



Managing the Main Hawaiian Island *Aprion virescens* (gray jobfish, uku) Fishery

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1. Introduction

The Western Pacific Regional Fishery Management Council (the Council) is specifying the annual catch limits (ACL) and accountability measures (AM) for the gray jobfish, *Aprion virescens*, also known as “uku”, in the US Exclusive Economic Zone around the main Hawaiian Islands (MHI), for fishing years 2022, 2023, 2024, and 2025. Uku fishermen have been subject to ACLs and AMs since 2012, when the requirement to have an ACL and AM was first implemented for non-Deep 7 bottomfish. Federal regulations at 50 CFR 665.4 (76 FR 37285, June 27, 2011) require NMFS to implement an ACL and AM(s) for all Hawaii BMUS, as recommended by the Council, and to consider the best available scientific, commercial, and other information about the fishery for that stock or stock complex.

2. New Scientific Information

The 2020 benchmark stock assessment (Nadon et al 2020) provided the Council and NMFS with new scientific information about uku stock status, and estimated risk of overfishing at various levels of catch. Fisheries scientists from NMFS PIFSC compiled data from various information sources (i.e. life history information, catch data for the commercial and non-commercial fisheries, length data from catch and underwater census surveys, or UVS) to produce a stock assessment that describes the current status of uku in a Stock Synthesis modeling framework. Stock Synthesis 3.30 is an integrated statistical catch-at-age model that fits a population model to relative abundance and size composition data in a likelihood-based statistical framework to generate maximum likelihood estimates of population parameters, derived outputs, and their associated variability. These outputs are then used to determine stock status and to develop stock projections under different management scenarios. The assessment produced the catch level associated with various levels of overfishing risk at 1 percent intervals based on analysis of catch data. The analysis used the total catch in 2019 to be the status quo catch based on the assumption that 2019 catches would likely be similar to recent catch amounts. The maximum catch was set to give a 50 percent probability of overfishing in the final year of the projections.

Fishing mortality on the stock (average F on ages 5-30) is currently 0.08 with an F/F_{MSY} value of 0.57. Fishing mortality has only been above F_{MSY} (0.14) twice, in 1988 and 1989 when F reached 0.19 and 0.16, respectively. The 2018 spawning stock biomass (SSB) of 819 mt is 272% above the SSB_{MSST} (301 mt). Therefore, relative to the reference points defined by the

Fisheries Ecosystem Plan, overfishing is not occurring and the MHI uku stock is not overfished (Nadon et al 2020).

3. Management Action

3.1 Council Recommendation

The Council deliberated the alternatives for ACLs and AMs for uku in fishing years 2022-2025 in accordance with requirements of the Magnuson-Stevens Fishery Conservation and Management Act and with the approved processes in the Fishery Ecosystem Plan for the Hawaiian Archipelago. The alternatives for the ACL levels were:

1. No Action. No harvest limits will be specified for fishing year 2022-2025
2. Specify the previous harvest limit at 127,205 lb using the 2016 assessment (Nadon 2017) for fishing year 2022-2025.
3. Specify an ACL at P*=41 percent equivalent to 134 mt (295,419 lb) based on the SEEM analysis using the 2020 benchmark stock assessment.
4. Set an ACT at P*=36 percent equivalent to 132 mt (291,010 lb) based on the SEEM analysis using the 2020 benchmark stock assessment.
5. Set an ACT 10 percent lower than the SEEM analysis at P*=26 percent equivalent to 128 mt (282,192 lb) using the 2020 benchmark stock assessment.

The proposed actions also includes three alternatives for AMs for this fishery, an in-season AM applied to two sectors of the fishery (commercial and non-commercial), an in-season AM for commercial fisheries only, and a post-season AM.

