WESTERN PACIFIC STOCK ASSESSMENT REVIEW

of

"Stock Assessment of Uku (*Aprion virescens*) in Hawaii, 2024 Update"

Individual Reviewer Report

By

Erik C. Franklin (Chair)

September 10, 2024

Prepared for
Pacific Islands Fisheries Science Center, National Marine Fisheries Service, NOAA
Pacific Islands Regional Office, National Marine Fisheries Service, NOAA
Western Pacific Regional Fishery Management Council

Background

A Western Pacific Stock Assessment Review (WPSAR) of the 2024 Main Hawaiian Islands (MHI) Uku (*Aprion virescens*) update stock assessment was conducted in Honolulu, HI on September 8-9, 2024. Update stock assessments should incorporate additional data collected since the prior assessment (Nadon et al. 2020) and not modify the methods used for that assessment. A three-person WPSAR panel comprised of Western Pacific Regional Fishery Management Council Scientific and Statistical Committee members was tasked with the evaluation of update assessment data sources, filtering, and their documentation, and if the methods of CPUE standardization, assessment models, and future projections were the same as those used for the prior assessment. The panel identified if the assessment results estimate stock status in relation to reference points and management goals for the MHI Uku stock. The WPSAR panel also provided recommendations to improve the future benchmark stock assessments of MHI Uku. The Terms of Reference list, participant list, and meeting agenda are in the Appendices. My responses to the Terms of Reference follow below.

TOR 1. Are input data sources and filtering methods well documented and the same as those used in the 2020 benchmark assessment?

Yes. The input data sources for the update assessment were the same used for the benchmark assessment. All methods were well documented. Data for the update assessment included 5 additional years of Uku commercial catch, CPUE, and size data from the Hawaii State Fisher Reporting System (FRS) and Uku non-commercial catch from the Hawaii Marine Recreational Fishing Survey (HMRFS), and one year of relative Uku abundance index from fisheries-independent diver surveys performed by NOAA Pacific Islands Fishery Science Center (PIFSC) as part of the Pacific Reef Assessment and Monitoring Program. One filtering method for HMRFS data was not the same as the benchmark assessment. The HMRFS non-commercial catch data was corrected with a linear factor for 2003-2017 to reflect the decline in landline phones (Ma 2023). This correction method was previously used for the benchmark assessment of MHI bottomfish (Syslo et al. 2024) and WPSAR approved for that assessment (Martell et al. 2024). This approach is considered an acceptable update to the data and does not warrant a negative response to this TOR.

TOR 2. Is the CPUE standardization methodology the same as those used in the 2020 benchmark stock assessment?

Yes. CPUE standardization methods used were the same as those used for the benchmark assessment. CPUE indices were standardized using generalized linear models and generalized mixed-effects models with a delta-lognormal approach to account for a large proportion of zero catches. Recommendations (TOR 6) are provided improvements to the CPUE standardization of future benchmark assessments.

TOR 3. Are the assessment model and methodology the same as those used in the 2020 benchmark stock assessment?

Yes. The update model was the same integrated statistical catch-at-age model used for the benchmark assessment with the Stock Synthesis 3.30 (SS3) software (Methot and Wetzel 2013) used for model fitting and results. The LBSPR method (Hordyk et al. 2016) was used to generate selectivity parameters for commercial fishing gears (inshore handline, trolling, and "others") as well as for the recreational sector.

TOR 4. Are methods used to project future population state the same as those used in the 2020 benchmark stock assessment?

Yes. The future population state projection used the same age-structured projection model in the AGEPRO software (Brodziak et al. 1998). Results were used to update the annual risk of overfishing for the years 2025-2031.

TOR 5. Do results include estimated stock status in relation to the estimated biological reference points, and other results required to address management goals stated in the relevant FEP or other documents provided to the review panel?

Yes. The update assessment includes MHI Uku stock status relative to reference points for spawning stock biomass and fishing mortality as well as the probability of overfishing for future years. These address management goals for the MHI Uku stock which is not overfished, nor experiencing overfishing.

TOR 6. For consideration in future benchmark assessments, suggest and prioritize recommendations for improvements and research. For each recommendation, prioritize to three categories (high, medium, low) dependent on importance to interpretation of this and future assessment results.

