WESTERN PACIFIC REGIONAL FISHERY MANAGEMENT COUNCIL

111th Meeting of the Scientific and Statistical Committee
October 24-26, 2012,
Council Office Honolulu, Hawaii

1. Introductions

2. Approval of Draft Agenda and Assignment of Rapporteurs

3. Status of the 110th SSC Meeting Recommendations

4. Report from the Pacific Islands Fisheries Science Center Director

Sam Pooley described recent and ongoing activities at PIFSC, including research cruises, participation in the Hawaii Fishing and Seafood Festival, the ISC meeting in Sapporo in July, the new NOAA facility at Ford Island, PIFSC blogs and Twitter accounts, the hiring of science coordinators in CNMI, Guam, and American Samoa, and six upcoming/recent retirements.

5. Program Planning

A. NMFS Science Plan & Prioritization Exercise

The director of the PIFSC presented the SSC with an overview of the Center's efforts to update its Science Plan. As part of this process, the SSC was asked to provide input on the priorities of certain PIFSC activities, particularly as those activities relate to SSC's and Council's mandates under the Magnuson-Stevens Act, Endangered Species Act and Marine Mammal Protection Act.

The SSC was presented with paired binary choices of selected current or potential PIFSC activities. Members were then asked to comment on the relative priority of each choice. Members could prioritize these choices, arbitrarily labeled A or B, as either:

A > B A=B A<B

The following section summarizes the opinions of the SSC on the relative importance of each activity.

1. A. Monitor Magnuson Act regulated insular and pelagic fisheries using fishery-dependent data collection via logbooks, observers, VMS, electronic data submission, State and Territorial agency data collection and surveys (WPacFIN) and recreational fishing surveys
1.B. Use cruise, dive, satellite, and fisheries data to monitor insular and pelagic ecosystems.

> **The SSC recommends 1A > 1B because is an SSC mandate, but agrees that the data types in B can support A for data-poor stocks.**

2.A. Map bottom habitat to support spatial analysis
2.B. Conduct sensitivity analyses on fishery stock assessments to provide priorities for further life history, process, and time-series research

The SSC recommends 2A > 2B, with the caveat that stock assessment analyses should always include a sensitivity analysis.

3.A. Monitor non-federally regulated insular and pelagic fisheries
3.B. Magnuson Act regulated insular and pelagic fisheries

The SSC recommends 3A = 3B because the SSC is responsible for ABCs for stocks throughout their range

4.A. Summarize fishery-dependent data and analyze and report to PIRO, the Council, other government agencies, fishermen, researchers, tuna and other RFMO's and other clients
4.B. Participate in the NMFS MRIP (Marine Recreational Informational Program), including enhancement of non-commercial fisheries monitoring and evaluation

The SSC recommends 4A < 4B because better non-commercial data are needed, while the data described in 4A will still be available for use.

5.A. Monitor RFMO managed pelagic fisheries
5.B. Monitor Magnuson Act regulated insular and pelagic fisheries

The SSC recommends 5A = 5B because there are mandates to monitor both, and both are economically and culturally important.

6.A. Understand factors that may mitigate fishery bycatch through laboratory and fishery testing of modified fishing methods, and investigation of post-release survival
6.B. Develop sea turtle assessment models, including parameters to provide information for ESA Section 7 analyses

The SSC recommends 6A > 6B because 6A is more critical for managing fisheries today.

7.A. Conduct interdisciplinary coral reef ecosystem assessments, reef fish and biodiversity assessments, including use of advanced technologies
7.B. Conduct surveys of MHI Hawaiian Monk seals and cetacean population studies for use in estimates of population size

SSC recommends 7A = 7B because of ESA requirements, plus the importance to State management.

8.A. Conduct fishery-independent insular resource surveys using cooperative research with

fishermen
8.B. Conducting cost-earnings studies on commercial fishing vessel trip-cost

The SSC did not address these activities as it was agreed that this was not a good dichotomous pairing. Nevertheless the SSC supports the continuation of these activities.