1. Allocate the ACL/ACT between the commercial and non-commercial sectors and apply and in-season AM whereby catch is tracked using the Fisher Reporting System (FRS) for the commercial fishery and Hawaii Marine Recreational Fishing Survey (HMRFS) for the non-commercial fishery. The federal fisheries will close if the ACT is projected to be reached. No rules are in place to limit the catch for the state-based uku fishery.
2. Decide on an appropriate allocation level for the commercial fishery sector and apply in-season accountability measures for the commercial sector of the fishery only.
3. Do not utilize allocation and apply a post-season AM, whereby the annual commercial catch from FRS (three-year average) and the non-commercial catch from HMRFS (five-year average) would be added and compared to the ACT and ACL. No overage adjustment will be made if the total average catches exceeded the ACT and an overage adjustment will be applied based on the amount of the overage if it exceeded the ACL.

At its 183rd meeting in September 2020, the Council made the following recommendations:

Regarding Annual Catch Limits (ACLs) for Main Hawaiian Island Uku, the Council:

1. Selected, as a preliminary preferred alternative, Alternative 4 that specifies an ACL at 41 percent risk of overfishing corresponding to an annual catch of 295,419 pounds and set an annual catch target (ACT) at 36 percent risk

of overfishing corresponding to annual catch of 291,010 pounds for fishing year 2022 to 2025.

2. Directed staff to convene an Action Team comprised of Council, NMFS PIRO, and NMFS PIFSC staff to develop alternative accountability measures for ensuring catch does not exceed the ACL. Recognizing challenges with tracking catch from the non-commercial fishing sector, the Council further recommended the Action Team also include as an alternative, the following Accountability Measures for the fishery:
 - a. An in-season accountability measure for only the commercial fishery in federal waters where the commercial catch is tracked through the monthly reports from the Fisher Reporting System by the Division of Aquatic Resources. The commercial and non-commercial fisheries for uku will close in federal waters once the commercial portion of the ACT is projected to be reached;
 - b. A postseason adjustment where the recent three year average of the commercial catch will be compared to the commercial portion of the ACT. No overage adjustment will be applied to the following year if the average catch exceeded the ACT. If the average catch exceeded the commercial portion of the ACL, the ACL and ACT will be reduced by the amount of the overage; and
 - c. For evaluation purposes, the Council directs staff to apply the same accountability measure process using the commercial and non-commercial data to evaluate the overall fishery performance to the total ACT and ACL for potential use as a postseason accountability measure for all fishery sectors.

3.2 Management Issues

3.2.1 Monitoring

Annual and an in-season monitoring are keys to an efficient management of the fisheries under an ACL framework. The uku fishery has been managed under an ACL since 2012 with no in-season accountability measure. Status quo is looking at the annual catch whether it exceeded the ACL or not. If it exceeded then the ACL will be reduced by the amount of the overage. It is only the commercial uku fishery that is being managed under an ACL. The new stock assessment provided information on the non-commercial fishery hence the Council should also look into the management of the federal portion of that fishery. The non-commercial fishery is dispersed over a broad spatial scale compared to the commercial fishery where it tends to gravitate towards Penguin banks during the summer months to take advantage of the spawning aggregation run.

The catches for the non-commercial fishery has high variability over time compared to the commercial fishery that showed a steady slow decline in the past 10 years (Figure 1). There are years when estimated non-commercial catches increased or decreased by an order of magnitude. This has repercussions on the stability of managing the fisheries by sector.

