Center for Independent Experts Review

of

American Samoa

Bottomfish assessments

Individual peer review report

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Executive summary

The 2023 assessments of the Western Pacific Regional Fishery Management Council's bottomfish management unit species (BMUS) off American Samoa were reviewed in American Samoa during February 2023. The Review Panel consisted of three reviewers, two appointed through the CIE and a non-CIE reviewer who also chaired the meeting.

There are 11 BMUS species and these were previously assessed as a species complex using a surplus production model. The latest such assessment was in 2019 and found that the complex was overfished and experiencing overfishing. An annual catch limit of 5000 lb was imposed as a result of the assessment.

The 2023 assessments split the complex into its individual species and used an integrated stock assessment model to perform benchmark assessments for nine of the species. There was inadequate data for the other two species. In contrast to the 2019 assessment, the 2023 stock assessments concluded that none of the stocks were overfished or experiencing overfishing.

The 2023 assessments used an age-structured model with species-specific life history parameters, which allows the fitting of biomass indices and length frequencies. This approach is to be preferred to a surplus production model for the species complex. However, these stock assessments were driven by length frequencies and the assumption that the life history parameters were known exactly. It is well known that biomass signals from length frequencies are problematic in such models. The ease with which length frequency data can be collected means that there is often a preponderance of such data in a model and the likelihood component from the length frequencies overwhelms the contribution from the biomass indices.

A recent paper advocates the use of integrated stock assessment models based on the biomass signal from length frequency data and suggests that biomass indices are not needed. This is a most unfortunate recommendation. Through a simulation study the authors showed that when life history parameters were known exactly, there was low to moderate recruitment variability, the fishing selectivity was flat topped, the length frequencies were representative of the fishery, and that all parameters were constant over time, then a stock assessment with a recent length frequency, and a known catch history was reasonably accurate. The long list of assumptions required is never met in practice.

The 2023 assessments were adequate except in two aspects. There were no bridging runs from the 2019 assessment to the 2023 assessments. Also, there was inadequate sensitivity analysis with regard to assumed values of natural mortality (M) and the growth parameter L_{inf}. Both deficiencies were adequately address by the Assessment Team during the review meeting.

The base models for each of the stock assessments should not be used in isolation for management purposes. These models assume that life history parameters are known exactly and therefore the point estimates are unreliable and uncertainty is underestimated. However, there was sufficient sensitivity analysis conducted, prior to and in the review meeting, to demonstrate that the stock status conclusions are robust (i.e., that the stocks are not overfished and are not experiencing overfishing).

The next assessments should formally incorporate the uncertainty associated with life history parameters. This is best achieved with a full Bayesian assessment using informed priors for life history parameters and virgin biomass. The CPUE indices starting in 1988 should be re-evaluated to see if they can be included in base models.

Background

The 2023 assessments of the Western Pacific Regional Fishery Management Council's bottomfish management unit species (BMUS) off American Samoa were reviewed in American Samoa during February 2023. The Review Panel consisted of three reviewers, two appointed through the CIE and a non-CIE reviewer who also chaired the meeting (see Appendix 3).

There are 11 BMUS species and these were previously assessed as a species complex using a surplus production model. The latest such assessment was in 2019 and found that the complex was overfished and experiencing overfishing (Langseth et al. 2019). An annual catch limit of 5000 lb was imposed as a result of the assessment.

The 2023 assessments split the complex into its individual species and used an integrated stock assessment model to perform benchmark assessments for nine of the species. There was inadequate data for the other two species.

This report is one of three individual reviewer reports and should be read in conjunction with the reports from the other two reviewers and the summary report from the Chair.

Review activities

Prior to the review meeting the stock assessment documents were accessed on a shared Google drive. The main assessment report was read in detail as were the other documents in the "required reading" folder. The papers in the additional literature folder were noted.

In the main report (Nadon et al. 2023), I noted the sensitivity of assessment results to alternate life history parameters for *E. coruscans* (ETCO) in particular. I ported the data and life history parameters from the ETCO base model to the stock assessment package CASAL (Bull et al. 2012) so that I could easily investigate the causes of the sensitivity (using the package that I am most familiar with). I did estimation runs and likelihood profiles for virgin spawning female biomass (B_0) and the von Bertalanffy growth parameter L_{inf}. The sensitivity identified in the main report was to a lower L_{inf}.

The review meeting started on Friday February 17 in Tafuna, American Samoa at the Tradewinds hotel. The Review Panel consisted of two CIE reviewers and a non-CIE chair. There were three scientists on the assessment team (assisted by another PIFSC scientist). On the first day there were about 30 other participants including members of the fishing community (see Appendix 3). Members of the public did not participate again until the final day (Thursday February 23) when the Review Panel's findings were presented, and public comment was again allowed.

The formal presentations of the background, methods, and results were completed by Saturday morning. The Panel had noted some issues with the assessment and written requests were formulated by the Panel for the assessment team. These focussed on the sensitivity of assessment results to L_{inf} and natural mortality (M). Also, we requested some runs aimed at "bridging" the gap between the 2019 assessment and the current assessments. In 2019 a surplus production model had been used on the stock complex (with a CPUE time series) whereas the current assessments were by individual species and driven by length data and assumed life-history parameters. Some bridging runs were essential as the 2019 assessment had found that the complex was overfished and that overfishing was occurring. In contrast, the current assessments found that there was no overfishing and no stocks were overfished.

There was no formal meeting on Sunday to give the Assessment Team time to complete the Review Panel's requests of the previous day. On Sunday morning I looked at the sensitivity to M of ETCO by

doing estimation runs and likelihood profiles in CASAL. In the afternoon, the two CIE reviewers were taken on a tour of the northeast side of Tutuila to view the main type of fishing vessel (approximately 30 foot, aluminium hulled catamarans, called alia) and the main ports and fish market. It was instructive to see the type of vessel used and the hand cranks used to drop and retrieve the fishing gear. Our guide also mentioned that there had been petrol subsidies given to the alia fishermen in recent years. I investigated this in the evening and found a NOAA Technical Memo that discussed the subsidies from 2014 to 2017 (Chan & Pan 2019).

