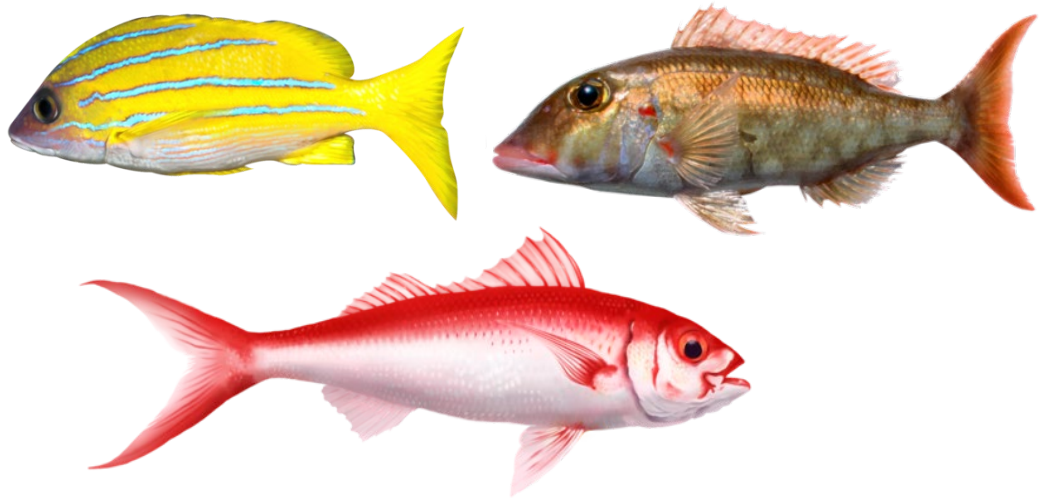
Amendment 5
Fishery Ecosystem Plan for the American Samoa Archipelago

Rebuilding Plan for the American Samoa Bottomfish Fishery
Including an Environmental Assessment and Regulatory Impact Review
RIN 0648-BK79

April 15, 2022



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Abstract

The National Marine Fisheries Service (NMFS) proposes to implement a rebuilding plan for the bottomfish multi-species stock complex in American Samoa with an annual catch limit (ACL) and accountability measures (AM) for the bottomfish fishery. The Western Pacific Regional Fishery Management Council (Council) developed the rebuilding plan in coordination with NMFS, the American Samoa Department of Marine and Wildlife Resources (DMWR), fishermen, and other interested and affected parties. The Council initiated development of the rebuilding plan due to new information about the American Samoa bottomfish fishery from the 2019 benchmark stock assessment (Langseth et al. 2019) that found the bottomfish stock complex is overfished and experiencing overfishing.

When NMFS determines that a fishery is overfished or experiencing overfishing, Section 304(e) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) and implementing regulations at 50 CFR 600.310(j) require the Council to develop a long-term plan to end overfishing and rebuild the stock. This rebuilding plan must be implemented within two years of the notification that a fishery is in an overfished condition or experiencing overfishing. Also, the rebuilding plan must be developed by the Council and should be submitted to NMFS within 15 months of the notification of overfishing or an overfished designation to allow sufficient time for NMFS to implement the plan. The rebuilding plan must specify a time for rebuilding that is as short as possible, considering the status of the biology of the affected stock(s), the needs of the fishing communities, and the interaction of the stock with the marine ecosystem, and generally may not exceed 10 years.

On February 10, 2020, NMFS notified the Council of its determination that the American Samoa bottomfish stock complex, which is managed under the American Samoa Archipelago Fishery Ecosystem Plan (FEP), had a change in status based on the results of the most recent benchmark stock assessment for the fishery (Langseth et al. 2019). The stock assessment was produced by NMFS Pacific Islands Fisheries Science Center (PIFSC) using data through 2017 and showed that the American Samoa multi-species bottomfish complex, which includes 11 species of bottomfish management unit species (BMUS), is both overfished and experiencing overfishing. The Council began the process of developing a rebuilding plan immediately upon notification of the change in the stock status. On November 1, 2019, the Council requested that NMFS develop an interim catch limit (ICL) for the American Samoa bottomfish fishery while the Council worked to develop the rebuilding plan. NMFS managed the fishery through an annual catch limit (ACL) of around 100,000 lb since 2012, while catch has fluctuated between 7,688 and 29,511 lb. However, no catch limit was set in 2018 or 2019. NMFS implemented an ICL of 13,000 lb for 2020 and 2021 to reduce overfishing in the fishery while minimizing socio-economic impacts to American Samoa fishing communities (85 FR 73003, November 16, 2020 and 86 FR 32361, June 21, 2021).

The bottomfish stock complex around American Samoa occurs in both territorial waters (generally from the shoreline to three nautical miles offshore) and Federal waters (the Exclusive Economic Zone, generally from three to 200 nautical miles offshore). The Council and NMFS only have the authority to implement fishery management regulations in Federal waters, and the American Samoa Government has discretion to implement management complementary to Federal action in its territorial waters. However, per 16 U.S.C. 1851(a)(3), the Council and

NMFS are required to manage stocks throughout their range. The benchmark stock assessment (Langseth et al. 2019) considered catch from both territorial and Federal waters in its finding that the American Samoa bottomfish stock complex is both overfished and experiencing overfishing. Analysis of the spatial distribution of bottomfish essential fish habitat indicates that approximately 85 percent occurs in territorial waters under the management authority of American Samoa, while the remaining 15 percent occurs in Federal waters under NMFS jurisdiction. Assuming that the distribution of bottomfish habitat is consistent with the amount of bottomfish catch around the territory, catch in Federal waters likely accounts for only 15 percent of total catch in American Samoa.

Since the Council and NMFS only have the authority to manage fishing in Federal waters, restricting harvest in a rebuilding plan so that catch does not exceed any ACL would require complementary management by the territory. If Federal waters are closed and the territory chooses not to implement complementary management with the Federal action, harvest would still be allowed in territorial waters. Thus, whether or not rebuilding can be achieved in the proposed timeline depends on the American Samoa government implementing management in its waters to complement this Federal action due to the displacement of fishing effort from Federal waters to territorial waters. NMFS does not currently have information to determine the level of displacement that may occur. In the event of a Federal closure, without complementary management by the territory, NMFS expects that there would still be 10,784 lb harvested in a fishing year due to continued fishing in territorial waters. Under this level of annual harvest, the stock complex would not be likely to rebuild in 10 years. Consistent with this information, the Council considered three action alternatives:

- implementation of a Rebuilding Plan with a 1,500 lb ACL, an in-season AM, and a higher performance standard,
- implementation of a Rebuilding Plan with a 5,000 lb ACL, an in-season AM, and a higher performance standard, or
- implementation of a Rebuilding Plan with a temporary moratorium on bottomfish fishing in Federal waters around American Samoa.

Biomass projections from PIFSC indicate that 5,000 lb of annual bottomfish catch would allow the American Samoa bottomfish stock complex to have a greater than 50 percent chance of rebuilding its biomass at maximum sustainable yield (B_{MSY}) in 10 years, which is the maximum amount of time allowed for rebuilding to occur for an overfished stock according to the Magnuson-Stevens Act. The projections also show that 1,500 lb of annual bottomfish catch, which is the highest amount of catch that would allow the American Samoa bottomfish stock complex to rebuild in the same time frame as in the absence of fishing mortality (i.e., a moratorium), would result in greater than a 50 percent probability that the stock complex rebuilds to its B_{MSY} in eight years. If the territory does not implement complementary management with this Federal action to limit catch in its waters to the authorized catch levels, there is likely no action NMFS can take to ensure that rebuilding would occur within 10 years.

At its 188th meeting on October 19, 2021, the Council took final action to recommend a rebuilding plan with an ACL of 5,000 lb. NMFS would count bottomfish catches from both territorial waters and Federal waters around American Samoa towards the ACL, and the

rebuilding plan would be in effect until the American Samoa bottomfish stock complex is rebuilt to B_{MSY}. NMFS expects that an annual catch of 5,000 lb of bottomfish would allow the bottomfish stock complex to have a greater than 50 percent change to rebuild biomass to B_{MSY} in 10 years. As an in-season AM, NMFS would evaluate available catch information during the fishing year and close the fishery in Federal waters for the remainder of the year when the fishery is projected to attain the ACL, or immediately if the catch is determined to have already exceeded the ACL. Generally, management is reevaluated if an ACL is exceeded more than once in a four-year period as a performance standard. For the American Samoa bottomfish fishery, we would implement a higher performance standard: if the ACL is exceeded during any fishing year over the course of the rebuilding plan, NMFS would close the fishery in Federal waters until a coordinated management approach is developed that ensures catch in both Federal and territorial waters can be maintained at levels that allow the stock to rebuild. Under the Magnuson-Stevens Act, NMFS and the Council would review the rebuilding plan every two years and amend it as necessary using the best scientific information available.

This EA was prepared to evaluate the potential environmental effects of alternative management measures, and it includes a description of the information and methods used by NMFS and the Council to develop the proposed management measures. The analysis in the EA indicates that each proposed action alternative may result in significant impacts to the American Samoa fishing community if the American Samoa Government implements complementary management with this Federal action. However, the included analysis also indicates that the proposed alternatives would not be likely to result in large beneficial or adverse effects on target, non-target, or bycatch species, protected species, marine habitats, or fishing communities relative to the environmental baseline if complementary management is not implemented. Additionally, whether rebuilding can be achieved under the various alternatives depends on whether American Samoa implements management in its waters to complement Federal management. If it does, rebuilding under the action alternatives is expected to be achieved within 10 years as required by National Standard 1 of the Magnuson-Stevens Act. If the territory does not implement complementary management, there is likely no action NMFS can take to rebuild the stock within statutory requirements. The likelihood of short-term economic and social impacts to local fishing communities is also dependent on the territory's decision to implement complementary management.

On January 21, 2022, NMFS published a notice of availability (NOA) for Amendment 5 and requested public comments; the comment period ended March 22, 2022 and there were two comments from individuals. These comments generally supported the action, and voiced concerns about the involvement of the indigenous community, subsistence fishing, and enforcement. On February 4, 2022, NMFS published a proposed rule to implement Amendment 5 and the rebuilding plan and again requested public comments. That comment period ended March 21, 2022. NMFS received seven comments from individuals generally supporting the action, with comments recommending community involvement, mandatory catch reporting, economic relief for fishermen. NMFS also received comments from the Governor of American Samoa and the DMWR. These comments also supported the action while highlighting concerns about social, economic, and cultural impacts from reduced access to bottomfish. NMFS considered all comments in finalizing Amendment 5 and the accompanying environmental assessment. None of the comments resulted in a change to the alternatives or a substantive change to the environmental effects analysis. We respond to the comments in the final rule.

CONTENTS

Figures

Tables

ABBREVIATIONS

ABC – Acceptable Biological Catch
ACL – Annual Catch Limit
ACT – Annual Catch Target
AM – Accountability Measure
ASAC – American Samoa Administrative Code
B – Biomass
B_{MSY} – Biomass at Maximum Sustainable Yield
BMUS – Bottomfish Management Unit Species
BSIA – Best Scientific Information Available
CEQ – Council on Environmental Quality
CFR – Code of Federal Regulations
CNMI – Commonwealth of the Northern Mariana Islands
DMWR – American Samoa Department of Marine and Wildlife Resources
DPS – Distinct Population Segment
EA – Environmental Assessment
ECS – Ecosystem Component Species
EEZ – Exclusive Economic Zone
EFH – Essential Fish Habitat
ESA – Endangered Species Act
F – Fishing Mortality
F_{MSY} – Fishing Mortality at Maximum Sustainable Yield
$F_{rebuild}$ – the Fishing Mortality associated with achieving T_{target}
FEP – Fishery Ecosystem Plan
FMP – Fishery Management Plan
FONSI – Finding of No Significant Impact
FR – Federal Register
H – Harvest Rate
HAPC – Habitats of Particular Concern
lb – Pounds
LOF – List of Fisheries
M – Natural Mortality
MFMT – Maximum Fishing Mortality Threshold
MMPA – Marine Mammal Protection Act
MPA – Marine Protected Area
Magnuson-Stevens Act – Magnuson-Stevens Fishery Conservation and Management Act
MSST – Minimum Stock Size Threshold
MSY – Maximum Sustainable Yield
MUS – Management Unit Species
NA – Not Applicable
NEPA – National Environmental Policy Act
nm – Nautical Miles
NMFS – National Marine Fisheries Service
NOAA – National Oceanic and Atmospheric Administration
OFL – Overfishing Limit
OLE – Office of Law Enforcement

P* – Probability or Risk of Overfishing
PIFSC – NMFS Pacific Islands Fisheries Science Center
PIRO – NMFS Pacific Islands Regional Office
RIN – Regulatory Identification Number
RIR – Regulatory Impact Review
SAFE report – Stock Assessment and Fishery Evaluation report
SAP – PIFSC Stock Assessment Program
SDC – Status Determination Criteria
SEEM – Social, Economic, and Ecological Considerations, or Management Uncertainty
SSC – Scientific and Statistical Committee
T_{max} – the maximum Time for rebuilding a stock to its MSY biomass level
T_{min} – the amount of Time a stock is expected to take to rebuild to its MSY biomass level in the absence of fishing mortality
T_{target} – the specified Time period for rebuilding a stock
USCG – U.S. Coast Guard
USFWS – U.S. Fish and Wildlife Service
WPacFIN – Western Pacific Fisheries Information Network
WPFMC (or Council) – Western Pacific Fishery Management Council
WPSAR – Western Pacific Stock Assessment Review

1 INTRODUCTION

1.1 Background Information

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) established the Western Pacific Fishery Management Council (Council) in 1976 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. The Fishery Ecosystem Plan for the American Samoa Archipelago (American Samoa FEP) specifies the management measures for the bottomfish complex within Federal waters of American Samoa (WPFMC 2009). The bottomfish fishery primarily harvests bottomfish management unit species (BMUS), an assemblage or complex of 11 species that include emperors, snappers, groupers, and jacks (Table 1). Bottomfish are found in waters subject to either territorial or Federal jurisdiction. The Council and the National Marine Fisheries Service (NMFS) manage the bottomfish fishery in Federal waters (i.e., the U.S. Exclusive Economic Zone, or EEZ, 3-200 miles from shore) around American Samoa in accordance with the American Samoa FEP, the Magnuson-Stevens Act, and implementing regulations at Title 50 Code of Federal Regulations, Part 665 (50 CFR 665). The territory of American Samoa manages the bottomfish fishery in territorial waters (i.e., 0 to 3 nm from shore) and has discretion to implement management in its waters that complements management in Federal waters. The most recent stock assessment, which was based on catch from both territorial and Federal waters, indicated that the American Samoa bottomfish stock complex is overfished and experiencing overfishing in 2020 (Langseth et al. 2019). On February 10, 2020, NMFS notified the Council of the change in stock status, and that the Council must amend the FEP to rebuild the stock.

Table 1. List of BMUS in American Samoa.

Scientific Name	Common Name(s)	Family
Aphareus rutilans	Red snapper, silvermouth, lehi	Lutjanidae
Aprion virescens	Gray snapper, jobfish	Lutjanidae
Caranx lugubris	Black trevally, jack	Carangidae
Etelis carbunculus	Red snapper, ehu	Lutjanidae
Etelis coruscans	Red snapper, onaga	Lutjanidae
Lethrinus rubrioperculatus	Redgill emperor	Lethrinidae
Lutjanus kasmira	Blueline snapper	Lutjanidae
Pristipomoides filamentosus	Pink snapper, paka	Lutjanidae
Pristipomoides flavipinnis	Yelloweye snapper	Lutjanidae
Pristipomoides zonatus	Flower snapper, gindai	Lutjanidae
Variola louti	Lunartail grouper, lyretail grouper	Serranidae

In the mid-1980s, the American Samoa bottomfish fishery included a maximum of 50 vessels that landed over 100,000 lb of bottomfish annually and accounted for nearly half of total catch of the territory's commercial fisheries (Levine and Allen 2009; WPFMC 2021). By 1988, bottomfish fishing in American Samoa began to decline as skilled commercial fishermen shifted focus from bottomfish fishing to trolling and small-scale longlining for pelagic species like albacore (WPFMC 2021). Currently, the American Samoa bottomfish fishery consists of less than 20 fishermen and is primarily non-commercial, but it is still of importance to the local

economy as well as from socio-cultural and food security standpoints (WPFMC 2009; WPFMC 2021; 86 FR 3028, January 14, 2021). Fishing for bottomfish primarily occurs using aluminum alia catamarans less than 32 feet in length that are outfitted with outboard engines and wooden hand reels that fishermen use for both trolling and bottomfish fishing. Fishermen typically fish less than 20 miles from shore because few vessels carry ice (WPFMC 2009). In 2020, the most recent year for which catch data are available, the total estimated annual catch of American Samoa bottomfish was 9,592 lb while the estimated commercial catch from the American Samoa Department of Marine and Wildlife Resources (DMWR) commercial receipt book system was just 307 lb (Fig. 1). The difference between the total estimated catch and estimated commercial catch is assumed to be the non-commercial component of the fishery.

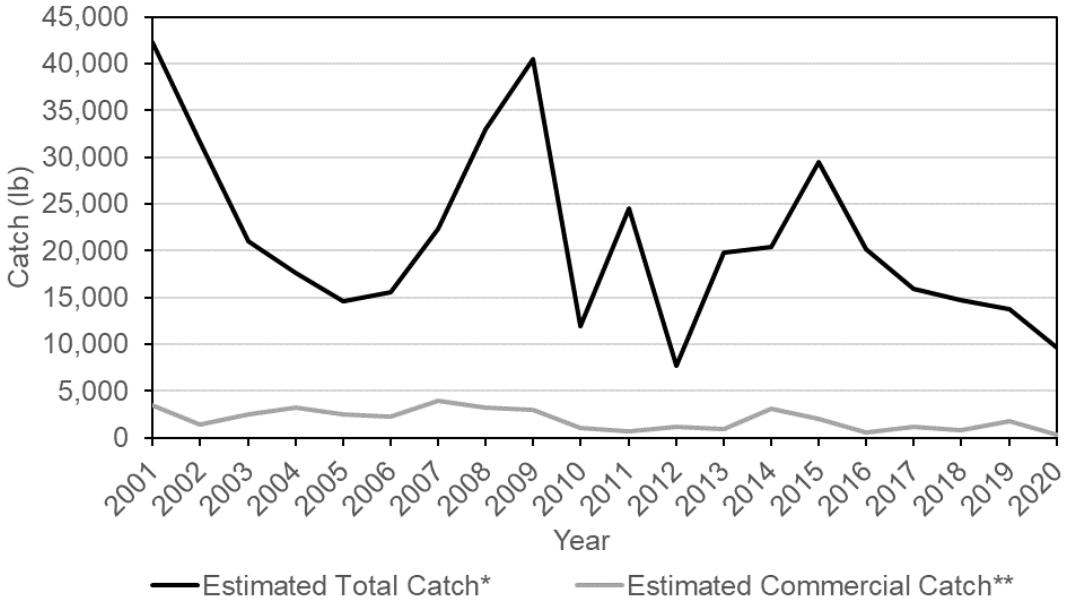

Figure 1. Total annual catch of BMUS estimated by the Pacific Islands Fisheries Science Center Stock Assessment Program using creel survey data and estimated commercial catch from the DMWR commercial receipt book program for 2001-2020.
(Source: *APPENDIX C and **WPFMC 2021)

Existing data reporting systems do not differentiate fish caught in territorial waters from fish caught in Federal waters. Therefore it is not possible to know how much of the catch is harvested in Federal waters and how much catch is harvested from territorial waters, nor is it possible to estimate catch of individual species. As shown in Fig. 2, the best information currently available shows that the majority of bottomfish habitat is in territorial waters (85 percent), and the rest is in Federal waters (15 percent). NMFS uses the amount of habitat as a proxy for estimating the catch harvested in Federal and territorial waters.

Since 2012, the Council and NMFS have managed the American Samoa bottomfish fishery in Federal waters with annual catch limits (ACL) and accountability measures (AM) for the bottomfish stock complex, as required under the Magnuson-Stevens Act. The ACLs and AMs were developed following the approved process in the FEP and designed to prevent overfishing and ensure the fishery was sustainably managed (see WPFMC 2011). Catches from both

territorial waters and Federal waters are counted towards the ACL. In no prior year has the American Samoa bottomfish fishery attained or exceeded the implemented ACL, and up until the most recent stock assessment in 2019, the fishery was considered to be harvesting sustainably (Yau et al. 2016; NMFS 2017). There is no Federal permit or reporting required to fish for bottomfish in Federal waters around American Samoa.

Table 2. Annual estimated BMUS catch (lb) in American Samoa from 2001-2020.

Year	Estimated Total Catch (lb)*	Estimated Commercial Catch (lb)**
2001	42,301	3,447
2002	31,657	1,448
2003	21,039	2,511
2004	17,622	3,233
2005	14,541	2,490
2006	15,569	2,203
2007	22,359	4,001
2008	32,965	3,171
2009	40,446	3,035
2010	11,978	1,084
2011	24,569	711
2012	7,688	1,161
2013	19,740	882
2014	20,352	3,140
2015	29,511	2,047
2016	20,181	566
2017	15,913	1,131
2018	14,756	838
2019	13,714	1,749
2020	9,592	307
Three Year Average (2018-2020)	**12,687**	**965**

(Source: **APPENDIX C and **WPFMC 2021)

The territory of American Samoa manages its bottomfish fishery with mandatory commercial licenses and invoice reports, gear restrictions, and voluntary non-commercial catch reporting. American Samoa does not have regulations that complement Federal catch limit regulations. The American Samoa DMWR is currently developing a territorial fishery management plan (FMP) to manage bottomfish from 0 to 3 nm from shore.

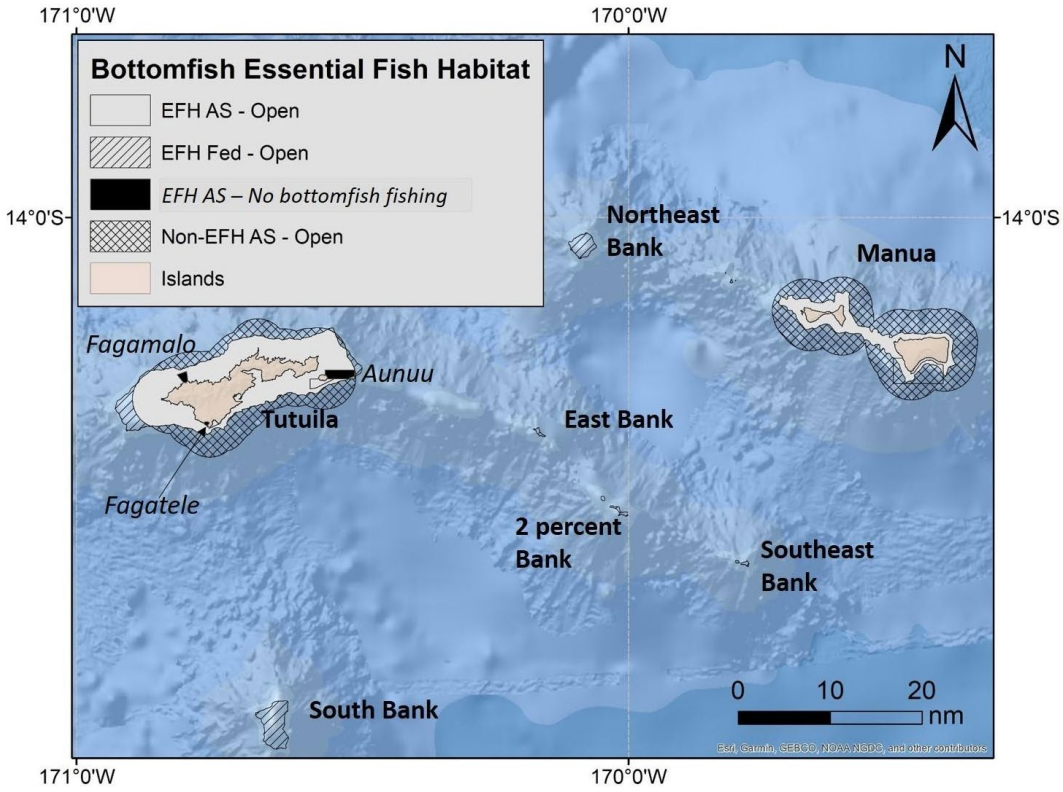

Figure 2. Map of Essential Fish Habitat (EFH) for bottomfish around American Samoa in Federal (Fed) and territorial (AS) waters. (Source: NMFS Pacific Islands Regional Office, or PIRO)

1.2 Proposed Action

NMFS proposes to approve the Council's recommended Amendment 5 to the American Samoa FEP which would implement a rebuilding plan for the American Samoa bottomfish fishery consistent with Magnuson-Stevens Act Section 304(e) and implementing regulations at 50 CFR 600.310(j). The proposed rebuilding plan would set a Federal ACL for American Samoa Bottomfish of 5,000 lb at the stock complex level with an in-season AM and a higher performance standard. As an in-season AM, if NMFS projects that the ACL would be reached, Federal waters would be closed to bottomfish fishing from that point through the remainder of the fishing year. As a higher performance standard, if the ACL is exceeded, NMFS would close the fishery in Federal waters until a coordinated management approach is developed that ensures catch in both Federal and territorial waters can be maintained at levels that allow the stock to rebuild. The complex exists in both territorial and Federal waters, and NMFS is obligated to manage the stock throughout its range. Therefore, NMFS would monitor catch from both territorial and Federal waters and use the total catch when assessing catch against the ACL. However, the Federal catch limit would not limit catch in territorial waters as NMFS can only implement fishery management measures in Federal waters.

The rebuilding plan would be implemented in 2022 and remain in place until such time that the stock complex is determined to be rebuilt (i.e., when the stock complex biomass (B) is above the biomass necessary to maintain the maximum sustainable yield (MSY)). NMFS and the Council

would review and amend the rebuilding plan as necessary using the best scientific information available (consistent with 50 CFR 600.310(j)(3)(iv)). If the fishery is closed in Federal waters, reopening would occur consistent with rebuilding requirements specified under National Standard 1 of the Magnuson-Stevens Act such that a reasonable method of restricting fishing mortality at the level needed to rebuild in the target timeframe is implemented.

1.3 Purpose and Need

The purpose of the action is to rebuild the overfished American Samoa Bottomfish stock complex. The action is needed to ensure the fishery complies with the requirements of the Magnuson-Stevens Act and the provisions of the FEP and implementing regulations, which require NMFS to implement management measures to end overfishing and rebuild the American Samoa bottomfish stock complex from its overfished designation, as recommended by the Council and based on the best scientific, commercial, and other information available about the fishery. The need for this action is to provide management oversight, prevent overfishing, and to provide for long-term sustainability of fishery resources while allowing fishery participants to continue to benefit from their use.

1.4 Action Area

The fishery management area for the American Samoa FEP bottomfish fishery includes the EEZ around American Samoa (Fig. 2). However, the action area also encompasses those areas in which fishing for bottomfish occurs in territorial waters of American Samoa. Bottomfish fishing primarily occurs in waters from the surface to 230 m depth around the islands and offshore banks of American Samoa, including Tutuila, Aunu'u, and the Manu'a Islands (i.e., Ta'ū and Ofu-Olosega, approximately 54 nm east of Tutuila). As of June 3, 2013, commercial fishing is prohibited in Rose Atoll Marine National Monument (78 FR 32996), which is approximately 80 nm east of Ta'ū. The fishery does not fish in areas closed to fishing around the Islands of Tutuila and Aunu'u, which include several community and territorial marine protected areas (MPAs), including at Fagamalo and several National Marine Sanctuary Management Areas (Fig. 2).

1.5 Benchmark Stock Assessment and Status of the Stock

The Magnuson-Stevens Act requires that a fishery management plan specify objective and measurable criteria, or reference points, for determining when a stock is subject to overfishing or is overfished. The FEP includes status determination criteria (SDC) that specify when the bottomfish stock is considered overfishing or when overfishing is occurring (WPFMC 2009). Overfishing of bottomfish occurs when the fishing mortality rate (F) is greater than the fishing mortality rate for maximum sustainable yield (F_{MSY}) for one year or more; this is the Maximum Fishing Mortality Threshold (MFMT) and is expressed as a ratio, $F/F_{MSY} = 1.0$ (Fig. 3). Thus, if the F/F_{MSY} ratio exceeds 1.0 for one year or more, overfishing is occurring. A stock is a considered to be overfished when its biomass (B) declines below the level necessary to produce the MSY on a continuing basis and can be expressed as the ratio $B/B_{MSY} < 1\text{-}M$, where M is the natural mortality of the stock. Table 3presents definitions of these commonly used terms alongside several others.

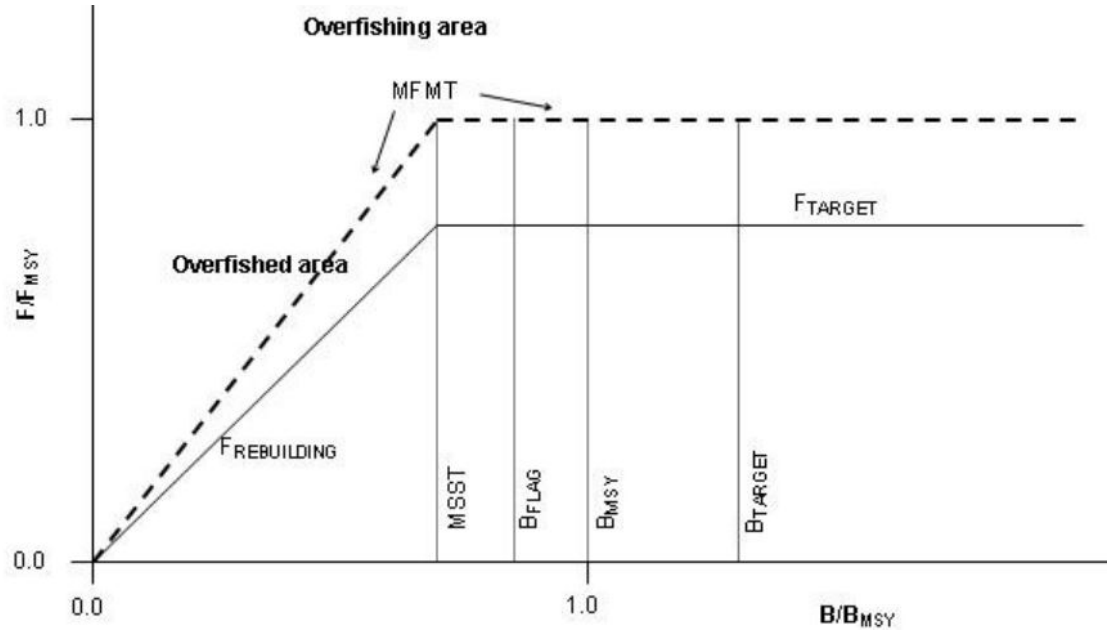

Figure 3. Example MSY, target, and rebuilding control rules.
(Source: Restrepo et al. 1998 and WPFMC 2009)

Table 3. Commonly used fishery stock assessment terms.

Term	Definition
B	Biomass or the amount of fish estimated in the stock.
F	The rate at which a fish stock is caught, which includes targeted harvest and non-targeted (bycatch) harvest.
MSY	The largest long-term average catch, or yield, that can be taken from a stock year after year under prevailing conditions.
F_{MSY}	The rate of fishing mortality that, if applied over the long term, would result in catching the MSY.
B_{MSY}	The long-term average size of the stock that would be achieved by fishing at a constant fishing mortality rate equal to F_{MSY}.
OFL	A catch level that corresponds to the stock's MSY. Fishing above the overfishing limit would likely result in overfishing and jeopardize the stock's capacity to produce MSY.
T_{min}	The minimum amount of time the stock is expected to take to rebuild to its B_{MSY} in the absence of any fishing mortality, where "expected" refers to a 50 percent chance of attaining B_{MSY}.
T_{max}	The maximum amount of time needed to rebuild a stock to its B_{MSY}.
T_{target}	The time period for rebuilding the stock that is considered to be as short a time as possible. T_{target} generally cannot exceed T_{max}, or 10 years, unless T_{min} exceeds 10 years.
MFMT	The rate of fishing mortality above which a stock is declared to be experiencing overfishing (i.e., fish are being removed at too rapid a rate). MFMT may not exceed F_{MSY}.
MSST	The biomass level that a stock can decline to before being declared overfished (stock abundance is too low) and requiring a rebuilding plan. It can be no lower than 50 percent of the B_{MSY}.
$F_{rebuild}$	The fishing mortality rate that is required to rebuild the stock.

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, which means 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 complex harvested from Federal and territorial waters is subject to overfishing and is overfished based on the SDC specified in the American Samoa FEP (WPFMC 2009). This is the first assessment that indicated the stock is overfished or subject to overfishing (Fig. 4).

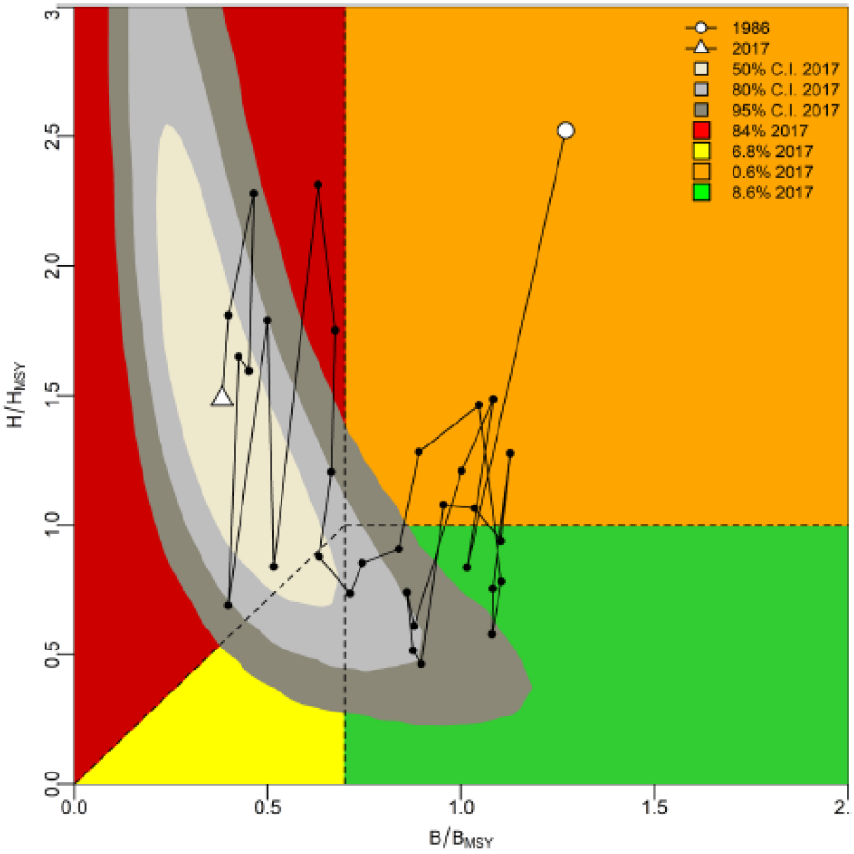

Figure 4. Kobe plot of relative biomass and relative exploitation rate from the best fitting production model for American Samoa bottomfish from 1982 to 2017.Colored areas delineate stock statuses (red = overfished and overfishing, yellow = overfished but not overfishing, orange = overfishing but not overfished, and green = not overfished and not overfishing). The gray or tan colored areas refer only to fishing year 2017. The status of the American Samoa BMUS stock in 2017 is shown in the shaded areas, with different shades showing different credible intervals as described in the legend. The figure legend indicates the robustness of the different stock status conditions for year 2017; with there being an 84% probability that the American Samoa bottomfish stock is overfished and being subject to overfishing. (Source: Figure 39 in Langseth et al. 2019)

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 lists[1], filtered catch data based on gear, standardized the catch per unit effort (CPUE) for covariates that could affect the catch rate, and applied a Bayesian state space surplus production model[2] (Langseth et al. 2019). Based on information contained in the 2019 assessment, the average annual catch of American Samoa bottomfish combined from both territorial and Federal waters from 2013 to 2017 was 21,139 lb. These numbers included catch of bottomfish reported at the species level, plus an estimate of bottomfish catch reported under more general categories (e.g., snapper, emperor, deep bottomfish). Estimated total catch data for 2018 through 2020 are available in the Council's annual Stock Assessment and Fishery Evaluation (SAFE) Report for the American Samoa Archipelago (WPFMC 2021) but are not directly comparable because they only include fish identified to the species level.

The assessment information estimated the long-term MSY in the fishery at an annual catch of 28,800 lb (Table 4), which is lower than the estimate of MSY in the previous stock assessment update for American Samoa bottomfish (Yau et al. 2016). Results of projected probabilities of overfishing for American Samoa 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. The projections indicate that total catch of no more than 8,000 lb per year would result in a 50 percent probability of overfishing in 2020 through 2025 (Table 5). Therefore, to end overfishing in the fishery, the total catch of bottomfish in American Samoa, in both Federal and territorial waters, must be limited to no more than 8,000 lb in each calendar year. This overfishing limit (OFL) of 8,000 lb is much lower than the MSY because the most recent biomass (B) estimates are substantially lower than B_{MSY} (i.e., $B_{2017}/B_{MSY} = 0.38$; see Table 23 in Langseth et al. 2019).

There has been one year (i.e., 2012) since ACLs were implemented in 2012 that annual catch did not exceed the OFL of 8,000 lb. The average annual catch of American Samoa bottomfish from 2018 to 2020 was 12,687 lb (Table 7), which exceeds the OFL by nearly 59 percent. The standing stock biomass in 2025 associated with this OFL is 122,400 lb with a harvest rate of 6 percent in 2025, and the probability that the stock would be overfished in that year is 64 percent (see Table 19 in Langseth et al. 2019).

Table 4. Stock assessment parameters for the American Samoa BMUS complex[3]. (Source: Langseth et al. 2019)

Parameter	Value	Status
MSY	28,800 lb (95% CI: 16.4-55.9)	

[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 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 American Samoa, this reduced the number of species in the stock complex from 17 to 11 (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.

[3] F and F_{MSY} are equivalent to harvest rate (H) and harvest rate that produces maximum sustainable yield (H_{MSY}) in the 2019 benchmark assessments. The harvest control rule determines the threshold for overfishing (defined as H_{CR}

Parameter	Value	Status
H_{2017}	0.15	
H_{CR}	0.107 (95% CI: 0.044-0.228)	
H_{2017}/H_{CR}	2.75	Overfishing occurring when $H/H_{CR} > 1$
B_{2017}	102,600	
B_{MSY}	272,800 (95% CI: 120.8-687.4)	
B_{2017}/B_{MSY}	0.38	Overfished when $B/B_{MSY} < 0.7$

Table 5. Probability of overfishing corresponding to bottomfish catch (in 1000 lb) by year. The highlighted number indicates the catch amount (8,000 lb) that would result in a 50 percent probability of overfishing in 2020 through 2025. Catch values for a given probability of overfishing in a given year assume equal catch in all previous years.

Prob. of overfishing (H/HCR>1) in terminal year	2020	2021	2022	2023	2024	2025	Prob. of overfishing (H/HCR>1) in terminal year	2020	2021	2022	2023	2024	2025
0.01	0	0	0	0	0	0	**0.26**	1	1	1	1	2	2
0.02	0	0	0	0	0	0	**0.27**	1	1	1	1	2	2
0.03	0	0	0	0	0	0	**0.28**	1	1	1	2	2	2
0.04	0	0	0	0	0	0	**0.29**	1	1	1	2	2	2
0.05	0	0	0	0	0	0	**0.30**	1	1	2	2	2	3
0.06	0	0	0	0	0	0	**0.31**	1	1	2	2	2	3
0.07	0	0	0	0	0	0	**0.32**	1	1	2	2	3	3
0.08	0	0	0	0	0	0	**0.33**	1	2	2	2	3	3
0.09	0	0	0	0	0	0	**0.34**	1	2	2	3	3	3
0.10	0	0	0	0	0	0	**0.35**	1	2	2	3	3	4
0.11	0	0	0	0	0	0	**0.36**	1	2	2	3	3	4
0.12	0	0	0	0	0	0	**0.37**	2	2	3	3	4	4
0.13	0	0	0	0	0	0	**0.38**	2	2	3	3	4	4
0.14	0	0	0	0	0	0	**0.39**	2	2	3	3	4	4
0.15	0	0	0	0	0	0	**0.40**	2	3	3	4	4	5
0.16	0	0	0	0	0	0	**0.41**	2	3	3	4	4	5
0.17	0	0	0	0	0	1	**0.42**	2	3	3	4	5	5
0.18	0	0	0	0	1	1	**0.43**	2	3	4	4	5	6
0.19	0	0	0	0	1	1	**0.44**	3	3	4	5	5	6
0.20	0	0	0	1	1	1	**0.45**	3	3	4	5	6	6

in the 2019 assessments) as a function of H_{MSY}, biomass (B), the biomass that produces maximum sustainable yield (B_{MSY}), and 1 minus the rate of natural mortality (M; assumed to be 0.3).

Prob. of overfishing (H/HCR>1) in terminal year	2020	2021	2022	2023	2024	2025	Prob. of overfishing (H/HCR>1) in terminal year	2020	2021	2022	2023	2024	2025
0.21	0	0	1	1	1	1	**0.46**	3	4	4	5	6	6
0.22	0	0	1	1	1	1	**0.47**	3	4	5	5	6	7
0.23	0	0	1	1	1	1	**0.48**	3	4	5	6	6	7
0.24	0	1	1	1	1	2	**0.49**	3	4	5	6	7	7
0.25	0	1	1	1	1	2	**0.50**	4	5	5	6	7	8

(Source: Table 20 in Langseth et al. 2019)

PIFSC presented the stock assessment findings to the Council at its 180th meeting on October 22-24, 2019, in Pago Pago, American Samoa (84 FR 53685, October 8, 2019), which showed that bottomfish in American Samoa are overfished and undergoing overfishing. As required under National Standard 2 of the Magnuson-Stevens Act (50 CFR 600.315), the 2019 assessment was subjected to an independent review by a panel of independent fishery science experts (i.e., a Western Pacific Stock Assessment Review, or WPSAR), which 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 15-17, 2019, in Honolulu, Hawaii. Although the SSC expressed its concerns regarding the impacts of the data used for the stock assessment on its results, the SSC endorsed the stock assessment for management purposes.

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 American Samoa bottomfish stock is overfished and subject to overfishing (85 FR 26940, May 6, 2020). On February 10, 2020, the NMFS Pacific Islands Regional Office (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 end overfishing and to implement a plan within two years to rebuild the stock as stipulated by the Magnuson-Stevens Act.

1.6 Magnuson-Stevens Act Criteria for Rebuilding Overfished Fisheries

Here, we explain the regulations that the Council and NMFS are working under in developing this rebuilding plan measure. Pursuant to Section 304(e) of the Magnuson-Stevens Act and implementing regulations at 50 CFR 600.310(j), 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. 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 NMFS must implement an 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 an FMP or plan amendment and any accompanying regulations to stop overfishing and rebuild affected stocks of fish within nine months.

A rebuilding plan must specify a time period for rebuilding the fishery that is as short as possible and generally 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 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. 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 generally cannot exceed T_{max}. The fishing mortality associated with achieving T_{target} is known as $F_{rebuild}$. According to projections provided by PIFSC (see Table 8) T_{min} is eight years for the fishery, so T_{max} is 10 years and therefore, T_{target} cannot exceed 10 years. However, this T_{min} value assumes no harvest of the stock complex in both Federal and territorial waters, and this scenario is not realistically achievable if the American Samoa Government does not take action to restrict fishing mortality in its waters. Therefore, the realistic T_{min} and T_{max} are likely longer than eight and 10 years, respectively, if the territory does not implement complementary management with this Federal action. Additionally, 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.

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 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.

1.7 Overview of ACL and AM Development Process

Federal regulations at 50 CFR 665.4 (76 FR 37285, June 27, 2011) require NMFS to implement an ACL and AM(s), as recommended by the Council, based on the best scientific, commercial,

and other information available for the fishery. In accordance with the Magnuson-Stevens Act and the FEP, there are three required elements in the development of an ACL as shown in Fig. 5: calculating the ABC, determining an ACL that may not exceed the ABC, and developing AMs. In the first step, the Council's SSC calculates an ABC that is set at or below the stocks OFL. The OFL is an estimate of the catch level above which overfishing is occurring and corresponds with the MFMT. In accordance with Federal regulations at 50 CFR 600.310 implementing National Standard 1 of the Magnuson-Stevens Act, the probability of overfishing (P*, pronounced P-star) cannot exceed 50 percent and should be a lower value. Thus, the ABC is the maximum amount the fishery can catch that provides at least a 50 percent chance, or better, of not overfishing the stock.

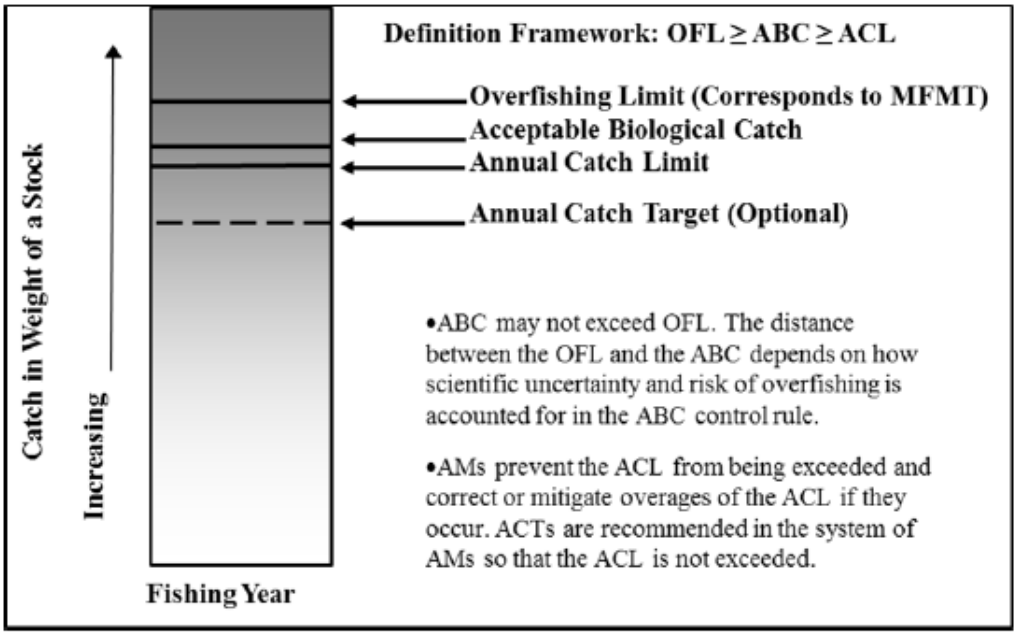

Figure 5. General relationship between OFL, ABC, and ACL.

Second, the Council must recommend an ACL that does not exceed the ABC recommended by the SSC. An ACL set below the ABC further reduces the probability that actual catch will exceed the ABC or OFL and result in overfishing. The SSC may reduce the ABC below the OFL considering factors evaluated in a P* analysis. The Council may then reduce the ACL below the ABC in consideration of social, economic, ecological, and management (SEEM) factors in a SEEM analysis (see Hospital et al. 2019 for SEEM considerations.). While the P* analysis considers management uncertainty arising from underreporting and misreporting of catch, the SEEM analysis is more forward-looking and considers uncertainty arising from concerns about compliance and/or management capacity.

The third and final element in the ACL process is the inclusion of AMs. There are two categories of AMs, in-season AMs and post-season AMs. In-season AMs prevent an ACL from being exceeded and may include closing the fishery, closing specific areas, changing bag limits, setting an annual catch target (ACT), or other methods to reduce catch. Post-season AMs reduce the ACL and/or ACT in subsequent years if the ACL is exceeded in order to mitigate potential impacts to fish stocks. Additionally, National Standard 1 and the FEP describe performance

standards that identify conditions when a system of ACLs and AMs should be reevaluated. Generally, if any fishery exceeds an ACL more than once in a four-year period, as a performance standard the Council is required to re-evaluate the ACL process for that fishery and adjust the system as necessary to improve its performance and effectiveness in ensuring sustainability of the fishery. The Council can also choose a higher performance standard to provide more conservative management for vulnerable stocks.

1.8 Recent Bottomfish Fishery Management Actions

In response to the assessment results and notification from NMFS, at its 180th meeting in Pago Pago, American Samoa, the Council requested that NMFS implement an interim measure to reduce overfishing consistent with provisions of Section 304(e)(6) and Section 305(c) of the Magnuson-Stevens Act. The Council noted that immediately ending overfishing (i.e., limiting total bottomfish catch to 8,000 lb, which is the OFL specified in the stock assessment) is expected to result in severe economic and cultural impacts to community members who use bottomfish resources for commercial, subsistence, religious, and cultural purposes. Therefore, the Council requested that the interim measure include a Federal catch limit that reduces, but does not end, overfishing while increasing biomass in 2020 as the Council developed a long-term rebuilding plan. In response, PIFSC extended the range of catch projections from the assessment to allow for evaluation of effects of catch levels above the OFL and showed that catches up to 13,000 lb in 2020 would reduce overfishing and allow stock biomass to increase during an interim measure. NMFS published a final rule for the interim measure on November 16, 2020 (85 FR 73003), implementing a 13,000 lb interim catch limit (ICL) and an in-season AM to close the fishery in Federal waters for the remainder of the year if this ICL was exceeded (NMFS 2020a). On June 21, 2021 (86 FR 32361), this interim measure was extended until November 18, 2021.

1.9 Public Review and Involvement

The Council convenes several meetings per year, including meetings for its SSC, 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 and SSC on its agenda items for the meeting.

At the Council's 134th SSC meeting on October 15-17, 2019, in Honolulu, Hawaii and the 180th Council meeting on October 22-24, 2019, in Pago Pago, American Samoa, NMFS presented the results of the most recent benchmark stock assessment for the American Samoa 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. At the 180th Council meeting where the Council discussed issues associated with ACLs and AMs for American Samoa bottomfish, public discussion focused on the implications of the findings of the 2019 benchmark stock assessment and their validity. Bottomfish fishermen from American Samoa expressed concerns that the data from creel surveys and the commercial receipt book system collected by the American Samoa DMWR in collaboration with NMFS and used for the stock assessment are not representative of the fishery despite these being the only data available to use in stock assessments. Fishermen also noted that there are only a small number of fishermen active in the fishery (fewer than 20 according to the 2021 List of Fisheries, or LOF, 86 FR 3028, January 14, 2021).

In addition to concerns about available catch data, bottomfish fishermen and Council members from American Samoa expressed concerns about the economic, social, and cultural effects of a implementing a catch limit much lower than recent catch levels and of a closure of the bottomfish fishery in Federal waters. Those concerns were reflected in the Council's request for an interim action, which was sent to NMFS on November 1, 2019. NMFS published a final rule for the interim measure on November 16, 2020 (85 FR 73003). This rule implemented an ICL of 13,000 lb and an in-season AM to provide balance between the regulatory requirements to reduce overfishing and the needs of the fishery and associated communities for continued access to bottomfish to the degree allowed by BSIA and Federal regulations regarding interim actions (NMFS 2020a). In a letter to NMFS dated June 15, 2020, DMWR indicated that they opposed the proposed ICL and AM and that they would not implement complementary management measures in territorial waters.

At the Council's 182nd meeting held virtually via web conference on June 23-25, 2020, there was a preliminary presentation on the development of the bottomfish rebuilding plan for American Samoa. The meeting was open to the public, which was notified through the *Federal Register* (85 FR 34420, June 4, 2020) and the Council's website. Discussion between PIFSC staff and the Council on this agenda item during the public comment period focused on addressing concerns from Council members regarding the improvement of American Samoa's bottomfish data and stock assessment prior to the next benchmark stock assessment scheduled for 2023.

At the Council's 138th SSC meeting on November 30-December 1, 2020, and the 184th Council meeting on December 2-4, 2020, both of which were held virtually via web conference, Council staff presented preliminary alternatives for parameters to be recommended for implementation in the rebuilding plan for the American Samoa bottomfish fishery. Both meetings were open to the public, which was notified through the *Federal Register* (85 FR 73029, November 16, 2020) and the Council's website. At the 138th SSC meeting where the SSC deliberated alternatives for the rebuilding plan, discussion between PIFSC staff and the SSC during the public comment period was centered on efforts by the PIFSC Stock Assessment Program (SAP) to enhance the utilization of available data, refine assessment methodologies, and potentially split the single stock complex into multiple stocks. At the 184th Council meeting where the Council discussed the potential alternatives for implementing a rebuilding plan for the American Samoa bottomfish fishery, discussion between PIFSC staff and the Council during the public comment period similarly focused on efforts to improve the next benchmark stock assessment, and Council members were encouraged to discern between these efforts and the current action to implement a rebuilding plan. The Council deferred action on recommending rebuilding plan parameters for the American Samoa bottomfish fishery to allow for the American Samoa Government to have sufficient time to develop its own territory bottomfish FMP, which is still in development as of March 2022.

At the Council's 139th SSC meeting on March 16-18, 2021, and the 185th Council meeting on March 23-25, 2021, both of which were held virtually via web conference, Council staff presented a review of the ongoing progress of the American Samoa bottomfish rebuilding plan. Both meetings were open to the public, which was notified through the *Federal Register* (86 FR 11505, February 25, 2021) and the Council's website. At the 139th SSC meeting where the SSC was presented the preliminary impact analysis for the alternatives under consideration, the SSC commented that the Council's support of a Community Development Plan in American Samoa

under the Magnuson-Stevens Act could maintain access for the American Samoa fishing community to culturally-important deep water snappers in Federal waters in the event of a Federal fishery closure by allowing harvest related to cultural practices. However, fishing under a Community Development Plan does not provide for catch beyond that allowed under the rebuilding plan. At the 185th Council meeting where the Council was presented an update on management options for the American Samoa bottomfish fishery associated with the rebuilding plan, Council members reiterated that the poor stock status is reflective of the data-poor situation that has compounded over the years, and that restrictions to the fishery may deter fishermen from participating in data collection improvement efforts. A public comment at this meeting suggested that there have been many good-sized bottomfish landed in the past few weeks, which may be indicative that the fishery is healthy.

At the Council's 186th meeting held virtually via web conference on June 22-24, 2021, Council staff presented updates to the development of the American Samoa bottomfish rebuilding plan, including the potential for adding an alternative with an ACL of 5,000 lb to the action. The meeting was open to the public, which was notified through the *Federal Register* (86 FR 29251, June 1, 2021) and the Council's website, and the public was allowed to submit oral or written comments on the provisions of the rebuilding plan. During the meeting, Council members generally supported the addition of the new alternative with a 5,000 lb ACL, and commented that characteristics of the fishery, such as the use of hand crank reels and mixing bottomfish fishing trips with trolling for bait, may impact the calculation of CPUE for the fishery during the stock assessment. During the public comment portion of the agenda, PIFSC staff noted that CPUE standardization is an essential part of the stock assessment process, that a goal moving forward is to work with fishermen to provide the best possible data, and that all management agencies will need to work together to better understand the available data for use in stock assessments. The Council ultimately deferred taking action on the American Samoa bottomfish rebuilding plan to allow time for the new alternative to be added to the document.

At the Council's 187th meeting on September 21-23, 2021, which was held virtually via web conference, the Council considered taking final action on the rebuilding plan for American Samoa bottomfish. This meeting was open to the public, which was notified through the Federal Register (86 FR 47626, August 26, 2021) and the Council's website. At the meeting, Council members reiterated concerns about additional regulations on the waning bottomfish fishery in American Samoa and the data used for the stock assessment that resulted in the overfished and experiencing overfishing designations. There were no public comments at the meeting on the American Samoa bottomfish rebuilding plan. The Council deferred taking final action on the American Samoa bottomfish rebuilding plan to allow for the American Samoa DMWR to consult with the Governor of American Samoa on coordinated management of the bottomfish fishery in both territorial and Federal waters.