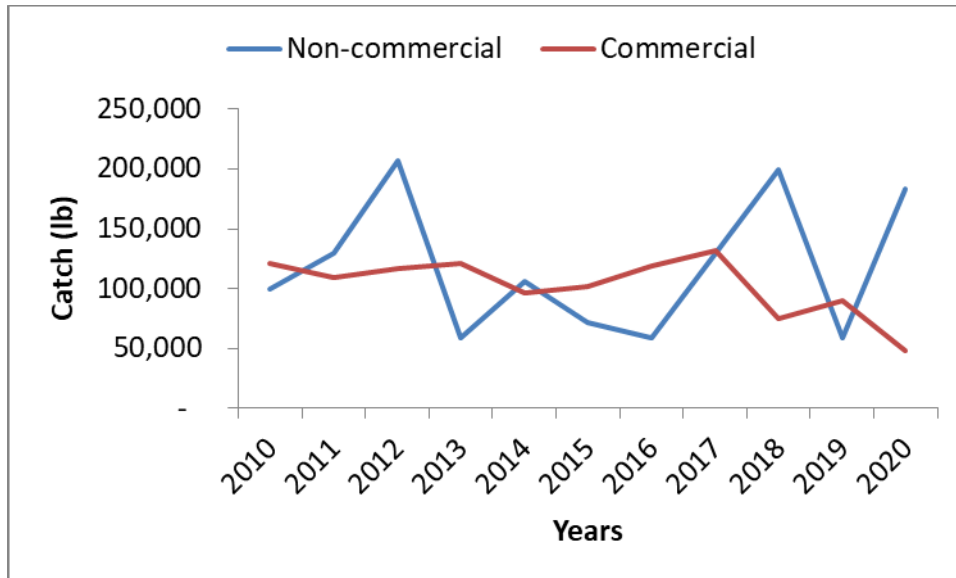


Figure 1. Commercial and non-commercial catches of uku from 2010 to 2020.

Figure 2 shows the total catch of uku relative to the ACT recommended by the Council at the 183rd meeting. The total catch exceeded the recommended ACT once over 10 years. In the recent three years, the total catches reached 50-93 percent of the ACT. The three-year average total catch is 218,010 lb which is 74 percent of the recommended ACT.

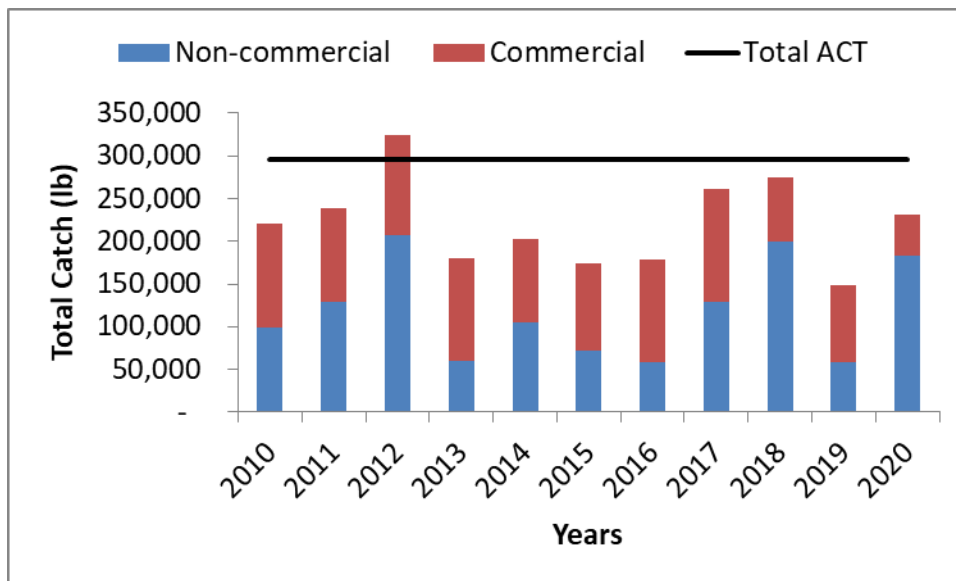


Figure 2. Total catch of uku from 2010 to 2020 relative to the Council recommended ACT.

Commercial Fishery

Monitoring approach: the current FRS monitors the commercial uku fishery on a monthly reporting level. Fishermen submit their monthly report on a paper and online platform. Discrepancy Report, validation of the fisher report and with the dealer report, is only applied to the deep 7 bottomfish fishery. Quality assurance and quality control procedures are done manually by scanning for obvious errors in the report submission. There is a two week delay in

the generation of the catch estimates after the monthly reporting period had closed. The previous month's data is updated the following month. The catch for each month will be added to generate a cumulative catch curve and will be compared to the commercial allocation of the ACT.

