivity-at-age (second column), fits to the CAL data aggregated over years (third column) and bubble plots of the corresponding standardised residuals for the BFTE-SCAL2 (in black and grey) and BFTE-SCAL0 (in green). The area of the bubble is proportional to the magnitude of the residual. For positive residuals the bubbles are grey, whereas for negative residuals the bubbles are white.

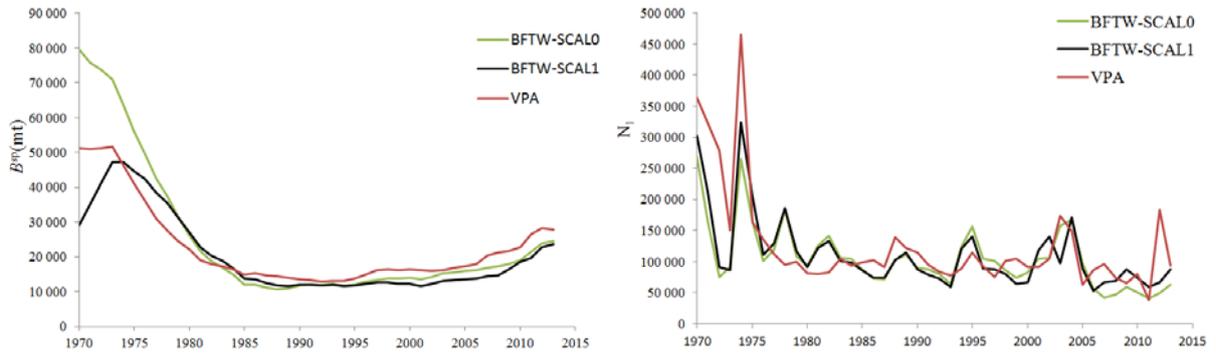


Figure 5. Spawning biomass and recruitment (number of 1-year-olds, N_1) trajectories for the BFTW-SCAL0, BFTW-SCAL1 and the VPA. VPA refers to 2014 Continuity Run.

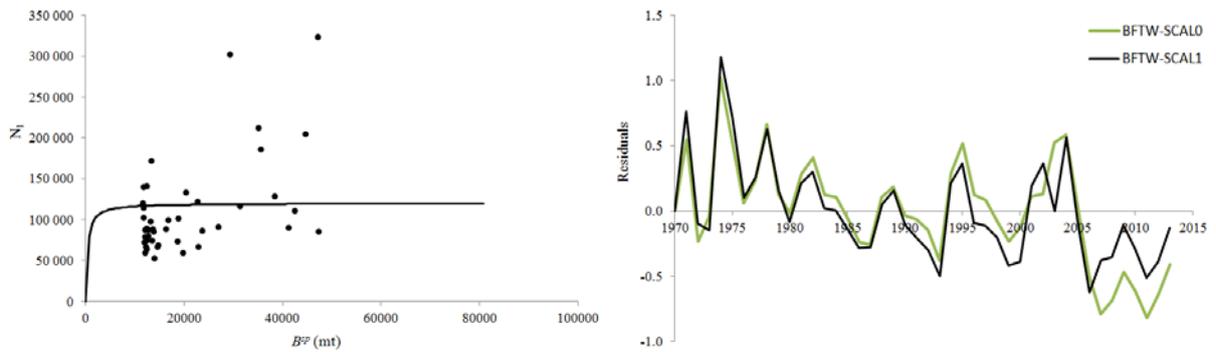


Figure 6. Stock-recruitment relationships (left-hand column) and time series of stock-recruitment residuals for the BFTW-SCAL0 and BFTW-SCAL1. Spawning stock biomass (SSB) is in mt.

