

**Main Hawaiian Islands Uku P* Working Group Meeting**

July 21, 2020

9:00 am to 12:00 pm

Council Conference Room and Via Google Meets

Honolulu, Hawaii

Participants: Jason Helyer (Chair, HDAR), Marc Nadon (PIFSC-SAP), Joe O'Malley (PIFSC-LHP), Tom Ogawa (HDAR), Clay Tam (AP Chair), Nathan Abe (CF), Eddie Ebisui III (CF)

Council Staff: Zachary Yamada, Marlowe Sabater

DRAFT REPORT**1. Introduction**

The meeting started at 9:00 am. Western Pacific Regional Fishery Management Council (Council) staff welcomed meeting participants and highlighted the importance of the involvement of the Hawaii Department of Aquatic Resources (HDAR) and the fishing community in the federal decision-making process. The Risk of Overfishing Analysis (denoted by P*) scores generated by the P* working group will be used by the Scientific and Statistical Committee (SSC) to set the Acceptable Biological Catch (ABC) for the Main Hawaiian Islands (MHI) uku (*Aprion virescens*) stock.

2. Recommendations from previous Council meetings

In June 2020, the Pacific Islands Fisheries Science Center (PIFSC) delivered the benchmark stock assessment for MHI uku. The SSC concluded that the stock assessment was to be considered the best scientific information available. The Council directed its staff to conduct the P* and Social, Ecological, Economic, and Management (SEEM) analyses. Council staff formed working groups in Hawaii to conduct the P* and SEEM analyses. The task of the P* working group is to quantify scientific uncertainty in the benchmark stock assessment for MHI uku.

3. Overview of the P* process

Council staff provided an overview of the P* process. The P* analysis is conducted to quantify scientific uncertainties in a new benchmark stock assessment associated with the risk of overfishing. In the P* analysis, reductions are made to the overfishing limit (OFL) to generate the ABC if the assessment is information poor, has poor characterization of uncertainty, and/or if stock status is overfished/experiencing overfishing. The P* process itself involves classifying the fish stock in one of five tiers, with the MHI uku stock being considered a Tier 1 stock because there are reliable estimates of the OFL and uncertainty in OFL for the stock from statistically-based stock assessments.

There are four dimensions considered for the P* scoring procedure: 1) assessment information; 2) uncertainty characterization; 3) stock status; and 4) productivity and

susceptibility. The P* working group generates scores for the first three dimensions, and the productivity attributes are scored in advance by the PIFSC Life History Program while the susceptibility attributes are scored by the fishermen at the working group meeting. The total reduction score from the sum of scores for each of the dimensions will be deducted from the level of 50% risk of overfishing described in Langseth et al. (2019) to generate the ABC that will be specified by the SSC at its 137th meeting in September 2020.

4. Report on 2020 Benchmark Stock Assessment for the MHI Uku Fishery

Marc Nadon, PIFSC, presented on the 2020 MHI uku benchmark stock assessment, focusing on information used in the stock assessment and the trends in the fishery over time. Nadon highlighted the significance of recreational catch for the stock, although the recreational data from the Hawaii Marine Recreational Fishing Survey (HMRFS) program are only available since 2004. The MHI uku stock is not overfished nor is it experiencing overfishing. The importance of Penguin Banks and the Maui Nui tri-isle was also emphasized.

Fishermen present at the working group meeting stated that the COVID-19 pandemic will likely result in an increase in biomass for the stock over the next few years, as the pandemic caused the market for bottomfish and uku to decline. Fishermen were concerned that the reduction in catch could be interpreted incorrectly as a decline in biomass, and there were additional concerns regarding decreases in catch due to shark depredation. Another participant noted that the production of the bottomfish and uku fisheries is dependent on the ahi fishery, since a productive ahi season will typically cause lower uku catches. PIFSC staff stated that the new data will be fed into the stock assessment model and will be analyzed using various considerations. By the time that a stock assessment update is initiated, the fishery will be given an independent index using bottomfish surveys being conducted in the coming year.

5. Working group scoring session

a. Assessment information (0.7)

The Assessment Information dimension pertains to the scientific information that was utilized in the stock assessment. The working group selected the 0-2 scoring level to which the 2020 benchmark stock assessment belongs.

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

The working group determined that the new benchmark stock assessment is a qualitative assessment that provides estimates of fishing mortality and biomass, and scored the various

assessment aspects to determine where exactly the assessment information falls on the scoring scale.

