

6.A.4(1)rev1

138th SSC



WESTERN
PACIFIC
REGIONAL
FISHERY
MANAGEMENT
COUNCIL

PRELIMINARY DRAFT

Options Paper for the Rebuilding Plan for the Guam Bottomfish Fishery

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November 24, 2020

Abstract

The Western Pacific Regional Fishery Management Council (Council) proposes to implement a rebuilding plan for the Guam bottomfish fishery. When the National Marine Fisheries Service (NMFS) determines that a fishery managed under a fishery management plan is overfished or experiencing overfishing, the Magnuson Fishery Conservation and Management Act (MSA) Section 304(e) and implementing regulations at 50 CFR 600.310(j) require the Council to develop a long-term plan to end overfishing and rebuild the fishery. The Council is also required to implement this rebuilding plan within two years of notification of a fishery in an overfished condition or experiencing overfishing, and the Council must submit the plan to NMFS within 15 months from that notification to allow for sufficient time for implementation. Additionally, the rebuilding plan must specify a time for rebuilding that is as short as possible and not exceeding 10 years, taking into account the status and biology of the overfished stocks, the needs of the fishing communities, and the interaction of the stock with the marine ecosystem.

A new benchmark stock assessment produced by NMFS Pacific Islands Fisheries Science Center (PIFSC) using data through 2017 showed that the Guam multi-species bottomfish complex, which harvests bottomfish management unit species (BMUS), is overfished but not experiencing overfishing. Moreover, at its 181st meeting in Honolulu, Hawaii, the Council recommended an multi-year specification of 27,000 lb as an ACL for the Guam bottomfish fishery from 2020 to 2023. Here, a range of alternative management measures are presented to the Council pursuant to MSA requirements to implement a rebuilding plan to end the overfished state of the Guam bottomfish fishery. The options for the Council to consider are: no action, temporary closure of the Guam bottomfish fishery in Federal waters, implementing an annual catch limit (ACL) of 27,000 lb for the next four years with an in-season accountability measure (AM) for NMFS to close the fishery in Federal waters if the ACL is exceeded (status quo), implementing a more conservative ACL (16,299 lb) than the status quo option, implementing a more relaxed ACL (31,000 lb) than the status quo option, and implementing Federally permitting and reporting requirements alongside bag limits and the ACL and AM from the status quo option. The ACL of the status quo option is intended to regulate catch levels of the fishery to mitigate some of the short-term economic and cultural impacts to the fishing community while rebuilding the stock.

The ACL for the status quo option was previously specified by the Council based on recommendations from the Council's Scientific and Statistical Committee and P* Working Group for the fishery at a 31 percent risk of overfishing. Biomass projections for the Guam bottomfish stock presented in the new stock assessment show that this ACL would rebuild stock biomass to its maximum sustainable yield (B_{MSY}) in four years. Other potential levels of annual catch could rebuild the fishery more quickly, but do not consider recent annual catches from the fishery or the needs of the Guam fishing community pursuant to the MSA and implementing regulations. Bottomfish catches from both territorial waters and Federal waters around Guam would be counted towards the catch limit. As an in-season AM, NMFS would monitor the fishery and close the Federal waters around Guam to bottomfish fishing if the ACL is exceeded. It is not clear if the proposed ACL will be exceeded given recent annual catches, and it is not expected that the territory would implement a complementary closure of territorial waters if so. For whichever option is selected, the Council will develop a draft environmental assessment to evaluate potential environmental effects of the provisions of the proposed rebuilding plan compared to the no action option and other action options.

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List of Acronyms and Abbreviations

ABC – Acceptable Biological Catch
ACL – Annual Catch Limit
AM – Accountability Measure
BSIA – Best Scientific Information Available
BMUS – Bottomfish Management Unit Species
CFR – Code of Federal Regulations
CNMI – Commonwealth of the Northern Mariana Islands
DAWR – Guam Division of Aquatic and Wildlife Resources
EA – Environmental Assessment
ECS – Ecosystem Component Species
EEZ – Exclusive Economic Zone
FEP – Fishery Ecosystem Plan
FMP – Fishery Management Plan
FR – Federal Register
lb – Pounds
LOF – List of Fisheries
MFMT – Maximum Fishing Mortality Threshold
MPA – Marine Protected Area
MSA – Magnuson-Stevens Fishery Conservation and Management Act
MSST – Minimum Stock Size Threshold
MSY – Maximum Sustainable Yield
MUS – Management Unit Species
NEPA – National Environmental Policy Act
nm – Nautical miles
NMFS – National Marine Fisheries Service
NOAA – National Oceanic and Atmospheric Administration
OFL – Overfishing Limit
P* - Probability or Risk of Overfishing
PIFSC – NMFS Pacific Islands Fisheries Science Center
PIRO – Pacific Islands Regional Office
RIR – Regulatory Impact Review
SAFE report - Stock Assessment and Fishery Evaluation report
SDC – Status Determination Criteria
SEEM – Social, Economic, and Ecological Considerations, or Management Uncertainty
SSC – Scientific and Statistical Committee
WPacFIN – Western Pacific Fisheries Information Network
WPRFMC or Council – Western Pacific Regional Fishery Management Council
WPSAR – Western Pacific Stock Assessment Review

1 INTRODUCTION

1.1 Background Information

The Western Pacific Fishery Management Council (Council) was established in 1976 under the Magnuson Fishery Conservation and Management Act (MSA) to develop management plans for fisheries within the United States Fishery Conservation Zone around Hawaii, U.S. Pacific territories, commonwealth, and possessions of the United States in the Pacific Ocean. From the late 1970's through 2009, the Council managed fisheries throughout the Western Pacific Region under separate taxonomic-based fishery management plans (FMPs), including the Bottomfish and Seamount Groundfish FMP (WPRFMC, 1986). These FMPs were reorganized into archipelagic fishery ecosystem plans (FEPs) in 2009, including the FEP for the Mariana Archipelago (WPRFMC, 2009).

The bottomfish fishery in Guam (hereafter, the fishery) primarily harvests bottomfish management unit species (BMUS), an assemblage or complex of species that include emperors, snappers, groupers, and jacks (Table 1). As authorized by the MSA, the National Marine Fisheries Service (NMFS) and the Council manage the BMUS fishery in Federal waters (i.e., the U.S. Exclusive Economic Zone, or EEZ) around Guam in accordance with the Mariana Archipelago FEP, as amended, and implementing regulations at Title 50 Code of Federal Regulations, Part 665 (50 CFR 665). The Mariana Archipelago FEP and amendments are available at the [Council's website](#).

Table 1. List of BMUS in Guam.

Scientific Name	Common Name(s)	Family
<i>Aphareus rutilans</i>	Red snapper, silvermouth, lehi	Lutjanidae
<i>Caranx ignobilis</i>	Giant trevally, jack	Carangidae
<i>Caranx lugubris</i>	Black trevally, jack	Carangidae
<i>Etelis carbunculus</i>	Red snapper, ehu	Lutjanidae
<i>Etelis coruscans</i>	Red snapper, onaga	Lutjanidae
<i>Lethrinus rubrioperculatus</i>	Redgill emperor	Lethrinidae
<i>Lutjanus kasmira</i>	Blueline snapper	Lutjanidae
<i>Pristipomoides auricilla</i>	Yellowtail snapper	Lutjanidae
<i>Pristipomoides filamentosus</i>	Pink snapper, paka	Lutjanidae
<i>Pristipomoides flavipinnis</i>	Yelloweye snapper	Lutjanidae
<i>Pristipomoides sieboldii</i>	Pink snapper, kalekale	Lutjanidae
<i>Pristipomoides zonatus</i>	Flower snapper, gindai	Lutjanidae
<i>Variola louti</i>	Lunartail grouper, lyretail grouper	Serranidae

The Guam bottomfish fishery has been managed by the Council since 1986. In the 1980s and 1990s, the fishery was defined by seasonal and small-scale commercial, subsistence, and recreational fishing (Allen and Bartram, 2008). Since then, BMUS catch in the fishery has continued to be variable year to year, ranging from approximately 15,000 lb to nearly 60,000 lb; however, total bottomfish catch (i.e., inclusive of all bottomfish species) has been as high as nearly 130,000 lb in 1996 (WPRFMC, 2020a). Allen and Bartram (2008) also note that the high

variability observed in catches is due to high liners entering and exiting the fishery. Currently, the Guam bottomfish fishery is still active, consisting mostly of vessels less than 25 feet in length fishing for recreational or subsistence purposes and primarily targeting shallow-water bottomfish species. Commercial vessels tend to be larger and concentrate their effort on the deepwater bottomfish complex (Allen and Bartram, 2008; WPRFMC, 2020a). The fishery continues to provide subsistence and cultural value for Guam communities.

Since 2012, the Council and NMFS have managed the Guam bottomfish fishery with annual catch limits (ACLs) and accountability measures (AMs) for the BMUS. The ACLs and AMs were designed to prevent overfishing and ensure the fishery was sustainably managed (see WPRFMC, 2011). In no prior year has the Guam bottomfish fishery attained or exceeded the ACL, and up until the most recent stock assessment in 2019, the fishery was considered to be harvesting BMUS sustainably (Yau et al., 2016; NMFS, 2017).

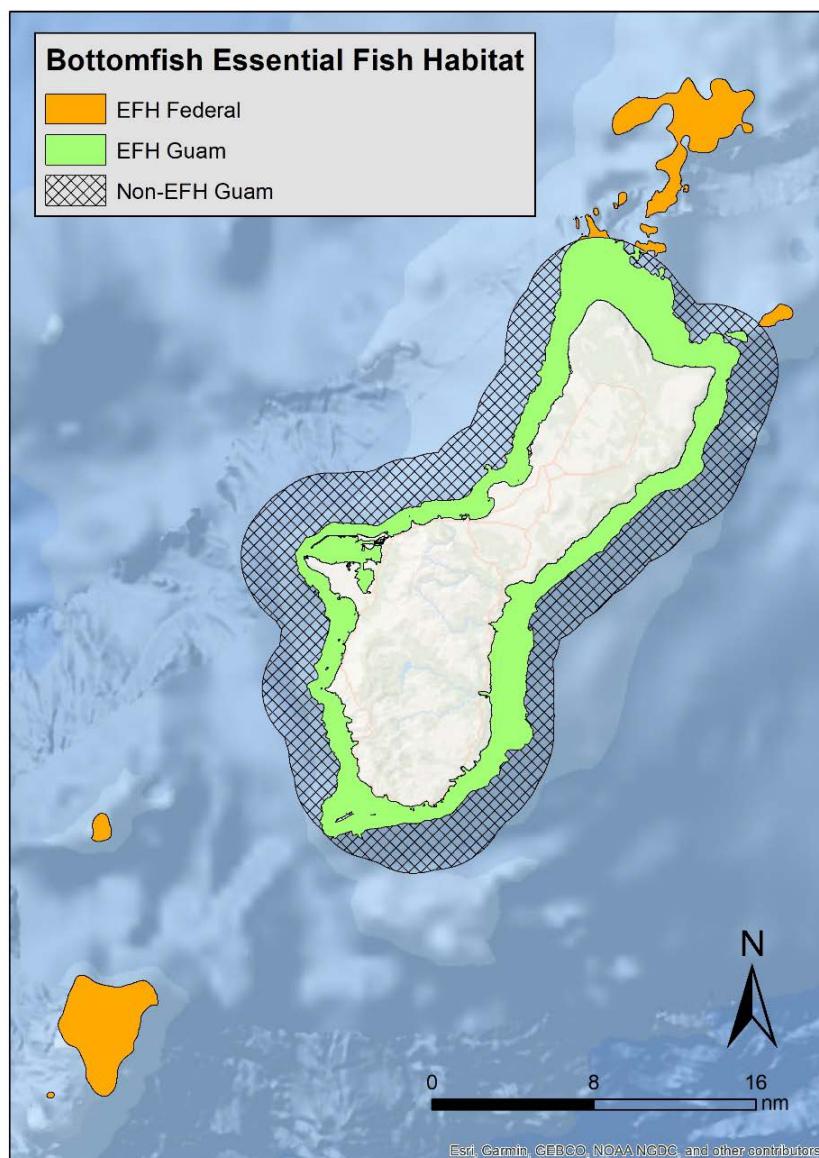


Figure 1. Map of Essential Fish Habitat (EFH) for bottomfish around Guam in Federal and territorial waters.

(Source: NMFS Pacific Islands Regional Office, or PIRO)

Bottomfish habitat is found in both Federal and territorial waters (Figure 1), and while many smaller recreational and subsistence vessels harvest shallow species nearshore, other recreational and larger commercial vessels target fish at the offshore banks (Brodziak et al., 2012). Habitat in these banks is primarily deepwater habitat where red snappers (e.g. *Pristipomoides* spp. and *Etelis* spp.), rather than reef-associated bottomfish (e.g., *Lutjanus* spp. and *Lethrinus* spp.), are caught. Catch from both territorial waters (generally, 0–3 nm from shore) and Federal waters (the EEZ) is counted towards the ACL. As shown in Figure 1, the majority of bottomfish habitat is in territorial waters (73.6 percent), and the rest is in Federal waters (26.4 percent) located both to the northeast and southwest of Guam. While these analysis of bottomfish habitat around Guam may exclude some of the smaller fishing grounds harvested by the Guam bottomfish fishery due to incomplete data, it represents the best information available. Existing data reporting systems do not provide quantitative estimates of how much bottomfish catch comes from territorial

versus Federal waters, and it is not possible to estimate catch of individual species from specific banks or fishing grounds.

1.2 Stock Assessment Findings and Implications

In August 2019, NMFS Pacific Islands Fisheries Science Center (PIFSC) completed a new benchmark stock assessment for the bottomfish fisheries of Guam, the Commonwealth of the Northern Mariana Islands (CNMI), and American Samoa (Langseth et al., 2019). The assessment was conducted as a benchmark, indicating that all components of the assessment analyses were re-evaluated by PIFSC and several changes were made relative to previous assessments of the bottomfish fisheries. The assessment results revealed that the bottomfish stock harvested in Guam is overfished but is not subject to overfishing based on the stock status determination criteria (SDC) specified in the Mariana Archipelago FEP (WPRFMC, 2009). This is the first assessment that indicated the stock is overfished.