On Monday, the assessment team presented the responses to our initial set of requests. Results were discussed and we formulated more requests. In particular, we wanted some idea of how large the stocks could be given the limited habitat (437 sq. km from 100-400 m depth). The Assessment Team tried using density estimates from other areas, but they said that the results were not useful. I suggested that they use the catch histories together with bounds on the maximum exploitation rate (e.g., at least 2% in the year of maximum exploitation and no more than 40% given it is a hook and line fishery). This is an approach that I have used on numerous stocks to form priors on B_0 (e.g., Cordue 2018, 2020). In the evening I ported the *L. kasmira* (LUKA) base model into CASAL. The LUKA stock was unique amongst the nine stocks assessed as it could apparently be fished without limit (as the base model had much of the mature biomass not available to the fishery).

The Assessment Team reported back on Tuesday afternoon with their responses to the latest requests. They had formed priors on B_0 using the suggested method and these priors were used in model runs where L_{inf} was estimated. They also did the requested runs where M was estimated with an informed prior. The point of these runs, and associated likelihood profiles, was to investigate the sensitivity of the results to imprecise knowledge of M and L_{inf}.

There was a similar schedule on Wednesday with responses to requests being presented in the afternoon. The Assessment Team presented a draft presentation that the Review Panel had requested (for presentation on the final day when the public were present). The Chair presented a draft presentation of the Review Panel's results (also to be presented on the final day). I made one final request that a plot of vulnerable biomass and exploitation rates be produced for LUKA. I had tried fitting the base model for LUKA in CASAL and had been unable to reproduce the reported results. The base model had an estimate of B_0 which, according to CASAL, meant that the historical catch could not have been removed. It turned out that this was also the case in the SS3 base model. There were four early years where the catch had been adjusted downwards (which was possible because the catches were not specified as being known exactly). Over 10 t of catch had been eliminated in those years (about 20% of the catch). One other species, *L. rubrioperculatus* (LERU), was also found to have had catch eliminated in four early years.

On Thursday, the public and others were again present. The assessment lead gave a presentation explaining the work that had been done during the review to bridge from the 2019 assessment to the current assessment. He also explained that numerous sensitivity runs had been done to make sure that the conclusion that the stocks were not overfished was robust. The Chair then presented the preliminary findings of the Review Panel. I spoke to a fisherman after the meeting was closed. He mentioned that the reason that there had been little fishing in recent years was because most of the alia fleet on the main island had been taken out of commission when the government "refurbished" the fleet. According to him, in late 2017, an anti-fouling paint had been applied to the hulls of most of the alia fleet on Tutuila. The paint contained copper which reacted with the aluminium hulls when in salt water and caused massive corrosion. He said that some of the alia fishermen had taken the government to court and had won the case. They were soon to get their compensation checks and the fisherman said that they could fix their boats and start fishing again and that the 5000 lb limit

could soon be reached in 2023. I confirmed the main elements of his story that evening from a newspaper article available online (Samoa News 2021).

The meeting was held in a collegial and friendly atmosphere and it was a very productive week. The review process worked very well for this group of assessments as model runs could be completed very quickly (i.e., as few parameters were estimated and maximum likelihood estimation was used).

Summary of findings

Before considering the strengths and weaknesses of the assessment relative to each TOR, I will give an overview of the assessment and its main strengths and weaknesses (which span a number of TOR).

The Assessment Team did a fine job of reconstructing the historical catch back to 1967. This covered the period of the two government programs during which catches had peaked for most species (the dory program in the 1970s and the alia program in the 1980s). The historical catches, although known imprecisely, provide crucial information on the scale of the stocks, when combined with plausible bounds on the maximum exploitation rates.

The move to individual species assessments was sensible. However, there should have been a series of intermediate runs to make it clear what differences in methods and data were driving the differences between the 2019 assessment of the species complex and the current individual species assessments. The compilation of life history studies across the Pacific for the species being assessed was comprehensive. Unfortunately, only one study directly on one the assessed stocks was available. Having to borrow life history parameters from other stocks, albeit of the same species, is problematic.

The elimination of the CPUE indices from 1988 to 2015 and the use of only the indices from 2016 to 2021 in the base models was not adequately justified. The 2016 to 20221 indices were flat for most species and a time series of such short duration is always going to be overwhelmed by length frequency data. The long CPUE time series do show trends for a number of the species. There needs to be another look at the available catch and effort data prior to the next assessment to see if defensible CPUE indices can be constructed over a longer timeframe.

The use of an age structured stock assessment model with species-specific life history parameters, which allows the fitting of biomass indices and length frequencies, is to be preferred to a surplus production model. However, these stock assessments were driven by length frequencies and the **assumption** that the life history parameters were known exactly. It is well known that biomass signals from length frequencies are problematic in such models. The ease with which length frequency data can be collected means that there is often a preponderance of such data in a model and the likelihood component from the length frequencies overwhelms the contribution from the biomass indices (this is the motivation of the data weighting work of Francis 2011).

The recent paper of Rudd et al. (2021) advocates the use of integrated stock assessment models based on the biomass signal from length frequency data and suggests that biomass indices are not needed. This is a most unfortunate recommendation. Through a simulation study the authors showed that when life history parameters were known exactly, there was low to moderate recruitment variability, the fishing selectivity was flat topped, the length frequencies were representative of the fishery, and that all parameters were constant over time, then a stock assessment with a recent length frequency, and a known catch history was reasonably accurate. The long list of assumptions required for such an assessment to be accurate is never met in practice.

A model run, with life history parameters assumed known which takes the biomass signal from length frequencies is inherently unreliable (because, **in reality**, the life history parameters are never known exactly and they vary over time). However, a carefully constructed set of model runs (a base model and sensitivities) can produce a reliable stock assessment result in terms of whether a stock is overfished or experiencing overfishing. The draft report from the Assessment Team was close to being adequate but it required additional sensitivity analysis particularly with regard to L_{inf} and M. This was achieved during the review meeting and the result that the stocks are not overfished now appears to be robust. The very low levels of recent catch means there is no risk that any of the stocks is experiencing overfishing.