Non-commercial catch data (High) – The accurate estimation of non-commercial catch for MHI Uku is very important for the management of this stock. The shift in HMRFS data collection from phone to mail surveys is a promising development but it doesn't go far enough. I recommend a further shift of MRIP resources to target directed data collection from boat owners and boat-based intercept surveys, as well as the spearfishing community and kayak fishers, that catch Uku. This will benefit improved data collection for Uku as well as the other federally-managed fishes in the region that are primarily targeted from boats. Planning and implementation of these activities should involve relevant federal and state agencies and the fishing community. Any additional efforts beyond this recommendation that would improve the accuracy of non-commercial fishery data for Uku and other federally-managed species in Hawaii should be pursued.

CPUE Standardization (High) – The inclusion of geographic regions as "AREA" in the CPUE standardization models are currently based on the Hawaii fishery reporting grid cells. While AREA is included as a variable in many of the models, there were convergence errors when the YEAR:AREA interaction was included (Table 4 in Nadon 2024). I recommend that different geographic delineations for an AREA2 variable based on island or coastline scales be explored in future CPUE standardizations. Similarly, the "FISHER" variable had convergence errors in the model. I recommend a FISHER2 variable that splits "high-liners" with long-time activity (10+

years) in the fishery away from the rest of the fishers. Fisher experience was not often informative for the CPUE standardization models. I recommend using cumulative fishing events over lifetime for fisher experience rather than years fished, if that is what is currently used.

Transition to FIMS (High) –NOAA Fisheries is in the process of developing FIMS software to replace SS3 to perform stock assessments (pers. comm. Carvalho). I recommend that future benchmark assessments have a side-by-side comparison of SS3 and FIMS outputs so that WPSAR panels can evaluate the new software relative to prior methods.

Automate and Streamline Update Stock Assessment Process (Medium) – Software tools are available to automate much of the steps involved in an update stock assessment and the results and report elements generated from it. I recommend exploring the adoption of software tools that facilitate more frequent update stock assessments, with a goal toward annual output, using a standardized set of report elements developed in consultation with the WPRFMC SSC, PIFSC, and PIRO.

Single Uku catch trips (Low) – Size structure in the Uku population from commercial catch is estimated from fishing trips that only catch a single Uku. It is unclear if there is bias introduced by relying on only single Uku catch trips. I recommend a pilot study to evaluate if the single Uku trips provide a representative size structure for all Uku catch.

Environmental linkages to stock dynamics (Low) – A better understanding of environmental influences on Uku stock status is needed to inform stock assessment and stock projection models. I recommend a research activity to explore potential causative relationships between environmental factors and Uku stock dynamics.

References

Brodziak, J., Rago, P., & Conser, R. (1998). A general approach for making short-term stochastic projections from an age-structured fisheries assessment model. In F. Funk, T. Quinn II, J. Heifetz, J. Ianelli, J. Powers, J. Schweigert, P. Sullivan, & C. Zhang (Eds.), *Fishery Stock Assessment Models* (pp. 933–954). Alaska Sea Grant, University of Alaska Fairbanks. https://doi.org/10.4027/fsam.1998.52

Hordyk AR, Ono K, Prince JD, Walters CJ (2016) A simple length-structured model based on life history ratios and incorporating size-dependent selectivity: application to spawning potential ratios for data-poor stocks. CJFAS 73: 1787-1799.

Ma, H. (2023). *Non-commercial catch estimation for Deep-7 bottomfish in the main Hawaiian Islands*. https://doi.org/10.25923/2MBE-XH91

Martell, S., Dichmont, C., & Jiao Y. (2024) WPSAR Panel Review of Benchmark Stock Assessment for the Main Hawaiian Islands Deep 7 Bottomfish Complex in 2024, with Catch Projections Through 2029. Prepared for Pacific Island Fisheries Science Center, NOAA/NMFS,

Pacific Islands Regional Offices, NOAA/NMFS, Western Pacific Fisheries Management Council. 8 pp.