9.A. Fast-track quota monitoring and forecasting
9.B. Fishery dependent collection data summarization, analysis, and fishery reporting to fishermen, the Council, other government agencies, PIFSC and other researchers, tuna and other RFMO's, and other clients

The SSC recommends 9A > 9B because A is the desirable gold standard in terms of ACL management.

10.A. Low tier annual catch limits (ACL) estimation and monitoring
10.B. Develop IEA (integrated ecosystem assessment) approaches to Pacific Island and high seas ecosystems

The SSC recommends 10A > 10B because ACLs are a current responsibility of the SSC.

11.A. Purse seine fishery data compilation and analysis
11.B. Post-hooking mortality rate analysis

The SSC recommends 11A < 11B, noting the increasing number of protected species issues that the Council must address such as those involving false killer whales. Nevertheless the SSC supports transfer of the responsibility and funding for maintaining the US purse seine database to PIFSC as opposed to its present location at the SWFSC.

12.A. Conducting socio-economic, human dimension research on resource conflicts (e.g., monk seal critical habitat, ESA listing/delisting, etc.)
12.B. Investigate environmental effects of siting aquaculture and ocean energy facilities

The SSC recommends 12A > 12B because if PIFSC does not conduct such studies they may not be conducted at all, while 12B will take place as part of broader coastal and marine spatial planning efforts.

13.A. Monitoring the status of ACL's for non-federally regulated species
13.B. Preparing oceanographic forecasts for bycatch mitigation (e.g., Turtle Watch)

SSC recommends 13A < 13B, with the caveat that the use and utility of Turtle Watch be evaluated.

14.A. Conducting annual census of Hawaiian monk seals in the main Hawaiian islands

14.B. Conducting surveys of cetacean populations in AS, G, NMI, PRIAs and high seas

The SSC recommends A < B because cetaceans are a Council issue looming in all jurisdictions.

15.A. Investigation of movement rates, metapopulation connectivity between areas, efficacy of marine protected areas, and stock structure
15.B. Surveying deepwater bottomfishes with botcam and acoustics

The SSC recommends A > B because A is important immediately and the utility of B is more uncertain.

16.A. Timely information for conservation and management decision-making
16.B. Peer-reviewed scientific publications

The SSC recommends A > B and notes that the SSC serves as a *de facto* peer-review panel that is broader and more timely than standard peer reviews.

17.A. External collaboration and partnerships working with local jurisdictions
17.B. International multicultural and bilateral scientific collaborations

The SSC recommends A > B because these are the entities for which the Council develops fisheries management plans, and therefore it is critical to build relationships with fishermen, agency employees, and stakeholders.

18.A. Develop and implement emerging Technologies (AUVs, ARMS, etc.)
18.B. Enhancing PIFSC on-site scientific capacity in AS, G, NMI, across research programs

The SSC recommends A < B, but notes that both were forward-looking and important.

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6. Insular fisheries

6. A.1.a.i. ABCs for the bottomfish MUS in American Samoa, Guam, and Commonwealth of Northern Mariana Islands

A sub-committee of SSC members and PIRO staff was formed to evaluate the 2012 PIFSC Territorial bottomfish stock assessment (Brodziak et al., 2012)[1] and conduct a P* analysis to set an ABC for the multi-species bottomfish stock complexes in American Samoa, Guam and CNMI. In accordance with the Council's ABC/ACL mechanism, the P* analysis is comprised of 4 dimensions: (1) assessment information; (2) uncertainty characterization; (3) stock status; and (4) productivity and susceptibility analyses which together, constitute the elements for evaluating the level of scientific uncertainty in the estimate of MSY and other reference points. Details of the P* analysis are described in the appendix.

Based on the P* analysis, the SSC sets the ABCs for the bottomfish fishery in fishing year 2013 and 2014 to 101,000 lb/year for American Samoa, 66,800 lb/year for Guam, and 228,000 lb/yr for CNMI (see Table 9 in Appendix 1).

The SSC notes that the ABCs are greater than MSY. However, whenever biomass is substantially higher than biomass at MSY, it is possible to harvest above MSY temporarily. Such a windfall catch is a well known and well understood outcome.