The relevant assessment aspects are reliable catch history, standardized CPUE, species-specific data, all sources of mortality being accounted for, fishery independent data, tagging data, and spatial analysis

Reliable catch history: the working group noted that there still exists a large uncertainty associated with catches in the recreational fishery due to the variable nature of non-commercial catches. Although the HMRFS program collects recreational data on the uku fishery, there is still large uncertainties as to if the estimated catches accurately describe the non-commercial fishery. As a result, the working group determined a reduction score of 0.5 for this section.

Standardized CPUE: the CPUE series used for the stock assessment was standardized appropriately. The working group did not determine a reduction was necessary and gave this section a reduction score of 0.

Species-specific data: the stock assessment used species-specific data for the MHI uku stock, and the working group gave this section a reduction score of 0.

All sources of mortality accounted for: all the known sources of uncertainty regarding mortality were accounted for in the stock assessment. It was not initially clear if post-release and shark depredation mortality were taken into account. Fishermen present at the working group stated that uku are very resilient, have a low post-release mortality rate, and that mortality from shark depredation has existed in the fishery for a long time. The working group determined a reduction score of 0 for this section.

Fishery independent data, tagging data, and spatial analysis: the working group determined a reduction score of 1 each for the tagging data and spatial analysis categories, as there are currently no tagging or spatial analysis data available. Fishery independent data was given a reduction score of 0 due to the existence of HMRFS data.

The total reduction score for the Assessment Information was **2.5**, which had a scaled equivalent of **0.7**.

b. Uncertainty characterization (2.5)

The working group gave the uncertainty characterization dimension a reduction score of **2.5**. The main sources of uncertainty were presented in the available reproduction and environmental information used in the stock assessment. Fishermen noted that uku is similar to yellowfin tuna, since move vertically in the water column at any given moment and can be anywhere in its environment. A score of 2.5 was given since there is room for improvement in the model.

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	2.5

recruitment	
Medium. Uncertainties are addressed via statistical techniques and sensitivities, but full uncertainty is not carried forward in projections	5.0
Low. Distributions of F_{MSY} and MSY are lacking	7.5
None. Only single point estimates; no sensitivities or uncertainty evaluations	10.0

c. Stock status (0)

The benchmark stock assessment demonstrated that the MHI uku stock is not overfished nor is experiencing overfishing occurring and was given a reduction score of **0**. The stock is above the biomass at the stock's maximum sustainable yield (B_{MSY}), below the maximum fishing mortality threshold (MFMT), and above the minimum stock size threshold (MSST).

		Biomass			
		Above B_{MSY}	Above MSST	Near* MSST	Below MSST
Fishing Mortality	Below MFMT	0.0	2.0	5.0	8.0
	Near* MFMT	1.0	3.0	6.0	9.0
	Above MFMT	2.0	4.0	7.0	10.0

d. Productivity and susceptibility (4.2)

The productivity attributes were previously scored by the PIFSC Life History Program using the attributes from Patrick et al. (2009):

Productivity attributes	High (0)	Moderate (5)	Low (10)	Scores	Remarks
<i>Rate of population increase (r)</i>	>0.5	0.16-0.5	<0.16	5	r=0.29. Langseth et al. 2019. r likely higher but still moderate
<i>Maximum age</i>	<10 yrs.	10-30 yrs	>30 yrs.	10	32 yrs. O'Malley in prep
<i>Maximum size</i>	<60 cm	60-150 cm	>150 cm	4	88. O'Malley in prep
<i>von Bertalanffy growth coefficient (k)</i>	>0.25	0.15-0.25	<0.15	2	0.3. O'Malley in prep
<i>Estimated natural mortality</i>	>0.40	0.20-0.40	<0.2	7	0.2
<i>Measured fecundity</i>	>10e4	10e2-10e3	<10e2	5	unknown
<i>Breeding strategy</i>	0	between 1 and 3	≥ 4	5	unknown
<i>Recruitment pattern</i>	high recruitment success	moderate recruitment success	infrequent recruitment success	5	unknown
<i>Age at maturity</i>	<2 yrs.	2-4 yrs.	>4 yrs.	5	L50=45 cm. Visually coverts to 2-4 years on the growth curve.

					O'Malley et al, in prep.
<i>Mean trophic level</i>	<2.5	between 2.5 and 3.5	>3.5	8	primarily piscivorous with fish accounting for 95% of the total index of relative importance with small pelagic crustaceans, cephalopods and pelagic urochordates

The productivity attributes were given a reduction score of **5.7**.