At the Council's 188th meeting on October 19, 2021, which was held virtually via web conference, the Council took final action on the rebuilding plan for American Samoa bottomfish. This meeting was open to the public, which was notified through the Federal Register (86 FR 54436, October 1, 2021) and the Council's website. During the public comments portion of the agenda, several oral comments suggested that there are many areas around American Samoa that are unexploited by fisheries, upcoming fishery development projects could help the American Samoa bottomfish fishery to rebound, shark depredation is having an impact on the local

bottomfish populations, and the data used by PIFSC to determine the stock status are flawed. The Council took final action for the bottomfish rebuilding plan, unanimously selecting Alternative 3 (i.e., an ACL of 5,000 lb with an in-season AM and higher performance standard) as its preferred alternative for the action.

On January 21, 2022, NMFS published a notice of availability (NOA) for Amendment 5 and requested public comments (87 FR 3276); the comment period ended March 22, 2022 and there were two comments from individuals. These comments generally supported the action, and voiced concerns about the involvement of indigenous community members in decision-making, subsistence fishing, and enforcement. On February 4, 2022, NMFS published a proposed rule to implement Amendment 5 and the rebuilding plan and again requested public comments (87 FR 6479). That comment period ended March 21, 2022. NMFS received seven comments from individuals generally supporting the action, with comments recommending community involvement and input, mandatory catch reporting, and one comment inquiring about relief to fishermen that may experience economic effects. NMFS also received comments from the Governor of American Samoa and the American Samoa Department of Marine and Wildlife Resources. These comments also supported the action while highlighting concerns about social, economic, and cultural impacts from reduced access to bottomfish. NMFS considered all comments in finalizing Amendment 5 and the accompanying environmental assessment. None of the comments resulted in a change to the alternatives or a substantive change to the environmental effects analysis. We respond to the comments in the final rule.

1.10 NEPA Compliance

NMFS prepared this Environmental Assessment (EA) in accordance with the requirements of National Oceanographic and Atmospheric Administration's (NOAA) Administrative Order (NAO) Section 216-6A, "Compliance with the National Environmental Policy Act, Executive Orders 12114, Environmental Effects Abroad of Major Federal Actions; 11988 and 13690, Floodplain Management; and 11990, Protection of Wetlands" and the associated Companion Manual. NAO 216-6A requires review under the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations, and other related authorities including review of environmental consequences on the human environment prior to making a decision.

This Environmental Assessment (EA) was prepared using the 2020 Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) Regulations. The effective date of the 2020 CEQ NEPA Regulations was September 14, 2020, and reviews begun after this date are required to apply the 2020 regulations unless there is a clear and fundamental conflict with an applicable statute. 85 Fed. Reg. at 43372-73 (§§ 1506.13, 1507.3(a)). The development of this EA began after September 14, 2020, and accordingly proceeds under the 2020 regulations.

The 2020 NEPA regulations require EAs to be 75 pages or less (40 CFR 1501.5(f)). EAs should "briefly discuss the purpose and need for the proposed action, alternatives as required by section 102(2)(E) of NEPA, and the environmental impacts of the proposed action and alternatives, and include a listing of agencies and persons consulted" (40 CFR 1501.5(c)(2)). This EA is consolidated with the Council-developed American Samoa Bottomfish Fishery Recovery Plan and includes information included to meet other statutes in addition to NEPA. Consistent with the 2020 CEQ NEPA Regulations, on November 6, 2020, the National Oceanic and Atmospheric Administration's (NOAA) Senior Agency Official, Janet Coit (Assistant Secretary of Commerce

for Conservation and Management, Acting), granted a blanket waiver for time and page limits for a one-year period for all EAs and Environmental Impact Statement developed to support fishery management actions that are: developed by the regional fishery management councils (councils) pursuant to the requirements of the Magnuson-Stevens Fishery Act, or developed by NMFS Atlantic Highly Migratory Species Management Division for actions taken under the requirements of the Magnuson-Stevens Act. Because this EA was prepared to support a Council fishery management action, the page and time limits defined in CEQ regulations are waived.

1.11 List of Preparers

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2 DESCRIPTION OF ALTERNATIVES CONSIDERED

The alternatives considered in this document were developed by the Council, pursuant to Magnuson-Stevens Act requirements, in response to the notification by NMFS that the American Samoa bottomfish stock complex is overfished and experiencing overfishing. Alternative 1 maintains the status quo and NMFS would not implement a rebuilding plan. Alternative 2 would implement an ACL of 1,500 lb, an in-season AM that would close the fishery in Federal waters for the remainder of the year if NMFS projects the ACL will be attained or determines it has already been exceeded, and a higher performance standard where NMFS would close the fishery in Federal waters if the ACL is exceeded during any fishing year over the course of the rebuilding plan until a coordinated management approach is developed that ensures catch in both Federal and territorial waters can be maintained at levels that allow the stock to rebuild. Alternative 3 would implement an ACL of 5,000 lb and the same in-season AM and higher performance standard as Alternative 2. Alternative 4 would implement a closure of Federal waters to the American Samoa bottomfish fishery with a reopening mechanism comparable to the performance standard under Alternative 2. Under Alternatives 2 through 4, overfishing would be prevented and the stock complex would be expected to rebuild in eight to 10 years, assuming catches in both territorial and Federal waters are limited to the amount authorized by the proposed management provisions (i.e., 1,500 lb, 5,000 lb, and 0 lb for Alternatives 2, 3, and 4, respectively). If the territory does not implement complementary management to limit catch in its waters to the authorized catch levels, there is likely no action NMFS can take to ensure that rebuilding would occur within 10 years. These alternatives are described in detail below.

2.1 Development of the Alternatives

The process of developing ACL alternatives, generating rebuilding timelines, and analyzing potential impacts incorporates multiple sources of catch data: the time series of catch presented in the stock assessment (Langseth et al. 2019) and the time series of catch included in the Council's annual SAFE report (WPFMC 2021).

Generally, the catch estimates in a stock assessment are considered to be more complete than the data in an annual SAFE report due to the consideration of combined information from creel surveys and commercial receipts. The catch estimates in the 2019 stock assessment are also considered to be BSIA. However, the use of catch estimates from the Council's 2020 SAFE report was also considered because it provides estimates through 2020, whereas the stock assessment time series ends in 2017. Additionally, the data presented in the SAFE report are the main source of information used for fishery monitoring under normal circumstances. In order to combine the key desirable qualities of the data sets (i.e., BSIA from the stock assessment and more recent catch estimates from the SAFE report), it was necessary to merge them for 2018 through 2020. To do this, the PIFSC SAP compared catch estimates in the stock assessment to those in the SAFE report. In general, catch estimates in the stock assessment were greater than the SAFE report, which means the numbers would not be directly comparable without a correction factor. Over the most recent four years of data from the stock assessment, the catch estimates in the stock assessment were 1.24 times greater than catch in the SAFE report (APPENDIX C – PIFSC memo to the record). This correction factor was applied to catch estimates for 2018 through 2020 from the SAFE report, which provided estimates that were properly scaled to those from the stock assessment, and these estimates were appended to the time series from the stock assessment (see Table 7). When management measures were identified and analyzed in early 2021, the most recent year for which catch estimates were available was 2020, so any subsequent information on catch will not be considered.

At the Council's 138th SSC meeting from November 30-December 1, 2020, the SSC recommended to the Council a 1,500 lb annual catch limit with in-season and post-season AMs for the rebuilding plan for the American Samoa bottomfish fishery, stating that a complete restriction of access to deepwater snappers at the offshore banks would result in cultural impacts to the local communities. Additionally, the SSC noted concerns that the substantially lower ACL associated with this rebuilding plan could discourage fishermen to report their catch, as data collection systems in American Samoa for the non-commercial sector of its bottomfish fishery are currently voluntary. At the 184th Council meeting on December 2-4, 2020, the Council deferred taking action to identify a preferred alternative for the rebuilding plan to allow the American Samoa Government to have additional time to complete its own territory bottomfish fishery management plan. Council members remarked on issues with data collection and its role in the rebuilding plan as well as future stock assessments, and they noted that data collection could be further hampered by the implementation of stricter regulations. The Council's American Samoa Advisory Panel also recommended a 1,500 lb annual catch limit with in-season and post-season AMs for the rebuilding plan. Since the 138th SSC and 184th Council meetings, a post-season AM (i.e., overage adjustment) was removed from the alternatives (see Section 2.7.3) and replaced with the higher performance standard.

At the 186th Council meeting on June 22-24, 2020, the Council again deferred taking action on the American Samoa bottomfish rebuilding plan to allow for the incorporation of an alternative with a 5,000 lb ACL into the draft document. Council staff had determined that an annual catch of 5,000 lb would be the highest level of harvest that would allow for rebuilding of the bottomfish stock complex to occur within 10 years, as required by the Magnuson-Stevens Act.

At its 188th meeting on October 19, 2021, the Council took final action to recommend a rebuilding plan with an ACL of 5,000 lb. NMFS would count bottomfish catches from both territorial waters and Federal waters around American Samoa towards the ACL. The rebuilding plan would be in effect until the American Samoa bottomfish stock complex is rebuilt to B_{MSY}. NMFS expects that an annual catch of 5,000 lb of bottomfish would allow the bottomfish stock complex to have a greater than 50 percent change to rebuild biomass to B_{MSY} in 10 years. As an in-season AM, NMFS would evaluate available catch information during the fishing year and close the fishery in Federal waters for the remainder of the year when the fishery is projected to attain the ACL, or immediately if the ACL catch is determined to have already exceeded the ACL. As a higher performance standard, if the ACL is exceeded during any fishing year over the course of the rebuilding plan, NMFS would close the fishery in Federal waters until a coordinated management approach is developed that ensures catch in both Federal and territorial waters can be maintained at levels that allow the stock to rebuild. Under the Magnuson-Stevens Act, NMFS and the Council would review the rebuilding plan every two years and amend it as necessary using BSIA.

2.2 Features Common among Alternatives

Each of the alternatives considered assumes that all existing Federal and local resource management regulations would continue alongside non-regulatory monitoring of catch through the creel survey expansions by NMFS and the DMWR commercial receipt system. NMFS would work with DMWR to encourage timely processing of data to track catches toward the applicable catch limit as necessary, and the fishery would continue to be monitored in the event of a Federal closure. Each action alternative assumes that only Federal waters could be closed as the result of the in-season AM and performance standard when NMFS projects that the catch will attain or has exceeded the implemented ACL (Alternatives 2 and 3) or due to the temporary moratorium (Alternative 4). The ability to coordinate a closure of both Federal and territorial waters would improve the effectiveness of management measures associated with a designated catch limit or moratorium; however, American Samoa does not have regulations in place to close bottomfish fishing in territorial waters if a Federal catch limit is reached. If the American Samoa Government implements complementary management with this Federal action, it would be likely that rebuilding could occur within 10 years. However, if the territory does not implement complementary management, NMFS expects that fishing would continue in territorial waters and the level of authorized catch would be exceeded, which would delay the rebuilding of the fishery. The territory could implement alternative management measures other than complementary management, but given the lack of available fishery data, it would not be possible to analyze the effect of alternatives other than catch restrictions (e.g., bag limits, size limits, etc.). The following descriptions and analyses account for both possibilities of the territory implementing or not implementing complementary management with this Federal action.

Under all alternatives, the cultural significance of bottomfish in American Samoa would remain unchanged. An important aspect of American Samoa is perpetuating *fa'a Samoa* (i.e., "The Samoan Way", custom and practice), which governs local social norms and practices. The foundation of *fa'a Samoa* is the title system at the village and higher levels, which is sustained and signified by the production and presentation of food and other goods, including deep and shallow water bottomfish at a variety of important cultural ceremonies. A letter from the DMWR to NMFS on June 15, 2020 noted that deep water snappers are important for cultural ceremonies and *fa'a lavelave* (i.e., funerals, weddings, births, special birthdays). This importance for subsistence and cultural use is evident during important community events, and demand for bottomfish varies depending on the need for fish at government and cultural events (WPFMC 2021).

The Council requested PIFSC to produce biomass projections for the American Samoa bottomfish fishery to help determine T_{min}, $T_{target,}$ and T_{max} for Alternatives 2 through 4 for the rebuilding plan (see Fig 6; Table 8), as the specification of a rebuilding time is required per Magnuson-Stevens Act Section 304(e)(4) for any overfished fishery. The projections utilize the B_{MSY} of 272,800 lb for the American Samoa bottomfish multi-species stock complex estimated by the stock assessment (Langseth et al. 2019; see Table 8) and extend for a total of 40 years from the initial year of 2022. The biomass projections assume that the specified level of annual catch would be caught in its entirety for each year. Because the estimated biomass in the projections changes over time, the estimated F values at a given catch level decrease as biomass increases.

2.2.1 In-Season Monitoring Plan

Under Alternatives 2 and 3, the in-season AM would require that NMFS close Federal waters around American Samoa to bottomfish fishing at such time as NMFS projects that the fishery would attain the ACL or immediately if it is determined that the fishery has exceeded the ACL. Whether territorial waters are also closed if the in-season AM is applied depends on the territory's decision to implement complementary management with this Federal action. Although NMFS would not be able to track catches for the fishery in near-real time, under Alternatives 2 and 3, NMFS would review in-season progress of the catches relative to the implemented ACL based on data reports from DMWR, which monitors the bottomfish fishery through its creel survey program. The alternatives would use a predetermined method to allow for in-season monitoring of the fishery over the course of each fishing year for the duration of the rebuilding plan. The in-season monitoring plan would rely on the use of expanded estimates from the creel survey program in American Samoa and is further described below. Though these data are expected to be associated with high scientific uncertainties when expanded during the fishing year, the creel survey data represent BSIA to NMFS for the purposes of in-season monitoring under this action. This action would represent the first attempt to utilize in-season monitoring of an ACL for implementing a closure for the bottomfish fishery. Previously, the Council and NMFS were not satisfied with the amount of scientific uncertainty in the data when used for in-season monitoring and did not feel that accepting the scientific uncertainties for in-season monitoring was prudent given the previously healthy status of the fishery. The fishery being identified as overfished and experiencing overfishing has prompted the Council and NMFS to reconsider the use of creel survey data for in-season monitoring despite the associated

uncertainties because tracking the fishery throughout the fishing year is necessary to ensure that the fishery is adhering to the proposed timelines of the rebuilding plan.

NMFS and the Council would use the creel survey data to monitor the fishery over the course of a fishing year until a more reliable catch monitoring system is in place. When DMWR has conducted sufficient creel survey interviews to allow for appropriate expansion of the available data based on scientific uncertainty, NMFS would estimate the total catch for the fishing year to that point. NMFS expects the first expansion to take place roughly halfway through the year. However, since fewer interviews increases the uncertainty in the catch estimates for the expansion time period, it is also expected that this semi-annual expansion would have high uncertainties associated with the data. After the initial expansion, NMFS would then perform additional expansions for the entire year on a month-to-month basis, or as DMWR is able to transmit creel survey data, whichever is more frequent.

2.3 Alternative 1: Status Quo / NMFS would not implement a Rebuilding Plan

Under Alternative 1, NMFS would not implement a rebuilding plan and would continue the same management actions in place in the American Samoa bottomfish fishery in 2021. On November 16, 2020 (85 FR 73003), an interim management measure for the fishery was implemented with an ICL of 13,000 lb in 2020 and an in-season AM. The measure was in place for 180 days, through May 17, 2021. An ICL is allowed to be extended only once and only for another 186 days. The measure was extended and the ICL was effective through November 18, 2021 (86 FR 32361). Therefore, Alternative 1 would implement management measures that mirror the most recent two years of management for the fishery, which is an ACL of 13,000 lb with an in-season AM to prevent the catch limit from being exceeded. While NMFS would count catches from both Federal and territorial waters towards the ACL, NMFS only has authority to manage the fishery in Federal waters and the American Samoan Government may implement management measures in territorial waters to complement federal rebuilding management at its discretion.

Under the in-season AM, NMFS would track progress of catches in relation to the ACL based on reports of catches provided to NMFS by DMWR. NMFS would close Federal waters around American Samoa to bottomfish fishing for the remainder of the year at such time as the agency estimates the fishery would attain the ACL or immediately if the agency determines that the fishery has attained or exceeded the ACL. There would be no post-season AM to correct any overages. These provisions would be implemented in lieu of a rebuilding plan with a new ACL, AMs, or other associated management measures for bottomfish in American Samoa to rebuild the stock. This alternative would not comply with Magnuson-Stevens Act section 304(e), which requires the Council to end overfishing and to implement conservation and management measures to rebuild the stock; Magnuson-Stevens Act section 301(a), which requires NMFS to prevent overfishing; or the purpose and need of this EA because rebuilding would not occur within ten years (T_{max}) and catches of 13,000 lb exceed the OFL.

The CEQ regulations require that agencies consider a “no action” alternative as part of the alternatives analysis (40 CFR 1502.14(d)). The Companion Manual for NOAA Administrative Order 216-6A states that, “the ‘no action’ alternative can assist decision makers by providing a baseline for comparison of environmental effects.” At the time of publication of this EA, the Federal fishery is not currently managed with any catch limit or AM, since the ICL expired on November 18, 2021. However, the fishery had been managed under the ICL for the preceding

two years and the fishery has been managed under an ACL since 2012 (with the exception of 2017 and 2018). NMFS selected a baseline "no action" alternative with an ACL and AM as this represents the most recent management of the fishery as well as the management regime of the fishery for nearly the past decade. Additionally, the Council took initial action on the rebuilding plan in November 2020, when the fishery was managed under the 13,000 lb ICL and AM, and took final action in October 2021, before the ICL expired. Lastly, when the ICL was in place, it was not exceeded, so the interim measure did not functionally constrain the fishery. The impacts of the interim measure are expected to be similar to the impacts of a no-management scenario. Therefore, this Alternative serves as the status quo and environmental baseline alternative against which effects on the human environment of action alternatives can be compared.

Table 6. Rebuilding parameters under Alternative 1 as required by National Standard 1 for an overfished fishery. Source: APPENDIX C.

Parameter	Value
T_{min}	8 years
T_{target}	32 years
T_{max}	10 years
$F_{rebuild}$	0.048 – 0.119

2.3.1 Expected Fishery Outcome

ACLs were first implemented for the Federal fishery in 2012 and, through 2017, catches were less than 30 percent of the ACLs (Table 7). Catches in 2018 and 2019 (when no ACL or AMs were implemented) were similar to or less than catches during previous years when ACLs were implemented (Table 7), indicating that fishery performance did not change dramatically whether or not ACLs and AMs were implemented. In 2020, when the ICL was implemented, catches were relatively lower than previous years in which ACLs were both implemented and not implemented. Because the status quo alternative would not change management for the fishery as it was under the ICL, NMFS expects the fishery to remain consistent with respect to catch and effort. Thus, NMFS expects Alternative 1 to result in the conduct of the fishery being similar to how it operated under the ICL in 2020 and 2021.

Given the recent average catch level of 12,687 lb, it is possible that the American Samoa bottomfish fishery could remain under the 13,000 lb catch limit. Additionally, catch in 2020 was 9,592 lbs. As a result of the way fisheries data is collected, reliable total catch estimates for 2021 will not be available until likely March 2022. At this time, we do not anticipate that the catch in 2021 exceeded the ICL. If catches stay at the recent average, then no in-season AM would be implemented and the bottomfish stock complex would be able to rebuild in 28 years (Table 8). Regardless if complementary management is implemented in territorial waters, Alternative 1 would reduce bottomfish fishing opportunities in Federal water in years of high catch where the ACL is attained due to the application of the in-season AM. If the catch reaches the ACL, then the in-season AM would be applied to restrict bottomfish catches in Federal waters and the timeline for rebuilding would be extended to 32 years if complementary management is also applied by the American Samoa Government. If there is no complementary management, it is likely that there would continue to be fishing in territorial waters that could offset the potential conservation benefits of restricting bottomfish harvest Federal waters. NMFS is not able to

predict the amount of displacement that may occur or if complementary management will be implemented. Refer to Section 3.6.1for additional analysis.

Table 7. Comparison of American Samoa bottomfish catches to the ACLs from 2012 to 2020. ACLs were not implemented in 2018 and 2019.

Year	ACL (lb)*	Catch (lb)**	Percent of ACL
2012	99,200	7,688	7.75
2013	101,000	19,740	19.54
2014	101,000	20,352	20.15
2015	101,000	29,511	29.22
2016	106,000	20,181	19.04
2017	106,000	15,913	15.01
2018	NA	14,756	NA
2019	NA	13,714	NA
2020	13,000	9,592	78.44
3-year avg. (2018-2020)	NA	12,687	NA

(Source: *the *Federal Register* at 77 FR 6019, February 2, 2012; 78 FR 15885, March 13, 2013; 79 FR 4276, January 27, 2014; 80 FR 52415, August 31, 2015; 82 FR 18716, April 21, 2017; 82 FR 58129, December 11, 2017; 85 FR 73003, November 16, 2020; and **APPENDIX C.)

2.3.2 Estimated Conservation and Management Benefit to Bottomfish Stocks

Under Alternative 1, the fishery would be expected to perform similarly to how it did while under the management of the interim measure with an annual catch of 12,687 lb based on the recent three-year average. Regardless if complementary management is implemented in territorial waters, overfishing would be slightly reduced from levels observed prior to the implementation of the interim measure (i.e., years prior to 2020) due to the more restrictive Federal catch limit as well as an in-season AM for Federal waters in years of high catch. If the territory does decide to implement complementary management with this Federal action, the annual catch would be limited to 13,000. In years of high catch without complementary management in territorial waters, NMFS expects that fishermen would continue to catch bottomfish in territorial waters, which would remain open to fishing, and any fishing effort that is displaced from Federal waters to territorial waters could offset the reduction in catch from the closure of Federal waters. However, NMFS is not able to predict the amount of displacement that may occur or if complementary management will be implemented. If catches stay at the recent average, then the bottomfish stock complex would be able to rebuild in 28 years. While NMFS does not expect that annual catches for the fishery would reach 13,000 lb, if this occurs, then rebuilding is expected to take 32 years (Fig. 6; Table 8). Either level of catch exceeds the OFL (8,000 lb), meaning that overfishing would continue. Therefore, while Alternative 1 would provide some conservation and management benefit to the American Samoa bottomfish fishery relative to fishing activity prior to the interim measure or relative to an unconstrained fishery, it would not be able to effectively eliminate overfishing or rebuild the fishery within statutory requirements. Refer to Section 3.5.1 for additional analysis.

2.3.3 Degree to which this Alternative Mitigates Cultural, Economic, and Social Effects

This alternative would not have short-term cultural, economic, or social impacts to fishing communities in American Samoa compared to the action alternatives because the status quo would be maintained, but there may be a slight reduction in revenues and resource availability compared to an unconstrained fishery or in years of high catch. NMFS does not expect Alternative 1 to restrict bottomfish fishing activity relative to the recent three-year average regardless of whether complementary management is implemented in territorial waters, but catch could be restricted in years of high catch due to the implementation of the in-season AM. If only a Federal closure is implemented through the application of the in-season AM, fishing would only be restricted in Federal waters. If complementary territorial management is also implemented, then in years of high catch fishing would be restricted in all waters and there would be no bottomfish resources available to the community. Given the recent average catch level of 12,687 lb, it is possible that the American Samoa bottomfish fishery could remain under the 13,000 lb catch limit and the fishery would remain open in Federal waters.

Since the fishery is expected to perform similarly to how it did in while under the management of the interim measure, commercial sales and revenues are also expected to remain consistent. An average of 7.2 percent of bottomfish catch is sold annually (Table 9). If there is 12,687 lb of catch on an annual basis, at the recent average price of $3.99 per lb (Table 9), expected revenue would be $3,645. Using the estimated number of 20 fishery participants from the 2021 LOF (86 FR 3028, January 14, 2021), each fisher would earn approximately $182. The status quo would not constrain bottomfish fishing activity in American Samoa relative to the most recent management action, so NMFS does not expect this alternative to adversely affect the commercial fishermen in American Samoa in the short-term. Non-commercial fishing (inclusive of recreational, sustenance, and cultural fishing) is expected to be similarly unaffected.

In summary, Alternative 1 would only slightly reduce overfishing of bottomfish relative to previous years, similar to what was observed under the interim measure, and it would take 28 to 32 years to rebuild the stock. This could have longer-term cultural, economic, and social impacts for the American Samoa fishing community if the diminished health of the stock complex reduces available bottomfish resources and revenues in the future. Refer to Section 3.7.1 for additional analysis.

Table 8. Projected biomass (B; 1,000 lb), probability that biomass is greater than or equal to B_{MSY}, and fishing mortality (F) for the American Samoa bottomfish stock complex from 2022 to 2062 under annual catches (lb) of 0 lb, 1,500 lb, 5,000 lb, 10,784 lb, 12,687 lb, and 13,000 lb. The highlights indicate the first year the probability that rebuilding would occur is at least 50 percent. Values for each year represent projections at the beginning of the listed year.

		0 lb			1,500 lb			5,000 lb			10,784 lb			12,687 lb			13,000 lb		
Year		Biomass	Prob. B > B_{MSY}	F	Biomass	Prob. B > B_{MSY}	F	Biomass	Prob. B > B_{MSY}	F	Biomass	Prob. B > B_{MSY}	F	Biomass	Prob. B > B_{MSY}	F	Biomass	Prob. B > B_{MSY}	F
2022	0	115.8	0.1600	0	115.4	0.1558	0.01309	114.6	0.1592	0.04462	116.0	0.1540	0.09761	116.6	0.1546	0.11520	115.8	0.1508	0.11910
2023	1	132.9	0.2089	0	131.3	0.2106	0.01149	127.7	0.1989	0.03993	122.6	0.1911	0.09206	120.9	0.1857	0.11086	119.1	0.1848	0.11556
2024	2	150.8	0.2626	0	150.3	0.2584	0.01003	141.2	0.2458	0.03604	130.0	0.2244	0.08659	127.8	0.2157	0.10453	125.5	0.2120	0.10936
2025	3	173.4	0.3129	0	168.6	0.3051	0.00894	156.5	0.2882	0.03248	137.2	0.2554	0.08184	131.8	0.2463	0.10122	129.4	0.2423	0.10586
2026	4	194.4	0.3621	0	189.0	0.3507	0.00797	172.1	0.3300	0.02949	146.2	0.2803	0.07662	137.7	0.2677	0.09664	134.1	0.2677	0.10195
2027	5	219.5	0.4057	0	212.0	0.3980	0.00710	188.1	0.3690	0.02695	155.1	0.3091	0.07206	143.4	0.2918	0.09262	138.8	0.2874	0.09838
2028	6	243.2	0.4516	0	235.5	0.4352	0.00639	206.0	0.3982	0.02457	165.1	0.3301	0.06755	148.5	0.3141	0.08930	146.8	0.3121	0.09270
2029	7	269.4	0.4912	0	256.4	0.4710	0.00587	223.9	0.4306	0.02258	174.1	0.3550	0.06394	156.2	0.3301	0.08472	153.2	0.3303	0.08869
2030	8	294.1	0.5288	0	275.7	0.5021	0.00546	244.4	0.4620	0.02067	185.2	0.3794	0.05999	163.1	0.3537	0.08096	160.8	0.3453	0.08428
2031	9	314.5	0.5593	0	296.4	0.5352	0.00507	259.6	0.4858	0.01944	193.1	0.3946	0.05746	169.7	0.3709	0.07768	165.9	0.3627	0.08160
2032	10	334.7	0.5894	0	316.6	0.5668	0.00475	275.7	0.5083	0.01830	202.2	0.4113	0.05482	177.3	0.3863	0.07423	173.7	0.3737	0.07780
2033	11	348.3	0.6159	0	332.6	0.5934	0.00452	292.3	0.5320	0.01725	213.2	0.4227	0.05190	186.9	0.4010	0.07029	180.1	0.3873	0.07494
2034	12	362.1	0.6380	0	346.7	0.6136	0.00434	304.7	0.5514	0.01655	222.8	0.4371	0.04961	195.1	0.4108	0.06725	188.5	0.4017	0.07148
2035	13	372.3	0.6624	0	359.2	0.6381	0.00418	316.5	0.5701	0.01592	230.3	0.4480	0.04795	201.2	0.4196	0.06514	193.1	0.4123	0.06968
2036	14	381.8	0.6832	0	371.4	0.6579	0.00405	326.6	0.5888	0.01543	243.2	0.4587	0.04535	210.2	0.4301	0.06225	201.0	0.4203	0.06688
2037	15	392.6	0.7032	0	376.7	0.6729	0.00399	335.6	0.6008	0.01501	254.6	0.4742	0.04329	219.2	0.4411	0.05963	205.6	0.4294	0.06531
2038	16	399.8	0.7209	0	386.7	0.6883	0.00389	345.0	0.6171	0.01460	260.7	0.4841	0.04225	227.3	0.4488	0.05744	213.1	0.4389	0.06294
2039	17	408.1	0.7363	0	391.4	0.7010	0.00384	352.0	0.6267	0.01431	265.4	0.4890	0.04149	231.1	0.4541	0.05647	216.7	0.4466	0.06185
2040	18	413.8	0.7507	0	398.6	0.7150	0.00377	358.5	0.6407	0.01404	272.9	0.4987	0.04033	238.5	0.4670	0.05467	226.9	0.4548	0.05901
2041	19	418.3	0.7630	0	404.4	0.7264	0.00372	364.9	0.6473	0.01380	279.7	0.5057	0.03932	242.8	0.4694	0.05366	233.3	0.4577	0.05733
2042	20	423.2	0.7774	0	410.2	0.7342	0.00366	368.7	0.6544	0.01365	282.5	0.5090	0.03892	250.2	0.4753	0.05204	238.0	0.4639	0.05617
2043	21	428.7	0.7872	0	414.8	0.7452	0.00362	373.6	0.6617	0.01347	289.8	0.5168	0.03792	249.6	0.4750	0.05216	240.2	0.4688	0.05565
2044	22	434.3	0.7980	0	417.9	0.7563	0.00360	378.1	0.6681	0.01331	291.7	0.5178	0.03767	253.5	0.4786	0.05135	244.0	0.4693	0.05475
2045	23	436.0	0.8079	0	421.3	0.7664	0.00357	378.6	0.6748	0.01329	296.6	0.5253	0.03703	257.4	0.4812	0.05054	250.9	0.4767	0.05320
2046	24	438.7	0.8159	0	421.2	0.7744	0.00357	382.5	0.6783	0.01316	297.2	0.5298	0.03696	261.4	0.4869	0.04975	255.5	0.4823	0.05222
2047	25	439.7	0.8200	0	426.4	0.7781	0.00352	383.6	0.6870	0.01312	299.9	0.5316	0.03663	262.9	0.4892	0.04946	256.1	0.4846	0.05209
2048	26	444.5	0.8273	0	428.7	0.7868	0.00350	386.5	0.6912	0.01302	303.0	0.5337	0.03625	270.3	0.4952	0.04807	259.3	0.4856	0.05144
2049	27	446.0	0.8349	0	430.6	0.7932	0.00349	389.9	0.6971	0.01291	305.6	0.5378	0.03593	272.2	0.4972	0.04772	262.4	0.4897	0.05081
2050	28	445.3	0.8410	0	430.4	0.7986	0.00349	391.1	0.7029	0.01287	309.8	0.5436	0.03543	278.2	0.5026	0.04668	263.2	0.4897	0.05065
2051	29	444.3	0.8481	0	433.5	0.7984	0.00347	390.9	0.7030	0.01287	313.3	0.5444	0.03502	273.9	0.4992	0.04743	265.6	0.4902	0.05018
2052	30	448.8	0.8521	0	434.3	0.8022	0.00346	390.9	0.7040	0.01287	313.6	0.5458	0.03500	275.5	0.5011	0.04715	267.7	0.4937	0.04977
2053	31	451.5	0.8548	0	435.3	0.8054	0.00345	393.1	0.7037	0.01280	316.5	0.5487	0.03467	277.3	0.5024	0.04683	269.6	0.4963	0.04942
2054	32	453.5	0.8569	0	434.8	0.8091	0.00346	393.6	0.7083	0.01278	317.3	0.5526	0.03458	278.6	0.5052	0.04661	277.5	0.5028	0.04798
2055	33	455.1	0.8633	0	435.0	0.8142	0.00345	394.0	0.7143	0.01277	322.5	0.5573	0.03401	280.9	0.5056	0.04622	279.2	0.5040	0.04769

Year		0 lb			1,500 lb			5,000 lb			10,784 lb			12,687 lb			13,000 lb		
Year		**Biomass**	**Prob. B > B_{MSY}**	**F**	**Biomass**	**Prob. B > B_{MSY}**	**F**	**Biomass**	**Prob. B > B_{MSY}**	**F**	**Biomass**	**Prob. B > B_{MSY}**	**F**	**Biomass**	**Prob. B > B_{MSY}**	**F**	**Biomass**	**Prob. B > B_{MSY}**	**F**
2056	34	453.4	0.8674	0	436.2	0.8139	0.00344	394.9	0.7186	0.01274	321.2	0.5581	0.03415	283.0	0.5086	0.04587	277.1	0.5023	0.04804
2057	35	456.1	0.8723	0	438.7	0.8174	0.00342	398.5	0.7220	0.01263	322.1	0.5556	0.03405	285.4	0.5110	0.04547	276.1	0.5018	0.04824
2058	36	458.3	0.8771	0	438.1	0.8198	0.00343	397.9	0.7233	0.01265	323.4	0.5559	0.03392	284.1	0.5108	0.04568	275.0	0.5004	0.04844
2059	37	459.8	0.8801	0	440.1	0.8231	0.00341	398.7	0.7247	0.01262	324.6	0.5584	0.03379	285.5	0.5118	0.04546	277.3	0.5027	0.04802
2060	38	458.8	0.8814	0	439.7	0.8244	0.00342	398.7	0.7256	0.01262	323.6	0.5567	0.03389	284.2	0.5100	0.04567	277.7	0.5031	0.04794
2061	39	462.3	0.8862	0	440.2	0.8230	0.00341	400.0	0.7263	0.01258	323.3	0.5563	0.03393	284.8	0.5110	0.04557	277.7	0.5028	0.04795
2062	40	457.3	0.8894	0	443.4	0.8246	0.00339	402.5	0.7279	0.01250	324.6	0.5579	0.03378	287.3	0.5123	0.04516	276.8	0.5028	0.04810

Source: APPENDIX C – PIFSC memo to the record.

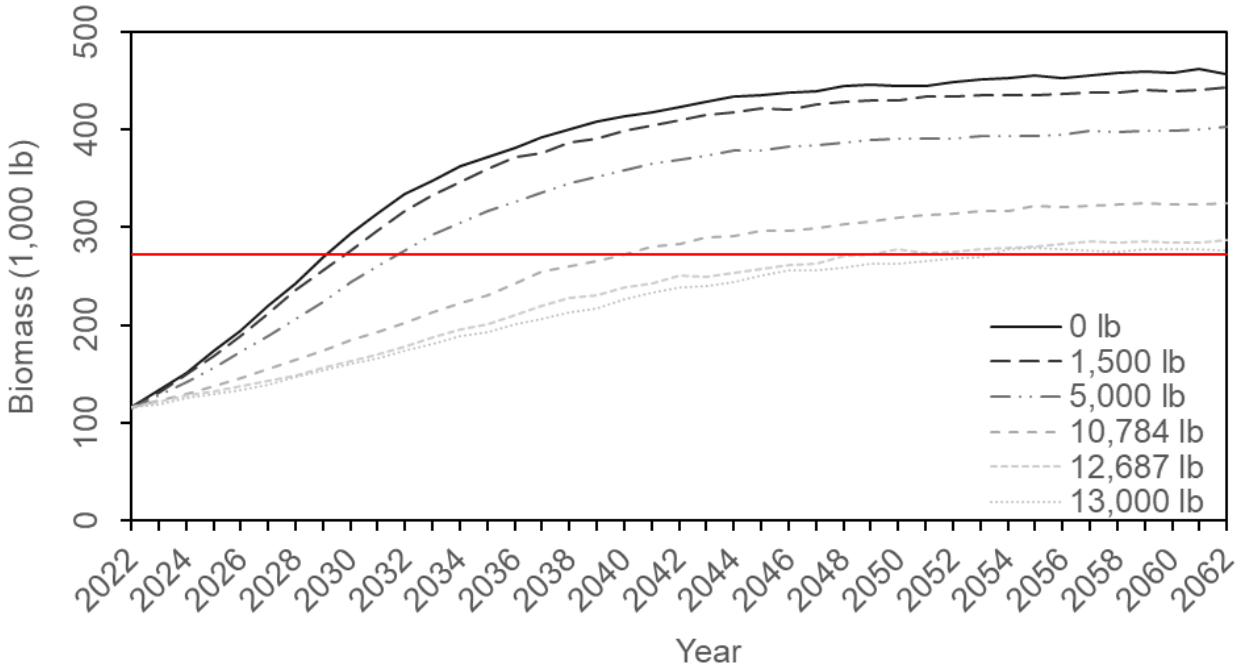

Figure 6. Projected biomass of the American Samoa bottomfish stock complex from 2022 to 2062 under annual catches of 0 lb, 1,500 lb, 5,000 lb, 10,784 lb, 12,687 lb, and 13,000 lb. The red line denotes B_{MSY} at 272,800 lb Source: APPENDIX C.

Table 9. Summary of American Samoa bottomfish commercial revenues from revenues from 2011 to 2020.

Year	Estimated total catch (lb)*	Estimated pounds sold (lb)**	Percent sold	Adjusted estimated revenue ($)**	Adjusted average price per pound ($)**
2011	24,569	711	2.9	2,128	2.99
2012	7,688	1,162	15.1	4,013	3.45
2013	19,740	882	4.5	3,375	3.83
2014	20,352	3,140	15.4	11,371	3.62
2015	29,511	2,048	6.9	6,304	3.08
2016	20,181	565	2.8	2,024	3.58
2017	15,913	1,130	7.1	5,778	5.11
2018	14,756	838	5.7	3,565	4.25
2019	13,714	1,749	12.8	7,423	4.24
2020	9,592	307	3.2	1,067	3.48
Three-Year Average	**12,687**	**965**	**7.2**	**4,018**	**3.99**

Source: *APPENDIX C and **WPFMC 2021

2.4 Alternative 2: Implement a Rebuilding Plan with a 1,500 lb ACL, In-Season AM, and Higher Performance Standard

Under this alternative, NMFS would implement a rebuilding plan with an ACL of 1,500 lb[4] for the American Samoa bottomfish fishery with an in-season AM and a higher performance standard to end overfishing and allow the stock complex to rebuild to its B_{MSY}. While NMFS would count catches from both Federal and territorial waters towards the ACL, NMFS only has authority to manage the fishery in Federal waters and the American Samoan Government may implement management measures in territorial waters to complement federal rebuilding management at its discretion. This level of catch, if maintained for both territorial and Federal waters, would end overfishing and allow the stock complex to rebuild in eight years (Table 8). However, whether rebuilding could occur within the timeframe under this alternative depends on whether the American Samoa Government implements complementary management to this action. Alternative 2 represents the Federal action that would rebuild the stock in the shortest amount of time while allowing the highest level of catch to the fishing community.

NMFS would implement the rebuilding plan starting in 2022 until such time that the American Samoa bottomfish stock complex is determined to be rebuilt (i.e., attained its B_{MSY} as specified in Langseth et al. 2019). As an in-season AM, NMFS would close Federal waters around American Samoa to bottomfish fishing for the remainder of the year when the agency estimates the fishery would attain the ACL or immediately if the agency determines that the fishery has attained or exceeded the ACL. As a higher performance standard, if the ACL is exceeded during any fishing year over the course of the rebuilding plan, NMFS would close the fishery in Federal waters until a coordinated management approach is developed that ensures catch in both Federal and territorial waters can be maintained at levels that allow the stock to rebuild. This higher performance standard was included to address the possibility that the American Samoa Government may not implement complementary management with this Federal action, which would mean catch may not be constrained below the level of authorized catch and, therefore, lead to a delay in rebuilding relative to the proposed timeline.

The development of the ACL under Alternative 2 was done in accordance with the process described in the American Samoa FEP, the Magnuson-Stevens Act, and Federal regulations. The SSC recommended an ABC based on a risk of overfishing (P*) and SEEM analysis. The P* analysis determined a reduction of 20 percent from the OFL for the ABC, meaning that the American Samoa bottomfish fishery should be managed at a 30 percent risk of overfishing (ABC = OFL – P* analysis = 50% - 20% = 30%; WPFMC 2020b). This corresponds to a catch level of 2,000 pounds[5]. A SEEM analysis was not conducted due to scheduling issues associated with COVID-19. However, the P* analysis acknowledged the importance of the fishery and the uncertainties surrounding the monitoring and management and did not recommend a further reduction in the ABC because the proposed ACL is so low that any additional reduction would

[4] When the Council began developing ACL options, PIFSC projections originally showed that stock could rebuild in 10 years for catch levels between 0 and 1,500 lb. Because the time to rebuild the stock would be the same in the absence of fishing (0 lb) as it would with an annual catch of 1,500 lb, the action options originally set the maximum ACL at 1,500 lb such that the stock could rebuild with 10 years while allowing a small amount of bottomfish catch. Subsequent updates to the projections with catch data through 2020 found that an ACL between 0 lb and 1,500 lb would rebuild the stock in eight years. This alternative was kept in to provide thorough analysis of a reasonable range of ACLs for the fishery.

[5] Catch levels for P* analysis were only available in 1,000 intervals.

not retain sufficient catch for the fishery in Federal waters or provide any conservation or management benefit. At the December 2020 SSC meeting, the SSC recommended a phased-in ABC of 5,000 lb in 2021 and 2,000 lb in 2022 to provide a gradual reduction in the ABC and to allow for limited access to the offshore banks for the culturally important deep water snappers. The SSC supported an ACL of 1,500 lb for the rebuilding plan with an in-season AM to close the fishery when the ACL is projected to be reached. At the same time, the Council's American Samoa Advisory Panel (AP) recommended an ACL of 1,500 lb and in-season AM[6].

In summary, Alternative 2 represents the Federal action that would be the most NMFS could do to mitigate impacts to the community and rebuild the fishery in the shortest possible time (i.e., in 8 years, or the same as Alternative 4). However, whether rebuilding can be achieved under this alternative depends on the territory's decision to implement management in its waters to complement Federal management. If it does, rebuilding under Alternative 2 is expected to take eight years. If the territory does not implement complementary management, then this alternative would not be likely to allow the rebuilding of the bottomfish stock complex within statutory requirements. The parameters required by Magnuson-Stevens Act for a rebuilding plan for an overfished fishery under Alternative 2 are presented in Table 10.

Table 10. Rebuilding parameters under Alternative 2 as required by National Standard 1 for an overfished fishery. Source: APPENDIX C.

Parameter	Value
T_{min}	8 years
T_{target}	8 years
T_{max}	10 years
$F_{rebuild}$	0.0055 – 0.0131

2.4.1 Expected Fishery Outcome

Under Alternative 2, the American Samoa bottomfish fishery would be expected to continue fishing as it has in the past and annual catch of bottomfish would be either slightly or notably less than recent years depending on whether complementary management is implemented in territorial waters. Annual catch for the fishery has surpassed the proposed ACL in all years from 2001 to 2020 (see Table 7). Based on monthly catch expansions for the fishery from 2016 to 2018 generated by NMFS from creel survey data (Fig. 7), the average monthly catch in the fishery is 1,232 lb. Given the relatively low ACL under Alternative 2, NMFS expects that the ACL would be reached and the in-season AM could be applied before the end of February. However, the ACL may be reached as early as January (based on 2017 fishery performance) or as late as March (based on 2018 fishery performance).

If complementary management is not implemented, the fishery is not expected to change the way it fishes with respect to the status quo while the fishery remains open, but it would change with respect to catch and areas fished if bottomfish fishing was prohibited in Federal waters. Furthermore, fishermen who fish mainly in Federal waters may be affected more by a temporary closure of Federal water or substantially by a longer term closure of Federal waters if the higher

[6] At this time, a rebuilding plan with a 5,000 lb ACL was not included in the analysis and available for SSC, AP, or Council deliberation.

performance standard is implemented. If NMFS implements the in-season AM (i.e., closes Federal waters) without complementary management in territorial waters it is likely that total catch would still exceed the proposed ACL due to the continuation of fishing in and potential displacement of fishing effort into territorial waters. The best information currently available shows that the majority of bottomfish habitat is in territorial waters (85 percent), and the rest is in Federal waters (15 percent). NMFS uses the amount of habitat as a proxy for estimating the catch harvested in Federal and territorial waters. Under this scenario, if the fishery continues to operate as it has in recent years, there would be another 11,187 lb of catch expected to be harvested in the fishery in the remainder of the year, assuming no displacement of effort. Therefore, NMFS expects the total annual catch under Alternative 2 if complementary management is not implemented to be 11,009 lb in the first year (i.e., 1,500 lb + (85 percent of 11,187 lb)) and 10,784 lb in subsequent years (i.e., 85 percent of 12,687 lb) when the higher performance standard is implemented in Federal waters.

If complementary management is implemented, the fishery is not expected to change the way it fishes with respect to fishing gear, effort, participation, or intensity while the fishery remains open compared to the status quo. However, the fishery would experience large impacts to operations and associated harvests if bottomfish fishing was prohibited in both Federal and territorial waters (either through the in-season AM being triggered or the higher performance standard being implemented). Under this scenario, total catch would be restricted to 1,500 lb annually. However, it is probable that catch would exceed the proposed ACL even if complementary management is implemented in territorial waters at the same time NMFS implements any necessary in-season AM. This is because catch statistics usually become available about six months after local management agencies collect the data. Given the low ACL, it is likely that by the time sufficient catch data is collected through the creel survey program and processed by NMFS Western Pacific Fisheries Information Network (WPacFIN), the fishery would have already exceeded the ACL. Therefore, NMFS expects the total annual catch under Alternative 2 to be higher than 1,500 lb in the first year and 0 lb in subsequent years if complementary management is implemented.

Regardless if complementary management is implemented, catch levels under Alternative 2 would be more restrictive than the status quo due to lower ACL and the higher performance standard. Refer to Section 3.6.1for additional analysis.

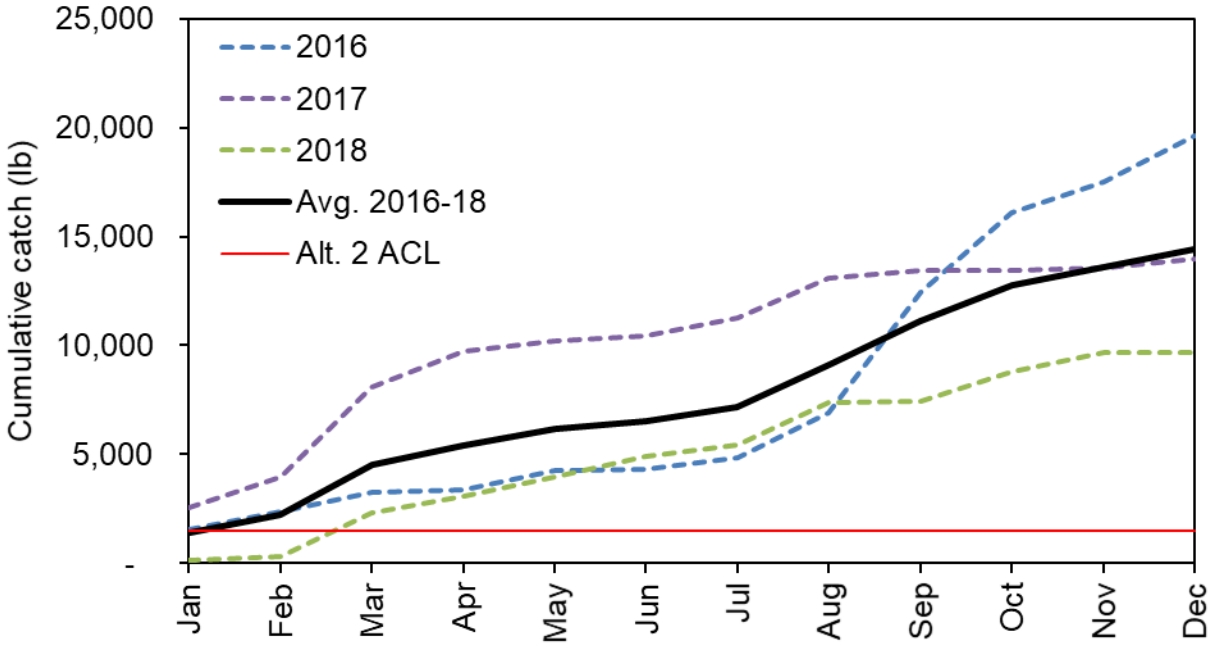

Figure 7. Cumulative monthly catch of American Samoa BMUS from 2016 to 2018 compared to the proposed ACL under Alternative 2. (Source: PIFSC Fisheries Research and Monitoring Division)

2.4.2 Estimated Conservation and Management Benefit to Bottomfish Stocks

Alternative 2 is expected to prevent overfishing and rebuild the American Samoa bottomfish stock complex in eight years while allowing relatively less harvest to occur than the status quo. The timeframe for rebuilding is ultimately dependent on whether the territory decides to implement complementary management. If Federal waters are closed through the higher performance standard and territorial waters remain open, NMFS expects that it would take 19 years for the stock to rebuild. Under this scenario, NMFS expects the total annual catch to be 11,009 lb in the first year and 10,784 lb in subsequent years, which exceeds the OFL specified in the benchmark stock assessment (8,000 lb) but is below the long-term MSY (28,800 lb). Any displacement of fishing effort from Federal waters to territorial waters could offset this anticipated conservation benefit. Nonetheless, a closure in Federal waters would reduce adverse impacts to fish populations in Federal waters relative to the status quo alternative, even though bottomfish harvested in territorial waters would continue experiencing consistent fishing effort if a complementary closure is not implemented. If complementary management is implemented and the fishery is able to either stay under the 1,500 lb ACL or Federal and territorial waters close to fishing through the higher performance standard, then the fishery could rebuild within eight years. Regardless if complementary management is implemented, this alternative would still supply minor conservation benefits and promote rebuilding to a greater extent than the status quo alternative due to the higher performance standard. Refer to Section 3.6.1 for additional analysis.

2.4.3 Degree to which this Alternative Mitigates Cultural, Economic, and Social Effects

Alternative 2 would do less to mitigate cultural, economic, and social effects to the fishing community than Alternatives 1 and 3. The extent of the impacts to the community would be

dependent on whether or not the territorial government implements complementary management. Without complementary management and while the total catch remains below the ACL, there would be no community impacts. If catches are similar to recent years, then it is likely that if the ACL would be attained during the first few months of the year. If the Federal fishery is closed through the in-season AM or the higher performance standard, the impacts would be greater to fishermen who harvest predominately in Federal waters and those community components that rely on fish from Federal waters. However, NMFS expects that operations would continue to occur in territorial waters if Federal waters are closed to bottomfish fishing, either through the in-season AM or the higher performance standard, and it is not clear if displacement of fishing effort into territorial waters would mitigate the impact to commercial fishermen or the community. Thus, large cultural, economic, or social impacts are not expected under Alternative 2 if complementary management is not implemented. If complementary management is implemented, catch would likely be higher than 1,500 lb in the first year and the fishery would be closed in Federal and territorial waters in subsequent years. If the fishery is closed, then catch and revenue would both be reduced to zero and this would likely result in substantial impacts to the fishing community due to both the loss of revenue as well as the lack of availability of locally-sourced bottomfish resources. However, the improved health of the stock complex could benefit the community in the long-term by improving fishery sustainability.

In summary, there would either be minor or substantial impacts expected under Alternative 2 if the fishery continues to operate at recent levels. Revenue and availability of bottomfish to the community would be lower under Alternative 2 than under the status quo, regardless if complementary management or the higher performance standard is implemented. The reduction in revenue and fish availability would increase if the higher performance standard is implemented and only Federal waters are closed. The greatest reduction would occur if both complementary management and the higher performance standard were implemented (i.e., both Federal and territorial waters are closed). Refer to Section 3.7.1for additional analysis.

2.5 Alternative 3: Implement a Rebuilding Plan with a 5,000 lb ACL, In-Season AM, and Higher Performance Standard (Council Preferred Alternative)

Under Alternative 3, NMFS would implement a rebuilding plan with an ACL of 5,000 lb for the American Samoa bottomfish fishery with an in-season AM and a higher performance standard to end overfishing and rebuild the stock to its B_{MSY}, which is expected to take ten years. While NMFS would count catches from both Federal and territorial waters towards the ACL, NMFS only has authority to manage the fishery in Federal waters and the American Samoa Government may implement management measures in territorial waters to complement federal rebuilding management at its discretion. This level of catch, if maintained for both territorial and Federal waters, would end overfishing and allow the stock to rebuild in ten years. However, whether rebuilding could occur within the timeframe under this alternative depends on whether the American Samoa Government implements complementary management to this action. Alternative 3 represents the Federal action that would provide the greatest amount of catch to the fishing community while still adhering to the rebuilding requirements of the Magnuson-Stevens Act.

NMFS would implement the rebuilding plan starting in 2022 until such time that the American Samoa bottomfish stock complex is determined to be rebuilt (i.e., attained its B_{MSY} as specified

in Langseth et al. 2019). As an in-season AM, NMFS would close Federal waters around American Samoa to bottomfish fishing for the remainder of the year when the agency estimates the fishery would attain the ACL or immediately if the agency determines that the fishery has attained or exceeded the ACL. As a higher performance standard, if the ACL is exceeded during any fishing year over the course of the rebuilding plan, NMFS would close the fishery in Federal waters until a coordinated management approach is developed that ensures catch in both Federal and territorial waters can be maintained at levels that allow the stock to rebuild. This higher performance standard was included to address the possibility that the American Samoa Government may not implement complementary management with this Federal action to maintain overall catch of the stock below the level of authorized catch, which could delay rebuilding relative to the proposed timeline.

The ACL under Alternative 3 was developed by PIFSC when requested by the Council to determine the highest level of annual catch of American Samoa bottomfish annually that would still allow for rebuilding to occur within 10 years as required by the Magnuson-Stevens Act. Although this level of annual catch would exceed the ABC as recommended by the SSC (2,000 lb), it would be less than the OFL specified in the stock assessment (8,000 lb)). At the June 2021 Council meeting, the Council directed staff to include 5,000 lb ACL in the rebuilding plan. The American Samoa AP supported a 5,000 lb ACL as the best opportunity for the fishing community while still allowing for the stock to rebuild within 10 years. At an intersessional Council meeting in October 2021, the Council selected this alternative as the preferred alternative. Inclusion of this alternative represents additional consideration for the American Samoa fishing community that could be impacted by the reduction in allowable bottomfish harvest required under the Federal action. The parameters required by Magnuson-Stevens Act for a rebuilding plan for an overfished fishery under Alternative 3 are presented in Table 11.

Table 11. Rebuilding parameters under Alternative 3 as required by National Standard 1 for an overfished fishery. Source: APPENDIX C.

Parameter	Value
T_{min}	8 years
T_{target}	10 years
T_{max}	10 years
$F_{rebuild}$	0.0183 – 0.0399

2.5.1 Expected Fishery Outcome

Under Alternative 3, the American Samoa bottomfish fishery would be expected to continue fishing as it has in the past and annual catch of bottomfish would be either slightly or notably less than recent years depending on whether complementary management is implemented in territorial waters. Annual catch for the fishery has surpassed the proposed ACL in all years from 2001 to 2020 (Table 2), and the estimated catch in 2020 is almost double the ACL. Based on monthly catch expansions for the fishery, NMFS expects that the ACL would be reached and the in-season AM could be applied before the end of May.

If complementary management is not implemented, the fishery is not expected to change the way it fishes with respect to the status quo while the fishery remains open, but it would change with respect to catch and areas fished if bottomfish fishing was prohibited in Federal waters.