6.A.1.a.ii. & iii. ABCs for Crustaceans and Precious Corals in American Samoa, Guam, CNMI, and Hawaii

The SSC heard a presentation by Council staff regarding the re-specification of ABCs of crustaceans and precious coral management unit species in American Samoa, Guam, CNMI and Hawaii for fishing year 2013. There is no new information nor data to revise the existing ABCs.

The SSC rolls over the existing 2012 ABCs for crustaceans and precious corals for fishing year 2013.The SSC further recommends that additional effort be directed to obtaining better harvest estimates for refining ABCs and ACLs.

[1] Brodziak, J, J. O'Malley, B. Richards and G. DiNardo. 2012. Stock Assessment Update of the Status of the Bottomfish Resources of American Samoa, the Commonwealth of the Northern Mariana Islands, and Guam. National Marine Fisheries Service, Pacific Islands Fisheries Science Center. PIFSC Internal Report IR-12-022, 126 pp.

6.A.1.b.i. ABCs for Main Hawaiian Islands non-deep 7 bottomfish species

The SSC heard a presentation by Council staff regarding the re-specification of ABCs for the main Hawaiian Islands non-deep 7 bottomfish species for fishing year 2013. Using available fisheries information through 2011, the SSC calculated the 2012 ABC as 135,000 lb. Incorporating 2011 data into the same ad-hoc model average approach used in setting the 2012 ABC (i.e., by analogy to Deep 7 bottomfish, mean catch of the last five years, and 75th percentile of the entire catch time series), resulted in a potential increase in the current ABCs by 5,000 lbs. The new ABC falls within a conservative range in the risk of overfishing at less than 26% probability of overfishing.

The SSC sets the ABC for the MHI non-deep 7 bottomfish at 140,000 lbs.

6.A.2. Alternatives for the moratorium on the gold coral fishery

The SSC heard a presentation from Council staff regarding the moratorium on the gold coral fishery in the Western Pacific Region. The moratorium will expire in August 2013. Recent studies have indicated that gold coral colonies grow at a rate of only 2.2 mm per year and not at 6.6. cm based on past research. They may have a life span up to 2,700 years (Parrish and Roark 2009)[2].

The SSC was in favor of extending the moratorium but questioned the utility of managing a fishery where the MSY is too low to be commercially viable. The length of the moratorium was also discussed, and it was reported that the armorhead moratorium was based on the species' life history. This rationale may not be appropriate in light of the potential millennial life history of the gold coral**.**

It was noted that the fishery can be re-opened at anytime if it is warranted and the SSC recommends extending the moratorium for another 5 years.

6.B.1. Cooperative Research bottomfish tagging projects in Hawaii

The SSC heard a presentation by Clay Tam of the Pacific Islands Fisheries Group. Bottomfish tagging projects were conducted outside the Bottomfish Restricted Fishing Areas confirms earlier research showing some bottomfish are able to cross deep water channels between islands. No tagging was conducted in BRFAs by this cooperative research project.

The SSC recommends that tagging be conducted in BRFAs in the future.

Another project investigated several techniques for minimizing barotrauma in fish in Hawaii and the Mariana Archipelago. The SSC thanked Clay Tam for a job well done and for an interesting presentation.

[2] Parrish FA, Roark EB (2009) Growth validation of gold coral *Gerardia* sp. in the Hawaiian Archipelago. Mar Ecol Prog Ser 397:163-172

6.B.2. Acoustic tagging of bottomfish

The SSC heard a presentation by Kevin Weng regarding acoustic tagging of onaga and ehu within a BRFA adjacent to the east coast of Niihau. The study showed that onaga cross deep water areas within the study area and beyond the BRFA boundary, whereas tagged ehu remained more localized to their area of release within the BRFA. Weng indicated that this research was being expanded to other areas of the main Hawaiian Islands such as Penguin Banks.

