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Appendix1. Stock Assessment Flow

Appendix2. Calculation Methods

This appendix explains the methodology of the cohort analysis of the main proposal and its model diagnostics.

Appendix3. Proposed Reference Points and Proposed Fishing Ban Level

This appendix shows the Kobe plots overlaid with the reference points proposed in the Research Institute Meeting materials in FY 2021 and redrawn paths with the latest assessment data.

Appendix4. Future Projections Based on Proposed HCRs

This appendix shows the results of future projections based on the proposed HCR in the Research Institute Meeting materials in FY 2021.

Appendix5. Future Projection Methods

This appendix explains the methodology of future projection.

Appendix6. Summary of Various Parameters and Assessment Results

Appendix7. Summary of R/V Survey Results

This appendix shows additional information about Egg production R/V survey and Northward season R/V survey, which indices were used for Tuned VPA.

Appendix8. Tuning Period and Terminal F Estimation Method for tuned VPA

This appendix presents preliminary results how the length of the period of tuning indices or difference of methods estimating terminal F affect model selection, that is the selection of ridge penalty parameter  $\lambda$ . For comparison, Supplementary Table 8-1 and 8-2 include duplicated scenarios from Supplementary Table 2-4.

Appendix9. Cohort Analysis Results

This appendix provides estimated values from the main proposal Tuned VPA.

Appendix10. Results of Stock Assessment and Future Projections Under Different Assumptions

This appendix shows the results of comparison between FY2022 and FY2021 assessments and also provides a different future projection result based on another assumption. In Supplementary Table 10-1, “Re-assessment” indicates simple data update without changing the methodology from the FY2021 assessment. Supplementary Fig. 10-2, Table 10-2 and 10-3 show the results of future projections with different assumptions. In other words, this appendix is a document for advance responses to frequently asked questions (FAQs).

Appendix11. Abundance Indices Listed in the FY 2021 Stock Assessment (not used for tuning)

This appendix shows information about extra abundance indices which were listed in the FY 2021 Assessment and not used for Tuned VPA in the latest Assessment FY 2022.

Appendix12. Trial Application of Tuned VPA with Accounting for Predation by Two Japanese Mackerel Species

This appendix shows preliminary results of Tuned VPA accounting for predation by two Japanese mackerel species. Its methodology was based on Tanaka (2022), in which 13 scenarios were studied. Three of the 13 scenarios have been implemented in R and showed results; S0: base case scenario in Tanaka (2022), S7: Scenario in which predation mortality coefficient increases with age, S8: Scenario in which predation mortality coefficient decreases with age.

Appendix13. Catch of Shirasu

This appendix shows basic information about Shirasu (anchovy’s post-larvae) fishery of this stock.