Furthermore, fishermen who fish mainly in Federal waters may be affected more by a temporary closure of Federal water or substantially by a longer term closure of Federal waters if the higher performance standard is implemented. If NMFS implements the in-season AM (i.e., closes Federal waters) without complementary management in territorial waters, it is probable that total catch would still exceed the proposed ACL due to the continuation of fishing in and potential displacement of fishing effort into territorial waters. The best information currently available shows that the majority of bottomfish habitat is in territorial waters (85 percent), and the rest is in Federal waters (15 percent). NMFS uses the amount of habitat as a proxy for estimating the catch harvested in Federal and territorial waters. Under this scenario, if the fishery continues to operate as it has in recent years, there would be another 7,687 lb of catch expected to be harvested in the fishery during the remainder of the year, assuming no displacement of effort. Therefore, NMFS expects the total annual catch under Alternative 3 if complementary management is not implemented to be 11,534 lb in the first year (i.e., 5,000 lb + (85 percent of 7,687 lb)) and 10,784 lb in subsequent years (i.e., 85 percent of 12,687 lb) when the higher performance standard is implemented in Federal waters.

If complementary management is implemented, the fishery is not expected to change the way it fishes with respect to fishing gear, effort, participation, or intensity while the fishery remains open compared to the status quo. However, the fishery would experience large impacts to operations and associated harvests if bottomfish fishing was prohibited in both Federal and territorial waters (either through the in-season AM being triggered or the higher performance standard being implemented). Under this scenario, total catch would be restricted to 5,000 lb annually. However, it is possible that catch would exceed the proposed ACL even if complementary management is implemented in territorial waters at the same time NMFS implements any necessary in-season AM, although it is less likely than compared to Alternative 2. This is due to the lag between the collection of fishery data through the creel survey program and the time to process the data by WPacFIN and take management action. Therefore, NMFS expects the total annual catch under Alternative 2, if complementary management is implemented, to be higher than 5,000 lb in the first year and 0 lb in subsequent years, although it would be possible for catch to continue in subsequent years if the fishery can stay below the ACL.

Regardless if complementary management is implemented, catch levels under Alternative 3 would be more restrictive than the status quo due to lower ACL and the higher performance standard. However, catch would be less restrictive than Alternatives 2 and 4. Refer to Section 3.6.1for additional analysis.

2.5.2 Estimated Conservation and Management Benefit to Bottomfish Stocks

Alternative 3 is expected to prevent overfishing and rebuild the American Samoa bottomfish stock complex in ten years while allowing relatively less harvest to occur than the status quo, with similar conservation and management benefit to Alternatives 2 and 4. The timeframe for rebuilding is ultimately dependent on whether the territory decides to implement complementary management. If Federal waters are closed through the higher performance standard and territorial waters remain open, NMFS expects that it would take 19 years for the stock to rebuild. Under this scenario, NMFS expects the total annual catch to be 11,534 lb in the first year and 10,784 lb in subsequent years, which exceeds the OFL specified in the benchmark stock assessment (8,000

lb) but is below the long-term MSY (28,800 lb). While the intended conservation benefits of the proposed management measures would be substantially reduced without complementary management in territorial waters, there would likely be minor conservation and management benefits to the bottomfish stock relative to the status quo due to the expected closure of the fishery in Federal waters. However, any displacement of fishing effort from Federal waters to territorial waters could offset this anticipated conservation benefit. Nonetheless, a closure in Federal waters would reduce adverse impacts to fish populations in Federal waters relative to the status quo alternative, even though bottomfish harvested in territorial waters would continue experiencing consistent fishing effort if a complementary closure is not implemented.

If complementary management is implemented and the fishery is able to stay under the 5,000 lb ACL, then the fishery could rebuild within ten years. If complementary management is implemented and Federal and territorial waters close to fishing through the higher performance standard, then the fishery could rebuild within eight years. Regardless if complementary management is implemented or not, this alternative would still supply minor conservation benefits and promote rebuilding to a greater extent than the status quo alternative due to the application of the higher performance standard. Refer to Section 3.5.1 for additional analysis.

2.5.3 Degree to which this Alternative Mitigates Cultural, Economic, and Social Effects

Alternative 3 establishes a more conservative ACL than the status quo but would do more to mitigate cultural, economic, and social effects to the fishing community while rebuilding bottomfish in a slightly longer timeframe than Alternatives 3 and 4. The extent of the impacts to the community would be dependent on whether or not the territorial government implements complementary management. Without complementary management, and while the total catch remains below the ACL, there would be no community impacts. If catches are similar to recent years, then it is likely that the ACL would be attained during the first half of the year. If the Federal fishery is closed through the in-season AM or the higher performance standard, the impacts would be greater to fishermen who harvest predominately in Federal waters and those community components that rely on fish from Federal waters. However, NMFS expects that operations would continue to occur in territorial waters if Federal waters are closed to bottomfish fishing, either through the in-season AM or the higher performance standard, and it is not clear if displacement of fishing effort into territorial waters would mitigate the impact to commercial fishermen or the community. Thus, large cultural, economic, or social impacts are not expected under Alternative 3 if complementary management is not implemented. If complementary management is implemented, catch could be higher than 5,000 lb in the first year. If this happens, then the fishery would be closed in Federal and territorial waters in subsequent years. If the fishery is closed, then catch and revenue would both be reduced to zero and this would likely result in substantial impacts to the fishing community due to both the loss of revenue as well as the lack of availability of locally-sourced bottomfish resources. However, the improved health of the stock complex could benefit the community in the long-term by improving fishery sustainability.

In summary, there are would either be minor or substantial impacts expected under Alternative 3 if the fishery continues to operate at recent levels. Revenue and availability of bottomfish to the community would be lower under Alternative 3 than under the status quo, but higher than under Alternatives 2 and 4, regardless if complementary management or the higher performance

standard is implemented. While the fishery remains under the ACL, there would be no impacts to the revenue or fish availability. Revenue and fish availability would be reduced if the higher performance standard is implemented and only Federal waters are closed, but fishing could still continue in territorial waters without complementary management in place. The greatest impact would occur if both complementary management and the higher performance standard were implemented (i.e., both Federal and territorial waters are closed). Refer to Section 3.7.1 for additional analysis.

2.6 Alternative 4: Implement a Rebuilding Plan with a Temporary Moratorium on Bottomfish Fishing in Federal Waters

Under Alternative 4, NMFS would implement a fishing prohibition for and possession of bottomfish caught from in Federal waters around American Samoa. NMFS would implement the rebuilding plan starting in 2022 until such time that the bottomfish stock complex is determined to be rebuilt, which is expected to take eight years. As an additional reopening mechanism, the Federal fishery closure may be ended if a coordinated management approach is developed and implemented by NMFS and American Samoa that would restrict fishing mortality in Federal and territorial waters at a level that would allow rebuilding within the timeframe required under the Magnuson-Stevens Act. Alternative 4 represents the Federal action that would be most likely to address overfishing as well as allow rebuilding of the stock complex in the shortest possible amount of time, in comparison to Alternative 2 which allows some fishing to occur while rebuilding in the same amount of time.

This action would be equivalent to implementing a catch limit of 0 lb in Federal waters but would rebuild the bottomfish stock in the same amount of time as under Alternative 2 (1,500 lb ACL). Whether this timeline is maintained is dependent on the territory's decision to implement complementary management alongside this Federal action. If complementary management were to be implemented, bottomfish catches would be completely restricted in both territorial and Federal waters all year until the measure was rescinded or replaced. There are no AMs associated with this alternative because there would be no need to track catch against attainment of an ACL. Likewise, there would be no in-season monitoring or higher performance standard. Overall, Alternative 4 would result in less annual catch for the bottomfish fishery than Alternatives 1 through 3 with a similar rebuilding timeframe compared to Alternatives 2 and 3. All other applicable fishing regulations would remain and the bottomfish fishery would continue to be monitored by NMFS and the Council. The rebuilding parameters are presented in Table 12.

Table 12. Rebuilding parameters under Alternative 4 as required by National Standard 1 for an overfished fishery. Source: APPENDIX C.

Parameter	Value
T_{min}	8 years
T_{target}	8 years
T_{max}	10 years
$F_{rebuild}$	0

2.6.1 Expected Fishery Outcome

NMFS expects that Alternative 4 would cause large impacts to operations and associated harvests compared to the other alternatives over the course of the rebuilding plan. The extent of the impacts would be dependent on whether the complementary management is implemented in territorial waters. Though a closure of Federal waters to bottomfish fishing would effectively be the same as setting an ACL of 0 lb, in the absence of complementary management, NMFS expects that fishing effort could be displaced to territorial waters where the bottomfish fishery would likely continue operating normally. Therefore, Alternative 4 would result in a moderate reduction in fishing compared to the status quo if complementary management is not enacted, but catch would not be completely eliminated (i.e., an ACL of 0 lb achieved). If complementary management is enacted, bottomfish fishing would be restricted in both territorial and Federal waters, resulting in an annual catch of 0 lb for the duration of the rebuilding plan. Refer to Section 3.6.1 for additional analysis.

2.6.2 Estimated Conservation and Management Benefit to Bottomfish Stocks

Alternative 4 would prevent overfishing and the bottomfish fishery would be rebuilt from its overfished state in eight years. However, similar to the other action alternatives, any displacement of fishing effort from Federal waters to territorial waters could offset the conservation benefit in this scenario. If a moratorium is enacted in only Federal waters, NMFS anticipates that fishing would continue in territorial waters without a complementary closure of territorial waters. This would cause the annual catch to be 10,784 lb, the stock to continue to be subject to overfishing, and the rebuilding time frame to extend to 19 years. Although displacement of fishing effort from Federal waters to territorial waters in this scenario could offset the anticipated reduction in catch, there would still likely be minor conservation and management benefits relative to the status quo. If the territory implements complementary management, the stock could rebuild in eight years. Regardless if complementary management is implemented, this alternative would reduce overfishing and promote rebuilding to a greater extent than all other alternatives. Alternative 4 would pose greater constraints to fishermen relative to the status quo (and likely Alternatives 2 and 3 in the first year) for a slight conservation gain if no complementary management is implemented, but it would likely provide a tangible conservation benefit in the first year of the rebuilding plan relative to Alternatives 2 and 3 due to the restriction of catches in Federal waters. Additionally, there would be reduced administrative costs under Alternative 4 relative to Alternatives 2 and 3, as there would be no need to implement an ACL and monitor catch. Although, resources from NMFS's Office of Law Enforcement (OLE) and the U.S. Coast Guard (USCG) would be needed to enforce a closure of Federal waters to bottomfish fishing. In summary, Alternative 4 would prevent overfishing and support rebuilding stock to the greatest practicable extent possible by NMFS. Refer to Section 3.5.1for additional analysis.

2.6.3 Degree to which this Alternative Mitigates Cultural, Economic, and Social Effects

Alternative 4 does not provide for authorized catch in Federal waters. Revenue and availability of bottomfish to the community would be moderately lower or completely reduced relative to the status quo depending on if complementary management is implemented. If territorial waters remained open, this would allow for some availability of bottomfish resources to the fishing community for the duration of the rebuilding plan. If fishermen compensated for a closure of

Federal waters by displacing their effort into territorial waters, revenue and fish availability could be closer to recent years. If complementary management is implemented, there would be substantial impacts to the fishing community due to the lack of bottomfish resources for ceremonial and subsistence purposes and commercial revenue from the fishery. Overall, implementation of Alternative 4 is expected to affect the fishery and associated communities more than the status quo and other action alternatives. Revenue would be decreased relative to the status quo 1 (and Alternatives 2 and 3 in the first year), but this decrease would be marginal and is not expected to result in any large social or economic effects to the American Samoa fishing community. In summary, this alternative does less than all other alternatives to mitigate adverse cultural, economic, and social effects by reducing or eliminating the amount of fish available. However, the reductions in catch would allow the biomass of the stock complex to recover, and the improved health of the stock complex could benefit the community in the long-term by improving the sustainability of the fishery.

2.7 Alternatives Considered but Not Analyzed

2.7.1 Implement an ACL between 5,000 lb and 13,000 lb

Under this alternative, an ACL higher than 5,000 lb (e.g., 6,000 lb, 7,000 lb, etc.) would be implemented for the American Samoa bottomfish fishery until it is determined that overfishing has ended and the stock complex has rebuilt to its B_{MSY}. The same in-season AM and performance standard as Alternatives 2 and 3 would also be implemented under this alternative. Also similar to Alternatives 2 and 3, NMFS would account the catch from both Federal and territorial waters against the ACL to determine if the in-season AM and performance standard should be implemented. Even under the implementation of a relatively higher ACL, both the in-season AM and performance standard could be applied to the fishery in the first fishing year based on recent fishery performance depending on the level of ACL that would be implemented. However, authorizing higher levels of annual catch in the fishery was not analyzed in this EA because doing so would not allow for rebuilding within 10 years, and, therefore, would not be in compliance with National Standard 1 of the Magnuson-Stevens Act. According to biomass projections by PIFSC SAP (APPENDIX C), an annual catch of 5,000 lb is the highest amount of catch that would allow rebuilding to within statutory requirements. Thus, the implementation of an ACL that would authorize a relatively higher level of annual catch would not allow for rebuilding to occur within the time frame specified under statutory requirements.

2.7.2 Implement Federal Permitting and Reporting Alongside Bag Limits

Under this alternative, annual bag limits would be implemented for bottomfish fishing in Federal waters in addition to the ACLs and AMs proposed in the presented action alternatives. Federal permitting and reporting would also be implemented to support the monitoring of the bag limits. This alternative was initially presented to the Council and its SSC at their meetings in November and December 2020 but was not heavily considered to be enacted. These provisions would require substantial additional administrative resources and effort relative to all other alternatives to enact the new limitations, establish a permitting scheme, and develop of consistent method of reporting for fishermen. These regulations could also result in additional costs to fishermen to obtain the permit and dedicate time to accurately reporting their catches under the bag limits in Federal waters. Fishermen would also need to learn about the bag limit regulations, comply with the new laws such that they do not harvest more than the limit that they are individually

allocated, and report their catches in Federal waters to NMFS. NMFS would need to dedicate resources to developing a system to distribute permits to fishermen, receive their catch reports, and ensure that fishermen are not exceeding their allocated bag limit. Additional resources would also be required by the NMFS OLE and USCG to enforce legal fishing in Federal waters under the bag limits. The substantial additional costs and effort required under this alternative for both NMFS and American Samoa bottomfish fishermen would likely result in little perceivable conservation benefit relative to the action alternatives, so this alternative was removed from consideration for this rebuilding plan when presented to the Council for final action.

2.7.3 Implement a Post-Season AM

This alternative would employ a post-season AM to augment the implementation of the ACL under Alternatives 2 and 3 for the fishery to help ensure that the ACL can result in the rebuilding of the American Samoa stock complex. The post-season AM would require an accounting of annual catch (using a three-year running average of recent catch) for the stock complex relative to its ACL immediately after the end of the fishing year, or as soon as possible given the limitations in the data collection and processing methods. If landings for the three-year running average exceed the specified ACL, the AM would require the Council to take action in accordance with 50 CFR 600.310(g) to correct the operational issue that caused the ACL overage, as well as any biological consequences to the stock or stock complex resulting from the overage. For the purposes of the post-season AM for this rebuilding plan, this would include a recommendation that NMFS implement a downward adjustment to the ACL in the subsequent fishing year by the amount of overage pursuant to 50 CFR 600.310(g)(3). NMFS would compare a three-year running average of catch to the ACL instead of comparing catch from a single year to apply the overage adjustment to the ACL in accordance with 50 CFR 600.310(g)(5). The American Samoa bottomfish fishery has variable catches and lacks reliable annual data on which to base a single-year post-season AM due to the nature of the creel survey program that currently collects data on the fishery.

A post-season AM was not included in the alternatives of this rebuilding plan because it ultimately would not be able to address the operational issues that are likely to cause the exceedance of the implemented ACL for the fishery (i.e., continued fishing). Further, because the recent average catch is higher than ACLs presented in the Alternatives 2 and 3, it is likely that the post-season AM would have to be applied each year of the rebuilding plan and result in an annual reduction of the ACL without tangible conservation benefit.

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

Topic	Alt. 1 – ACL of 13,000 lb w/ In-Season AM	Alt. 2 – ACL of 1,500 lb with In-Season AM and Higher Performance Standard	Alt. 3 – ACL of 5,000 lb with In-Season AM and Higher Performance Standard	Alt. 4 – Temporary Closure of Fishery in Federal Waters
Also referred to as:	Status quo, baseline.	N/A.	N/A.	N/A.
Active fisheries affected	American Samoa bottomfish.	No change from status quo.	No change from status quo.	No change from status quo.
Active fisheries potentially affected indirectly	American Samoa troll.	No change from status quo.	No change from status quo.	No change from status quo.
General characteristics of alternative	ACL set consistent with previous interim management measure; in-season fishery closure as the AM. Alt. 1 would have less effects on the fishing community than the other alternatives.	ACL set to end overfishing and rebuild the fishery; in-season fishery closure as the AM with a higher performance standard. Alt. 2 would have impacts to the fishing community relative to Alt. 1; reduces effects on fishing community relative to Alt. 4.	ACL set to end overfishing and rebuild the fishery; in-season fishery closure as the AM with a higher performance standard. Alt. 3 would have impacts to the fishing community relative to Alt. 1 but would have less impacts to the fishing community relative to Alt. 2 and 4.	Moratorium on fishing for or possessing BMUS in Federal waters to end overfishing and rebuild the fishery. Alt. 4 has more short-term effects on fishing community than the status quo but would increase sustainability over time.
Authorized annual catch (lb) of BMUS in American Samoa	13,000 lb.	1,500 lb.	5,000 lb.	0 lb.
Time to rebuild w/comp mgmt.	32 years.	8 years.	10 years.	8 years.

Topic	Alt. 1 – ACL of 13,000 lb w/ In-Season AM	Alt. 2 – ACL of 1,500 lb with In-Season AM and Higher Performance Standard	Alt. 3 – ACL of 5,000 lb with In-Season AM and Higher Performance Standard	Alt. 4 – Temporary Closure of Fishery in Federal Waters
Time to rebuild w/no comp mgmt.	32 years.	19 years.	19 years.	19 years.
Catch monitored by:	American Samoa DMWR Creel Surveys and commercial receipts program.	No change from status quo.	No change from status quo.	No change from status quo.
ACL likely to be exceeded in a given year (based on recent average catch)	No, since the recent average catch is below this ACL. However, it remains possible.	Yes, likely by Feb. in the first year of the rebuilding plan.	Yes, likely by May in the first year of the rebuilding plan.	N/A.
Accountability Measures	*In-season*: If NMFS projects the ACL would be attained or has already been exceeded, NMFS would close Federal fishery for the remainder of the fishing year.	*In-season*: No change from status quo. *Higher performance standard*: if the ACL is exceeded, NMFS would close fishery in Federal waters until coordinated management approach is developed that ensures catch in Federal and territorial waters can be maintained at levels that would rebuild the stock.	*In-season*: No change from status quo. *Higher performance standard*: Same as Alt. 2.	No AM implemented, as there would be no ACL to track catch towards.
Possibility of fishery closure in Federal waters	Not likely, but possible.	Likely by February in the first year and for the full year each subsequent year.	Likely by May in the first year and for the full year each subsequent year.	Full year for duration of plan.

Topic	Alt. 1 – ACL of 13,000 lb w/ In-Season AM	Alt. 2 – ACL of 1,500 lb with In-Season AM and Higher Performance Standard	Alt. 3 – ACL of 5,000 lb with In-Season AM and Higher Performance Standard	Alt. 4 – Temporary Closure of Fishery in Federal Waters
Expected annual catch of bottomfish	*With complementary management*: 12,687 lb. *Without complementary management*: 12,687 lb.	*With complementary management*: 1,500 lb in 2022 if the fishery remains below the ACL, but 0 lb in subsequent years if the ACL is exceeded. *Without complementary management*: 11,009 lb in 2022 and 10,784 lb in subsequent years.	*With complementary management*: 5,000 lb in 2022 if the fishery remains below the ACL, but 0 lb in subsequent years if the ACL is exceeded. *Without complementary management*: 11,534 lb in 2022 and 10,784 lb in subsequent years.	*With complementary management*: 0 lb. *Without complementary management*: 10,784 lb.
Probability of rebuilding in 10 years	*With complementary management*: 38.6 percent. *Without complementary management*: 38.6 percent.	*With complementary management*: 56.7 to 58.9 percent. *Without complementary management*: 40.7 to 41.1 percent	*With complementary management*: 50.8 to 58.9 percent. *Without complementary management*: 39.9 to 41.1 percent	*With complementary management*: 58.9 percent. *Without complementary management*: 41.1 percent.
Mitigates effects to fishing communities during rebuilding	Yes, in the short term. Fishing in the fishery would be the same as it has been under the interim measure and closer to previous years than the action alternatives. However, this alternative lacks the long-term benefits of restricting overfishing and shortening the rebuilding time frame to the same extent that the action alternatives would provide.	Yes, in the short term. Most mitigation of community impacts possible while rebuilding in the shortest feasible time frame. More fishing would be expected than under Alt. 4 in the first year of the plan. Long-term, there would likely be additional benefit to rebuilding the stock than under Alt. 1 and 3.	Yes, to the greatest possible extent under statutory requirements. More fishing would be expected than under Alt. 2 and 4 in the first year of the plan. Long-term, there would likely be additional benefit to rebuilding the stock than under Alt. 1.	In the short term, not relative to Alts. 1-3. Long-term, there would likely be additional benefit to rebuilding the stock more quickly than under Alt. 1 and 3, and potentially a better chance of rebuilding within 10 years than Alt. 2.

3 AFFECTED ENVIRONMENT AND POTENTIAL EFFECTS OF THE ALTERNATIVES

This section describes the affected fishery, fishery resources, protected species, habitats, and the potential environmental effects of the proposed rebuilding plan on these resources. Climate change and environmental justice are considered, along with potential effects to fishing communities, species marine areas and other resources, and potential effects on fishery administration and enforcement.

3.1 Overview of American Samoa

The Territory of American Samoa consists of five volcanic islands (i.e., Tutuila, Aunu'u, Ofu, Olosega, and Ta'ū) with steep, mountainous terrain and high sea cliffs in addition to two coral atolls (i.e., Swains Island and Rose Atoll). The population in 2020 was 55,191 people. Tutuila is the largest and most populous island in the territory, inhabited by over 95 percent of the total population of American Samoa. Tutuila is characterized by an extensive shelf area accompanied by offshore banks and barrier reefs. Tutuila is also the center of government and business for the territory, and Pago Pago Harbor on Tutuila is one of the most sheltered natural deep water harbors in the Southern Pacific (WPFMC 2009).

3.2 Overview of Bottomfish Biology and Distribution

Very little biological information is known about the bottomfish stock complex in American Samoa. The bottomfish fishery in primarily harvests 11 species that include emperors, snappers, groupers, and jacks (Table 1). All species have a wide Indo-Pacific distribution and their range generally extends east to Hawaii, north to Japan, south to Australia, and, for some, as far west as East Africa. Most species prefer rocky bottom substrates or rocky reefs; however, in Hawaii the blueline snapper (*Lutjanus kasmira*) prefers schooling on sandy substrates in the juvenile stage while adults are more solitary and inhabit deep reefs. The majority of the stock complex can be found at depths between 10 and 350 m (33 and 1,150 ft), but some species, such as the red snapper (*Etelis carbunculus)* and pink snapper (*Pristipomoides sieboldii)* can occur at depths up to 400 and 500 m, respectively (1,310 and 1,640 ft). As shown in Figure 2, the best information currently available shows that the majority of bottomfish habitat is in territorial waters (85 percent), and the rest is in the Federal waters located on and around offshore banks (15 percent). All species in the complex are predatory fish and feed on fish, squid, mollusks, crustaceans, and zooplankton.

Spawning has been recorded nearly year-round for most species, but is more common in warmer months and with peak activity occurring in some species around November and December. Spawning aggregations have been reported in the giant trevally (*Caranx ignobilis*), red snapper (*Etelis carbunculus*), and lunartail grouper (*Variola louti*). While most groupers are protogynous hermaphrodites (i.e., animals that are born female and at some point in their lifespan change sex to male), it has yet to be confirmed in the lunartail grouper. Sexual maturity and life span varies greatly among the stock complex. *Pristipomoides sieboldii* reaches sexual maturity at three years old and has a lifespan of not more than eight years. In contrast, *Pristipomoides filamentosus* is a slow growing, long lived species, with the oldest fish recorded at 44 years old.

3.3 Overview of the Bottomfish Fishery

Throughout the development of the American Samoa bottomfish fishery in the 1900s, indigenous people harvested many of the same bottomfish species and used some of the same gears and techniques utilized currently (WPFMC 2009). Bottomfish are typically harvested in deep waters, though some species are caught over reefs at shallower depths. The 2021 LOF estimated that there were less than 20 participants in the American Samoa bottomfish fishery (86 FR 3028, January 14, 2021). Fishing for bottomfish primarily occurs using aluminum alia catamarans less than 32 feet in length that are outfitted with outboard engines and wooden hand reels that fishermen use for both trolling and bottomfish fishing. Fishermen typically fish less than 20 miles from shore because few vessels carry ice (WPFMC 2009). Over the last three years (2018 to 2020), approximately 7.2 percent of that catch has been commercially sold (Table 8; see Section 3.6.1), so the fishery is primarily non-commercial. Though the pelagic fisheries play a relatively larger role in American Samoa's economy, insular fisheries hold fundamental socioeconomic and dietary importance (Levine and Allen 2009). The demand for bottomfish on American Samoa varies depending on the need for fish at government and cultural events, and alia fishermen may switch to bottomfish fishing during periods when longline catches or prices are low (WPFMC 2021). Fishing grounds in Federal waters around American Samoa are also important for the harvest of deep-water snappers used for chiefly position entitlements and *fa'a lavelave* ceremonies (e.g., funerals, weddings, births, and special birthdays).

3.4 Overview of Fishery Management and Data Collection

NMFS and the Council manage bottomfish fishing in Federal waters (3 to 200 nm) around American Samoa in accordance with the FEP for the American Samoa Archipelago (WPFMC 2009), which was developed by the Council and implemented by NMFS under the authority of the Magnuson-Stevens Act. The American Samoa Archipelago FEP emphasizes community participation, increased consideration of the habitat and ecosystem in its management structure, and other elements that are not usually incorporated in fishery management decision making. The American Samoa DWMR manages bottomfish fishing from 0 to 3 nm from the shore. A joint Federal-territorial partnership enforces Federal fishery regulations, and the American Samoa Archipelago FEP requires the Council to produce an annual performance report for the fishery (e.g., WPFMC 2021). Federal regulations prohibit bottom trawls, bottom gillnets, explosives, and poisons (50 CFR Parts 665.104 and 665.406). Additionally, territorial regulations also prohibit the use of explosives, poisonous substances, and electrical devices, in addition to specifying requirements for which cast nets, gill nets, seines, surround nets, and drag nets may be used (ASCA § 24.0920 through 24.0933). The American Samoa bottomfish fishery is monitored using data voluntarily provided by fishermen to DMWR through the boat-based and shore-based creel survey programs. Additionally, DMWR receives commercial sales data from the mandatory commercial receipt book system in accordance with territorial regulations.

3.4.1 Overview of Federal Permit and Reporting Requirements

Currently, there are no Federal permit or reporting requirements for bottomfish fishing in Federal waters around American Samoa.

3.4.2 Overview of Territorial Permit and Reporting Requirements

There are currently no required territorial permitting or reporting requirements for bottomfish fishing in territorial waters around American Samoa.

3.4.3 Boat-Based Creel Survey Program

The boat-based creel survey program collects data on catch, effort, and participation for offshore fishing activities conducted by commercial and non-commercial fishing vessels. Surveys are conducted at main docks and boat ramps using two separate phases of data collection: participation counts and fishermen interviews. Participation counts are done by counting the number of boats absent from port, identifying the presence of boat trailers, and determining the type of gear used. The fishermen interviews document catch composition, CPUE, length-weight information, catch disposition, and additional socioeconomic information. Survey days are randomly selected three to eight times per month. Surveys follow a random stratified design by survey area, weekday/weekend, and time of day (e.g., daytime and nighttime). The creel survey data are transcribed weekly into the NMFS Western Pacific Fisheries Information Network (WPacFIN) database. NMFS applies catch expansion algorithms to the data, which also include port, time of day, and fishing method, at the stratum level on an annual scale to estimate total catch, effort, and CPUE in the fishery.

3.4.4 Shore-Based Creel Survey Program

The shore-based creel survey program collects data on catch, effort, and participation for inshore fishing activities. The surveys randomly sample shore-based fishing and also consist of both participation counts and fishermen interviews. Participation counts are done using a "bus route" method, with data collectors using predefined stopping points and time constraints to count the number of fishermen along the shoreline while recording gear type and number of gears. The fishermen interviews document catch composition, CPUE, length-weight information, catch disposition, and additional socioeconomic information. Survey dates are randomly selected two to four times per week and the surveys take place over eight-hour periods. The creel survey data are transcribed weekly into the WPacFIN database. NMFS applies catch expansion algorithms to the data, which also include island region, weekday/weekend, and fishing method, at the stratum level on an annual scale to estimate total catch, effort, and CPUE in the fishery.

3.4.5 Dealer Reporting

American Samoa has a mandatory requirement for entities that sell any seafood products (e.g., fish dealers, hotels, and restaurants) to submit invoice reports to DMWR (ASCA § 24.0305). This commercial receipt book system collects information by the 16th day of every month. The system monitors fish sold locally and collects information by vendors who purchase fish directly from fishermen. The reported information typically includes the weight and number of each species purchased, the name of the fishermen providing the fish, the boat registration name and number as applicable, the name of the dealer, the date, the price paid, the type of fishing gear used, whether fish were taken in territorial or Federal waters, and other information as requested by DMWR. The submitted invoices usually compile daily trip landings.

3.5 Target, Non-Target, and Bycatch Species and Potential Effects of the Alternatives

Bottomfish stocks are typically monitored at the complex level, and the 2019 stock assessment (Langseth et al. 2019) provides stock status and biomass projections at this level. Therefore, the proposed rebuilding plan under the action alternatives would be applied to the entire American Samoa bottomfish stock complex rather than to the 11 individual species comprising the group. The primary sources of information on target, non-target, and bycatch species associated with American Samoa bottomfish are NMFS stock assessments by Brodziak et al. (2012), Yau et al. (2016), and Langseth et al. (2019), data provided by PIFSC SAP (APPENDIX C), as well as data provided by NMFS and summarized in the Council's annual SAFE report (e.g., WPFMC 2021).

The stock assessment concluded that the American Samoa bottomfish stock complex is overfished and experiencing overfishing (Section 1.5), estimated the long-term MSY for the stock complex to be 28,800 lb, and determined the six-year OFL proxy for the stock to be 8,000 lb for 2020 to 2025. Between 2018 and 2020, the fishery harvested an average of 12,687 lb annually (Table 7), which is 44 percent of the MSY and 159 percent of the OFL from the 2019 stock assessment. The following section analyzes if the alternatives will rebuild the American Samoa bottomfish stock complex from its overfished designation, based on the best scientific, commercial, and other information available about the fishery when compared to the status quo.

The Magnuson-Stevens Act defines bycatch as finfish, mollusks, crustaceans, and all other forms of marine animal and plant life (other than marine mammals and seabirds) that are harvested in a fishery that are not sold or kept for personal use. Bycatch can be further described as either economic or regulatory discards. Economic discards are fish that are discarded because they are of undesirable size, sex, or quality, while regulatory discards are fish that are discarded because regulations do not allow fishermen to retain the fish. Discards in American Samoa usually occur due to regulatory requirements, cultural reasons, ciguatera poisoning, or shark depredation. Data on bycatch harvested in the American Samoa bottomfish fishery are collected through the boat-based and shore-based creel survey programs run by DMWR and are reported by the Council in its annual SAFE reports. Bottomfish fishing is target-specific, and no fish recorded in creel survey fishermen interviews for the American Samoa bottomfish fishery were released in 2020 (see Table 12 in WPFMC 2021). Thus, there is no current concern regarding non-target or bycatch species in the fishery.

3.5.1 Potential Effects of the Alternatives on Target Stocks

Alternative 1: Status Quo / NMFS would not implement a Rebuilding Plan

Under Alternative 1, NMFS would not implement a rebuilding plan. Management measures would mirror the same provisions as the interim measure in 2020 and 2021 for the fishery with an ACL of 13,000 lb and an in-season AM to prevent the fishery from greatly exceeding the catch limit. The level of catch authorized under this alternative is more than 60 percent larger than the OFL specified in the benchmark stock assessment (8,000 lb) but is below the long-term MSY (28,800 lb). Thus, the catch level authorized under this alternative would limit overfishing relative to an unrestricted fishery but would not end overfishing. If catch is restricted to 13,000 lb annually, the stock is expected to rebuild in approximately 32 years. If complementary management is not implemented, there would still be some benefit to bottomfish stocks located in Federal waters (e.g., South Bank, Northeast Bank; see Figure 2) in years of high catch if the

in-season AM is triggered, though fish at inshore areas in territorial waters are expected to experience continued fishing effort. If complementary management is implemented, there could be greater conservation benefits to the entire stock complex in years of high catch. NMFS expects a small reduction in overfishing from years prior to the interim measure, regardless if complementary management is implemented. Overall, implementation of the status quo would slightly reduce overfishing, but it would not serve to end overfishing or rebuild the stock complex in accordance with the Magnuson-Stevens Act.

Alternative 2: Implement a Rebuilding Plan with a 1,500 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 2, NMFS would implement a rebuilding plan with an ACL of 1,500 lb, an in-season AM, and a higher performance standard. The authorized level of catch is intended to prevent overfishing while rebuilding the American Samoa bottomfish fishery to its B_{MSY} in eight years, but the achievement of this outcome is dependent on the territory implementing complementary management.

If Federal waters are closed through the higher performance standard and fishing levels remain constant to recent years, then, without complementary management by the territory, the intended conservation benefits of the proposed management measures would be substantially reduced and NMFS expects that it would take 19 years for the stock to rebuild. Under this scenario, NMFS expects the total annual catch to be 11,009 lb in the first year and 10,784 lb in subsequent years, which exceeds the OFL specified in the benchmark stock assessment (8,000 lb) but is below the long-term MSY (28,800 lb). Any displacement of fishing effort from Federal waters to territorial waters could offset this anticipated conservation benefit and increase the timeline for rebuilding. Additionally, since fishing would persist in territorial waters, this alternative may not end overfishing, but overfishing would still likely be reduced relative to the status quo. Nonetheless, a closure in Federal waters would reduce adverse impacts to fish populations in Federal waters relative to the status quo alternative, even though bottomfish harvested in territorial waters would continue experiencing consistent fishing effort if a complementary closure is not implemented.

If complementary management is implemented and the fishery is able to either stay under the 1,500 lb ACL or Federal and territorial waters close to fishing through the higher performance standard, then overfishing would be restricted and the fishery could rebuild within eight years. An annual catch level of 0 lb to 1,500 lb would generate biomass increases for the stock from 7.5 to 14.8 percent annually, with a total biomass increase of 139 to 154 percent over eight years (Fig. 6).

In summary, without complementary management, Alternative 2 is expected to slightly reduce overfishing relative to the status quo alternative, so fishery impacts on bottomfish would be slightly diminished and there would be a minor conservation benefit relative to the baseline. However, without complementary management, implementation of Alternative 2 would not end overfishing or rebuild the stock complex in accordance with the Magnuson-Stevens Act. If complementary management is implemented, there would be reduced adverse impacts to the bottomfish stock due to the restriction of harvest in both territorial and Federal waters likely to occur in the first year of the rebuilding plan, overfishing would be reduced, and the stock could rebuild in accordance with the rebuilding requirements of the Magnuson-Stevens Act. Regardless if complementary management is implemented, this alternative would still provide conservation

benefits and promote rebuilding to a greater extent than the status quo alternative due to the higher performance standard.

Alternative 3: Implement a Rebuilding Plan with a 5,000 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 3, NMFS would implement a rebuilding plan with an ACL of 5,000 lb, an in-season AM, and a higher performance standard. The authorized level of catch is intended to prevent overfishing while rebuilding the American Samoa bottomfish fishery to its B_{MSY} in ten years, but this outcome being achieved is dependent on the territory implementing complementary management. This alternative would authorize the highest possible amount of annual harvest that would still allow the stock complex to rebuild within the required ten-year timeframe.

Similar to Alternative 2, if Federal waters are closed through the higher performance standard without complementary management by the territory, the intended conservation benefits of the proposed management measures would be substantially reduced and NMFS expects that it would take 19 years for the stock to rebuild. Under this scenario, NMFS expects the total annual catch to be 11,534 lb in the first year and 10,784 lb in subsequent years, which exceeds the OFL specified in the benchmark stock assessment (8,000 lb) but is below the long-term MSY (28,800 lb). Any displacement of fishing effort from Federal waters to territorial waters could offset this anticipated conservation benefit and increase the timeline for rebuilding. Additionally, since fishing would persist in territorial waters, this alternative may not end overfishing but overfishing would still likely be reduced relative to the status quo. Nonetheless, a closure in Federal waters would reduce adverse impacts to fish populations in Federal waters relative to the status quo alternative, even though bottomfish harvested in territorial waters would continue experiencing consistent fishing effort if a complementary closure is not implemented.

If complementary management is implemented and the fishery is able to stay under the 5,000 lb ACL, then overfishing would be restricted and the fishery could rebuild within eight years. An annual catch level of 5,000 lb would generate biomass increases for the stock from 6.2 to 11.5 percent annually, with a total biomass increase of over 140 percent over 10 years (Figure 6). If complementary management is implemented, and the fishery is not able to stay under the ACL, then Federal and territorial waters would close to fishing under the higher performance standard. This scenario would end overfishing and rebuild the stock in eight years from the time of closure. The entire stock complex would receive conservation benefits from the restrictions on fishing in both territorial and Federal waters.

In summary, Alternative 3 would provide notable conservation benefits to the American Samoa bottomfish stock complex, but these benefits may not be fully realized if complementary management is not implemented. Without complementary management, Alternative 3 is expected to reduce, but not end, overfishing relative to the status quo, so fishery impacts on bottomfish would be slightly diminished and there would be a minor conservation benefit relative to the baseline, but this action would not end overfishing or rebuild the stock complex in accordance with the Magnuson-Stevens Act. If complementary management is implemented, there would be an increased conservation benefit to the bottomfish stock due to the restriction of harvest in both territorial and Federal waters likely to occur in the first year of the rebuilding plan, overfishing would be ended, and the stock could rebuild in accordance with the rebuilding

requirements of the Magnuson-Stevens Act. Regardless if complementary management is implemented, this alternative would still provide conservation benefits and promote rebuilding to a greater extent than the status quo alternative due to the higher performance standard. Alternative 3 would allow the most catch of the target species while maintaining a high likelihood of the stock complex rebuilding within the regulatory maximum time in consideration of mitigating social, cultural, and economic impacts to the American Samoa fishing community.

Alternative 4: Implement a Rebuilding Plan with a Temporary Moratorium on Bottomfish Fishing in Federal Waters

Under Alternative 4, NMFS would implement a rebuilding plan with a temporary moratorium on the harvest and possession of bottomfish in Federal water. Alternative 4 would prevent overfishing and the bottomfish fishery would be rebuilt from its overfished state in eight years. However, similar to the other alternatives, the achievement of this outcome is dependent on the territory implementing complementary management. The effect of Alternative 4 would be the same as described if the higher performance standard was implemented under Alternatives 2 and 3 (i.e., likely after the first year of the rebuilding plan being implemented), either if complementary management is implemented or if it is not implemented in territorial waters.

If a moratorium is enacted in only Federal waters, NMFS anticipates that fishing would continue in territorial waters without a complementary closure of territorial waters which would cause annual catch to be 10,784 lb, the stock would continue to be subject to overfishing, and the rebuilding time frame to extend to 19 years. A closure in Federal waters would reduce adverse impacts to fish populations in Federal waters relative to the status quo, even though bottomfish harvested in territorial waters would continue experiencing consistent fishing effort if a complementary closure is not implemented. Additionally, since fishing would persist in territorial waters, this alternative may not end overfishing, but overfishing would still likely be reduced relative to the status quo and would also be reduced to the greatest possible extent by NMFS. In this scenario, rebuilding would not take place consistent with Magnuson-Stevens Act requirements, but there is likely no action NMFS could take to achieve this without territorial cooperation.

If the territory implements complementary management, then Federal and territorial waters would be closed to fishing. This scenario would end overfishing and rebuild the stock in eight years. The entire stock complex would receive conservation benefits from the restrictions on fishing in both territorial and Federal waters. An annual catch level of 0 lb would generate biomass increases for the stock from approximately 9.2 to 14.8 percent annually, with a total biomass increase of approximately 154 percent over the course of eight years (Fig. 6). Regardless if complementary management is implemented or not, this alternative would reduce overfishing and promote rebuilding to a greater extent than all other alternatives. If the territory does not implement complementary management, Alternative 4 would pose greater constraints to fishermen than the status quo (and likely Alternatives 2 and 3 in the first year) for a slight conservation gain, but would provide minor additional conservation benefit in the first year of the rebuilding plan relative to Alternatives 2 and 3 due to the restriction of catches in Federal waters. In summary, Alternative 4 would prevent overfishing and support rebuilding stock to the greatest practicable extent possible by NMFS.

3.6 American Samoa Bottomfish Fishery and Potential Effects

The 2021 LOF estimated that there were less than 20 participants in the American Samoa bottomfish fishery (86 FR 3028, January 14, 2021). Fishing for bottomfish primarily occurs using aluminum *alia* catamarans less than 32 feet in length that are outfitted with outboard engines and wooden hand reels that fishermen use for both trolling and bottomfish fishing. Commercial and non-commercial fisheries for bottomfish occur primarily less than 20 miles from shore because few vessels carry ice, although some fishermen make longer trips to offshore banks in Federal waters (Brodziak et al. 2012).

Since 2000, the boat-based segment of the fishery has landed between an estimated 7,688 and 42,301 lb of bottomfish annually (Table 2). Over the last three years (2018 to 2020), approximately 7.2 percent of that catch has been commercially sold (Table 8; see Section 3.6.1), so the fishery is primarily non-commercial. Though the pelagic fisheries play a relatively larger role in American Samoa's economy, insular fisheries hold fundamental socioeconomic and dietary importance (Levine and Allen 2009). The demand for bottomfish on American Samoa varies depending on the need for fish at government and cultural events, and *alia* fishermen may switch to bottomfish fishing during periods when longline catches or prices are low (WPFMC 2021). Fishing grounds in Federal waters around American Samoa are also important for the harvest of deep-water snappers used for chiefly position entitlements and *fa'a lavelave* ceremonies (e.g., funerals, weddings, births, and special birthdays). The following section analyzes the effects of the alternatives on fishery catch.

3.6.1 Potential Effects of the Alternatives on the Fishery

Alternative 1: Status Quo / NMFS would not implement a Rebuilding Plan

Under Alternative 1, NMFS would not implement a rebuilding plan. Management measures would be the same as implemented under the interim measure in 2020 and 2021 for the fishery with an ACL of 13,000 lb and an in-season AM. While NMFS would count catches from both Federal and territorial waters towards the ACL, NMFS only has authority to manage the fishery in Federal waters. Regardless if complementary management is implemented in territorial waters, Alternative 1 would reduce bottomfish fishing opportunities in Federal waters in years of high catch where the ACL is attained, due to the application of the in-season AM.

ACLs were first implemented in 2012. Since then, the lowest estimated catch of bottomfish in American Samoa was in 2012 at 7,688 lb, and the greatest catch was in 2015 at 29,511 lb. The average annual catch from 2018 to 2020 was 12,687 lb (Table 7). The amount of catch authorized under this alternative is the same as implemented in 2020 and 2021, approximately 12 percent of the ACLs implemented in 2016 and 2017 (ACLs were not implemented in 2018 and 2019), and 103 percent of the recent three-year average.

Given the recent average catch level of 12,687 lb, it is possible that the American Samoa bottomfish fishery could remain under the 13,000 lb catch limit. If catches stay at the recent average, then no in-season AM would be implemented and the fishery would stay open in Federal waters year round. It is also possible that the catch limit could be exceeded during a year of high catch and cause the application of the in-season AM. Without complementary management, fishing would still occur in waters outside NMFS jurisdiction if a Federal closure

was implemented through the in-season AM. Since bottomfish habitat is predominantly found in territorial waters, NMFS expects that some fishing effort could be displaced from Federal waters to territorial waters in response to the application of the in-season AM without complementary management, and this displacement would limit the potential reduction in catch from the application of the in-season AM. However, given the recent average catch level relative to the ACL under this alternative, we expect that the fishery will continue operating as it has in recent years and not attain the ACL.

In summary, the status quo alternative would not change management for the fishery as it was under the interim measure and NMFS does not expect the ACL to be reached during the fishing year, except in years of high catch. Therefore, NMFS expects the fishery to continue operating as it has in recent years and to remain consistent with respect to catch and effort, with slight changes to catch and areas fished if the in-season AM is implemented, which would be late in the season. However, the stock complex persisting in an overfished state could impact fishery productivity in the long-term if the worsening condition of the stock complex results in reduced availability of bottomfish resources. Additionally, implementing the status quo alternative is not consistent with the rebuilding requirements under the Magnuson-Stevens Act.

Alternative 2: Implement a Rebuilding Plan with a 1,500 lb ACL, In-Season AM, and Higher Performance Standard

Under this alternative, NMFS would implement a rebuilding plan with an ACL of 1,500 lb for the American Samoa bottomfish fishery with an in-season AM and a higher performance standard to end overfishing and allow the stock complex to rebuild to its B_{MSY}, which is expected to take eight years. This alternative would set the ACL at 1.4 percent of the ACLs recently implemented in 2016 and 2017 (ACLs were not implemented in 2018 or 2019), at 11.5 percent of the ACL under the status quo, and approximately 12 percent of the recent three year average catch of 12,687 lb. While NMFS would count catches from both Federal and territorial waters towards the ACL, NMFS only has authority to manage the fishery in Federal waters, and the American Samoan Government may implement complementary management measures in territorial waters at its discretion. Regardless if complementary management is implemented, catch levels under Alternative 2 would be more restrictive than the status quo due to the lower ACL and the higher performance standard.

Under Alternative 2, the American Samoa bottomfish fishery would be expected to continue fishing as it has in the past and annual catch of bottomfish would be either slightly or notably less than recent years depending on whether complementary management is implemented in territorial waters. Annual catch for the fishery has surpassed the proposed ACL in all years from 2001 to 2020 (see Table 2). Based on monthly catch expansions for the fishery from 2016 to 2018 generated by NMFS from creel survey data (Figure 7), the average monthly catch in the fishery is 1,232 lb. Given the relatively low nature of the ACL under Alternative 2, NMFS expects that the ACL would be reached and the in-season AM could be applied before the end of February. However, the ACL may be reached as early as January (based on 2017 fishery performance) or as late as March (based on 2018 fishery performance).

Fishery closure estimation
12,687 lb ÷ 365 days = 34.8 lb/day
12,687 lb – 1,500 lb = 11,187 lb

11,187 lb ÷ 34.8 lb/day = ~321 days
365 days – 321 days = 44 days, or February 13

If complementary management is not implemented, the fishery is not expected to change the way it fishes with respect to fishing gear, effort, participation, or intensity compared to the status quo, but it would change with respect to catch and areas fished since bottomfish fishing would likely be prohibited in Federal waters for a majority of the first fishing year and the entirety of subsequent years of the rebuilding plan. Furthermore, fishermen who fish mainly in Federal waters may be affected more by a temporary closure of Federal water or substantially by a longer term closure of Federal waters. If NMFS implements the in-season AM (i.e., closes Federal waters) without complementary management in territorial waters it is probable that total catch would still exceed the proposed ACL due to the continuation of fishing in and potential displacement of fishing effort into territorial waters. If the fishery continues to operate as it has in recent years and assuming no displacement of effort, we would expect another 11,187 lb of catch to be harvested in the fishery during the remainder of the year after the ACL is reached. The best information currently available shows that the majority of bottomfish habitat is in territorial waters (85 percent), and the rest is in Federal waters (15 percent). NMFS uses the amount of habitat as a proxy for estimating the catch harvested in Federal and territorial waters. Assuming constant fishing effort throughout the year and no displacement of effort during a closure of Federal waters, NMFS estimates that there would be a reduction of catch in the fishery of 1,678 lb under Alternative 2 in the first year of the plan. That is, using the recent three-year average catch of 12,687 lb and the amount of habitat in Federal and territorial waters as a proxy for overall catch composition, NMFS projects that the fishery would reach the ACL of 1,500 lb in February. Approximately 1,678 lb of potential catch in Federal waters would not be caught in the remainder of the first year of the plan. In subsequent years, if the Federal fishery is closed year-round due to the higher performance standard, approximately 1,903 lb which may have been harvested in Federal waters would not be caught.

11,187 lb * 15% estimated habitat in Federal waters = ~1,678 lb of catch restricted due to the in-season AM and closure of Federal waters in the first year
12,687 * 15% estimated habitat in Federal waters = ~1,903 lb of catch restricted due to the higher performance standard after the first year

Therefore, NMFS expects the total annual catch under Alternative 2 if complementary management is not implemented to be 11,009 lb in the first year (i.e., 1,500 lb + (85 percent of 11,187 lb)) and 10,784 lb in subsequent years (i.e., 85 percent of 12,687 lb) when the higher performance standard is implemented in Federal waters. Continued harvest in territorial waters would limit the potential reduction in catch realized from a closure of Federal waters.

If complementary management is implemented, the fishery is not expected to change the way it fishes with respect to fishing gear, effort, participation, or intensity while the fishery remains open compared to the status quo. However, there could be substantial changes to effort, participation, intensity, catch, and areas fished if complementary management is enacted by the territory and both territorial and Federal waters are closed to the fishery by the application of the in-season AM and performance standard. If complementary management is enacted by the territory, catch in both territorial and Federal waters would be limited to 1,500 lb. However, it is probable that catch would exceed the proposed ACL even if complementary management is

implemented in territorial waters at the same time NMFS implements the in-season AM. This is because catch statistics usually become available about six months after local management agencies collect the data. Given the low ACL, it is likely that by the time sufficient catch data is collected through the creel survey program and processed by WPacFIN, the fishery would have already exceeded the ACL. Therefore, NMFS expects the total annual catch under Alternative 2 if complementary management is implemented in territorial waters to be higher than 1,500 lb in the first year and 0 lb in subsequent years.

Alternative 3: Implement a Rebuilding Plan with a 5,000 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 3, NMFS would implement a rebuilding plan with an ACL of 5,000 lb for the American Samoa bottomfish fishery with an in-season AM and a higher performance standard to end overfishing and rebuild the stock to its B_{MSY}, which is expected to take ten years. Alternative 3 would set the ACL at 4.7 percent of the ACLs implemented in 2016 and 2017 (ACLs were not implemented in 2018 or 2019), 38.5 percent of the ACL under the status quo, and at 39.4 percent of the recent average catch of 12,687 lb. While NMFS would count catches from both Federal and territorial waters towards the ACL, NMFS only has authority to manage the fishery in Federal waters and the American Samoa Government may implement management measures in territorial waters to complement federal rebuilding management at its discretion. Regardless if complementary management is implemented, catch levels under Alternative 2 would be more restrictive than the status quo due to lower ACL and the higher performance standard, but not as restrictive as Alternatives 2 or 4.

Under Alternative 3, the American Samoa bottomfish fishery would be expected to continue fishing as it has in the past and annual catch of bottomfish would be either slightly or notably less than recent years, depending on whether complementary management is implemented in territorial waters. Annual catch for the fishery has surpassed the proposed ACL in all years from 2001 to 2020 (Table 2), and the estimated catch in 2020 is almost double the ACL. Based on monthly catch expansions for the fishery, NMFS estimates that the ACL could be reached by May 24, based on the method described under Alternative 2, triggering the in-season AM.

If complementary management is not implemented, the fishery is not expected to change the way it fishes with respect to fishing gear, effort, participation, or intensity compared to the status quo while the fishery remains open. However, if ACL is reached and the in-season AM is triggered, the fishery would change with respect to catch and areas fished since bottomfish fishing would likely be prohibited in Federal waters for a more than half of the first fishing year and for the entirety of subsequent years if the higher performance standard is implemented. Furthermore, fishermen who fish mainly in Federal waters may be affected more by a temporary closure of Federal water or substantially by a longer term closure of Federal waters. If the ACL is reached and the in-season AM implemented without complementary management in territorial waters it is probable that total catch would still exceed the proposed ACL due to the continuation of fishing in and potential displacement of fishing effort into territorial waters. If the fishery continues to operate as it has in recent years and assuming no displacement of effort, there would be another 7,687 lb of catch expected to be harvested in the fishery during the remainder of the year. Assuming constant fishing effort throughout the year and no displacement of effort in the event of a closure of Federal waters, NMFS estimates that there would be a reduction of catch in

the fishery of 1,153 lb under Alternative 3 in the first year of the plan, based on the method described under Alternative 2. In subsequent years, if the Federal fishery is closed year-round due to the higher performance standard, approximately 1,903 lb which may have been harvested in Federal waters would not be caught, the same as under Alternative 2. Therefore, if complementary management is not implemented NMFS expects the total annual catch under Alternative 3 to be 11,534 lb in the first year (i.e., 5,000 lb + (85 percent of 7,687 lb)) and 10,784 lb in subsequent years (i.e., 85 percent of 12,687 lb) if the higher performance standard is implemented in Federal waters. Continued harvest in territorial waters would limit the potential reduction in catch realized from a closure of Federal waters.

If complementary management is implemented, the fishery is not expected to change the way it fishes with respect to fishing gear, effort, participation, or intensity while the fishery remains open compared to the status quo. However, the fishery would experience large impacts to operations and associated harvests if bottomfish fishing was prohibited in both Federal and territorial waters (either through the in-season AM being triggered or the higher performance standard being implemented). Under this scenario, total catch would be restricted to 5,000 lb annually. However, it is possible that catch would exceed the proposed ACL even if complementary management is implemented in territorial waters at the same time NMFS implements the in-season AM, although it is less likely than compared to Alternative 2. This is due to the lag between the collection of fishery data through the creel survey program and the time to process the data by WPacFIN and take management action. Therefore, NMFS expects the total annual catch under Alternative 3, if complementary management is implemented, to be higher than 5,000 lb in the first year and 0 lb in subsequent years, although it would be possible for catch to continue in subsequent years if the fishery can stay below the ACL.

In summary, Alternative 3 has the potential to result in increased health of the bottomfish stock relative to Alternative 1, which could allow for a more productive fishery going forward, while reducing adverse social, cultural, and economic effects on the fishing community relative to Alternatives 2 and 4. Regardless if complementary management is implemented, catch levels under Alternative 3 would be more restrictive than the status quo due to the lower ACL and the higher performance standard. However, catch would be less restrictive than Alternatives 2 and 4.

Alternative 4: Implement a Rebuilding Plan with a Temporary Moratorium on Bottomfish Fishing in Federal Waters

Under Alternative 4, NMFS would implement a fishing prohibition for and possession of bottomfish caught from in Federal waters around American Samoa. NMFS would implement the rebuilding plan starting in 2022 to rebuild the stock to its B_{MSY}, which is expected to take eight years. This alternative is functionally equivalent to the implementation of an ACL of 0 lb in Federal waters and is the Federal action that would support reducing overfishing to the greatest extent while rebuilding the bottomfish stock complex in the shortest possible time. The fishery is not expected to make any significant changes to its fishing gear, effort, participation, or intensity over the course of the rebuilding plan as a result of this alternative without the implementation of complementary management, but slight changes are expected for the total amount of catch and areas fished since bottomfish fishing would be prohibited in Federal waters.

Without complementary management, catch would not be completely eliminated (i.e., an ACL of 0 lb achieved). NMFS expects a moderate reduction in catch relative to the status quo and only

slightly relative to Alternatives 2 and 3 in the first year of the rebuilding plan if territorial waters are not also closed. In this scenario, if the fishery continues activity as it has in recent years, catch of bottomfish may be reduced by 1,903 lb annually from the status quo over the course of the rebuilding plan. This would be a reduction of 225 lb from Alternative 2 and 750 lb from Alternative 3 in the first year of the rebuilding plan and likely the same reduction as these alternatives in subsequent years. Total catch from territorial waters under this scenario is expected to be 10,784 lb annually. However, it is expected that some fishing activity would be displaced from Federal waters to territorial waters if a closure were to be implemented and may offset some of the expected reduction in catch.