Each of the TOR for each of the species are considered below. Most of the strengths and weaknesses are common to all the stock assessments. **The required yes/no answers to TOR 1-9 are all YES**.

1. **Of the data considered for inclusion in the assessment, were final decisions on inclusion/exclusion of particular data appropriate, justified, and well-documented?**

   Generally, the decisions regarding the use of data in the assessment were appropriate and well documented. The main exception was the exclusion of standardized CPUE indices before 2016. Catch and effort data were used to produce CPUE indices from 1988 to 2021. However, only the indices from 2016 to 2021 were used in the base models as the assessment team argued that this period corresponded to improved training of the boat-based creel survey interviewers. Also, for three of the shallower species there was a noticeable drop in CPUE in 2016 or slightly earlier.

   To exclude such a long and potentially informative time series for the stock assessment of each species required a convincing and detailed explanation which was absent. These longer CPUE time series need to be re-examined prior to the next stock assessments for possible inclusion in base models.

   The reconstruction of the historical catch back to 1967 and the use of the extended catch history in the base models was well done and well considered. The size of the two peaks in the catches during the dory and alia programs contains valuable information on the minimum size of the stocks. However, catches from 2018 to 2021 need to be reconsidered as most of the alia fleet on Tutuila were apparently unseaworthy during these years. It is likely that the percentage of the total catch from the Manu'a Islands during those years was far higher than the historical percentage of 14% (and the adjustment that was used to predict the catch for the Manu'a Islands will not be appropriate).

2. **Is the CPUE standardization properly applied and appropriate for this species, fishery, and available data?**

   The standardization was appropriate. The explanatory variables used were sensible and at an appropriate scale. The use of principal components as a proxy for targeting particular species was a good approach.

   However, the gas subsidies from 2014 to 2017 casts doubt on the use of those years. During those years the small fish boat fleet used approximately twice as much gas per trip as they had in preceding years (Chan & Pan 2019). The cheap gas was only available if fishermen had their catch observed. It may be that an analysis of the catch composition in those years may reveal that the fishermen used the cheap gas to fish further from shore and perhaps moved more often. However, other explanations have been suggested which involve the diversion

of gas to other vehicles. Whatever the explanation there was a substantial change in the behaviour of the fleet.

There may also be problems due to the (reported) absence of most of the Tutuila fleet from 2018 to 2021. Many of the alia were apparently not fishing because the boats were not seaworthy. A change in fleet composition can result in changes in catch rates that are not related to changes in abundance (because individual vessel effects can be strong).

In any case, the CPUE indices used in the base models are short and typically flat with high CVs on the 2021 index. They have little to no effect on base model results which are driven by the length frequencies. The standardized indices beginning in 1988 should be looked at again for inclusion in future assessments.

3. Are the assessment models used reliable, properly applied, adequate, and appropriate for the species, fishery, and available data?

Single species, area, and fishery models were used for each of the nine assessments. These are appropriate for the stocks given the level of available data which would preclude more complicated models. The models were implemented in SS3 which is a reliable and well tested package.

4. Are decision points and input parameters reasonably chosen?

The decision to split the species complex that was assessed in 2019 into individual species assessments was reasonable. That decision was made after a thorough review of the available data and on the recommendations that followed the 2019 assessment. However, the decision to move in one large step from a species complex to individual species assessments without intermediate stock assessment runs was not well made. There is always a requirement to include "bridging runs" from one stock assessment to another and more so when such a substantial change in methods is made and/or there is a change in the assessed stock status. During the meeting, the Review Panel requested model runs and diagnostics which have successfully bridged from the 2019 assessment (species complex overfished and subject to overfishing) to the current assessments (not overfished and no overfishing for any species).

Sensible decisions were made regarding the life history parameters to include in the base models. There was only one local growth study and parameters were generally borrowed from studies on the same species in another area of the Pacific. When no proxies were available then the stepwise method was used to provide parameters (Nadon & Ault 2016). Standard sensitivities of plus or minus 10% were done for M and h (Beverton-Holt stock recruitment steepness). The choice of 10% was not well considered as sensitivities should be based on the plausible range of a parameter and M and h are almost never known to within 10%. The sensitivity of the results to L_{inf} was not well addressed in the original assessments but was well explored during the meeting.

5. Are primary sources of uncertainty documented and presented?

The draft assessment report presented a base model and several sensitivity runs for each stock. The use of plus or minus 10% for M and h in the sensitivity runs was not well considered as the imprecision on these parameters is almost certainly higher than 10%. There was an "alternate life history parameter" run for each stock but this was somewhat ad

hoc. There needed to be a systematic approach taken to investigating the sensitivity of the assessment results to L_{inf} and more work on the sensitivity to M. Also, the sensitivity run which dropped the historical catch was not useful. It simply showed that the historical catch mattered little **when** the life history parameters were **assumed** known. It did not show that the historical catch was unimportant (the contrary is true).

During the meeting the Review Panel requested extra analysis and model runs aimed at exploring the sensitivity of the results to L_{inf}, in particular, and to M. The results of the sensitivity analysis are fairly predictable given the size of the fish in the righthand limb of the observed length frequencies (although there can be some strange effects at extreme values due to changes in the estimated selectivity). If M gets too large, then the length frequencies cannot be fitted because too many large fish have died and to compensate the model estimates a large stock size (Figure 1). Conversely, if M gets too low then a lot of large fish must have died due to fishing and the model estimates a low stock size. For L_{inf}, there are similar effects. When L_{inf} is fixed at a high value then the model sees that the large fish are missing and deduces a low stock size. When L_{inf} is set at a low level (relative to the observed length frequencies) then the model creates a high stock size to try to get as many large fish as possible (Figure 2).