Monitoring issue: depending on the allocated ACL level, the monthly tracking of catch may or may not be adequate to close the federal waters in time before the ACT is reached. The two week lag also adds to the uncertainty on the timeliness of fishery closure. There is a need to increase the reporting frequency to trip level reporting, similar to the deep 7 bottomfish fishery, for the deep-sea and inshore handline, and troll catching uku.

Figure 3 shows the cumulative monthly reported landings of uku from 2009 to 2019 and an arbitrary ACL of 147,709 lb assuming that the commercial to non-commercial ratio is 50-50. The commercial fishery therefore is unlikely to reach this ACL level and the closest commercial landing is in 2017 at 132,709 lb (roughly 90 percent of the ACL was caught).

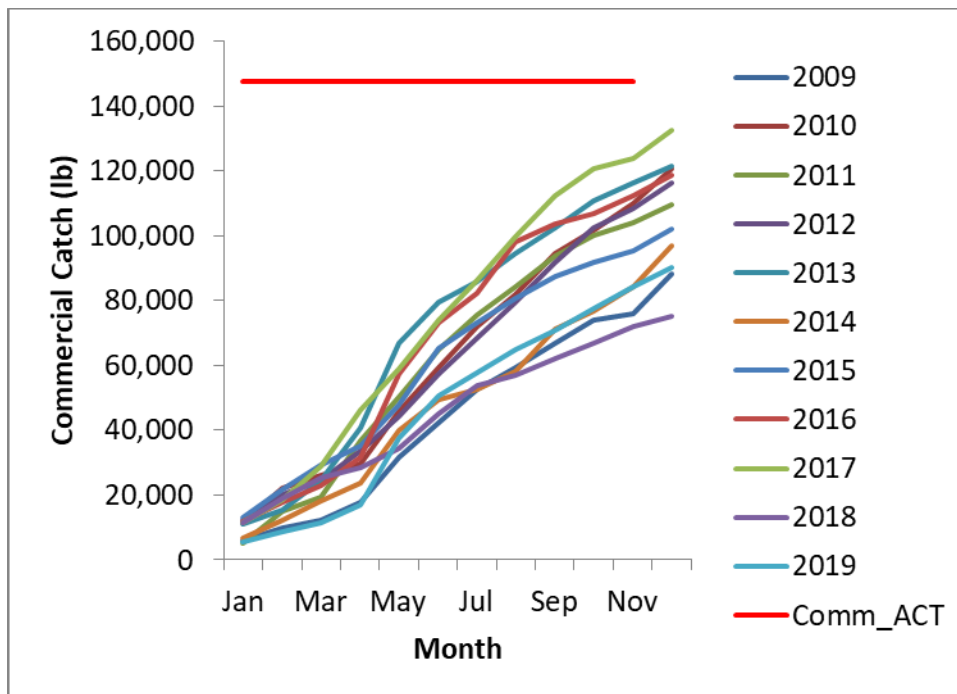


Figure 3. Cumulative commercial catch of uku from 2009 to 2019 relative to an arbitrary ACT (Source: HDAR)

Non-Commercial Fishery

Monitoring approach: the monitoring of the non-commercial uku fishery is through the mail Fishing Effort Survey and the Access Point Angler Interview Survey of HMRFS. The uku data is submitted to MRIP and expansion estimates are generated on a two-month wave. Hence, expanded catch estimates are received every two months and compiled to generate a cumulative curve to compare with the non-commercial allocation of the ACT.

Monitoring issue: due to the high variability in the annual catch expansion estimate (as demonstrated in the stock assessment), it would be difficult rely on the two-month wave

estimates for the tracking of catch. The two-month wave is more inadequate compared to the FRS reporting in terms of frequency track catch against the ACT. The total non-commercial and the commercial catch estimate will only be calculated when the MRIP estimate is made available every two months. The availability of the total catch estimate has repercussion in the decision whether to do a sector allocation of the uku fishery.