If complementary management is implemented, the fishery would be closed in both territory and Federal waters, resulting in an annual catch of 0 lb for the duration of the rebuilding plan. This would result in a significant impact to effort, participation, intensity, catch, and areas fished by the fishery.

3.7 American Samoa Fishing Communities and Potential Effects

The Magnuson-Stevens Act defines a fishing community as "a community that is substantially dependent upon or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew, and fish processors that are based in such communities" (16 U.S.C. § 1802(16)). NMFS further specifies in the National Standard guidelines that a fishing community is "a social or economic group whose members reside in a specific location and share a common dependency on commercial, recreational, or subsistence fishing or on directly related fisheries dependent services and industries (for example, boatyards, ice suppliers, tackle shops)".

In 1998, the Council identified American Samoa as a fishing community and requested the Secretary of Commerce concur with this determination. American Samoa was recognized in regulation as a fishing community under the Magnuson-Stevens Act on April 19, 1999 (64 FR 19067). The community continues to participate in the Council decision-making process through its representatives on the Council, its Advisory Panel members, opportunities for public input during the Council's deliberations, and public comment periods during NMFSs rulemaking process. The most recent SAFE report (WPFMC 2021) was just the second iteration of the report to present sales data after the ECS amendment that revised the list of bottomfish in the American Samoa Archipelago. Therefore, estimates of commercial sales of the 11 species that remain categorized as BMUS only recently became available. The remaining species were selected in part because of their importance to the fishery, and likely comprised most reported sales prior to the ECS amendment.

This section evaluates the effect management alternatives may have on the economy, way of life, and traditions of human communities, including fishing communities. Table 9in Section 2.3.3shows that between 2018 and 2020, American Samoa bottomfish fishermen caught an average of 12,687 lb of bottomfish annually and sold an average of 965 lb (i.e., a recent average of 7.2 percent of total estimated catch is sold). Based on the 2020 commercial estimate of pounds sold (307 lb) and the commercial value of the fishery in 2020 ($1,067), the average adjusted price per pound in 2020 was $3.48. The 2021 LOF estimated there were less than 20 participants in the fishery (86 FR 3028, January 14, 2021). If participation and effort were equal in 2020,

each of the 20 fishermen would have sold approximately 15 lb of bottomfish, valued at $53 per fisherman.

"Cultural fishing" is a relatively new term and is not readily defined (Kleiber and Leong 2018). As with other studies of culture, cultural fishing is context dependent; definitions from other areas may not be suitable for American Samoa. As noted in Section 2.2, American Samoa culture is often framed in terms of *fa'a Samoa*, or the "Samoan Way", which governs local social norms and practices. This includes core values and practices such as *tautua*, or "service", which involves the broad collective sharing of labor, resources, income, and social and political support to strengthen the *aiga* (family groups), the village, and the role of chiefs in perpetuating *fa'a Samoa*. In a fisheries context, this may mean the distribution of catch within the *aiga*, or the use of fish at specific ceremonial events. In a letter to NMFS on June 15, 2020, the DMWR highlighted that deepwater snappers are critical for cultural ceremonies and *fa'a lavelave* (e.g., funerals, weddings, births, or special birthdays). Cultural fishing also encompasses day-to-day practices of subsistence, and coral reef fisheries are particularly important from a dietary and socio-cultural standpoint (Kilarski et al. 2006; Levine and Allen 2009). Considering that generally less than eight percent of bottomfish catch is sold (Table 9), this fishery can be considered predominantly non-commercial, providing fish for sustenance and cultural events. This importance for subsistence and cultural use is evident during important community events, and demand for bottomfish varies depending on the need for fish at government and cultural events (WPFMC 2021).

3.7.1 Potential Effects of the Alternatives on the American Samoa Fishing Community

Alternative 1: Status Quo / NMFS would not implement a Rebuilding Plan

Under Alternative 1, NMFS would not implement a rebuilding plan. Management measures would be the same as implemented under the interim measure in 2020 and 2021 for the fishery with an ACL of 13,000 lb and an in-season AM. While NMFS would count catches from both Federal and territorial waters towards the ACL, NMFS only has authority to manage the fishery in Federal waters.

As described in Section 3.5.1, since the fishery is expected to perform similarly to how it did under the interim measure, commercial sales and revenues are also expected to remain consistent to recent years. An average of 7.2 percent of bottomfish catch is sold annually (Table 9). If there is 12,687 lb of catch on an annual basis, at the recent average price of $3.99 per lb (Table 9), expected revenue would be $3,645. Using the estimated number of 20 fishery participants from the 2021 LOF (86 FR 3028, January 14, 2021), each fisher would earn approximately $182. NMFS expects this scenario to remain consistent regardless of the implementation of complementary management by the territorial government.

This alternative would not further restrict bottomfish fishing activity in American Samoa relative to the fishery under the interim measure and there would be only a slight reduction in revenues and resource availability compared to an unconstrained fishery or in years of high catch. Therefore, this alternative is not expected to have short-term cultural, economic, or social impacts to fishing communities in American Samoa. If only a Federal closure is implemented through the application of the in-season AM, fishing would only be restricted in Federal waters. If complementary territorial management is also implemented, then in years of high catch fishing

would be restricted in all waters and there would be no bottomfish resources available to the community. If this occurred, it would likely be very late in the fishing season. However, given the recent average catch level of 12,687 lb, it is possible that the American Samoa bottomfish fishery could remain under the 13,000 lb catch limit and the fishery would remain open in Federal waters. Non-commercial fishing (inclusive of recreational, sustenance, and cultural fishing) would be similarly affected under the status quo.

Alternative 1 would only slightly reduce overfishing of bottomfish relative to previous years, similar to what was observed under the interim measure, but it would take 28 to 32 years to rebuild the stock. This could have longer-term cultural, economic, and social impacts for the American Samoa fishing community if the diminished health of the stock complex reduces available bottomfish resources and revenues in the future. Additionally, this alternative would not be in compliance with the rebuilding requirements of the Magnuson-Stevens Act.

Table 14. Estimated revenues in American Samoa bottomfish fishery under each of the alternatives. All estimates assume a price per lb of $3.99 and 20 participants in the fishery.

Years	Alt.	Parallel mgmt. by territory?	Expected catch (lb)	Expected lb sold	Total revenue ($)	Revenue per participant ($)	Difference from Alt. 1 ($)	Percent difference from Alt. 1
Annually	1	Yes	12,687	913	3,645	182	0.0	0.0
Annually	1	No	12,687	913	3,645	182	0.0	0.0
2022	2	Yes	1,500	108	431	22	160.7	88.2
2022	2	No	11,009	793	3,163	158	24.1	13.2
After 2022	2	Yes	0	0	0	0	182.0	100.0
After 2022	2	No	10,784	776	3,098	155	27.3	15.0
2022	3	Yes	5,000	360	1,436	72	110.4	60.6
2022	3	No	11,534	830	3,313	166	16.6	9.1
After 2022	3	Yes	0	0	0	0	182.2	100.0
After 2022	3	No	10,784	776	3,098	155	27.3	15.0
Annually	4	Yes	0	0	0	0	182.0	100.0
Annually	4	No	10,784	776	3,098	155	27.3	15.0

Alternative 2: Implement a Rebuilding Plan with a 1,500 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 2, NMFS would implement a rebuilding plan with an ACL of 1,500 lb, an in-season AM, and a higher performance standard. The authorized level of catch is intended to prevent overfishing while rebuilding the American Samoa bottomfish fishery to its B_{MSY} in eight years. Alternative 2 establishes a more conservative ACL than the status quo and would do less to mitigate cultural, economic, and social effects to the fishing community while rebuilding bottomfish faster than Alternative 1, slightly faster than Alternative 3, and at the same time as Alternative 4. The extent of the impacts to the community would be dependent on whether the territorial government implements complementary management. There is not detailed information on whether catch for commercial or non-commercial purposes comes disproportionately from territorial or Federal waters or the proportions of species that are caught in these waters. Overall, it is expected that the amount of fish caught for sustenance and cultural purposes would be affected similarly to fish caught for commercial purposes.

Without complementary management and while the total catch remains below the ACL, there would be no community impacts. If catches are similar to recent years, then it is likely that the ACL would be attained during the first few months of the year. If the Federal fishery is closed through the in-season AM or the higher performance standard, the impacts would be greater to fishermen who harvest predominately in Federal waters and those community components that rely on fish from Federal waters. If catch is 11,009 lb in the first year of the plan and 7.2 percent of the catch is sold commercially at $3.99 pound, then 793 lb would be sold for $3,163. With 20 participants in the fishery, each fisher would earn $158. This is a decrease of approximately $24 (or 13 percent) from the status quo alternative (Table 14). For the subsequent years when Federal waters are closed, if total catch is 10,784 lb from territorial waters and 7.2 percent of the catch is sold commercially at $3.99 pound, then 776 lb would be sold for $3,098 and each participant would earn an average of $155. This is a decrease of $27 (or 15 percent) from the status quo alternative (Table 14). If fishermen compensated for a closure of Federal waters by catching bottomfish in territorial waters that remained open to fishing, revenue and fish availability would be closer to that expected under the status quo alternative. Thus, large cultural, economic, or social impacts are not expected under Alternative 2 if complementary management is not implemented.

If complementary management is implemented, catch would likely be higher than 1,500 lb in the first year and 0 lb in subsequent years. If 7.2 percent of this catch is sold for $3.99 per pound, then 108 lb would be sold for a total of $431 and each fishery participant would earn $22 in the first year. This would be a decrease of approximately $161 (or 88 percent) per fisher from the status quo (Table 14). If the fishery is closed in subsequent years, then catch and revenue would both be reduced to zero and this would result in an expected loss of revenue of $3,645 for the fishery and over $182 per fisher relative to the status quo. This would likely have substantial impacts to the fishing community due to both the elimination of commercial revenue as well as locally-sourced bottomfish for subsistence, cultural, and religious purposes. However, the improved health of the stock complex could benefit the community in the long-term by improving fishery sustainability.

Alternative 2 represents the Federal action that would rebuild the stock in the shortest amount of time while allowing the highest level of catch to the fishing community. However, NMFS does not expect these objectives to be achieved in the absence of complementary management since fishing is likely to continue in territorial waters. Under Alternative 2, revenue and fish availability would be lower than under the status quo alternative, regardless if complementary management or the higher performance standard is implemented. Without complementary management, there would be a decrease in revenue and fish availability of 13.2 percent in the first year of the rebuilding plan and by 15 percent for subsequent years of the rebuilding plan compared to the status quo. With complementary management, the decrease in revenue would be 88 percent in the first year and 100 percent in subsequent years. The decrease in revenue under Alternative 2 is more than would be expected under Alternative 3 and less than Alternative 4 for the first year of the rebuilding plan, but the alternatives would likely be comparable after the first year regardless of whether complementary management is implemented. Substantial social, cultural, or economic effects to the American Samoa fishing community are not expected if complementary management is not implemented by the territory. If complementary management is implemented, there would be substantial impacts to the fishing community.

Alternative 3: Implement a Rebuilding Plan with a 5,000 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 3, NMFS would implement a rebuilding plan with an ACL of 5,000 lb for the American Samoa bottomfish fishery with an in-season AM and a higher performance standard to end overfishing and rebuild the stock to its B_{MSY}, which is expected to take ten years. This alternative would do more to mitigate cultural, economic, and social effects to the fishing community compared to Alternatives 2 and 4 while rebuilding bottomfish within ten years. The extent of the impacts to the community would be dependent on whether the territorial government implements complementary management or not. There is not detailed information on whether catch for commercial or non-commercial purposes comes disproportionately from territorial or Federal waters or the proportions of species that are caught in these waters. Overall, it is expected that the amount of fish caught for sustenance and cultural purposes would be affected similarly to fish caught for commercial purposes.

Without complementary management, and while the total catch remains below the ACL, there would be no community impacts. If catches are similar to recent years, then it is likely that if the ACL would be attained during the first half of the year. If the Federal fishery is closed through the in-season AM or the higher performance standard, the impacts would be greater to fishermen who harvest predominately in Federal waters and those community components that rely on fish from Federal waters. If catch is 11,534 lb in the first year of the rebuilding plan and 7.2 percent of the catch is sold commercially at $3.99 pound, then 830 lb would be sold for $3,313. With 20 participants in the fishery, each fisher would earn $166. This is a decrease of nearly $17 (or 9.1 percent) from the status quo alternative (Table 14). If Federal waters are closed in subsequent years, total catch from territorial waters is expected to be 10,784 lb. If 7.2 percent of the catch is sold commercially at $3.99 pound, then 776 lb would be sold for $3,098 and each participant would earn an average of $155. This is a decrease of $27 (or 15 percent) from the status quo alternative (Table 14). If fishermen compensated for a closure of Federal waters by catching bottomfish in territorial waters that remained open to fishing, revenue and fish availability would be closer to that expected under the status quo alternative. Thus, large cultural, economic, or social impacts are not expected under Alternative 3 if complementary management is not implemented.

If complementary management is implemented, both territorial and Federal waters would be restricted to bottomfish fishing after the ACL is attained in accordance with the in-season AM. NMFS expects that the fishery would catch around 5,000 lb, considering potential delays in tracking the cumulative annual catch and applying the in-season AM. If 7.2 percent of this catch is sold for $3.99 per pound, 360 lb would be sold for a total of $1,436 and each fishery participant would earn $72. This would be a decrease in revenue of approximately $110 (or 60.6 percent) per fisher from the status quo (Table 14). If the fishery is closed in subsequent years, then catch and revenue would both be reduced to zero and this would result in an expected loss of revenue of $3,645 for the fishery and over $182 per fisher relative to the status quo. This would likely have substantial impacts to the fishing community due to both the elimination of commercial revenue as well as locally-sourced bottomfish for subsistence, cultural, and religious purposes. However, the improved health of the stock complex could benefit the community in the long-term by improving fishery sustainability.

Alternative 3 represents the Federal action that would provide the greatest amount of catch to the fishing community while still adhering to the rebuilding requirements of the Magnuson-Stevens Act. However, NMFS does not expect these objectives to be achieved in the absence of complementary management since fishing is likely to continue in territorial waters. While the fishery remains under the ACL, there would be no impacts to the revenue or fish availability. If the fishery reaches or exceeds the ACL, regardless if complementary management or the higher performance standard is implemented, revenue and fish availability would be lower than under the status quo alternative. Without complementary management, there would be a decrease in revenue and fish availability of 9.1 percent in the first year of the rebuilding plan and by 15 percent for subsequent years of the rebuilding plan. With complementary management, there would be a decrease of 60.6 percent in the first year and 100 percent in subsequent years. For the first year of the rebuilding plan, the decrease in revenue under Alternative 3 is less than would be expected under Alternatives 2 and 4, but the alternatives would be comparable after the first year regardless of whether complementary management is implemented. Similar to Alternative 2, substantial social, cultural, or economic effects to the American Samoa fishing community are not expected if complementary management is not implemented by the territory. If complementary management is implemented and the fishery is unable to stay under the ACL, there would be substantial impacts to the fishing community.

Alternative 4: Implement a Rebuilding Plan with a Temporary Moratorium on Bottomfish Fishing in Federal Waters

Under Alternative 4, NMFS would implement a fishing prohibition for and possession of bottomfish caught from in Federal waters around American Samoa. NMFS would implement the rebuilding plan starting in 2022 until such time that the bottomfish stock complex is determined to be rebuilt, which is expected to take eight years. Revenue and availability of bottomfish to the community would be moderately lower or completely reduced relative to the status quo depending on if complementary management is implemented. There is not detailed information on whether catch for commercial or non-commercial purposes comes disproportionately from territorial or Federal waters or the proportions of species that are caught in these waters. Overall, it is expected that the amount of fish caught for sustenance and cultural purposes would be affected similarly to fish caught for commercial purposes.

If territorial waters remained open, some bottomfish resources would be available to the fishing community for the duration of the rebuilding plan. If fishermen compensated for a closure of Federal waters by displacing their effort into territorial waters, revenue and fish availability could be closer to recent years. If complementary management is implemented, there would be substantial impacts to the fishing community due to the lack of bottomfish resources for ceremonial and subsistence purposes and commercial revenue from the fishery.

Overall, implementation of Alternative 4 is expected to affect the fishery and associated communities more than the status quo and all other action alternatives. Revenue would be decreased relative to the status quo (and Alternatives 2 and 3 in the first year), but this decrease would be marginal and is not expected to result in any large social or economic effects to the American Samoa fishing community. In summary, this alternative does less than all other alternatives to mitigate adverse cultural, economic, and social effects by reducing or eliminating the amount of fish available. However, the reductions in catch would allow the biomass of the

stock complex to recover, and the improved health of the stock complex could benefit the community in the long-term by improving the sustainability of the fishery.

Without complementary management, bottomfish catch may be slightly reduced from the status quo. If total catch is 10,784 lb from territorial waters and 7.2 percent of the catch is sold commercially at $3.99 pound, then 776 lb would be sold for $3,098 and each participant would earn an average of $155. This is a decrease of $27 (or 15 percent) from the status quo alternative (Table 14). If fishermen compensated for a closure of Federal waters by catching bottomfish in territorial waters that remained open to fishing, revenue and fish availability would be closer to that expected under the status quo alternative. Thus, large cultural, economic, or social impacts are not expected under Alternative 2 if complementary management is not implemented.

If complementary management is implemented, then both territorial and Federal waters would be closed to the fishery. Catch and revenue would both be reduced to zero and this would result in an expected loss of revenue of $3,645 for the fishery and over $182 per fisher relative to the status quo. This would likely have substantial impacts to the fishing community due to both the elimination of commercial revenue as well as locally-sourced bottomfish for subsistence, cultural, and religious purposes. However, the improved health of the stock complex could benefit the community in the long-term by improving fishery sustainability.

Alternative 4 represents the Federal action that would be most likely to address overfishing as well as allow rebuilding of the stock complex in the shortest possible amount of time. However, NMFS does not expect these objectives to be achieved in the absence of complementary management since fishing is likely to continue in territorial waters. Revenue and fish availability would be lower than under the status quo alternative, regardless if complementary management is implemented. Without complementary management, there would be an annual decrease in revenue and fish availability of 15 percent. With complementary management, the decrease in revenue would be 100 percent. Therefore, implementation of Alternative 4 is expected to affect the fishery and associated communities more than the status quo alternative as well as Alternatives 2 and 3 in the first year. Overall, this alternative does less than the status quo alternative to mitigate effects on commercial markets and sustenance and cultural practices in American Samoa and does not mitigate socio-economic effects as well as Alternatives 2 or 3.

3.7.2 Potential Effects to Public Health and Safety at Sea

Considering the past and current operation of the American Samoa bottomfish fishery, there have been no noted adverse effects on public health and no significant concerns with safety at sea. The fishery has not typically fostered a “race to fish”. This is expected to remain consistent under the status quo alternative as the most recent management regime for the fishery would be maintained. Under Alternatives 2 and 3, the fishery would likely exceed the implemented ACL and be subject to a Federal closure in subsequent years of the rebuilding plan under the higher performance standard. Whether fishing in territorial waters would also occur is dependent on the territory’s decision to implement complementary management with this Federal action. In the absence of complementary management, fishing is expected to continue in territorial waters where the majority of bottomfish habitat occurs (about 85 percent, see Fig. 2), so a race to fish is not expected. If complementary management is implemented under Alternatives 1, 2 or 3, a race to fish might occur in the first year of the rebuilding plan before the performance standard is expected to close the fishery in subsequent years. Alternative 4, which would implement a

complete closure of Federal waters to bottomfish fishing, is not expected to result in a race to fish if complementary management is not implemented since territorial waters would remain open and unrestricted to bottomfish fishing. If complementary management is implemented under Alternative 4, then a race to fish would similarly not occur because both territorial and Federal waters would be closed to the fishery. Because none of the proposed alternatives are expected to result in drastic changes to current fishery operations and the majority of bottomfish habitat would remain unrestricted with respect to the harvest of bottomfish if complementary management is not implemented, none of the proposed alternatives are expected to result in an increased likelihood for impacts to public health, issues associated with safety at sea, or a race to fish for bottomfish fishermen in American Samoa. If complementary management is implemented, a race to fish might occur in the first year of the rebuilding plan before the higher performance standard is expected to close the fishery in subsequent years. However, NMFS does not expect a race to fish to occur given the small number of participants in the fishery and because the fishery would be open for at least several months in the first year. Therefore, there are no expected changes due to this action that would increase the likelihood for impacts to public health or issues associated with safety at sea.

3.7.3 Potential for Controversy

The Council developed the proposed action for implementation by NMFS via a public process in accordance with the Magnuson-Stevens Act, implementing regulations, the American Samoa Archipelago FEP, and other applicable statutes. NMFS and the Council's SSC determined the results of the 2019 stock assessment (Langseth et al. 2019) to be BSIA (Section 1.5), which allows the stock assessment to be used in the setting of ACLs for the American Samoa bottomfish stock complex consistent with National Standard 2 and the American Samoa Archipelago FEP. The Council immediately began work towards this proposed rebuilding plan, as required by the Magnuson-Stevens Act, in consultation with its advisory bodies, PIFSC fishery scientists and managers, and the American Samoa DMWR. The Council used BSIA in the development of this proposed action alongside input from the public during publicly-noticed Council meetings. This public coordination has not revealed significant controversy regarding impacts to the quality of the human environment from this action. However, American Samoa bottomfish fishermen, members of the Council, and members of the Council's SSC have all expressed concerns at SSC and Council meetings regarding the social, cultural, and economic effects of taking action to end overfishing and rebuild the American Samoa bottomfish fishery using a relatively low catch limit or closure of Federal waters. Fishermen have expressed concerns about the data used in the stock assessment, which produced results leading to the proposed action, and regarding the implementation of a much lower catch limit than the one offered in the interim measure developed by NMFS (i.e., the status quo). A letter to NMFS from the American Samoa DWMR on June 15, 2020 also indicated that DMWR opposed the catch limit implemented by the interim measure, and they would not implement complementary management measures with that Federal action. The negative reaction to a relatively higher interim catch limit than proposed under the alternatives for this action indicates that the catch limits and closure proposed under the action alternatives would likely illicit similar responses. However, all Council members from American Samoa voted in favor of the preferred alternative (Alt. 3) when the Council took final action on the rebuilding plan at its 188th meeting on October 19, 2021.

The concerns regarding the negative effects of immediately ending overfishing were reflected in the Council's request for NMFS to implement an interim measure while a rebuilding plan was developed. The interim measure recommended a catch limit of 13,000 lb, which is the largest catch level that would allow stock biomass to increase, as required by 50 CFR 600.310(j)(4), but does not end overfishing. The proposed action presents ACLs of 1,500 lb and 5,000 lb, which are intended to both prevent overfishing and promote rebuilding of the bottomfish stock complex in accordance with Magnuson-Stevens Act requirements, as well as a Federal fishery closure, which is the action that could be taken by NMFS to best restrict overfishing and achieve rebuilding in the shortest possible amount of time. Alternative 2 for this action represents an increased consideration for the fishery and fishing community (inclusive of cultural fishing practices), as it would allow the most possible bottomfish catch while also promoting rebuilding in the shortest possible time (i.e., the same amount of time as in absence of fishing). Alternative 3 addresses impacts to the fishery and associated fishing communities to the greatest extent permitted by the requirements of the Magnuson-Stevens Act and implementing regulations, as it would allow the highest possible level of bottomfish catch while allowing for rebuilding to occur in the regulatory maximum timeframe. The proposed action alternatives would reduce overfishing relative to the status quo, and Alternatives 2 and 3 would mitigate socioeconomic impacts to the fishing community relative to the Alternative 4. The presented alternatives satisfy regulatory requirements to set an authorized catch level that would end overfishing and rebuild the fishery within 10 years, though their ability to do so is dependent on whether the territory implements management in its waters to complement Federal management. The Council and NMFS solicited additional public comments on the potential effects of the proposed action over a 60-day public comment period associated with this rulemaking.

On January 21, 2022, NMFS published a NOA for Amendment 5 and requested public comments (87 FR 3276); the comment period ended March 22, 2022 and there were two comments from individuals. These comments generally supported the action, and voiced concerns about the involvement of indigenous community members in decision-making, subsistence fishing, and enforcement. On February 4, 2022, NMFS published a proposed rule to implement Amendment 5 and the rebuilding plan and again requested public comments (87 FR 6479). That comment period ended March 21, 2022, and NMFS received seven comments from individuals generally supporting the action, with comments recommending community involvement and input, coordinated management with the territory, mandatory catch reporting, and inquiring about relief to fishermen that may experience economic effects as a result of the action. NMFS also received comments from the Governor of American Samoa and the DMWR. These comments supported the action while highlighting concerns about social, economic, and cultural impacts from reduced access to bottomfish; recommended Federal and territorial collaboration to improve bottomfish data acquisition and stock assessments; requested that NMFS adjust the rebuilding plan if the next stock assessment shows bottomfish stocks are healthier; and sought assistance from NMFS to develop a community development plan. NMFS considered all comments in finalizing the EA, and provides responses in the Final Rule. None of the comments resulted in a change to the alternatives or a substantive change to the environmental effects analysis.

3.8 Protected Resources in American Samoa and Potential Effects

There are several protected species known to occur in the waters around American Samoa, and thus, there exists potential for the American Samoa bottomfish fishery to interact with these protected species. NMFS has evaluated potential impacts on protected species by the American Samoa bottomfish fishery such that they can be managed in compliance with the Magnuson-Stevens Act, the Marine Mammal Protection Act (MMPA), the Endangered Species Act (ESA), and other laws as applicable. More detailed descriptions of protected species around American Samoa are available in Section 3.3.4 of the FEP for the American Samoa Archipelago (WPFMC 2009) and online on the NMFS website.

3.8.1 Applicable ESA Coordination for American Samoa Bottomfish Fisheries

In a biological opinion submitted on March 8, 2002, for the FMP for Bottomfish and Seamount Groundfish Fisheries of the Western Pacific, NMFS determined that bottomfish and seamount groundfish fisheries of the Western Pacific region (including the bottomfish fishery of American Samoa) that operate in accordance with regulations implementing the FMP were not likely to adversely affect ESA-listed sea turtle and marine mammal species. Critical habitat is not designated for any species in American Samoa, so bottomfish fishery does not adversely modify critical habitat of any ESA-listed species. Bottomfish fishing vessels are anchored or moving slowly while fishing, and there have been no reports of observations between the American Samoa bottomfish fishery and ESA-listed protected species.

In 2009, the Council recommended and NMFS approved the development of five archipelagic-based FEPs, including the FEP for the American Samoa Archipelago. The FEP incorporated and reorganized elements of the Council's species-based FMPs, including the Bottomfish and Seamount Groundfish Fisheries FMP into a spatially-oriented management plan (75 FR 2198, January 14, 2010). The Council retained all applicable regulations pertaining to bottomfish fishing in the development and implementation of the FEP for the American Samoa Archipelago.

There have been several new species added to the list of threatened and endangered species since the 2002 biological opinion by NMFS. On July 3, 2014, NMFS published a final rule that listed four distinct population segments (DPSs) of scalloped hammerhead sharks under the ESA (79 FR 38213), and it was shown that the threatened Indo-West Pacific DPS occurs around American Samoa. On September 10, 2014, NMFS published a final rule that listed 20 species of reef-building corals as threatened under the ESA (79 FR 53852), and six of those species may occur around American Samoa. On April 9, 2015, NMFS documented its determination in a Letter of Concurrence under section 7 of the ESA that the continued authorization of the bottomfish fishery is not likely to adversely affect the Indo-West Pacific DPS of scalloped hammerhead sharks or ESA-listed reef building corals.

On January 22, 2018, NMFS issued a final rule to list the giant manta ray as a threatened species under the ESA (83 FR 2916). On January 30, 2018, NMFS issued a final rule to list the oceanic whitetip shark as a threatened species under the ESA (83 FR 4153). On September 28, 2018, NMFS issued a final rule to list the chambered nautilus as a threatened species under the ESA (83 FR 48976). These species occur within the area of operation the fisheries. In a biological evaluation (BE) dated June 5, 2019, prepared in support of re-initiated consultation, NMFS

concluded that the American Samoa bottomfish fishery may affect, but is not likely to adversely affect:

- Loggerhead, leatherback, olive ridley, green, and hawksbill sea turtles;
- Humpback, blue, fin, sei, and sperm whales;
- Indo-West Pacific DPS of scalloped hammerhead shark, oceanic whitetip shark;
- Giant manta ray; and
- Chambered nautilus, and
- Five reef-building corals – *Acropora globiceps, A. jacquelineae, A. retusa, A. speciosa, Euphyllia paradivisa,* and *Isopora crateriformis*.

On June 5, 2019, NMFS requested concurrence with this finding. On June 6, 2019, August 11, 2020, December 15, 2020, and February 9, 2022, NMFS determined that, pending the completed consultation, the continued operation of the bottomfish fishery in American Samoa would not violate ESA Section 7(a)(2), or result in an irreversible or irretrievable commitment of resources precluding implementation of any reasonable and prudent alternatives, and would not violate ESA Section 7(d) (NMFS 2019b; NMFS 2020a; NMFS 2020b). Based on all data available, there have been no observed or reported interactions between the American Samoa bottomfish fishery and any species of sea turtle or whale, scalloped hammerhead sharks, oceanic whitetip sharks, giant manta rays, or chambered nautilus to date. Given the limited number of bottomfish fishing vessels in American Samoa and how the fishery operates (i.e., bottomfish fishing occurs while either at anchor or slowly drifting over fishing grounds), interactions or vessel collisions between bottomfish vessels and these species are not expected.

Additional information is provided on sea turtles, marine mammals, seabirds, corals, giant manta rays, sharks, and chambered nautilus in American Samoa in the following sections.

3.8.2 Sea Turtles

All sea turtles are subject to protection under the ESA in American Samoa (Table 15). Direct harvest, direct harm, and indirect harm are prohibited unless the ESA section 9 prohibition on take is otherwise exempted. In the United States, NMFS and the U.S. Fish and Wildlife Service (USFWS) have joint jurisdiction for the recovery and conservation of ESA-listed threatened and endangered sea turtles. NMFS has jurisdiction over sea turtles in the marine environment, while the USFWS has jurisdiction of these species in the terrestrial environment (e.g. nesting beaches). NMFS has coordinated the continued authorization of the American Samoa bottomfish fishery under Section 7 of the ESA. All six sea turtle species occurring in U.S. waters are listed under the ESA. The range of five of these species overlaps with the EEZ around American Samoa, and they may be encountered by fishermen. Territorial regulations prohibit the take, possession, and sale of green, hawksbill, and leatherback sea turtles (ASCA § 24.0959). Table 14 lists the sea turtle species reasonably likely to occur around American Samoa. No critical habitat has been established for any sea turtle species in American Samoa.

On September 22, 2011, NMFS published a final rule determining that the world loggerhead turtle population was comprised of nine DPSs, five of which are an endangered and four that are threatened. The distribution of the South Pacific Loggerhead turtle DPS overlaps with the EEZ around American Samoa. Though this DPS is known to nest on beaches several hundred nautical

miles north of the islands of the Samoa Archipelago, loggerheads may travel to and reside in habitats in the central and southeastern Pacific Ocean for several years before returning to the western Pacific for reproduction (Conant et al. 2009). There are no records of this species nesting in American Samoa, but loggerheads are known to transit the EEZ around the territory (Maison et al. 2010; Seminoff et al. 2015). The presence of green turtles, hawksbill turtles, and olive ridley turtles in the EEZ around American Samoa is well-documented (Seminoff et al. 2015).

Sea turtles currently face many threats, including (1) direct harvest of animals and eggs or predation; (2) incidental interactions with fisheries; (3) collisions with vessels and automobiles; (4) urban development / loss of habitat; (5) pollution (e.g., plastics); and (6) climate change. Sea turtle conservation initiatives are also in place, including restoration of habitats, laws to protect turtles, and management of threats to help provide for recovery. More information on the conservation of sea turtles is available on the NMFS website.

Table 15. ESA-listed sea turtles known to occur or reasonably expected to occur in waters around the American Samoa Archipelago.

Common names/ DPS if applicable	Scientific Name	ESA listing status in American Samoa	Occurrence in American Samoa	Interactions with the American Samoa bottomfish fishery through 2020
Green sea turtle (laumei enaena and fonu) Central South Pacific DPS	*Chelonia mydas*	Endangered DPS	Frequently seen. Nest at Rose Atoll. Known to migrate to feeding grounds.	No interactions observed or reported.
Hawksbill sea turtle (laumei uga)	*Eretmochelys imbricata*	Endangered	Frequently seen. Nest at Rose Atoll and Swain's Island.	No interactions observed or reported.
Leatherback sea turtle	*Dermochelys coriacea*	Endangered	Rare in American Samoa. One recovered dead in experimental longline fishing.	No interactions observed or reported.
Olive ridley sea turtle	*Lepidochelys olivacea*	Threatened	Uncommon in American Samoa. Three sightings.	No interactions observed or reported.
Loggerhead sea turtle South Pacific DPS	*Caretta caretta*	Endangered DPS	American Samoa is within the species nesting range, but the species has not been observed in the territory.	No interactions observed or reported.

Both commercial and non-commercial fisheries have the potential to cause adverse effects to sea turtles, including injuries and mortalities that occur incidental to fishing, such as fishing gear or vessel interactions. The most likely impacts of the bottomfish fishery in American Samoa on sea turtles is the potential for vessel collisions causing injuries and mortalities. The frequency of this type of effect is unknown in American Samoa. However, given the limited number of bottomfish fishing vessels in American Samoa (seven recorded vessels; WPFMC 2021), and the fact that

bottomfish fishing occurs while either at anchor or slowly drifting over fishing grounds, sea turtle collisions with vessels in this fishery are expected to be rare. As Table 14 indicates, no records exist of interactions between the American Samoa bottomfish fishery and sea turtles.

3.8.2.1 Potential Effects of the Alternatives on Sea Turtles

Alternative 1: Status Quo / NMFS would not implement a Rebuilding Plan

Under Alternative 1, NMFS would not implement a rebuilding plan and the same management measures as implemented under the previous interim measure would be applied to the American Samoa bottomfish fishery. The 2002 ESA consultation evaluated the potential impact of the bottomfish fishery prior to the implementation of management measures such as ACLs, but the implementation of a catch limit under this alternative is not expected to change the conduct of the fishery relative to operations considered under this consultation. The fishery is expected to continue catching bottomfish as it has in recent years under this alternative (Section 2.3.1). Because Alternative 1 is not expected to result in substantial changes to fishing activity relative to years considered in previous consultations, regardless of the implementation of complementary management, this alternative would not increase the potential for, or severity of, interactions between the fishery and ESA-listed sea turtles. The fishery is not likely to adversely affect any ESA-listed sea turtle species under this alternative, and vessel collisions are expected to be rare. In summary, previous ESA-section 7 consultations found that the American Samoa bottomfish fishery is not likely to adversely affect sea turtles, and because fishing activity under Alternative 1 is not expected to change, this alternative is not likely to cause any adverse effects to ESA-listed sea turtle species.

Alternative 2: Implement a Rebuilding Plan with a 1,500 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 2, NMFS would implement a rebuilding plan in which bottomfish catch in future years may be slightly less than the status quo due to the closure of Federal waters when the ACL is reached in accordance with the in-season AM and higher performance standard. This may result in the displacement of fishing activity to unrestricted territorial waters if complementary management is not enacted (Section 2.4.1). Because there have been no reported interactions with any species of sea turtles for this fishery in territorial or Federal waters, this change is not expected to affect the number of interactions. Additionally, fishing activity under Alternative 2 is expected to be slightly less or notably less than the Alternative 1, which is not expected to increase the potential for or severity of interactions between the fishery and listed sea turtles. If complementary management is implemented, there would be no displacement of fishing effort to territorial waters since restrictions would occur in both territorial and Federal waters if the ACL is attained, which would further decrease the likelihood of interactions occurring in the fishery. Thus, Alternative 2 is not expected to change or increase interactions with listed sea turtles in any way that is not already considered in prior consultations. Under this alternative, the fishery is not likely to adversely affect any listed sea turtle species, vessel collisions would be rare, and there is no anticipated change to the number, severity, or types of interactions with sea turtles.

Alternative 3: Implement a Rebuilding Plan with a 5,000 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 3, NMFS would implement a rebuilding plan in which, if complementary management is not implemented by the territory, bottomfish catch may be slightly less than the status quo due to the closure of Federal waters when the ACL is attained in accordance with the in-season AM and higher performance standard, which could result in the displacement of fishing activity to unrestricted territorial waters. Because there have been no reported interactions with any species of sea turtles for this fishery in territorial or Federal waters, this change is not expected to affect the number of interactions. Additionally, fishing activity under Alternative 3 is expected to be slightly or notably less than Alternative 1, and the status quo alternative is not expected to increase the potential for or severity of interactions between the fishery and listed sea turtles. If complementary management is implemented, there would be no displacement of fishing effort to territorial waters since the fishery would be restricted in both territorial and Federal waters if the ACL is attained. This would further decrease the likelihood of interactions occurring in the fishery. Thus, this alternative is not expected to change or increase interactions with listed sea turtles in any way that is not already considered in prior consultations. Under this alternative, the fishery is not likely to adversely affect any listed sea turtle species, vessel collisions would be rare, and there is no anticipated change to the number, severity, or types of interactions with sea turtles.

Alternative 4: Implement a Rebuilding Plan with a Temporary Moratorium on Bottomfish Fishing in Federal Waters

Under Alternative 4, NMFS would implement a rebuilding plan in which bottomfish catch is expected to be slightly reduced from the status quo due to the closure of Federal waters around American Samoa to bottomfish fishing, and some fishing may be displaced into territorial waters if complementary management is not implemented (Section 2.6.1). Since this fishery has no reported interactions with any species of sea turtle in territorial or Federal waters, this change is not expected to affect the number of interactions in the fishery. It is expected that fishing activity under Alternative 4 would be slightly less than the status quo alternative, and the status quo alternative is not expected to increase the potential for or severity of interactions between the fishery and listed sea turtles in any way not already considered in prior consultations. Therefore, implementation of Alternative 4 is not expected to change or increase interactions with listed sea turtles. If complementary management is implemented, the fishery would be restricted in both territorial and Federal waters, eliminating the likelihood of interactions occurring. Under this alternative, the fishery is not likely to adversely affect any listed sea turtle species, vessel collisions would be rare, and there is no anticipated change to the number, severity, or types of interactions with sea turtles.

All Alternatives

Overall, no alternative considered would substantially change fishing activity in the American Samoa bottomfish fishery such that there would be no adverse effects to listed sea turtles that have not already been considered in prior consultations of the fishery under the ESA, regardless of the implementation of complementary management.

3.8.3 Marine Mammals

Marine mammal species that are reasonably likely to occur in American Samoa are listed in Table 16. In accordance with ESA Section 7(a)(2), NMFS previously evaluated the potential impacts of the American Samoa bottomfish fishery to ESA-listed marine mammals and determined that the fishery is not likely to adversely affect any species in the action area. No critical habitat has been established for any whale species in American Samoa. NMFS documented its determinations in a Biological Opinion for bottomfish fisheries on March 8, 2002 and a Letter of Concurrence for bottomfish fisheries on June 3, 2008. The MMPA prohibits, with certain exceptions, taking of marine mammals in the U.S. and by persons aboard U.S. flagged vessels (i.e., persons and vessels subject to U.S. jurisdiction). Territorial regulations prohibit the take, possession, and sale any marine mammal (ASCA § 24.0960). NMFS classifies the American Samoa bottomfish fishery as a Category III fishery under Section 118 of the MMPA (86 FR 3028, January 14, 2021). A Category III fishery is one with a low likelihood or no known incidental takings of marine mammals. Additionally, the ESA lists five whale species known to occur in the EEZ around American Samoa (see note under Table 16).

Table 16. Marine mammals known to occur or reasonably expected to occur in waters around American Samoa.

Common Name	Scientific Name	Interactions with the Fishery
Humpback whale* (tafola or ia manu)	*Megaptera novaeangliae*	No interactions observed or reported.
Sperm whale*	*Physeter macrocephalus*	No interactions observed or reported.
Blue whale*	*Balaenoptera musculus*	No interactions observed or reported.
Fin Whale*	*Balaenoptera physalus*	No interactions observed or reported.
Sei whale*	*Balaenoptera borealis*	No interactions observed or reported.
Blainville's beaked whale	*Mesoplodon densirostris*	No interactions observed or reported.
Bottlenose dolphin	*Tursiops truncatus*	No interactions observed or reported.
Bryde's whale	*Balaenoptera edeni*	No interactions observed or reported.
Common dolphin	*Delphinus delphis*	No interactions observed or reported.
Cuvier's beaked whale	*Ziphius cavirostris*	No interactions observed or reported.
Dwarf sperm whale	*Kogia sima*	No interactions observed or reported.
False killer whale	*Pseudorca crassidens*	No interactions observed or reported.
Fraser's dolphin	*Lagenodelphis hosei*	No interactions observed or reported.
Killer whale	*Orcinus orca*	No interactions observed or reported.
Melon-headed whale	*Peponocephala electra*	No interactions observed or reported.
Minke whale	*Balaenoptera acutorostrata*	No interactions observed or reported.
Pygmy killer whale	*Feresa attenuata*	No interactions observed or reported.
Pygmy sperm whale	*Kogia breviceps*	No interactions observed or reported.
Risso's dolphin	*Grampus griseus*	No interactions observed or reported.
Rough-toothed dolphin	*Steno bredanensis*	No interactions observed or reported.
Short-finned pilot whale	*Globicephala macrorhynchus*	No interactions observed or reported.
Spinner dolphin	*Stenella longirostris*	No interactions observed or reported.
Spotted dolphin (Pantropical spotted dolphin)	*Stenella attenuata*	No interactions observed or reported.
Striped dolphin	*Stenella coeruleoalba*	No interactions observed or reported.
Longman's beaked whale	*Indopacetus pacificus*	No interactions observed or reported.

(Source: NMFS PIRO and PIFSC unpublished data)
* Species is also listed under the Endangered Species Act.

3.8.3.1 Potential Effects of the Alternatives on Marine Mammals

None of the alternatives considered are expected to impact marine mammals because the American Samoa bottomfish fishery is not known to affect marine mammals through gear interactions or through disruptions in or adverse effects on prey, and no alternative would change the conduct of the bottomfish fishery in a manner that would alter the type or frequency of marine mammal interactions with the fishery.

Alternative 1: Status Quo / NMFS would not implement a Rebuilding Plan

Under Alternative 1, NMFS would not implement a rebuilding plan and the fishery would be subject the same management provisions as the interim measure with an ACL of 13,000 lb and an in-season AM to close the fishery when the ACL is attained. The bottomfish fishery is not known to adversely affect marine mammals in terms of noise, water pollution, accidental entanglement, or competition for food resources. No interactions have been reported between the fishery and marine mammals (Table 16). There have been no comprehensive diet studies of piscivorous marine mammals in American Samoa and their relationship to the fishery to date. However, evaluation of the bottomfish fishery in Hawaii did not find that it would adversely modify prey populations important to the insular false killer whale (NMFS 2018). Inshore dolphins, such as spinner dolphins, feed on shrimp, squid, and small fish (e.g., Myctophidae) in the mid-water (Benoit-Bird 2004). The bottomfish fishery in American Samoa is similar in terms of gear, methods, and species targeted, so it can be reasonably concluded that the fishery is not adversely affecting prey available to marine mammals. Under Alternative 1, the fishery would continue to catch bottomfish similar to or slightly less than recent years (Section 2.3.1), and catches would continue to be monitored through the fisheries monitoring programs administered by the DMWR with assistance from NMFS. In recent years, the fishery has not interacted with or affected marine mammals, and the fishery is not expected to change under status quo, so interactions with marine mammals are not anticipated under this alternative.

Alternative 2: Implement a Rebuilding Plan with a 1,500 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 2, NMFS would implement a rebuilding plan with an ACL of 1,500 lb, an in-season AM to close fishing for bottomfish in Federal waters for the remainder of the fishing year if available information indicates that the ACL would be reached, and a higher performance standard to close the fishery in Federal waters if the ACL is exceeded until a coordinated management approach is developed that ensures catch in both Federal and territorial waters can be maintained at levels that allow the stock to rebuild. Under this alternative, it is expected that bottomfish catch may be slightly reduced from the status quo and some fishing activity may move into territorial waters if a closure of Federal waters is implemented in the absence of complementary management (Section 2.4.1). However, since this fishery has no reported interactions with any species of marine mammal in territorial or Federal waters, this change is not expected to affect the number of interactions. Further, since fishing activity under Alternative 2 is expected to be slightly or notably less than the status quo alternative, and the status quo alternative is not expected to increase the potential for or severity of interactions between the fishery and marine mammals in any way, implementation of Alternative 2 is not expected to

change or increase interactions with marine mammals. If complementary management is implemented, fishing activity would be substantially reduced, further decreasing the likelihood of interactions occurring. In summary, this alternative is not expected to change the conduct of the fishery in any way that would affect marine mammals, so interactions with marine mammals are not anticipated and a change to the number, severity, or type of interactions with marine mammals is not expected.

Alternative 3: Implement a Rebuilding Plan with a 5,000 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 3, NMFS would implement a rebuilding plan with an ACL of 5,000 lb and the same in-season AM and higher performance standard as under Alternative 2. NMFS expects that, if complementary management is not implemented by the American Samoa Government, Alternative 3 would slightly reduce bottomfish catch relative to the status quo and that some fishing activity may move into territorial waters if a closure of Federal waters is implemented (Section 2.5.1). However, since this fishery has no reported interactions with any species of marine mammal in territorial or Federal waters, this change is not expected to affect the number of interactions. Further, since fishing activity under Alternative 3 is expected to be slightly or notably less than the status quo alternative, and the status quo alternative is not expected to increase the potential for or severity of interactions between the fishery and marine mammals in any way, implementation of Alternative 3 is not expected to change or increase interactions with marine mammals. If complementary management is implemented, fishing activity would be substantially reduced, further decreasing the likelihood of interactions occurring. In summary, Alternative 3 is not expected to change the conduct of the fishery in any way that would affect marine mammals, so interactions with marine mammals are not anticipated and a change to the number, severity, or type of interactions with marine mammals is not expected.

Alternative 4: Implement a Rebuilding Plan with a Temporary Moratorium on Bottomfish Fishing in Federal Waters

Under Alternative 4, NMFS would implement a rebuilding plan with provisions that would prohibit fishing for and possession of bottomfish in Federal waters around American Samoa. Under Alternative 4, it is expected that bottomfish catch may be slightly reduced from the status quo and some fishing activity may move into territorial waters due to the closure of Federal waters in the absence of complementary management. However, since this fishery has no reported interactions with any species of marine mammal in territorial or Federal waters, this change is not expected to affect the number of interactions. Additionally, since it is expected that fishing activity under Alternative 4 would be less than the status quo alternative, and the status quo alternative is not expected to increase the potential for or severity of interactions between the fishery and marine mammals in any way, implementation of Alternative 4 is not expected to change or increase interactions with marine mammals. If complementary management is implemented, fishing activity would be completely restricted, eliminating the likelihood of interactions occurring in the fishery. Overall, this alternative is not expected to change the conduct of the fishery in any way that would affect marine mammals, so interactions with marine mammals are not anticipated and a change to the number, severity, or type of interactions with marine mammals is not expected.

All Alternatives

In summary, there is no new information that indicates that the American Samoa bottomfish fishery may affect ESA-listed marine mammals in a manner or to an extent that is not previously considered in past consultations. All prior consultations for ESA-listed marine mammal species remain valid and effective. Because the fishery has had no known interactions with marine mammals, because interactions with marine mammals are expected to remain rare under any of the alternatives under consideration, and because none of the alternatives would substantially change the conduct of the fishery in a way that would increase interactions, the fishery is not expected to interact with marine mammals under any of the considered alternatives.

3.8.4 Seabirds

Table 17lists seabird species that are considered residents or visitors of American Samoa. Of the presented species, only the Newell's shearwater is listed as threatened under the ESA.

Table 17. Seabirds occurring in American Samoa.

Samoan name	English name	Scientific name
Taio	Wedge-tailed shearwater	*Puffinus pacificus*
Taio	Audubon's shearwater	*Puffinus lherminieri*
Taio	Christmas shearwater	*Puffinus nativitatis*
Taio	Tahiti petrel	*Pterodroma rostrata*
Taio	Herald petrel	*Pterodroma heraldica*
Taio	Collared petrel	*Pterodroma brevipes*
Fuao	Red-footed booby	*Sula sula*
Fuao	Brown booby	*Sula leucogaster*
Fuao	Masked booby	*Sula dactylatra*
Tavaesina	White-tailed tropicbird	*Phaethon lepturus*
Tavaeula	Red-tailed tropicbird	*Phaethon rubricauda*
Atafa	Great frigatebird	*Fregata minor*
Atafa	Lesser frigatebird	*Fregata ariel*
Gogouli	Sooty tern	*Onychoprion fuscatus*
Gogo	Brown noddy	*Anous stolidus*
Gogo	Black noddy	*Anous minutus*
Laia	Blue-gray noddy	*Procelsterna cerulea*
manu sina	Common fairy-tern (white tern)	*Gygis alba*
Taio	Short-tailed shearwater	*Puffinus tenuirostris*
Taio	Newell's shearwater (ESA threatened)	*Puffinus auricularis newelli*
Taio	Mottled petrel	*Pterodroma inexpectata*
Taio	Phoenix petrel	*Pterodroma alba*
Taio	White-bellied storm petrel	*Fregetta grallaria*
Taio	Polynesian storm petrel	*Nesofregetta fuliginosa*
-----	Laughing gull	*Larus atricilla*
Gogosina	Black-naped tern	*Sterna sumatrana*

(Source: WPFMC 2009; online sources).

There has only been one confirmed sighting of the threatened Newell's shearwater in American Samoa (Grant et al.1994), and it appears to be an uncommon visitor to the archipelago. There have been no reports of interactions between the American Samoa bottomfish fishery and seabirds (WPFMC 2009).

3.8.4.1 Potential Effects of the Alternatives on Seabirds

None of the alternatives under consideration are expected to affect seabirds, as the American Samoa bottomfish fishery is not known to affect seabirds through gear interactions or through disruptions in or adverse effects on seabird prey since seabirds are not known to prey on bottomfish. No alternative considered would change the bottomfish fishery in a manner that would change the type or frequency of interactions with seabirds.

Alternative 1: Status Quo / NMFS would not implement a Rebuilding Plan

Under Alternative 1, NMFS would not implement a rebuilding plan and management would be identical to the interim measure with an ACL of 13,000 lb and an in-season AM to close Federal waters when the ACL is attained for the bottomfish fishery in American Samoa. Under the status quo alternative, it is expected that the fishery would continue to catch bottomfish in the same way as under the interim measure and possibly slightly less than previous years (Section 2.3.1). Because this alternative is not expected to change fishing activity relative to previous years, this alternative would not increase the potential for, or severity of, interactions between the fishery and listed seabirds. Under this alternative, the fishery is not likely to adversely affect any listed seabird species. In summary, the bottomfish fishery is not known to affect seabirds, and under Alternative 1 the fishery is not expected to change, so the fishery is not likely to adversely affect any seabird species under this alternative.

Alternative 2: Implement a Rebuilding Plan with a 1,500 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 2, NMFS would implement a rebuilding plan in which catch of bottomfish may be slightly reduced from the status quo, and some fishing activity may be displaced into territorial waters if a closure of Federal waters is implemented as an AM in the absence of complementary management (Section 2.4.1). However, since this fishery has no reported interactions with any species of seabird in territorial or Federal waters, this change is not expected to affect the number of interactions. Further, since fishing activity under Alternative 2 is expected to be slightly less than the status quo alternative, and the status quo alternative is not expected to increase the potential for or severity of interactions between the fishery and seabirds, implementation of Alternative 2 is not expected to change or increase interactions with listed seabirds in any way. If complementary management is implemented, fishing activity would be substantially reduced, further decreasing the likelihood of interactions occurring. Under this alternative, the fishery is not likely to adversely affect any listed seabird species, and there is no anticipated change to the number, severity, or type of interactions with seabirds.

Alternative 3: Implement a Rebuilding Plan with a 5,000 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 3, NMFS would implement a rebuilding plan where whether bottomfish catch would be slightly or substantially reduced from the status quo would be dependent on the

territory implementing complementary management with this Federal action. In the absence of complementary management, some fishing activity may be displaced into territorial waters if a closure of Federal waters is implemented as an AM, as NMFS anticipates (Section 2.5.1). However, since this fishery has no reported interactions with any species of seabird in territorial or Federal waters, this change is not expected to affect the number of interactions. Further, since fishing activity under Alternative 3 is expected to be slightly or notably less than the status quo alternative, and the status quo alternative is not expected to increase the potential for or severity of interactions between the fishery and seabirds, implementation of this alternative is not expected to change or increase interactions with listed seabirds in any way. If complementary management is implemented, fishing activity would be substantially reduced, further decreasing the likelihood of interactions occurring. Under Alternative 3, the fishery is not likely to adversely affect any listed seabird species, and there is no anticipated change to the number, severity, or type of interactions with seabirds.

Alternative 4: Implement a Rebuilding Plan with a Temporary Moratorium on Bottomfish Fishing in Federal Waters

Under Alternative 4, NMFS would implement a rebuilding plan in which bottomfish catch may be slightly reduced from the status quo, and some fishing activity may be displaced into territorial waters due to the complete closure of Federal waters in the absence of complementary management. However, since this fishery has no reported interactions with any species of seabirds in territorial or Federal waters, this change is not expected to affect the number of interactions. Further, since fishing activity under Alternative 4 is expected to be slightly less than the status quo alternative, and the status quo alternative is not expected to increase the potential for or severity of interactions between the fishery and seabirds, implementation of Alternative 4 is not expected to change or increase interactions with listed seabirds. If complementary management is implemented, fishing activity would be completely restricted, removing the likelihood of interactions occurring. Under this alternative, the fishery is not likely to adversely affect any listed seabird species, and there is no anticipated change to the number, severity, or type of interactions with seabirds.

All Alternatives

No alternative under consideration would substantially change the conduct of the fishery in a manner that would affect seabirds, and there are no expected adverse effects to these species.

3.8.5 ESA-Listed Reef Building Corals

On September 10, 2014, NMFS listed 20 species of reef-building corals as threatened under the ESA (79 FR 53852). Six species of listed corals are known to occur in waters around American Samoa from 0–50 m deep. None of the species have common names.

On November 27, 2020, NMFS published a proposed rule in the Federal Register (85 FR 76262) to designate critical habitat for the seven threatened corals in U.S. waters in the Indo-Pacific pursuant to Section 4 of the ESA. Six of these corals occur around American Samoa: *Acropora globiceps*, *Acropora jacquelineae*, *Acropora retusa*, *Acropora speciosa*, *Euphyllia paradivisa*, and *Isopora crateriformis*. Specific occupied areas containing physical features essential to the conservation of these coral species are being proposed for designation as critical habitat. At this point in time there is insufficient information to determine the proposed designation's potential

impacts on the American Samoa bottomfish fishery. If the proposal is finalized, NMFS would re-initiate consultation under Section 7 of the ESA to determine the impact of fishing activities on critical habitat and any necessary management measures.

Table 18 lists the ESA-listed coral species found in American Samoa. Corals usually live in colonies and form "heads" or "shelves." Generally, thousands of individual coral organisms (polyps) live together in a single structure that grows over time. Recently, many nearshore coral reefs have died through a process called bleaching when coral expel algae that live within them. Bleaching often leads to death for coral colonies by causing malnutrition and increasing the colony's susceptibility to disease. Some coral species populations have suffered declines because of bleaching.

Table 18. ESA-listed corals in American Samoa.

