Version 2 – 10/9/2015

Amendments to the U.S. Caribbean Reef Fish, Spiny Lobster, and Corals And Reef Associated Plants and Invertebrates Fishery Management Plans:

Timing of Accountability Measure-Based Closures

Public Hearing Draft

Including Draft Environmental Assessment

Version 2, October 2015

Amendments to the U.S. Caribbean Reef Fish, Spiny Lobster, and Corals and Reef Associated Plants and Invertebrates Fishery Management Plans: Timing of Accountability Measure-Based Seasonal Closures

Amendment 8 to the Fishery Management Plan for the Reef Fish Fishery of Puerto Rico and the U.S. Virgin Islands

Amendment 7 to the Fishery Management Plan for the Spiny Lobster of Puerto Rico and the U.S. Virgin Islands

Amendment 6 to the Fishery Management Plan for the Corals and Reef Associated Plants and Invertebrates of Puerto Rico and the U.S. Virgin Islands

Proposed Action:

Modify the timing for the application of accountability measures in the Reef Fish, Spiny Lobster, and Corals and Reef Associated Plants and Invertebrates fishery management plans.

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Abbreviations and Acronyms Used

ACL	annual catch limit
APA	Administrative Procedure Act
CEA	cumulative effects assessment
CEQ	Council on Environmental Quality
CFMC	Caribbean Fishery Management Council; Council
CZMA	Coastal Zone Management Act
DNER	Department of Natural and Environmental Resources of Puerto Rico
DPNR	Department of Planning and Natural Resources of the USVI
EA	environmental assessment
EEZ	exclusive economic zone
EFH	essential fish habitat
EIS	environmental impact statement
ESA	Endangered Species Act
FEIS	final environmental impact statement
FMP	fishery management plan
FMU	fishery management unit
GU	Grouper Unit
HAPC	habitat area of particular concern
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MMPA	Marine Mammal Protection Act
MPA	marine protected area
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OMB	Office of Management and Budget
PRA	Paperwork Reduction Act
RFA	Regulatory Flexibility Act
RIR	Regulatory Impact Review
SEFSC	Southeast Fisheries Science Center
SEIS	supplemental environmental impact statement
SFA	Sustainable Fisheries Act
SERO	Southeast Regional Office
SU	Snapper Unit
USVI	United States Virgin Islands

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Chapter 1. Introduction

1.1 What Actions are Being Proposed?

Accountability measure (AM) regulations in U.S. Caribbean federal waters require the National Marine Fisheries Service (NMFS) to shorten the length of the fishing season for a fishery management unit (FMU) (i.e., species/species complex) for which the annual catch limit (ACL) has been exceeded. The fishing season is shortened in the year following an overage determination by the amount necessary to constrain landings to the ACL. These AM-based reductions in the length of the fishing season, for any FMU (e.g., goatfish, parrotfish) for which the ACL has been exceeded,[1] are designed to end on December 31st of the closure year and extend backward into the year for the number of days necessary to achieve the required reduction in landings. The timing of these AM closures may result in negative socio-economic impacts to U.S. Virgin Islands (USVI) and Puerto Rico fishers. Therefore, this amendment to the Reef Fish, Spiny Lobster, and Coral fishery management plans (FMPs) evaluates alternative timeframes for the establishment of fishery closure dates, other than the standard end of the year closure, designed to further minimize such socio-economic impacts in the event a species or species complex exceeds its assigned ACL.

[1]See Section 1.5 for more information about accountability measures in federal waters of the U.S. Caribbean and their applicability.

1.2 Who is Proposing the Action?

The Caribbean Fishery Management Council (Council) proposes the actions in this amendment. The proposed actions would be implemented through amendments to the Reef Fish, Spiny Lobster, and Corals and Reef Associated Plants and Invertebrates (Coral) fishery management plans (FMPs). The Council develops the FMP amendments and submits them to NMFS who ultimately approves, disapproves, or partially approves the actions in the amendment on behalf of the Secretary of Commerce, and implements the regulations.

Through this document, NMFS and the Council evaluate potential actions and alternatives to address identified issues with the current approach to implement AMs. This may result in changes to the management of federal fisheries in the U.S. Caribbean.