Figure 4 shows the cumulative curve of the MRIP expanded non-commercial catch estimates of uku from 2009 to 2019. The variability for the non-commercial fishery is higher compared to the commercial fishery. Again, if we assume that the commercial and non-commercial ratio is 50:50, there are years where the non-commercial fishery hit the ACT early (as in the case of 2012), mid-year (in 2018), and the latter part of the year. Taking the within year average approach seemed to be a viable approach to address the variability if we are to use the MRIP data for in-season tracking of non-commercial catch.

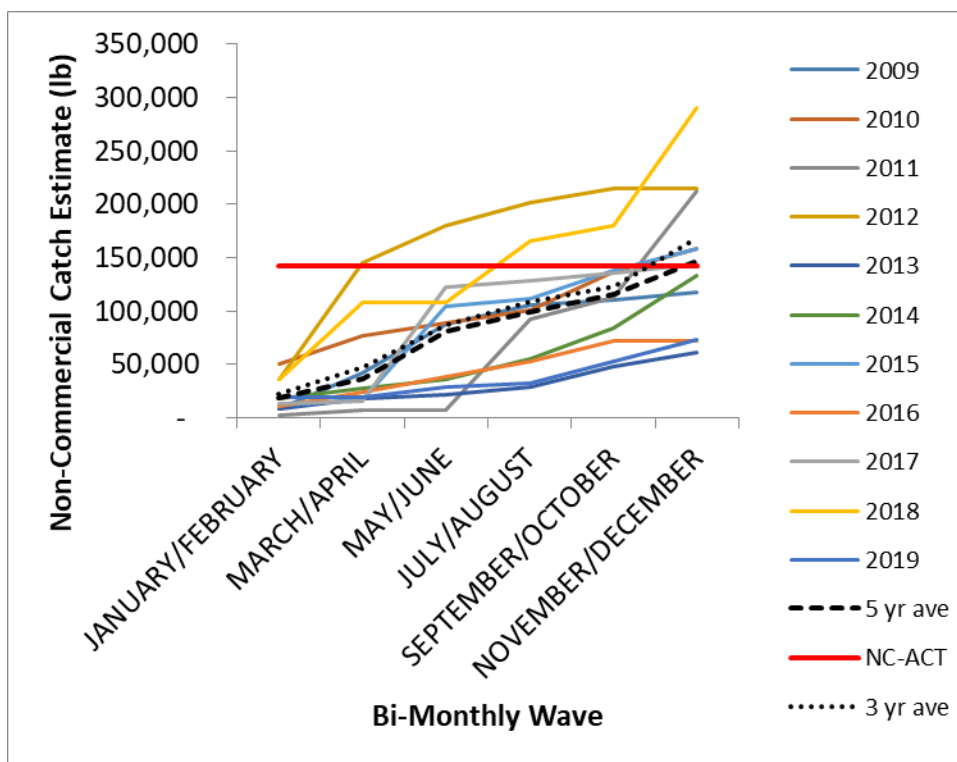


Figure 4. Cumulative two-month wave non-commercial catch of uku from 2009 to 2019 relative to an arbitrary ACT (Source: MRIP)

3.2.2 Management Gaps

Sector allocations

A decision needs to be made if the uku fishery should be managed separately by sector (commercial and non-commercial). The Council, with recommendations from its advisory bodies, needs to decide how much of the 295,419 pounds ACT is to be allocated for the commercial and non-commercial sector. Based on data from the stock assessment and the Hawaii Annual SAFE Report, the historical ratio between the commercial and non-commercial fishery

ranges from 47:53, if we are to consider the whole time series (2003-2020) and 36:64, if we are considering only the last 3 years (Table 1).

Table 1. Estimate of the commercial to non-commercial ratio based on the different means of the commercial and non-commercial catch estimates.