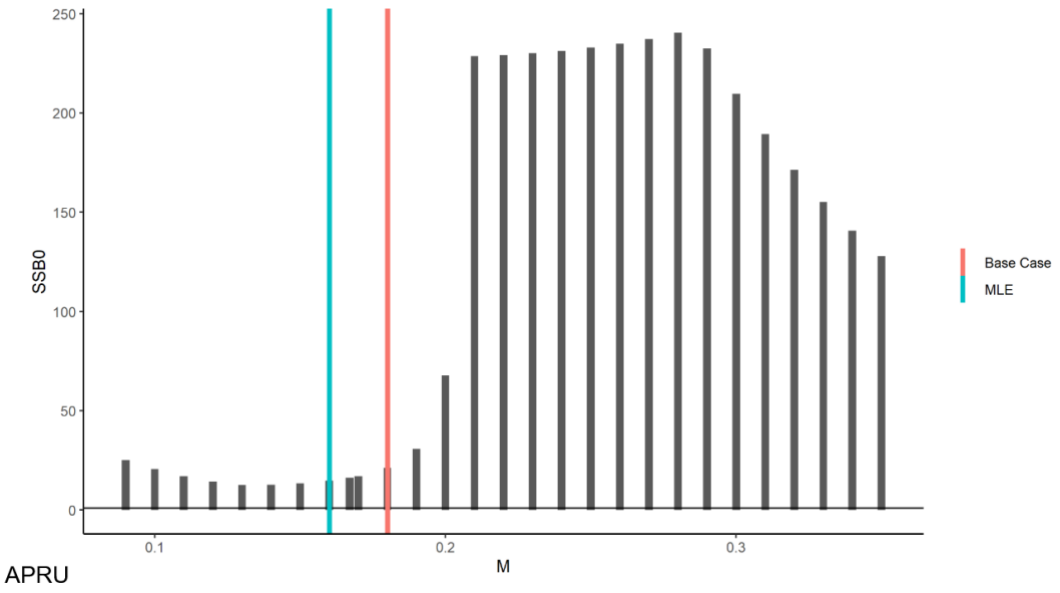

Figure 1: Estimated spawning stock biomass for different fixed values of M in the *A. rutilans* **(APRU) base model. The value of M assumed in the base model is shown together with the estimate when M is estimated in the base model (with an informed prior). Graphic courtesy of Assessment Team.**

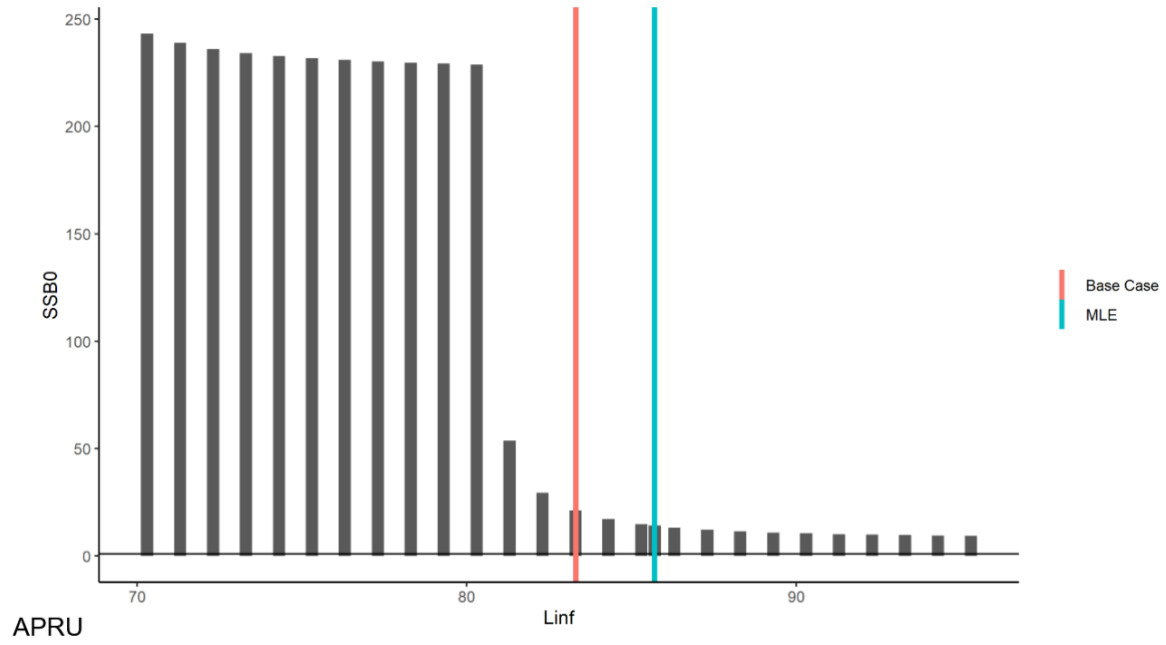

Figure 2: Estimated spawning stock biomass for different fixed values of L_{inf} in the *A. rutilans* (APRU) base model. The value of L_{inf} assumed in the base model is shown together with the estimate when L_{inf} is estimated in the base model. Graphic courtesy of Assessment Team.