The SSC thanked Kevin Weng for a job well done and for an interesting presentation, and encouraged further research with acoustic tagging, noting that funding must be sourced to greatly supplement the number of receivers in order to provide results for bottomfish spatial management.

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7. Pelagic Fisheries

7.A. Status of Opah Caught by the Hawai'i-based Pelagic Longline Fishery

Pierre Kleiber of PIFSC, reported that the status of North Pacific opah is still unknown. This is because a production model assessment conducted by Kleiber could not resolve the drastic decline in both catch and catch rate in the year 2000, which was followed by increasing catches and stable catch rates.

The SSC voiced appreciation for the clear, detailed description of the steps involved in data quality control of the Hawaii longline fishery data, and of the mathematical process for standardization of the catch rates. This process produced a data set suitable for a potential stock assessment, should other data sets be obtained for foreign longline fleets operating in the North Pacific.

The drastic decline in opah catch rates in the year 2000 generated considerable discussion by the SSC. It was noted that major changes occurred in the longline fishery management in 2000, which was also coincident with operational changes in the types of bait used in the longline fishery.

Consequently, the SSC recommended that vessel departures from the longline fishery, switching between the tuna and swordfish components of the fishery, and other possible consequences of these management changes be investigated in the next assessment.

The study showed in 2000 a majority of the fishery switched longline bait from Pacific saury to various sardine species. However, this bait switch was unable to explain the steep decline in opah catch rates. The SSC recommended that highliner opah fishermen be interviewed to determine how they completed their logbooks when using a mixture of saury and sardine on the same set.

The SSC further recommended that highliner opah fishermen be asked for their opinions on why the opah catch rates declined.

7.B. ISSF Research

The SSC heard a presentation from SSC member David Itano who was collaborating with the International Seafood Sustainability Foundation (ISSF) on minimizing incidental bigeye catch and other species bycatch in tuna purse seine fisheries. Itano showed the results of his work on

the chartered purse seiner, Cape Finisterre, which included trials with a release panel in the purse seine net to allow bycatch to escape. The Western Pacific Council was among the organizations to provide support for this research.

The SSC strongly supports this research and recommends continued Council support for this collaborative research with ISSF and the purse seine fishing industry.

7.C. Tracking the Changes of Economic Performance Indicators for the Main Commercial Fisheries in the Western Pacific Areas

Minling Pan of PIFSC, Socio-Economic Group, reported to the SSC on the Center's efforts to regularly collect fishing vessel operating costs and to create economic performance indicators for fleets in American Samoa, Hawaii, Guam, and the CNMI.

The SSC endorses this PIFSC initative and makes the following recommendations for additional associated research:

1. **Efforts be undertaken to expand the measurements of fisheries benefits by incorporating the psychological, social, cultural and other non-market values that accrue to practitioners and their communities.**

2. **To improve understanding of the Hawaii-based longline fishery, develop bio-economic models, which include the following:**

   (i) Catch as a function of season, effort and other relevant environmental and operational factors;
   (ii) Effort as a function of fish price, fuel costs and relevant socio-economic factors; and
   (iii) Price as a function of catch, and the price of substitutes, and other relevant consumer factors.

7.D. Levels of Observer Coverage in Shallow Set Swordfish Fishery

Marti McCracken, PIFSC, presented the results of a simulation study undertaken to investigate the possible consequences of the Council reducing the observer coverage in the Hawaii shallow-set longline fishery to less than 100%.

As an aid to the Council in setting the acceptable level of statistical error in estimating the catch (take) of loggerhead and leatherback sea turtles, the simulation study was conducted by resampling the historical data collected using 100% coverage to simulate different coverage rates and then computing the errors in estimating the true takes in the historical data. The results of the simulation study made it clear that a number of critical decisions have to be made to guide the process of selecting an acceptable error level, and she posed the following questions to facilitate this process.

1) Should the criteria be based on the error, relative error, or some other statistic?

2) Should the criteria be specified for the absolute value of the selected error term or the value when catch is underestimated or overestimated?

3) Should the criteria be satisfied for all likely levels of total catch in the near future, or should the focus be on a level a total catch that is close to the current hard limits of incidental take or possible new levels of allowable incidental take?