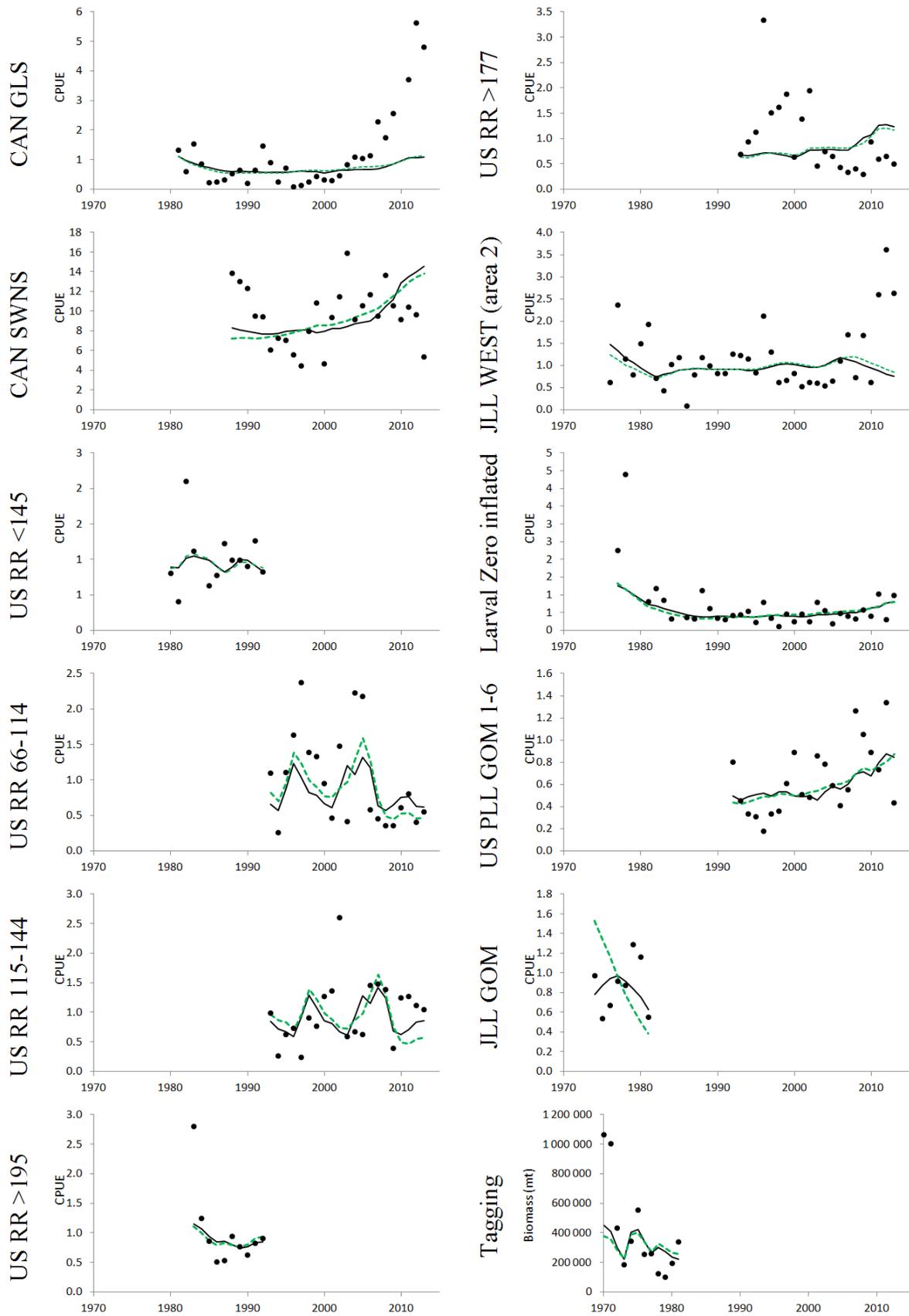


Figure 7. Fits of BFTW-SCAL1 (black lines) and BFTW-SCAL0 (green lines) to the various CPUE series.