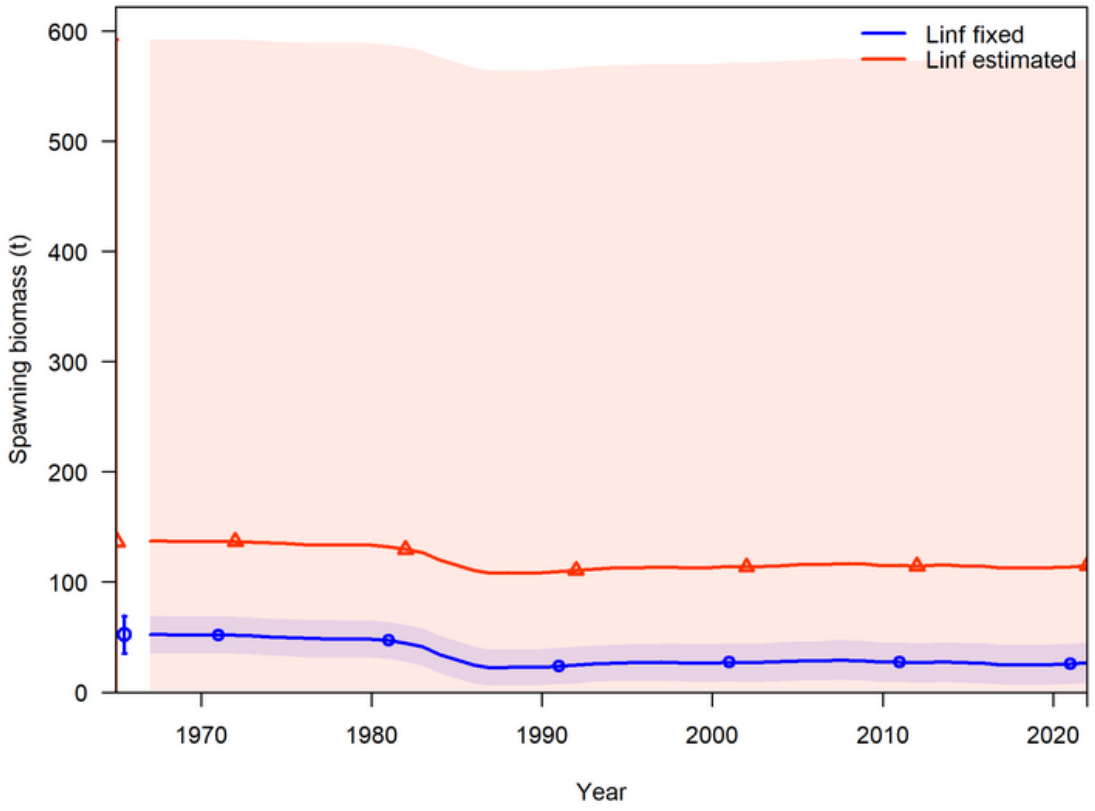

Figure 3: SSB trajectories and 95% CIs for the *E. coruscans* (ETCO) base model and when L_{inf} is estimated. Graphic courtesy of Assessment Team.

The assumption of known life history parameters leads to an under-estimation of uncertainty in stock size and potentially in the risk of being overfished. For example, when L_{inf} was estimated in the ETCO base model the apparent information on stock size disappeared (Figure 3). The very high estimates of spawning biomass shown in Figure 3 were considered to be implausible and this early run lead to the request to form priors on B_0 to limit the upper end of estimates.

6. Are model assumptions reasonably satisfied?

The assessment results are driven by the assumptions that all life history parameters are known, the fishing selectivity is flat topped, the recruitment numbers are deterministic (coming directly off the stock-recruitment curve), and that the length frequencies are representative of the catch. These assumptions are not true and may differ substantially from reality. However, the sensitivity of the assessment results is generally in a single direction that leads to lower probability of a stock being overfished or experiencing overfishing.

M can be very sensitive on the high side but this leads to a large estimate of stock size and less chance of being overfished. Similarly, L_{inf} can be very sensitive on the low side but this also leads to a large estimate of stock size. Also, if the fishing selectivity is dome shaped then there is a refuge for large fish and the stock can safely be fished harder than if the selectivity is flat topped.

The assumption that the length frequencies are representative of the fishery was not tested by the Assessment Team. The Review Panel requested some information on the distribution of the catches through the season and across areas. The results suggested that aggregate catches were fairly consistent through the year except on the Banks where catches increased towards the end of the year. The Panel also requested an analysis of fish length using a linear model. For the three species investigated, this showed that fish on Tutuila were generally smaller than in the other fishing areas.

It is apparent that more consideration needs to be given to the sampling design for length frequency data in the future. Some stratification and scaling will probably be necessary to make the length frequencies more representative of the catch. The existing data should be investigated as post-stratification may be possible in some years. Length frequencies which are unlikely to be representative of the catch should **not** be used in the stock assessments (irrespective of the sample size). Down weighting the effective size is not the best approach. When considering whether data should be used in an assessment, the key factor is quality and not quantity. There should be some concern about using the length frequencies from the bio-sampling program as only fish that went to market were measured (rather than the fish that were caught).

7. Are the final results scientifically sound, including but not limited to estimated stock status in relation to the estimated overfishing and overfished status determination criteria (SDC)?

The conclusion that the stocks are not overfished and not experiencing overfishing is scientifically sound based on the entirety of the assessments including the work done during the review meeting. The base models cannot be taken in isolation. Certainly, the LUKA assessment must be treated cautiously. In particular, it is not certain that the stock can be

sustainably fished at very high fishing mortalities (as implied by the base model). There may be a plausible subset of the parameter space which would contradict such a conclusion (e.g., lower M and maturity at an older age).

8. **Are the methods used to project future population state adequate, including the characterization of uncertainty, and appropriately applied for implementation of overfishing limits (OFL)?**

   The projections were done from the base models and incorporate uncertainty in the catch history and the estimated parameters. However, the base models assume that life history parameters are known and that recruitment is from the stock recruitment curve (i.e., no recruitment variability). Hopefully, an appropriate buffer can be built in during the "P*" meetings to allow for the extra uncertainty.

9. **If applied, is the choice of indicator species to evaluate more poorly known species that are in a stock complex appropriate?**

   The Assessment Team were asked by the Review Panel to recommend appropriate indicator species for the two stocks in the complex that had not been assessed. They identified suitable species of the same genus that appeared appropriate as they clustered together in the catches (Ahrens 2022).

10. **Can the results be used to address management goals stated in the relevant FEP or other documents provided to the review panel?**

    The assessment results, including the bridging analysis and the sensitivity analysis performed during the review meeting, can be used to address management goals.

Recommendations

The recommendations below are high priority relative to the specified time frame.

For the current assessment the bridging analysis and the sensitivity analysis performed during the meeting should be incorporated into the main assessment report.

In the short term, thought needs to be given to how better information can be collected from the fishery. It may be that the use of logbooks could be beneficial. Certainly, there needs to be accurate information on the number of vessels participating in the fishery, their effort, and the areas and depths that they are fishing (available by vessel and not just in aggregate).