4) Should the criteria be the same for leatherback and loggerhead estimated catch?

5) What amount of effort is expected in the fishery in the near future?

6) What are the criteria? For example, what are the values of d or r and α that specify the criteria for the error or relative error, respectively?

The SSC noted that future Federal budget issues might lead to increased interest in reducing costs by reducing the level of observer coverage.

The SSC recommends that the Council task the SSC to address the six questions posed by McCracken via a subcommittee.

7. E. American Samoa and Hawaii Longline Quarterly Reports

David Hamm, PIFSC, reported on the 2nd quarter for the American Samoa longline fishery and Russell Ito, PIFSC, did likewise for the Hawaii longline fishery.

The SSC thanked Dave Hamm for his many years of service reporting on these fisheries and appreciated his pictorial summary of changes in the American Samoan government facility and the longline fleet. The SSC wishes Dave well in his forthcoming retirement.

The SSC recommended that opah be added to the list of species described in the Hawaii quarterly report because of its increasing importance in the Hawaii longline fishery.

7.F. International Fisheries Meetings

Council staff presented on three Western and Central Pacific Fisheries Commission Conservation and Management Measures (CMMs) that will be the focus of discussions at the WCPFC ninth meeting in Manila in December this year. The three CMMs were as follows:

CMM 2008-01: Conservation and Management Measure for Bigeye and Yellowfin Tuna in the Western and Central Pacific Ocean

CMM 2010-01: Conservation and Management Measure for North Pacific Striped Marlin

CMM 2010-05: Conservation and Management Measure for South Pacific Albacore

The SSC reviewed the measures and their intended efficacy at stock conservation, and generated

recommendations to the Council about the new iterations of these measures.

With respect to CMM 2008-01, the SSC noted that the longline fisheries in the WCPO have, by and large, reduced their catches of bigeye in compliance with CMM 2008-01, especially the Hawaii longline fishery. By contrast, CMM 2008-01 has failed to control FAD-associated purse seine fishing effort, which is the main source of juvenile bigeye fishing mortality. The SSC reiterates its recommendation that a new CMM must address the substantial catch of juvenile bigeye by purse seine fleets, especially in light of the continued increase in the number purse seine vessels, fishing effort, purse seine catch of juvenile bigeye, and increasing prevalence of FAD sets.

With respect to CMM 2010-01, the SSC notes the seriously depleted condition of NP Striped Marlin from the recent ISC stock assessment, and encourages the WCPFC to take the required management action to rebuild the stock.

With respect to CMM-2010-05, the SSC supports the timely development of conservation and management measures for South Pacific albacore currently being pursued by the FFA/Te Vaka Moana members. This may include in-zone South Pacific albacore MSY-based catch limits and limits on high seas catches. The SSC also encourages the active participation of American Samoa in the FFA/Te Vaka Moana process.

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8. Protected Species

8A Update on ESA and MMPA actions

Dawn Golden (PIRO) provided an update on the status of 12 ESA actions addressing a range of species including the monk seal, several reef fish, 82 species of coral, great white shark, scalloped hammerhead shark, loggerhead turtle and the Hawaiian green turtle. Golden also provided an update on the status of MMPA actions addressing species such as false killer whale, spinner dolphin and stock assessment reports.

SSC members aired concern about the findings that the Hawaiian Islands are considered a core area for great white sharks. Concerns were also raised on the petition for the listing of damselfish. Other members shared information on significant harvests of *Chromis viridis* in the South Pacific for the aquarium trade.

The SSC thanked Dawn Golden for an informative presentation.

8B. Draft 2012 Marine Mammal Stock Assessment Reports and new abundance estimates for FKW

Erin Oleson (PIFSC) provided an update on false killer whale (FKW) group size estimation as there was some concern that previous FKW abundance in Hawaiian waters had been underestimated. The pelagic stock was now estimated to be around 1500 whales and the NWHI stock was estimated to be around 550 whales. She also reported on the draft 2012 FKW Stock Assessment Report (SAR). There are 4 FKW stocks considered in the SAR — the Hawaiian insular and pelagic stocks are considered "strategic stocks" due to apparent declines and fishery-related interactions. Using the recent stock abundance estimates, the PBR (Potential Biological Removal) was now estimated to be 0.3 for the Hawaiian insular stock and 9.1 for the Hawaiian pelagic stock.