Common name	Scientific Name	ESA listing status in American Samoa	Occurrence in American Samoa	Interactions with the American Samoa bottomfish fishery
None	*Acropora globiceps*	Threatened	Present	No interactions observed or reported
None	*Acropora jacquelineae*	Threatened	Present	No interactions observed or reported
None	*Acropora retusa*	Threatened	Present	No interactions observed or reported
None	*Acropora speciosa*	Threatened	Present	No interactions observed or reported
None	*Euphyllia paradivisa*	Threatened	Present	No interactions observed or reported
None	*Isopora crateriformis*	Threatened	Present	No interactions observed or reported

3.8.5.1 Potential Effects of the Alternatives on ESA-Listed Corals

Some damage to corals and the bottom is possible via anchoring or entanglement of bottomfish fishing tackle on the bottom, but studies in Hawaii where methods are similar found that bottomfish fishing generally has minimal impact on benthic habitat (Kelley and Moffit 2004; Kelley and Ikehara 2006). The bottomfish fishery is a hook-and-line fishery, and fishermen have an interest in minimizing both of these interactions, not only for the conservation benefit, but also because they do not want to lose their gear. The FEP also protects corals and habitat through prohibitions on the use of bottom-set nets, bottom trawls, explosives, and poisons. Territory regulations prohibit the use of explosives and poisons (ASCA § 24.0921 through 24.0923) and specify requirements for the use of gillnets and drag nets (ASCA § 24.0930 through 24.0931). It is unlawful for any person to fish for, take, or retain any wild live rock or live hard coral except under a valid special permit for scientific research, aquaculture seed stock collection or traditional and ceremonial purposes by indigenous people (50 CFR 665.125(c)). Additionally, territory regulations pursuant to ASCA § 24.0951 through 24.0964 prohibit the take of certain species of fish and invertebrates, including coral and live rock. On April 9, 2015, NMFS

documented its determination in a Letter of Concurrence under section 7 of the ESA that the continued authorization of the bottomfish fishery is not likely to adversely affect reef-building corals. Methods, locations, and target species of fishery operations have not changed substantially since 2015. Also, the fishery has not had any known interactions with listed corals. Based on this information, NMFS reasonably concludes that the analysis in that 2015 consultation and its conclusion that the fishery is not likely to adversely affect listed corals, remains valid today. On June 5, 2019, NMFS reinitiated consultation in response to listing of the oceanic whitetip shark, giant manta ray, and chambered nautilus, and to seek concurrence with the conclusion that the American Samoa bottomfish fishery may affect, but is not likely to affect, any listed coral. On June 6, 2019, August 11, 2020, December 15, 2020, and February 9, 2022, NMFS determined that, pending the completed consultation, the continued operation of the bottomfish fishery in American Samoa would not violate ESA Section 7(a)(2), or result in an irreversible or irretrievable commitment of resources precluding implementation of any reasonable and prudent alternatives, and would not violate ESA Section 7(d) (NMFS 2019b; NMFS 2020a; NMFS 2020b).

Alternative 1: Status Quo / NMFS would not implement a Rebuilding Plan

Under Alternative 1, NMFS would not implement a rebuilding plan and management would be identical to the interim measure with an ACL of 13,000 lb and an in-season AM to close Federal waters when the ACL is attained for the bottomfish fishery in American Samoa. While the 2015 consultation evaluated the potential impact of the bottomfish fishery on ESA-listed corals under a higher ACL and post-season AM, it is expected that the fishery would continue to catch bottomfish under the status quo alternative slightly less than previous years because the fishery in 2015 was not functionally constrained by an in-season AM (Section 2.3.1). Because this alternative is not expected to change fishing activity relative to years considered in the 2015 consultation, this alternative would not increase the potential for, or severity of, interactions between the fishery and listed corals, and the fishery is not likely to adversely affect listed coral species. In summary, the previous consultation found that the bottomfish fishery is not likely to adversely affect corals, and the fishery is expected to have less activity under Alternative 1, so this alternative is not likely to cause the fishery to adversely affect any listed coral species.

Alternative 2: Implement a Rebuilding Plan with a 1,500 lb ACL, In-Season AM, and Higher Performance Standard

Under this alternative, NMFS would implement a rebuilding plan where bottomfish catch may be slightly reduced from the status quo, and some fishing activity may be displaced into territorial waters if a closure of Federal waters is implemented and complementary management is not implemented (Section 2.4.1). However, since this fishery has no reported interactions with any species of listed coral in territorial or Federal waters, this change is not expected to affect the number of interactions. Since fishing activity under Alternative 2 is expected to be slightly less than the status quo alternative, and the status quo alternative is not expected to increase the potential for or severity of interactions between the fishery and listed corals in any way not already considered in prior consultations, implementation of Alternative 2 is not expected to change or increase interactions with listed corals. If complementary management is implemented, fishing activity would be substantially reduced, further decreasing the likelihood

of interactions occurring. Thus, there is no anticipated change to the number, severity, or type of interactions with listed corals under this alternative.

Alternative 3: Implement a Rebuilding Plan with a 5,000 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 3, NMFS would implement a rebuilding plan in which bottomfish catch may be slightly reduced from the status quo, and some fishing activity may be displaced into territorial waters if a closure of Federal waters is implemented in the absence of complementary management (Section 2.5.1). However, since this fishery has no reported interactions with any species of listed coral in territorial or Federal waters, this change is not expected to affect the number of interactions. Since fishing activity under Alternative 3 is expected to be less than the status quo alternative, and the status quo alternative is not expected to increase the potential for or severity of interactions between the fishery and listed corals in any way not already considered in prior consultations, implementation of this alternative is not expected to change or increase interactions with listed corals. If complementary management is implemented, fishing activity would be substantially reduced, further decreasing the likelihood of interactions occurring. Thus, there is no anticipated change to the number, severity, or type of interactions with listed corals under this alternative.

Alternative 4: Implement a Rebuilding Plan with a Temporary Moratorium on Bottomfish Fishing in Federal Waters

Under Alternative 4, NMFS would implement a rebuilding plan in which bottomfish catch is expected to be slightly reduced from the status quo, and some fishing activity may be displaced into territorial waters due to the closure of Federal waters if complementary management is not enacted (Section 2.6.1). However, since this fishery has no reported interactions with any listed species of coral in territorial or Federal waters, this change is not expected to affect the number of interactions. Further, since fishing activity under Alternative 4 is expected to be slightly less than the status quo alternative, and the status quo alternative is not expected to increase the potential for or severity of interactions between the fishery and listed corals in any way not already considered in prior consultations, implementation of Alternative 4 is not expected to change or increase interactions with listed corals. If complementary management is implemented, fishing activity would be completely restricted, precluding the likelihood of interactions occurring. Thus, there is no anticipated change to the number, severity, or type of interactions with listed corals under this alternative.

All Alternatives

In summary, the bottomfish fishery has no recorded interactions with listed corals, and no alternative under consideration would substantially change the conduct of the fishery in a way that would increase the likelihood of interactions, so it is not expected there would be effects on listed coral species that have not already been considered in prior consultations of the fishery under the ESA. Under all alternatives considered, the proposed action is not expected to have a substantial effect on the overall population size of ESA-listed corals in American Samoa.

3.8.6 Scalloped Hammerhead Sharks

On July 3, 2014, NMFS listed the Indo-West Pacific scalloped hammerhead shark DPS under the ESA (79 FR 38213). The Indo-West Pacific scalloped hammerhead shark DPS occurs in all U.S. Pacific Island territories. Scalloped hammerhead sharks range widely from nearshore to pelagic environments and from the surface to 500 meters (m) deep. Because the shark is listed in American Samoa, it is illegal to target or retain the shark.

As noted in the final rule (79 FR 38213, July 3, 2014), the significant operative threats to the listed scalloped hammerhead DPSs are overutilization by foreign industrial, commercial, and artisanal fisheries as well as inadequate regulatory mechanisms in foreign nations to protect these sharks from the heavy fishing pressure and related mortality, with illegal fishing identified as a significant problem in areas outside of U.S. jurisdiction. Some fishermen target sharks, including the scalloped hammerhead, to harvest their fins. Incidental capture in fisheries also contributes to increased mortality in this species (79 FR 38213, July 3, 2014).

Conservation initiatives for scalloped hammerhead sharks are in place and include, in addition to the Federal prohibition on retention of the scalloped hammerhead DPS, territorial prohibitions on the retention or transport of any sharks. The territorial government passed a law in 2012 (ASAC § 24.0961) stating that no person shall:

> (1) Possess, deliver, carry, transport or ship by any means whatsoever any shark species or the body parts of any such species;
> (2) Import, export, sell or offer for sale any such species or body parts of such species; or
> (3) Take or kill any such species in American Samoa.

3.8.6.1 Potential Effects of the Alternatives on Scalloped Hammerhead Sharks

NMFS conducted Section 7 consultation under the ESA to evaluate the potential effects of the American Samoa bottomfish fisheries on the Indo-West Pacific DPS of scalloped hammerhead shark. This consultation found that American Samoa bottomfish fisheries did not have any recorded or observed catches of scalloped hammerhead sharks based on boat-based creel surveys conducted from 2002 to 2013 (NMFS 2015). On April 9, 2015, NMFS concluded that the continued authorization of the bottomfish fishery under the FEP for American Samoa is not likely to adversely affect the Indo-west Pacific scalloped hammerhead shark DPS. Their conclusion was based on the finding that the effects of reauthorizing the fishery were expected to be insignificant and discountable because fishery participants are very unlikely to interact with Indo-West Pacific scalloped hammerhead sharks because of limited distribution, selective fishing techniques, and the small scale and scope of these fisheries. Methods, locations, and target species of fishery operations have not changed substantially since 2015. Also, the fishery has not had any known interactions with scalloped hammerhead sharks. Based on this information, NMFS reasonably concludes that the analysis in that 2015 consultation, and the conclusion that the fishery is not likely to adversely affect this species, remain valid today. On June 5, 2019, NMFS reinitiated consultation in response to listing of the oceanic whitetip shark, giant manta ray, and chambered nautilus, and to seek concurrence with the conclusion that the American

Samoa bottomfish fishery may affect but is not likely to affect the Indo-West Pacific DPS of scalloped hammerhead shark.

Alternative 1: Status Quo / NMFS would not implement a Rebuilding Plan

Under Alternative 1, NMFS would not implement a rebuilding plan and management would be identical to the interim measure, with an ACL of 13,000 lb and an in-season AM to close Federal waters when the ACL is attained for the bottomfish fishery in American Samoa. While the 2015 consultation evaluated the potential impact of the bottomfish fishery on scalloped hammerheads under a higher ACL and post-season AM, it is expected that the fishery would catch slightly less bottomfish under the status quo alternative than in previous years because the fishery in 2015 was not functionally constrained by an in-season AM (Section 2.3.1). Because the 2015 consultation found that effects of the fishery on the Indo-West Pacific scalloped hammerhead shark DPS would be insignificant and discountable and this alternative is not expected to change fishing activity relative to years considered in the 2015 consultation, Alternative 1 would not increase the potential for, or severity of, interactions between the fishery and the Indo-West Pacific scalloped hammerhead shark such that the fishery is not likely to adversely affect this DPS. In summary, the previous consultation found that the bottomfish fishery is not likely to adversely affect the Indo-West Pacific DPS of scalloped hammerhead shark, and under Alternative 1 the fishery is expected to have less activity, so the fishery is not likely to adversely affect this DPS.

Alternative 2: Implement a Rebuilding Plan with a 1,500 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 2, NMFS would implement a rebuilding plan in which bottomfish catch may be slightly reduced from the status quo, and some fishing activity may be displaced into territorial waters if a closure of Federal waters is implemented in the absence of complementary management (Section 2.4.1). However, since this fishery has no reported interactions with scalloped hammerhead sharks in territorial or Federal waters, this change is not expected to affect the number of interactions. Since fishing activity under Alternative 2 is expected to be slightly less than the status quo alternative and the status quo alternative is not expected to increase the potential for or severity of interactions between the fishery and the Indo-West Pacific scalloped hammerhead shark in any way not already considered in prior consultations, implementation of Alternative 2 is not expected to change or increase interactions with this DPS. If complementary management is implemented, fishing activity would be substantially reduced, further decreasing the likelihood of interactions occurring. Thus, there is no anticipated change to the number, severity, or type of interactions with this DPS.

Alternative 3: Implement a Rebuilding Plan with a 5,000 lb ACL, In-Season AM, and Higher Performance Standard

Under this alternative, NMFS would implement a rebuilding plan where, in the absence of complementary management, bottomfish catch may be slightly reduced from the status quo, and some fishing activity may be displaced into territorial waters if a closure of Federal waters is implemented (Section 2.5.1). However, since this fishery has no reported interactions with scalloped hammerhead sharks in territorial or Federal waters, this change is not expected to affect the number of interactions. Since fishing activity under Alternative 3 is expected to be slightly or substantially less than the status quo alternative and the status quo alternative is not

expected to increase the potential for or severity of interactions between the fishery and the Indo-West Pacific scalloped hammerhead shark in any way not already considered in prior consultations, implementation of this alternative is not expected to change or increase interactions with this DPS. If complementary management is implemented by the American Samoa Government, fishing activity would be substantially reduced, further decreasing the likelihood of interactions occurring. Thus, there is no anticipated change to the number, severity, or type of interactions with this DPS.

Alternative 4: Implement a Rebuilding Plan with a Temporary Moratorium on Bottomfish Fishing in Federal Waters

Under Alternative 4, NMFS would implement a rebuilding plan in which bottomfish catch may be slightly reduced from the status quo, and some fishing activity may be displaced into territorial waters due to the complete closure of Federal waters if complementary management is not implemented. However, since this fishery has no reported interactions with scalloped hammerhead sharks in territorial or Federal waters, this change is not expected to affect the number of interactions. Since fishing activity under Alternative 4 is expected to be slightly less than the status quo alternative, and the status quo alternative is not expected to increase the potential for or severity of interactions between the fishery and the Indo-West Pacific scalloped hammerhead shark in any way not already considered in prior consultations, implementation of Alternative 4 is not expected to change or increase interactions with this DPS. If complementary management is implemented, fishing activity would be completely prohibited, eliminating the likelihood of interactions occurring. Thus, there is no anticipated change to the number, severity, or type of interactions with this DPS.

All Alternatives

There are no targeted shark fisheries in American Samoa, and regulations prohibit take or killing of any shark species as well as possession and sale of shark fins and shark products. The likelihood of interactions is low, and the 2015 consultation found that American Samoa bottomfish fisheries did not have any recorded or observed catches of scalloped hammerhead sharks (NMFS 2015). No alternative under consideration would substantially change the way the fishery is conducted with respect to increasing interactions or result in effects on scalloped hammerhead sharks that have not already been considered in the 2015 consultation. Under all alternatives considered, the proposed action is not expected to have a substantial effect on the overall population size of the Indo-West Pacific scalloped hammerhead shark DPS and is not likely to appreciably reduce the likelihood of both survival and recovery of the species in the wild.

3.8.7 Oceanic Whitetip Sharks

On January 30, 2018, NMFS issued a final rule to list the oceanic whitetip shark as threatened under the ESA (83 FR 4153). The oceanic whitetip shark is found in tropical and subtropical seas between 30º N. and 35º S. latitudes worldwide. The oceanic whitetip shark experiences high encounter and mortality rates in some commercial fisheries (e.g., pelagic longline, purse seine, and gillnet fisheries) throughout its range because of its tropical distribution and tendency to remain in surface waters (NMFS 2019a).

As noted in the final rule, the greatest threat to the oceanic whitetip shark is overutilization from fishing pressure and inadequate regulatory mechanisms to protect the species. However, American Samoa has territorial conservation measures that prohibit retention or transport of any shark (ASAC § 24.0961). The best available information to estimate interactions with oceanic white tip sharks are boat-based creel surveys, and review of 33 years of creel survey data did not find evidence of interactions with oceanic whitetip sharks and the American Samoa bottomfish fishery (NMFS 2019a). On June 5, 2019, NMFS reinitiated informal consultation under the ESA to seek concurrence that bottomfish fishing activities are not likely to adversely affect this species, as required by 50 CFR 402.16. On June 6, 2019, August 11, 2020, December 15, 2020, and February 9, 2022, NMFS determined that, pending the completed consultation, the continued operation of the bottomfish fishery in American Samoa would not violate ESA Section 7(a)(2), or result in an irreversible or irretrievable commitment of resources precluding implementation of any reasonable and prudent alternatives, and would not violate ESA Section 7(d) (NMFS 2019b; NMFS 2020a; NMFS 2020b).

3.8.7.1 Potential Effects of the Alternatives on Oceanic Whitetip Sharks

Alternative 1: Status Quo / NMFS would not implement a Rebuilding Plan

Under Alternative 1, NMFS would not implement a rebuilding plan and management would be identical to the interim measure with an ACL of 13,000 lb and an in-season AM to close Federal waters when the ACL is attained for the bottomfish fishery in American Samoa. The American Samoa bottomfish fishery is expected to continue to catch bottomfish in a manner consistent with, if not slightly less than, recent years, and catches would continue to be monitored through the fisheries monitoring program administered by the DMWR with assistance from NMFS. The management provisions under this alternative would not substantially change the conduct of the fishery relative to recent years (Section 2.3.1). Therefore, this alternative is not expected to increase the potential for interactions between the fishery and oceanic whitetip shark in any way.

Alternative 2: Implement a Rebuilding Plan with a 1,500 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 2, NMFS would implement a rebuilding plan in which bottomfish catch may be slightly reduced from the status quo, and some fishing activity may be displaced into territorial waters if a closure of Federal waters is implemented as an AM in the absence of complementary management (Section 2.4.1). However, since this fishery has no reported interactions with oceanic whitetip sharks in territorial or Federal waters, this change is not expected to affect the number of interactions. Since fishing activity under Alternative 2 is expected to be slightly less than the status quo alternative, and the status quo alternative is not expected to increase the potential for or severity of interactions between the fishery and the oceanic whitetip shark in any way, implementation of Alternative 2 is not expected to change or increase interactions with this species. If complementary management is implemented, fishing activity would be substantially reduced, further decreasing the likelihood of interactions occurring. Thus, there is no anticipated change to the number, severity, or type of interactions with oceanic whitetip sharks.

Alternative 3: Implement a Rebuilding Plan with a 5,000 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 3, NMFS would implement a rebuilding plan where, in the absence of complementary management, bottomfish catch may be slightly reduced from the status quo, and some fishing activity may be displaced into territorial waters if a closure of Federal waters is implemented as an AM. However, since this fishery has no reported interactions with oceanic whitetip sharks in territorial or Federal waters, this change is not expected to affect the number of interactions. Since fishing activity under Alternative 3 is expected to be slightly or notably less than the status quo alternative, and the status quo alternative is not expected to increase the potential for or severity of interactions between the fishery and the oceanic whitetip shark in any way, implementation of this alternative is not expected to change or increase interactions with this species. If complementary management is implemented, fishing activity would be substantially reduced, further decreasing the likelihood of interactions occurring. Thus, there is no anticipated change to the number, severity, or type of interactions with oceanic whitetip sharks.

Alternative 4: Implement a Rebuilding Plan with a Temporary Moratorium on Bottomfish Fishing in Federal Waters

Under Alternative 4, NMFS would implement a rebuilding plan in which bottomfish catch may be slightly reduced from the status quo, and some fishing activity may be displaced into territorial waters due to the closure of Federal waters without the implementation of complementary management. However, since this fishery has no reported interactions with oceanic whitetip sharks in territorial or Federal waters, this change is not expected to affect the number of interactions. Since fishing activity under Alternative 4 is expected to be slightly less than the status quo alternative, and the status quo alternative is not expected to increase the potential for or severity of interactions between the fishery and the oceanic whitetip shark in any way, implementation of Alternative 4 is not expected to change or increase interactions with this species. If complementary management is implemented, fishing activity would be prohibited, precluding the likelihood of interactions occurring. Thus, there is no anticipated change to the number, severity, or type of interactions with oceanic whitetip sharks.

All Alternatives

There are no targeted shark fisheries in American Samoa, and regulations prohibit take or killing of any shark species, along with possession and sale of shark fins and shark products. The alternatives under consideration would not change the way the fishery operates with respect to areas fished, gear used, or methods employed in a manner that would alter the likelihood of interactions with oceanic whitetip sharks, so interactions with this shark are not anticipated. Based on the lack of expected interactions with oceanic whitetip sharks, the proposed action is not expected to have a substantial effect on the overall population size of oceanic whitetip sharks under all alternatives considered and is not likely to reduce appreciably the likelihood of both survival and recovery of the species in the wild.

3.8.8 Giant Manta Rays

On January 22, 2018, NMFS issued a final rule to list the giant manta ray as a threatened species under the ESA (83 FR 2916). The giant manta ray is found worldwide in tropical, subtropical,

and temperate bodies of water. It is commonly found offshore, in oceanic waters, and near productive coastlines. As noted in the final rule (83 FR 2916, January 22, 2018), the giant manta ray appears to be most at risk of overutilization in the Indo-Pacific and eastern Pacific portions of its range. Targeted fishing and incidental capture of the species in Indonesia, Philippines, Sri Lanka, India, and throughout the eastern Pacific, has led to observed declines in populations.

There are no targeted giant manta ray fisheries in American Samoa. Manta rays are filter feeders who forage near the surface and do not interact with bottomfish fishing gear (Miller and Klimovich 2016). The rate at which the American Samoa bottomfish fishery interacts with giant manta rays in other ways is unknown; however, there are no reported or observed collisions with giant manta rays and bottomfish fishing vessels in any island area. Over the last ten years, there have been less than 100 trips per year on average (WPFMC 2021). Due to the small number of bottomfish trips in American Samoa and the fact that there have been no reported or observed collisions between giant manta rays and bottomfish fishing vessels, interactions between the bottomfish vessels and giant manta ray are not expected. On June 5, 2019, NMFS reinitiated informal consultation under ESA to seek concurrence that fishing activities are not likely to adversely affect this species, as required by 50 CFR 402.16. On June 6, 2019, August 11, 2020, December 15, 2020, and February 9, 2022, NMFS determined that, pending the completed consultation, the continued operation of the bottomfish fishery in American Samoa would not violate ESA Section 7(a)(2), or result in an irreversible or irretrievable commitment of resources precluding implementation of any reasonable and prudent alternatives, and would not violate ESA Section 7(d) (NMFS 2019b; NMFS 2020a; NMFS 2020b).

3.8.8.1 Potential Effects of the Alternatives on Giant Manta Rays

Alternative 1: Status Quo / NMFS would not implement a Rebuilding Plan

Under Alternative 1, NMFS would not implement a rebuilding plan and management would be identical to the interim measure with an ACL of 13,000 lb and an in-season AM to close Federal waters when the ACL is attained for the bottomfish fishery in American Samoa. The fishery is expected to continue to catch bottomfish in a manner similar to recent years, and catches would continue to be monitored through the fisheries monitoring program administered by the DMWR with assistance from NMFS. The management provisions under this alternative would not substantially change the conduct of the fishery relative to recent years (Section 2.3.1). Therefore, this alternative would not increase the potential for interactions between the fishery and giant manta ray in any way.

Alternative 2: Implement a Rebuilding Plan with a 1,500 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 2, NMFS would implement a rebuilding plan in which bottomfish catch may be slightly reduced from the status quo, and some fishing activity may be displaced into territorial waters if a closure of Federal waters is implemented in the absence of complementary management (Section 2.4.1). However, since this fishery has no reported interactions with giant manta rays in territorial or Federal waters, this change is not expected to affect the number of interactions. Since fishing activity under Alternative 2 is expected to be slightly less than the status quo alternative, and the status quo alternative is not expected to increase the potential for or severity of interactions between the fishery and the giant manta ray in any way,

implementation of Alternative 2 is not expected to change or increase interactions with this species. If complementary management is implemented, fishing activity would be substantially reduced, further decreasing the likelihood of interactions occurring. Thus, there is no anticipated change to the number, severity, or type of interactions with giant manta rays.

Alternative 3: Implement a Rebuilding Plan with a 5,000 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 3, NMFS would implement a rebuilding plan where, in the absence of complementary management, bottomfish catch may be slightly reduced from the status quo, and some fishing activity may be displaced into territorial waters if a closure of Federal waters is implemented. However, since this fishery has no reported interactions with giant manta rays in territorial or Federal waters, this change is not expected to affect the number of interactions. Since fishing activity under Alternative 3 is expected to be slightly or notably less than the status quo alternative, and the status quo alternative is not expected to increase the potential for or severity of interactions between the fishery and the giant manta ray in any way, implementation of this alternative is not expected to change or increase interactions with this species. If complementary management is implemented, fishing activity would be substantially reduced, further decreasing the likelihood of interactions occurring. Thus, there is no anticipated change to the number, severity, or type of interactions with giant manta rays.

Alternative 4: Implement a Rebuilding Plan with a Temporary Moratorium on Bottomfish Fishing in Federal Waters

Under Alternative 4, NMFS would implement a rebuilding plan in which bottomfish catch may be slightly reduced from the status quo, and some fishing activity may be displaced into territorial waters due to the closure of Federal waters in the absence of complementary management. However, since this fishery has no reported interactions with giant manta rays in territorial or Federal waters, this change is not expected to affect the number of interactions. Since fishing activity under Alternative 4 is expected to be slightly less than the status quo alternative, and the status quo alternative is not expected to increase the potential for or severity of interactions between the fishery and the giant manta ray in any way not already considered in prior consultations, implementation of Alternative 4 is not expected to change or increase interactions with this species. If complementary management is implemented, fishing activity would be prohibited, precluding the likelihood of interactions occurring. Thus, there is no anticipated change to the number, severity, or type of interactions with giant manta rays.

All Alternatives

The alternatives under consideration are not expected to change the way the fishery operates with respect to areas fished, gear used, or methods employed in a manner that would alter the likelihood of interactions with giant manta ray, so interactions with this species are not anticipated. Based on the lack of expected interactions with giant manta rays, the proposed action is not expected to have a substantial effect on the overall population size of the giant manta ray under all alternatives considered and is not likely to reduce appreciably the likelihood of both survival and recovery of the species in the wild.

3.8.9 Chambered Nautilus

On September 28, 2018, NMFS issued a final rule to list the chambered nautilus as threatened under the ESA (83 FR 48976). The chambered nautilus is found in tropical, coastal reef, deep-water habitats native to tropical reef habitats of the Indo-Pacific, and its known range includes waters off American Samoa. As noted in the final rule (83 FR 48976, September 28, 2018), the most significant threat to the chambered nautilus is overutilization through commercial harvest to meet the demand for the international nautilus shell trade. Targeted fishing of, and trade in, the species is thought to primarily occur in Philippines, Indonesia, India, and China, despite prohibitions (Miller 2018). Commercial harvest of the species is also thought to occur in Papua New Guinea, East Asia, Thailand, Vanuatu, and Vietnam (Miller 2018).

There is no known local utilization or commercial harvest of chambered nautilus in American Samoa (CITES 2016). Additionally, there are no records of any interaction between the American Samoa bottomfish fishery and chambered nautilus, and it is highly unlikely that they would be caught while bottomfish fishing. Research suggests that chambered nautilus may be strict or obligate bottom-dwelling scavengers (Barord 2015; Barord et al. 2014; Miller 2018). Further, chambered nautilus have an estimated average swimming speed of 0.10 m/s (Barord et al. 2014). To catch them, targeted fisheries use traps that are deployed for several hours or left overnight (Freitas and Krishnasamy 2016). Given the limited mobility and feeding behavior of the species, they would not be able to approach and take bait in the short time it is deployed by hook and line while bottomfish fishing.

On June 5, 2019, NMFS reinitiated informal consultation under ESA to seek concurrence that fishing activities are not likely to adversely affect this species, as required by 50 CFR 402.16. On June 6, 2019, August 11, 2020, December 15, 2020, and February 9, 2022, NMFS determined that, pending the completed consultation, the continued operation of the bottomfish fishery in American Samoa would not violate ESA Section 7(a)(2), or result in an irreversible or irretrievable commitment of resources precluding implementation of any reasonable and prudent alternatives, and would not violate ESA Section 7(d) (NMFS 2019b; NMFS 2020a; NMFS 2020b).

3.8.9.1 Potential Effects of the Alternatives on Chambered Nautiluses

Alternative 1: Status Quo / NMFS would not implement a Rebuilding Plan

Under Alternative 1, NMFS would not implement a rebuilding plan and management would be identical to the interim measure with an ACL of 13,000 lb and an in-season AM to close Federal waters when the ACL is attained for the bottomfish fishery in American Samoa. The fishery is expected to continue to catch bottomfish in a manner consistent with recent years, and catches would continue to be monitored through the fisheries monitoring program administered by the DMWR with assistance from NMFS. The management provisions under this alternative would not substantially change the conduct of the fishery relative to recent years (Section 2.3.1). Therefore, this alternative would not increase the potential for interactions between the fishery and the chambered nautilus in any way.

Alternative 2: Implement a Rebuilding Plan with a 1,500 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 2, NMFS would implement a rebuilding plan in which bottomfish catch may be slightly reduced from the status quo, and some fishing activity may be displaced into territorial waters if a closure of Federal waters is implemented in the absence of complementary management (Section 2.4.1). However, since this fishery has no reported interactions with chambered nautilus in territorial or Federal waters, this change is not expected to affect the number of interactions. Since fishing activity under Alternative 2 is expected to be slightly less than the status quo alternative, and the status quo alternative is not expected to increase the potential for or severity of interactions between the fishery and the chambered nautilus in any way, implementation of Alternative 2 is not expected to change or increase interactions with this species. If complementary management is implemented, fishing activity would be substantially reduced, further decreasing the likelihood of interactions occurring. Thus, there is no anticipated change to the number, severity, or type of interactions with chambered nautilus.

Alternative 3: Implement a Rebuilding Plan with a 5,000 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 3, NMFS would implement a rebuilding plan where, in the absence of complementary management, bottomfish catch may be slightly reduced from the status quo, and some fishing activity may be displaced into territorial waters if a closure of Federal waters is implemented. However, since this fishery has no reported interactions with chambered nautilus in territorial or Federal waters, this change is not expected to affect the number of interactions. Since fishing activity under Alternative 3 is expected to be slightly or substantially less than the status quo alternative, and the status quo alternative is not expected to increase the potential for or severity of interactions between the fishery and the chambered nautilus in any way, implementation of this alternative is not expected to change or increase interactions with this species. If complementary management is implemented, fishing activity would be substantially reduced, further decreasing the likelihood of interactions occurring. Thus, there is no anticipated change to the number, severity, or type of interactions with chambered nautilus.

Alternative 4: Implement a Rebuilding Plan with a Temporary Moratorium on Bottomfish Fishing in Federal Waters

Under Alternative 4, NMFS would implement a rebuilding plan in which bottomfish catch may be slightly reduced from the status quo, and some fishing activity may move into territorial waters due to the closure of Federal waters without complementary management in place. However, since this fishery has no reported interactions with chambered nautilus in territorial or Federal waters, this change is not expected to affect the number of interactions. Since NMFS expects fishing activity under Alternative 4 to be slightly less than the status quo alternative, and the status quo alternative is not expected to increase the potential for or severity of interactions between the fishery and the chambered nautilus in any way, implementation of Alternative 4 is not expected to change or increase interactions with this species. If complementary management is implemented, fishing activity would be completely restricted, removing the likelihood of interactions occurring in the fishery. Thus, there is no anticipated change to the number, severity, or type of interactions with chambered nautilus.

All Alternatives

The alternatives under consideration would not change the way the fishery operates with respect to areas fished, gear used, or methods employed in a manner that would alter the likelihood of interactions with chambered nautilus, so interactions with this species are not anticipated. Based on the lack of expected interactions with chambered nautilus, under all alternatives considered, the proposed action is not expected to have a substantial effect on the overall population size of chambered nautilus and is not likely to reduce appreciably the likelihood of either survival or recovery of the species in the wild.

3.8.10 Habitats and Vulnerable Ecosystems and Potential Effects

3.8.10.1 Essential Fish Habitat and Habitat Areas of Particular Concern

The Magnuson-Stevens Act defines essential fish habitat (EFH) as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (Magnuson-Stevens Act § 3(10)). This includes the marine areas and their chemical and biological properties that organisms use. Substrate includes sediment, hard bottom, and other structural relief underlying the water column along with their associated biological communities. In 1999, the Council developed and NMFS approved EFH definitions for management unit species (MUS) of the Bottomfish and Seamount Groundfish FMP (Amendment 6), Crustacean FMP (Amendment 10), Pelagic FMP (Amendment 8), and Precious Corals FMP (Amendment 4) (64 FR 19067, April 19, 1999). NMFS approved additional EFH definitions for coral reef ecosystem species in 2004 as part of the implementation of the Coral Reef Ecosystem FMP (69 FR 8336, February 24, 2004). NMFS approved EFH definitions for deepwater shrimp through an amendment to the Crustaceans FMP in 2008 (73 FR 70603, November 21, 2008).

In addition to, and as a subset of EFH, the Council described habitat areas of particular concern (HAPC) based on the following criteria: ecological function of the habitat is important, habitat is sensitive to anthropogenic degradation, development activities stress or would stress the habitat, and/or the habitat type is rare. The FMPs defined HAPC for bottomfish, crustaceans, pelagic, and coral reef species in Guam, CNMI, and American Samoa and for bottomfish, pelagic, and coral reef species in the Pacific Remote Island Areas.

Ten years later, in 2009, the Council developed and NMFS approved five new archipelagic-based FEPs. The FEPs incorporated and reorganized elements of the Councils' species-based FMPs into a spatially-oriented management plan (75 FR 2198, January 14, 2010). The Council subsequently carried forward EFH definitions and related provisions for all FMP fishery resources into the respective FEPs. In 2019, Amendment 4 to the American Samoa FEP, and Amendment 5 to the Marianas FEP reclassified some bottomfish, pelagic, crustacean, precious coral and coral reef ecosystem species as ecosystem component species (84 FR 2767, February 8, 2019). These species do not have EFH or HAPC under the Magnuson-Stevens Act, as these habitat categories only apply to MUS. The following discussion and analysis of potential effects on EFH and HAPC will only consider these habitat designations for species remaining as bottomfish.

Table 19summarizes the designated areas of EFH and HAPC for American Samoa FEP bottomfish by life stage. To analyze the potential effects of a proposed fishery management action on EFH, one must consider all designated EFH.

According to the most recent bottomfish fishery ESA consultations for American Samoa (April 9, 2015), the current bottomfish fishery does not have an adverse effect on listed corals in American Samoa. The findings were based on the fact that the fishery is a targeted fishery with little bycatch, or gear contact with the bottom (i.e., no trawling, nets, traps, etc. and only a few weighted hooks and lines deployed at a time). However, this fishery is not known to adversely affect habitat. Similar methods are used to fish for bottomfish in American Samoa and Hawaii, and studies of bottomfish habitat in Hawaii have not found adverse impacts to habitat from bottomfish fishing activities (Kelley and Moffit 2004; Kelley and Ikehara 2006). Also, to prevent and minimize adverse bottomfish fishing impacts to EFH, each western Pacific FEP prohibits the use of explosives, poisons, bottom trawl, and other non-selective and destructive fishing gear. No alternative under consideration would result in substantial changes to the way fishermen conduct the bottomfish fishery in American Samoa, and, under complementary management, may substantially reduce fishery activity; therefore, the alternatives are not expected to result in adverse effects on bottomfish EFH or HAPC.

Table 19. Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC) for American Samoa bottomfish management unit species (BMUS).

American Samoa BMUS	EFH	HAPC
Lehi (*Aphareus rutilans*) Uku (*Aprion virescens*) Black trevally (*Caranx lugubris*) Lunartail grouper *(Variola louti)* Ehu (*Etelis carbunculus*) Onaga (*Etelis coruscans*) Redgill emperor *(Lethrinus rubrioperculatus)* Blueline snapper (*Lutjanus kasmira*) Opakapaka (*P. filamentosus*) Yelloweye snapper (*P. flavipinnis*) Gindai (*P. zonatus*)	**Eggs and larvae:** the water column extending from the shoreline to the outer limit of the EEZ down to a depth of 400 m (200 fm). **Juvenile/adults:** the water column and all bottom habitat extending from the shoreline to a depth of 400 m (200 fm)	All slopes and escarpments between 40–280 m (20 and 140 fm)

3.8.10.2 Marine Protected Areas (MPAs)

Bottomfish fishing is prohibited through Federal management in the Rose Atoll Marine National Monument, the National Marine Sanctuary of American Samoa in the Fagatele Bay unit, and the research zone of the Aunu'u Island units. It is also prohibited in the territorial MPAs where and/or when fishing is prohibited, such as the no-take Fagamalo Village Marine Protected Area.

These MPAs would not be affected by the proposed action, so adverse effects to them would be unlikely under all alternatives under consideration. None of the proposed alternatives would change the way bottomfish fishing is conducted with respect to these MPAs, so continued operation of the fishery under the baseline or action alternatives would not result in adverse impacts to the Monument, Sanctuary, or other MPAs.

3.8.10.3 Vulnerable Marine or Coastal Ecosystems

Although precious coral species occur in American Samoa, there are no known precious coral beds in waters around American Samoa (WPFMC 2009). All precious coral species in American Samoa are classified as ecosystem component species. Although little is known about the distribution and abundance of precious corals in American Samoa, bottomfish fishing is unlikely to affect these species. Exposure of precious corals to damage from bottomfish fishing activities is limited due to existing Federal regulations (e.g., use of trawls, poisons, explosives) that are not subject to change due to the proposed action. In addition to overlapping potential deep water precious coral habitat, the fishery operates in areas that include coral reef ecosystem habitat (e.g., areas shallower than 50 m). As discussed elsewhere, the fishery is not known to adversely affect benthic habitats (Section 3.7.5 and Section 3.7.10.1).

Fishing activity under the status quo alternative is not expected to change from 2020 and 2021 and only slightly from previous years; therefore, it is unlikely that the fishery would affect vulnerable marine ecosystems such as deep or shallow coral ecosystems under this alternative. Fishing activity under any of the action alternatives is not expected to increase relative to the status quo and may substantially decrease if complementary management is implemented. Additionally, none of the alternatives under consideration would fundamentally change the way the fishery is conducted. Considering that the fishery is not expected to change in a way that would impact vulnerable marine ecosystems under any alternative, the fishery is not expected to affect vulnerable marine ecosystems under any alternative, and no adverse impacts are expected to these areas as a result of implementing any alternative.

In summary, none of the alternatives are expected to change the way in which this fishery is conducted or the magnitude of impacts on habitats. Also, the alternatives under consideration would not change regulations that are in place to prevent and minimize adverse effects from bottomfish fishing on fish habitat. For these reasons, none of the alternatives considered are expected to lead to substantial physical, chemical, or biological alterations to ocean, coral, or coastal habitats or result in impacts to the marine habitat, including areas designated as EFH, HAPC, or unique areas such as MPAs or deep coral ecosystems.

3.9 Scientific, Historic, Archaeological, or Cultural Resources

Historical and archaeological resources may be found in Federal waters of American Samoa in the future, but there are no known districts, sites, highways, structures, or objects that are listed in or eligible for listing in the National Register of Historic Places in the areas that the Federal bottomfish fishery operates. Shipwrecks may exist in areas where the fishery operates, but the fishery is not known to adversely affect shipwrecks. Bottomfish fishermen tend to avoid fishing in, anchoring on, and anchoring near known shipwrecks to avoid losing gear.

Sites with unique scientific resources have not been identified in American Samoa, apart from those protected as MPAs (Section 3.8.10.2). Fishing is generally restricted in these areas, including fishing for bottomfish, so this fishery would not affect MPAs. NMFS does not expect the proposed rebuilding plan to have an effect on objects or places listed in the National Register of Historical Places as no such areas exist in the U.S. EEZ around American Samoa. While fishing may occur in areas of potential scientific, cultural, or historical interest, the fishery is not currently known to cause loss or destruction to any such resources. In the absence of complementary management, fishing operations are not expected to change under the implementation of any of the alternatives for the proposed rebuilding plan in any way that would affect historic resources. Because management under the action alternatives is not expected to result in significant changes to the conduct of the fishery in this scenario (Sections 2.4through 2.6), none of the action alternatives are expected to affect areas of scientific, historic, cultural, or archaeological importance. If complementary management is implemented, then fishery activity may be substantially reduced. NMFS does not expect that a fishery with reduced or zero activity would result in adverse effects to resources of scientific, historic, cultural, or archaeological importance.

3.10 Physical Resources and Potential Effects

There are no known significant impacts to air quality, noise, water quality, view planes, or terrestrial resources from past or current bottomfish fishing activity in American Samoa. The fishery does not have adverse effects on unique features of the geographic environment, and fishing behavior and effort are not expected to change under any alternative in a manner that would result in effects on physical resources (see Sections 2.3through 2.6). Given the characteristics of the fishing fleet and the offshore nature of the fishery, none of the alternatives would result in impacts to air quality, noise, water quality, view planes, or terrestrial resources.

3.11 Potential Effects on the Fishery Management Setting

Under the authority of the Magnuson-Stevens Act, the Council is responsible for developing management plans and NMFS is responsible for implementing regulations to manage the bottomfish fishery in Federal waters surrounding American Samoa. The NOAA OLE and the USCG enforce Federal fisheries rules. They may conduct enforcement activities through patrols both on and off the water, and they also conduct criminal and civil investigations. The Enforcement Section of the NOAA Office of General Counsel provides legal support to the NOAA OLE and other NOAA offices and prosecutes cases.

To prevent and minimize adverse bottomfish fishing impacts to EFH, each western Pacific FEP prohibits the use of explosives, poisons, bottom trawl, and other non-selective and destructive fishing gear. Federal law also requires the Council-appointed American Samoa FEP team to prepare an annual report on the performance of all Federal fisheries, including American Samoa bottomfish fishery, by June 30 of each year (e.g., WPFMC 2021). These activities and responsibilities would continue under all alternatives, and catches would continue to be monitored through the territorial fishery monitoring program under DMWR with assistance from NMFS.

3.11.1 Federal Agencies and the Council

Alternative 1: Status Quo / NMFS would not implement a Rebuilding Plan

Under Alternative 1, NMFS would not implement a rebuilding plan and the same ACL and AM for the fishery under the interim measure would persist. The fishery is expected to perform similarly as under the interim measure, and no substantial changes are expected relative to recent catches or fishing activity (Section 2.3.1). Administrative efforts would be required to track the fishery catches in-season relative to the ACL regardless of whether the territory government decides to implement complementary management or not. While the closure of Federal waters through the in-season AM would not require an additional action by the Council, it would require administrative resources by NMFS to close the fishery and enforce the closure. Although this would be the just the second time an in-season AM would be used in American Samoa, NMFS has utilized an in-season closure as an AM in the Hawaii Deep 7 bottomfish fishery since 2007. The Deep 7 fishery reached the catch limit each year from 2007 to 2010, so NMFS has experience with this type of action. If the fishery were closed in Federal waters around American Samoa, NMFS OLE and the USCG would be responsible for enforcing the closure. Enforcement of the bottomfish fishing closure in Federal waters would not be difficult on the water because the 3-mile limit is easily determined using GPS. However, existing data reporting systems do not differentiate catch from fish caught in territorial from fish caught in Federal waters. Overall, administrative and enforcement efforts would be required under the status quo, but activities and costs would not be expected to change relative to the preceding management action because this alternative would apply the same management measures as previously implemented.

Alternative 2: Implement a Rebuilding Plan with a 1,500 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 2, NMFS would implement a rebuilding plan with a 1,500 lb ACL, in-season AM, and performance standard, and the performance of the fishery would be dependent on the territory's decision to implement complementary management with this Federal action or not. In the absence of complementary management, it is expected that the fishery would perform similarly to the status quo alternative, though bottomfish catch may be slightly reduced from the recent average, and catch is expected to be between 10,784 lb and 12,687 lb (Section 2.4.1). If complementary management is implemented, annual bottomfish catch would be notably reduced to 1,500 lb. The fishery is expected to reach the authorized catch of 1,500 lb early in the first fishing year, which would require that NMFS close the fishery in Federal waters in accordance with the in-season AM. This would not require an additional action by the Council but would require administrative resources by NMFS to close the fishery and enforce the closure, similar to the status quo. Although this would be the just the second time an in-season AM would be used in American Samoa, NMFS has utilized an in-season closure as an AM in the Hawaii Deep 7 bottomfish fishery since 2007. The Deep 7 fishery reached the catch limit each year from 2007 to 2010, so NMFS has experience with this type of action. If the fishery were closed in American Samoa, NMFS OLE and the USCG would be responsible for enforcing the closure in Federal waters. Enforcement of the bottomfish fishing closure in Federal waters would not be difficult on the water because the 3-mile limit is fairly easily determined using GPS. However, existing data reporting systems do not differentiate catch from fish caught in territorial from fish caught in Federal waters. The application of the performance standard to close the Federal fishery in subsequent years until a new management approach is developed similarly would not require an

additional action by the Council but would require resources by NMFS to enact and enforce the closure. Fishermen would continue to comply with existing laws, and they would need to learn about the potential for an in-season closure under the new ACL and comply with the no-retention regulation for bottomfish caught in Federal waters if a closure is implemented.

Alternative 3: Implement a Rebuilding Plan with a 5,000 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 3, NMFS would implement a rebuilding plan with a 5,000 lb ACL, in-season AM, and performance standard. The extent of management and administrative effort by NMFS and the Council is dependent on fishery performance, which, in turn, is dependent on the territory's decision to implement complementary management with this Federal action. In the absence of complementary management, NMFS expects that the fishery would perform similarly to the status quo alternative with a slight reduction in catch. If complementary management is implemented, annual catches of bottomfish would be substantially reduced relative to the status quo. In either case, NMFS anticipates implementing the in-season AM and performance standard approximately halfway through the first fishing year under the rebuilding plan given recent average fishery performance. The in-season AM would require that NMFS close the fishery in Federal waters, which would not require an additional action by the Council but would require administrative resources by NMFS to close the fishery and enforce the closure, similar to the status quo and Alternative 2. Although this would be the just the second time an in-season AM would be used in American Samoa, NMFS has utilized an in-season closure as an AM in the Hawaii Deep 7 bottomfish fishery (see Alternative 2 above), and so NMFS has experience with this type of action. If the fishery were closed in American Samoa, NMFS OLE and the USCG would be responsible for enforcing the closure in Federal waters. Enforcement of the bottomfish fishing closure in Federal waters would not be difficult on the water because the 3-mile limit is fairly easily determined using GPS. However, existing data reporting systems do not differentiate catch from fish caught in territorial from fish caught in Federal waters. The application of the performance standard to close the Federal fishery in subsequent years until a new management approach is developed similarly would not require an additional action by the Council but would require resources by NMFS to enact and enforce the closure. The new regulations would not cause substantial costs to fishermen. Fishermen would need to continue to comply with existing laws, learn about the potential for an in-season closure under the new ACL, and comply with the no-retention regulation for bottomfish caught in Federal waters if a closure is implemented.

Alternative 4: Implement a Rebuilding Plan with a Temporary Moratorium on Bottomfish Fishing in Federal Waters

Under Alternative 4, NMFS would implement a rebuilding plan in which the fishery would be closed in Federal waters, so it would not be necessary to evaluate catch relative to an ACL and a subsequent administrative action by NMFS would not be necessary to close the fishery. This alternative would not require more administrative resources than the status quo, but resources from NOAA OLE and the USCG would be needed to enforce a closure of Federal waters to bottomfish fishing. Enforcement of the bottomfish fishing closure in Federal waters would not be difficult because the 3-mile limit is easily determined using GPS. Fishermen would continue to comply with existing laws, and they would need to learn about the complete closure and comply with the no-retention regulation for bottomfish caught in Federal waters. Compliance would be

easier for fishermen under Alternative 4 compared to Alternatives 2 and 3 because the closure of Federal waters would not change over the course of the rebuilding plan.

All Alternatives

None of the alternatives would establish a precedent for future actions with significant effects or represent a decision in principle about future actions with potentially significant environmental effects. NMFS has specified ACLs and post-season AMs for American Samoa bottomfish from 2012 through 2017 as required by the Magnuson-Stevens Act, and the recent interim measure implemented a catch limit with an in-season AM in 2020 and 2021. The proposed action is a long-term management action that consists of an ACL, AM, and performance standard for Alternatives 2 and 3 and a complete closure for Alternative 4. ACLs have been implemented in the fishery since 2012 and would not generate substantial impacts to administrative efforts. The use of the in-season AM or the higher performance standard would not require an additional action by the Council but would require resources by NMFS to enact and enforce any closure. The proposed action is a long-term action but is of limited duration, and each of the action alternatives would reduce fishery impacts on target bottomfish species compared to the status quo. The action alternatives are also intended to mitigate effects of a new fishery management need (i.e., ending overfishing and rebuilding the stock) on the American Samoa fishing community. Because of the limited nature of the management, none of the actions would have large effects in terms of increasing or decreasing future management options available to NMFS and the Council after the duration of the rebuilding plan is complete. However, in accordance with the Magnuson-Stevens Act, if the rebuilding plan is not making adequate progress towards ending overfishing and rebuilding the stock within its duration, different or additional management measures may be implemented by the Secretary as necessary to ensure rebuilding is achieved.

3.11.2 Territorial Management Agencies

Alternative 1: Status Quo / NMFS would not implement a Rebuilding Plan

Under Alternative 1, NMFS would not implement a rebuilding plan and would maintain the same management as under the interim measure. In the absence of complementary management, the implementation of the status quo alternative with an ACL and in-season AM for the fishery would not change responsibilities for DMWR, as it would continue to collect catch data through the creel survey program and commercial receipt system and provide this information to NMFS. Because of the need for timely data to support an in-season AM, NMFS would coordinate with DMWR to provide timely and effective monitoring. Thus, under this scenario, implementation of a 13,000 lb ACL and potential Federal closure would not affect fishing in territorial waters and therefore not lead to added burden on territorial management agencies. If the territory implements complementary management and the in-season AM is applied, there may be an additional burden on the territory to both close territorial waters to bottomfish fishing and enforce the closure in its territorial waters. Fishermen would continue to comply with existing laws, and they would need to learn about the potential for an in-season closure under the ACL and comply with the no-retention regulation for bottomfish caught in territorial waters if a closure is implemented with complementary management.

Alternative 2: Implement a Rebuilding Plan with a 1,500 lb ACL, In-Season AM, and Higher Performance Standard

NMFS would implement a rebuilding plan under Alternative 2 in which the use of an ACL, AM, and higher performance standard for the bottomfish fishery of American Samoa is not expected to change fishery monitoring by the local resource management agencies. NMFS would continue to monitor catch data as it becomes available in collaboration with local resource management agencies and the Council. Because of the need for timely data to support an in-season AM, NMFS would coordinate with DMWR to provide timely and effective monitoring. If complementary management is not applied to this Federal action by the territory, implementation of a 1,500 lb ACL and potential Federal closure would not affect fishing in territorial waters and thus not lead to added burden on territorial management agencies. If complementary management is implemented, there may be an added burden on territorial management agencies to close territorial waters to the fishery and enforce the closure if the in-season AM is applied. NMFS expects this to happen early in the first fishing year under the proposed rebuilding plan under Alternative 2. Fishermen would continue to comply with existing laws, and they would need to learn about the potential for an in-season closure under the ACL and comply with the no-retention regulation for bottomfish caught in territorial waters if a closure is implemented with complementary management.

Alternative 3: Implement a Rebuilding Plan with a 5,000 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 3, NMFS would implement a rebuilding plan with a 5,000 lb ACL, in-season AM, and higher performance standard. NMFS does not expect that implementing an ACL, AM, and higher performance standard for the American Samoa bottomfish fishery would change fishery monitoring by the local resource management agencies. NMFS would continue to monitor catch data as it becomes available in collaboration with local resource management agencies and the Council. Because of the need for timely data to support an in-season AM, NMFS would coordinate with DMWR to provide timely and effective monitoring. If complementary management is applied to this Federal action by the American Samoa Government, implementation of a 5,000 lb ACL and potential Federal closure would not affect fishing in territorial waters and, thus, not lead to added burden on territorial management agencies. If complementary management is implemented, there may be an added burden on territorial management agencies to close territorial waters to the fishery and enforce the closure if the in-season AM is applied, as NMFS expects to happen nearly halfway through the first fishing year under the rebuilding plan. Fishermen would need to continue to comply with existing laws, to learn about the potential for an in-season closure under the ACL, and to comply with the no-retention regulation for bottomfish caught in territorial waters if a closure is implemented under complementary management by the territory with this Federal action.

Alternative 4: Implement a Rebuilding Plan with a Temporary Moratorium on Bottomfish Fishing in Federal Waters

Under Alternative 4, NMFS would implement a rebuilding plan that would establish a temporary moratorium on the possession of and harvest of bottomfish in Federal waters. The effects of Alternative 4 on the DMWR are expected to be the same as Alternatives 2 and 3. Although an in-season AM is not part of Alternative 4, the DMWR would continue to monitor catch in

collaboration with NMFS and the Council. Similar to the other action alternatives, the DMWR would not be required to implement a complementary closure in territorial waters in the absence of complementary management. If complementary management is implemented by the American Samoa Government, then there would be added burden to territorial management agencies to close territorial waters to the fishery and enforce the closure. Fishermen would continue to comply with existing laws, and they would need to learn about the fishery closure and comply with the no-retention regulation for bottomfish caught in territorial waters if a closure is implemented with complementary management.

3.11.3 Implementation of ACLs and AMs for other Pacific Island Fisheries

The proposed implementation of a rebuilding plan for American Samoa would not conflict with or reduce the efficacy of existing bottomfish resource management by any local resource management agency, NMFS, or the Council. Additionally, the proposed management measures would also not conflict with ACL and AM implementations for the other Western Pacific bottomfish fisheries in the CNMI, Guam, or Hawaii because these fisheries are geographically separated and bottomfish fishery participants do not fish in different territories such that management in one island area (e.g., American Samoa) would adversely affect the stock status of bottomfish in another island area (e.g., Guam, CNMI, or Hawaii).

3.12 Other Potential Effects

3.12.1 Biodiversity and Ecosystem Function

To date, there have been no identified effects to marine biodiversity and/or ecosystem function from the American Samoa bottomfish fishery. Bottomfish species are not known to have critical ecosystem roles, such as other tropical species like parrotfishes or reef-building corals (Bozec et al. 2013; Wild et al. 2011), and the fishery is not known to have large effects on biodiversity or ecosystem function. In the absence of complementary management by the American Samoa Government, none of the alternatives under consideration would result in substantial changes to the fishery with respect to gear, effort, participation, or areas fished (Sections 2.3through 2.6); therefore, implementation of the proposed rebuilding plan would not affect marine biodiversity and/or ecosystem function. If the territory does implement complementary management, there may be substantial changes to the fishery, but it is not immediately clear what impacts this may have on marine biodiversity and/or ecosystem function. Because fishery activity would be further limited under complementary management, NMFS expects that the effect of the rebuilding plan under this scenario would result in additional bottomfish biomass.

Bottomfish fishing is not known to be a potential vector for spreading alien species as none of the bottomfish vessels fish outside of their archipelagic waters. Because fishing would not change in this regard under any of the alternatives in the absence of complementary management (Sections 2.3through 2.6), the proposed rebuilding plan would not have the potential to spread invasive species into or within the waters of American Samoa. In the scenario where complementary management is implemented by the territory, NMFS does not expect the proposed rebuilding plan to have increased potential to spread invasive species into or within the waters of American Samoa because fishery activity would be substantially reduced.

3.12.2 Highly Uncertain Effects, Unique or Unknown Risks

As authorized by the Magnuson-Stevens Act, the Council and NMFS have managed the bottomfish fishery in American Samoa since 1986 (WPFMC 1986), and fishery managers and scientists involved in developing the proposed action are highly experienced in terms of understanding the way the fishery operates and the likely outcomes of the proposed measure. No catch limits were specified in 2018 and 2019, so fishery performance is known under a no action scenario. Similarly, the management applied to the fishery in 2020 gives insight into fishery impacts under the status quo. The proposed action is part of continued management of the fishery under a system of catch limits and AMs that was first used in 2012. Effects on the human environment of operation and management of the fishery under a catch limit are generally known and have been considered in the development and recommendation of management alternatives. This action would represent just the second effort by NMFS to enact an in-season AM in American Samoa. However, NMFs has never had to enforce an in-season closure in this fishery. NMFS has implemented an in-season closure as an AM in the Hawaii Deep 7 bottomfish fishery since 2007. The Deep 7 fishery reached the catch limit each year from 2007 to 2010, so NMFS has experience with this type of action.