There needs to be more consideration given to collecting length frequencies which are demonstrably representative of the catches (i.e., appropriate stratification which allows raw data to be appropriately scaled by number to the catch within each stratum).

For the next assessment, the uncertainty in life history parameters needs to be formally incorporated into the assessment. This is best achieved by performing a full Bayesian stock assessment. Life history parameters borrowed from other stocks should not be assumed known in a base model. Instead, the information from life history studies on the same species or family should be incorporated into priors and the parameters estimated within the base model (and sensitivity runs). If length-age data are available for the stock then it should be fitted in the model so that

selectivity effects can be properly accounted for. Priors should also be formed on virgin biomass or recruitment using the historical catch and bounds on the maximum exploitation rate.

Catch histories need to be assumed known in the base model with sensitivity runs performed for "low" and "high" catch history scenarios. The reason for this is that the model should not be allowed to modify historical catches based on recent length frequencies. In the model, with life history parameters assumed known, there is a link between recent length frequencies and historical catch. However, there is obviously no real information in recent length frequencies about the level of catch in the 1970s or 1980s. The same applies to estimating an historical F. There is no real information in recent length frequencies and an historical F should not be estimated (for stocks with this type of data).

The CPUE indices starting in 1988 need to be reconsidered for inclusion in the next stock assessments. Recent years appear to be particularly problematic and may need to be excluded for some species.

Life history studies for the actual stocks being assessed would be beneficial. LUKA should be given the highest priority.

In a 5-10 year time frame, life history studies should be completed for as many of the stocks as possible.

Conclusions

The 2023 stock assessments of the bottomfish stocks off American Samoa were adequate except in two aspects. There were no bridging runs from the 2019 assessment to the 2023 assessments. Also, there was inadequate sensitivity analysis regarding assumed values of M and L_{inf}. Both deficiencies were adequately addressed by the Assessment Team during the review meeting.

The base models for each of the stock assessments should not be used in isolation for management purposes. These models assume that life history parameters are known exactly and therefore the point estimates are unreliable and uncertainty is underestimated. However, there was sufficient sensitivity analysis conducted, prior to and in the review meeting, to demonstrate that the stock status conclusions are robust (i.e., that the stocks are not overfished and are not experiencing overfishing).

The next assessments should formally incorporate the uncertainty associated with life history parameters. This is best achieved with a full Bayesian assessment using priors for life history parameters and virgin biomass. The CPUE indices starting in 1988 should be re-evaluated to see if they can be included in base models.

Acknowledgements

The review meeting was conducted in a friendly and collegial atmosphere. The Assessment Team are thanked for their excellent work during the meeting. Thanks also to all of those who organized the review meeting and hosted the Review Panel.

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Appendix 2: Performance Work Statement

Performance Work Statement for Center for Independent Experts' Contribution of Reviewers to the Western Pacific Stock Assessment Review of the 2023 Benchmark Stock Assessment for the American Samoa Bottomfish

February 17-23, 2023

Background

The National Marine Fisheries Service (NMFS) is mandated by the Magnuson-Stevens Fishery Conservation and Management Act, Endangered Species Act, and Marine Mammal Protection Act to conserve, protect, and manage our nation's marine living resources based upon the best scientific information available (BSIA). NMFS science products, including scientific advice, are often controversial and may require timely scientific peer reviews that are strictly independent of all outside influences. A formal external process for independent expert reviews of the agency's scientific products and programs ensures their credibility. Therefore, external scientific peer reviews have been and continue to be essential to strengthening scientific quality assurance for fishery conservation and management actions.

Scientific peer review is defined as the organized review process where one or more qualified experts review scientific information to ensure quality and credibility. These expert(s) must conduct their peer review impartially, objectively, and without conflicts of interest. Each reviewer must also be independent from the development of the science, without influence from any position that the agency or constituent groups may have. Furthermore, the Office of Management and Budget (OMB), authorized by the Information Quality Act, requires all federal agencies to conduct peer reviews of highly influential and controversial science before dissemination, and that peer reviewers must be deemed qualified based on the OMB Peer Review Bulletin standards[1].

Scope

A stock assessment benchmark of the American Samoa bottomfish was conducted through 2021 by PIFSC scientists. The deep-slope fishes of American Samoa support a small yet valuable boat-based fishery in depths ranging around 100 m to 400 m. The Western Pacific Regional Fishery Management Council's fishery ecosystem plan for American Samoa includes 11 bottomfish management unit species (BMUS) that have traditionally been assessed and managed as a species complex. The current benchmark assessment split the complex into its component BMUS (i.e. single-species assessments). This allowed the implementation of age-structured models and the incorporation of size and life history information. Moving assessment models from a complex-level to a finer taxonomic resolution meant that special consideration needed to be given to species identification in the various data sets. These considerations followed recommendations from a series of community workshops that involved fishers, managers, and scientists on best practices for analyzing bottomfish catch and effort, and size data for use in stock assessments. The 2023 benchmark

[1] https://www.whitehouse.gov/wp-content/uploads/legacy_drupal_files/omb/memoranda/2005/m05-03.pdf

assessment diverges significantly from this previous work as it implements the first integrated single species stock assessments for the American Samoa bottomfish. These integrated assessments use the Stock Synthesis framework to incorporate CPUE indices, size frequency, and catch data into a single age-structured model for each one of the 11 species. These integrated models were used to estimate biomass and stock status through time, and stock status was evaluated against MSY-based reference points described in the Fishery Ecosystem Plan for the American Samoa Archipelago. Projections were provided to inform management and the setting of annual catch limits. The specified format and contents of the individual peer review reports are found in **Annex 1**. The Terms of Reference (ToRs) of the peer review are listed in **Annex 2**. Lastly, the tentative agenda of the panel review meeting is attached in **Annex 3**.