Methot, R. D., & Wetzel, C. R. (2013). Stock Synthesis: A biological and statistical framework for fish stock assessment and fishery management. *Fisheries Research*, *142*, 86–99. https://doi.org/10.1016/j.fishres.2012.10.012

Nadon MO, Sculley M, Carvalho F. 2020. Stock assessment of uku (*Aprion virescens*) in Hawaii, 2020. U.S. Dept. of Commerce, NOAA Technical Memorandum NOAA-TM-NMFS-PIFSC-100, 120 p. doi:10.25923/57nb-8138

Syslo J, Oshima M, Ma H, Ducharme-Barth N, Nadon M, Carvalho F (2024). Benchmark stock assessment for the main Hawaiian Islands Deep 7 bottomfish complex in 2024 with catch projections through 2029 U.S. Dept. of Commerce, NOAA Technical Memorandum NOAA-TM-NMFS-PIFSC-157

Public Comment

Ed Watamura (Fisher) expressed concerns about shark depredation and the accuracy of data inputs to the assessment.

Nathan Abe (Fisher) raised concerns about the apparently high number of shark interactions (depredation) in the Main Hawaiian Islands uku fishery and its effects on uku CPUE.

Clay Tam (Pacific Islands Fisheries Group) also raised concerns about the high apparent level of shark depredation in Hawaiian waters and attributed some cause for increased depredation on shark feeding tours.

Appendix 1. Terms of Reference for Peer Review

Terms of Reference for the Peer Review

*2024 Stock Assessment Update for Main Hawaiian Islands Uku (*Aprion virescens*)*

Peer Review under the Western Pacific Stock Assessment Review framework: *2024 Stock Assessment Update for Main Hawaiian Islands Uku (*Aprion virescens*)*

For questions 1-4 and their subcomponents, reviewers shall provide a "yes" or "no" answer. If they answer "no", they must explain if a specific change was justifiable, and if not, which alternative set of existing information/results should be used to inform fishery management and why. Each panel member will provide a report based on their answers to these questions, and the Chair will provide a report summarizing the answers to these questions across the review panel.

1. Are input data sources and filtering methods well documented and the same as those used in the 2020 benchmark assessment?

2. Is the CPUE standardization methodology the same as those used in the 2020 benchmark stock assessment?

3. Are the assessment model and methodology the same as those used in the 2020 benchmark stock assessment?

4. Are methods used to project future population state the same as those used in the 2020 benchmark stock assessment?

5. Do results include estimated stock status in relation to the estimated biological reference points, and other results required to address management goals stated in the relevant FEP or other documents provided to the review panel?

6. For consideration in future benchmark assessments, suggest and prioritize recommendations for improvements and research. For each recommendation, prioritize to three categories (high, medium, low) dependent on importance to interpretation of this and future assessment results.

7. Draft a report (individual reports from each of the panel members and an additional Summary Report from Chair) addressing the above TOR questions.

Appendix 2. Panel Meeting Participants and Agenda

WPSAR panel: Chair Erik Franklin (WPRFMC SSC and University of Hawaii), Milani Chaloupka (WPRFMC SSC, Ecological Modelling Services Pty Ltd, and University of Queensland), and Jason Helyer (WPRFMC SSC and Hawaii State Division of Aquatic Resources)

WPSAR Coordinating Committee: Mark Fitchett (WPRFMC), Brett Schumacher (NOAA Fisheries PIRO), Marlowe Sabater (NOAA Fisheries PIFSC)

Stock Assessment Team: Marc Nadon (NOAA Fisheries PIFSC), Felipe Carvalho (NOAA Fisheries PIFSC)

Attendees: Jarad Makaiau (NOAA Fisheries PIRO), Hongguang Ma (NOAA Fisheries PIFSC), Katherine Papacostas (NOAA Fisheries Office of Science and Technology), Sarah Lazo (NOAA Fisheries OST) Clay Tam (Pacific Islands Fisheries Group), Ed Watamura (public, fisher), Nathan Abe (public, fisher)

Meeting was held at NOAA Honolulu Service Center at Pier 38 at 1139 N. Nimitz Hwy, Suite 220. Honolulu, HI 96817 with a hybrid online video option for remote participants.

<u>Day 1, Monday September 9</u>

1. Introduction (Franklin)
2. Review objectives and terms of reference (Franklin)
3. Presentation of stock assessment updates (Nadon)
4. Summary of comments and analysis during desktop phase (Panel)
5. Questions to presenters (Panel)
6. Public comment

<u>Day 2, Tuesday September 10</u>

7. Panel presentation on the review results and recommendations (Franklin)
8. Questions to reviewers (Nadon, Carvalho)
9. Public comment
10. Closing comments and adjourn (Franklin)