	Commercial (lb)	Non-commercial (lb)
Arbitrary 50:50	0.50	0.50
Mean 2003-2020	0.47	0.53
Mean 2016-2020	0.45	0.55
Mean 2017-2020	0.40	0.60
Mean 2018-2020	0.36	0.64

Applying these ratio scenarios to the recommended ACT will result in the following sector allocated ACTs (Table 2). In all of the scenarios, it is obvious that the focus of management should be on the non-commercial fisheries.

Table 2. Annual Catch Targets for the commercial and non-commercial sectors based on the ratio in Table 1. The Council recommended ACT is 295,419 pounds.

	Commercial (lb)	Non-commercial (lb)
50:50 ratio	147,709	147,709
47:53 ratio	138,104	157,315
45:55 ratio	133,396	162,023
40:60 ratio	117,380	178,039
36:64 ratio	106,771	188,648

The fishery performance in the commercial uku fishery showed that the more conservative commercial ratio (36:64 and 40:60) resulting in an ACT of 106,771 lb and 117,380 lb will result in exceedance of the ACT 50 to 60 percent of the time (Figure 5).

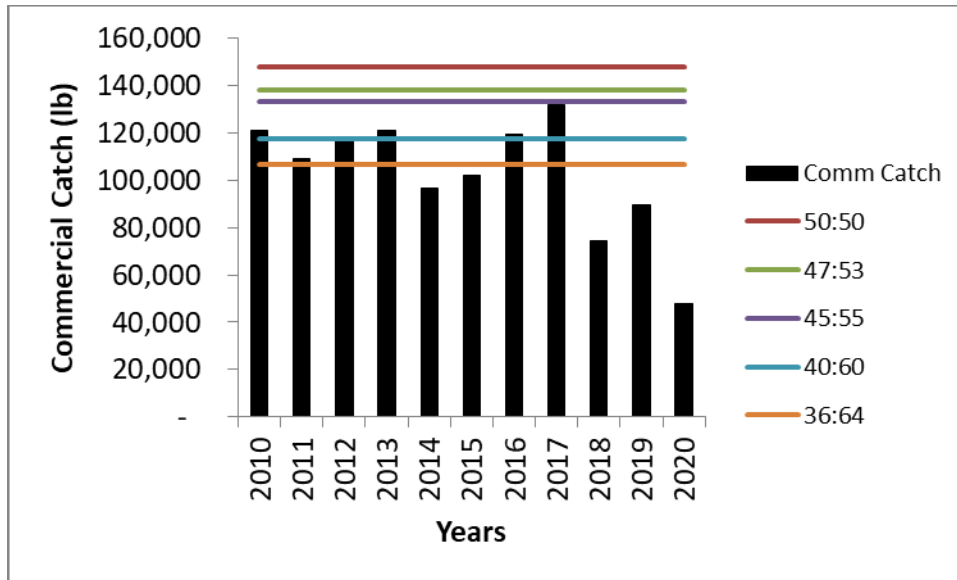


Figure 5. Commercial catch of uku from 2010 to 2020 under varying commercial to non-commercial catch ratio scenarios

On the other hand, the non-commercial uku fishery performance showed that regardless of the commercial to non-commercial catch ratio scenario, the fishery will exceed the ACT at around 20 to most likely 30 percent of the time (Figure 6).