Requirements for Center of Independent Experts (CIE) Reviewers

NMFS requires two reviewers who are external to PIFSC, Pacific Islands Regional Office (PIRO), and the Western Pacific Regional Fishery Management Council and its affiliated bodies to conduct an impartial and independent peer review in accordance with this Performance Work Statement (PWS), OMB Guidelines, and the ToRs in Annex 2.

CIE reviewers shall have:

- Working knowledge and recent experience in the application of stock assessment
- models for data-limited and moderate fisheries, sufficient to complete a thorough review.
- Knowledge of integrated assessment models, more specifically Stock Synthesis;
- Expertise with measures of model diagnostics, uncertainty, forecasting, and biological
- reference points;
- Familiarity with federal fisheries science requirements under the Magnuson-Stevens
- Fishery Conservation and Management Act;
- Familiarity with local Pacific Islands fisheries as well as artisanal fisheries and fishing
- practices;
- Excellent oral and written communication skills to facilitate the discussion and
- communication of results.

The chair, who is in addition to the two reviewers, will be not be provided by the CIE. Although the chair will be participating in this review, the chair's participation (i.e. labor and travel) is not covered by this contract.

Tasks for Reviewers

Pre-review Background Documents

Each of the CIE reviewers shall complete the following tasks in accordance with the PWS and Schedule of Milestones and Deliverables.

Pre-review Background Documents: No later than two weeks before the peer review, the NMFS Project Contact will provide reviewers the necessary background information and reports for the peer review. The reviewers shall read all documents prior to the peer review in accordance with the PWS scheduled deadlines.

Required pre-review documents:

DRAFT 2023 American Samoa Bottomfish Stock Assessment Report

Previous 2019 bottomfish stock assessment: Langseth B, Syslo J, Yau A, Carvalho F. 2019. Stock Assessments of the Bottomfish Management Unit Species of Guam, the Commonwealth of the Northern Mariana Islands, and American Samoa (focus on sections pertaining to American Samoa)

American Samoa Archipelago Ecosystem Plan: Western Pacific Regional Fishery Management Council. 2009.

Methot, R.D. and Wetzel,C. 2013. Stock synthesis: A biological and statistical framework for fish stock assessment and fishery management. Fisheries Research 142: 86-99.

Rudd, MB, Cope, JM, Wetzel, CH, and Hastie, J. 2021. Catch and length models in the stock synthesis framework: expanded application to data-moderate stocks. Frontiers in Marine Science.

Nadon, MO and Ault, J. 2016. A stepwise stochastic simulation approach to estimate life history parameters for data-poor fisheries. CJFAS 73:1874-1884.

Panel Review Meeting

Each CIE reviewer shall conduct the independent peer review in accordance with the PWS and ToRs, and shall not serve in any other role unless specified herein. Each CIE reviewer shall actively participate in a professional and respectful manner as a member of the meeting review panel, and their peer review tasks shall be focused on the ToRs as specified herein. The meeting will consist of presentations by NOAA and other scientists to facilitate the review, to provide any additional information required by the reviewers, and to answer any questions from reviewers.

Contract Deliverables - Independent CIE Peer Review Reports

The CIE reviewers shall complete an independent peer review report in accordance with the requirements specified in this PWS and OMB guidelines. Each CIE reviewer shall complete the independent peer review according to required format and content as described in **Annex 1**. Each CIE reviewer shall complete the independent peer review addressing each ToR as described in **Annex 2**.

Other Tasks – Contribution to Summary Report

The CIE reviewers will assist the Chair of the panel review meeting with contributions to the Summary Report, based on the terms of reference of the review. The CIE reviewers are not required to reach a consensus, and shall provide a brief summary of each reviewer's views on the summary of findings and conclusions reached by the review panel in accordance with the ToRs.

Foreign National Security Clearance

When reviewers participate during a panel review meeting at a government facility, the NMFS Project Contact is responsible for obtaining the Foreign National Security Clearance approval for reviewers who are non-US citizens. For this reason, the reviewers shall provide requested information (e.g., first

and last name, contact information, gender, birth date, passport number, country of passport, travel dates, country of citizenship, country of current residence, and home country) to the NMFS Project Contact for the purpose of their security clearance, and this information shall be submitted at least 30 days in accordance with the NOAA Deemed Export Technology Control Program NAO 207-12 regulations available at the Foreign National Guest website. The contractor is required to use all appropriate methods to safeguard Personally Identifiable Information (PII).

Place of Performance

The place of performance shall be at the contractor's facilities, and in Tutuila, American Samoa or virtually dependent on conditions of the COVID 19 pandemic.

Period of Performance

The period of performance shall be from the time of award through April 2023. Each reviewer's duties shall not exceed 14 days to complete all required tasks.

Schedule of Milestones and Deliverables: The contractor shall complete the tasks and deliverables in accordance with the following schedule.

Within two weeks of award	Contractor selects and confirms reviewers
Approximately 2 weeks later	Contractor provides the pre-review documents to the reviewers
February 17-23, 2023	Each reviewer participates and conducts an independent peer review during the panel review meeting
Within two weeks of panel review meeting	Contractor receives draft reports
Within three weeks of receiving draft reports	Contractor submits final reports to the Government

*The Chair's Summary Report will not be submitted to, reviewed, or approved by the Contractor.

Modifications to the Performance Work Statement: Each reviewer will write an individual review report in accordance with the PWS, OMB Guidelines, and the ToRs below. Modifications to the PWS and ToRs cannot be made during the peer review, and any PWS or ToRs modifications prior to the peer review shall be approved by the Contracting Officer's Representative (COR) and the CIE contractor. The PWS and ToRs shall not be changed once the peer review has begun.

Applicable Performance Standards

The acceptance of the contract deliverables shall be based on three performance standards:

(1) The reports shall be completed in accordance with the required formatting and content (2) The reports shall address each ToR as specified (3) The reports shall be delivered as specified in the schedule of milestones and deliverables.

Travel

All travel expenses shall be reimbursable in accordance with Federal Travel Regulations (http://www.gsa.gov/portal/content/104790). International travel is authorized for this contract. Travel is not to exceed $15,000.