Photo credit: NOAA NCCOS/UNCW – T. Battista

Caribbean Fishery Management Council

- Responsible for conservation and management of U.S. Caribbean fish stocks, except highly migratory species, which are managed directly by NMFS
- Consists of seven voting members:
  - Four voting members appointed by the Secretary of Commerce
  - One voting member appointed by each of the Governors of Puerto Rico and the U.S. Virgin Islands
  - The Regional Administrator of NMFS for the Southeast Region
- Manages the area from 3 to 200 nautical miles (nm) off the coasts of the U.S. Virgin Islands, and 9 to 200 nm off the coast of Puerto Rico.
- Develops fishery management plans and recommends regulations to NMFS for implementation on behalf of the Secretary of Commerce

1.3 Where is the Project Located?

Fishery resources in federal waters of the U.S. Caribbean are presently managed by the Council under four FMPs. Federal waters in the U.S. Caribbean are located in the 3 - 200 nautical mile (nm) (6 - 370 kilometers [km]) U.S. exclusive economic zone (EEZ) off the USVI, and in the 9 - 200 nm (17 - 370 km) EEZ off the Commonwealth of Puerto Rico (Fig. 1.3.1).

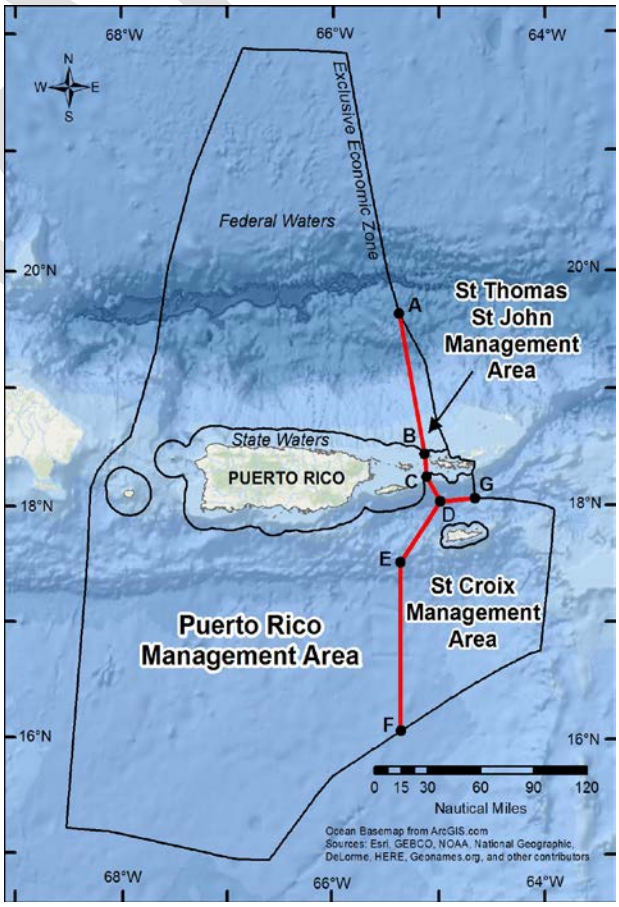

Figure 1.3.1. Jurisdictional boundaries of the Caribbean Fishery Management Council, the Commonwealth of Puerto Rico, and the Territory of the U.S. Virgin Islands, including management areas.

1.4 Why is the Council Considering Action?

Fishers in the USVI and Puerto Rico have expressed to the Council that extending AM-based closures through the end of the year results in negative socio-economic impacts, for example, by resulting in repetitive and potentially overlapping closures during the important Christmas holiday season. To address this issue, the Council is evaluating alternative timeframes for closure dates other than the standard end of the year closures in the event of an overage of the ACL for a species or species complex. The Council's goals for this action are to remain within the ACL and lessen the socio-economic impact of AMs (Figure 1.4.1). The proposed closure dates may occur during times of the year when the economic and/or cultural impacts are less severe.

Figure 1.4.1. Biological, economic, and socio-cultural goals of the proposed action.

Purpose for Action

The purpose of this action is to limit harvest to the annual catch limits while minimizing adverse socio-economic effects of accountability measure (AM)-based closures.

Need for Action

There is a need to ensure AM-based closures successfully achieve their conservation objective and, to the extent practicable, minimize adverse economic impacts to fishers and fishing communities, consistent with National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act.

Background

In 2013, the Council established a committee (Ad Hoc Committee) to evaluate options for choosing AM-based closure periods that would be more socially and economically advantageous to the fishermen. This committee was composed of representatives from the USVI and Puerto Rico fishery sectors, and representatives from the Council and NMFS. For this purpose, the Council's economist prepared a model template (Seasonal Choices Model) and examples for specific FMUs that incorporated ecological, economic, and social considerations to help guide the selection of the most appropriate closure periods for each FMU and island management area. Even though the model was not directly used for the development of the current management alternatives, it provided invaluable guidance. While this type of model could be used to provide economic effects information for any alternative considered in this amendment with an identified start date that moves toward the end of the year, a separate model would need to be developed for each FMU. Once preferred alternatives are chosen, specific models for FMUs could be created to estimate economic benefits based on past landings and ex-vessel revenue history.