Analysis of the proposed management action includes consideration of BSIA and expected levels of catch under scenarios where complementary management by the American Samoa Government either is or is not implemented. Some uncertainty exists in the potential response of fishermen to a closure of Federal waters in the absence of complementary management. However, because a relatively small proportion of bottomfish habitat in American Samoa lies in Federal waters, the difference between the maximum possible effect (i.e., proportional reduction in catch), and minimum possible effect (i.e., no reduction in catch) is relatively small. However, neither outcome is expected to comply with the statutory requirement to end overfishing without complementary management, as it is expected there would be only a slight reduction in catch under the action alternatives compared to the status quo alternative in this scenario. Similarly, neither outcome is expected to comply with the statutory requirement to rebuild the fishery without complementary management. If the territory implements complementary management, fishery activity could be notably restricted and there may be a substantial or complete reduction in bottomfish catch. There exists some uncertainty as to whether bottomfish fishermen may opt to target a different fishery species if they are disallowed from harvesting bottomfish in waters surrounding American Samoa. The effects of continued fishing for bottomfish within these limited constraints under either scenario of complementary management for the duration of the rebuilding plan are understood based on the stock assessment and are not highly risky. Risks associated with proposed management are therefore not unique or unknown, and potential outcomes are informed by available scientific information.

3.12.3 Environmental Justice

The effect of the alternatives on environmental justice communities that include members of minority and low-income groups was considered. Overall, the fishery is not having a large adverse effect on subsistence harvests of marine resources, the environment, or human health in a way that disproportionately affects members of environmental justice communities. The fishery does not pollute marine waters and, thus, does not have adverse effects to human health or on marine life. The ACL or Federal closure would apply to everyone that catches bottomfish, so it would not disproportionately affect any particular subset of the bottomfish fishery. The

environmental review in this EA shows that the fishery would continue to be conducted similar to recent years under the status quo alternative and that Alternatives 2 through 4 may slightly decrease catch compared to the status quo without complementary management. These alternatives could decrease the amount of bottomfish available to fishing communities in this scenario, though none of the effects are expected to be substantial (Section 3.6.1). If complementary management were to be implemented by the territory for any action alternative, NMFS expects the decrease in bottomfish available to the fishing community to result in significant impacts. The ACL, AM, and higher performance standard under Alternatives 2 and 3, closure under Alternative 4, monitoring, and other fishery management measures are intended to end overfishing, rebuild the fishery, and mitigate impacts to fishing communities, including minority and low-income groups such that communities that rely on their harvest can continue to benefit from the fishery in the future. Because the fishery is not expected to change its conduct substantially under any alternative in the absence of complementary management, implementation of these management measures is not anticipated to result in substantial changes to the fishery, regardless of which alternative is being considered. As a result, no adverse effects to the environment were found that could have disproportionately high or adverse effects on members of environmental justice communities in American Samoa. However, in the scenario where complementary management is implemented by the territorial government, there may be substantial changes to fishery activity and performance. This may have notable impacts to members of environmental justice communities in American Samoa that are reliant on locally-source bottomfish for subsistence, cultural, or religious purposes as well as revenue.

3.13 Additional Considerations

3.13.1 Climate Change

Although there are no specific studies examining the potential effects of climate change on Pacific Island bottomfish, changes in the environment from global climate change have the potential to affect bottomfish fisheries. Effects of climate change may include sea level rise, increased intensity or frequency of coastal storms and storm surges, changes in rainfall (more or less) that can affect salinity nearshore or increase storm runoff and pollutant discharges into the marine environment, increased temperatures resulting in coral bleaching, and temperature mediated responses in some marine species (IPCC 2007). The effects from climate change may occur slowly and be difficult to discern from other effects. Climate change has the potential to adversely affect some organisms, while others could benefit from changes in the environment. Increased carbon dioxide uptake can increase ocean acidity which can disrupt calcium uptake processes in corals, crustaceans, mollusks, reef-building algae, and plankton, among other organisms (Houghton et al. 2001; The Royal Society 2005; Caldeira and Wickett 2005; Doney 2006; Kleypas et al. 2006). Climate change can also lead to changes in ocean circulation patterns, which can affect the availability of prey, migration, survival, and dispersal (Buddemeier et al. 2004). Damage to coastal areas due to storm surge or sea level rises as well as changes to catch rates, migratory patterns, or visible changes to habitats are among the most likely changes.

The efficacy of the proposed alternatives for the rebuilding plan in providing for sustainable levels of fishing for bottomfish is not expected to be adversely affected by climate change. Recent catches and biological status of the species complex informed the development of the alternatives, and climate change effects, if any, would be indirectly reflected in those statistics.

Monitoring of bottomfish catches and stocks would continue, regardless of which alternative is selected, and if environmental factors were found to be affecting the stocks, management could be adjusted in the future.

3.13.1.1 Consideration of Greenhouse Gas Emissions

The fishery relies on vessels that are powered by fossil fuels and emit greenhouse gases from fossil fuel combustion. Management under the alternatives considered would not result in a change in fishing in any way that would have large effects on vessel use or fuel consumption or greenhouse gas emissions except if complementary management were to be implemented by the territory. Under Alternative 4, catch, and thus vessel activity, would be reduced to zero, which would be likely to result in a decrease of fossil fuel consumption for the fishery. Similarly, a coordinated closure associated with the application of the in-season AM for Alternatives 2 and 3 may also notably reduce vessel usage for the fishery and related fossil fuel consumption. It is not clear, however, if bottomfish fishermen would opt to target a different fishery species and potentially offset this anticipated reduction in fossil fuel usage. In the absence of complementary management, if the fishery were to be subject to a closure of Federal waters to bottomfish fishing, some fishing activity may move from offshore banks in Federal waters to closer habitats in territorial waters that require less transit (Fig. 2). However, NMFS does not have detailed information on the current level of fishing effort in Federal versus territorial waters. The closure would affect a small proportion of bottomfish habitat, so fishing activity is not expected to change substantially relative to the status quo, and any potential decreases in fossil fuel consumption are expected to be minor. For these reasons, none of the action alternatives is expected to result in substantial changes to the way vessels are used except for Alternatives 2 through 4 associated with complementary management, so there would be no change in greenhouse gas emissions if complementary management is not implemented.

Table 20. Environmental effects of the alternatives.

Topic	Alt. 1 – ACL of 13,000 lb with In-Season AM (Status Quo)	Alt. 2 – ACL of 1,500 lb with In-Season AM and Higher Performance Standard	Alt. 3 – ACL of 5,000 lb with In-Season AM and Higher Performance Standard	Alt. 4 – Temporary Moratorium of Fishery in Federal Waters
Overview of the alternatives	Existing fishery under interim measure in 2020 and 2021. ACL of 13,000 lb with an in-season AM to close the fishery in Federal waters if the ACL is attained. Rebuilding would likely take 30 to 32 years.	Fishery operating under proposed ACL of 1,500 lb of BMUS, in-season AM, and higher performance standard. Authorized catch level would rebuild fishery in eight years assuming complementary management by American Samoa, but rebuilding would occur in 19 to 20 years due to continued catch in territorial waters in the absence of complementary management. Likely subject to an in-season Federal fishery closure in the first fishing year of the rebuilding plan, followed by a complete Federal closure in subsequent years until a new coordinated management approach is developed in accordance with the performance standard.	Fishery operating under proposed ACL of 5,000 lb of BMUS, in-season AM, and higher performance standard. Authorized catch level would rebuild fishery in 10 years assuming complementary management by American Samoa, but rebuilding would occur in 19 to 21 years due to continued catch in territorial waters in the absence of complementary management. Likely subject to an in-season Federal fishery closure in the first fishing year of the rebuilding plan, followed by a complete Federal closure in subsequent years until a new coordinated management approach is developed in accordance with the performance standard.	Federal waters closed for the duration of the rebuilding plan. This is functionally equivalent to an ACL of 0 lb in Federal waters. Authorized catch level would rebuild fishery in eight years assuming complementary management, but rebuilding would occur in 19 years due in the absence of complementary management due to continued catch in territorial waters. No AMs.

Topic	Alt. 1 – ACL of 13,000 lb with In-Season AM (Status Quo)	Alt. 2 – ACL of 1,500 lb with In-Season AM and Higher Performance Standard	Alt. 3 – ACL of 5,000 lb with In-Season AM and Higher Performance Standard	Alt. 4 – Temporary Moratorium of Fishery in Federal Waters
Expected fishery outcome	Continuation of fishery as operated under the interim measure. A Federal fishery closure would not be implemented if catch remains consistent with recent annual averages. Catch expected to exceed OFL, so overfishing would not be prevented, and rebuilding projected to take 30 to 32 years.	Federal fishery may close January - March in the first fishing year; Federal fishery closure expected for the full year in subsequent years due to the performance standard; catch expected to be less than Alt. 1 if complementary management is not implemented, or substantially less if it is. Desired reduction in harvest of BMUS could be offset by fishing in territorial waters where the majority of bottomfish habitat is located, as some fishing effort may redistribute there if complementary management is not implemented. Overfishing would be reduced, but not ended, and rebuilding likely to take 19 to 20 years because of fishing in territorial waters if complementary management is not implemented. If it is, overfishing would be ended, and rebuilding would be achieved in eight years.	Federal fishery may close in May of the first fishing year; Federal fishery closure expected for the full year in subsequent years due to the performance standard; catch expected to be slightly less than Alt. 1 if complementary management is not implemented, or substantially less if it is. Desired reduction in harvest of BMUS could be offset by fishing in territorial waters where the majority of bottomfish habitat is located, as some fishing effort may redistribute there if complementary management is not implemented. Overfishing would be reduced, but not ended, and rebuilding likely to take 19 to 21 years because of fishing in territorial waters if complementary management is not implemented. If it is, overfishing would be ended, and rebuilding would be achieved in 10 years.	Catch expected to be less than Alt. 1 for the duration of the rebuilding plan and less than Alt. 2 and 3 in the first year. Desired reduction in harvest of BMUS could be offset by fishing in territorial waters where the majority of bottomfish habitat is located, as some fishing effort may redistribute there if complementary management is not implemented. Overfishing would be reduced, but not ended, and rebuilding likely to be delayed to 19 years because of fishing in territorial waters if complementary management is not implemented. If it is, overfishing would be ended, and rebuilding would be achieved in eight years.

Topic	Alt. 1 – ACL of 13,000 lb with In-Season AM (Status Quo)	Alt. 2 – ACL of 1,500 lb with In-Season AM and Higher Performance Standard	Alt. 3 – ACL of 5,000 lb with In-Season AM and Higher Performance Standard	Alt. 4 – Temporary Moratorium of Fishery in Federal Waters
Fishery operation in terms of location, gear, participation, effort, seasonality	The fishery operates around American Samoa and its offshore banks. Distribution of harvest in Federal and territorial waters is unknown. 85 percent of bottomfish habitat is in territorial waters; most catch is assumed to be from these waters. There is no detailed analysis on seasonality, but the fishery operates year round. Alt. 1 would not change the fishery with respect to catch, location, areas fished, gear, seasonality, participation, or intensity relative to the interim measure. (Section 2.3, Section 3.4)	Dependent on the implementation of complementary management by the territory. No large change from Alt. 1 in the absence of complementary management. Some fishing may be displaced into territorial waters over the duration of the rebuilding if Federal waters close. Since most fishing occurs in territorial waters, this would not result in a large change. Large change from Alt. 1 if the ACL is attained with complementary management since both territorial and Federal waters would be closed to the fishery. Overall, NMFS expects effort to be reduced or eliminated during the rebuilding plan because of a fishery closure in Federal waters, and possibly territorial waters, for most of the first year and in subsequent years of the rebuilding plan.	Same as Alt 2.	Dependent on the implementation of complementary management by the territory. No large change from Alt. 1 in the absence of complementary management. Federal waters would be closed for the duration of the rebuilding plan, so all fishing would occur in territorial waters during this time. Since most fishing occurs in territorial waters, this would not result in a large change. Large change from Alt. 1 with complementary management since both territorial and Federal waters would be closed for the duration of the plan. Overall, effort is expected to be reduced or eliminated during the rebuilding plan because of the complete closure to fishing in Federal and possibly territorial waters for the duration of the rebuilding plan.

Topic	Alt. 1 – ACL of 13,000 lb with In-Season AM (Status Quo)	Alt. 2 – ACL of 1,500 lb with In-Season AM and Higher Performance Standard	Alt. 3 – ACL of 5,000 lb with In-Season AM and Higher Performance Standard	Alt. 4 – Temporary Moratorium of Fishery in Federal Waters
Effects on air and water quality, noise, and view planes	No effect, not considered further.	No change from status quo.	No change from status quo.	No change from status quo.
Effects on unique features of the geographic environment	The fishery does not affect unique features of the geographic environment. (Sections 3.7.10, 3.9, and 3.9)	No change from status quo.	No change from status quo.	No change from status quo.
Estimated annual catch of BMUS	12,687 lb regardless of whether complementary management is implemented.	*With complementary management*: 1,500 lb in the first year, and 0 lb in subsequent years. *Without complementary management*: Between 10,784 lb and 12,687 lb.	*With complementary management*: 5,000 lb in the first year, and 0 lb in subsequent years. *Without complementary management*: Between 10,784 lb and 12,687 lb.	*With complementary management*: 0 lb. *Without complementary management*: Between 10,784 lb and 12,687 lb.
Effects on target species (BMUS)	Stock would be managed under an authorized catch consistent with the interim measure but would take 30 to 32 years to rebuild. Overfishing would not be reduced from recent years. Impacts to BMUS would be expected to be the same as under the interim measure.	Catch would be authorized at a level that is intended to end overfishing and rebuild the fishery in eight years. A reduction in overfishing is expected, but overfishing would not be prevented without a complementary closure in territorial waters.	Catch would be authorized at a level that is intended to end overfishing and rebuild the fishery in 10 years, the regulatory maximum time. A reduction in overfishing is expected, but it would not be prevented without a complementary closure in territorial waters.	Authorized catch would be functionally equivalent to zero in Federal waters, which is intended to end overfishing and rebuild the fishery in eight years. However, whether this would be achievable would be dependent on the territory implementing complementary management.

Topic	Alt. 1 – ACL of 13,000 lb with In-Season AM (Status Quo)	Alt. 2 – ACL of 1,500 lb with In-Season AM and Higher Performance Standard	Alt. 3 – ACL of 5,000 lb with In-Season AM and Higher Performance Standard	Alt. 4 – Temporary Moratorium of Fishery in Federal Waters
		In the absence of complementary management, there would be a reduction in harvest from offshore areas due to a closure of Federal waters to bottomfish fishing expected early in the first year and for the full year in subsequent years of the rebuilding plan, which would reduce overfishing but not end it. There may be less displacement into territorial waters than Alt. 4, but more than Alt. 3, in the first year due to Federal waters being open to bottomfish fishing until the ACL is reached. If complementary management is implemented, catch would be limited to 1,500 lb in the first year, and then likely be 0 lb in subsequent years due to the application of the performance standard, with comparable impacts as Alt. 4.	In the absence of complementary management, there would be a reduction in catch from offshore areas due to a Federal closure expected halfway through the first year and in subsequent years of the rebuilding plan, which would reduce but not end overfishing. There may be less displacement to territorial waters than Alt. 1 and 4 in the first year due to Federal waters being open until the relatively higher ACL is reached. If complementary management is implemented, catch would be limited to 5,000 lb in the first year, and then likely be 0 lb in subsequent years due to the performance standard, with comparable impacts as Alt. 4.	Without it, fishing would not be limited in territorial waters. Reduction in overfishing is expected, but effects would not be completely mitigated without complementary management. There would be a reduction in harvest of BMUS from offshore areas due to the closure of Federal waters, but overfishing would be eliminated with the implementation of complementary management.

Topic	Alt. 1 – ACL of 13,000 lb with In-Season AM (Status Quo)	Alt. 2 – ACL of 1,500 lb with In-Season AM and Higher Performance Standard	Alt. 3 – ACL of 5,000 lb with In-Season AM and Higher Performance Standard	Alt. 4 – Temporary Moratorium of Fishery in Federal Waters
Effects on non-target species and bycatch	Fishery effects on non-target stocks are expected to continue at low levels because bottomfish fishing is target-specific, and there has been no recorded bycatch in the fishery in recent years.	No change from status quo.	No change from status quo.	No change from status quo.
Effects on protected species	The fishery is known to have limited level of interactions with protected species and operates within existing ESA and MMPA authorizations. The fishery is a Category III fishery under the MMPA (remote likelihood or no known incidental mortality and serious injury of marine mammals). The fishery is not adversely interacting with seabirds.	No change from status quo.	No change from status quo.	No change from status quo.
Effects on critical habitat	Currently, there is no designated critical habitat in the action area.	No change from status quo.	No change from status quo.	No change from status quo.

Topic	Alt. 1 – ACL of 13,000 lb with In-Season AM (Status Quo)	Alt. 2 – ACL of 1,500 lb with In-Season AM and Higher Performance Standard	Alt. 3 – ACL of 5,000 lb with In-Season AM and Higher Performance Standard	Alt. 4 – Temporary Moratorium of Fishery in Federal Waters
Effects on habitats and vulnerable ecosystems	The fishery is not known to have adverse effects on habitats including EFH or HAPC, coral reefs, or vulnerable ecosystems.	No change from status quo.	No change from status quo.	No change from status quo.
Effects on other vulnerable marine or coastal ecosystems	The fishery is not known to be adversely affecting other vulnerable coastal ecosystems including deep coral ecosystems.	No change from status quo.	No change from status quo.	No change from status quo.
Effects on fishing communities	The affected fishing community is comprised of people from the American Samoa Archipelago, which includes fishermen, vendors, and consumers. BMUS are important for social and cultural uses, and the fishery supports jobs and provides revenue for fishermen. Impacts to the fishing community would be the same as under the interim measure.	Slight or substantial change. Without complementary management, commercial fishermen would see a 13.2 percent reduction in revenues for the first year and a 15 reduction in subsequent years of the rebuilding plan relative to the status quo due to the expected closures of Federal waters. There would be a similar reduction in BMUS for the community. Effects on non-commercial, sustenance, and cultural fishing would be similar to commercial fishing. Fishing in territorial waters would	Slight or substantial change. Without complementary management, commercial fishermen would see a 9.1 percent reduction in revenues for the first year and a 15 reduction in subsequent years of the rebuilding plan relative to the status quo due to the expected closures of Federal waters. There would be a similar reduction in BMUS for the community. Effects on non-commercial, sustenance, and cultural fishing would be similar to commercial fishing. Fishing in territorial waters would	Slight or substantial change. Without complementary management, revenue would be reduced about 15 percent for fishermen each year for the duration of the rebuilding plan relative to the status quo as the fishery would be closed in Federal waters. A similar reduction is expected in BMUS for the community. Effects on non-commercial, sustenance, and cultural fishing would be similar to commercial fishing. Fishing in territorial waters would still be available and would partially offset the effects.

Topic	Alt. 1 – ACL of 13,000 lb with In-Season AM (Status Quo)	Alt. 2 – ACL of 1,500 lb with In-Season AM and Higher Performance Standard	Alt. 3 – ACL of 5,000 lb with In-Season AM and Higher Performance Standard	Alt. 4 – Temporary Moratorium of Fishery in Federal Waters
		still be available and would partially offset the effects. With complementary management, there would be an 88.2 percent reduction in revenue in the first year and a 100 percent reduction in subsequent years due to the expected closure of territorial and Federal waters to the fishery. Long-term, the management measure would improve conservation of BMUS over Alt 1 and 3.	still be available and would partially offset the effects. With complementary management, there would be a 60.6 percent reduction in revenue in the first year and a 100 percent reduction in subsequent years due to the expected closure of territorial and Federal waters to the fishery. Long-term, the management measure would improve conservation of BMUS over Alt 1.	With complementary management, there would be a 100 percent reduction in revenue for all years under the rebuilding plan. Long-term, Alt. 4 would improve conservation of BMUS over the status quo and slightly more than Alt. 2 and 3 in the first year but would provide less mitigation of management impacts on the fishing community.
Effects on fishery revenue	Fishing is expected to continue at levels similar to the interim measure, and fishermen would realize $3,645 in total revenue if they catch 12,687 lb and 7.2 percent is sold.	In the absence of complementary management, revenue under this alternative is expected to be slightly less than the status quo at $3,163 in the first year of the rebuilding plan since catch is expected to be reduced due to a closure of Federal waters if the ACL is reached. Revenue in subsequent years is expected to be $3,098 since catch is expected to be further reduced due to a complete closure of Federal	In the absence of complementary management, revenue under this alternative is expected to be slightly less than the status quo at $3,313 in the first year of the rebuilding plan since catch is expected to be reduced due to a closure of Federal waters if the ACL is reached. Revenue in subsequent years is expected to be $3,098 since catch is expected to be further reduced due to a complete closure of Federal	In the absence of complementary management, revenue under this alternative is expected to be slightly less than the status quo at $3,098 each year of the rebuilding plan since catch is expected to be reduced relative to recent levels due to a complete closure of Federal waters. If complementary management is enacted, revenue is expected to be $0 for the duration of the rebuilding plan.

Topic	Alt. 1 – ACL of 13,000 lb with In-Season AM (Status Quo)	Alt. 2 – ACL of 1,500 lb with In-Season AM and Higher Performance Standard	Alt. 3 – ACL of 5,000 lb with In-Season AM and Higher Performance Standard	Alt. 4 – Temporary Moratorium of Fishery in Federal Waters
		waters in accordance with the performance standard. If complementary management is enacted, revenue is expected to be $431 in the first year followed by $0 for subsequent years of the rebuilding plan.	waters in accordance with the performance standard. If complementary management is enacted, revenue is expected to be $1,436 in the first year followed by $0 for subsequent years of the rebuilding plan.	
Potential for controversy	There is low potential for controversy from fishermen since the same management would be implemented as 2020 and 2021.	There may be potential for controversy with fishermen due to the implementation of a relatively low ACL compared to the status quo.	Same as Alt. 2, though the proposed ACL represents the maximum level of catch that would allow for rebuilding within statutory requirements.	There may be the potential for controversy with fishermen due to the fishing grounds in the offshore banks being completely restricted for the duration of the rebuilding plan.
Safety at sea	There are no known safety-at-sea issues in the fishery.	No change from status quo.	No change from status quo.	No change from status quo.
Scientific, historic, archaeological, or cultural resources	The fishery is not known to be having an adverse effect on historic, archaeological, or cultural resources.	No change from status quo.	No change from status quo.	No change from status quo.
NMFS management	NMFS would implement the same management as the interim measure. NMFS would continue to participate in annual fishery monitoring activities with the Council.	NMFS would continue to participate in Council fishery monitoring activities. Additional administrative costs would be required for NMFS to monitor the	Same as Alt. 2, but NMFS does not expect to apply the in-season AM until roughly halfway through the first fishing year.	Similar to Alt. 2, but there would not be a need to monitor progress toward an ACL or to implement an in-season closure. The closure would be implemented at the

Topic	Alt. 1 – ACL of 13,000 lb with In-Season AM (Status Quo)	Alt. 2 – ACL of 1,500 lb with In-Season AM and Higher Performance Standard	Alt. 3 – ACL of 5,000 lb with In-Season AM and Higher Performance Standard	Alt. 4 – Temporary Moratorium of Fishery in Federal Waters
	Additional administrative costs would be required for NMFS to monitor the fishery's progress toward the ACL and to implement an in-season Federal fishery closure, which may occur late in each fishing year.	fishery's progress toward the ACL and to implement an in-season Federal fishery closure, which is expected to occur early in the first year of the rebuilding plan under this alternative. Additionally, the performance standard would require administrative costs to implement a Federal closure and develop a new management approach.		start of each fishing year for the duration of the rebuilding plan.
Council management activities	The Council would continue to monitor and review annual BMUS catches in the annual SAFE report.	No change from status quo.	No change from status quo.	No change from status quo.
Territorial management activities	American Samoa DMWR would administer the commercial receipt book system and creel survey program and would continue to enforce fishery related laws in territorial waters and on shore.	In the absence of complementary management, no change from status quo. If complementary management is implemented, there would be additional burden on territorial management agencies to implement fishery closures alongside this Federal action.	Same as Alt. 2.	Same as Alt. 2.
Same Federal and territorial	No new Federal action under the status quo alternative relative to the interim	American Samoa is not currently proposing to implement a complementary	Same as Alt. 2.	Same as Alt. 2.

Topic	Alt. 1 – ACL of 13,000 lb with In-Season AM (Status Quo)	Alt. 2 – ACL of 1,500 lb with In-Season AM and Higher Performance Standard	Alt. 3 – ACL of 5,000 lb with In-Season AM and Higher Performance Standard	Alt. 4 – Temporary Moratorium of Fishery in Federal Waters
management of the fishery?	measure, so no change to the management relationship. American Samoa is not currently proposing to implement a complementary closure for BMUS in territorial waters if the catch attains the ACL.	closure for BMUS in territorial waters if the catch is anticipated to reach the ACL. In this scenario, this alternative would result in no change in management by American Samoa in terms of fishery closure regulation or enforcement. However, it remains possible that the territory could decide to implement complementary management with this Federal action, in which the territory would implement fishery closures consistent with the in-season AM and performance standard in this Federal action.		
Fishermen's compliance	Fishermen would continue to comply with closed fishing areas, territorial laws regarding commercial reporting requirements, and Federal rules regarding destructive fishing practices. The same potential for a Federal closure would exist as under the interim measure.	The regulations would not cause substantial costs to fishermen. Fishermen would continue to comply with existing laws, and the mechanism for the potential Federal closure would be the same as the status quo. Fishermen would need to comply with the no-retention regulation for BMUS caught in Federal waters if a closure	Same as Alt. 2.	Same as Alt. 2. Fishermen would need to comply with the no-retention regulation for BMUS caught in Federal waters, and for territorial waters if complementary management is enacted. Compliance for fishermen would be easier than under Alt. 1 or 2 because the closure of Federal waters

Topic	Alt. 1 – ACL of 13,000 lb with In-Season AM (Status Quo)	Alt. 2 – ACL of 1,500 lb with In-Season AM and Higher Performance Standard	Alt. 3 – ACL of 5,000 lb with In-Season AM and Higher Performance Standard	Alt. 4 – Temporary Moratorium of Fishery in Federal Waters
		were to be implemented. If complementary management is implemented, fishermen would also need to learn about and comply with the fishery closure in territory waters.		would not change over the course of the rebuilding plan.
Enforcement	NOAA OLE, USCG, and DMWR would continue to enforce fishery regulations around American Samoa and for the Federal closure if needed.	Similar to Alt.1, and enforcement of the bottomfish fishing closure in Federal waters would not be difficult to enforce because the 3 mile limit is easily determined. If complementary management is enacted, the territory would be responsible for enforcing the regulations in territorial waters.	Same as Alt. 2.	Same as Alt. 2.
Violation of Federal, state, or local law or requirements imposed for environmental protection?	No violations are occurring and are not expected.	No change from status quo.	No change from status quo.	No change from status quo.
Would the action under each alternative	No. The Magnuson-Stevens Act and the American Samoa FEP require that NMFS	No. The proposed rebuilding plan, despite being long-term, is a management action	Same as Alt 2.	Same as Alt 2.

Topic	Alt. 1 – ACL of 13,000 lb with In-Season AM (Status Quo)	Alt. 2 – ACL of 1,500 lb with In-Season AM and Higher Performance Standard	Alt. 3 – ACL of 5,000 lb with In-Season AM and Higher Performance Standard	Alt. 4 – Temporary Moratorium of Fishery in Federal Waters
be expected to establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration?	implement ACLs and AMs for all management unit species annually. Implementing the same provisions as the interim measure would not change this requirement.	of limited duration intended to benefit BMUS by ending overfishing and rebuilding the stock while considering the effects of this new fishery management need on the American Samoa fishing community. This alternative would not narrow future choices having to do with rebuilding the fishery.		
Biodiversity and ecosystem function	Other than effects on BMUS stocks, the fishery is not known to be having large adverse effects on biodiversity or ecosystem function. Fishery managers are not aware of imbalances to ecosystem function from the fishery.	No change from status quo.	No change from status quo.	No change from status quo.
Introduction or spread of invasive species	Not occurring as a result of fishery management and not expected to occur.	No change from status quo.	No change from status quo.	No change from status quo.
Substantial uncertainty or scientific disagreement.	Catches are monitored, and the characteristics of the fishery are known due to a recent stock assessment. The effects of continued fishing	The effects of the proposed action are known due to an understanding of the fishery and a recent stock assessment. The effects of	Same as Alt. 2.	Same as Alt. 2.

Topic	Alt. 1 – ACL of 13,000 lb with In-Season AM (Status Quo)	Alt. 2 – ACL of 1,500 lb with In-Season AM and Higher Performance Standard	Alt. 3 – ACL of 5,000 lb with In-Season AM and Higher Performance Standard	Alt. 4 – Temporary Moratorium of Fishery in Federal Waters
	for BMUS under the same provisions as the interim measure are understood and are not subject to uncertainty or scientific disagreement.	continued fishing for BMUS within the limited constraints of this fishery rebuilding plan are understood and are not subject to uncertainty or scientific disagreement.		
Environmental justice	Members of minority and low-income groups may be affected by management decisions. However, the fishery is not having a large adverse effect on subsistence harvests of marine resources, the environment, or human health in a way that disproportionately affects members of environmental justice communities.	Without complementary management, no change from status quo. With complementary management, there may be a substantial reduction in subsistence harvests of marine resources that could impact members of environmental justice communities.	Same as Alt. 2.	Same as Alt. 2.
Climate change and greenhouse gases	The fishery requires the use of vessels that are powered by fossil fuels. NMFS does not control the amount of vessel use or where vessels are used by the fishery.	No substantial change from the status quo in the absence of complementary management. If there is a closure of Federal waters to bottomfish fishing, vessel use could be slightly reduced or remain the same. Larger change from the status quo if complementary management is implemented and a fishery closure occurs	Same as Alt. 2.	Same as Alt. 2.

Topic	Alt. 1 – ACL of 13,000 lb with In-Season AM (Status Quo)	Alt. 2 – ACL of 1,500 lb with In-Season AM and Higher Performance Standard	Alt. 3 – ACL of 5,000 lb with In-Season AM and Higher Performance Standard	Alt. 4 – Temporary Moratorium of Fishery in Federal Waters
		in both territorial and Federal waters.		

4 REFERENCES

Barord, G.J. 2015. *On the biology, behavior, and conservation of the chambered nautilus, Nautilus* sp. Ph.D. Dissertation. City University of New York Academic Works. 96 p.

Barord G.J., F. Dooley, A. Dunsta, A. Ilano, K.N. Keister, H. Neumeister, T. Preuss, S. Schoepfer, and P.D. Ward. 2014. "Comparative population assessments of *Nautilus* sp. in the Philippines, Australia, Fiji, and American Samoa using baited remote underwater video systems." PLoS One, 9: e100799.

Benoit-Bird, K.J. 2004. "Prey caloric value and predator energy needs: foraging predictions for wild spinner dolphins" Marine Biology, 145: 435-444.

Bozec, Y.M., L. Yakob, S. Bejarano, and P.J. Mumby. 2013. "Reciprocal facilitation and non-linearity maintain habitat engineering on coral reefs." Oikos, 122: 428–440.

Brodziak, J., J. O'Malley, B. Richards, and G. DiNardo. 2012. *Stock Assessment Update of the Status of Bottomfish Resources of American Samoa, the Commonwealth of the Northern Mariana Islands and Guam, 2010*. NMFS, Pacific Islands Fisheries Science Center, Internal Report IR-12-022. Honolulu, HI. 126 p.

Buddemeier, R.W., J.A. Kleypas, and R.B. Aronson. 2004. *Coral Reefs and Global ClimateChange: Potential Contributions of Climate Change to Stresses on Coral ReefEcosystems.* Pew Center on Global Climate Change. Arlington, VA. 56 p.

Caldeira, K. and M.E. Wickett. 2005. "Ocean model predictions of chemistry changes from carbon dioxide emissions to the atmosphere and ocean." Journal of Geophysical Research, 110 (C09S04).

CITES (Conservation on International Trade in Endangered Species of Wildlife Fauna and Flora). 2016. *Consideration of proposals for amendment of Appendices I and II: Nautilidae.* Paper presented at the Convention on International Trade in Endangered Species of Wild Fauna and Flora; Seventeenth meeting of the Conference of the Parties; 24 September – 5 October 2016. Johannesburg, South Africa. 34 p.

Conant, T.A., P.H. Dutton, T. Eguchi, S.P. Epperly, C.C. Fahy, M.H. Godfrey, S.L. MacPherson, E.E. Possardt, B.A. Schroeder, J.A. Seminoff, M.L. Snover, C.M. Upite, and B.E. Witherington. 2009. Loggerhead sea turtle (*Caretta caretta*) *2009 status review under the U.S. Endangered Species Act.* Report of the Loggerhead Biological Review Team to the National Marine Fisheries Service. 222 p.

Craig, P., G. Dinonato, D. Fenner, and C. Hawkins. 2005. "The state of coral reef ecosystems in American Samoa." *In:* Waddell, J. (Ed), *The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2005.* NOAA Tech. Memo. NOS NCC11. Silver Spring, MD. 522 p.

Doney, S.C. 2006. "The dangers of ocean acidification." Scientific American, 294(3): 58–65.

Freitas B. and K. Krishnasamy. 2016. *An investigation into the trade of* Nautilus. TRAFFIC, WWF. Washington, D.C. 112 p.

Grant, G.S., P.W. Trail, and R.B. Clapp. 1994. "First specimens of Sooty Shearwater, Newell's Shearwater, and White-faced Storm Petrel from American Samoa." Notornis, 41: 215–217.

Hospital, J., B. Schumacher, A. Ayers, K. Leong, and C. Severance. 2019. *A structure and process for considering social, economic, ecological, and management uncertainty information in setting of annual catch limits: SEEM*. Pacific Islands Fisheries Science Center, PIFSC Internal Report, IR-19-011, 13 p.

Houghton, J.T., Y. Ding, D.J. Griggs, M. Noguer, P.J. van der Linden, and D. Xiaosu (Eds.) 2001. *IPCC Third Assessment Report: Climate Change 2001: The Scientific Basis.* Cambridge University Press, Cambridge, UK, 944 p. [Also see: Summary for Policymakers and Technical Summary, 98 p.]

IPCC (Intergovernmental Panel on Climate Change). "2007: Summary for Policymakers." *In*: Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller (Eds.) *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge University Press, Cambridge. United Kingdom and New York. 18 p.

Kelley, C., and R. Moffit. 2004. *The impacts of bottomfishing on the Raita and West St. Rogatien Reserve Preservation Areas in the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve*. Unpublished report, Hawaii Undersea Research Laboratory. Honolulu, HI. 49 p.

Kelley, C., and W. Ikehara. 2006. "The impacts of bottomfishing on Raita and West St. Rogatien Banks in the Northwestern Hawaiian Islands." Atoll Research Bulletin, 543: 305–317.

Kleiber, D., and K. Leong. 2018. *Cultural fishing in American Samoa*. Pacific Islands Fisheries Science Center, PIFSC Administrative Report, H-18-03, 21 p. https://doi.org/10.25923/fr4m-wm95.

Kilarski, S., D. Klaus, J. Lipscomb, K. Matsoukas, R. Newton, and A. Nugent. 2006. *Decision support for coral reef fisheries management: community input as a means of informing policy in American Samoa*. M.S. Thesis. University of California at Santa Barbara, Santa Barbara, CA. 132 p.

Kleypas, J.A., R.A. Feely, V.J. Fabry, C. Langdon, C.L. Sabine, and L.L. Robbins. 2006. *Impacts of Ocean Acidification on Coral Reefs and Other Marine Calcifiers: a Guide for Future Research.* Report of a workshop sponsored by the National Science Foundation, National Oceanic and Atmospheric Administration, and the U.S. Geological Survey. 88 p.

Levine, A., and S. Allen. 2009. *American Samoa as a fishing community*. NOAA Technical

Memorandum, NOAA-TM-NMFS-PIFSC-19, 74 p.

Langseth, B., J. Syslo, A. Yau, and F. Carvalho. 2019. *Stock assessments of the bottomfish management unit species of Guam, the Commonwealth of the Northern Mariana Islands, and American Samoa, 2019*. NOAA Technical Memorandum, NMFS-PIFSC-86. 165 p. + supplement. doi:10.25923/bz8b-ng72.

Maison, K.A., I. Kinan Kelly, and K.P. Frutchey. 2010. *Green Turtle Nesting Sites and Sea Turtle Legislation throughout Oceania*. NOAA Technical Memorandum, NMFS-F/SPO-110. 52 p.

Martell, S. 2019. *Benchmark Stock Assessments for the Bottomfish Management Unit Species of American Samoa, the Commonwealth of the Northern Mariana Islands, and Guam in 2019*. Report prepared for the Pacific Islands Fisheries Science Center, NOAA/NMFS Pacific Islands Regional Offices, NOAA/NMFS, and Western Pacific Fishery Management Council. 6 p

Miller, M.H. 2018. *Endangered Species Act Status Review Report: Chambered Nautilus* (Nautilus pompilius). Report to National Marine Fisheries Service, Office of Protected Resources. Silver Spring, MD. 62 p.

Miller, M.H. and C. Klimovich. 2016. *Endangered Species Act Status Review Report: Giant Manta Ray* (Manta birostris) *and Reef Manta Ray* (Manta alfredi). Report to National Marine Fisheries Service, Office of Protected Resources. Silver Spring, MD. 128 p.

NMFS (National Marine Fisheries Service). 2002. *Endangered Species Act Section 7 Consultation on the Fishery Management Plan for the Bottomfish and Seamount Groundfish Fisheries in the Western Pacific Region*. NMFS, Sustainable FisheriesDivision, Southwest Region, Pacific Islands Area Office. Honolulu, HI. 66 p.

NMFS. 2015. *Biological Evaluation. Potential Impacts of American Samoa Coral Reef, Bottomfish, Crustacean, and Precious Coral Fisheries on Reef-Building Corals and Indo-West Pacific Scalloped Hammerhead Shark Distinct Population Segment.* NMFS, Pacific Islands Region, Sustainable Fisheries Division. Honolulu, HI. 33 p.

NMFS. 2017. *Environmental Assessment Specification of 2016-2017 Annual Catch Limits and Accountability Measures for American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands Bottomfish Fisheries*. NMFS, Pacific Islands Region. Honolulu, HI. 124 p.

NMFS. 2018. *Designation of Critical Habitat for the Endangered Main Hawaiian Islands Insular False Killer Whale Distinct Population Segment: Biological Report.* Biological Report, NMFS, Pacific Islands Region, Protected Resources Division. Honolulu, HI. 73 p.

NMFS. 2019a. *Biological Evaluation: Potential Effects of Bottomfish Fisheries in American Samoa, Guam and Northern Mariana Islands on Oceanic Whitetip Shark, Giant Manta Ray, and Chambered Nautilus.* NMFS, Pacific Islands Region. Honolulu, HI. 33 p.

NMFS. 2019b. *Endangered Species Act Section 7 Consultation on the Continued Operation of bottomfish fisheries of American Samoa, Guam and the Northern Mariana Islands - Section 7(a)(2) and 7(d) Determinations; Likelihood of Jeopardy and Commitment of Resources during Consultation.* NMFS, Pacific Islands Region. Honolulu, HI. 14 p.

NMFS. 2020a. *Interim Measures to Address Overfishing in the American Samoa Bottomfish Fishery in 2020 and 2021: Final Environmental Assessment, including a Regulatory Impact Review*. NMFS, Pacific Islands Region. Honolulu, HI. 135 p.

NMFS. 2020b. *Section 7(a)(2) and 7(d) Extension. Determinations on the continued operation of bottomfish fisheries of American Samoa, Guam, and the Northern Mariana Islands under Section 7 of the ESA*. NMFS PIRO, Honolulu, HI, August 11, 2020. 12 pp.

NMFS. 2020c. *Section7(a)(2) and 7(d) Extension. Determinations on the continued operation of bottomfish fisheries of American Samoa, Guam, and the Northern Mariana Islands under Section 7 of the ESA*. NMFS PIRO, Honolulu, HI, December 15, 2020. 12 pp.

Raynal, J., A. Levine, and M.T. Comeros-Raynal. 2016. American Samoa's Marine Protected Area System: Institutions, Governance, and Scale. *Journal of International Wildlife Law & Policy*, *19*(4), pp. 301-316. doi: 10.1080/13880292.2016.1248679.

Restrepo, V.R., G.G. Thompson, P.M. Mace, W.L. Gabriel, L.L. Low, A.D. MacCall, R.D. Methot, J.E. Powers, B.L. Taylor, P.R. Wade, and J.F. Witzig. 1998. *Technical guidance on the use of Precautionary Approaches to implementing National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act*. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-F/SPO-31, 54 p.

Seminoff, J.A., C.D. Allen, G.H. Balazs, P.H. Dutton, T. Eguchi, H.L. Haas, S.A. Hargrove, M.P. Jensen, D.L. Klemm, A.M. Lauritsen, S.L. MacPherson, P. Opay, E.E. Possardt, S.L. Pultz, E.E. Seney, K.S. Van Houtan, and R.S. Waples. 2015. *Status Review of the Green Turtle (Chelonia mydas) under the U.S. Endangered Species Act.* NOAA Technical Memorandum, NOAA-NMFS-SWFSC-539. 571 p.

The Royal Society. 2005. Ocean Acidification Due to Increasing Atmospheric Carbon Dioxide. The Royal Society, London, 60 p.

Wild, C., O. Hoegh-Guldberg, M.S. Naumann, M.F. Colombo-Pallotta, M. Ateweberhan, W.K. Fitt, R. Iglesias-Prieto, C. Palmer, J.C. Bythell, J.C. Ortiz, Y. Loya, and R. van Woesik. 2011. "Climate change impedes scleractinian corals as primary reef ecosystem engineers." Marine and Freshwater Research, 62(2): 205–215. doi:10.1071/mf10254.

WPFMC (Western Pacific Regional Fishery Management Council). 1986. *Fishery Management Plan for Bottomfish and Seamount Fisheries of the Western Pacific Region.* Western Pacific Fishery Management Council. Honolulu, Hawaii. 314 p.

WPFMC. 2009. *Fishery Ecosystem Plan for the American Samoa Archipelago.* Western Pacific Fishery Management Council. Honolulu, Hawaii. 220 p.

WPFMC. 2011. *Omnibus Amendment for the Western Pacific Region to Establish a Process for Specifying Annual Catch Limits and Accountability Measures.* Western Pacific Fishery Management Council. Honolulu, Hawaii. 123 p. + Appendices.

WPFMC. 2020a. *Annual Stock Assessment and Fishery Evaluation Report for the American Samoa Archipelago Fishery Ecosystem Plan 2019*. Remington, T., Sabater, M., Ishizaki, A. (Eds.) Western Pacific Fishery Management Council. Honolulu, Hawaii. 161 p. + Appendices.

WPFMC. 2020b. *American Samoa P* Working Group Report*. Western Pacific Regional Fishery Management Council. Honolulu, Hawaii 96813. 8 p.

WPFMC. 2021. *Annual Stock Assessment and Fishery Evaluation Report for the American Samoa Archipelago Fishery Ecosystem Plan 2020*. Remington, T., Sabater, M., Ishizaki, A. (Eds.) Western Pacific Fishery Management Council. Honolulu, Hawaii. 147 p. + Appendices.

Yau A., M. Nadon, B. Richards, J. Brodziak, and E. Fletcher. 2016. *Stock assessment updates of the bottomfish management unit species of American Samoa, the Commonwealth of the Northern Mariana Islands, and Guam in 2015 using data through 2013*. NOAA Technical Memorandum, NMFS-PIFSC-51. 54 p. doi:10.7289/V5PR7T0G.

APPENDIX A - DRAFT PROPOSED REGULATIONS

PART 665 — FISHERIES IN THE WESTERN PACIFIC

1. The authority citation for 50 CFR part 665 continues to read as follows:

Authority: 16 U.S.C. 1801 *et seq*.

2. Revise § 665.102 to read as follows:

§ 665.102 [Reserved]

3. Revise § 665.103 to read as follows:

§ 665.103 Prohibitions

In addition to the general prohibitions specified in § 600.725 of this chapter and § 665.15, it is unlawful for any person to do any of the following:

(a) Fish for American Samoa bottomfish MUS or ECS using gear prohibited under § 665.104.

(b) Fish for or possess any American Samoa Bottomfish MUS as defined in § 665.101 after a closure of the fishery in violation of § 665.106.

(c) Sell or offer for sale any American Samoa Bottomfish MUS as defined in § 665.101 after a closure of the fishery in violation of § 665.106.

3. Add § 665.106 to read as follows:

§ 665.106 American Samoa Annual Catch Limits (ACL)

(a) In accordance with § 665.4, the ACL for American Samoa bottomfish MUS is 5,000 lb.

(b) When NMFS projects the ACL will be reached, the Regional Administrator shall publish a document to that effect in the **Federal Register** and shall use other means to notify permit holders. The document will include an advisement that the fishery will be closed, beginning at a specified date that is not earlier than seven days after the date of filing the closure notice for public inspection at the Office of the Federal Register, through the end of the fishing year in which the catch limit is reached.

(c) If the ACL is exceeded in any fishing year while the American Samoa bottomfish fishery is under a rebuilding plan, the Regional Administrator shall publish a document to that effect in the **Federal Register** and shall use other means to notify permit holders. The document will include an advisement that the fishery will be closed, beginning at a specified date that is not earlier than seven days after the date of filing the closure notice for public inspection at the Office of the Federal Register. The fishery will remain closed until such time that a coordinated approach to management is developed that ensures catch in both Federal and territorial waters can be maintained at levels that allow the stock to rebuild or the rebuilding plan is modified based on the best scientific information available.

(d) On and after the date the fishery is closed as specified in paragraphs (b) or (c) of this section, fishing for and possession of American Samoa bottomfish MUS is prohibited in the American Samoa fishery management area, except as otherwise authorized by law.

(e) On and after the date the fishery is closed as specified in paragraphs (b) or (c) of this section, the sale, offering for sale, and purchase of any American Samoa bottomfish MUS caught in the American Samoa fishery management area is prohibited.

APPENDIX B - REGULATORY IMPACT REVIEW
Regulatory Impact Review

Proposed Rebuilding Plan for the American Samoa Bottomfish Fishery

(RID 0648-BK79)

1. Introduction

This is a regulatory impact review (RIR) prepared under Executive Order (E.O.) 12866, "Regulatory Planning and Review." The regulatory philosophy of E.O.12866 stresses that, in deciding whether and how to regulate, agencies should assess all costs and benefits of all regulatory alternatives and choose those approaches that maximize the net benefits to the society. To comply with E.O. 12866, the National Marine Fisheries Service (NMFS) prepares an RIR for regulatory actions that are of public interest. The RIR provides an overview of the problems, policy objectives, and anticipated impacts of regulatory actions. The regulatory philosophy of E.O. 12866 is reflected in the following statement:

> *In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider. Further, in choosing among alternative regulatory approaches, agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages, distributive impacts; and equity), unless a statute requires another regulatory approach.*

This RIR is for the proposed implementation of a rebuilding plan for the American Samoa bottomfish multi-species stock complex.

2. Problem Statement and Management Objective

The purpose of this action is to implement a rebuilding plan for the American Samoa bottomfish complex to end overfishing and rebuild the stock complex as required under the Magnuson-Stevens Fisheries Conservation and Management Act (Magnuson-Stevens Act). In February 2020, NMFS notified the Western Pacific Fishery Management Council that the American Samoa bottomfish stock complex was overfished and experiencing overfishing. Under the proposed action, the Council would submit and NMFS would implement a rebuilding plan for the American Samoa bottomfish fishery consistent with Magnuson-Stevens Act section 304(e) and implementing regulations at 50 CFR 600.310(j). The management objective would be to provide management oversight, prevent overfishing, and to bolster the long-term sustainability of fishery resources while allowing fishing participants to benefit from their use.

3. Description of the Fisheries

More details on the fishery and the fishing community can be found in the 2019 and 2020

Annual Stock Assessment and Fishery Evaluation (SAFE) Report for the American Samoa Archipelago Fishery Ecosystem Plan, as well as Sections 3.5 and 3.6 of the Environment Assessment (EA) associated with this action.

In the mid-1980s, the fishery landed over 100,000 lb of bottomfish annually and accounted for nearly half of total catch of the territory's commercial fisheries. By 1988, bottomfish fishing in American Samoa began to decline as skilled commercial fishermen shifted focus from bottomfish fishing to trolling and small-scale longlining for pelagic species like albacore. Currently, the fishery is relatively small with an estimated 20 or fewer participants and primarily non-commercial; between 2018 and 2020, bottomfish catch averaged 12,687 lb and fishermen sold an average of about 7.2 percent of their bottomfish catch (965 lb) during that three year timeframe. In 2020, the most recent year for which catch data are available, total bottomfish catch is estimated to be 9,592 lb, with 307 lb sold. Since 2011, percent of catch sold ranged from 2.9 percent (2011) to 15.4 percent (2014). The percent of catch sold in 2020 was an estimated 3.2 percent.

The fishery has been managed with annual catch limits (ACL) and accountability measures (AM) since 2012. Catch from both territorial waters and Federal waters count towards the ACL, however, the existing data reporting systems does not specify how much bottomfish catch comes from territorial versus Federal waters. Until 2017, the ACL for this fishery had ranged from 99,200 (2012) to 106,000 (2016 and 2017) and far exceeded catch. The fishery was considered to be harvesting sustainably until the 2019 stock assessment. In 2020-2021, the fishery was subject to an interim catch limit of 13,000 lb.

Fishing for bottomfish primarily occurs using aluminum *alia* catamarans less than 32 feet in length that are outfitted with outboard engines and wooden hand reels that fishermen use for both trolling and bottomfish fishing. The demand for bottomfish on American Samoa varies depending on the need for fish at government and cultural events, and *alia* fishermen may switch to bottomfish fishing during periods when longline catches or prices are low. Fishing grounds in Federal waters around American Samoa are also important for the harvest of deep-water snappers used for chiefly position entitlements and *fa'a lalave* ceremonies (e.g., funerals, weddings, births, and special birthdays).

4. Description of the Alternatives

This section briefly describes the alternatives for the rebuilding plan. Sections 2.3, 2.4, 2.5, and 2.6 of the EA provides more details on each alternative. American Samoa is not likely to implement a complementary closure in territorial waters if a Federal catch limit is reached, but the analyses for each alternative does also consider the outcomes if American Samoa implements complementary closure. Without complementary closure, bottomfish fishing would only close in Federal waters as the result of the enactment of an in-season AM and performance standard.

Alternative 1: NMFS would not implement a Rebuilding Plan (Status Quo)

Alternative 1 would maintain the same measures that had temporarily been in place through an interim catch limit (ICL, 85 FR 73003, November 16, 2020 and 86 FR 32361, June 21, 2021). This would consist of an ACL of 13,000 lb with an in-season closure as an AM. NMFS would track catches in relation to the ACL using catch reports provided by American Samoa

Department of Marine and Wildlife Resources. When NMFS estimates the fishery will soon reach or has already reached the ACL, the agency would close Federal waters around American Samoa to bottomfish fishing for the remainder of the fishing year. Because Alternative 1 would implement the same management for the fishery as seen in recent years, it serves as the status quo and environmental baseline alternative. However, Alternative 1 would not be in compliance with the Magnuson-Stevens Act, implementing Federal regulations, and the provisions of the Council's FEP to end overfishing and rebuild the stock complex as an ACL of 13,000 lb would exceed the OFL and rebuilding would not occur within ten years.

Alternative 2: Implement a rebuilding Plan with a 1,500 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 2, NMFS would implement an ACL of 1,500 lb with an in-season closure of bottomfish fishing in Federal waters around American Samoa as an AM. As an additional performance standard, if the ACL is exceeded during any fishing year over the course of the rebuilding plan, NMFS would close the fishery in Federal waters until a coordinated management approach is developed that ensures catch in both Federal and territorial waters can be maintained at levels that allow the stock to rebuild.

Alternative 3: Implement a Rebuilding Plan with a 5,000 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 3, NMFS would implement an ACL of 5,000 lb with an in-season closure of bottomfish fishing in Federal waters around American Samoa as an AM. As an additional performance standard, if the ACL is exceeded during any fishing year over the course of the rebuilding plan, NMFS would close the fishery in Federal waters until a coordinated management approach is developed that ensures catch in both Federal and territorial waters can be maintained at levels that allow the stock to rebuild.

Alternative 4: Temporary Moratorium on Bottomfish Fishing in Federal Waters

Alternative 4 would be equivalent to setting an ACL of 0 lb in Federal waters around American Samoa. Fishing for and possessing bottomfish in Federal waters around American Samoa would be prohibited until it is determined that the stock complex is no longer experiencing overfishing and has been rebuilt. There would be no AMs or performance standard associated with this alternative because catch would not need to be monitored towards an ACL. However, Alternative 4 does include a reopening mechanism that would enable new management under the rebuilding plan for the fishery, if a coordinated management approach is developed and implemented that would restrict fishing mortality in Federal and territorial waters at a level that would allow rebuilding within a ten-year timeframe.

5. Analysis of Alternatives

This section describes potential economic effects and evaluates the impacts of the action alternatives relative to the status quo alternative. Although the American Samoa government would not likely implement a complementary closure of territorial waters, which contains an estimated 85 percent of bottomfish habitat, the analyses of impacts also considers impacts if the territorial government were to implement complementary management. Without complementary

management, implementing any action alternative would likely result in the movement of some, if not most, bottomfish fishing activity to territorial waters upon closure of Federal waters. In developing the analyses of impacts (baseline as well as the implementation of action alternatives), NMFS uses the average 2020 price for bottomfish of $3.48 per lb. The price per lb in 2020 was lower than the average prices for 2017 ($5.11), 2018 ($4.25), 2019 ($4.24), but consistent with prices for years prior to 2017. If bottomfish prices were higher, this would lead to higher predicted revenue losses if the amount sold remains the same, under each of the action alternatives.

Alternative 1: NMFS would not implement a Rebuilding Plan (Status Quo)

Under Alternative 1, NMFS would not implement a rebuilding plan. American Samoa bottomfish management would mirror provisions implemented under the interim measure in 2020 and 2021, with an ACL of 13,000 lb and an in-season AM to close Federal waters upon reaching the ACL for the bottomfish fishery in American Samoa. The average catch of American Samoa bottomfish from 2018-2020 was 12,687 lb and expected catch under this ACL is expected to be 12,687 or more annually, which potentially results in a stock rebuilding time frame of 30 or more years. Given recent fishery performance, if the fishery closed, NMFS believes this would occur towards the end of the year, but it is expected that the fishery would continue to harvest bottomfish in territorial waters closer to shore. As a result, overall catch could exceed 13,000 lb. The fishery is not expected to change the way it fishes with respect to fishing gear, fishing effort, participation, or intensity, and is expected to change slightly with respect to total catch and areas fished with the closure in Federal waters for a small portion of the year.

Based on the 2018-2020 catch and revenue information, without complementary management, NMFS anticipates that fishery participants would sell an average of 7.2 percent of their bottomfish catch. This would suggest that if catch is 12,687 lb, the expected amount sold would be 913.5 lb fleetwide under Alternative 1. Using the 2020 average price of $3.48 per lb and the average pounds sold between 2018-2020, NMFS estimates revenue from bottomfish sales under Alternative 1, would be approximately $3,179. Using the upper estimate of the number of fishery participants from the 2021 LOF, the 20 participants would each earn approximately $159, with the remaining 93 percent of the catch considered to be non-commercial. This alternative would not further restrict bottomfish fishing activity in American Samoa relative to the interim measure and only slightly constrain commercial and non-commercial catch relative to previous years, so the status quo is not expected to substantially impact the fishing communities in American Samoa.

With complementary territorial management, upon reaching ACL, catch would not exceed 13,000 lb per year. Unless fishery participants decide to sell catch that would otherwise be retained or shared, revenues would be lower than without complementary management for the years in which the fishery reaches ACL.