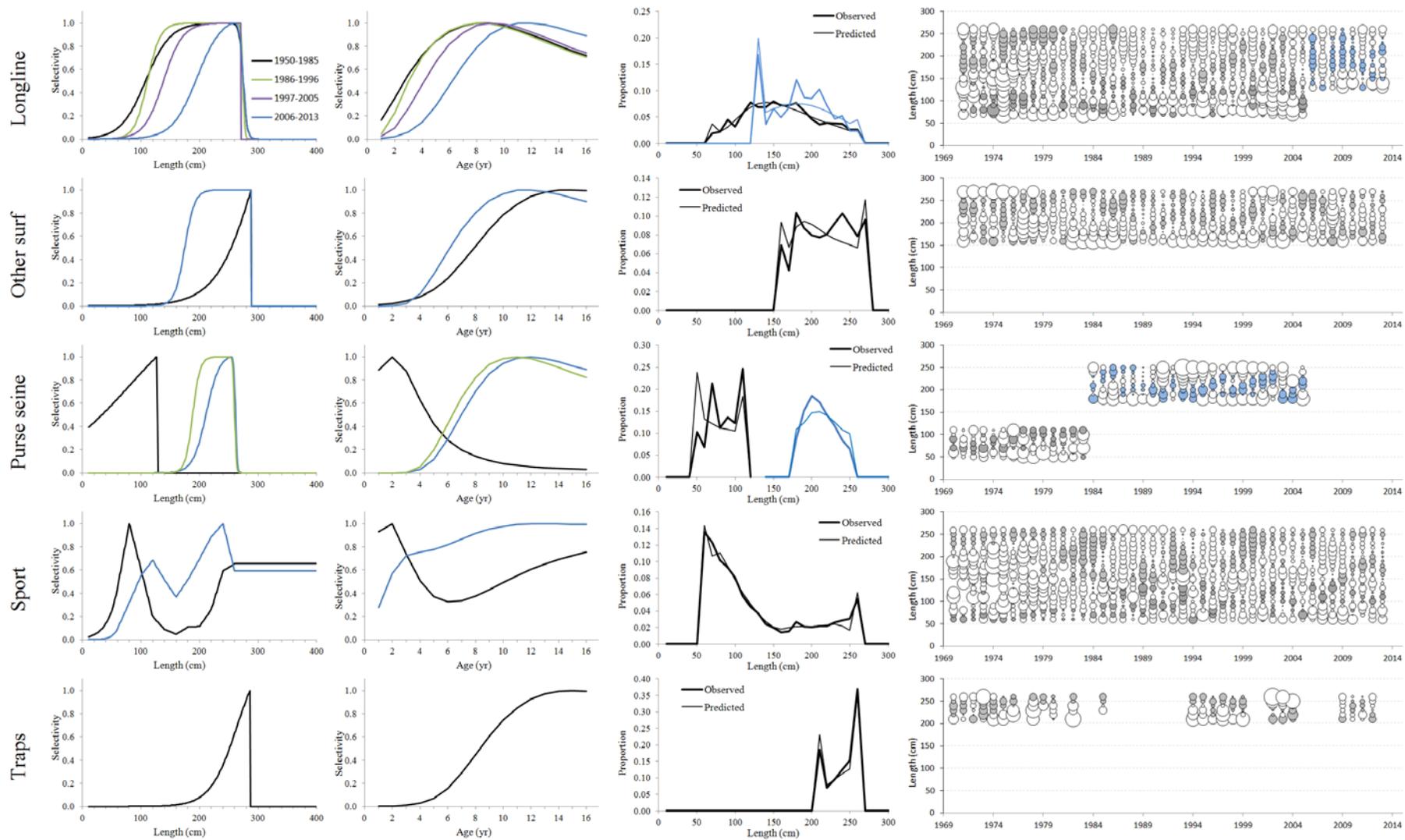


Figure 8. Estimated selectivities-at-length, the effective equivalent selectivities-at-age, fit to the CAL data (as average over all the years with data available), and bubble plots of the CAL standardised residuals for the associated fisheries for BFTW-SCAL1.