The new benchmark stock assessment differs from previous assessments in several ways. The assessment included additional years of fishing and catch data, used new species lists¹, filtered catch data based on gear, standardized the catch per unit effort for covariates that could affect the catch rate, and applied a Bayesian state space surplus production model² (Langseth et al. 2019). Based on information contained in the 2019 assessment (Table 2), the average catch of Guam BMUS for the most recent five year period of data included (2013 to 2017) was 21,677 lb. These numbers included catch of BMUS reported at the species level, plus an estimate of BMUS catch reported under more general categories (e.g., snapper, emperor, deep bottomfish). Estimated total catch data for 2018 and 2019 are available in the Council's Stock Assessment and Fishery Evaluation (SAFE) Report for the Mariana Archipelago (WPRFMC, 2020a) but are not directly comparable. The assessment information estimated the long-term maximum sustainable yield (MSY) in the fishery at an annual catch of 42,100 lb (Table 3). However, overfishing probability projection values for 2020 through 2025 (i.e., through the terminal year of the assessment) show that the level of catch associated with a 50 percent probability of overfishing is 36,000 lb of BMUS annually (see Table 16 in Langseth et al., 2019). Therefore, to end overfishing in the fishery, the 2019 assessment projection results indicate total catch of BMUS in Guam must be limited to no more than 36,000 lb in each calendar year. This overfishing limit (OFL) is currently much lower than the MSY because the most recent biomass (B) estimates are lower than the biomass needed to produce MSY (i.e., $B_{2017}/B_{MSY} = 0.57$; see Table 23 in Langseth et al., 2019).

The stock assessment findings were presented by PIFSC to the Council at its 180th meeting on October 22 to 24, 2019 in Pago Pago, American Samoa (84 FR 53685, October 8, 2019), and showed that BMUS in Guam are overfished but not experiencing overfishing. As required under National Standard 2 of the MSA (50 CFR 600.315), the 2019 assessment was subjected to an

¹ On February 8, 2019, NMFS implemented the Council's recommendation to modify the lists of species in American Samoa, the CNMI, Guam, and Hawaii that are included as BMUS (84 FR 2767). Some species were reclassified as ecosystem component species (ECS) because they were not targeted, were a minor component of the fishery, and were not in need of management. The 2019 stock assessment analyzed the revised stock complexes. In Guam, this reduced the number of species in the stock complex from 16 to 13 (Table 1).

² This type of fishery production model is used to assess the biomass and exploitation level of marine populations in situations where age and size information are unavailable. It assumes that population growth, which translates to yield or production, is greatest at an intermediate level of biomass. The excess production at this point is the maximum sustainable yield.

independent review by a panel of independent fishery science experts (i.e., a Western Pacific Stock Assessment Review, or WPSAR), who concurred that the changes to the assessment process were appropriate, improved on the previous assessments, and provided scientifically sound management advice (Martell et al., 2019). The WPSAR panel reports and the peer-reviewed benchmark stock assessment were received by the Council’s Scientific and Statistical Committee (SSC) at its 134th meeting on October 15 to 17, 2019 in Honolulu, Hawaii. Though the SSC expressed its concerns regarding uncertainties with the data used for the stock assessment, it endorsed the assessment for management purposes.

Table 2. Catch of Guam BMUS from 2000 to 2017 used in the new benchmark stock assessment (Langseth et al., 2019).

Year	BMUS Catch (lb)
2000	66,447
2001	46,427
2002	21,727
2003	29,835
2004	25,236
2005	29,046
2006	34,917
2007	18,186
2008	34,249
2009	40,735
2010	26,544
2011	54,062
2012	19,714
2013	30,243
2014	20,554
2015	11,711
2016	30,192
2017	15,684
Recent (five-year) Average	21,677

(Source: Langseth et al., 2019)

On January 10, 2020, PIFSC sent a memorandum to the Council stating that NMFS determined the 2019 benchmark stock assessment to be the best scientific information available (BSIA) consistent with National Standard 2. On February 6, 2020, NMFS determined that the Guam Samoa bottomfish stock is overfished but not subject to overfishing. On February 10, 2020, PIRO issued a notification informing the Council of this determination, which included the basis for the change in stock status and outlined the obligations of the Council to take immediate action to implement a plan to rebuild the stock within two years as stipulated by the MSA.

At its 180th meeting in Pago Pago, American Samoa, the Council noted concerns that the precipitously lower OFL in the 2019 stock assessment will severely limit the bottomfish fishery in Guam as well as hamper fishery development aspirations by impacting the approval of

bottomfish fishery-related projects using Federal funding. At its 181st meeting on March 9 to 12, 2020, held in Honolulu, Hawaii, the Council deliberated on the specification of the ACL for fishing years 2020 through 2023 for the Guam bottomfish fishery. Using information from the new benchmark stock assessment, its Risk of Overfishing Analysis (P*) working group, and its Social, Economic, and Ecological Considerations, or Management (SEEM) Uncertainty working group, the Council ultimately recommended that the ACL for the fishery be implemented equal to the ABC at 27,000 lb at a 31 percent risk of overfishing. The Council noted that this level of catch would allow harvest to be maximized while preventing overfishing and allowing the Guam bottomfish stock to rebuild within four years, with a 50 percent chance of catch not exceeding the ACL. A downward adjustment post-season accountability measure also was recommended by the Council, where the ACL for the subsequent year will be reduced by the amount of overage from the recent three-year average catch for the fishery. This action to implement a rebuilding plan for the Guam bottomfish fishery is separate from this ACL specification, and is intended to be enacted for the 2020 fishing year.

1.3 MSA Criteria for Rebuilding Overfished Fisheries

Pursuant to Section 304(e)(2) of the MSA and implementing regulations at 50 CFR 600.310(j)(1), if the Secretary of Commerce (Secretary) determines at any time that a fishery is overfished, overfishing is occurring, or a stock is approaching an overfished condition, the Secretary shall immediately notify the Council and request that action be taken to end overfishing in the fishery and to implement conservation and management measures to rebuild the impacted fish stocks. As required by MSA 304(e)(3) and implementing regulations at 50 CFR 600.310(j)(2), upon notification of a stock undergoing overfishing, the Council should immediately begin working with its SSC to ensure that the Acceptable Biological Catch (ABC) is set appropriately to end overfishing. The Council must prepare and implement a FMP, plan amendment, or proposed regulations for the fishery within two years to end overfishing and rebuild affected stocks, and Council actions should be submitted to NMFS within 15 months of the initial notification to ensure there is sufficient time to enact the measures. If the Council does not submit one of these items to the Secretary within two years, the Secretary will prepare a FMP or plan amendment and any accompanying regulations to stop overfishing and rebuild affected stocks of fish within nine months as indicated by MSA 304(e)(5).

Section 304(e)(4) of the MSA and implementing regulations at 50 CFR 600.310(j)(3) state that any FMP, plan amendment, or proposed regulation prepared by a Council pursuant to MSA 304(e)(3) or 304(e)(5) must specify a time period for rebuilding the fishery that is as short as possible and does not exceed 10 years, taking into account the status and biology of the overfished stocks, the needs of the fishing communities, and the interaction of the stock with the marine ecosystem. The minimum time for rebuilding a stock (T_{\min}) is the amount of time the stock is expected to take to rebuild to its biomass at MSY (B_{MSY}) in the absence of any fishing mortality, where “expected” refers to a 50 percent chance of attaining B_{MSY} and T_{\min} is calculated from the first year the rebuilding plan is likely to be implemented. If T_{\min} is less than 10 years, then the maximum time for rebuilding a stock to its B_{MSY} (T_{\max}) is 10 years. If T_{\min} exceeds 10 years, then T_{\max} can be calculated with one of the following methods:

- i. T_{\min} plus the length of time associated with one generation time for the stock, where “generation time” is the average length of time between when an individual is born and the birth of its offspring;

- ii. The amount of time the stock is expected to take to rebuild to B_{MSY} if fished at 75 percent of the Maximum Fishing Mortality Threshold (MFMT); or
- iii. T_{min} multiplied by two.

When T_{min} exceeds 10 years, T_{max} is the maximum time for rebuilding linked to the biology of the stock. A Council and its SSC should consider all relevant biological data and its uncertainties when selecting a method for determining T_{max} , and rationale must be provided for the decisions based on BSIA. The target time to rebuild a stock (T_{target}) is the specified time period for rebuilding the stock that is considered to be as short a time as possible and cannot exceed T_{max} , and the fishing mortality associated with achieving T_{target} is known as $F_{rebuild}$.

Additionally, pursuant to Section 304(e)(4) of the MSA and implementing regulations at 50 CFR 600.310(j)(3), the action prepared to end overfishing and rebuild a stock must allocate both overfishing restrictions and recovery benefits fairly and equitably among sectors of the fishery and, for a fishery managed under an international agreement, reflect traditional participation in the fishery, relative to other nations, by fishermen of the United States.

As required by MSA 304(e)(7) and implementing regulations at 50 CFR 600.310(j)(3)(iv), the Secretary will review rebuilding plans at least every two years to determine whether the plan has resulted in adequate progress towards ending overfishing and rebuilding the affected fish stock. The Secretary may find that adequate progress is not being made if $F_{rebuild}$ or the associated ACL is exceeded and AMs are not correcting the operational issue that caused the overage nor addressing any biological consequences to the stock resulting from the overage. A lack of adequate progress may also be found when the rebuilding expectations of a stock are significantly changed due to new and unexpected information about stock status, which will cause the Secretary to notify the Council to develop and implement a new or revised rebuilding plan within two years. Revising rebuilding timeframes or $F_{rebuild}$ is not necessary unless the Secretary determines adequate progress is not being made. If a stock is not rebuilt by T_{max} , then the fishing mortality rate should be maintained at its current $F_{rebuild}$ or 75 percent of the MFMT, whichever is less, until the stock is rebuilt or the fishing mortality rate is changed as a result of the Secretary finding that adequate progress is not being made.

1.4 Proposed Action

Under the alternatives considered, the Council will submit and NMFS will implement a rebuilding plan for the Guam bottomfish fishery consistent with MSA Section 304(e) and implementing regulations at 50 CFR 600.310(j). The proposed rebuilding plan will set an ACL for Guam BMUS of 27,000 lb for the next four years (2020 to 2023) at the stock complex level with an in-season AM for the status quo option, a relatively lower or higher ACL with the same AM, implement a closure of the fishery in Federal waters, or implement the status quo ACL and AM with additional provisions for Federal permitting, reporting, and bag limits. For options utilizing ACLs, NMFS will use catch data from local resource management agencies and NMFS Federal logbooks to estimate landings for the stock complex for the fishing year, which begins on January 1 and ends on December 31 each year. As an in-season AM, if NMFS projects that the ACL has been exceeded, then Federal waters will be closed to bottomfish fishing at that point. Considering the average amount of catch in recent years for the Guam bottomfish fishery relative to the 27,000 lb ACL under the status quo option, it is unknown if the fishery will exceed the ACL causing Federal waters to be closed to bottomfish fishing. This Federal closure would not

prevent bottomfish fishing in territorial waters. Without territorial action to close these waters, fishing is expected to continue there and will potentially offset some of the conservation benefit of the Federal closure. The public was given an opportunity to submit comments on the initial specification of this ACL at the 181st Council meeting in March 2020, and will be able to comment on the proposed rebuilding plan both at the 184th Council meeting in December 2020 and in response to the draft environmental assessment (EA) during its submission process. NMFS will consider public comments received when developing the final rule and evaluating whether to implement the rebuilding plan for the fishery.

1.5 Purpose and Need

The purpose of this proposed action is to establish a FEP amendment with an ACL and AM appropriate to rebuild the Guam bottomfish stock complex from its overfished designation to the extent possible around Guam as required by MSA 304(e)(3). Consistent with the provisions of the MSA and implementing regulations at 50 CFR 600.310(j)(2), the need for this action is to rebuild the Guam bottomfish stock complex from its overfished state as identified by the most recent stock assessment (Langseth et al., 2019). Because the Council was notified by NMFS that the Guam bottomfish stock complex is overfished on February 10, 2020, the Council must submit the plan amendment to NMFS within 15 months from that notification (i.e., by May 2021). The action to rebuild the stock must be implemented within two years (i.e., by February 2022). Additionally, pursuant to MSA 304(3)(4) and implementing regulations at 50 CFR 600.310(j)(3), the amendment must specify the time period for rebuilding the fishery that is as short as possible and does not exceed 10 years, and must identify the fishing mortality rate to achieve rebuilding the stock within this time frame.

1.6 Action Area

The fishery management area for the Mariana Archipelago FEP bottomfish fishery in Guam includes the EEZ around the island of Guam. However, the action area also encompasses those areas in which fishing for BMUS occurs in territorial and Federal waters of Guam (Figure 1). Bottomfish fishing takes place in waters from the surface to more than 275 m depth directly around Guam, but also occurs at several offshore banks, including Galvez Bank, 11-Mile Bank, and Santa Rosa Reef. As of June 3, 2013, commercial fishing is prohibited in the Marianas Trench Marine National Monument (78 FR 32996), which is just over 50 nm east of Guam. Additionally, large vessels (i.e., greater than 50 feet in length) are prohibited from fishing for bottomfish in Federal waters within 50 nm around Guam with the intention of maintaining viable participation and bottomfish catches by small vessels of the fishery in the area (71 FR 64474, November 2, 2006). The fishery does not fish in areas closed to fishing around the island of Guam, which include several Federal marine protected areas (MPAs) and territorial marine preserves established by Guam Division of Aquatic and Wildlife Resources (DAWR), though these areas are primarily situated around nearshore reefs.

1.7 Public Review Process and Involvement

The Council and its SSC convene several meetings per year, all of which are open to the public. The Council notifies and invites the public to these meetings through notices published in the *Federal Register* and on its website. Public comment, including both oral and written statements, are accepted by the Council on its agenda items for the meeting.

At the Council's 134th SSC meeting on October 15 to 17, 2019 in Honolulu, Hawaii and the 180th Council meeting on October 22 to 24, 2019 in Pago Pago, American Samoa, NMFS presented the results of the most recent benchmark stock assessment for the Guam bottomfish multi-species complex (Langseth et al., 2019). Both meetings were open to the public, which was notified through the *Federal Register* (84 FR 53685, October 8, 2019) and the Council's website. Given the location of the meeting the 180th Council meeting, public discussion focused on issues associated with the portion of the stock assessment for bottomfish in American Samoa, including concerns that the data from creel surveys and the commercial receipt program used for the stock assessment are not representative of the fishery despite these being the only data available to use in stock assessments.