Council members and meeting attendees at the 147th Council meeting, held in August 2013 in Puerto Rico, expressed the need to get fishers involved in the process to select potential AM-based closure dates. Factors such as revenue maximization and least amount of days that a species/species complex can be closed are very important to the fishermen.

This amendment evaluates alternative timeframes for establishing AM-based closures. The analyses of the effects of alternative closure dates consider information provided by Council members and representatives of the fishing communities in Puerto Rico and the USVI regarding dates (date ranges) when important economic, cultural, and market conditions are present (e.g., higher demand, lower demand) (Table 1.4.1).

Table 1.4.2 shows existing federal and/or territorial/Commonwealth seasonal closures for various species, which also are considered when evaluating alternative timeframes for AM-based closures.

Table 1.4.1. Example of important market dates identified by Caribbean Fishery Management Council members and fishery participants for each of Puerto Rico, St. Thomas/St. John, and St. Croix.

Island Management Area	Pre-identified Date Ranges	Reason (change in demand from average)
Puerto Rico	March 1- April 30	Higher demand due to Lent
	May 1 - July 31	Higher demand due to summer vacation
	Aug 1 - Oct 31	Lower demand due to back to school costs
St. Thomas/St. John, USVI	Jan 1 – June 30	Higher demand due to tourism (lobster, yellowtail)
	March 1 - April 30	Higher demand due to Lent (all reef fish)
	July 1 - Sept 30	Lower demand due to summer hotel/restaurant closures (yellowtail, lobster)
	Aug 1 - Sept 30	Lower demand due to saving for beginning of school year (all species)
	Sept 1 - Nov 30	Higher demand due to elections activities (all species, alternate years)
	Oct 1 - Dec 31	Higher demand due to tourism season (yellowtail, lobster)
	Dec 1 - Dec 31	Higher demand due to Christmas holiday (all species)
St. Croix, USVI	Jan 1 - May 31	Higher demand due to tourism season
	Feb 1 - Feb 28	Higher demand before, during, and after Agriculture and Food Fair
	March 1 - April 30	Higher demand due to Lent
	Aug 1 - Sept 30	Lower demand due to back to school costs
	Nov 1 - Nov 30	Slightly higher demand due to tourism season and election activities
	Dec 1 - Dec 31	Higher demand due to tourism season

Table 1.4.2. Calendar of seasonal fishing closures in federal waters, Puerto Rico commonwealth waters, and U.S. Virgin Islands territorial waters (state waters).

Island Management Area	Species	Seasonal Closure Dates in Federal and in State Waters
Puerto Rico	yellowfin, red, tiger, black, and yellowedge groupers	Federal: Feb 1 – Apr 30
	yellowfin grouper	State: Feb 1 – Apr 30
	red hind grouper	Federal: Red Hind Spawning Aggregation Areas: Bajo de Sico, Tourmaline, Abrir La Sierra, western Puerto Rico - Dec 1 – Feb 28
		State: Dec 1 – last day of February
	silk, black, blackfin, and vermilion snappers	Federal: Oct 1 – Dec 31
	silk and blackfin snappers	State: Oct 1 – Dec 31
	mutton and lane snappers	Federal - Apr 1 – Jun 30
	Mutton snapper	State: Apr 1 – May 31
	All Council managed reef fish	Federal: Bajo de Sico, western Puerto Rico - Oct 1 – Mar 31
	All species	Federal: Tourmaline Bank and Abrir La Sierra, western Puerto Rico – Dec 1 – Feb 28
U.S. Virgin Islands (St. Thomas/St. John, St. Croix)	yellowfin, red, tiger, black, and yellowedge groupers	Federal and State : Feb 1 – Apr 30
	red hind grouper	Federal: Red Hind Spawning Aggregation Area: Lang Bank in St. Croix – Dec 1 – Feb 28
	silk, black, blackfin, and vermilion snappers	Federal: October 1 – December 31
	silk and blackfin snappers	State: St. Thomas/St. John ONLY – October 1 – December 31
	mutton and lane snappers	Federal and State: April 1 – June 30
	All species (except HMS)	Grammanik Bank, St. Thomas – Feb 1 – Apr 30
	All species	Hind Bank, St. Thomas – YEAR ROUND
	All species	Mutton Snapper Spawning Aggregation Area, St. Croix – Mar 1 – Jun 30