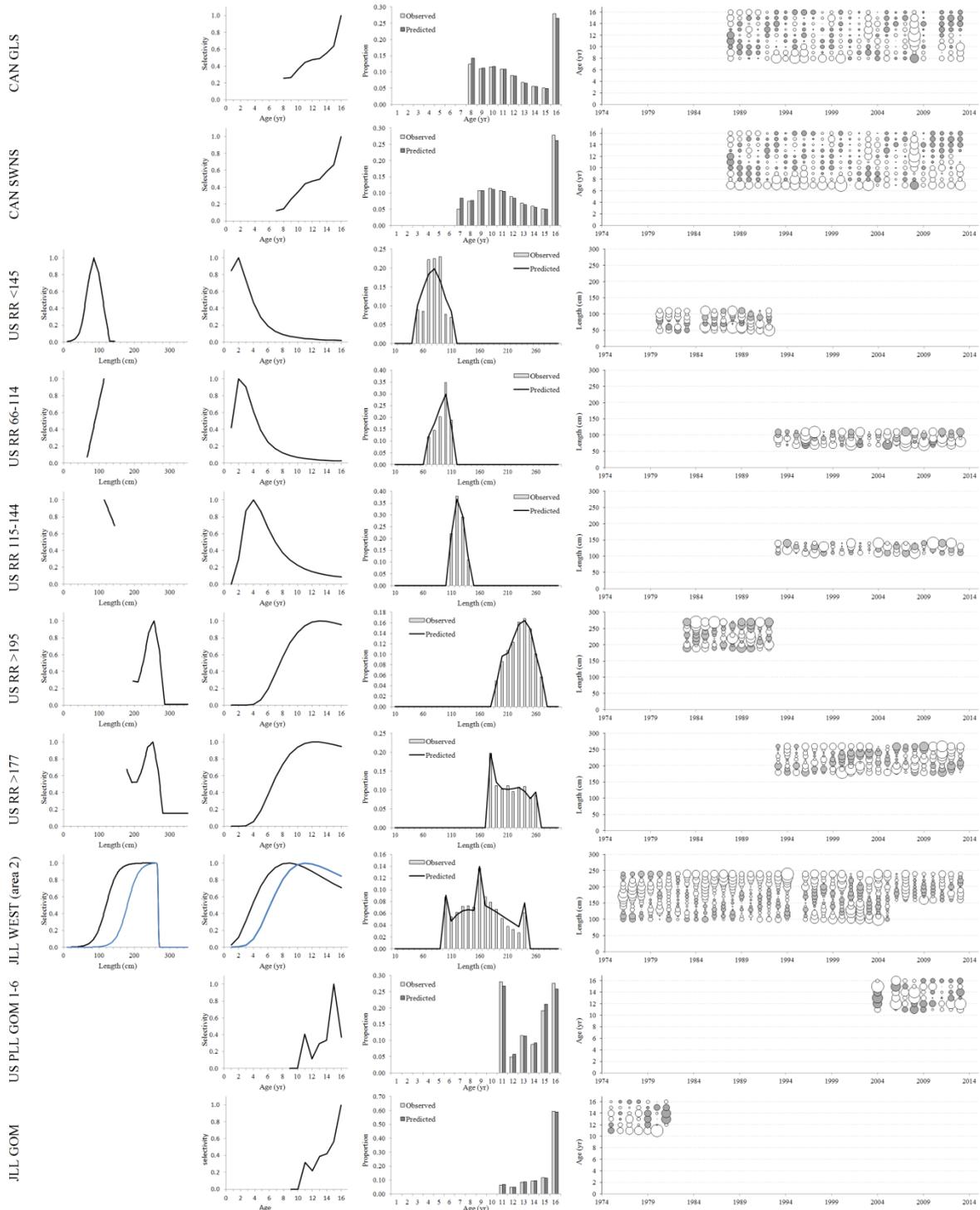


Figure 9. Estimated selectivities-at-length (where applicable), the effective equivalent selectivities-at-age, fit to the CAA/CAL data (as average over all the years with data available), and bubble plots for the CAA/CAL standardised residuals for the catches associated with indices of abundance for BFTW-SCAL1. Note that for CAN GLS, CAN SWNS, US PLL GOM 1-6 and JLL GOM, the model is fit to CAA data rather than CAL data.