The susceptibility attributes for the commercial and non-commercial aspects of the uku fishery were scored by the fishermen present at the working group using the following attributes:

Susceptibility attributes	Low (0)	Moderate (5)	High (10)
Areal overlap	<25% of stock occurs in the area fished	25%-50% of the stock occurs in the area fished	>50% of the stock occurs in the area fished
Geographic concentration	stock distributed in > 50% of its range	stock distributed in 25-50% of its range	stock distributed in <25% of its range
Vertical overlap	<25% of stock occurs in the depths fished	25%-50% of the stock occurs in the depths fished	>50% of the stock occurs in the depths fished
Seasonal migrations	Seasonal migrations decrease overlap w/ the fishery	Seasonal migrations do not substantially affect the overlap w/ the fishery	Seasonal migrations increase overlap with the fishery
Schooling/aggregation	Behavioral responses decrease the catchability of the gear	Behavioral responses do not substantially affect the catchability of the gear	Behavioral responses increase the catchability of the gear
Morphology affecting capture	Species shows low selectivity to the fishing gear	Species shows moderate selectivity to the fishing gear	Species shows high selectivity to the fishing gear
Desirability/value of the fishery	Stock is not highly valued or desired by the fishery	Stock is moderately valued or desired by the fishery	Stock is highly valued or desired by the fishery
Management strategies or current regulations on the species	Targeted stocks have catch limits and other local management regs; regs fully enforced	Targeted stock have catch limits and other local management regs but no strong enforcement	No regulations both at federal and local side hence no enforcement needed
Fishing rate relative to M	<0.5	0.5-1.0	>1
Biomass of spawners (SSB) or other proxies	B is 40% of B ₀ (or max observed from time series of biomass estimates)	B is between 25%-40% of B ₀ (or maximum observed from time series of biomass estimates)	B is <25% of B ₀ (or maximum observed from time series of biomass estimates)
Survival after capture and release	Probability of survival >67%	Probability of survival between 33-37%	Probability of survival <33%
Fishery impact to EFH or habitat in general	Adverse effects absent, minimal or temporary	Adverse effects more than minimal or temporary but are mitigated	Adverse effect more than minimal or temporary and are not mitigated

Areal overlap for the commercial and non-commercial sector were scored as moderate (5) due to the species constantly moving from deep to shallow depths and from inshore to offshore areas, and vice versa. Uku also move when they form spawning aggregations, and are able to breed from 20 to 65 fathoms deep. The uku is also one of the few species that may be caught when targeting ahi. Geographic concentration was scored low (0) because uku are known to come together, spawn, then move to other areas. There are spawning aggregates in shallow waters that are difficult to target with a hook but easier targets for divers. Vertical overlap was scored low to moderate (2.5) for commercial fishing and moderate (5) for non-commercial fishing. Fishermen explained that uku in different areas have different preferred ranges in the water column. In Kona, the species may be found at depths of 65 fathoms versus Penguin Banks where uku may be found at 20 fathoms. There was uncertainty on the suitable habitat where uku are primarily caught in the non-commercial sector of the fishery.

Seasonal migration was scored moderate (5) for both the commercial and non-commercial sectors of the uku fishery because the species has been described as a more mobile fish. The fact that uku are caught year-round may indicate that the stock is plentiful. Schooling and aggregation was scored moderate (5) for the commercial fishery sector because they are caught year-round. For the non-commercial fishery sector, schooling and aggregation was scored low to moderate (2.5) because the fish are more likely to be found solitary on the reef.

Morphology affecting capture was scored low to moderate (2.5) because there is no selectivity, much like other bottomfish. For desirability and value, a moderate (5) score was given. Fishermen stated that the price per pound will dictate how much uku fishers will try to catch. The uku is a known, good food fish that holds a better shelf life and also provides as a substitute for the Deep 7 bottomfish and mahimahi. Management strategies were scored low to moderate (2.5) due to the uncertainty in managing the non-commercial sector of the fishery.

The PIFSC working group member calculated the fishing rate relative to natural mortality (M) and scored it as moderate (5) at 0.8. Biomass of spawners (SSB) were calculated and scored low (0) at 0.65. Survival after capture and release was scored low (0). Fishermen noted that uku is a durable and tough fish. Fishery impacts to essential fish habitat and habitat in general was given a reduction score of 0.

The susceptibility analysis for uku was given a reduction score of 2.7.

The overall reduction score for the productivity and susceptibility dimension was 4.2.

6. Conclusion

The P* working group finalized the following reduction scores for each of the P* dimensions:

Dimension	Score
Assessment information	0.7
Uncertainty characterization	2.5
Stock status	0.0
Productivity-Susceptibility	4.2
Total	7.4

The total reduction score was 7.4 rounded to 7, lowering the total P* level to a 43% risk of overfishing