1.5 Applicability of Accountability Measures for Caribbean Council Managed Species

Accountability measures apply to all species managed by the Council, including prohibited corals and species with harvest moratoria (e.g., goliath and Nassau grouper). Accountability measures require the NMFS' Assistant Administrator to reduce the length of the fishing season for a given species/species complex in the year following a determination that prior year(s) landings exceeded the respective ACL. For purposes of ACL monitoring, a multi-year average of landings is used. Annual catch limits are evaluated relative to the most recent multi-year average of landings. The extent to which fishing seasons are shortened to account for any overages equals the amount necessary to constrain landings to the ACL. Accountability measure-based closures are designed to end on December 31st of the closure year and extend backward into the year for the number of days necessary to ensure the ACL is not again exceeded[2]. In calculating the length of the closure, NMFS assumes that future fishing effort will resemble the most recent years of fishing effort information and that reducing the fishing season will decrease fishing effort and therefore landings.

If NMFS determines the ACL for a particular species/species complex has been exceeded based upon a pre-defined average of landings, scientists (in consultation with managers) evaluate the cause of the reported catch increase prior to making a determination that actual landings exceeded the ACL. Specifically, they consider whether the reported increase represents an actual increase in landings or just improved data collection and monitoring. The intent of this evaluation is to eliminate any incentive for fishermen to under-report or misreport catches to avoid exceeding ACLs and triggering associated AMs. Fishers may fear that if they improve their reporting, reported landings will increase relative to the established baseline averages even though actual catch has not increased. The result would be an unnecessary and unfair application of AMs.

For the 2013 fishing season, NMFS determined that ACLs for several FMUs were exceeded based on an analysis of the average landings for previous years, triggering AMs to reduce the length of the fishing seasons in 2013 by the amount necessary to ensure landings would not again exceed the assigned ACLs for those FMUs. Thus in 2013, AM-based closures were implemented for the commercial sector of snapper unit 2 (SU2) in Puerto Rico, the recreational sector of wrasses in Puerto Rico, triggerfish and filefish in St. Croix (all fishing), spiny lobster in St. Croix (all fishing), and groupers in St. Thomas/St. John (all fishing) (FR 78 18247) (Table 1.5.1).

[2] December 31st is the last day of an AM-based closure in a fishing year. This date is used as the starting point to count backward into the year and determine the duration of the closure.

For the 2014 fishing season, commercial harvest of SU2 in Puerto Rico was found to have again exceeded its assigned ACL based on the average of the three most recent years of available landings data (2010-2012). However, in this case AMs were not applied because the most recent information for the year 2013 indicated that fishing effort had decreased thus reducing catch rates and were not likely to exceed the ACL that year. However, NMFS determined that the Puerto Rico commercial ACL for wrasses was exceeded, thus triggering an AM that reduced the length of the 2014 fishing season for wrasses that year (79 FR 62575). This stock complex was closed from October 20, 2014 through December 31, 2014 (Table 1.4.1). None of the FMUs in St. Croix, St. Thomas/St. John, Puerto Rico recreational sector, or U.S. Caribbean-wide exceeded their corresponding ACLs, and AMs were not triggered in those areas during 2014. There were no ACL overages in 2014 that triggered AMs in 2015.

Table 1.5.1. Accountability measure-based closures applied in the U.S. Caribbean exclusive economic zone since the implementation of accountability measures in 2012.

Fishery Management Unit	Island/Island Group	Length of AM closure
Snapper Unit 2 (Commercial)	Puerto Rico	Sep 21 – Dec 31, 2013
Wrasses (Recreational)	Puerto Rico	Oct 21 – Dec 31, 2013
Triggerfish and Filefish (All fishing)	St. Croix, USVI	Nov 21 – Dec 31, 2013
Spiny Lobster (All fishing)	St. Croix, USVI	Dec 19 – 31, 2013
Groupers (All fishing)	St. Thomas/St. John, USVI	Dec 20 – 31, 2013
Wrasses (Commercial)	Puerto Rico	Oct 20 – Dec 31, 2014

* No AM-based closures were required in 2015 in Puerto Rico, St. Croix, St. Thomas/St. John, or for Caribbean-wide FMUs.