The SSC raised a number of ongoing concerns about the FKW population abundance estimates and the estimated spatial genetic structure comprising 3 stocks**.**

An SSC subcommittee comprising David Itano (Chair) , Milani Chaloupka. Robert Skillman, Brian Bowen, Jim Lynch and Pierre Kleiber was established to undertake a review of the Hawaii FKW SAR and related documents.

The SSC thanked Erin Oleson for an informative presentation.

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9. Other Business

Apart from the dates for the next SSC meeting, Stewart Allen asked for SSC thoughts on a social science cooperative research study. Suggestions from the SSC included bringing scientists and fishermen together to talk about selected issues such as habitat conservation and stock assessments. It was noted that one –on-one conversation with fishermen may work better than group meetings. Moreover a person with outreach skills may be more effective at talking to fishermen than scientists.

APPENDIX 1. DETERMINATION OF RISK OF OVERFISHING OF TERRITORY BOTTOMFISH

Each dimension of information was worth a total score of (10) points with all four dimension worth a total of (40) points. The sum of the scores from all dimensions was then subtracted from the 50% probability of overfishing to determine the acceptable risk of overfishing for 2013 and 2014. A risk of 50% is the maximum allowable by law. ABC is calculated as the amount of catch projected by Brodziak et al., (2012) that corresponds to the acceptable level of risk over the two year period 2013 and 2014.

1. Assessment Information

The assessment information dimension relates to adequacy of the assessment model used and the data that went into it. The same model was used for the 3 territories. It was deemed quite good, resulting in a reduction of only 1.6 to the risk level.

Table 1. Dimension 1: Assessment Information

Assessment Information Description	Score
Perfect. Quantitative assessment provides estimates of exploitation and B; includes MSY-derived benchmarks	0.0
Quantitative assessment provides estimates of exploitation and B; includes MSY-derived benchmarks; no spatially-explicit information	2.0
Good. Measures of exploitation or B, proxy reference points, no MSY benchmarks; some sources of mortality accounted for	4.0
Relative measures of exploitation or B, proxy reference points, absolute measures of stock unavailable	6.0
No benchmark values, but reliable catch history	8.0
Bad. No benchmark values, and scarce or unreliable catch records	10.0

Table 2. Assessment aspects used in determining the score for the first dimension

Assessment Aspects (AAs)	Score
Reliable catch history	0.5
Standardized CPUE	0.5
Species-specific data	1.0
All sources of mortality accounted for	0.5
Fishery independent survey	1.0
Tagging data	1.0
Spatial analysis	1.0
SUM	**5.5**

Table 3. Scaling equivalent for the assessment aspect scores

AAs Score	Scaled equivalent	AAs Score	Scaled equivalent
0.5	0.1	**4**	1.1
1	0.3	**4.5**	1.3
1.5	0.4	**5**	1.4
2	0.6	**5.5**	1.6
2.5	0.7	**6**	1.7
3	0.9	**6.5**	1.9
3.5	1.0	**7**	2.0

DIMENSION SCORE = 1.6

2. Uncertainty Characterization.
The uncertainty characterization dimension relates to how well the assessment estimates uncertainty. This was deemed to be middling complete for the current assessment, resulting in a reduction of 5 out of possible 10 to the risk level.