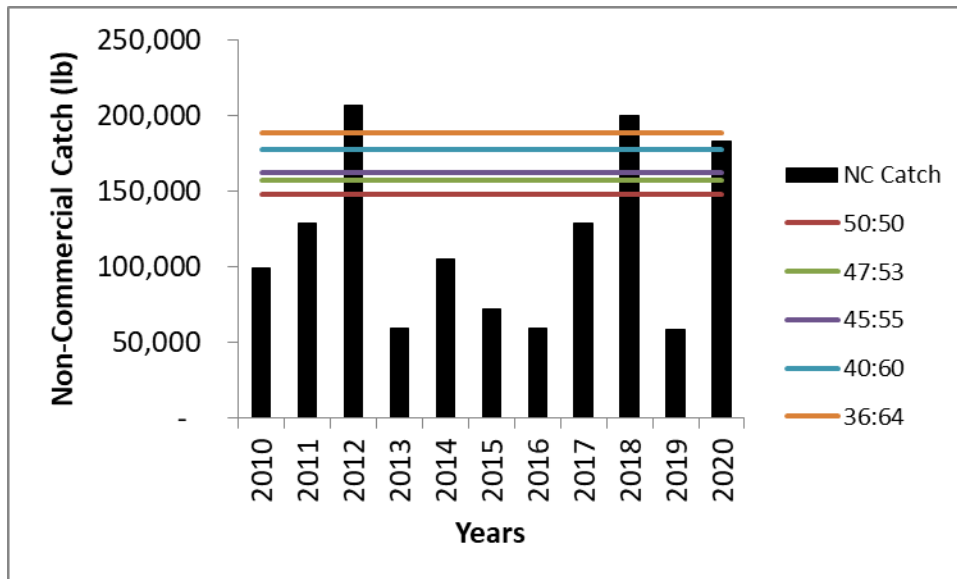


Figure 6. Non-commercial catch of uku from 2010 to 2020 under varying commercial to non-commercial catch ratio scenarios

Closing the fishery when the ACT is projected to be reached

The Council and the State of Hawaii should have a parallel management structure that has the ability to close the fishery once the ACT is projected to be reached similar to the deep 7

bottomfish measure. The Council, working with NMFS, will close the fishery in federal waters while the state will cover the state waters. Complementary closures on both sides will ensure that the catch will not exceed the ACT.

At the 183rd meeting of the Council, the State of Hawaii supported the recommended ACT. However, closing the non-commercial uku fishery in State waters is not something that the State of Hawaii will consider. The effect of keeping the non-commercial fishery open in State waters would be twofold:

- 1) If there is a sector allocation for the ACT, depending on the overage, the adjustment will be applied if the ACL is exceeded. The reduction will be based on the amount of the overage and the ACT the following year will be adjusted proportionally downward. This will only affect the non-commercial fishery both in the State and federal waters. But since the uku fishery in the State waters is unregulated, then there is a disproportionate impact to the non-commercial uku fishermen in federal waters.
- 2) If there is no sector allocation and the fishery is managed as a single sector, the continuation of catch in the State waters will creep towards the total ACT and has a potential to exceed it. Again depending on the level of catch in the non-commercial fishery, the overage adjustment will be applied to the total ACT and the total ACT will be adjusted downwards accordingly which would affect both the commercial and non-commercial fishermen in federal waters and the commercial fishermen in State waters as well (since the commercial fishery is managed as a unit regardless on whether its in federal and state waters).

Other measures aside from ACLs (bag limits)

The State of Hawaii expressed interest in implementing a state bag limit for uku instead of a non-commercial ACL. To calculate the bag limit for the non-commercial uku fishery, we need to know the following: 1) number of fishermen that fishes for uku; 2) number of trips that caught uku; 3) number of pieces of uku caught per trip; and 4) average weight of individual uku. The number of pieces of uku per person per trip over the fishing year should not exceed the ACT for that sector. In the end, the fishery will still be monitored to determine the fishery performance relative to the harvest limits.

4. Monitoring and Management Direction

The advisory groups will be discussing the monitoring and management direction for the uku fishery based on the available information. The advisory groups will make recommendations on the following items:

- Should the MHI uku fishery be managed as a whole (commercial and non-commercial fisher combined) or should be sector allocation be applied?
- If sector allocation is applied, what level of ACT should be used based on the ratio scenarios?
- What are the management measures that should be in place to avoid breaching the ACT?
- What level of monitoring and in-season tracking should be implemented?
- Should a trip level reporting be applied to the commercial uku fishery?

- How can HMRFS be improved to reduce variability of uku catches on an wave level and on an annual level?

5. References

Nadon, M.O. 2017. Stock assessment of the coral reef fishes of Hawaii, 2016. NOAA Technical Memorandum NMFS-PIFSC-60, NOAA PIFSC, Honolulu, HI.
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