Alternative 2: Implement a rebuilding Plan with a 1,500 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 2, with an ACL of 1,500 lb and an in-season AM to close Federal waters upon reaching the ACL for the bottomfish fishery in American Samoa, NMFS expects the fishery to

exceed the ACL within the first few months of the year. Without complementary territorial management in place and assuming that bottomfish catch is proportional to the bottomfish EFH in Federal and territorial waters, the level of bottomfish catch would be expected to be 11,009 lb or more during the first year. While the fishery would close earlier in the year in Federal waters under Alternative 2 compared to Alternative 1, expected catch would depend on the level of fishing activity transferring to territorial waters, once the in-season closure occurs. If all fishing effort that would have been conducted in Federal waters moves to territorial waters, catch could be closer to levels when the fishery had not been constrained by a limit. However, if post-closure fishing effort in Federal waters does not move to territorial waters, then implementing Alternative 2 would result in a potential reduction of 1,678 lb in expected catch relative to the status quo. With the application of the higher performance standard, the fishery will likely close in subsequent fishing years of the rebuilding plan, effectively closing Federal waters around American Samoa to bottomfish fishing after the first year of the rebuilding plan, until the development of a more effective management approach. Thus, the expected annual catch from the second year until reopening would likely be 10,784 lb or more. This represents a potential reduction of catch of up to 1,903 lb from the status quo.

Based on the recent catch and sales information NMFS anticipates that fishery participants would sell an average of 7.2 percent of bottomfish catch. Using the 2020 average price of $3.48 per lb, the estimated fleetwide bottomfish revenue during the first year of the rebuilding plan under Alternative 2 could be as low as $2,760 (776 lb sold). Under that scenario, the 20 participants would earn approximately $138 each. For subsequent years, fleetwide revenue could be as low as $2,702, until the development of a more effective management approach which would allow the bottomfish fishery to reopen in Federal waters.

Alternative 2 could constrain non-commercial catch relative to previous years, although the extent to which that occurs depends on how much bottomfish fishing activity would transfer to territorial waters upon closure in Federal waters. However, NMFS lacks detailed information on whether catch for commercial or non-commercial purposes comes disproportionately from territorial or Federal waters or the proportions of species that are caught in these waters. Overall, NMFS expects that the amount of fish caught for sustenance and cultural purposes would be affected similarly to fish caught for commercial purposes, in that there might be a slight decrease in non-commercial catch.

Overall, implementation of Alternative 2 without complementary management, is expected to change the fishery slightly relative to the status quo during the time frame of the rebuilding plan, particularly if fishing activity transfers to territorial waters upon closure of Federal waters. The fishery is not expected to substantially change the way it fishes with respect to fishing gear, fishing effort, participation, or intensity, but may change slightly with respect to total catch and areas fished, with the fishermen who would normally choose to fish in Federal waters being affected more adversely.

Larger impacts to fishery participants would occur if the American Samoa government implemented a complementary closure in territorial waters. Expected fleetwide catch would not exceed 1,500 lb for the first year, with 108 lb sold resulting in fleetwide revenue of $376, if price per lb and percent catch sold remain similar to activity in recent years. With 20 participants, each participant would earn an estimated $18.80 from bottomfish catch during the first year of

implementation. Fishermen may decide to sell a greater proportion of catch which would generate more revenue; however, this would further exacerbate the shortage of fish available for non-commercial use. The amount of bottomfish available for sustenance or cultural activities would drop considerably compared to recent years. If the fishery exceeds the ACL and the higher performance standard is triggered, as is expected to occur the first year of implementation, there would be no bottomfish fishing in subsequent years. Fishermen would not have bottomfish available for non-commercial use nor would fishermen be able to earn any revenue from selling bottomfish.

Alternative 3: Implement a Rebuilding Plan with a 5,000 lb ACL, In-Season AM, and Higher Performance Standard

Under Alternative 3, with an ACL of 5,000 lb and an in-season AM to close Federal waters upon reaching the ACL for the bottomfish fishery in American Samoa, NMFS expects the fishery to exceed the ACL within the first half of the year. Without complementary management in place and assuming that bottomfish catch is proportional to the bottomfish EFH in Federal and territorial waters, the level of bottomfish catch would be expected to be 11,534 lb or more during the first year. While the fishery would close earlier in the year in Federal waters under Alternative 3 compared to Alternative 1, expected catch would depend on the level of fishing activity transferring to territorial waters, once the in-season closure occurs. If all fishing effort that would have been conducted in Federal waters moves to territorial waters, catch could be closer to levels when the fishery had not been constrained by a limit. However, if post-closure fishing effort in Federal waters does not move to territorial waters, then implementing Alternative 3 would result in a potential reduction of 1,153 lb in expected catch relative to the status quo. With the application of the higher performance standard, the fishery will likely close in subsequent fishing years of the rebuilding plan, effectively closing Federal waters around American Samoa to bottomfish fishing after the first year of the rebuilding plan, until the development of a more effective management approach. Thus, the expected annual catch from the second year until reopening would likely be 10,784 lb or more. This represents a potential reduction of catch of up to 1,903 lb from the status quo.

Based on the recent catch and sales information NMFS anticipates that fishery participants would sell an average of 7.2 percent of bottomfish catch. Using the 2020 average price of $3.48 per lb, the estimated fleetwide bottomfish revenue during the first year of the rebuilding plan under Alternative 3 could be as low as $2,888 (830 lb sold). Under that scenario, the 20 participants would earn approximately $144 each. For subsequent years, fleetwide revenue could be as low as $2,702, until the development of a more effective management approach which would allow the bottomfish fishery to reopen in Federal waters.

Alternative 3 could constrain non-commercial catch relative to previous years, although the extent to which that occurs depends on how much bottomfish fishing activity would transfer to territorial waters upon closure in Federal waters. However, NMFS lacks detailed information on whether catch for commercial or non-commercial purposes comes disproportionately from territorial or Federal waters or the proportions of species that are caught in these waters. Overall, NMFS expects that the amount of fish caught for sustenance and cultural purposes would be

affected similarly to fish caught for commercial purposes, in that there might be a slight decrease in non-commercial catch.

Overall, implementation of Alternative 3 without complementary management, is expected to change the fishery slightly relative to the status quo during the time frame of the rebuilding plan, particularly if fishing activity transfers to territorial waters upon closure of Federal waters. The fishery is not expected to substantially change the way it fishes with respect to fishing gear, fishing effort, participation, or intensity, but may change slightly with respect to total catch and areas fished, with the fishermen who would normally choose to fish in Federal waters being affected more adversely.

Larger impacts to fishery participants would occur if the American Samoa government implemented a complementary closure in territorial waters. Expected fleetwide catch would not exceed 5,000 lb for the first year, with 360 lb sold resulting in fleetwide revenue of $1,253, if price per lb and percent catch sold remain similar to activity in recent years. With 20 participants, each participant would earn an estimated $62.64 from bottomfish catch during the first year of implementation. Fishermen may decide to sell a greater proportion of catch which would generate more revenue; however, this would further exacerbate the shortage of fish available for non-commercial use. The amount of bottomfish available for sustenance or cultural activities would drop considerably compared to recent years. If the fishery exceeds the ACL and the higher performance standard is triggered, as is expected to occur the first year of implementation, there would be no bottomfish fishing in subsequent years. Fishermen would not have bottomfish available for non-commercial use nor would fishermen be able to earn any revenue from selling bottomfish.

Alternative 4: Temporary Moratorium on Bottomfish Fishing in Federal Waters

Under Alternative 4, with a moratorium on bottomfish fishing in Federal waters, and without complementary management in place, the level of bottomfish catch would be expected to be 10,784 lb or more until it is determined that the stock complex is no longer experiencing overfishing, or if a coordinated management is implemented. The expected catch would depend on the level of fishing activity that would transfer to territorial waters with the closure of bottomfish fishing in Federal waters. If no fishing in Federal waters transfers to territorial waters, then implementing Alternative 2 would result in a potential reduction of 1,903 lb in expected catch relative to the status quo.

Based on the recent catch and sales information, NMFS anticipates that an average of 7.2 percent of bottomfish catch would be sold. Using the recent average price of $3.48 per lb, the estimated fleetwide bottomfish revenue during the first year of the rebuilding plan under Alternative 4 could be as low as $2,702 (776 lb). Under that scenario, the 20 participants would earn approximately $135 each.

Alternative 4 could constrain non-commercial catch and the amount of bottomfish available to the community relative to previous years, although the extent to which that occurs depends on how much bottomfish fishing activity would transfer to territorial waters due to the closure to bottomfish fishing in Federal waters. However, NMFS lacks detailed information on whether catch for commercial or non-commercial purposes comes disproportionately from territorial or

Federal waters or the proportions of species that are caught in these waters. Overall, NMFS expects that the amount of fish caught for sustenance and cultural purposes would be affected similarly to fish caught for commercial purposes, in that there might be a slight decrease in non-commercial catch.

Overall, implementation of Alternative 4 without complementary management, is expected to change the fishery slightly relative to the status quo during the time frame of the rebuilding plan, particularly if fishing activity transfers to territorial waters upon closure of Federal waters. The fishery is not expected to substantially change the way it fishes with respect to fishing gear, fishing effort, participation, or intensity, but may change slightly with respect to total catch and areas fished, with the fishermen who would normally choose to fish in Federal waters being affected more adversely.

Larger impacts to fishery participants would occur if the American Samoa government implemented a complementary closure in territorial waters. There would be no bottomfish fishing. Fishermen would not be able to retain bottomfish, have bottomfish available for non-commercial use nor would fishermen be able to earn any revenue from selling bottomfish.

6. Determination of Significant Regulatory Action

Pursuant to E.O. 12866, a regulation is considered a "significant regulatory action" if it is expected to result in: (1) an annual effect of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities; (2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; (3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights or obligations of recipients thereof; or (4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this executive order. Based on the information provided above, this regulatory action was determined to not be economically significant for the purposes of E.O. 12866.

APPENDIX C – PIFSC MEMO TO THE RECORD

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Pacific Islands Fisheries Science Center
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August 5, 2021

MEMORANDUM: For the Record

FROM: T. Todd Jones, Ph.D.
Director, Fisheries Research and Monitoring Division

Re: Advice regarding projection results to use in rebuilding plans for the Bottomfish Management Unit Species of Guam and American Samoa

The most recent stock assessments for bottomfish management unit species (BMUS) in the Commonwealth of the Northern Mariana Islands and U.S. territories of American Samoa and Guam were completed by the Pacific Islands Fisheries Science Center (PIFSC) in 2019 (Langseth et al. 2019). The assessments used data through 2017 and provided projections for 2020 through 2025. In January 2020, PIFSC determined that the assessment results represent the best scientific information available consistent with National Standard 2. Based on the assessment results, in February 2020 NMFS determined that the status of BMUS in Guam and American Samoa in 2017 was overfished, defined as $B<0.7*B_{MSY}$ in the relevant Fishery Ecosystem Plans. NMFS then informed the Western Pacific Fishery Management Council (WPFMC) of its obligation to develop rebuilding plans for these stocks within two years (i.e., by February 2022) as required by section 304(e) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson Stevens Act).

In 2020, the WPFMC initiated work on developing the rebuilding plans, which will be drafted as amendments to the fishery ecosystem plans for the Marianas and American Samoa with integrated environmental assessments (EAs). The WPFMC has requested various iterations of projection scenarios from the stock assessment program at PIFSC to account for extended projection timeframes (relative to the initial stock assessment) to reach rebuilding (i.e., $B \geq B_{MSY}$) under alternative catch scenarios in the integrated FEP amendments/EAs. Ultimately, the Council requested a set of projections with a start time delayed by two years to coincide with the date the rebuilding plans must go into effect (i.e., 2022 rather than 2020). Accommodation of this delayed start time required revision to the projection methodology and is the subject of this memo.

In the initial stock assessment projections, catches for years 2018 and 2019 were calculated from the average of the catch estimates among the three most recent years with data (i.e., 2015-2017) because 2018 and 2019 data were not available when the assessment was conducted. Given the new projection timeframe starting in 2022 and the availability of additional years of data, a

decision must be made on calculating catch estimates to use for the period 2018-2021. The request for a new start year was made with an imminent deadline; therefore, PIFSC scientists did not have adequate time to retrieve the 2018-2020 data from the servers and use the same expansion algorithms (and additional calculations) that were used for the stock assessment. The annual Stock Assessment and Fishery Evaluation (SAFE) reports with data through 2020 provided an efficient means of obtaining catch estimates for 2018-2020 in Guam (WPRFMC 2021a) and American Samoa (WPRFMC 2021b). The BMUS catches included in the SAFE report are typically less than those produced for the stock assessment because 1) a different expansion algorithm is used, 2) they only report catches estimated from boat-based creel survey (i.e., catches from the shore-based survey are excluded), and 3) the catch does not account for catches reported at taxonomic levels above species (e.g., genus or family level).

The catches from the SAFE report were compared to the catches from the assessment to calculate a correction factor that could be used to convert the SAFE report catches for 2018-2020 (Table 1) to catches that would be expected using the estimation methods for the stock assessment. The 2021 versions of the SAFE reports did include estimates of BMUS catch from the creel survey of shore-based fishing. We investigated including the shore-based BMUS catch with the boat-based catch before estimating the conversion, but this added a slight amount of variability to the correction factor (i.e., it slightly increased the standard deviation of the *assessment*:*SAFE* catch ratio among years). Only the boat-based catch data were used because they produced the most consistent correction factor. The majority of the discrepancy between the SAFE report catches and the catches in the stock assessment appears to be a function of the different expansion algorithm and the inclusion of catch reported at the species-group level, and a smaller proportion appears to be due to the shore-based catch that was previously omitted in the SAFE reports. Ultimately, the effect of this choice on total catches is negligible.

For Guam, the ratio of SAFE report catch to stock assessment catch varied from 0.99 to 1.23 for the ten-year period between 2008 and 2017. For American Samoa, the ratio was more variable, ranging from 1.05 to 3.67; however, excluding two high values considered to be outliers in 2012 and 2013 resulted in a range of 1.05 to 1.74. The recent 5 years (i.e., 2013-2017) were considered the most consistent (excluding 2013 from American Samoa as an outlier), resulting in conversion factors of 1.10 for Guam and 1.24 for American Samoa.

Using the conversion factors, the catches for 2018, 2019, and 2020 were 31,226 lb, 31,760 lb, and 18,933 for Guam, respectively. For American Samoa, the catches were 14,756 lb in 2018 and 13,714 lb in 2019, and 9,592 in 2020. After converting the 2018-2020 SAFE report catches, the 3-year averages were used for the 2021 catches, following methodology for calculating unknown catches for pre-projection years in the original stock assessment. The 3-year average corresponded to 27,310 lb for Guam and 12,687 lb for American Samoa (Table 2). Values used in the assessment (the 2015-2017 averages) were 19,256 for Guam and 21,868 for American Samoa. An additional refinement is that projection results are expressed as the probability of biomass (B) equaling or exceeding the biomass that produces maximum sustainable yield (B_{MSY}) in a given year consistent with requirements of National Standard 1 of the Magnuson Stevens Act.

Projection results for management alternatives requested by the Council are provided in Tables 3 and 4. In addition to the specific management alternatives, projection results given catch in 500-lb increments are provided as an appendix (Tables A1-G through A5-G for Guam and A1-AS through A5-AS for American Samoa). The tables in the appendix include projections through ten years of rebuilding since that is the T_{MAX}, or the maximum time allowed for rebuilding of these fisheries under the Magnuson Stevens Act. Results for additional years are available from NMFS upon request. The new projection timeframe results in different probabilities of rebuilding within a given timeframe compared to previous versions provided to fulfill previous requests from WPFMC. For the projections starting in 2022, the updated method is considered the most robust given the incorporation of recent data. These projections are suitable for use to inform rebuilding timeframes and associated management measures for the fishery. Continuing to use the average catch from 2015-2017 to inform pre-projection years 2018-2021 would result in less accurate projections because the values have been demonstrated to be inappropriate in consideration of recent information.

References:

Langseth, B, Syslo J, Yau A, Carvalho F. 2019. Stock assessments of the bottomfish management unit species of Guam, the Commonwealth of the Northern Mariana Islands, and American Samoa, 2019. NOAA Tech Memo. NMFS-PIFSC-86, 177 p. (+ supplement, 165 p.). doi:10.25923/bz8b-ng72.

Western Pacific Regional Fishery Management Council (WPRFMC). 2021a. Annual Stock Assessment and Fishery Evaluation Report for the Mariana Archipelago Fishery Ecosystem Plan 2020. Remington, T., Sabater, M., Ishizaki, A. (Eds.) Western Pacific Regional Fishery Management Council. Honolulu, Hawaii 96813 USA.

Western Pacific Regional Fishery Management Council (WPRFMC). 2021b. Annual Stock Assessment and Fishery Evaluation Report for the American Samoa Archipelago Fishery Ecosystem Plan 2020. Remington, T., Sabater, M., Ishizaki, A. (Eds.) Western Pacific Regional Fishery Management Council. Honolulu, Hawaii 96813 USA.

Table 1. Catch of bottomfish management unit species (BMUS) from the annual SAFE reports and from the stock assessments, along with the ratio of assessment:SAFE report catches.

	Guam			American Samoa		
Year	**SAFE**	**Assessment**	**Ratio**	**SAFE**	**Assessment**	**Ratio**
2008	31,103	34,249	1.10	22,095	32,965	1.49
2009	35,029	40,735	1.16	34,388	40,446	1.18
2010	23,928	26,544	1.11	7,044	11,978	1.70
2011	52,230	54,062	1.04	14,083	24,569	1.74
2012	17,518	19,714	1.13	2,094	7,688	3.67
2013	27,277	30,243	1.11	5,728	19,740	3.45
2014	20,687	20,554	0.99	13,970	20,352	1.46
2015	10,782	11,711	1.09	21,510	29,511	1.37
2016	24,479	30,192	1.23	19,307	20,181	1.05
2017	14,653	15,864	1.08	14,791	15,913	1.08
2018	28,364			11,957		
2019	28,849			11,082		
2020	17,198			7,751		

Table 2. Catches simulated for years 2018-2021 using the average from 2015-2017 (previous method with projections starting in 2020) versus using the catches from 2018, 2019, and 2020 SAFE reports with the conversion factor (updated method with projections starting in 2022). Expected catches from estimates are italicized; catches from expansions in SAFE reports are in regular text.

	Guam		American Samoa	
Year	**Previous**	**Updated**	**Previous**	**Updated**
2018	*19,256*	31,226	*21,868*	14,756
2019	*19,256*	31,760	*21,868*	13,714
2020	*Simulated ACL range*	18,933	*Simulated ACL range*	9,592
2021	*Simulated ACL range*	*27,310*	*Simulated ACL range*	*12,687*

Table 3. Summary of the probability of overfishing (pOFL), biomass (B), and the probability that B reaches B_{MSY} for catch levels under consideration for bottomfish in Guam (2022-2032). The value of pOFL is at the end of the year after fishing has occurred, while the values for biomass-related quantities are reported for the beginning of the year. B_{MSY} for Guam bottomfish is 248,800 lb. For each catch level under consideration, the grey cells indicate the earliest date rebuilding is projected to occur (i.e., when there is a 50% probability that B has reached B_{MSY}) and the associated pOFL and B value.

		0 lb			**16,500 lb**			**27,000 lb**			**31,000 lb**		
Year	**Year of Rebuilding**	**pOFL**	**B (lb)**	**Prob. $B \geq B_{MSY}$**	**pOFL**	**B (lb)**	**Prob. $B \geq B_{MSY}$**	**pOFL**	**B (lb)**	**Prob. $B \geq B_{MSY}$**	**pOFL**	**B (lb)**	**Prob. $B \geq B_{MSY}$**
2022	0	0.000	201,522	0.370	0.286	201,577	0.368	0.408	198,243	0.362	0.461	199,772	0.368
2023	1	0.000	239,132	0.477	0.257	224,980	0.440	0.388	210,620	0.402	0.445	207,476	0.396
2024	2	0.000	277,534	0.570	0.238	247,845	0.498	0.370	220,890	0.437	0.436	212,897	0.413
2025	3	0.000	317,296	0.641	0.219	270,631	0.546	0.362	233,707	0.461	0.424	220,196	0.432
2026	4	0.000	349,651	0.694	0.204	290,709	0.584	0.349	241,286	0.484	0.416	226,430	0.451
2027	5	0.000	377,420	0.745	0.189	309,052	0.618	0.341	252,789	0.509	0.411	234,621	0.466
2028	6	0.000	404,639	0.784	0.179	326,660	0.649	0.331	264,156	0.530	0.409	240,810	0.484
2029	7	0.000	423,419	0.813	0.171	341,722	0.674	0.323	272,918	0.546	0.402	246,661	0.497
2030	8	0.000	441,265	0.837	0.165	351,962	0.695	0.317	281,895	0.561	0.401	248,168	0.499
2031	9	0.000	454,623	0.858	0.159	364,126	0.712	0.313	289,847	0.577	0.397	250,116	0.502
2032	10	0.000	463,810	0.872	0.152	374,061	0.725	0.312	297,031	0.585	0.393	254,269	0.511

Table 4. Summary of the probability of overfishing (pOFL), biomass (B), and the probability that B reaches B_{MSY} for catch levels under consideration for bottomfish in American Samoa (2022-2032). The value of pOFL is at the end of the year after fishing has occurred, while the values for biomass-related quantities are reported for the beginning of the year. B_{MSY} for American Samoa bottomfish is 272,800 lb. For each catch level under consideration, the grey cells indicate the earliest date rebuilding is projected to occur (i.e., when there is a 50% probability that B has reached B_{MSY}) and the associated pOFL and B value.

		0 lb			**1,500 lb**			**5,000 lb**			**13,000 lb**		
Year	**Year of rebuilding**	**pOFL**	**B (lb)**	**Prob. $B \geq B_{MSY}$**	**pOFL**	**B (lb)**	**Prob. $B \geq B_{MSY}$**	**pOFL**	**B (lb)**	**Prob. $B \geq B_{MSY}$**	**pOFL**	**B (lb)**	**Prob. $B \geq B_{MSY}$**
2022	0	0.000	115,829	0.160	0.244	115,604	0.157	0.425	114,586	0.159	0.609	115,371	0.162
2023	1	0.000	132,911	0.209	0.226	130,216	0.208	0.395	127,742	0.199	0.588	119,649	0.192
2024	2	0.000	150,791	0.263	0.208	148,060	0.256	0.372	141,239	0.246	0.570	122,534	0.218
2025	3	0.000	173,414	0.313	0.194	166,477	0.301	0.349	156,456	0.288	0.554	126,424	0.245
2026	4	0.000	194,437	0.362	0.182	184,486	0.349	0.329	172,081	0.330	0.540	130,517	0.274
2027	5	0.000	219,455	0.406	0.169	206,081	0.389	0.314	188,065	0.369	0.531	134,443	0.295
2028	6	0.000	243,187	0.452	0.159	227,923	0.433	0.299	205,998	0.398	0.519	140,704	0.312
2029	7	0.000	269,352	0.491	0.150	250,987	0.470	0.288	223,915	0.431	0.509	145,762	0.328
2030	8	0.000	294,061	0.529	0.143	271,390	0.503	0.278	244,437	0.462	0.497	151,292	0.342
2031	9	0.000	314,454	0.559	0.139	292,720	0.534	0.269	259,648	0.486	0.491	159,971	0.360
2032	10	0.000	334,684	0.589	0.132	308,765	0.561	0.260	275,733	0.508	0.485	165,710	0.375

Appendix – Projection results given catch in 500-lb increments through maximum time to rebuild (T_{MAX})

Table A1-G. Probability that the biomass (B) of bottomfish management unit species in Guam is greater than or equal to biomass at maximum sustainable yield (B_{MSY}). A stock is considered to be rebuilt with the probability reaches 0.50. Results are presented through ten years of potential rebuilding (2022-2032), which corresponds to T_{MAX}. The probability shown is for the beginning of each fishing year, so the probability in 2022 would be the probability that $B \geq B_{MSY}$ prior to implementation of the rebuilding plan. Probability in 2032 would be at 10 years of rebuilding, or T_{MAX}.

Prob. B ≥ B_{MSY}	**Year**										
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
0.0	0.369778	0.477333	0.569556	0.641444	0.693778	0.745222	0.783667	0.812778	0.836556	0.857889	0.871556
0.5	0.369889	0.475444	0.566444	0.634889	0.691889	0.741111	0.776000	0.808778	0.829333	0.850667	0.867889
1.0	0.370556	0.478222	0.565556	0.635333	0.690111	0.739444	0.776556	0.804889	0.831667	0.853333	0.873111
1.5	0.373667	0.477444	0.566222	0.638222	0.689667	0.739778	0.775111	0.807222	0.828889	0.846556	0.862889
2.0	0.372889	0.478556	0.563333	0.633556	0.690333	0.735667	0.773889	0.802556	0.826000	0.847556	0.866778
2.5	0.370333	0.474889	0.564889	0.632222	0.688889	0.733222	0.768222	0.794444	0.815889	0.836111	0.854333
3.0	0.374444	0.472889	0.556000	0.627000	0.681778	0.728889	0.764111	0.793222	0.815667	0.837667	0.855333
3.5	0.366556	0.473778	0.550444	0.621667	0.680111	0.722889	0.754222	0.785444	0.809667	0.829111	0.848222
4.0	0.363889	0.466889	0.553556	0.622222	0.673556	0.717444	0.751667	0.779778	0.805222	0.824444	0.844444
4.5	0.374222	0.467556	0.551333	0.612778	0.668889	0.712333	0.749111	0.779222	0.806222	0.824778	0.840444
5.0	0.363333	0.464000	0.542111	0.608111	0.666556	0.710667	0.748556	0.774000	0.802333	0.818889	0.836889
5.5	0.375222	0.467444	0.541667	0.606778	0.663778	0.703556	0.743889	0.770778	0.797778	0.818222	0.835778
6.0	0.371889	0.462444	0.539556	0.600000	0.654778	0.694222	0.729000	0.767222	0.792556	0.810778	0.831889
6.5	0.367111	0.458222	0.536000	0.605778	0.652000	0.692778	0.729444	0.759333	0.789222	0.806111	0.824556
7.0	0.364667	0.454556	0.534222	0.596111	0.653000	0.697333	0.728556	0.758889	0.783444	0.804667	0.819556
7.5	0.370000	0.461222	0.538222	0.597778	0.645556	0.687333	0.722111	0.752667	0.781778	0.803444	0.822444
8.0	0.369889	0.456333	0.531889	0.590556	0.642889	0.683222	0.721667	0.750000	0.775000	0.793778	0.811222
8.5	0.374333	0.461556	0.533778	0.594889	0.646111	0.687556	0.717667	0.746222	0.771778	0.790556	0.813000
9.0	0.371111	0.453889	0.528222	0.586556	0.638000	0.686000	0.719000	0.744667	0.767778	0.786556	0.806778
9.5	0.369333	0.455778	0.526778	0.588778	0.638333	0.679444	0.713333	0.743556	0.764333	0.787556	0.805556

Prob. B ≥ B_{MSY}	Year										
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
10.0	0.361333	0.450667	0.518667	0.578333	0.624889	0.665000	0.699556	0.730222	0.754444	0.777667	0.792444
10.5	0.369000	0.449333	0.520556	0.582111	0.633444	0.673333	0.706778	0.739444	0.762111	0.782333	0.797444
11.0	0.370778	0.451667	0.521556	0.575444	0.623111	0.664778	0.700111	0.725889	0.750667	0.773778	0.785222
11.5	0.366667	0.449778	0.519000	0.573444	0.618333	0.658444	0.694556	0.720333	0.746556	0.767111	0.782556
12.0	0.373889	0.451889	0.516222	0.574889	0.621000	0.657667	0.694111	0.723444	0.744556	0.762889	0.779556
12.5	0.365444	0.447000	0.508222	0.567000	0.612333	0.651000	0.683333	0.713111	0.733889	0.754222	0.769444
13.0	0.370444	0.448222	0.506556	0.561444	0.611222	0.647333	0.676333	0.707111	0.727889	0.749889	0.761778
13.5	0.366556	0.441333	0.507667	0.559667	0.607111	0.644333	0.678556	0.709444	0.727333	0.746000	0.764000
14.0	0.372000	0.447556	0.508889	0.563222	0.603333	0.642667	0.674444	0.699778	0.723667	0.740222	0.756556
14.5	0.372778	0.440222	0.497778	0.551111	0.595222	0.636000	0.666667	0.694556	0.718667	0.738333	0.752000
15.0	0.365333	0.437778	0.504000	0.558444	0.600111	0.631667	0.663222	0.688667	0.709778	0.730222	0.747111
15.5	0.371222	0.440000	0.499889	0.544889	0.587222	0.626889	0.656444	0.684111	0.708000	0.726444	0.744000
16.0	0.369111	0.444222	0.494333	0.542111	0.585556	0.624222	0.654444	0.678000	0.703556	0.717111	0.731333
16.5	0.367556	0.439556	0.498444	0.546444	0.584222	0.617556	0.648556	0.674000	0.695000	0.712333	0.724889
17.0	0.368667	0.431111	0.487333	0.534556	0.576889	0.612444	0.639222	0.667000	0.686333	0.706778	0.723556
17.5	0.370000	0.435222	0.488222	0.539222	0.582222	0.611333	0.640000	0.662333	0.677556	0.693222	0.715556
18.0	0.362778	0.432222	0.484111	0.531889	0.570667	0.603556	0.634222	0.659667	0.679444	0.697222	0.710111
18.5	0.369778	0.426111	0.481556	0.528222	0.566222	0.596667	0.623889	0.650556	0.668778	0.691556	0.702444
19.0	0.367222	0.428667	0.477000	0.525667	0.566222	0.595778	0.618889	0.638667	0.664333	0.681333	0.694333
19.5	0.369889	0.427111	0.476444	0.520667	0.557778	0.587667	0.616444	0.642111	0.663444	0.681444	0.694000
20.0	0.367889	0.425000	0.469556	0.516556	0.547333	0.580000	0.611000	0.632000	0.652444	0.671778	0.687333
20.5	0.379667	0.427444	0.478444	0.519000	0.552222	0.578222	0.608444	0.626667	0.647556	0.663000	0.679111
21.0	0.372667	0.425667	0.468222	0.506889	0.545222	0.570111	0.599667	0.622444	0.637444	0.652778	0.667556
21.5	0.367889	0.422444	0.468889	0.509222	0.537889	0.572444	0.593889	0.610444	0.629444	0.651000	0.663556
22.0	0.365222	0.417111	0.459111	0.497556	0.530222	0.562444	0.591667	0.609333	0.630111	0.646444	0.658333
22.5	0.369889	0.415000	0.459556	0.500444	0.533222	0.562889	0.584444	0.603667	0.622556	0.635556	0.653889
23.0	0.363333	0.415000	0.461111	0.497778	0.527222	0.558778	0.577778	0.594556	0.607222	0.623778	0.639444

Prob. B ≥ B_{MSY}	Year										
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
23.5	0.368000	0.411111	0.451111	0.489222	0.520778	0.545889	0.569667	0.586889	0.607000	0.620333	0.630889
24.0	0.369000	0.412333	0.454444	0.486667	0.513111	0.539444	0.566000	0.586222	0.602889	0.617111	0.629889
24.5	0.370111	0.410667	0.456444	0.487333	0.521667	0.545889	0.568444	0.588111	0.598000	0.613000	0.623111
25.0	0.369444	0.416222	0.457889	0.493556	0.518556	0.545000	0.566111	0.578556	0.597000	0.612111	0.620444
25.5	0.371000	0.412778	0.451667	0.480778	0.505333	0.530778	0.551444	0.569222	0.582778	0.595778	0.610889
26.0	0.371444	0.407556	0.444000	0.476333	0.497333	0.521667	0.545556	0.562889	0.578778	0.586556	0.603000
26.5	0.363222	0.402111	0.435889	0.467667	0.487222	0.516889	0.539000	0.556000	0.566444	0.578556	0.589778
27.0	0.361667	0.402222	0.436778	0.460889	0.484333	0.508556	0.530222	0.545889	0.560667	0.577444	0.585111
27.5	0.364222	0.402111	0.436556	0.464444	0.490000	0.510222	0.526111	0.543333	0.556444	0.564556	0.577556
28.0	0.371667	0.405667	0.438000	0.466222	0.486556	0.507111	0.518333	0.534556	0.544444	0.551444	0.562889
28.5	0.364889	0.401222	0.429444	0.453444	0.477333	0.496556	0.510000	0.526778	0.541556	0.549556	0.557444
29.0	0.378889	0.408000	0.435444	0.462111	0.486000	0.504556	0.516778	0.533556	0.544889	0.556556	0.563778
29.5	0.370333	0.401000	0.427222	0.451222	0.469556	0.491222	0.504444	0.514222	0.525889	0.536222	0.541889
30.0	0.363778	0.394778	0.424667	0.451222	0.471000	0.482111	0.493333	0.505333	0.513333	0.523889	0.532556
30.5	0.366556	0.394667	0.422556	0.445444	0.460111	0.476222	0.490556	0.500556	0.509667	0.518778	0.523889
31.0	0.367556	0.396111	0.412556	0.432444	0.450889	0.465667	0.483667	0.496556	0.499111	0.502222	0.510889
31.5	0.366444	0.393222	0.410889	0.429111	0.443111	0.460333	0.472000	0.482889	0.488000	0.496556	0.505444
32.0	0.369778	0.388778	0.409556	0.425222	0.440778	0.459667	0.468222	0.479222	0.483333	0.491444	0.492667
32.5	0.368556	0.390000	0.406667	0.425889	0.438111	0.449000	0.461444	0.474222	0.479889	0.488889	0.493000
33.0	0.373556	0.390333	0.406333	0.420889	0.438000	0.449889	0.456222	0.465889	0.470778	0.475889	0.481889
33.5	0.370000	0.395333	0.416000	0.428444	0.439889	0.446778	0.460444	0.463333	0.468889	0.473889	0.481111
34.0	0.360333	0.383111	0.405222	0.418333	0.428556	0.439556	0.444778	0.449556	0.457667	0.460889	0.461667
34.5	0.370333	0.392111	0.405444	0.416889	0.428444	0.433222	0.447778	0.453444	0.454222	0.458222	0.458889
35.0	0.379222	0.392333	0.405556	0.414889	0.428778	0.437444	0.440667	0.441222	0.450000	0.450444	0.457556
35.5	0.370444	0.382222	0.397556	0.406889	0.416556	0.421222	0.425556	0.430667	0.437000	0.445667	0.446000
36.0	0.369889	0.382778	0.395667	0.406000	0.409000	0.415667	0.418333	0.423889	0.430000	0.433222	0.434000
36.5	0.371667	0.381556	0.389778	0.396778	0.406333	0.406667	0.409667	0.414222	0.414000	0.416556	0.418889

Prob. B ≥ B_{MSY}	Year										
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
37.0	0.369000	0.379778	0.389111	0.399222	0.406889	0.408000	0.412444	0.412000	0.414889	0.413778	0.415333
37.5	0.365444	0.372444	0.382667	0.388333	0.392444	0.399222	0.399556	0.404000	0.405444	0.404222	0.405111
38.0	0.373889	0.384444	0.388222	0.388889	0.389778	0.391111	0.390444	0.392444	0.392111	0.390556	0.386222
38.5	0.371333	0.375778	0.385444	0.383222	0.385778	0.385778	0.386667	0.379333	0.382000	0.375222	0.375778
39.0	0.368333	0.371444	0.375444	0.379000	0.380111	0.381222	0.385333	0.380778	0.383111	0.382333	0.375444
39.5	0.365111	0.365000	0.369667	0.372889	0.372333	0.375444	0.374778	0.370000	0.368333	0.368889	0.362444
40.0	0.372778	0.373111	0.371778	0.369111	0.369222	0.367444	0.361556	0.362444	0.364333	0.355333	0.355111
40.5	0.369000	0.371000	0.374556	0.371889	0.366333	0.367444	0.357667	0.354333	0.352000	0.351778	0.350778
41.0	0.369667	0.370111	0.371222	0.372444	0.366444	0.359889	0.356333	0.354000	0.348000	0.342333	0.338111
41.5	0.369667	0.362556	0.363222	0.360667	0.357000	0.353667	0.345333	0.340000	0.334889	0.331444	0.329556
42.0	0.378444	0.363556	0.361556	0.353667	0.351556	0.342778	0.339333	0.340000	0.331778	0.328556	0.327111
42.5	0.369444	0.366000	0.359111	0.349556	0.344111	0.337222	0.331000	0.324889	0.320667	0.315000	0.305000
43.0	0.368111	0.359333	0.357556	0.349111	0.345778	0.337111	0.333556	0.326333	0.313111	0.308889	0.303556
43.5	0.369556	0.356000	0.352444	0.343000	0.334111	0.327222	0.318667	0.312000	0.302667	0.293556	0.286778
44.0	0.363444	0.363778	0.352778	0.340222	0.327444	0.320444	0.313222	0.304778	0.295667	0.292778	0.283333
44.5	0.368111	0.359444	0.350778	0.342444	0.330222	0.324889	0.313889	0.303000	0.294556	0.286222	0.276556
45.0	0.362111	0.349000	0.333222	0.324222	0.316667	0.306222	0.289556	0.286222	0.275889	0.268333	0.260222
45.5	0.369222	0.361778	0.347556	0.332667	0.322444	0.307667	0.295000	0.285444	0.275556	0.265556	0.259222
46.0	0.363556	0.356333	0.338556	0.324556	0.312000	0.295889	0.287000	0.276667	0.270667	0.261000	0.251222
46.5	0.373444	0.359222	0.340444	0.323667	0.312889	0.298222	0.285556	0.273556	0.262333	0.250333	0.242333
47.0	0.367556	0.352667	0.335444	0.324556	0.308333	0.296000	0.278444	0.269333	0.258333	0.247333	0.239000
47.5	0.364222	0.349778	0.331222	0.318444	0.302889	0.286111	0.273333	0.258333	0.246333	0.238000	0.226000
48.0	0.367778	0.349444	0.331111	0.313444	0.297333	0.280667	0.271556	0.255222	0.246000	0.231000	0.220000
48.5	0.373889	0.351778	0.326000	0.308667	0.295222	0.281444	0.266000	0.253444	0.238222	0.227778	0.217222
49.0	0.373222	0.346333	0.327444	0.307778	0.285667	0.274222	0.258778	0.242444	0.230333	0.221667	0.209667
49.5	0.374778	0.348889	0.329111	0.306222	0.286444	0.269111	0.243889	0.235556	0.222333	0.210667	0.203889
50.0	0.364444	0.339667	0.313333	0.291444	0.272556	0.256333	0.241333	0.226778	0.215889	0.204778	0.193889

Table A2-G. Biomass of bottomfish management unit species in Guam through ten years of rebuilding (2022-2032). Biomass is presented in 1,000 lb increments. Biomass shown is the estimated biomass at the beginning of each fishing year, so the biomass in 2022 would be the biomass prior to implementation of the rebuilding plan. Biomass in 2032 would be the biomass after 10 years of rebuilding, or T_{MAX}.

Biomass (1,000 lb)	**Year**										
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
0.0	201.522	239.132	277.534	317.296	349.651	377.420	404.639	423.419	441.265	454.623	463.810
0.5	200.051	238.870	277.844	313.955	346.440	374.675	402.227	418.648	435.626	448.459	458.753
1.0	199.562	239.054	276.774	311.228	344.844	372.963	398.113	419.421	432.190	444.686	456.724
1.5	201.463	239.665	278.072	314.054	345.714	372.970	397.760	416.245	434.000	445.931	455.830
2.0	199.799	238.856	274.648	310.205	343.354	371.083	394.819	413.359	428.108	439.263	449.945
2.5	202.396	238.152	277.209	310.341	341.131	370.537	392.857	412.608	428.555	439.816	450.930
3.0	201.750	238.117	272.062	307.206	338.743	366.951	391.902	411.430	423.574	439.392	447.457
3.5	199.363	238.019	272.083	307.520	339.942	365.031	388.445	404.611	421.181	433.160	443.630
4.0	198.645	235.563	272.389	306.652	335.463	359.971	383.405	405.686	418.819	432.514	444.180
4.5	201.178	236.369	270.865	303.384	332.742	361.024	381.560	402.149	417.931	430.658	442.827
5.0	198.454	234.169	267.093	299.910	331.911	358.293	379.776	398.564	413.002	428.045	437.465
5.5	200.588	234.367	267.044	297.115	330.284	353.102	376.734	395.148	412.146	424.738	433.939
6.0	200.741	233.025	264.612	297.468	325.840	354.823	375.991	396.033	407.511	419.276	428.853
6.5	199.480	231.499	264.627	299.006	327.755	354.440	373.863	388.761	404.921	419.803	428.325
7.0	200.742	229.400	263.625	294.929	324.092	348.377	371.252	388.504	405.418	414.440	426.543
7.5	199.331	231.140	265.066	295.983	324.763	348.530	370.184	385.409	398.621	413.215	423.950
8.0	198.792	230.088	263.416	294.589	318.359	342.606	364.686	384.115	397.291	411.263	421.176
8.5	202.174	231.393	264.853	291.141	319.193	345.725	366.727	385.272	400.265	408.731	418.626
9.0	199.924	229.666	259.425	288.124	315.150	338.521	357.374	377.545	392.298	405.492	415.051
9.5	200.024	230.477	258.669	289.403	314.859	336.989	361.802	376.040	394.017	403.448	415.322
10.0	198.831	228.819	256.188	283.929	309.013	332.723	356.214	373.680	386.582	399.260	410.747
10.5	201.486	228.894	258.187	288.130	313.055	337.628	357.118	373.657	389.805	401.615	409.046
11.0	201.106	228.085	257.565	283.653	309.579	332.486	356.365	369.634	380.818	394.106	405.516

Biomass (1,000 lb)	Year										
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
11.5	201.926	229.436	256.458	281.840	307.651	330.948	348.837	363.505	379.172	392.154	402.072
12.0	199.111	228.720	254.540	282.497	307.705	332.138	346.917	365.131	379.290	392.262	401.539
12.5	198.347	226.693	253.097	278.800	304.302	327.306	343.135	359.189	375.334	386.661	395.154
13.0	199.093	226.110	250.632	275.568	298.926	322.708	340.561	356.869	370.798	382.088	389.522
13.5	201.714	227.421	251.123	276.637	299.948	319.338	337.832	355.333	367.981	379.681	389.881
14.0	201.194	227.669	252.666	278.305	300.589	319.481	337.872	356.575	366.183	376.620	386.703
14.5	200.514	223.104	247.256	272.490	294.004	316.280	334.782	349.587	363.759	374.298	385.579
15.0	199.585	224.393	249.821	275.598	296.630	316.986	333.159	350.274	360.899	372.069	380.393
15.5	201.942	225.101	248.402	269.263	290.473	312.179	330.072	345.969	358.076	367.756	380.407
16.0	200.210	224.679	246.250	269.119	289.288	309.407	326.501	341.712	352.402	362.528	373.602
16.5	201.577	224.980	247.845	270.631	290.709	309.052	326.660	341.722	351.962	364.126	374.061
17.0	199.829	220.897	242.878	264.533	284.150	304.271	319.309	334.528	349.131	359.795	367.954
17.5	201.287	221.547	242.750	266.323	285.764	303.165	317.232	333.857	345.169	355.099	362.257
18.0	199.446	220.711	241.065	262.230	282.471	298.401	316.480	329.557	339.901	349.329	361.750
18.5	200.644	220.970	239.754	259.956	278.593	297.009	311.602	328.055	338.200	349.132	357.928
19.0	201.011	220.132	239.042	260.264	280.168	295.415	311.030	325.576	336.623	347.818	354.035
19.5	200.591	218.446	238.039	257.110	276.092	292.061	306.257	319.719	332.172	344.264	354.684
20.0	201.844	218.608	235.449	255.343	270.006	287.232	303.087	315.630	325.929	337.509	346.942
20.5	200.925	220.049	238.750	257.956	274.030	288.305	303.170	314.987	327.979	336.783	346.253
21.0	199.991	218.458	235.693	252.021	270.643	283.327	300.340	316.489	325.670	331.091	341.581
21.5	199.382	217.390	234.621	252.510	265.652	283.484	294.630	306.864	315.858	327.450	336.781
22.0	199.760	215.009	232.564	247.440	264.224	280.182	293.883	305.770	314.807	326.438	334.346
22.5	198.759	215.505	231.792	248.617	264.474	278.305	290.705	302.310	310.367	318.592	325.159
23.0	198.340	214.416	231.044	247.547	262.583	276.160	288.530	298.661	309.074	316.427	325.310
23.5	200.758	213.984	228.449	244.356	257.948	270.395	282.073	294.637	302.136	313.917	319.299
24.0	200.542	213.706	229.183	242.247	254.477	267.364	280.893	290.647	299.301	310.218	319.455
24.5	200.851	215.095	230.669	242.606	258.927	271.517	284.357	296.209	302.782	311.614	317.945
25.0	201.413	214.664	231.211	245.690	256.411	270.110	282.303	289.919	298.931	306.358	313.569
25.5	202.472	215.199	227.004	240.162	251.202	262.614	273.887	281.706	291.878	298.521	306.326

Biomass (1,000 lb)	Year										
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
26.0	200.118	211.994	225.019	237.014	246.852	258.729	270.276	279.258	286.962	296.008	302.460
26.5	198.658	209.880	221.657	235.440	242.910	257.525	269.946	276.814	284.977	291.941	297.567
27.0	198.243	210.620	220.890	233.707	241.286	252.789	264.156	272.918	281.895	289.847	297.031
27.5	197.913	210.184	222.729	232.404	243.511	254.134	262.740	269.961	278.105	285.077	289.255
28.0	201.379	211.938	222.518	231.535	242.034	251.547	258.496	265.834	271.585	279.027	284.390
28.5	199.282	207.029	218.312	227.197	237.581	247.045	253.983	262.859	270.486	276.252	281.254
29.0	202.766	213.192	220.414	232.475	242.906	250.073	258.066	266.583	272.688	278.579	282.920
29.5	200.482	209.112	217.824	225.586	234.255	243.725	250.567	255.533	262.865	267.796	272.136
30.0	198.711	208.117	218.143	224.938	232.528	240.315	245.172	251.119	255.830	260.850	267.295
30.5	199.903	207.754	215.048	224.157	231.437	237.474	244.070	248.675	254.024	258.945	261.225
31.0	199.772	207.476	212.897	220.196	226.430	234.621	240.810	246.661	248.168	250.116	254.269
31.5	198.374	206.368	211.083	216.961	222.708	227.745	233.326	238.726	241.640	246.527	252.124
32.0	199.927	205.771	210.124	215.679	222.741	227.280	232.515	237.275	240.460	244.605	244.407
32.5	200.355	206.284	209.532	216.889	222.767	224.463	230.017	234.175	237.640	242.510	245.285
33.0	201.339	204.961	209.135	214.160	220.013	223.707	228.387	229.648	232.452	234.027	237.702
33.5	201.120	206.251	211.304	213.878	218.766	222.882	226.929	229.384	232.515	235.370	238.543
34.0	198.799	203.445	208.258	211.261	214.367	216.826	219.516	220.991	225.128	226.340	226.051
34.5	202.647	205.728	209.828	213.575	216.557	218.751	220.594	222.205	221.346	225.032	226.248
35.0	204.872	206.184	209.495	212.612	215.337	216.937	218.165	218.027	217.540	219.778	222.192
35.5	201.209	202.853	205.451	209.322	210.391	210.850	212.624	213.882	213.780	216.885	215.785
36.0	200.571	202.903	205.358	204.410	206.783	208.993	207.893	208.438	210.319	210.561	210.256
36.5	202.165	203.923	203.124	203.695	205.196	204.986	204.849	204.469	202.098	200.019	200.759
37.0	200.471	201.429	203.524	203.149	202.730	203.341	201.595	201.562	200.531	200.452	199.156
37.5	199.392	198.835	198.471	197.899	199.304	198.972	197.678	196.342	195.707	191.807	189.396
38.0	201.086	201.838	200.240	198.653	197.718	193.725	190.856	188.018	185.331	183.631	180.755
38.5	201.316	200.414	199.513	197.036	196.655	192.090	188.021	184.845	180.614	176.989	173.896
39.0	199.827	197.556	197.719	195.726	192.877	191.163	188.016	183.888	180.331	174.617	169.225
39.5	200.312	196.825	195.131	193.125	190.234	187.658	183.508	177.197	173.391	166.568	162.917
40.0	201.978	198.375	193.479	191.492	188.424	183.429	179.868	174.625	169.357	162.516	154.386

Biomass (1,000 lb)	Year										
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
40.5	199.703	196.974	194.596	190.939	185.379	180.378	176.243	169.987	165.272	159.062	150.316
41.0	200.562	196.398	191.706	186.259	183.287	178.447	171.639	165.697	158.507	148.969	139.366
41.5	198.972	194.288	190.847	183.730	179.078	173.051	165.424	158.935	150.928	141.621	132.898
42.0	200.511	196.207	191.788	187.634	179.786	173.094	164.953	158.647	149.880	139.429	127.586
42.5	199.235	193.889	188.175	180.779	175.492	167.806	158.932	149.293	139.699	128.617	116.396
43.0	200.130	194.909	188.847	184.054	177.104	167.567	158.864	150.757	140.382	129.461	116.648
43.5	197.965	192.901	186.740	179.848	170.704	163.099	154.494	142.757	130.486	116.429	100.993
44.0	198.841	193.476	186.240	178.003	170.050	160.823	149.335	138.646	126.293	112.801	97.622
44.5	199.441	192.880	185.192	177.585	166.708	156.390	145.646	132.867	119.060	100.590	82.664
45.0	199.185	191.183	182.964	173.572	162.207	150.386	138.146	125.195	110.630	93.161	71.752
45.5	200.255	191.997	183.530	174.815	162.206	150.181	139.514	125.021	107.860	88.820	68.308
46.0	199.409	190.445	181.922	171.870	161.138	148.491	134.301	118.639	104.878	84.166	63.890
46.5	202.210	193.242	183.332	171.575	159.736	147.111	132.082	114.927	97.836	78.317	54.664
47.0	199.914	190.589	180.803	168.390	157.687	143.450	128.494	112.291	91.566	69.910	44.852
47.5	198.428	188.884	178.454	166.656	151.927	138.034	122.032	103.750	82.332	58.353	29.007
48.0	200.387	189.966	179.542	167.621	154.828	139.879	122.798	102.572	81.971	57.606	28.120
48.5	201.694	191.487	178.454	164.313	149.995	133.480	116.505	96.797	73.813	47.903	18.048
49.0	201.228	188.401	176.618	162.124	148.540	131.178	112.634	90.167	63.836	35.102	1.237
49.5	202.291	189.623	176.954	161.652	145.637	127.148	107.827	84.909	59.001	28.744	0.903
50.0	198.194	185.250	170.876	156.494	140.901	121.906	102.384	78.732	51.807	19.069	0.837

Table A3-G. Harvest rate (H) for bottomfish management unit species in Guam. Results are presented through ten years of rebuilding (2022-2031). The H shown is for the end of each fishing year, so the H in the column for calendar year 2022 would be the H after one year of implementation of the rebuilding plan. H in 2031 would be the H at 10 years, or T_{MAX}.

