## Linefish document list for IWS 2018, with additional comments and background linking the documents to the key questions addressed to the Panel

*A description of each document is provided in red italics, with the particular aim of linking the documents to the key questions to the Panel. “E.” makes reference to the relevant sub-sections in the 2017 IWS panel report.*

## Primary Papers

**P2:** Winker, H., Carvalho, FC, Thorson, J.T., Parker, D., Kerwath. S.E., Booth, A.J., Kell, L. 2018. JABBA-Select: an alternative surplus production model to account for changes in selectivity and relative mortality from multiple fisheries

*This document provides the full specifications of the JABBA-Select model, together with a worked example on the South African linfishery species, silver kob, and a simulation-estimation experiment that compare the performance of JABBA-Select to (1) a “naïve” Schaefer model, (2) a deterministic Age-Structured Model (ASPM-det) and (3) a stochastic Age-Structured Model (ASPM-stoch). The document represents a full revision of the 2017 documents P2 and P3. It aims address a number of panel recommendations in IWS2018 under E.1, E.2 and E.3.3:*

*Model specifications (E.1):*

1. *The non-independence of the leading model parameters Hmsy and m has been addressed formulation of a joint MVN prior (P2 Section 2.1.1) and is now routinely displayed a scatter plot together and compared against the MVN prior expectation (E.1) – Question 1a)*
2. *Marginal posteriors distributions are displayed by kernel densities instead of gamma distributions. The recommended posterior to prior variance ratio (PPVR; as CV2) and prior distributions is displayed when informative priors were used (E.1). As additional metric posterior to prior mean ratio (PPMR) was introduced to depict the posterior update relative to the prior. Posteriors of estimated observation variances have been added to the plot (P2 Section 2.2).*
3. *Also on model diagnostics: Details on the calculations of the process error deviates within the JABBA-Select have been provided (P2 Section 2.2)*
4. *(iii) a) The panel noted the model documentation was not complete (E.1). It know clearly stated that the relationship SB and EB as a function of SB depletion is externally estimated based on mean values of M and h and is not updated by the data (P2 Section 2.1.3). This is highlighted as caveat of the model and leads to Question 1b. b) It has been clarified that the Monte-Carlo distribution of m is summarized by taking the equally weighted mean across the different of selectivity replicates for each iteration to construct the joint MVN prior of Hmsy and m (P2 Section 2.1.1) .*

 *Simulation Experiment (E.2)*

1. *The simulation-estimation experiment as presented in P2 (P2 Section 2.3) has been replaced and now includes comparisons a conventional Schaefer model and, as recommended, a stochastic version of the ASPM for “fair” comparisons – Question 2. To do this, the simulation experiment is considerable more idealized compared to the case study (e.g. complete catch history) based on the age-structured simulator implemented in CCSRA (Thorson and Cope 2015). The ASPMs are fitted in TMB using maximum likelihood instead of Bayesian inference. In is argued that the idealized simulation has the advantages to increase comparability with previous studies and preclude other confounding factors that may not necessarily be attributed to structural differences among the models, but see E.3.3.*
2. *The performance metrics have been revised and now include estimates of absolute SB in addition to the relative quantity SB/SB0 (E.2). Model performance is now evaluated over the entire time horizon instead of only considering the final assessment year (P2 Section 2.3.4).*

*Additional background - Stochastic ASPM in TMB (E.3.3)*

*The 2017 IWS panel questioned why it should not be possible to also fit a stochastic ASPM? This was further explored, but all attempts to use the original design (incomplete catch history starting a low depletion) failed provide reasonable convergence. This was also confirmed based on additional ‘NUTS’ MCMC diagnostic tests for the original Bayesian ASPM in ADMB, which were kindly provided by Cole Mannahan (UWA). An alternative solution was found in implementing the stochastic (and deterministic) ASPM in TMB and then extending the more “idealized” simulation-estimation framework by Thorson, Ruud, Winker (in press, Fisheries Research)* *to introduce the desired selectivity change in the OM and ASPMs. Options explored for estimating stochastic recruitment included penalized likelihood (Methot and Taylor 2011) and marginal likelihood (Thorson and Kristensen 2016*) *by treating recruitment as random effects and applying the epsilon-bias correction. The latter was used in P2 due to slightly better performance – still there seems to a consistent positive bias on SB and SB0, also when compared to the deterministic ASPM. Initial trials included estimating M and h simultaneously using the same prior distributions for M and h as in JABBA-Select. However, due to poor convergence (even with complete catch history), it was eventually decided to fix h, which lead to a convergence rate of 90% and just under 80% for the sensitivity runs when the OM was mis-specififyed (high M: from 0.18 to 0.23, low h: from 0.8 to 0.65).*

**P3:** Winker, H. 2018. Investigation into the process error in biomass dynamics of fishes

*This document further explores the process error of the biomass dynamics using simulations with intention to address the two following recommendations under IWS 2017 E.1 – Questions 3 a) and b):*

1. *Sensitivity should be explored to the catch term not being affected [by the timing of process error] (P3 Section 2.1).*
2. *Ideally, the posterior for the process error variance [on the biomass] should be comparable to the variation in spawning biomass obtained by projecting the age-structured model forward for many years without catches, but with process error (P3 Section 2.2).*

## Background

* BG1: Parker, D., Winker, H., Kerwath, S.E., Attwood, C.G. 2018. An Overview of the South African Linefish fishery.