At the Council's 135th SSC meeting on March 3 to 5, 2020, options were presented for the SSC to set the ABC for bottomfish fisheries in the Mariana Archipelago alongside associated P* and SEEM analyses. The SSC set the ABC for the Guam bottomfish fishery based on these analyses, and no public comments were received at this time. Subsequently, at its 181st meeting held on March 10 to 12, 2020, the Council received a presentations on the P* and SEEM analyses as well as on alternatives to specify and ACL and AM for the bottomfish fisheries in the Mariana Archipelago, including Guam. Council members briefly commented on the need for incorporating management uncertainty in the ACL specification and how the ACL would be changed in light of a new benchmark stock assessment before making their recommendation. No public comments were received at this time. The public will be able to submit comments on the proposed rebuilding plan at the 184th Council meeting in December 2020.

2 DESCRIPTION OF ALTERNATIVES

2.1 Development of the Alternatives

The alternatives considered in this document were developed by the Council, pursuant to MSA requirements, in response to the notification by NMFS PIRO that the Guam bottomfish fishery is overfished but not experiencing overfishing. Six alternatives were generated to evaluate a range of management options from a baseline of no Federal action (Alternative 1) to the maximum Federal action possible (closing the bottomfish fishery in Federal waters, Alternative 5). The status quo alternative (Alternative 2) would set an ACL that would close the Guam bottomfish fishery in Federal waters when the annual catch reaches 27,000 lb, which would prevent overfishing and rebuild the fishery within four years. Alternatives 3 and 4 would implement ACLs for the bottomfish fishery at 16,299 lb to rebuild the fishery in three years or at 31,000 lb to rebuild the fishery six years, respectively. Alternative 5 would implement a closure of Federal waters to bottomfish fishing, aiming to rebuild the fishery in two years. Alternative 6 would implement an ACL and AM identical to Alternative 2 with the added provisions of Federal permitting, reporting, and bag limits. These alternatives are described in detail below.

The initial phase of alternative development and consideration of their effects on the fishery is the comparison of stock status against measures of overfishing and overfished status, which is done in stock assessments performed by PIFSC. Under the Council's FEP for the Mariana Archipelago (WPRFMC, 2009), overfishing of bottomfish occurs when the fishing mortality rate (F) exceeds the fishing mortality rate for maximum sustainable yield (F_{MSY}) for one year or more; this is the MFMT and is expressed as a ratio, $F/F_{MSY} = 1.0$. Thus, if the F/F_{MSY} ratio exceeds 1.0 for one year or more, overfishing is occurring. A stock is considered to be overfished when its biomass (B) declines below the level necessary to produce MSY on a continuing basis (B_{MSY}), which is when $B \leq (1-M)*B_{MSY}$, where M is the natural mortality of the stock. The benchmark stock assessment defined M for Pacific Island bottomfish complexes as 0.3 (Langseth et al., 2019), so bottomfish stocks become overfished when $B \leq 0.7*B_{MSY}$; this value is known as the minimum stock size threshold (MSST) and may also be expressed as the ratio $B/B_{MSY} = 0.7$. Thus, if the B/B_{MSY} ratio falls below 0.7, the stock complex is considered overfished. If possible, SDC of MFMT and MSST are applied to individual species within the multi-species stock complex. Alternatively, when that is not possible, SDC are applied to indicator species for the multi-species stock complex. Current fishery data does not have the resolution to allow the use of either approach for bottomfish in Guam, therefore the Council and NMFS apply SDC to the entire bottomfish multi-species complex as prescribed in the Mariana Archipelago FEP (WPRFMC, 2009). Both the 2015 (Yau et al., 2016) and 2019 (Langseth et al., 2019) stock assessments used the same approach of evaluating bottomfish as a multi-species stock complex.

Alternative 2

Development of the status quo alternative (Alternative 2) began with estimation of the OFL for the Guam bottomfish fishery from the benchmark stock assessment (see Section 2.1.1.1). The Council's SSC accepted the benchmark stock assessment at its 134th meeting in October 2019 and recommended the Council convene its P* and SEEM working groups. The Council held a P* working group on January 31, 2020, to quantify the scientific uncertainty associated with the stock assessment and lower the MSY-based OFL to specify the Acceptable Biological Catch

(ABC). The P* working group determined a total reduction score of 19 percent, meaning that the highest risk level that the Guam bottomfish fishery can be managed at is a 31 percent risk of overfishing (WPRFMC, 2020b). Also on January 31, 2020, the Council held a SEEM working group meeting, where it was determined that the ACL for the Guam bottomfish fishery should be set equal to the ABC (WPRFMC, 2020c). The SEEM working group acknowledged the socioeconomic importance of the bottomfish fishery to Guam fishing communities and noted that any additional reduction of the ABC would likely lead to overages of the conservative quota.

At the Council's 135th SSC meeting in March 2020, the SSC noted that the P* analysis adequately captured the scientific uncertainties associated with the new benchmark stock assessment, and recommended the ABC for the Guam bottomfish fishery be set at 31 percent risk of overfishing corresponding to a catch level of 27,000 lb based on the P* analysis. At its 181st meeting in March 2020, the Council recommended the implementation of an ACL of 27,000 lb for the Guam bottomfish fishery, which is consistent with the P* and SEEM analyses and would let catch to be maximized while preventing overfishing and allowing the stock to rebuild within four years. There would be an approximately 50 percent chance that the Guam bottomfish fishery would not exceed the ACL from 2020 to 2023 based on historical catch data. While a downward adjustment post-season AM was recommended by the Council alongside the ACL, this rebuilding plan proposes the use of an in-season AM to close the fishery when the ACL is reached to ensure that the Guam bottomfish stock rebuilds in a reasonable time frame. The recommendations of the P* working group, SEEM working group, SSC, and Council combined with analysis of recent catch averages and future projections for the Guam bottomfish fishery resulted in the provisions of Alternative 2, which would rebuild the fishery in four years (i.e., 2020 to 2023) and are further detailed Section 2.4 alongside additional information on this alternative.

Alternative 3

Development of the alternative representing a relatively lower ACL than recommended by the Council was generated by using an overage adjustment for the highest level of recorded catch since ACLs began being implemented in 2012. Because the estimated annual catch in 2019 of 37,701 lb exceeds the Council-recommended ACL of 27,000 lb, which is consistent with the P* working group analysis, by 10,701 lb, the ACL proposed under Alternative 3 is 16,299 lb. This is equivalent to a P* of 14 to 15 percent, and it would rebuild the Guam bottomfish stock in three years (i.e., from 2020 to 2022) using biomass projections from PIFSC and Langseth et al. (2019).

Alternative 4

Alternative 4, which represents a relatively higher ACL than the one recommended by the Council, was developed using the P* recommended by the Council's P* working group prior to the most recent recommendation of 40 percent risk of overfishing (WPRFMC, 2015). Using projections from Langseth et al. (2019), a P* of 40 percent over the next four years corresponds with an ACL of 31,000 lb. This level of annual catch would likely rebuild the Guam bottomfish fishery in six years (i.e., 2020 to 2025).

2.1.1 Summary of Guam Bottomfish Fishery Information

2.1.1.1 Estimation of the Overfishing Limit

The 2019 benchmark stock assessment for Guam bottomfish (Langseth et al., 2019) provided the estimate for the long-term MSY for the stock at 42,100 lb (95% CI = 29,300-65,500 lb), which is lower than the estimate for MSY of 56,130 lb in the previous stock assessment update for the stock (Yau et al., 2016). Results of projected probabilities of overfishing for Guam bottomfish are presented within the assessment, which assumed that a six-year ACL set for the stock would be harvested in its entirety for its duration and indicated that an ACL set at 36,000 lb would result in a 50 percent probability of overfishing in 2020 through 2025 (Table 3). Therefore, 36,000 lb is considered to be the OFL proxy for this six-year period for the fishery despite the long-term MSY estimate of 42,100 lb. The average catch of Guam BMUS from 2017 to 2019 was 26,906 lb with 37,701 lb of catch landed in 2019, the most recent year for which complete catch data are available (Table 5). The recent three-year average catch was approximately 25 percent lower than the OFL, and the 2019 estimated catch exceeded the OFL by nearly 5 percent. There has been one year (i.e., 2019) since ACLs were implemented in 2012 that estimated annual catch exceeded the OFL of 36,000 lb. The standing stock biomass in 2025 associated with this OFL is 222,100 lb with a harvest rate of 17 percent in 2025, and the probability that the stock would be overfished in that year is 37 percent (see Table 15 in Langseth et al., 2019).

Table 3. Projected probabilities of overfishing for Guam BMUS in fishing years 2020 to 2025 for a range of annual catch (in 1000 lb).

Probability of overfishing ($H/H_{CR}>1$) in terminal year	2020	2021	2022	2023	2024	2025	Probability of overfishing ($H/H_{CR}>1$) in terminal year	2020	2021	2022	2023	2024	2025
0.01	2	2	2	3	3	3	0.26	21	23	24	25	25	26
0.02	3	3	4	4	5	5	0.27	22	23	24	25	26	26
0.03	4	5	5	6	6	7	0.28	23	24	25	26	26	27
0.04	5	5	6	7	8	9	0.29	23	24	26	27	27	27
0.05	5	6	7	8	9	9	0.30	24	26	26	27	27	28
0.06	6	7	9	9	10	11	0.31	25	26	27	27	28	28
0.07	7	8	9	10	11	11	0.32	25	27	27	28	28	29
0.08	8	9	10	11	12	13	0.33	26	27	27	28	29	29
0.09	9	10	11	12	13	13	0.34	26	27	28	29	29	30
0.10	9	10	12	13	13	15	0.35	27	28	29	29	30	30
0.11	10	11	13	13	14	16	0.36	27	29	29	30	30	31
0.12	11	12	13	14	15	16	0.37	28	29	30	30	31	31
0.13	11	13	14	15	17	17	0.38	29	30	30	31	31	31
0.14	12	13	15	16	17	18	0.39	29	31	31	31	31	32
0.15	13	15	16	17	18	18	0.40	30	31	31	31	31	32
0.16	13	15	17	18	19	19	0.41	31	31	32	32	32	33
0.17	14	16	17	18	19	19	0.42	31	32	32	33	33	33
0.18	15	17	18	19	19	21	0.43	32	32	33	33	33	33
0.19	16	18	19	19	20	22	0.44	32	32	33	33	33	34
0.20	16	18	19	20	21	22	0.45	33	33	33	34	35	35
0.21	17	19	20	21	22	23	0.46	33	34	35	35	35	35
0.22	18	19	21	22	23	24	0.47	34	35	35	35	35	35
0.23	19	20	22	23	23	24	0.48	35	35	35	36	35	36
0.24	19	21	22	23	24	24	0.49	35	36	36	36	36	36
0.25	20	22	23	24	25	25	0.50	36	36	36	36	36	36

(Source: Langseth et al. 2019)

2.1.1.2 Stock Status

In 2017, the most recent year that was taken into account in the stock assessment for Guam bottomfish, $H_{2017}/H_{CR} = 0.81$ where H is the harvest rate, indicating overfishing is not occurring, while $B_{2017}/B_{MSY} = 0.57$, indicating that the stock is overfished (Langseth et al., 2019; Table 4). The results of the production model used in the assessment showed that there were several years from 1982 to 2017 where the fishery was not overfished nor experiencing overfishing, but in the terminal year of the analysis, the stock is overfished but not experiencing overfishing (Figure 2).

In 2019, the most recent year for which catch data are available for Guam BMUS through the Council's Annual SAFE Report for the Mariana Archipelago (WPRFMC, 2020a), the total estimated annual catch was 37,701 lb from boat-based creel surveys, while the estimated commercial catch from the DAWR commercial reporting system was not reported due to data confidentiality rules (Table 5). The difference between the total estimated creel survey catch and estimated commercial catch is typically assumed to be the non-commercial component of the fishery. The estimated three-year average catch (2017 to 2019) from boat-based creel surveys was 26,906 lb (Table 5), which is comprises nearly 75 percent of the OFL (see Section 2.1.1.1).

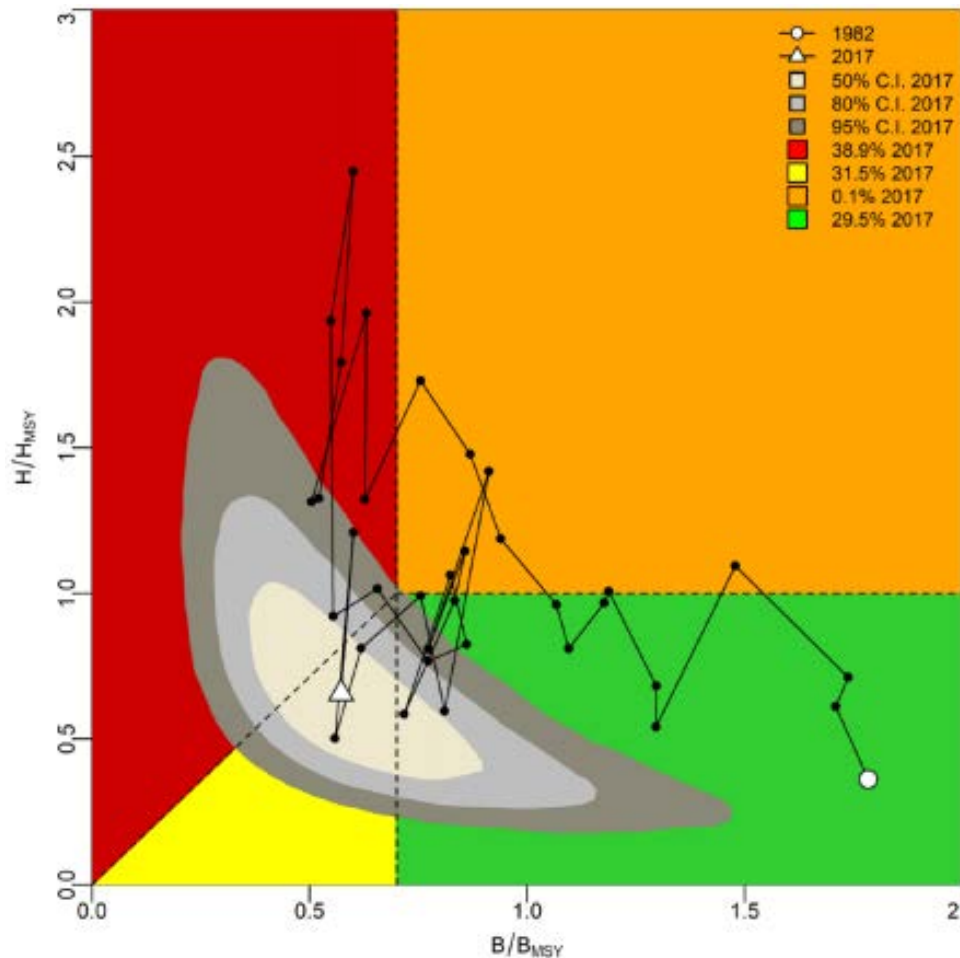


Figure 2. Kobe plot of relative biomass and relative exploitation rate from the best fitting production model for Guam bottomfish from 1982 to 2017

(Source: Langseth et al., 2019)

Table 4. Stock assessment parameters for the Guam BMUS complex.