Table 4. Dimension 2: Uncertainty Characterization

Uncertainty Characterization Description	Score
Complete. Key determinant – uncertainty in both assessment inputs and environmental conditions included	0.0
High. Key determinant – reflects more than just uncertainty in future recruitment	2.5
Medium. Uncertainties are addressed via statistical techniques and sensitivities, but full uncertainty is not carried forward in projections	5.0
Low. Distributions of Fmsy and MSY are lacking	7.5
None. Only single point estimates; no sensitivities or uncertainty evaluations	10.0

DIMENSION SCORE = 5.0

3. Stock Status

The stock status dimension has to do with where the stock currently stands on the "Kobe" (overfished vs. overfishing) diagram. Because the stock status in all 3 territories stands solidly in the most favorable situation (biomass being well above Bmsy and F being well below Fmsy), there was no reduction to the risk level.

Table 5. Dimension 3: Stock Status

Stock Status Description	Biomass level and Fishing level	Score
Neither overfished nor overfishing.	Stock > MSST and B_{MSY}, F < MFMT	0.0
Neither overfished nor overfishing.	Stock > MSST, F < MFMT	2.0
Neither overfished nor overfishing.	Stock ≥ MSST, F ≤ MFMT	4.0
Stock is not overfished, overfishing is occurring	Stock >MSST, F > MFMT	6.0
Stock is overfished, overfishing is not occurring	Stock <MSST, F ≤ MFMT	8.0
Stock is overfished, overfishing is occurring	Stock <MSST, F > MFMT	10.0

DIMENSION SCORE = 0.00

4. Productivity-Susceptibility

The productivity-susceptibility (P-S) dimension depends on the biological productivity and the susceptibility to fishing of the various species in the Territory bottomfish fishery. Domingo Ochavillo (AS DMWR Senior Scientist), Mike Triani (PIFSC CNMI Science Coordinator), and Bob Humphreys (PIFSC – insert position) provided their expert scores beforehand on a scale of zero to 10 for 16 species for each of the territories. The resulting average P-S scores for each

Territory are: American Samoa = 1.95; Guam = 4.45; and CNMI = 4.61.

Table 6. Dimension 4: Productivity and Susceptibility

Species	Productivity			Susceptibility		
	GU	NMI	AS	GU	NMI	AS
Caranx lugubris (black trevally)	2.5	5	0	5	2.5	0
Aphareus rutilans (lehi)	5	5	5	5	5	0
Etelis carbunculus (ehu)	2.5	5	0	2.5	5	2.5
Etelis coruscans (onaga)	5	5	7.5	2.5	5	0
Pristipomoides auricilla (yellowtail snapper)	2.5	7.5	0	5	2.5	0
Pristipomoides filamentosus (opakapaka)	5	7.5	5	2.5	2.5	0
Pristipomoides flavipinnis (yelloweye opakapaka)	2.5	5	0	2.5	2.5	0
Pristipomoides seiboldi (kalekale)	2.5	5	0	2.5	5	0
Pristipomoides zonatus (gindai)	5	5	5	2.5	2.5	0
Aprion virescens (uku)	5	5	2.5	5	2.5	0
Caranx ignobilis (giant trevally)	2.5	5	10	7.5	5	0
Epinephelus fasciatus (black tip grouper)	7.5	5	5	7.5	5	0
Lethrinus amboinensis (ambon emperor)	5	5	5	7.5	2.5	0
Lethrinus rubrioperculatus (red gill emperor)	2.5	7.5	5	7.5	2.5	0
Lutjanus kasmira (blue lined snapper)	2.5	7.5	5	7.5	2.5	0
Variola louti (lunar tail grouper)	5	5	5	7.5	5	0

Table 7. Average productivity-susceptibility scores for the 16 BMUS species in Guam, Northern Mariana Islands and American Samoa.

Species	Average P-S scores		
	GU	NMI	AS
Caranx lugubris (black trevally)	3.75	3.75	0
Aphareus rutilans (lehi)	5	5	2.5
Etelis carbunculus (ehu)	2.5	5	1.25
Etelis coruscans (onaga)	3.75	5	3.75
Pristipomoides auricilla (yellowtail snapper)	3.75	5	0
Pristipomoides filamentosus (opakapaka)	3.75	5	2.5