Restricted or Limited Use of Data

The contractors may be required to sign and adhere to a non-disclosure agreement.

NOAA Fisheries Project Contact:

Felipe Carvalho
NOAA Fisheries
FRMD/PIFSC/NMFS/NOAA
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Annex 1: Format and Contents of CIE Independent Peer Review Report

The report must be prefaced with an Executive Summary providing a concise summary of the findings and recommendations.

The report must contain a background section, description of the individual reviewers' roles in the review activities, summary of findings for each ToR, in which the weaknesses and strengths are described, and conclusions and recommendations in accordance with the ToRs.

Reviewers must describe in their own words the review activities completed during the panel review meeting, including a brief summary of findings, of the science, conclusions, and recommendations.

Reviewers should discuss their independent views on each ToR even if these were consistent with those of other panelists, but especially where there were divergent views.

Reviewers should elaborate on any points raised in the summary report that they believe might require further clarification.

Reviewers shall provide a critique of the NMFS review process, including suggestions for improvements of both process and products.

The report shall be a stand-alone document for others to understand the weaknesses and strengths of the science reviewed, regardless of whether or not they read the summary report. The report shall represent the peer review of each ToR, and shall not simply repeat the contents of the summary report.

The report shall include the following appendices:

Appendix 1: Bibliography of materials provided for review

Appendix 2: A copy of this Statement of Work

Appendix 3: Panel membership or other pertinent information from the panel review meeting.

Annex 2: Terms of Reference for the Peer Review

External Independent Peer Review under the Western Pacific Stock Assessment Review framework: 2023 Benchmark Stock Assessment for the American Samoa Bottomfish

For questions 1-9 and their subcomponents, reviewers shall provide a "yes" or "no" answer and will not provide an answer of "maybe". Only if necessary, caveats may be provided to these yes or no answers, but when provided they must be as specific as possible to provide direction and clarification to NMFS.

1. Of the data considered for inclusion in the assessment, were final decisions on inclusion/exclusion of particular data appropriate, justified, and well-documented?
2. Is the CPUE standardization properly applied and appropriate for this species, fishery, and available data?
3. Are the assessment models used reliable, properly applied, adequate, and appropriate for the species, fishery, and available data?
4. Are decision points and input parameters reasonably chosen?
5. Are primary sources of uncertainty documented and presented?
6. Are model assumptions reasonably satisfied?
7. Are the final results scientifically sound, including but not limited to estimated stock status in relation to the estimated overfishing and overfished status determination criteria (SDC)?
8. Are the methods used to project future population state adequate, including the characterization of uncertainty, and appropriately applied for implementation of overfishing limits (OFL)?
9. If applied, is the choice of indicator species to evaluate more poorly known species that are in a stock complex appropriate?
10. Can the results be used to address management goals stated in the relevant FEP or other documents provided to the review panel? If any results of these models should not be applied for management purposes with or without minor short-term further analyses (in other words, if any responses to any parts of questions 1-9 are "no"), indicate which alternative option should be used to inform setting stock status and fishery catch limits between 1) using the previous assessment, 2) using an indicator species, or 3) designing the stock status as "unknown".
11. As needed, suggest recommendations for future improvements and research priorities. Indicate whether each recommendation should be addressed in the short/immediate term (for this assessment), mid-term (next assessment) and long-term (5-10 years). Also indicate whether each recommendation is high priority (likely most affecting results and/or interpretation), mid priority, or low priority.
12. Draft a report (individual reports from each of the panel members and an additional Summary Report from Chair) addressing the above ToR questions.

Annex 3: Tentative Agenda

2023 Benchmark Stock Assessment for the American Samoa Bottomfish

Tutuila, American Samoa
February 17-23, 2023

Day 1, Friday February 17
Welcome and Introductions
Background information
Objectives and Terms of Reference
Fishery operation
Management
History of stock assessments and reviews
Data
DMWR creel-survey and Biosampling
Public comment period (30 minutes)

Day 2, Saturday February 18
Presentation and review of stock assessment

Day 3, Sunday February 19
Continue review of stock assessment

Day 4, Monday February 20
Continue review of stock assessment
Public comment period (30 minutes)

Day 5, Tuesday February 21
Continue review of stock assessment

Day 6, Wednesday February 22
Continue review of stock assessment
Panel discussion (Closed; afternoon)

Day 7, Thursday February 23
Present results (Morning)
Public comment period (30 minutes)
Adjourn

Appendix 3: Panel Membership and List of Participants

WPSAR Panel

Erik Franklin, WPSAR Chair, University of Hawaii

Joseph Powers, Center for Independent Experts

Patrick Cordue, Center for Independent Experts

NMFS - Pacific Islands Fisheries Science Center (PIFSC)-Stock Assessment Team

Marc Nadon

Megumi Oshima

Felipe Carvalho

NMFS - PIFSC

Robert Ahrens

Marlowe Sabater

NMFS - Pacific Islands Regional Office

Brett Schumacher

Western Pacific Fishery Management Council

Mark Daniel Fitchett

Nonu Tuisamoa (Advisory Panel)

Territorial Agency

Taotasi Archie Soliai (Director - DMWR)

Domingo Ochavillo (DMWR)

Warren Sevaaetasi (DMWR)

Christina Samau (DMWR)

Tepora Lavatai (DMWR)

Yvonne Mika (DMWR)

Selaina Vaitautolu (DMWR)

Mareko Milo (DMWR)

Letisha Fala (DMWR)

Shaun Laolagi (DMWR)

Auvaa Soonaolo (DMWR)

Herbie Umi (DMWR)

Tony Langkilde (DOC)

Fishing Community (Public)

Omar Shalhout

Keith Ahsoon

Leuma Sue

Fereti Lemoa

Punipuao Lemoa

Ropeti Misa

Howard Dunham

Calvin Ilaoa

Muamalae Tata Aga

Maselino Ioane

Ogesefolo Tuala

Paepae Simi

Manaima V

Brian Peck

American Samoa Fono (legislature)

Samuel Meleisea