Parameter	Value	Notes	Status
MSY	42.1 (29.3-65.5)	Expressed in 1000 lb (with 95% confidence interval)	
H ₂₀₁₇	0.11	Expressed in percentage	
H _{CR}	0.170 (0.071-0.382)	Expressed in percentage (with 95% confidence interval)	
H ₂₀₁₇ /H _{CR}	0.81		No overfishing
B ₂₀₁₇	143.0	Expressed in 1000 lb	
B _{MSY}	248.8 (107.1-636.8)	Expressed in 1000 lb (with 95% confidence interval)	
B ₂₀₁₇ /B _{MSY}	0.57		Overfished

(Source: Langseth et al., 2019)

Table 5. Annual estimated BMUS catch (lb) in Guam from 2000 to 2019

Year	Estimated Total Catch (lb)	Estimated Commercial Catch (lb)
2000	58,640	12,184
2001	43,696	10,554
2002	20,366	*
2003	29,506	*
2004	25,233	*
2005	29,087	*
2006	33,414	*
2007	22,576	*
2008	31,103	*
2009	35,029	*
2010	23,928	*
2011	52,230	*
2012	17,518	*
2013	27,277	*
2014	20,687	*
2015	10,782	*
2016	24,479	*
2017	14,653	4,002
2018	28,364	3,029
2019	37,701	*
Three-Year Average (2017-2019)	26,906	3,526

(Source: WPRFMC, 2020a)

* Data are confidential due to less than three vendors reporting.

2.2 Features Common to All Alternatives

Each of the alternatives considered assumes that all existing Federal and local resource management regulations will continue alongside non-regulatory monitoring of catch through the creel survey expansions from the NMFS Western Pacific Fishery Information Network (WPacFIN) and the DAWR commercial reporting system. The Council has two years to prepare and implement an FMP, FMP amendment, or proposed regulations to rebuild an overfished stock, if overfishing is still occurring for that stock (see MSA Section 304(e) and 50 C.F.R. § 600.310(j)). The Council previously recommended an ACL and AM for the Guam bottomfish fishery for 2020 to 2023 at its March 2020 meeting, which can be maintained or supplanted by the provisions of the proposed rebuilding plan. There is little available information on the life history for Guam BMUS to inform the action alternatives, and not much is known on how the stock complex interacts with the surrounding marine ecosystem.

There is no Federal permit or reporting required to fish for BMUS in Guam nor is a commercial fishing license required for fishermen engaged in commercial fishing in Guam waters by the territorial government, but the Guam DAWR encourages fishing vendors to participate in their commercial reporting program. Additionally, DAWR performs shore- and boat-based creel surveys to gather data on fishing methods used, fishing effort, and annual catch before transferring these data to NMFS through WPacFIN. Under each of the alternatives, NMFS would work with WPacFIN and DAWR to encourage timely processing of data and would track catches toward any applicable limit as data are provided. The ability to coordinate a closure of both Federal and territorial waters would improve management measures associated with a designated catch limit, but Guam does not have regulations in place to close bottomfish fishing in territorial waters if a Federal catch limit is reached. For this reason, the following outcome analyses for each proposed alternative account only for action that NMFS can take within its regulatory authority. Each action alternative assumes that only Federal waters could be closed as the result of the in-season AM when NMFS projects that the catch has exceeded the implemented ACL. The explanation of each action alternative describes the ideal scenario where the ACL is caught in full, whereas expected outcomes associated with continued fishing in excess of the ACL are described in the subsequent outcome analyses for each alternative. The analyses are based on an effective date of January 1, 2020, to provide a baseline for comparison if the measures were enacted at the beginning of the current fishing year.

2.3 Alternative 1: No Action – Do not implement ACLs

Under Alternative 1, the Council would not implement a rebuilding plan with an ACL, AM, or other associated management measure for BMUS in Guam from 2020 to 2023 to rebuild the bottomfish fishery. Alternative 1 serves as the no management alternative. Since the fishery did not operate under an ACL in 2018 or 2019, this would also act as the and environmental baseline alternative. In the absence of an ACL, the fishery would not operate under catch limits and AMs would not be required. The fishery would continue to be subject to other Federal and territorial management measures such as gear and spatial restrictions. The Council and NMFS would continue to monitor catches through the creel survey expansions from WPacFIN, the DAWR commercial reporting system, and other sources of data as available.

The Council and NMFS are required to implement ACLs and AMs for fisheries managed under a FMP, so this alternative would not be in compliance with the MSA, implementing Federal

regulations, or the provisions of the Council’s FEP. While Alternative 1 does not meet the stated purpose and need for action, it serves as the environmental baseline alternative against which effects on the human environment of action alternatives can be compared.

2.3.1 Expected Fishery Outcome (Alt. 1)

Under Alternative 1, the Guam bottomfish fishery is expected to continue fishing as it has in the past and harvest annual catch of Guam BMUS similar to recent years. Although ACLs in previous years were based on the Guam bottomfish complex prior to Amendment 5 to the FEP that reduced the number of MUS from 16 to 13, annual catches have not been greater than 41 percent of the ACLs since they were implemented in 2012 (Table 6). Due to the lack of in-season closures, ACLs and AMs did not functionally constrain the fishery. However, catches in 2018 and 2019 (when no ACL or AMs were implemented), while somewhat similar to catches during years when ACLs were implemented (Table 6), were relatively higher than catch levels observed in the previous six years. This indicates that fishery performance does not change dramatically whether or not ACLs and AMs are implemented, but that the fishery may have slightly increased catch in the absence of ACLs due to variability inherent in the fishery. Catch in 2019 was the highest observed since the implementation of ACLs and is comparable to catch levels prior to 2012 (see Table 5), but it would not have exceeded any of the ACL levels implemented since 2012. The variability in catch observed over recent years likely reflects normal operations of the fishery. The catch level estimated for 2019 exceeds the OFL and is the highest catch recorded since 2011, but it does not reach the long-term MSY. Under these conditions, past fishery performance can be used to approximate behavior in the fishery in the absence of a catch limit (i.e., performance in an unconstrained fishery), and it is therefore expected that catches will continue to be similarly variable to past years. While the recent average catch of 26,906 lb does not exceed the OFL or the long-term MSY, these parameters may be exceeded with any increase in catch in subsequent years. Thus, the fishery, if unconstrained, may exceed sustainable harvest levels specified in Langseth et al. (2019).

Table 6. Comparison of Guam bottomfish catches to the ACLs from 2012 to 2019. ACLs were not implemented in 2018 or 2019.

Year	ACL (lb)	Catch (lb)	Percent of ACL
2012	48,200	17,518	36.34
2013	66,800	27,277	40.83
2014	66,800	20,687	30.97
2015	66,800	10,782	16.14
2016	66,000	24,479	37.09
2017	66,000	14,653	22.20
2018	NA	28,364	NA
2019	NA	37,701	NA

(Source: WPRFMC, 2020a)

2.3.2 Estimated Conservation and Management Benefit (Alt. 1)

Under Alternative 1, there would be no anticipated reduction of BMUS catch in Guam over the next four years, and annual catch would likely continue to be similar or increase from the recent three-year average catch of 26,906 lb. This level of annual catch may prevent overfishing but would not help rebuild the fishery from its overfished state in a reasonable time frame.

2.3.3 Degree to which this Alternative Mitigates Cultural, Economic, and Social Effects of the Management Measure (Alt. 1)

This alternative would not have short-term cultural, economic, or social impacts to fishing communities in Guam compared to other alternatives because it would not constrain bottomfish fishing activity and is not expected to adversely affect the fishing communities. However, Alternative 1 would not reduce overfishing of BMUS relative to recent levels nor help rebuild the stock complex. This would likely cause the stock complex to persist in its overfished state and elongate the timeframe to improve the stock status relative to the action alternatives, which may have longer-term cultural, economic, and social impacts.

Since the fishery, and therefore, commercial sales are expected to remain consistent under Alternative 1, the Council anticipates around 19 percent of recent average catch, or 5,112 lb, will be sold in 2020 based on recent data (Table 7). Although commercial sales data for Guam bottomfish are confidential for 2019, data for 2017 and 2018 can be used to determine recent trends in the commercial fishery. At the recent average price of \$4.82 per lb, expected revenue would be \$24,640. Using the estimated number of 300 fishery participants from the 2020 LOF (85 FR 21095, April 16, 2020), each fisher would earn approximately \$82. This alternative would not constrain bottomfish fishing activity in Guam, so it is not expected to adversely affect the fishing communities in the territory. Non-commercial fishing (inclusive of recreational, sustenance, and cultural fishing) would likely be unaffected relative to the action alternatives.

Table 7. Summary of Guam bottomfish commercial revenues from 2010 to 2019.

Year	Estimated total catch (lb)	Estimated pounds sold (lb)	Percent sold	Estimated adjusted revenue (\$)	Adjusted average price per pound (\$)
2010	23,928	*	*	*	*
2011	52,230	*	*	*	*
2012	17,518	*	*	*	*
2013	27,277	*	*	*	*
2014	20,687	*	*	*	*
2015	10,782	*	*	*	*
2016	24,479	*	*	*	*
2017	14,653	4,002	27	18,131	4.53
2018	28,364	3,028	11	15,443	5.10
2019	37,701	*	*	*	*
Three-year avg.	26,906	3,515	19	16,787	4.82

(Source: WPRFMC, 2020a); * Data are confidential due to less than three vendors reporting.

2.4 Alternative 2: Implement an Annual Catch Limit of 27,000 lb and an In-Season Accountability Measure from 2020 to 2023 (status quo alternative)

Under this alternative, the Council would utilize BSIA to implement an ACL of 27,000 lb for the Guam bottomfish fishery for the next four years (2020 to 2023), as the Council recommended at its 181st meeting and consistent with recommendations of the SSC and P* working group, to allow for the rebuilding of the stock. The Council's SSC used the results of the P* working group meeting (WPRFMC, 2020b) to set the ABC using a 19 percent reduction to the probability of overfishing, resulting in a catch level of 27,000 lb at a 31 percent risk of overfishing using 2023 as the terminal year. The SEEM working group meeting suggested no further reduction in the risk of overfishing to minimize further impacts on the conduct of the Guam bottomfish fishery and recommended that the ACL be set equal to the ABC (WPRFMC, 2020c). This level of catch would likely rebuild the Guam bottomfish stock to B_{MSY} in four years. As an in-season AM, NMFS will monitor catch levels throughout each year and close Federal waters around Guam to bottomfish fishing if and when the implemented ACL is reached. Catches from both Federal and territorial waters would be counted towards the ACL. Due to the moderate level of recent catches relative to the proposed ACL, it is not clear if the fishery will harvest more than 27,000 lb; annual catch for four of the past 10 years have exceeded the proposed ACL, while the catch for the remaining six years was below 27,000 lb. As this is the ACL that the Council has already recommended for implementation at its 131st meeting in March 2020, Alternative 2 is the status quo alternative.

Information was utilized from Langseth et al. (2019) and biomass projections by PIFSC (Figure 4; Table 8) to determine the viability of using the catch level recommended by the Council and its SSC to rebuild the Guam bottomfish stock in the associated time frame, as the specification of a rebuilding time is required per MSA 304(e)(4) for any overfished fishery. The stock biomass information assumes that the entirety of an ACL will be harvested in a given year for projected catch levels. Because B_{MSY} for the Guam bottomfish multi-species stock complex is 248,800 lb (Table 4), at a 31 percent risk of overfishing, an ACL of 27,000 lb will allow the Guam bottomfish stock to rebuild to its B_{MSY} in four years (i.e., by 2023 if initiated in 2020; Table 8). Thus, T_{target} for this proposed rebuilding plan is four years. The projections show that, in the absence of fishing, the Guam bottomfish stock complex can be rebuilt to a biomass 253,136 lb in two years (i.e., by 2021 if initiated in 2020), so T_{min} for this rebuilding plan is two years. Because T_{min} is less than 10 years, T_{max} is 10 years, pursuant to implementing regulations at 50 CFR 600.310(j)(3)(b)(1). While the shortest possible time to rebuild the stock to B_{MSY} would be to have zero fishing mortality (i.e., annual catch of zero), this would not take into account the needs of the Guam fishing community as required in the MSA Section 304(e)(4)(A)(i) and is not possible to enforce in territorial waters. An ACL of 27,000 lb will both prevent overfishing and ensure that the fishery will rebuild in a relatively short amount of time while allowing adequate availability of bottomfish resources to the Guam fishing communities. The harvest rate associated with an annual catch level of 27,000 lb is 0.12 (see Table 15 in Langseth et al., 2019) so this will be the $F_{rebuild}$ over the next four years. The parameters required by MSA 304(e) and implementing regulations at 50 CFR 600.310(j)(3) for a rebuilding plan for an overfished fishery are presented in Table 8.