H	**Year**									
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
0.5	0.002499	0.002093	0.001800	0.001593	0.001443	0.001334	0.001243	0.001194	0.001148	0.001115
1.0	0.005011	0.004183	0.003613	0.003213	0.002900	0.002681	0.002512	0.002384	0.002314	0.002249
1.5	0.007446	0.006259	0.005394	0.004776	0.004339	0.004022	0.003771	0.003604	0.003456	0.003364
2.0	0.010010	0.008373	0.007282	0.006447	0.005825	0.005390	0.005066	0.004838	0.004672	0.004553
2.5	0.012352	0.010497	0.009018	0.008056	0.007329	0.006747	0.006364	0.006059	0.005834	0.005684
3.0	0.014870	0.012599	0.011027	0.009765	0.008856	0.008175	0.007655	0.007292	0.007083	0.006828
3.5	0.017556	0.014705	0.012864	0.011381	0.010296	0.009588	0.009010	0.008650	0.008310	0.008080
4.0	0.020136	0.016981	0.014685	0.013044	0.011924	0.011112	0.010433	0.009860	0.009551	0.009248
4.5	0.022368	0.019038	0.016613	0.014833	0.013524	0.012465	0.011794	0.011190	0.010767	0.010449
5.0	0.025195	0.021352	0.018720	0.016672	0.015064	0.013955	0.013166	0.012545	0.012106	0.011681
5.5	0.027419	0.023467	0.020596	0.018511	0.016652	0.015576	0.014599	0.013919	0.013345	0.012949
6.0	0.029889	0.025748	0.022675	0.020170	0.018414	0.016910	0.015958	0.015150	0.014724	0.014310
6.5	0.032585	0.028078	0.024563	0.021739	0.019832	0.018339	0.017386	0.016720	0.016053	0.015483
7.0	0.034871	0.030514	0.026553	0.023735	0.021599	0.020093	0.018855	0.018018	0.017266	0.016890
7.5	0.037626	0.032448	0.028295	0.025339	0.023094	0.021519	0.020260	0.019460	0.018815	0.018150
8.0	0.040243	0.034769	0.030370	0.027157	0.025129	0.023350	0.021937	0.020827	0.020136	0.019452
8.5	0.042043	0.036734	0.032093	0.029195	0.026630	0.024586	0.023178	0.022062	0.021236	0.020796
9.0	0.045017	0.039187	0.034692	0.031237	0.028558	0.026586	0.025184	0.023838	0.022942	0.022195
9.5	0.047494	0.041219	0.036726	0.032826	0.030172	0.028191	0.026257	0.025263	0.024111	0.023547
10.0	0.050294	0.043703	0.039034	0.035220	0.032361	0.030055	0.028073	0.026761	0.025868	0.025046
10.5	0.052113	0.045873	0.040668	0.036442	0.033540	0.031099	0.029402	0.028101	0.026937	0.026144
11.0	0.054698	0.048228	0.042708	0.038780	0.035532	0.033084	0.030867	0.029759	0.028885	0.027911
11.5	0.056951	0.050123	0.044842	0.040803	0.037380	0.034749	0.032967	0.031636	0.030329	0.029325

H	Year									
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
12.0	0.060268	0.052466	0.047144	0.042478	0.038998	0.036130	0.034590	0.032865	0.031638	0.030592
12.5	0.063021	0.055141	0.049388	0.044835	0.041078	0.038191	0.036429	0.034801	0.033304	0.032328
13.0	0.065296	0.057494	0.051869	0.047175	0.043489	0.040284	0.038172	0.036428	0.035060	0.034024
13.5	0.066926	0.059361	0.053758	0.048800	0.045008	0.042275	0.039961	0.037993	0.036687	0.035556
14.0	0.069585	0.061493	0.055409	0.050305	0.046575	0.043821	0.041436	0.039262	0.038232	0.037173
14.5	0.072314	0.064992	0.058644	0.053213	0.049319	0.045845	0.043312	0.041477	0.039862	0.038739
15.0	0.075156	0.066847	0.060043	0.054427	0.050568	0.047321	0.045024	0.042824	0.041563	0.040315
15.5	0.076755	0.068858	0.062399	0.057564	0.053361	0.049651	0.046960	0.044802	0.043287	0.042148
16.0	0.079916	0.071213	0.064975	0.059453	0.055308	0.051712	0.049004	0.046823	0.045403	0.044135
16.5	0.081854	0.073340	0.066574	0.060969	0.056758	0.053389	0.050511	0.048285	0.046880	0.045314
17.0	0.085073	0.076959	0.069994	0.064264	0.059828	0.055871	0.053240	0.050818	0.048692	0.047249
17.5	0.086940	0.078990	0.072091	0.065710	0.061239	0.057724	0.055165	0.052418	0.050700	0.049282
18.0	0.090250	0.081555	0.074669	0.068642	0.063723	0.060322	0.056876	0.054619	0.052957	0.051527
18.5	0.092203	0.083722	0.077163	0.071166	0.066405	0.062288	0.059371	0.056393	0.054701	0.052988
19.0	0.094522	0.086312	0.079484	0.073003	0.067816	0.064316	0.061087	0.058358	0.056443	0.054626
19.5	0.097213	0.089267	0.081919	0.075843	0.070629	0.066767	0.063672	0.060991	0.058704	0.056643
20.0	0.099087	0.091488	0.084944	0.078326	0.074072	0.069630	0.065988	0.063365	0.061363	0.059258
20.5	0.102028	0.093161	0.085864	0.079471	0.074809	0.071105	0.067619	0.065082	0.062504	0.060870
21.0	0.105005	0.096129	0.089099	0.083326	0.077593	0.074119	0.069921	0.066353	0.064483	0.063427
21.5	0.107833	0.098900	0.091637	0.085145	0.080933	0.075842	0.072973	0.070064	0.068069	0.065659
22.0	0.110132	0.102321	0.094597	0.088911	0.083263	0.078520	0.074860	0.071950	0.069884	0.067394
22.5	0.113202	0.104406	0.097070	0.090501	0.085075	0.080847	0.077398	0.074427	0.072495	0.070623
23.0	0.115962	0.107268	0.099548	0.092912	0.087591	0.083285	0.079715	0.077010	0.074416	0.072686
23.5	0.117056	0.109821	0.102867	0.096171	0.091104	0.086910	0.083312	0.079759	0.077780	0.074860
24.0	0.119675	0.112304	0.104720	0.099073	0.094311	0.089765	0.085442	0.082574	0.080187	0.077365
24.5	0.121981	0.113903	0.106213	0.100987	0.094621	0.090234	0.086159	0.082712	0.080916	0.078623
25.0	0.124123	0.116461	0.108126	0.101754	0.097500	0.092555	0.088557	0.086231	0.083631	0.081604

H	Year									
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
25.5	0.125943	0.118495	0.112333	0.106178	0.101512	0.097101	0.093104	0.090520	0.087365	0.085421
26.0	0.129923	0.122645	0.115546	0.109698	0.105326	0.100491	0.096198	0.093104	0.090604	0.087835
26.5	0.133395	0.126263	0.119554	0.112555	0.109094	0.102903	0.098168	0.095732	0.092990	0.090772
27.0	0.136197	0.128193	0.122233	0.115530	0.111901	0.106808	0.102213	0.098931	0.095780	0.093153
27.5	0.138950	0.130838	0.123469	0.118329	0.112931	0.108210	0.104666	0.101867	0.098884	0.096465
28.0	0.139041	0.132114	0.125833	0.120932	0.115686	0.111311	0.108319	0.105329	0.103098	0.100349
28.5	0.143014	0.137662	0.130547	0.125442	0.119959	0.115364	0.112212	0.108423	0.105366	0.103167
29.0	0.143022	0.136027	0.131570	0.124745	0.119388	0.115966	0.112375	0.108784	0.106349	0.104100
29.5	0.147145	0.141073	0.135430	0.130771	0.125931	0.121038	0.117733	0.115445	0.112225	0.110158
30.0	0.150973	0.144149	0.137524	0.133370	0.129017	0.124836	0.122363	0.119465	0.117265	0.115009
30.5	0.152574	0.146808	0.141829	0.136065	0.131786	0.128435	0.124964	0.122650	0.120068	0.117786
31.0	0.155177	0.149415	0.145611	0.140784	0.136908	0.132128	0.128732	0.125679	0.124915	0.123943
31.5	0.158791	0.152640	0.149230	0.145187	0.141441	0.138313	0.135004	0.131950	0.130359	0.127775
32.0	0.160058	0.155512	0.152291	0.148368	0.143665	0.140795	0.137625	0.134865	0.133078	0.130823
32.5	0.162212	0.157550	0.155108	0.149846	0.145893	0.144790	0.141294	0.138785	0.136762	0.134015
33.0	0.163902	0.161006	0.157793	0.154090	0.149991	0.147514	0.144492	0.143698	0.141965	0.141009
33.5	0.166567	0.162423	0.158539	0.156631	0.153132	0.150304	0.147623	0.146043	0.144077	0.142329
34.0	0.171027	0.167121	0.163259	0.160938	0.158606	0.156808	0.154886	0.153852	0.151025	0.150217
34.5	0.170247	0.167697	0.164421	0.161535	0.159311	0.157713	0.156396	0.155262	0.155864	0.153311
35.0	0.170838	0.169751	0.167068	0.164619	0.162536	0.161337	0.160429	0.160531	0.160890	0.159251
35.5	0.176434	0.175003	0.172791	0.169595	0.168733	0.168366	0.166962	0.165979	0.166059	0.163682
36.0	0.179488	0.177424	0.175303	0.176117	0.174096	0.172255	0.173166	0.172713	0.171168	0.170972
36.5	0.180546	0.178989	0.179693	0.179190	0.177879	0.178061	0.178180	0.178511	0.180606	0.182483
37.0	0.184565	0.183687	0.181797	0.182133	0.182509	0.181960	0.183536	0.183566	0.184510	0.184583
37.5	0.188072	0.188598	0.188945	0.189491	0.188155	0.188469	0.189702	0.190993	0.191613	0.195509
38.0	0.188974	0.188270	0.189772	0.191288	0.192193	0.196155	0.199103	0.202109	0.205038	0.206936
38.5	0.191241	0.192103	0.192969	0.195396	0.195774	0.200427	0.204764	0.208283	0.213162	0.217528

H	Year									
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
39.0	0.195168	0.197412	0.197250	0.199258	0.202201	0.204015	0.207429	0.212085	0.216269	0.223345
39.5	0.197192	0.200686	0.202428	0.204531	0.207639	0.210490	0.215249	0.222915	0.227809	0.237141
40.0	0.198042	0.201638	0.206740	0.208886	0.212287	0.218068	0.222385	0.229063	0.236187	0.246130
40.5	0.202801	0.205611	0.208123	0.212109	0.218471	0.224528	0.229796	0.238253	0.245050	0.254618
41.0	0.204426	0.208760	0.213869	0.220124	0.223693	0.229760	0.238873	0.247439	0.258664	0.275225
41.5	0.208572	0.213601	0.217452	0.225875	0.231742	0.239813	0.250870	0.261114	0.274966	0.293035
42.0	0.209465	0.214060	0.218992	0.223841	0.233611	0.242643	0.254619	0.264739	0.280225	0.301228
42.5	0.213316	0.219198	0.225853	0.235093	0.242176	0.253269	0.267410	0.284674	0.304226	0.330438
43.0	0.214861	0.220616	0.227698	0.233628	0.242795	0.256614	0.270673	0.285227	0.306308	0.332147
43.5	0.219736	0.225504	0.232944	0.241871	0.254827	0.266710	0.281564	0.304714	0.333368	0.373620
44.0	0.221282	0.227418	0.236254	0.247187	0.258747	0.273592	0.294641	0.317356	0.348395	0.390069
44.5	0.223124	0.230714	0.240291	0.250584	0.266934	0.284545	0.305535	0.334922	0.373763	0.442389
45.0	0.225921	0.235377	0.245949	0.259258	0.277423	0.299230	0.325743	0.359439	0.406761	0.483036
45.5	0.227210	0.236983	0.247916	0.260275	0.280507	0.302969	0.326133	0.363938	0.421844	0.512273
46.0	0.230681	0.241540	0.252855	0.267644	0.285469	0.309783	0.342514	0.387730	0.438607	0.546540
46.5	0.229959	0.240630	0.253639	0.271019	0.291105	0.316087	0.352055	0.404604	0.475287	0.593745
47.0	0.235101	0.246603	0.259951	0.279114	0.298058	0.327640	0.365776	0.418555	0.513289	0.672296
47.5	0.239382	0.251476	0.266175	0.285019	0.312651	0.344118	0.389243	0.457831	0.576932	0.814017
48.0	0.239536	0.252676	0.267347	0.286361	0.310022	0.343154	0.390887	0.467964	0.585573	0.833253
48.5	0.240463	0.253281	0.271778	0.295168	0.323345	0.363350	0.416290	0.501050	0.657066	NA*
49.0	0.243505	0.260084	0.277435	0.302237	0.329877	0.373538	0.435037	0.543434	0.767591	NA*
49.5	0.244697	0.261044	0.279734	0.306213	0.339887	0.389310	0.459070	0.582976	0.838965	NA*
50.0	0.252278	0.269906	0.292609	0.319501	0.354858	0.410153	0.488358	0.635064	0.965122	NA*

*Catch would exceed available biomass, and harvest rate is therefore undefined.

Table A4-G. Instantaneous fishing mortality (F) for bottomfish management unit species in Guam. Results are presented through ten years of rebuilding (2022-2031). The F shown is for the end of each fishing year, so the F in the column for calendar year 2022 would be the F after one year of implementation of the rebuilding plan. F in 2031 would be the F at 10 years, or T_{MAX}.

F	Year									
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
0.5	0.002502	0.002095	0.001801	0.001594	0.001444	0.001335	0.001244	0.001195	0.001148	0.001116
1.0	0.005024	0.004192	0.003620	0.003218	0.002904	0.002685	0.002515	0.002387	0.002316	0.002251
1.5	0.007473	0.006278	0.005409	0.004788	0.004348	0.004030	0.003778	0.003610	0.003462	0.003369
2.0	0.010061	0.008409	0.007309	0.006468	0.005842	0.005404	0.005078	0.004850	0.004683	0.004563
2.5	0.012429	0.010553	0.009059	0.008088	0.007356	0.006770	0.006384	0.006077	0.005851	0.005700
3.0	0.014982	0.012679	0.011088	0.009813	0.008896	0.008209	0.007684	0.007318	0.007108	0.006851
3.5	0.017712	0.014814	0.012947	0.011447	0.010349	0.009634	0.009051	0.008688	0.008345	0.008113
4.0	0.020342	0.017126	0.014794	0.013130	0.011995	0.011174	0.010488	0.009909	0.009597	0.009291
4.5	0.022622	0.019222	0.016753	0.014944	0.013616	0.012543	0.011864	0.011253	0.010826	0.010504
5.0	0.025518	0.021583	0.018898	0.016812	0.015179	0.014053	0.013253	0.012624	0.012180	0.011750
5.5	0.027802	0.023747	0.020811	0.018685	0.016793	0.015699	0.014707	0.014017	0.013435	0.013034
6.0	0.030345	0.026086	0.022936	0.020376	0.018586	0.017054	0.016087	0.015266	0.014833	0.014414
6.5	0.033127	0.028480	0.024870	0.021978	0.020031	0.018509	0.017539	0.016861	0.016183	0.015605
7.0	0.035493	0.030990	0.026912	0.024021	0.021835	0.020298	0.019035	0.018182	0.017417	0.017035
7.5	0.038352	0.032986	0.028703	0.025666	0.023365	0.021754	0.020468	0.019652	0.018994	0.018317
8.0	0.041075	0.035388	0.030841	0.027532	0.025450	0.023627	0.022181	0.021047	0.020342	0.019644
8.5	0.042952	0.037426	0.032620	0.029630	0.026991	0.024893	0.023451	0.022309	0.021465	0.021015
9.0	0.046062	0.039976	0.035308	0.031735	0.028974	0.026946	0.025506	0.024127	0.023209	0.022445
9.5	0.048659	0.042092	0.037418	0.033377	0.030637	0.028596	0.026608	0.025588	0.024406	0.023829
10.0	0.051603	0.044686	0.039816	0.035855	0.032896	0.030516	0.028475	0.027125	0.026208	0.025365
10.5	0.053520	0.046958	0.041518	0.037123	0.034116	0.031593	0.029843	0.028503	0.027306	0.026492
11.0	0.056250	0.049429	0.043646	0.039552	0.036179	0.033644	0.031354	0.030211	0.029311	0.028308
11.5	0.058638	0.051423	0.045878	0.041659	0.038097	0.035367	0.033522	0.032148	0.030799	0.029764

F	Year									
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
12.0	0.062161	0.053892	0.048291	0.043407	0.039779	0.036798	0.035203	0.033417	0.032149	0.031070
12.5	0.065094	0.056719	0.050650	0.045871	0.041945	0.038939	0.037109	0.035421	0.033871	0.032862
13.0	0.067525	0.059213	0.053262	0.048324	0.044463	0.041118	0.038920	0.037108	0.035689	0.034616
13.5	0.069271	0.061196	0.055257	0.050031	0.046052	0.043195	0.040781	0.038733	0.037377	0.036204
14.0	0.072124	0.063465	0.057003	0.051614	0.047695	0.044810	0.042319	0.040054	0.038982	0.037881
14.5	0.075062	0.067200	0.060433	0.054681	0.050577	0.046930	0.044278	0.042362	0.040678	0.039509
15.0	0.078130	0.069186	0.061921	0.055964	0.051891	0.048477	0.046069	0.043768	0.042451	0.041150
15.5	0.079860	0.071344	0.064431	0.059288	0.054838	0.050926	0.048098	0.045836	0.044252	0.043061
16.0	0.083290	0.073876	0.067182	0.061294	0.056897	0.053097	0.050246	0.047955	0.046466	0.045138
16.5	0.085399	0.076168	0.068893	0.062906	0.058432	0.054867	0.051832	0.049489	0.048015	0.046373
17.0	0.088911	0.080081	0.072564	0.066422	0.061692	0.057493	0.054710	0.052155	0.049918	0.048402
17.5	0.090954	0.082285	0.074821	0.067968	0.063195	0.059457	0.056745	0.053841	0.052030	0.050538
18.0	0.094586	0.085073	0.077603	0.071111	0.065844	0.062218	0.058557	0.056167	0.054410	0.052902
18.5	0.096735	0.087435	0.080302	0.073825	0.068713	0.064312	0.061206	0.058045	0.056254	0.054444
19.0	0.099292	0.090266	0.082821	0.075805	0.070226	0.066478	0.063033	0.060130	0.058099	0.056175
19.5	0.102268	0.093505	0.085470	0.078873	0.073247	0.069100	0.065789	0.062930	0.060498	0.058310
20.0	0.104346	0.095947	0.088770	0.081564	0.076959	0.072173	0.068266	0.065462	0.063327	0.061086
20.5	0.107616	0.097790	0.089776	0.082807	0.077756	0.073760	0.070014	0.067297	0.064543	0.062801
21.0	0.110937	0.101068	0.093321	0.087004	0.080769	0.077010	0.072486	0.068657	0.066655	0.065528
21.5	0.114102	0.104140	0.096112	0.088990	0.084396	0.078872	0.075772	0.072639	0.070496	0.067914
22.0	0.116683	0.107943	0.099376	0.093114	0.086934	0.081775	0.077810	0.074669	0.072446	0.069773
22.5	0.120138	0.110268	0.102110	0.094861	0.088913	0.084302	0.080557	0.077342	0.075257	0.073241
23.0	0.123255	0.113469	0.104859	0.097515	0.091667	0.086959	0.083071	0.080137	0.077330	0.075464
23.5	0.124494	0.116333	0.108552	0.101115	0.095524	0.090921	0.086988	0.083120	0.080971	0.077811
24.0	0.127465	0.119126	0.110618	0.104331	0.099059	0.094053	0.089314	0.086184	0.083585	0.080521
24.5	0.130087	0.120929	0.112287	0.106458	0.099402	0.094567	0.090099	0.086334	0.084378	0.081886
25.0	0.132530	0.123820	0.114431	0.107312	0.102586	0.097122	0.092727	0.090177	0.087336	0.085126

F	Year									
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
25.5	0.134610	0.126125	0.119159	0.112249	0.107042	0.102144	0.097728	0.094882	0.091420	0.089292
26.0	0.139174	0.130844	0.122785	0.116195	0.111296	0.105907	0.101145	0.097727	0.094975	0.091935
26.5	0.143172	0.134976	0.127327	0.119409	0.115516	0.108591	0.103327	0.100630	0.097602	0.095159
27.0	0.146410	0.137187	0.130374	0.122766	0.118672	0.112954	0.107822	0.104173	0.100683	0.097781
27.5	0.149603	0.140226	0.131783	0.125936	0.119833	0.114525	0.110559	0.107437	0.104121	0.101440
28.0	0.149709	0.141695	0.134483	0.128893	0.122943	0.118008	0.114647	0.111299	0.108809	0.105748
28.5	0.154333	0.148108	0.139891	0.134037	0.127787	0.122579	0.119022	0.114763	0.111341	0.108885
29.0	0.154343	0.146214	0.141069	0.133239	0.127138	0.123260	0.119205	0.115168	0.112439	0.109926
29.5	0.159166	0.152071	0.145523	0.140148	0.134596	0.129014	0.125261	0.122670	0.119037	0.116712
30.0	0.163664	0.155660	0.147948	0.143144	0.138132	0.133344	0.130522	0.127226	0.124731	0.122178
30.5	0.165552	0.158771	0.152952	0.146258	0.141317	0.137465	0.133491	0.130849	0.127910	0.125320
31.0	0.168628	0.161831	0.157368	0.151735	0.147234	0.141711	0.137806	0.134307	0.133435	0.132324
31.5	0.172915	0.165630	0.161614	0.156873	0.152500	0.148863	0.145031	0.141506	0.139675	0.136708
32.0	0.174422	0.169025	0.165218	0.160601	0.155093	0.151748	0.148065	0.144869	0.142807	0.140209
32.5	0.176990	0.171441	0.168546	0.162338	0.157698	0.156408	0.152328	0.149411	0.147064	0.143888
33.0	0.179010	0.175552	0.171729	0.167343	0.162508	0.159599	0.156060	0.155133	0.153110	0.151997
33.5	0.182202	0.177242	0.172616	0.170351	0.166210	0.162876	0.159727	0.157875	0.155575	0.153535
34.0	0.187568	0.182867	0.178241	0.175471	0.172696	0.170561	0.168284	0.167061	0.163726	0.162774
34.5	0.186627	0.183559	0.179630	0.176183	0.173534	0.171635	0.170072	0.168729	0.169442	0.166422
35.0	0.187340	0.186029	0.182803	0.179868	0.177377	0.175946	0.174864	0.174986	0.175413	0.173463
35.5	0.194111	0.192376	0.189697	0.185842	0.184805	0.184363	0.182676	0.181497	0.181592	0.178746
36.0	0.197826	0.195315	0.192740	0.193727	0.191276	0.189050	0.190152	0.189604	0.187738	0.187501
36.5	0.199117	0.197219	0.198076	0.197463	0.195868	0.196089	0.196234	0.196637	0.199190	0.201483
37.0	0.204034	0.202958	0.200644	0.201055	0.201515	0.200844	0.202773	0.202810	0.203967	0.204056
37.5	0.208344	0.208992	0.209419	0.210093	0.208445	0.208833	0.210354	0.211948	0.212715	0.217545
38.0	0.209455	0.208587	0.210440	0.212312	0.213432	0.218348	0.222023	0.225783	0.229461	0.231852
38.5	0.212255	0.213320	0.214394	0.217405	0.217875	0.223677	0.229116	0.233551	0.239733	0.245297

F	Year									
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
39.0	0.217122	0.219914	0.219712	0.222217	0.225899	0.228174	0.232473	0.238366	0.243690	0.252760
39.5	0.219640	0.224002	0.226183	0.228823	0.232738	0.236342	0.242389	0.252206	0.258523	0.270682
40.0	0.220699	0.225194	0.231605	0.234314	0.238622	0.245988	0.251524	0.260148	0.269432	0.282535
40.5	0.226651	0.230182	0.233349	0.238396	0.246504	0.254284	0.261100	0.272141	0.281104	0.293859
41.0	0.228691	0.234153	0.240632	0.248620	0.253208	0.261053	0.272955	0.284273	0.299302	0.321894
41.5	0.233916	0.240290	0.245200	0.256022	0.263630	0.274191	0.288843	0.302611	0.321537	0.346774
42.0	0.235046	0.240875	0.247169	0.253397	0.266066	0.277920	0.293859	0.307530	0.328816	0.358430
42.5	0.239928	0.247434	0.255994	0.268002	0.277305	0.292050	0.311169	0.335017	0.362730	0.401131
43.0	0.241894	0.249251	0.258379	0.266087	0.278121	0.296541	0.315633	0.335791	0.365727	0.403687
43.5	0.248123	0.255543	0.265196	0.276902	0.294139	0.310214	0.330679	0.363433	0.405517	0.467798
44.0	0.250107	0.258017	0.269520	0.283939	0.299413	0.319644	0.349048	0.381781	0.428317	0.494409
44.5	0.252474	0.262292	0.274820	0.288461	0.310519	0.334837	0.364614	0.407851	0.468026	0.584094
45.0	0.256081	0.268372	0.282296	0.300103	0.324932	0.355575	0.394145	0.445411	0.522157	0.659783
45.5	0.257748	0.270475	0.284908	0.301477	0.329209	0.360925	0.394722	0.452460	0.547911	0.717999
46.0	0.262250	0.276465	0.291496	0.311489	0.336129	0.370749	0.419332	0.490582	0.577333	0.790848
46.5	0.261311	0.275267	0.292545	0.316107	0.344048	0.379924	0.433950	0.518528	0.644904	0.900773
47.0	0.268011	0.283164	0.301039	0.327275	0.353905	0.396962	0.455353	0.542240	0.720085	1.115644
47.5	0.273624	0.289653	0.309484	0.335499	0.374912	0.421774	0.493057	0.612178	0.860222	1.682102
48.0	0.273827	0.291257	0.311083	0.337377	0.371096	0.420306	0.495751	0.631044	0.880859	1.791279
48.5	0.275047	0.292066	0.317149	0.349795	0.390593	0.451536	0.538352	0.695249	1.070216	NA*
49.0	0.279059	0.301218	0.324948	0.359876	0.400295	0.467667	0.570996	0.784022	1.459258	NA*
49.5	0.280636	0.302517	0.328134	0.365590	0.415344	0.493165	0.614465	0.874612	1.826134	NA*
50.0	0.290724	0.314582	0.346172	0.384929	0.438285	0.527892	0.670131	1.008034	3.355901	NA*

*Catch would exceed available biomass

Table A5-G. Probability of exceeding the overfishing limit (pOFL) at various catch levels for bottomfish management unit species in Guam. Results are presented through ten years of rebuilding (2022-2031). The pOFL shown is through the end of each fishing year, so the pOFL in the column for calendar year 2022 would be the pOFL after the first year of the rebuilding plan. The pOFL in 2031 would be the pOFL through 10 years of fishing, or T_{MAX}.

pOFL	**Year**									
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
1.0	0.039000	0.033778	0.030333	0.027111	0.024889	0.022556	0.020778	0.019778	0.018333	0.018000
1.5	0.050889	0.043556	0.037556	0.033778	0.030333	0.028667	0.026889	0.025444	0.023444	0.021444
2.0	0.062111	0.052667	0.046889	0.041000	0.036556	0.032000	0.029111	0.027333	0.026333	0.024667
2.5	0.075111	0.061333	0.053667	0.050444	0.044778	0.039000	0.037333	0.033333	0.031222	0.030556
3.0	0.085444	0.073556	0.064889	0.057889	0.051667	0.047222	0.041333	0.040111	0.037667	0.035444
3.5	0.097111	0.079444	0.068222	0.060889	0.054333	0.048000	0.044333	0.041556	0.039222	0.036667
4.0	0.108556	0.091111	0.078667	0.068222	0.060111	0.054667	0.049889	0.046667	0.043556	0.041000
4.5	0.118667	0.097333	0.082889	0.074000	0.064778	0.059222	0.054222	0.049222	0.045444	0.043778
5.0	0.121444	0.102556	0.091222	0.079333	0.072111	0.064778	0.058889	0.054444	0.050556	0.048333
5.5	0.129222	0.110556	0.094778	0.083222	0.074222	0.068111	0.063000	0.057889	0.054889	0.052111
6.0	0.145111	0.121222	0.104778	0.092667	0.084000	0.076778	0.070556	0.066111	0.062333	0.057111
6.5	0.153222	0.130444	0.112667	0.100778	0.088778	0.079778	0.074667	0.070333	0.063222	0.060444
7.0	0.157444	0.132778	0.116778	0.102444	0.093444	0.085333	0.079111	0.073222	0.069333	0.065000
7.5	0.166222	0.142000	0.124444	0.111667	0.099333	0.088667	0.080111	0.075889	0.068333	0.064444
8.0	0.179222	0.149556	0.131333	0.117333	0.104778	0.097000	0.089556	0.083556	0.077556	0.073667
8.5	0.180889	0.152556	0.133444	0.118889	0.105333	0.096222	0.091222	0.084667	0.080889	0.076333
9.0	0.186556	0.161444	0.143556	0.127444	0.113778	0.104444	0.094667	0.089667	0.083222	0.079778
9.5	0.197222	0.167333	0.143000	0.131333	0.119222	0.111889	0.102556	0.096667	0.092111	0.087444
10.0	0.215333	0.184333	0.164889	0.146556	0.135000	0.123889	0.113333	0.105222	0.098556	0.094000
10.5	0.205000	0.179444	0.155889	0.136889	0.125111	0.116778	0.110778	0.101667	0.096111	0.090556
11.0	0.219667	0.190000	0.165111	0.149444	0.133778	0.126222	0.118333	0.113000	0.105444	0.100889
11.5	0.224222	0.197778	0.175111	0.156333	0.141222	0.132111	0.123000	0.117000	0.110111	0.104778

pOFL	Year									
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
12.0	0.229000	0.195333	0.178000	0.161556	0.145778	0.134667	0.125333	0.118000	0.113444	0.109444
12.5	0.233444	0.205444	0.184556	0.164444	0.153333	0.146444	0.133667	0.127222	0.119889	0.115333
13.0	0.246222	0.212889	0.192333	0.173889	0.159889	0.149556	0.139556	0.130556	0.123333	0.118556
13.5	0.245667	0.219889	0.197333	0.175889	0.162556	0.153667	0.142667	0.137444	0.130667	0.124333
14.0	0.252111	0.223333	0.200778	0.185222	0.167667	0.158667	0.149333	0.141889	0.136667	0.131667
14.5	0.267111	0.235889	0.212000	0.195000	0.178111	0.166111	0.157889	0.147889	0.141889	0.137556
15.0	0.269444	0.242889	0.219778	0.200222	0.185222	0.173000	0.163111	0.155222	0.146667	0.140889
15.5	0.279667	0.245000	0.223444	0.204667	0.188778	0.175778	0.164000	0.157000	0.150667	0.147556
16.0	0.286778	0.257444	0.229667	0.211222	0.194556	0.182000	0.171778	0.164000	0.157889	0.152667
16.5	0.286444	0.256667	0.238444	0.218667	0.204000	0.189333	0.179444	0.171111	0.165000	0.158889
17.0	0.287333	0.259333	0.239111	0.221778	0.204889	0.194889	0.183556	0.175000	0.167222	0.162333
17.5	0.304444	0.273000	0.252111	0.234556	0.216889	0.204778	0.196667	0.189111	0.180000	0.175222
18.0	0.301333	0.272556	0.247778	0.231444	0.218222	0.206222	0.196111	0.187667	0.182000	0.175667
18.5	0.312444	0.283889	0.260444	0.244333	0.228667	0.217333	0.204778	0.195667	0.189444	0.185333
19.0	0.317889	0.290889	0.263556	0.247333	0.234111	0.220889	0.213444	0.206111	0.198444	0.191889
19.5	0.323333	0.291556	0.273000	0.254889	0.238889	0.229222	0.216444	0.206333	0.195667	0.190000
20.0	0.332222	0.300333	0.279333	0.261333	0.246667	0.235778	0.224000	0.217889	0.208444	0.203222
20.5	0.331333	0.305444	0.285222	0.268778	0.256222	0.243000	0.234222	0.224333	0.217667	0.213444
21.0	0.342444	0.315111	0.294000	0.275778	0.262667	0.251333	0.239444	0.231889	0.223000	0.216778
21.5	0.348556	0.320889	0.297667	0.282889	0.269556	0.254333	0.246000	0.235444	0.228000	0.223222
22.0	0.348778	0.323889	0.304667	0.287111	0.270667	0.260556	0.252889	0.242222	0.236667	0.231444
22.5	0.356111	0.332111	0.307222	0.290000	0.277556	0.267222	0.255667	0.248111	0.237889	0.230889
23.0	0.365000	0.338111	0.318889	0.301222	0.289444	0.278667	0.266444	0.262111	0.254333	0.249111
23.5	0.369222	0.344000	0.324222	0.307333	0.295444	0.283333	0.272444	0.264556	0.257000	0.251111
24.0	0.372556	0.351556	0.332111	0.317556	0.302889	0.292556	0.284222	0.275333	0.268667	0.263556
24.5	0.376778	0.352000	0.331000	0.316000	0.305222	0.294556	0.285778	0.278444	0.272889	0.268889

pOFL	Year									
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
25.0	0.384889	0.361333	0.339778	0.326111	0.313667	0.305000	0.298778	0.290111	0.282667	0.276778
25.5	0.387556	0.362556	0.345778	0.334333	0.320667	0.309889	0.298778	0.290222	0.286556	0.280778
26.0	0.397667	0.376667	0.359333	0.343000	0.328000	0.319000	0.310444	0.300556	0.294778	0.291889
26.5	0.403111	0.383444	0.372444	0.355444	0.346000	0.334222	0.323333	0.316444	0.310000	0.303333
27.0	0.408222	0.388444	0.370111	0.362222	0.348667	0.340556	0.330778	0.322889	0.316889	0.313111
27.5	0.417222	0.396000	0.379556	0.367000	0.352444	0.342778	0.339222	0.330556	0.326000	0.322556
28.0	0.418444	0.397000	0.387000	0.370667	0.360333	0.352778	0.341667	0.339333	0.337444	0.334111
28.5	0.433111	0.414667	0.397222	0.380111	0.370444	0.363333	0.356333	0.350667	0.346000	0.342889
29.0	0.431222	0.408556	0.394111	0.377889	0.368667	0.360333	0.353778	0.347333	0.341333	0.340556
29.5	0.441444	0.422111	0.411667	0.396889	0.390556	0.381889	0.374222	0.368667	0.364556	0.361000
30.0	0.450556	0.428778	0.415778	0.407667	0.397333	0.387000	0.380222	0.378111	0.374889	0.368889
30.5	0.455556	0.439111	0.429889	0.415778	0.406778	0.399000	0.393778	0.385111	0.382667	0.379333
31.0	0.461000	0.444778	0.436444	0.424333	0.415778	0.410556	0.408556	0.402222	0.401222	0.397333
31.5	0.472444	0.452889	0.445111	0.439889	0.432333	0.424333	0.419222	0.412222	0.409889	0.405667
32.0	0.473444	0.460333	0.453444	0.447889	0.437111	0.431444	0.426556	0.422000	0.418778	0.416222
32.5	0.486333	0.472333	0.462778	0.448444	0.440889	0.437333	0.435111	0.429111	0.424000	0.423000
33.0	0.486111	0.479222	0.469889	0.463333	0.452556	0.449000	0.444778	0.444778	0.445667	0.439444
33.5	0.496556	0.482889	0.470000	0.464222	0.457111	0.455111	0.450889	0.446000	0.446000	0.443889
34.0	0.510667	0.496889	0.484778	0.476000	0.471333	0.468667	0.468333	0.468222	0.458556	0.460444
34.5	0.502111	0.493778	0.485333	0.475778	0.474667	0.474778	0.471889	0.470222	0.471222	0.470000
35.0	0.510667	0.504667	0.496000	0.494444	0.484778	0.484444	0.480667	0.481778	0.483556	0.480778
35.5	0.523889	0.517222	0.514444	0.505889	0.503222	0.501222	0.496111	0.495778	0.496778	0.492556
36.0	0.536444	0.525444	0.521556	0.518667	0.513222	0.513778	0.509889	0.506778	0.507889	0.506667
36.5	0.538222	0.532444	0.526333	0.526778	0.523000	0.519889	0.521333	0.521667	0.523889	0.525889
37.0	0.549556	0.543889	0.535444	0.534333	0.534222	0.527444	0.530556	0.529889	0.530000	0.530556
37.5	0.560778	0.553111	0.549444	0.551222	0.546889	0.545222	0.547444	0.546444	0.544556	0.545556

pOFL	Year									
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
38.0	0.556444	0.554222	0.551444	0.552333	0.558333	0.558778	0.559778	0.561000	0.562556	0.568222
38.5	0.572222	0.569111	0.563667	0.562778	0.566000	0.567889	0.569333	0.574667	0.577444	0.579000
39.0	0.581111	0.579667	0.573556	0.576222	0.575889	0.576000	0.579778	0.579667	0.582333	0.584333
39.5	0.587222	0.588889	0.585778	0.584444	0.584111	0.586111	0.590667	0.593222	0.596556	0.600889
40.0	0.592556	0.588889	0.595111	0.596889	0.597333	0.601667	0.601778	0.607222	0.605444	0.612667
40.5	0.600778	0.595111	0.595111	0.604444	0.603889	0.605778	0.610667	0.614667	0.620556	0.621222
41.0	0.606222	0.609111	0.607889	0.609222	0.612889	0.615444	0.618111	0.624556	0.633444	0.638111
41.5	0.615444	0.617556	0.616333	0.623111	0.625333	0.630667	0.638000	0.639556	0.647444	0.649889
42.0	0.617222	0.619667	0.628000	0.633778	0.636444	0.641222	0.649111	0.651222	0.656000	0.660333
42.5	0.626889	0.631111	0.634778	0.641667	0.645556	0.653222	0.657111	0.663333	0.667889	0.672556
43.0	0.635778	0.637111	0.645111	0.649111	0.653667	0.659444	0.666556	0.668778	0.677889	0.684667
43.5	0.640111	0.656111	0.655111	0.660333	0.669667	0.675889	0.681556	0.686889	0.694111	0.701444
44.0	0.646667	0.649111	0.659000	0.667444	0.677889	0.686667	0.691889	0.699889	0.705000	0.706444
44.5	0.654222	0.657333	0.667333	0.675556	0.681000	0.686667	0.693889	0.702111	0.707889	0.719333
45.0	0.669667	0.675889	0.683778	0.691667	0.698889	0.708889	0.717222	0.725556	0.729778	0.735556
45.5	0.666667	0.674111	0.682889	0.692556	0.702000	0.711444	0.720333	0.726889	0.738222	0.742444
46.0	0.671444	0.685000	0.695000	0.703111	0.711333	0.719667	0.730222	0.734889	0.741667	0.750556
46.5	0.677333	0.684778	0.702111	0.715222	0.721889	0.726556	0.735556	0.748556	0.756667	0.764000
47.0	0.682111	0.696889	0.707111	0.715333	0.730556	0.736667	0.743889	0.752222	0.758111	0.767333
47.5	0.696889	0.705000	0.716667	0.726222	0.736778	0.749111	0.754444	0.767000	0.775333	0.782333
48.0	0.701556	0.712444	0.718333	0.738000	0.744889	0.754333	0.761000	0.769333	0.783222	0.792111
48.5	0.701556	0.714889	0.730778	0.743222	0.754000	0.763222	0.772222	0.781444	0.789444	0.799000
49.0	0.702889	0.721556	0.737556	0.746444	0.763778	0.771222	0.781333	0.788556	0.794667	0.804000
49.5	0.714222	0.726111	0.742667	0.753778	0.767222	0.778111	0.794444	0.801667	0.809111	0.814556
50.0	0.726778	0.742333	0.758000	0.767778	0.780444	0.791333	0.798556	0.806111	0.816778	0.822111

Table A1-AS. Probability that the biomass (B) of bottomfish management unit species in American Samoa is greater than or equal to biomass at maximum sustainable yield (B_{MSY}). A stock is considered to be rebuilt with the probability reaches 0.50. Results are presented through ten years of potential rebuilding (2022-2032), which corresponds to T_{MAX}. The probability shown is for the beginning of each fishing year, so the probability in 2022 would be the probability that $B \geq B_{MSY}$ prior to implementation of the rebuilding plan. Probability in 2032 would be at 10 years of rebuilding, or T_{MAX}.

Prob. B ≥ B_{MSY}	**Year**										
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
1.0	0.155333	0.204333	0.255667	0.302556	0.353222	0.397889	0.442556	0.479889	0.511111	0.540556	0.576889
1.5	0.157111	0.207778	0.256333	0.301111	0.349222	0.388556	0.433333	0.469667	0.502667	0.533556	0.560889
2.0	0.153667	0.206667	0.257000	0.299000	0.347444	0.389000	0.428778	0.462444	0.493556	0.525000	0.552778
2.5	0.152222	0.205333	0.248778	0.293889	0.343667	0.387111	0.426778	0.461556	0.494222	0.524778	0.547111
3.0	0.156222	0.203111	0.247556	0.290556	0.339667	0.378889	0.413222	0.452667	0.481778	0.514889	0.537333
3.5	0.154667	0.202556	0.251111	0.292444	0.336556	0.380667	0.413889	0.444778	0.476222	0.503667	0.525889
4.0	0.152000	0.199444	0.243333	0.286778	0.330111	0.370333	0.406000	0.443222	0.473333	0.495222	0.526222
4.5	0.155333	0.198667	0.239889	0.279667	0.322111	0.362222	0.396778	0.428111	0.459556	0.484222	0.510667
5.0	0.159222	0.198889	0.245778	0.288222	0.330000	0.369000	0.398222	0.430556	0.462000	0.485778	0.508333
5.5	0.155667	0.197333	0.238444	0.282778	0.314778	0.352111	0.384556	0.416444	0.444222	0.472111	0.494444
6.0	0.157222	0.202333	0.245333	0.285556	0.322778	0.353111	0.390556	0.420222	0.441000	0.467111	0.491333
6.5	0.159444	0.203667	0.245667	0.282333	0.320111	0.353000	0.383889	0.415000	0.440333	0.466778	0.488444
7.0	0.156444	0.196444	0.241000	0.279667	0.306333	0.341222	0.376333	0.406556	0.430556	0.454000	0.477222
7.5	0.160222	0.197333	0.235000	0.273667	0.306667	0.342111	0.371444	0.400222	0.422333	0.448111	0.466000
8.0	0.158111	0.197000	0.236333	0.269333	0.302000	0.332444	0.362333	0.390111	0.411000	0.437556	0.457333
8.5	0.156667	0.194556	0.233333	0.266778	0.296000	0.330889	0.358889	0.385222	0.410222	0.428444	0.447667
9.0	0.158000	0.194889	0.231444	0.266000	0.298222	0.331444	0.361000	0.382222	0.403889	0.426222	0.447000
9.5	0.153889	0.190778	0.225000	0.258556	0.292111	0.318556	0.341333	0.364778	0.388000	0.409556	0.428222
10.0	0.155111	0.192889	0.223778	0.250778	0.282444	0.308222	0.336778	0.360444	0.382222	0.405111	0.420000
10.5	0.157667	0.190889	0.222333	0.254556	0.284556	0.309667	0.337111	0.358556	0.381111	0.400111	0.415667
11.0	0.155444	0.188333	0.218444	0.250667	0.279889	0.305000	0.329667	0.350222	0.370556	0.391111	0.406222

Prob. B ≥ B_{MSY}	Year										
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
11.5	0.155444	0.186444	0.220444	0.252222	0.280889	0.306222	0.327000	0.351556	0.369667	0.384444	0.399333
12.0	0.161111	0.193333	0.225444	0.256556	0.281333	0.302333	0.327222	0.348667	0.365222	0.383111	0.399778
12.5	0.154333	0.190000	0.220778	0.244000	0.268778	0.288778	0.313667	0.333000	0.349889	0.366778	0.380222
13.0	0.162333	0.191778	0.218111	0.244889	0.273889	0.295111	0.312000	0.327889	0.342444	0.360333	0.374889
13.5	0.157667	0.185111	0.213333	0.245778	0.268111	0.287556	0.312000	0.330556	0.348444	0.364889	0.377000
14.0	0.157667	0.183333	0.209556	0.234333	0.252556	0.273111	0.293778	0.309778	0.320667	0.332444	0.347000
14.5	0.155111	0.181667	0.209889	0.230222	0.252889	0.272222	0.290667	0.307000	0.319778	0.337333	0.351444
15.0	0.159111	0.186556	0.210556	0.232111	0.251889	0.270667	0.291222	0.305111	0.317778	0.334556	0.345778

Table A2-AS. Biomass of bottomfish management unit species in American Samoa through ten years of rebuilding (2022-2032). Biomass is presented in 1,000 lb increments. Biomass shown is the estimated biomass and the beginning of each fishing year, so the biomass in 2022 would be the biomass prior to implementation of the rebuilding plan. Biomass in 2032 would be the biomass after 10 years of rebuilding, or T_{MAX}.

Biomass (1,000 lb)	**Year**										
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
1.0	114.387	129.816	148.919	167.477	189.877	210.835	234.082	257.598	276.639	297.323	319.013
1.5	115.604	130.216	148.060	166.477	184.486	206.081	227.923	250.987	271.390	292.720	308.765
2.0	115.724	129.315	145.270	165.080	181.374	203.133	225.212	245.539	265.689	286.074	304.411
2.5	114.305	129.622	146.498	162.316	181.358	202.846	225.015	244.210	266.353	285.085	302.789
3.0	115.849	130.317	145.086	161.270	181.055	200.454	218.807	239.840	257.326	279.411	294.479
3.5	114.856	127.967	143.280	159.991	177.859	197.705	217.117	234.949	253.915	272.828	287.026
4.0	115.532	128.595	141.718	158.079	173.934	192.222	212.483	233.327	253.167	266.457	285.705
4.5	114.272	126.931	141.844	154.623	169.320	188.531	207.064	226.862	242.085	258.688	277.005
5.0	114.586	127.742	141.239	156.456	172.081	188.065	205.998	223.915	244.437	259.648	275.733
5.5	113.418	124.467	135.978	150.953	165.339	180.368	197.487	214.569	231.915	249.298	265.789
6.0	117.152	128.159	140.076	152.582	167.225	183.284	201.883	215.593	230.124	246.861	263.733
6.5	115.630	125.106	139.369	151.848	165.437	180.232	195.689	212.197	226.730	244.802	261.797
7.0	116.422	126.852	138.328	150.688	164.555	178.283	192.622	209.694	225.347	238.377	255.660
7.5	114.673	123.323	133.728	146.872	157.497	171.657	185.047	200.705	213.607	232.464	243.964
8.0	115.247	125.009	134.350	145.406	157.668	169.081	182.736	196.545	208.663	224.646	238.139
8.5	114.294	123.015	133.161	143.536	157.309	167.896	180.772	193.264	206.869	221.214	231.870
9.0	115.972	124.242	132.978	142.514	153.205	163.697	179.083	192.537	201.684	215.303	226.194
9.5	113.474	121.891	129.794	138.643	148.292	156.526	168.428	178.618	192.062	203.180	216.565
10.0	115.069	121.633	128.597	136.927	145.660	155.372	165.666	180.261	191.871	201.504	210.487
10.5	112.814	119.787	126.061	133.424	141.971	150.443	161.465	171.703	182.590	194.261	203.165
11.0	114.500	121.582	127.706	133.977	141.599	149.883	158.768	167.247	174.749	185.382	194.872
11.5	114.532	119.811	126.136	134.454	140.691	148.509	156.530	164.923	173.158	180.330	189.093

Biomass (1,000 lb)	Year										
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
12.0	114.620	119.579	125.422	131.355	139.583	148.460	155.225	163.611	170.471	180.609	187.986
12.5	113.045	117.879	121.962	127.761	132.468	136.571	142.566	149.413	156.112	161.261	169.264
13.0	115.371	119.649	122.534	126.424	130.517	134.443	140.704	145.762	151.292	159.971	165.710
13.5	117.327	120.766	124.362	129.366	133.549	138.410	145.925	152.420	157.045	166.219	172.817
14.0	111.902	115.111	116.953	119.590	122.463	126.381	128.115	132.724	138.073	141.913	148.628
14.5	112.476	115.243	116.886	121.203	122.719	127.280	129.565	131.124	134.405	137.637	143.811
15.0	114.469	114.816	116.102	119.139	121.798	124.714	126.811	127.074	129.598	134.031	136.006

Table A3-AS. Harvest rate (H) for bottomfish management unit species in American Samoa. Results are presented through ten years of rebuilding (2022-2031). The H shown is for the end of each fishing year, so the H in the column for calendar year 2022 would be the H after one year of implementation of the rebuilding plan. H in 2031 would be the H at 10 years, or T_{MAX}.

H	Year

Annual Catch (1,000 lb)	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
1.0	0.008742	0.007703	0.006715	0.005971	0.005267	0.004743	0.004272	0.003882	0.003615	0.003363
1.5	0.012975	0.011519	0.010131	0.009010	0.008131	0.007279	0.006581	0.005976	0.005527	0.005124
2.0	0.017283	0.015466	0.013767	0.012115	0.011027	0.009846	0.008881	0.008145	0.007528	0.006991
2.5	0.021871	0.019287	0.017065	0.015402	0.013785	0.012325	0.011110	0.010237	0.009386	0.008769
3.0	0.025896	0.023021	0.020677	0.018602	0.016570	0.014966	0.013711	0.012508	0.011658	0.010737
3.5	0.030473	0.027351	0.024428	0.021876	0.019679	0.017703	0.016120	0.014897	0.013784	0.012829
4.0	0.034622	0.031105	0.028225	0.025304	0.022997	0.020809	0.018825	0.017143	0.015800	0.015012
4.5	0.039380	0.035452	0.031725	0.029103	0.026577	0.023869	0.021732	0.019836	0.018588	0.017396
5.0	0.043635	0.039141	0.035401	0.031958	0.029056	0.026587	0.024272	0.022330	0.020455	0.019257
5.5	0.048493	0.044189	0.040448	0.036435	0.033265	0.030493	0.027850	0.025633	0.023716	0.022062
6.0	0.051216	0.046817	0.042834	0.039323	0.035880	0.032736	0.029720	0.027830	0.026073	0.024305
6.5	0.056214	0.051956	0.046639	0.042806	0.039290	0.036065	0.033216	0.030632	0.028668	0.026552
7.0	0.060126	0.055183	0.050605	0.046454	0.042539	0.039263	0.036341	0.033382	0.031063	0.029365
7.5	0.065403	0.060816	0.056084	0.051065	0.047620	0.043692	0.040530	0.037368	0.035111	0.032263
8.0	0.069416	0.063995	0.059546	0.055018	0.050739	0.047315	0.043779	0.040703	0.038339	0.035612
8.5	0.074370	0.069097	0.063832	0.059218	0.054034	0.050627	0.047021	0.043981	0.041089	0.038424
9.0	0.077605	0.072439	0.067680	0.063152	0.058745	0.054980	0.050256	0.046744	0.044624	0.041802
9.5	0.083720	0.077938	0.073193	0.068521	0.064063	0.060693	0.056404	0.053186	0.049463	0.046757
10.0	0.086904	0.082214	0.077762	0.073031	0.068653	0.064362	0.060362	0.055475	0.052118	0.049627
10.5	0.093074	0.087656	0.083293	0.078697	0.073959	0.069794	0.065030	0.061152	0.057506	0.054051
11.0	0.096070	0.090474	0.086136	0.082103	0.077684	0.073391	0.069283	0.065771	0.062947	0.059337
11.5	0.100409	0.095985	0.091171	0.085531	0.081739	0.077436	0.073469	0.069729	0.066413	0.063772
12.0	0.104694	0.100352	0.095677	0.091355	0.085971	0.080830	0.077307	0.073345	0.070393	0.066442
12.5	0.110576	0.106041	0.102491	0.097839	0.094363	0.091528	0.087678	0.083661	0.080071	0.077514
13.0	0.112680	0.108652	0.106093	0.102829	0.099604	0.096695	0.092392	0.089186	0.085927	0.081265
13.5	0.115063	0.111787	0.108554	0.104355	0.101087	0.097536	0.092513	0.088571	0.085963	0.081218
14.0	0.125109	0.121622	0.119706	0.117067	0.114321	0.110776	0.109277	0.105482	0.101396	0.098652
14.5	0.128917	0.125821	0.124053	0.119634	0.118156	0.113922	0.111913	0.110582	0.107883	0.105349

H	Year									
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
15.0	0.131040	0.130644	0.129196	0.125903	0.123155	0.120275	0.118286	0.118042	0.115742	0.111914

Table A4-AS. Instantaneous fishing mortality (F) for bottomfish management unit species in American Samoa. Results are presented through ten years of rebuilding (2022-2031). The F shown is for the end of each fishing year, so the F in the column for calendar year 2022 would be the F after one year of implementation of the rebuilding plan. F in 2031 would be the F at 10 years, or T_{MAX}.

F	**Year**									
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
1.0	0.008781	0.007733	0.006738	0.005989	0.005280	0.004754	0.004281	0.003890	0.003621	0.003369
1.5	0.013060	0.011586	0.010183	0.009051	0.008164	0.007305	0.006603	0.005994	0.005542	0.005138
2.0	0.017434	0.015587	0.013863	0.012189	0.011088	0.009895	0.008920	0.008179	0.007556	0.007016
2.5	0.022114	0.019475	0.017212	0.015522	0.013881	0.012401	0.011173	0.010290	0.009430	0.008808
3.0	0.026237	0.023290	0.020894	0.018778	0.016708	0.015079	0.013806	0.012587	0.011727	0.010795
3.5	0.030947	0.027732	0.024731	0.022119	0.019875	0.017862	0.016252	0.015009	0.013880	0.012912
4.0	0.035236	0.031600	0.028631	0.025629	0.023266	0.021029	0.019005	0.017292	0.015926	0.015126
4.5	0.040176	0.036096	0.032239	0.029535	0.026937	0.024158	0.021972	0.020035	0.018763	0.017549
5.0	0.044616	0.039928	0.036043	0.032480	0.029487	0.026946	0.024571	0.022583	0.020667	0.019445
5.5	0.049708	0.045195	0.041288	0.037115	0.033831	0.030968	0.028245	0.025967	0.024001	0.022309
6.0	0.052574	0.047948	0.043778	0.040117	0.036539	0.033284	0.030171	0.028225	0.026419	0.024605
6.5	0.057855	0.053354	0.047762	0.043749	0.040082	0.036731	0.033780	0.031111	0.029087	0.026911
7.0	0.062010	0.056764	0.051930	0.047567	0.043470	0.040055	0.037017	0.033952	0.031556	0.029805
7.5	0.067640	0.062744	0.057718	0.052415	0.048791	0.044675	0.041375	0.038084	0.035742	0.032795
8.0	0.071943	0.066135	0.061392	0.056590	0.052072	0.048471	0.044766	0.041555	0.039094	0.036261
8.5	0.077280	0.071600	0.065961	0.061044	0.055548	0.051953	0.048162	0.044978	0.041957	0.039182
9.0	0.080782	0.075197	0.070080	0.065234	0.060541	0.056549	0.051563	0.047872	0.045651	0.042700
9.5	0.087433	0.081143	0.076010	0.070982	0.066207	0.062613	0.058057	0.054653	0.050728	0.047885
10.0	0.090914	0.085791	0.080952	0.075836	0.071123	0.066526	0.062261	0.057073	0.053526	0.050900
10.5	0.097694	0.091738	0.086967	0.081966	0.076837	0.072349	0.067240	0.063102	0.059226	0.055566
11.0	0.101004	0.094832	0.090073	0.085671	0.080867	0.076223	0.071801	0.068034	0.065016	0.061170
11.5	0.105815	0.100909	0.095599	0.089412	0.085274	0.080599	0.076307	0.072280	0.068722	0.065896
12.0	0.110590	0.105752	0.100569	0.095801	0.089892	0.084284	0.080459	0.076174	0.072994	0.068752

F	Year									
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
12.5	0.117181	0.112096	0.108132	0.102962	0.099116	0.095991	0.091763	0.087368	0.083459	0.080683
13.0	0.119550	0.115020	0.112153	0.108509	0.104921	0.101695	0.096943	0.093417	0.089845	0.084757
13.5	0.122239	0.118543	0.114911	0.110211	0.106569	0.102626	0.097076	0.092742	0.089884	0.084706
14.0	0.133657	0.129678	0.127499	0.124506	0.121400	0.117407	0.115721	0.111470	0.106913	0.103864
14.5	0.138018	0.134470	0.132449	0.127418	0.125740	0.120950	0.118686	0.117188	0.114158	0.111322
15.0	0.140458	0.140002	0.138339	0.134564	0.131425	0.128146	0.125888	0.125611	0.123007	0.118687

Table A5-AS. Probability of exceeding the overfishing limit (pOFL) at various catch levels for bottomfish management unit species in American Samoa. Results are presented through ten years of rebuilding (2022-2031). The pOFL shown is through the end of each fishing year, so the pOFL in the column for calendar year 2022 would be the pOFL after the first year of the rebuilding plan. The pOFL in 2031 would be the pOFL through 10 years of fishing, or T_{MAX}.

pOFL	**Year**									
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
1.0	0.198556	0.183444	0.169444	0.159222	0.148000	0.139444	0.130889	0.124111	0.117889	0.113556
1.5	0.244111	0.226444	0.207889	0.193778	0.181889	0.169333	0.159000	0.150222	0.143333	0.138889
2.0	0.289444	0.265778	0.245778	0.228000	0.209333	0.194889	0.181111	0.176000	0.167222	0.161444
2.5	0.314667	0.287000	0.267000	0.250444	0.234889	0.221111	0.211111	0.202889	0.194333	0.186889
3.0	0.340222	0.314556	0.292778	0.270444	0.253667	0.241444	0.228556	0.218556	0.207333	0.200222
3.5	0.367222	0.340556	0.317556	0.298111	0.278556	0.264667	0.252889	0.239333	0.229000	0.220444
4.0	0.390111	0.362444	0.335778	0.311667	0.297889	0.279333	0.267000	0.255000	0.246556	0.238667
4.5	0.405444	0.380889	0.355889	0.334556	0.316556	0.303778	0.288111	0.274778	0.266333	0.254667
5.0	0.425333	0.395444	0.371556	0.348667	0.328778	0.313556	0.298667	0.287556	0.278111	0.269333
5.5	0.451889	0.422000	0.392111	0.369889	0.353333	0.337778	0.323222	0.312333	0.299667	0.292000
6.0	0.455889	0.427111	0.402778	0.381778	0.363222	0.345778	0.331333	0.320111	0.311000	0.302667
6.5	0.474889	0.446444	0.418667	0.396667	0.377556	0.362889	0.347000	0.338111	0.327000	0.314778
7.0	0.485111	0.454444	0.429333	0.408111	0.383556	0.369556	0.355111	0.343111	0.335444	0.326889
7.5	0.505667	0.478222	0.451778	0.429444	0.409222	0.394556	0.378556	0.367778	0.357667	0.346556
8.0	0.516111	0.484333	0.458889	0.437444	0.421778	0.406333	0.395000	0.380667	0.369000	0.359778
8.5	0.525778	0.500556	0.475222	0.450111	0.428667	0.417111	0.399778	0.388000	0.381333	0.369889
9.0	0.538556	0.509111	0.484667	0.463889	0.443889	0.427111	0.413556	0.405556	0.391444	0.383667
9.5	0.551333	0.523000	0.502222	0.481333	0.463222	0.448889	0.436222	0.422111	0.412222	0.403000
10.0	0.558889	0.534333	0.516667	0.491444	0.476444	0.457444	0.438222	0.426111	0.415778	0.405889
10.5	0.574222	0.546889	0.528000	0.506333	0.489000	0.475667	0.460556	0.450222	0.441778	0.435444
11.0	0.582222	0.554667	0.529778	0.511000	0.497667	0.480222	0.465778	0.458889	0.448889	0.441667
11.5	0.587000	0.563222	0.545778	0.519667	0.504556	0.489444	0.477000	0.467222	0.459333	0.452667

pOFL	Year									
Annual Catch (1,000 lb)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
12.0	0.597556	0.573444	0.547444	0.528222	0.509000	0.497444	0.484889	0.474889	0.466222	0.459444
12.5	0.608889	0.588111	0.567889	0.548556	0.533889	0.523444	0.508778	0.496778	0.490778	0.483111
13.0	0.609111	0.588333	0.570222	0.553556	0.539889	0.531000	0.519222	0.509222	0.497444	0.490778
13.5	0.612333	0.591889	0.571778	0.552556	0.541000	0.528778	0.516556	0.506556	0.496889	0.490111
14.0	0.633667	0.615333	0.593556	0.579111	0.567556	0.557778	0.545889	0.538444	0.529111	0.520000
14.5	0.645889	0.624111	0.604556	0.588333	0.576111	0.564444	0.553444	0.544889	0.538111	0.528222
15.0	0.645556	0.628222	0.611444	0.599111	0.584556	0.571000	0.562000	0.551111	0.545222	0.540667