Pristipomoides flavipinnis (yelloweye opakapaka)	2.5	3.75	0
Pristipomoides seiboldi (kalekale)	2.5	5	0
Pristipomoides zonatus (gindai)	3.75	3.75	2.5
Aprion virescens (uku)	5	3.75	1.25
Caranx ignobilis (giant trevally)	5	5	5
Epinephelus fasciatus (black tip grouper)	7.5	5	2.5
Lethrinus amboinensis (ambon emperor)	6.25	3.75	2.5
Lethrinus rubrioperculatus (red gill emperor)	5	5	2.5
Lutjanus kasmira (blue lined snapper)	5	5	2.5
Variola louti (lunar tail grouper)	6.25	5	2.5
OVERALL AVERAGE	**4.45** **GU**	**4.61** **NMI**	**1.95** **AS**

The total scores were 8.55 for American Samoa, 11.05 for Guam, and 11.1 for CNMI. Subtracting the total scores from 50% probability of overfishing in the second year resulted in rounded risk levels of 41% for American Samoa, 40% for Guam, and 39% for CNMI. Corresponding ABC levels were then obtained from a table derived from Brodziak et al., (2012)

Table 8. Summary of the dimension scores.

Dimension	AS	GU	NMI
Assessment Information	1.6	1.6	1.6
Uncertainty Characterization	5	5	5
Stock Status	0	0	0
Productivity and Susceptibility	1.95	4.45	4.61
FINAL SCORE	8.55 ~ **9**	11.05 ~ **11**	11.21 ~ **11**

Table 9. Probability of overfishing and associated Acceptable Biological Catch in American Samoa, Guam, and CNMI.

	American Samoa Bottomfish			Guam Bottomfish			CNMI Bottomfish		
MSY Est	*76,200 ± 14,300 lb*			*55,000 lb ± 7,900 lb*			*172,900 ± 32,200 lb*		
$Catch_{2010}$	*9,509 lb*			*28,958 lb*			*22,395 lb*		
Ave_{08-10}	*30,593 lb*			*35,499 lb*			*35,314 lb*		
	ABC(lb)	*Probability of Overfishing in 2013 (%)*	*Probability of Overfishing in 2014 (%)*	***ABC(lb)***	*Probability of Overfishing in 2013 (%)*	*Probability of Overfishing in 2014 (%)*	***ABC(lb)***	*Probability of Overfishing in 2013 (%)*	*Probability of Overfishing in 2014 (%)*
Alternative 1 *(Status Quo)*	**99,200**	28-29	38-39	**48,200**	5-10	5-11	**182,500**	10-15	11-17
Alternative 2 (<30%)	**33,000**	0	0	**22,000**	0	0	**40,000**	0	0
	60,000	5	5	**44,000**	5	5	**130,000**	5	5
	73,000	10	12	**51,000**	10	11	**162,000**	10	11
	81,000	15	18	**56,000**	15	17	**183,000**	15	17
	89,000	20	26	**61,000**	20	26	**203,000**	20	26
	90,200	21	27	**61,800**	21	28	**206,200**	21	28
	91,400	22	29				**209,400**	22	29
Alternative 3 (30-39%)	**92,600**	23	30	**62,600**	22	30	**212,600**	23	31
	93,800	24	32	**63,400**	23	31	**215,800**	24	32
	95,000	25	33	**64,200**	24	33	**219,000**	25	34
	96,200	26	35	**65,000**	25	35	**222,000**	26	36
	97,400	27	36	**65,600**	26	37	**225,000**	27	38
	98,600	28	38	**66,200**	27	38	**228,000**	28	39
	99,800	29	39						
Alternative 4 (40-45%)	**101,000**	30	41	**66,800**	28	40	**231,000**	29	41
	102,200	31	43	**67,400**	29	41	**234,000**	30	43
	103,400	32	44	**68,000**	30	43	**237,000**	31	45
				68,500	31	45			
Alternative 5 (46-50%)	**104,600**	33	46	**69,200**	32	46	**240,000**	32	47
	105,800	34	47	**69,800**	33	48	**243,000**	33	48
	107,000	35	49	**70,400**	34	49	**246,000**	34	50
	108,000	36	50	**71,000**	35	51			