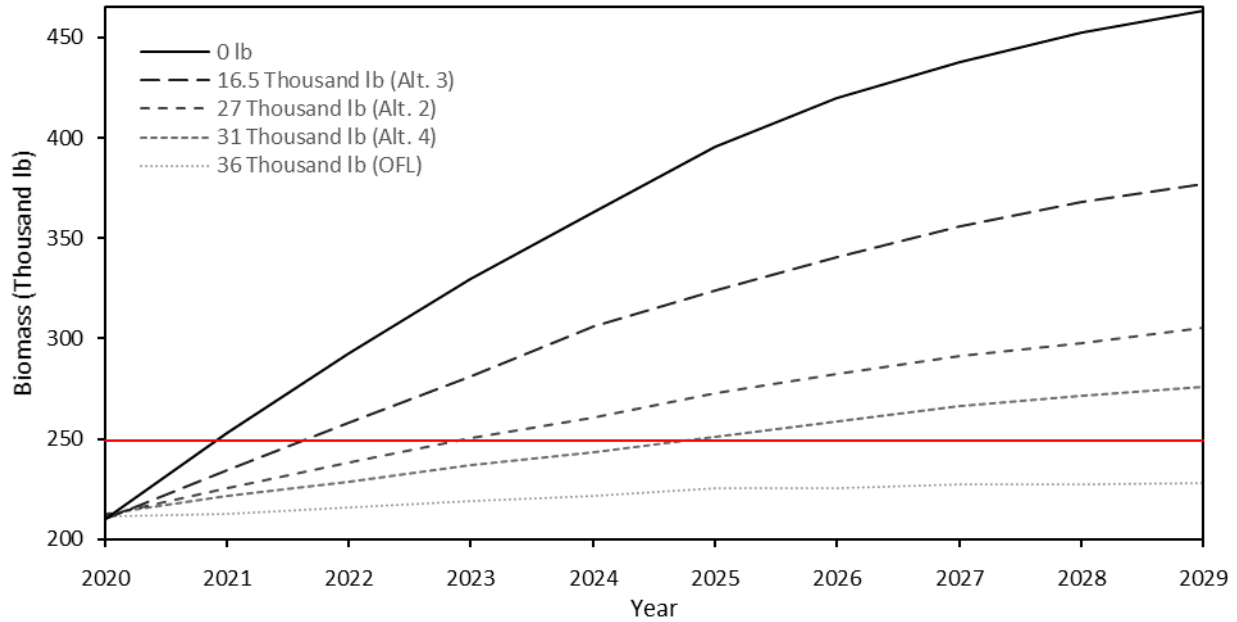


Figure 3. Projected biomass of the Guam bottomfish stock complex from 2020 to 2029 with annual catches reflecting each of the alternatives in this paper as well as 0 lb and the six-year OFL identified in Langseth et al. (2019). The red line denotes B_{MSY} at 248,800 lb. (Source: PIFSC Stock Assessment Program)

In Guam archipelagic fisheries, the fishing year begins January 1 and ends on December 31. In accordance with 50 CFR 665.4, when NMFS projects that catches will reach an ACL for any stock or stock complex, the agency must restrict fishing for that stock or stock complex in the applicable U.S. EEZ to prevent catches from exceeding the ACL. The restriction may include, but is not limited to, closing the fishery, closing specific areas, or restricting effort (76 FR 37286, June 27, 2011). However, an in-season restriction is difficult to implement for any territorial bottomfish fishery because catch statistics only become available about six months after local management agencies collect the data. Regardless, the Council proposes an accountability measure that would require NMFS to monitor catch for the stock complex relative to its ACL as quickly as possible given the limitations in the data collection and processing methods. If landings of the stock complex exceed the specified ACL during the fishing year, the AM will require NMFS to close the fishery in Federal waters. As an additional performance measure specified in the FEP, if catches exceed any ACL more than once in a four-year period, the Council must re-evaluate the ACL process, and adjust the system, as necessary, to improve its performance and effectiveness. Future changes to an ACL would be subject to a separate environmental review at such time as changes are proposed and are not part of the current proposed action.

Table 8. Projected biomass (1,000 lb) of the Guam bottomfish stock complex from 2020 to 2029 with annual catches (lb) ranging from 0 to 31,000.

Annual Catch	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
0	210.1	253.1	292.7	329.5	363.2	395.7	419.7	437.6	452.2	463.0
500	212.3	253.9	292.1	329.6	364.3	393.4	415.3	431.3	447.3	461.8
1,000	212.6	251.8	291.2	328.2	360.0	387.4	410.1	431.0	443.6	457.2
1,500	211.8	250.8	290.1	326.6	359.1	386.3	413.1	430.9	442.2	457.1
2,000	212.1	251.4	289.3	326.7	357.9	387.3	411.7	427.6	444.1	458.0
2,500	211.3	249.0	287.8	323.1	354.9	382.6	404.1	422.5	436.9	448.3
3,000	212.5	249.3	288.2	324.1	355.4	382.9	407.0	423.3	440.3	450.0
3,500	211.5	250.6	286.9	320.1	351.3	380.2	400.8	418.8	434.3	447.2
4,000	211.1	247.6	284.0	319.1	355.2	377.5	402.2	418.6	433.2	445.0
4,500	211.7	246.4	282.7	317.6	348.2	375.7	396.7	416.6	430.3	442.7
5,000	212.9	249.6	284.9	317.7	346.3	374.1	397.7	413.4	427.7	440.4
5,500	210.4	245.3	279.9	312.0	343.1	371.3	395.3	411.4	428.0	440.7
6,000	213.1	245.7	281.3	315.2	345.3	370.3	392.1	409.0	424.5	433.8
6,500	209.7	245.0	279.9	312.2	343.1	367.9	388.0	407.8	418.9	431.9
7,000	214.2	243.8	278.9	310.9	339.0	366.8	386.1	404.0	417.8	428.6
7,500	209.6	243.8	276.4	307.1	337.7	361.5	382.9	401.1	416.2	425.6
8,000	211.2	242.7	274.3	308.1	333.7	361.9	383.9	395.6	413.3	422.0
8,500	212.5	245.0	277.1	308.0	335.3	357.4	382.0	395.8	410.2	423.2
9,000	211.3	242.9	276.2	305.5	333.8	358.0	379.9	396.0	410.6	420.6
9,500	211.6	242.9	273.6	302.1	329.1	353.9	373.7	393.8	408.2	416.7
10,000	210.8	242.6	273.4	303.4	331.7	353.0	372.9	390.4	402.8	414.4
10,500	211.3	242.3	273.4	303.1	330.8	352.1	371.8	385.8	399.9	409.6
11,000	211.9	241.4	271.0	301.7	327.3	350.4	368.0	383.2	398.5	407.5
11,500	211.7	241.4	269.8	297.2	322.0	341.6	362.8	381.9	395.6	407.7
12,000	212.3	243.6	272.4	296.1	319.7	343.1	364.7	377.0	393.0	403.2
12,500	213.8	241.6	270.2	293.6	317.2	339.1	359.9	376.9	390.9	401.7
13,000	211.3	237.9	265.7	290.7	314.4	336.9	353.9	371.0	385.5	397.7
13,500	211.9	237.0	264.4	289.1	315.1	338.0	357.1	370.6	385.5	393.9
14,000	212.5	239.0	266.3	291.4	316.1	333.6	352.5	368.5	381.5	391.3
14,500	211.1	235.3	261.5	286.8	309.4	330.8	348.6	365.9	379.1	390.8
15,000	212.8	236.5	261.4	287.3	310.0	329.5	346.2	363.0	377.8	386.8

Annual Catch	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
15,500	213.2	236.4	261.7	286.8	308.0	330.8	346.1	359.6	376.1	385.8
16,000	212.0	237.4	260.7	283.4	307.5	326.9	345.0	359.7	371.8	384.9
16,500	210.2	234.3	258.4	281.2	306.2	323.8	340.4	355.6	368.2	377.0
17,000	212.2	235.9	260.2	280.4	301.9	320.4	337.6	351.7	365.4	375.6
17,500	211.0	234.2	255.3	278.9	298.9	321.4	336.0	348.7	364.0	374.9
18,000	210.8	232.5	252.3	273.6	295.4	314.4	329.6	343.7	358.2	365.8
18,500	211.1	233.2	255.5	276.9	295.5	316.6	335.1	348.4	355.6	365.3
19,000	212.2	231.6	250.7	272.3	290.8	308.6	323.4	337.4	350.6	360.4
19,500	211.3	229.8	250.1	268.6	286.1	304.7	320.0	334.7	346.3	355.2
20,000	213.2	234.3	254.4	272.3	288.3	306.7	320.3	334.0	346.9	354.9
20,500	211.3	232.2	251.2	270.9	289.3	305.1	322.4	332.9	343.8	356.4
21,000	211.6	229.9	249.0	268.2	284.3	299.0	315.4	327.8	341.1	349.0
21,500	211.6	230.6	246.0	265.7	283.1	298.3	313.6	326.7	338.5	348.8
22,000	212.4	229.5	247.5	265.5	279.7	296.7	311.2	323.2	332.3	344.8
22,500	212.5	229.8	247.2	266.6	282.2	295.8	308.5	319.6	329.0	336.9
23,000	211.9	227.1	244.9	260.8	277.4	290.0	302.5	315.2	326.7	335.1
23,500	212.8	227.9	245.3	261.4	277.5	290.2	302.9	312.7	325.8	332.9
24,000	210.3	227.5	242.0	256.7	271.7	287.7	302.1	312.7	318.8	327.3
24,500	212.1	227.3	241.2	256.3	271.4	283.7	297.0	308.0	319.2	325.8
25,000	211.5	227.3	241.7	255.9	269.4	282.2	292.6	303.0	313.5	320.6
25,500	212.0	227.6	240.8	255.8	269.1	281.0	293.2	303.8	310.2	316.8
26,000	209.9	223.5	235.2	250.2	262.7	274.4	285.6	296.4	305.2	313.1
26,500	210.9	224.6	237.3	249.3	262.5	274.2	282.7	293.5	302.2	309.9
27,000	212.2	225.7	238.2	250.5	260.9	272.6	282.4	291.0	297.9	305.6
27,500	210.0	222.2	234.8	245.8	255.8	267.7	277.2	285.7	293.4	298.4
28,000	213.8	224.2	235.9	247.9	259.3	269.2	276.7	283.6	292.8	298.1
28,500	212.8	223.9	235.7	246.9	256.2	265.0	273.5	281.4	288.9	294.3
29,000	210.4	219.7	231.7	241.5	250.7	259.4	271.8	278.8	286.0	296.7
29,500	210.8	222.2	229.7	240.0	249.8	256.5	266.9	273.1	276.6	283.1
30,000	212.6	222.2	232.0	240.8	249.5	256.0	264.9	271.4	277.9	283.0
30,500	212.7	221.2	230.4	239.8	246.6	252.8	259.0	265.5	273.1	278.8
31,000	212.9	221.8	228.6	236.9	243.4	251.3	258.5	266.6	271.5	276.3

(Source: PIFSC Stock Assessment Program)

Table 9. Rebuilding plan parameters under Alternative 2 as required by National Standard 1 for an overfished fishery.

Parameter	Value
T _{min}	2 years
T _{target}	4 years
T _{max}	10 years
F _{rebuild}	0.12

2.4.1 Expected Fishery Outcome (Alt. 2)

Under Alternative 2, the Guam bottomfish fishery is expected to continue fishing as it has in the past with a small reduction and harvest slightly less annual catch of Guam BMUS similar to recent years. Fishery performance has been relatively consistent regardless of the implementation of an ACL despite some variability (see Table 6). There were no in-season management measures (e.g., fishing closures) that limited fishing activity in previous years, so management under catch limits did not functionally constrain the fishery. Estimated catch in 2018 and 2019, years where no ACL was implemented, had relatively higher catch levels than the previous six years where ACLs were specified; however, this is likely consistent with expected variability in the fishery. Thus, it is expected that catch under Alternative 2 could be slightly constrained and result in lower catch levels in years where variability results in relatively high levels of catch than would be seen under the no action alternative. Additionally, if variability in the fishery causes catch to be higher than the recent average annual catch, it is expected that catch under Alternative 2 would be slightly less than Alternative 1; in years where catch does not approach the ACL, harvest levels under Alternatives 1 and 2 are expected to be the same. NMFS would close Federal waters around Guam when the ACL is exceeded, which would further reduce harvest in years where relatively high catch occurs. There are no regulations in place to close territorial waters alongside Federal waters in this proposed action, so it is expected that fishing could continue in territorial waters and may offset potential conservation benefits of a Federal closure. Alternative 2 provides the Federal action that will support rebuilding and prevent overfishing within the fishery while allowing a level of annual catch comparable to recent levels. All other applicable fishing regulations would remain in place.

Considering the variability of recent average annual catch levels (Table 5), it is not certain if the Guam bottomfish fishery will reach an ACL of 27,000 lb over the next four years but it is likely that catch will approach the ACL. Catch in four of the past 10 years (40 percent) would have exceeded this level of catch, but the average catch from the past three years of 26,906 lb falls comprises over 99 percent of the proposed limit. Thus, it is not clear if a closure of Federal waters will need to be implemented, but the ACL of 27,000 lb will not be exceeded if recent average levels of catch continue. If catch persists at the recent average level, overfishing will be prevented, and the fishery will be rebuilt from its overfished state in four years. However, even if harvest continues at the level observed in 2019, a simple calculation can be performed to determine the restriction of catch under this alternative. While data on the seasonality of catch is not available in the bottomfish fishery, assuming that catch is consistent throughout the year allows for a rough estimate using average annual BMUS catch. An associated closure of Federal waters will deny fishing access to some of the Guam’s offshore banks where bottomfish fishing occurs if a Federal fishery closure occurs. If the average annual catch is assumed to be 37,701 lb

and catch is consistent throughout the year (3,142 lb/month), the ACL will be exceeded by September after 28,276 lb of catch. There would be another 9,425 lb expected to be caught after this time, assuming catch is consistent with 2019 levels. If catches are proportional to bottomfish habitat in Federal and territorial waters (26.4 and 73.6 percent, respectively; see Figure 1), 2,488 lb that might have ordinarily been caught in Federal waters would not be caught in the fishery. Therefore, the total catch for this scenario would be 35,213 lb rather than the 2019 catch of 37,701 lb assuming 2019 levels of catch persist. This improvement may not be fully realized if fishing is displaced to territorial waters, and this level of catch associated with an exceedance of the ACL would elongate the rebuilding time frame. Thus, this alternative may slightly reduce fishing depending on variability in the fishery, but assuming that future catches will be consistent with recent averages, Alternative 2 will minimize adverse impacts to the Guam bottomfish stock and support rebuilding.

Though fishing cannot necessarily be constrained in territorial waters, Alternative 2 will restrict some of the variability of catch in the fishery and be in compliance with the MSA, implementing Federal regulations, and the provisions of the Council's FEP that require ACLs and AMs to be implemented annually. Alternative 2 also meets the stated purpose and need for Federal action to rebuild the Guam bottomfish fishery.

2.4.2 Estimated Conservation and Management Benefit to MUS (Alt. 2)

Alternative 2 is intended to prevent overfishing and rebuild the Guam bottomfish fishery within four years while allowing relatively similar harvest from recent years to occur. Under Alternative 2, conservation and management benefits to Guam BMUS are expected from constraining years where annual catch may exceed 27,000 lb for any reason; using the 2019 catch as an example, catch would be reduced by 6,937 lb. However, any displacement of fishing effort from Federal waters to territorial waters could offset the anticipated reduction in catch, as the fishery is expected to continue operations in territorial waters in the event of a Federal closure. Additionally, years of relatively high catch would result in a delay of the fishery being rebuilt. In years where catch is relatively lower and does not reach the ACL, catch is expected to be the same as Alternative 1; these harvest levels would still prevent overfishing and promote rebuilding of the fishery. It is not clear if the proposed ACL will be exceeded considering data on recent average annual catch for the fishery. Thus, adverse impacts to the Guam bottomfish stock from fishing will be mitigated if they occur, overfishing will be prevented to the extent practicable, and rebuilding will likely occur within the proposed time frame.

2.4.3 Degree to which this Alternative Mitigates Cultural, Economic, and Social Effects of the Management Measure (Alt. 2)

Alternative 2 is intended to rebuild the Guam bottomfish fishery from its overfished state while mitigating cultural, economic, and social impacts to Guam communities by allowing a level of fishing similar to recent years. Under Alternative 2, minor cultural, economic, and social effects may impact fishermen who harvest bottomfish in Federal waters if catch is variably high for the year and the ACL is exceeded, resulting in a closure of Federal waters. Using 2019 catch as an example, if catch is reduced by an estimated 2,488 lb and roughly 19 percent of that catch would have been sold (see Table 7), there would be an expected loss of revenue of \$2,279 for the fishery, or \$8 per fisher (using 300 fishers estimated in the LOF 2020). However, it is expected that fishing will continue to occur in territorial waters if the ACL is exceeded and fishing in

Federal waters is prohibited, and is not clear if the fishery will exceed the ACL over the next four years. Thus, large economic impacts are not expected in years of average catch, and the economic impacts would be relatively minor in years with variably high catch. Because the average amount of bottomfish sold is just 19 percent of the total catch, the Guam bottomfish fishery is considered to be predominantly non-commercial, primarily providing fish for recreation and sustenance. Because fishing is not expected to be constrained in most years for the fishery, there are no large cultural or social impacts expected under Alternative 2.

2.5 Alternative 3: Implement an Annual Catch Limit of 16,299 lb and an In-Season Accountability Measure from 2020 to 2022

Alternative 3 involves the Council implementing a more conservative ACL than Alternative 2 of 16,299 lb (see Section 2.1) for the Guam bottomfish fishery over the next three years (2020 to 2022). This ACL would be lower than the recommended risk of overfishing for the fishery of 31 percent by the Council's P* working group, reducing the P* to roughly 14 to 15 percent (Table 3). Using catch projections from PIFSC (Table 8) and Langseth et al. (2019), this level of catch would likely rebuild the Guam bottomfish stock from its overfished state to B_{MSY} in three years. As an in-season AM, similar to Alternative 2, NMFS will monitor catch levels throughout each year and close Federal waters around Guam to bottomfish fishing if and when the implemented ACL is reached. Catches from both Federal and territorial waters would be counted towards the ACL. Due to the levels of recent catch in the fishery relative to the proposed ACL, it is expected that annual catch will exceed the ACL in subsequent years, resulting in the closure of Federal waters to the fishery; annual catches for eight of the past 10 years have exceeded the proposed ACL, and the recent three-year average catch of 26,906 lb exceeds the proposed ACL by 10,607 lb. Compared to the status quo alternative, this alternative represents the application of a more conservative ACL to allow the Guam bottomfish fishery to rebuild faster than Alternative 2.

Projections results provided in Langseth et al. (2019) were used to analyze the outcomes of implementing the ACL proposed under Alternative 3 and the associated time frame. The specification of a rebuilding time is required per MSA 304(e)(4) for a rebuilding plan for an overfished fishery. The stock projection information assumes that the entirety of an ACL will be harvested in a given year. Because B_{MSY} for the Guam bottomfish multi-species stock complex is 248,800 lb (Table 4), at a 14 to 15 percent risk of overfishing, an ACL of 16,299 lb will allow the Guam bottomfish stock to rebuild to its B_{MSY} in three years or less (i.e., by 2022 if initiated in 2020; Table 8). Thus, T_{target} for this proposed rebuilding plan is three years. The T_{min} for this rebuilding plan would be two years (see Section 2.4), and T_{max} is 10 years because T_{min} is less than 10 years pursuant to implementing regulations at 50 CFR 600.310(j)(3)(b)(1). While the shortest possible time to rebuild the stock to B_{MSY} would be to have zero fishing mortality (i.e., annual catch of zero), this would not take into account the needs of the Guam fishing community as required in the MSA Section 304(e)(4)(A)(i). An ACL of 16,299 lb would both prevent overfishing and ensure that the fishery will rebuild in shorter amount of time than Alternative 2, but the availability of bottomfish resources to Guam fishing communities would be more restricted. The harvest rate associated with an annual catch level of 16,299 lb is 0.08 (see Table 15 in Langseth et al., 2019), so this will be the $F_{rebuild}$ for the proposed rebuilding plan. The parameters required by MSA 304(e) and implementing regulations at 50 CFR 600.310(j)(3) for a rebuilding plan for an overfished fishery are presented in Table 10.

Table 10. Rebuilding plan parameters under Alternative 3 as required by National Standard 1 for an overfished fishery.

Parameter	Value
T _{min}	2 years
T _{target}	3 years
T _{max}	10 years
F _{rebuild}	0.08

2.5.1 Expected Fishery Outcome (Alt. 3)

The expected outcome of Alternative 3 for the Guam bottomfish fishery is that the fishery would likely continue fishing as observed in recent years with a moderate reduction in annual catch of Guam BMUS due to the constraints associated with a more conservative ACL and in-season AM. Fishery performance for Guam bottomfish has remained variable regardless of the implementation of ACLs (Table 6), and in-season AMs were not present in previous years to constrain the fishery. Thus, it is expected that catch under a more conservative ACL with Alternative 3 could be more constrained than Alternative 2 and result in lower catch levels in years where variability would normally result in relatively high levels of catch. In years where catch does not approach the ACL, harvest levels under Alternative 3 would be expected to be inherently similar to or less than Alternative 2. The lower ACL of 16,299 lb is more likely to be exceeded considering recent average levels of annual catch for Guam BMUS, meaning that a closure of Federal waters to bottomfish fishing is more probable; this would further restrict catch. There are no regulations in place to close territorial waters alongside Federal waters in this proposed action, so it is expected that fishing could continue in territorial waters and may offset potential conservation benefits of a Federal closure. Additionally, any exceedance of the ACL would delay the proposed rebuilding time. Alternative 3 provides the Federal action that will support rebuilding and prevent overfishing within the fishery more quickly than Alternative 2 but would also reduce bottomfish resources available to the Guam fishing communities due to a more cautious ACL. All other applicable fishing regulations would remain in place.

Given recent average annual catch levels (Table 5), it is likely that Guam bottomfish fishery will exceed an ACL of 16,299 lb. Catch in eight of the past 10 years (80 percent) would have exceeded this level of catch, and the average catch from the past three years of 26,906 lb exceeds this limit by approximately 65 percent. Thus, it is expected that the in-season AM would be employed to close Federal waters around Guam in some of the subsequent years in which this proposed ACL is implemented. However, if catch falls beneath the ACL for the next few years, overfishing will be prevented, and the fishery will be rebuilt from its overfished state in three years. If harvest of Guam BMUS continues at recent average levels every year, a simple calculation can be used to determine the impact of the closure on expected catch, similar to what was done for Alternative 2. Data on the seasonality of catch is not available for the Guam bottomfish fishery, but assuming that catch is consistent throughout the year allows for a rough estimate of monthly bottomfish catch. If the average annual catch is assumed remain consistent with recent levels at 26,906 lb and catch is consistent throughout the year (2,242 lb/month), the ACL will be exceeded by August after 17,936 lb of catch. There would be another 8,970 lb expected to be caught after this time. If catches are proportional to bottomfish habitat in Federal and territorial waters (see Figure 1), 2,368 lb that might have ordinarily been caught in Federal

waters would not be caught in the fishery. Therefore, the total catch for this scenario would be 24,538 lb, but this improvement may not be fully realized if fishing is displaced to territorial waters. An annual of catch level of 24,538 would also delay the rebuilding time for this alternative from three years to four years, which is the same time frame for Alternative 2. Therefore, this alternative may moderately reduce fishing depending on variability in the fishery, adverse impacts to the Guam bottomfish stock would be diminished, and rebuilding will likely still occur within four years as it would under Alternative 2 despite fishing in territorial waters.

Similar to Alternative 2, fishing cannot necessarily be constrained in territorial waters, but this alternative will restrict more of the variability in interannual catches than the status quo alternative. It may cause greater impacts to Guam's fishing communities under Alternative 3. This alternative would be in compliance with the MSA, implementing Federal regulations, and the provisions of the Council's FEP that require ACLs and AMs to be implemented annually.

2.5.2 Estimated Conservation and Management Benefit to MUS (Alt. 3)

Alternative 3 would provide increased conservation benefits relative to the status quo alternative by preventing overfishing and supporting the rebuilding of the Guam bottomfish fishery in three years. Under this alternative, conservation and management benefits to Guam BMUS are expected from constraining years where annual catch may exceed 16,299 lb, as observed in eight of the past 10 years. If catch continues at recent average levels, a Federal closure in accordance with the proposed AM would reduce catch by 2,368 lb due to catch not harvested in Federal waters; this level of catch would delay the rebuilding time to be four years. Thus, Alternative 3 may not provide additional conservation benefits than Alternative 2 with respect to rebuilding the fishery if the catch remains consistent with recent averages. Additionally, any displacement of fishing effort from Federal waters to territorial waters could offset the anticipated reduction in catch due to the closure of Federal waters, as the fishery is expected to continue operations in territorial waters in the event of a Federal closure. In years where catch is relatively lower and does not reach the ACL, catch is expected to be the same or less than Alternatives 1 and 2; these harvest levels would prevent overfishing and promote rebuilding of the fishery. Thus, adverse impacts to the Guam bottomfish stock from fishing will be reduced, overfishing will be prevented, and rebuilding will occur within a relatively shorter or equal time frame.

2.5.3 Degree to which this Alternative Mitigates Cultural, Economic, and Social Effects of the Management Measure (Alt. 3)

Alternative 3 would do less to mitigate cultural, economic, and social effects to the Guam fishing community while rebuilding the bottomfish fishery than Alternative 2 by establishing a more conservative ACL and further restricting availability of bottomfish resources. Especially for fishermen who harvest bottomfish in Federal waters, these impacts may be prevalent due to increased constraints from a lower ACL and a potential Federal closure. Using recent average annual catch, a reduction of 2,368 lb with 19 percent expected to be sold would lead to an expected loss of \$2,169 in revenue for the fishery, or roughly \$7 per fisher (using 300 fishers estimated in the LOF 2020). This estimate does not consider any reduction in fishing effort from perceived constraints due to the more conservative ACL. It is expected that operations will continue to occur in territorial waters if Federal waters are closed to bottomfish fishing, which may offset some of the cultural, economic, and social impacts associated with this alternative. Thus, there are minor economic impacts expected under Alternative 3 if the fishery continues to operate at

average levels, but these impacts would be diminished in years where the ACL is not reached. However, because fishing is expected to be constrained due to a Federal closure in most years that this ACL is implemented, there may be larger impacts than expected under Alternative 2.

2.6 Alternative 4: Implement an Annual Catch Limit of 31,000 lb and an In-Season Accountability Measure from 2020 to 2025

Under Alternative 4, the Council would implement a relatively less strict ACL than Alternative 2 of 31,000 lb (see Section 2.1) for the Guam bottomfish fishery over the next six years (2020 to 2025). This ACL would be consistent with a higher risk of overfishing for the fishery than recommended most recently by the Council's P* working group at 40 percent risk of overfishing (Table 3). Using catch projections from PIFSC (Table 8) and Langseth et al. (2019), this level of catch would likely rebuild the Guam bottomfish stock from its overfished state to B_{MSY} in six years. As an in-season AM, similar to Alternatives 2 and 3, NMFS will monitor catch levels throughout each year and close Federal waters around Guam to bottomfish fishing if and when the implemented ACL is reached. Catches from both Federal and territorial waters would be counted towards the ACL. Due to the levels of recent catch in the fishery relative to the proposed ACL, there is a lower chance that annual catch will exceed the ACL in subsequent years than under Alternative 2, which makes the closure of Federal waters to the fishery less likely. Annual catches for two of the past 10 years have exceeded the proposed ACL, and the recent three-year average catch of 26,906 lb reaches approximately 87 percent the proposed ACL. Compared to the status quo alternative, this alternative represents the application of a more relaxed ACL to allow the Guam bottomfish fishery greater harvest that would cause it to rebuild more slowly than Alternative 2 but provide additional bottomfish resources to the local community.

Biomass projections from Langseth et al. (2019) were used to analyze the outcomes and time frame of implementing the ACL proposed under Alternative 4. The specification of a rebuilding time is required per MSA 304(e)(4) for a rebuilding plan for an overfished fishery. The stock projection information assumes that the entirety of an ACL will be harvested in a given year. Because B_{MSY} for the Guam bottomfish multi-species stock complex is 248,800 lb (Table 4), at a 40 percent risk of overfishing, an ACL of 31,000 lb will likely allow the Guam bottomfish stock to rebuild to its B_{MSY} in six years (i.e., by 2025 if initiated in 2020; Table 8). Thus, T_{target} for this proposed rebuilding plan is six years. The T_{min} for this rebuilding plan would be two years (see Section 2.4.1), and T_{max} is 10 years because T_{min} is less than 10 years pursuant to implementing regulations at 50 CFR 600.310(j)(3)(b)(1). While the shortest possible time to rebuild the stock to B_{MSY} would be to have zero fishing mortality (i.e., annual catch of zero), this would not take into account the needs of the Guam fishing community as required in the MSA Section 304(e)(4)(A)(i). An ACL of 31,000 lb would both help restrict overfishing but rebuild the fishery in a relatively longer time frame than Alternative 2; additionally, the availability of bottomfish resources to Guam fishing communities would be less constrained than under Alternative 2. The harvest rate associated with an annual catch level of 31,000 lb is 0.14 (see Table 15 in Langseth et al., 2019), so this will be the $F_{rebuild}$ for the proposed rebuilding plan; the harvest rate may be reduced to 0.12 for future years not presented in the projection results in Langseth et al. (2019). The parameters required by MSA 304(e) and implementing regulations at 50 CFR 600.310(j)(3) for a rebuilding plan for an overfished fishery are presented in Table 11.

Table 11. Rebuilding plan parameters under Alternative 4 as required by National Standard 1 for an overfished fishery.

Parameter	Value
T_{\min}	2 years
T_{target}	6 years
T_{\max}	10 years
F_{rebuild}	0.14

2.6.1 Expected Fishery Outcome (Alt. 4)

Under Alternative 4, the Guam bottomfish fishery would likely continue fishing as observed in recent years with a less of a reduction of annual catch of Guam BMUS than Alternatives 2 or 3 due to the implementation of a relatively higher ACL. Fishery performance for Guam bottomfish has remained variable regardless of the implementation of ACLs (Table 6), and in-season AMs were not present in previous years to constrain the fishery. Thus, it is expected that catch under an ACL of 31,000 lb would not alter fishery operations except in years where catch is relatively high, for which a Federal closure would be implemented in accordance with the in-season AM. In years where catch does not approach the ACL, harvest levels under Alternative 3 would be expected to be similar to Alternative 2. The relatively higher ACL of 31,000 lb is less likely to be exceeded considering recent average levels of annual catch for Guam BMUS, meaning that a closure of Federal waters to bottomfish fishing is less probable. In the unlikely event of a Federal closure, there are no regulations in place to close territorial waters alongside Federal waters in this proposed action; thus, it is expected that fishing could continue in territorial waters and may offset potential conservation benefits of the AM. Alternative 4 supports a Federal action that will aid in rebuilding the Guam fishery, but the time frame for rebuilding would be twice as long as provided under Alternative 2. However, in years where interannual variability results in relatively high levels of catch, Alternative 4 may allow for more bottomfish resources to be available to Guam fishing communities. All other applicable fishing regulations would remain.

Given recent average annual catch levels (Table 5), it is less likely that Guam bottomfish fishery will exceed the proposed ACL under Alternative 4 than under Alternatives 2 and 3. Catch in two of the past 10 years (20 percent) would have exceeded an ACL of 31,000, and the average catch from the past three years of 26,906 lb comprises just 87 percent of this limit. Thus, it is not expected that the in-season AM would be employed to close Federal waters around Guam in the years that this proposed ACL would be implemented; however, due to the high variability in catch of Guam BMUS, it remains possible that the ACL could be exceeded in a year with relatively higher catches. Regardless, this level of catch would help to prevent overfishing and allow the Guam bottomfish fishery to be rebuilt within six years. Since recent average levels of catch do not exceed the ACL, the relatively high level of catch from the most recent year of data (2019) can be used to determine the impact of the closure on fishery, similar to what was done for Alternatives 2, with a simple calculation. Data on the seasonality of catch is not available for the Guam bottomfish fishery, but assuming that catch is consistent throughout the year allows for a rough estimate of monthly bottomfish catch. If 2019 levels of catch at 37,701 lb occurred under this ACL and catch is consistent throughout the year (3,142 lb/month), the ACL will be exceeded by October after 31,420 lb of catch. There would be another 6,281 lb expected to be caught

through the end of the fishing year. If catches are proportional to bottomfish habitat in Federal and territorial waters (see Figure 1), 942 lb that might have ordinarily been caught in Federal waters would not be caught in the fishery due to the in-season AM. Therefore, the total catch for this scenario would be 36,759 lb, but this minor reduction in catch may not be fully realized if fishing is displaced to territorial waters. Therefore, this alternative may very slightly reduce fishing in years with high levels of catch depending on variability in the fishery. Regardless, under this ACL during years consistent with recent average catch, adverse impacts to the Guam bottomfish stock would be diminished and rebuilding would likely occur within six years.

Similar to Alternatives 2 and 3, fishing cannot necessarily be constrained in territorial waters, but this alternative will restrict less of the variability in interannual catches than either of the previous action alternatives such that there would likely be fewer short-term impacts to Guam's fishing communities. However, if the more relaxed ACL fails in preventing overfishing or rebuilding the fishery in a reasonable time frame, there may be additional long-term impacts to the fishery. Alternative 4 would be in compliance with the MSA, implementing Federal regulations, and the provisions of the Council's FEP that require ACLs and AMs to be implemented annually.

2.6.2 Estimated Conservation and Management Benefit to MUS (Alt. 4)

Under this alternative, there would be minor conservation and management benefits relative to Alternatives 1, 2, and 3 by preventing overfishing and rebuilding the Guam bottomfish fishery in six years while still allowing bottomfish fishing operations to continue in a comparatively normal manner. Alternative 4 would provide conservation benefits by limiting catch in years where high levels of catch would occur and slightly restricting catch in years where bottomfish catches would exceed 31,000 lb; however, only two of the past 10 years have had catches that surpassed this level. If catch in a given year reached the level observed in 2019, a Federal closure in accordance with the proposed AM would reduce catch by 942 lb due to catch not harvested in Federal waters. However, any displacement of fishing effort from Federal waters to territorial waters could offset the anticipated reduction in catch, as the fishery is expected to continue operations in territorial waters in the event of a Federal closure. In years where catch is relatively lower and does not reach the ACL, catch is expected to be the same as Alternative 1 and 2; these harvest levels are expected to prevent overfishing and promote rebuilding of the fishery, albeit in a relatively longer time frame than the previous action alternatives. Given MSA obligations to rebuild the Guam bottomfish fishery as quickly as possible, Alternative 4 does not satisfy these requirements as well as Alternatives 2 or 3.

2.6.3 Degree to which this Alternative Mitigates Cultural, Economic, and Social Effects of the Management Measure (Alt. 4)

Compared to the previously described action alternatives, Alternative 4 would do more to mitigate cultural, economic, and social effects to the Guam fishing community in the short-term while rebuilding the bottomfish fishery by allowing slightly increased access to bottomfish resources through the implementation of a less restrictive ACL. Fishers who primarily harvest BMUS in the Federal waters around Guam are less likely to be impacted by a potential Federal closure if the ACL is exceeded, and fishers will likely feel generally less constricted by the implementation of a relatively higher catch limit. Using recent average fishery data, a reduction of 942 lb with 19 percent expected to be sold would lead to an expected loss of \$863 in revenue for

the fishery, or roughly \$3 per fisher (using 300 fishers estimated in the LOF 2020). However, it is likely that fishing for Guam BMUS would continue to occur in territorial waters in the event of a closure of Federal waters, which may offset some of the short term cultural, economic, and social impacts of this action. In the long-term, implementing an ACL of 31,000 lb would lengthen the time it will take to rebuild the Guam bottomfish fishery from its overfished state, which may have implications for the health of the stock going into the future. This may have indirect consequences to Guam fishing communities if the health of the fishery decreases and impacts catches of bottomfish. Thus, there are minor short-term economic impacts expected under Alternative 4 if the fishery operates at relatively high levels, but there would be negligible impacts to the fishing communities of Guam if the fishery continues harvesting bottomfish near the recent average. These impacts may increase in the long-term if the status of the stock is not improved in a reasonable time period due to the higher catch limit. Because fishing is not expected to be restricted by the in-season AM in most, if not all years, for which the proposed ACL is implemented, there will likely be fewer tangible impacts to socioeconomics with this alternative than under Alternatives 2 or 3.

2.7 Alternative 5: Establish a Temporary on Bottomfish Fishing in Federal Waters around Guam from 2021 to 2022

Under Alternative 5, the Council would recommend a fishing prohibition for and possession of BMUS in Federal waters around Guam for the next three years. This action would be equivalent to implementing a catch limit of 0 lb in Federal waters around Guam and is the maximum action that the Council could recommend to address the overfished state of Guam bottomfish. There would be no AM associated with this alternative because catch would not need to be monitored towards an ACL. It is expected that there would be displacement of bottomfish fishing in Federal waters around Guam to territorial waters since it is not anticipated that a complementary closure of territorial waters for the fishery will be implemented. Despite fishing for BMUS being probable to continue in territorial waters, Alternative 5 would likely result in less annual catch for the Guam bottomfish fishery than Alternatives 1 through 4. All other applicable fishing regulations would remain and the fishery would continue to be monitored.

Using biomass projections for various levels of catch from Langseth et al. (2019), the time to rebuild the fishery to B_{MSY} in the absence of fishing mortality would be two years (see Section 2.4), thus both the T_{min} and T_{target} for this alternative would be two years in accordance with MSA Section 304(e)(4) and implementing regulations at 50 CFR 600.310(j)(3). Because Alternative 5 is intended to result in an annual catch of 0 lb, the $F_{rebuild}$ for the fishery would be 0 in the absence of fishing. The parameters required by MSA 304(e) and implementing regulations at 50 CFR 600.310(j)(3) for a rebuilding plan for an overfished fishery are presented in Table 12.

Table 12. Rebuilding plan parameters under Alternative 5 as required by National Standard 1 for an overfished fishery.

Parameter	Value
T_{min}	2 years
T_{target}	2 years
T_{max}	10 years
$F_{rebuild}$	0

2.7.1 Expected Fishery Outcome (Alt. 5)

The Council expects that Alternative 5 would cause catches of Guam BMUS to continue at slightly lower levels than recent years and less than would be observed for any of the other action alternatives. Though the closure of Federal waters around Guam to bottomfish fishing would effectively be the same as setting an ACL of 0 lb in Federal waters, it is expected that effort will be displaced to territorial waters. It is not expected that the Guam government will implement a complementary closure of territorial waters alongside this Federal action, and thus, the bottomfish fishery would likely continue operating normally in territorial waters. As described for the previous action alternatives, the Council and NMFS do not possess the spatial data to determine how much bottomfish fishing is occurring in Federal versus territorial waters. If these levels of catch are assumed to be equal to the proportion of bottomfish EFH in Federal and territorial waters around Guam, then a rough estimate can be made for the reduction in catch resulting from a Federal closure. Assuming the fishery continues to harvest bottomfish as it has in recent years at 26,906 lb (Table 5), catch would be reduced by 26.4 percent (7,103 lb) using the best available information on bottomfish EFH around Guam (see Figure 1). Expected catch would then be 19,803 lb in a given year with a closure of Federal waters. Because fishing in territorial waters would result in continued fishing mortality despite the Federal closure, the rebuilding time for this alternative would be lengthened to three years under this alternative. Thus, Alternative 5 would result in a moderate reduction in fishing but catch will not be completely diminished due to fishing that will occur in territorial waters. Due to the anticipated 19,803 lb of catch annually, this measure would have to be in place for three years to rebuild the stock to B_{MSY} (Table 8). Under this alternative, it is expected that overfishing will be prevented for Guam BMUS, and the stock complex would be expected to be rebuilt from its overfishing designation in three years, a shorter time than the status quo alternative.

This alternative will not restrict fishing in territorial waters, but it would reduce anticipated catches from Federal waters to a greater extent than expected for Alternatives 1 through 4. Alternative 5 is the most extreme action that the Council could recommend for rebuilding the Guam bottomfish fishery consistent with the MSA, implementing Federal regulations, and provisions of the Council's FEP. Additionally, this alternative would likely rebuild the fishery in the shortest amount time, but it does not necessarily consider the needs of the Guam fishing community that is reliant on locally harvested bottomfish. While Alternative 5 would result in the rebuilding of the rebuilding of the Guam bottomfish fishery from its overfished state, the other action alternatives allow for increased availability of bottomfish resources.

2.7.2 Estimated Conservation and Management Benefit to MUS (Alt. 5)

Under Alternative 5, overfishing of Guam BMUS would continue to be restricted and the bottomfish fishery would be rebuilt from its overfished state in the shortest possible amount of time by prohibiting all bottomfish catch in Federal waters. It is anticipated that a complete closure of Federal waters to the fishery would decrease estimated annual catch by 7,103 lb. This reduction of catch would result in increased conservation and management benefits relative to the other action alternatives by eliminating harvest in Federal waters. However, similar to the other action alternatives, any displacement of fishing effort from Federal waters to territorial waters could offset the anticipated reduction in catch. If Federal waters are closed to the fishery under Alternative 5, the Council anticipates that fishing would continue in territorial waters without a complementary closure of territorial waters; it is not expected that the government of

Guam will implement such a closure. Thus, Alternative 5 would cause the rebuilding time frame to extend to three years rather than the two years anticipated in the absence of fishing mortality. This alternative would serve to reduce adverse impacts to the bottomfish stock to the greatest practicable extent by preventing overfishing and supporting the rebuilding of the bottomfish fishery in the fastest possible amount of time.

2.7.3 Degree to which this Alternative Mitigates Cultural, Economic, and Social Effects of the Management Measure (Alt. 5)

Under Alternative 5, the Council expects that the Guam bottomfish fishery would harvest annual catches moderately less than each of the other action alternatives due to the closure of the fishery in Federal waters. However, there may be some slight economic impacts to bottomfish fishers under this alternative. Annual catch is expected to be 19,803 lb (see Section 2.7.1) if the fishery operates similar to its recent average levels without harvesting BMUS in Federal waters. If 19 percent of this level of catch is expected to be commercially sold at \$4.82 per pound (see Table 7), the expected revenue would be \$18,136. The estimated number of 300 fishery participants from the 2020 LOF would then earn roughly \$60 each if divided equally; this is a decrease of approximately \$22, or 27 percent, per fisher from the no action alternative. If fishermen compensated for a closure of Federal waters by catching BMUS in territorial waters that remained open to fishing, revenue would be closer to that expected under the no action alternative. NMFS does not have information to estimate the magnitude of compensation that may occur. If a complementary closure was implemented in territorial waters, the socioeconomic impacts would be much larger, as the catch and revenue of the fishery would be anticipated to drop to zero. Because this alternative is expected to result in less catch of bottomfish than Alternatives 1 through 4 despite fishing for BMUS being likely to continue in territorial waters, Alternative 5 would still result in less bottomfish available for subsistence and cultural purposes than the other alternatives.

Alternative 5 does not provide for authorized catch in Federal waters, but territorial waters would remain open to fishing for bottomfish. This would allow for some availability of bottomfish resources to the Guam fishing community, however, bottomfish are expected to be available in moderately lower quantities than all other alternatives considered. Alternative 5 would pose greater constraints to fishermen than with minimal conservation gain, given that the projected time frame to rebuild the fishery under a complete closure would be less than under an ACL of 27,000 lb (i.e., the status quo alternative). The Federal fishery closure would also decrease the amount of bottomfish available to the community for subsistence and cultural purposes as well as revenues for fishermen. While fishers' revenues would be decreased relative to all other alternatives, the decreases are moderate and are not expected to result in substantial economic impacts to the Guam fishing community. In summary, this alternative does less than the no action and other action alternatives to mitigate adverse cultural, economic, and social effects by hindering the amount of fish available to markets in Guam. Thus, Alternative 5 does not meet the need to mitigate socio-economic effects as well as the other alternatives considered.

2.8 Alternative 6: Implement Federal Permitting and Reporting Requirements for the Fishery alongside Bag Limits

Under Alternative 4, an ACL of 27,000 lb would be implemented for the Guam bottomfish fishery consistent with the status quo alternative and the Council's previous recommendation

(see Alternative 2), as this level of catch would allow the fishery to rebuild within four years. An in-season AM would be implemented similar to Alternative 2 where Federal waters would be closed to bottomfish fishing if this ACL is exceeded. Because approximately 26.4 percent of bottomfish EFH around Guam is situated in Federal waters, there would be 7,128 lb of bottomfish available to allocate among the fishers for annual bag limits in Federal waters. The LOF 2020 estimates that there are 300 active fishers in the Guam bottomfish fishery, meaning that, when distributed equally, the annual bag limit for Guam bottomfish harvested from Federal waters would be 23.7 lb per fisher. When an individual fisher harvests bottomfish in Federal waters that would reach or exceed the amount of their bag limit in a given year, they will no longer be allowed to fish in Federal waters for the remainder of the year. The catch contributing to the bag limit of each fisher would also be counted against the ACL. Otherwise, the rebuilding plan parameters for Alternative 6 would be similar to those presented under Alternative 2.

To effectively monitor the individual annual bag limits for bottomfish, permitting and reporting would be implemented for fishers harvesting bottomfish in Federal waters. Fishers who would like to harvest bottomfish in Federal waters will need to apply for and receive a Federal permit from NMFS. This permit will require the fishers to report the species and amount of all bottomfish catch harvested in Federal waters, which will then be counted against the implemented ACL. If the amount of catch reported by a fisher exceeds their individual annual bag limit, then they will no longer be permitted to fish in Federal waters for the rest of that fishing year.

2.8.1 Expected Fishery Outcome (Alt. 6)

Under Alternative 6, the Council expects that catch would be relatively similar to catch anticipated under Alternative 2 despite the implementation of additional fishing regulations. Given the proportion of bottomfish EFH in federal waters (i.e., 26.4 percent, see Figure 1) and the average annual catch in recent years of 26,906 lb (Table 5), Alternative 6 would restrict bottomfish catch to 7,128 lb in Federal waters around Guam using bag limits. Considering the estimated amount of bottomfish catch harvested from Federal waters in recent years (i.e. 7,103 lb, see Alternative 5), the implementation of a bag limit would result in total annual catch of 26,930 lb of bottomfish catch if fishing in territorial waters occurred consistent with recent annual average catch (i.e., 19,803 lb, see Alternative 5). Because recent average annual catch is slightly lower than the proposed ACL for this alternative, implementing an annual bag limit for federal waters would slightly increase catch assuming the total annual bag limit is harvested by all fishers and fishing in territorial waters continued consistent with recent averages. However, it is not clear if fishers would opt to harvest the entirety of the available bag limit in lieu of normal fishing operations. Regardless, this alternative would not result in a reduction of fishing relative to the status quo alternative, but overfishing will be prevented and the time necessary to rebuild the Guam bottomfish stock would be consistent with Alternative 2 at four years.

Similar to Alternative 2, it is not clear if the Guam bottomfish fishery will exceed an ACL of 27,000 lb considering recent average annual catch levels. Using Guam BMUS catch over the past 10 years as reference, there is an estimated 40 percent chance that the ACL will be exceeded in subsequent years. Since the implementation of annual bag limits based on the proposed ACL would not serve to reduce catch in Federal waters, Alternative 6 will likely not reduce catch as much as under Alternative 2. However, if it is assumed that the bag limits will reduce the catch

of fishers who harvest disproportionately more than other fishers in Federal waters, some reduction of catch may be provided by this alternative; NMFS and the Council do not have the data necessary to determine if bag limits would be able to reduce catch in Federal waters in this way. Alternative 6 would be in compliance with the MSA, implementing Federal regulations, and the provisions of the Council's FEP that requires ACLs and AMs to be implemented annually. However, this alternative does not necessarily consider the needs of the Guam fishing community, which may be reliant on locally harvested bottomfish from a few fishers that harvest disproportional amounts of catch in Federal waters relative to the proposed bag limits and may not be amenable to increased Federal regulations in the form of permitting and reporting. Implementing Alternative 6 is estimated to cause the stock to rebuild in a similar time frame to Alternative 2, but Alternative 2 would impose less of a regulatory burden on the fishing community while allowing a similar level of catch.

2.8.2 Estimated Conservation and Management Benefit to MUS (Alt. 6)

Alternative 6 would reduce overfishing and rebuild the Guam bottomfish fishery in the same time frame as Alternative 2 by implementing the same ACL and AM as Alternative 2 with the added provisions of Federal permitting and reporting along with bag limits for harvest in Federal waters. Under Alternative 6, slight conservation and management benefits to Guam BMUS are expected relative to the no action alternative due to the reduction of harvest in Federal waters in years where interannual variability causes relatively high levels of catch. For example, if 2019 levels of catch were harvested by the fishery, this alternative would restrict catch by 6,937 lb relative to the no action alternative due to the in-season AM. However, any anticipated reduction in catch could be offset by the displacement of fishing effort from Federal waters to territorial waters. If Federal waters are closed to the fishery under Alternative 6 after reaching the ACL, the fishery is expected to continue operations in territorial waters without the implementation of a complementary fishery closure by the territory. The Guam bottomfish stock would have overfishing prevented by this alternative, and rebuilding will be promoted in a similar time frame to Alternative 2. This alternative would provide greater conservation benefits than the no action alternative by restricting years of relatively high catch if and when they occur. The implementation of bag limits based on the ACL would serve to slightly increase bottomfish resources available to the fishing community but may end up reducing over catch if harvest is normally disproportionate among individual fishermen.

2.8.3 Degree to which this Alternative Mitigates Cultural, Economic, and Social Effects of the Management Measure (Alt. 6)

Under Alternative 6, it is expected that the performance of the Guam bottomfish fishery would be relatively similar to Alternative 2. This alternative would implement Federal permitting, reporting, and bag limits in addition to the ACL and AM specified in Alternative 2. Catch under Alternative 6 is expected to be 26,930 lb (see Section 2.8.1) due to a slight increase of catch from Federal waters; however, if the annual bag limits are not caught in their entirety or if harvest in Federal waters is typically disproportional among individual fishers, this increase in catch may not be realized. Under the expected catch for Alternative 6, if 19 percent of it is sold commercially at \$4.82 per pound (see Table 7), then the expected revenue would be \$24,641. If divided equally among the 300 fishers estimated from the 2020 LOF, each fisher would receive \$82; this is functionally equivalent to the no action alternative. In years where the catch was relatively higher than the recent annual averages, the ACL and bag limits would restrict catches

in Federal waters such that there may be a slight reduction in revenues than would be expected under the no action alternative. Additionally, in this scenario, fishers may compensate for the Federal closure by fishing in territorial waters, and NMFS does not have information to estimate the magnitude of compensation that may occur. Thus, this alternative is expected to result in a similar amount of bottomfish catch as Alternatives 1, 2, and 4, but less than Alternatives 3 and 5; the economic impacts to the fishery would be similar to Alternatives 1, 2, and 4.

Alternative 6 imposes more regulations for bottomfish harvest in Federal waters around Guam, but territorial waters would remain open to fishing for BMUS without these policies. This alternative would allow for the availability of bottomfish resources to the Guam fishing community at similar levels to the no action and status quo alternatives. However, the increased restrictions that come with Alternative 6, included mandatory permitting and reporting, could act as a deterrent for some fishers to participate in fishing in Federal waters. The increased regulatory burden may also negatively impact the attitude of local fishers toward Federal management of the fishery due to a larger necessary effort to navigate the new administrative procedures associated with this alternative. The time frame to rebuild the fishery would be identical to Alternative 2, and this alternative is not expected to result in any substantial social or economic effects to the Guam fishing community due to the due to the functionally equivalent nature of the anticipated catches. In summary, Alternative 6 similarly mitigates cultural, economic, and social impacts of this action similar to the status quo alternative considering the broad assumptions made regarding how the bag limits will influence catch behaviors. Thus, Alternative 4 does meet the need to mitigate socio-economic effects similarly to the no action or status quo alternatives, though the implementation of additional Federal regulations could result in unanticipated social consequences.

2.9 Comparison of Features of the Alternatives

Table 13 presents a summary of various features of the alternatives to allow for comparison among the alternatives.

Table 13. Comparison of the proposed fishery management features and expected outcomes for this action.

Topic	Alt. 1 - No Action/Status Quo	Alt. 2 – ACL of 27,000 lb w/ In-Season AM	Alt. 3 – ACL of 16,299 lb w/ In-Season AM	Alt. 4 – ACL of 31,000 lb w/ In-Season AM	Alt. 5 – Closure of Fishery in Federal Waters	Alt. 6 – Federal Permitting, Reporting, and Bag Limits
General characteristics of alternative	No ACL or AM(s).	ACL set to reduce overfishing and rebuild the fishery in four years; in-season fishery closure as the AM. Alt. 2 reduces adverse effects on the fishing community relative to Alt. 3 but would have impacts to the fishing community relative to Alt. 1.	ACL set to reduce overfishing and rebuild the fishery in three years; in-season fishery closure as the AM. Alt. 3 increases adverse effects on the fishing community relative to Alt. 1, 2, and 4.	ACL set to reduce overfishing and rebuild the fishery in six years; in-season fishery closure as the AM. Alt. 4 reduces adverse effects on the fishing community relative to Alt. 2 and 3.	Moratorium on fishing for or possessing BMUS in Federal waters to reduce overfishing and rebuild the fishery. Alt. 4 has no reduction of adverse effects on fishing community during the period of effectiveness.	Requirement for fishers harvesting bottomfish in Federal waters to receive a permit and report their catch; implementation of bag limits for permitted fishers; same ACL and AM as Alt. 2. Alt. 6 has similar adverse effects on the fishing community as Alt. 1 and 2.
Duration of management action	N/A.	4 years.	3 years.	6 years.	2 years.	4 years.
Authorized annual catch (lb) of BMUS in Guam	No limit.	27,000 lb.	16,299 lb.	31,000 lb.	0 lb.	27,000 lb.
Accountability	No AM. The	If available data	Same as Alt. 2.	Same as Alt. 2.	No AM	Same as Alt. 2

Measure: Closure of Federal waters to bottomfish fishing when ACL is reached	fishery would not be subject to a potential fishery closure.	indicates the fishery will exceed the ACL, NMFS will close the fishery in Federal waters.			implemented, as the fishery would be closed in Federal waters.	with the addition of individual bag limits. If a fisher exceeds the annual bag limit, they will no longer be permitted to fish in Federal waters.
Complementary closure of territorial waters by Guam Government	N/A.	Not anticipated. Not a part of the proposed action.	Same as Alt. 2.	Same as Alt. 2.	Same as Alt. 2.	Same as Alt. 2.
Possibility of fishery closure in Federal waters	None.	Approx. 40% chance each year from 2020-2023.	Possible after August from 2020-2022.	Approx. 20% chance each year from 2020-2025.	Full year from 2021-2022.	Same as Alt. 2.
Expected annual catch of Guam BMUS (see text for detail)	26,906 lb.	26,906 lb.	24,539 lb.	26,906 lb.	19,803 lb.	26,930 lb.
Reduces overfishing relative to previous years	No, catch expected to be similar to recent annual averages.	Potentially. ACL would allow similar levels of catch to recent years (but more than Alt. 3 and 5).	Yes. slight reduction of catch relative to recent annual averages (less catch than all alternatives but Alt. 5).	Potentially. ACL would allow similar levels of catch to recent years (but more than Alt. 2, 3, and 5).	Yes. moderate reduction of catch relative to recent annual averages (less than other alternatives).	Same as Alt. 2.
Authorized catch would allow	No.	Yes, restriction of catch would	Yes, restriction of catch would	Yes, restriction of catch would	Yes, strict reduction in	Same as Alt. 2.

<p>stock biomass to increase during the specification period</p>		<p>allow biomass to increase at a moderate rate; however, biomass increases may not be realized due to a shift of fishing effort from Federal to territorial waters.</p>	<p>allow biomass to increase at a high rate; however, biomass increases may not be realized due to a shift of fishing effort from Federal to territorial waters.</p>	<p>allow biomass to increase at a slight rate; however, biomass increases may not be realized due to a shift of fishing effort from Federal to territorial waters.</p>	<p>catch would allow biomass to increase at the maximum rate; however, biomass increases may not be realized due to a shift of fishing effort from Federal to territorial waters.</p>	
<p>Mitigates effects of immediately ending overfishing on communities during time frame of rebuilding plan</p>	<p>Yes. Fishing in the fishery would be the same as it has been in previous years. This alternative lacks long-term benefits of shortening rebuilding time frame the action alternatives would provide.</p>	<p>Yes. More than Alt. 3 and 5 but less than Alt. 1 and 4, as less fishing would be expected than under Alt. 1 and 4 but less than would be expected under Alt. 3 and 5 during rebuilding from 2020-2023. The implementation of an ACL, despite being similar to recent catch, would help to mitigate impacts on</p>	<p>Yes. More than Alt. 5 but less than the other alternatives. Alt. 3 represents the most strict amount of catch allowed among these alternatives. The conservative ACL would do less than most of the other action alternatives to ensure bottomfish resources are available to the Guam fishing community.</p>	<p>Yes. More than any of the other action alternatives because of the relatively higher ACL to be implemented. The more relaxed ACL would to more than each of the other action alternatives to ensure that bottomfish resources are available to the Guam fishing community. Long-term, there</p>	<p>In the short term, no. Not relative to other action alternatives, since a closure of Federal waters would be the most extreme action that the Council could take in implementing a rebuilding plan for the fishery. Long-term, there would likely be additional benefit to rebuilding the stock than under other action</p>	<p>Yes. More than Alt. 3 and 5 but less than Alt. 1 and 4 due to expected level of annual catch being functionally equivalent to Alt. 2. There may be additional impacts to the fishing community associated with the implementation of the ACL and bag limits alongside</p>

		<p>Guam fishing communities that depend on fishing in Federal waters for locally harvested bottomfish. Long-term, there would likely be additional benefit to rebuilding the stock than under Alternative 1, which could improve the future outlook of the fishery.</p>	<p>Long-term, there would be additional benefit to rebuilding the stock more quickly than any of the other action alternatives where an ACL is implemented, which may improve the future outlook of the fishery.</p>	<p>may be reduced benefit in taking additional time to rebuild the overfished bottomfish stock (longer than any other action alternative).</p>	<p>alternatives, which may improve the future outlook of the fishery.</p>	<p>Federal permitting and reporting. This may seem excessive to local communities in Guam, who may choose opt to fish in territorial waters instead of submitting to additional regulations. Long-term, same as Alt. 2.</p>
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