1.6 Management History

A summary of federal fishery management actions implemented through 2011, for managed species in the U.S. Caribbean Reef Fish, Queen Conch, Corals and Reef Associated Plants and Invertebrates, and Spiny Lobster FMPs, can be found in the 2010 and 2011 Caribbean ACL Amendments (CFMC 2011a, b) and is incorporated herein by reference.

2005 Caribbean Sustainable Fisheries Act (SFA) Amendment (CFMC 2005)

The Comprehensive Amendment to the FMPs of the U.S. Caribbean to address required provisions of the Magnuson-Stevens Act (2005 Caribbean SFA Amendment) included a supplemental environmental impact statement (SEIS), regulatory impact review (RIR), and regulatory flexibility analysis (RFA) (CFMC 2005). Regulations were implemented in November 2005 (70 FR 62073). The amendment accomplished the following:

- Redefined the FMUs for the four FMPs;
- Established seasonal closures;
- Imposed gear restrictions and requirements;
- Established biological reference points and stock status criteria;
- Established rebuilding schedules and strategies to end overfishing and rebuild overfished stocks. The amendment established rebuilding plans for overfished units: grouper unit (GU)1, GU2, GU4, and queen conch;
- Designated essential fish habitat (EFH) and habitat areas of particular concern (HAPCs); and minimized adverse impacts on such habitat to the extent practicable.

2010 Caribbean ACL Amendment (CFMC 2011a)

Amendment 2 to the FMP for the Queen Conch Fishery of Puerto Rico and the USVI and Amendment 5 to the Reef Fish FMP of Puerto Rico and the USVI (2010 Caribbean ACL Amendment), including environmental impact statement (EIS), RIR, and RFA (CFMC 2011a) became effective on January 30, 2012 (76 FR 82404) and accomplished the following:

- Amended the unit composition in the Reef Fish FMUs;
- Revised management reference points (maximum sustainable yield, optimum yield, overfishing limit, allowable biological catch) for snapper, grouper, parrotfish, and queen conch in the U.S. Caribbean;
- Established island-specific ACLs and AMs in response to harvesting activities on a single island (Puerto Rico, St. Croix) or island group (St. Thomas/St. John) while minimizing the effects of fishing activities on the other islands or island groups;
- Established separate ACLs for each of the commercial and recreational sectors for the Puerto Rico EEZ management area, an area where landings data are

available for both the commercial and recreational sectors;

- Set management measures with specific emphasis on harvest prohibition for three parrotfish species (midnight, blue, rainbow) that serve an essential ecological function and that are relatively long-lived;
- Established recreational bag limits for snappers, groupers, and parrotfishes.
- Provided guidelines for triggering AMs and applying those AMs;
- Established framework provisions separately for the Reef Fish and Queen Conch FMPs.

2011 Caribbean ACL Amendment (CFMC 2011b)

Amendment 6 to the Reef Fish FMP, Amendment 5 to the FMP for the Spiny Lobster Fishery, Amendment 3 to the FMP for the Queen Conch Resources, and Amendment 3 to the Coral FMP of Puerto Rico and the USVI (2011 Caribbean ACL Amendment), including EIS, Biological Assessment, RIR, RFA, and Social Impact Assessment (CFMC 2011b) became effective on January 29, 2012 (76 FR 82414) and accomplished the following:

- Established ACLs and AMs for reef fish and spiny lobster, and for aquarium trade species in the Reef Fish and Coral FMPs that were not determined to be undergoing overfishing.
- Allocated ACLs among island management areas;
- Established recreational bag limits for reef fish and spiny lobster;
- Removed eight conch species from the Queen Conch FMP;
- Established framework procedures for the Spiny Lobster FMP and modified framework measures for the Coral FMP;
- Revised management reference points and status determination criteria for selected reef fish, spiny lobster, and aquarium trade species.

1.5.1 Recent Council Actions

Caribbean actions implemented in 2013 affected the Coral, Queen Conch, and Reef Fish FMPs. Updated management histories for these FMPs can be found in: Amendment 4 to the Coral FMP (CFMC 2013a), Regulatory Amendment 2 to the Queen Conch FMP (CFMC 2013b), and Regulatory Amendment 4 to the Reef Fish FMP (CFMC 2013c), respectively. The new management measures in these amendments are summarized below. There have been no new actions affecting the Spiny Lobster FMP since the 2011 Caribbean ACL Amendment. A complete list of current management measures for Council-managed species can be found in Appendix C.

CORALS AND REEF ASSOCIATED PLANTS AND INVERTEBRATES

Amendment 4 to the Coral FMP of Puerto Rico and the USVI, including Environmental Assessment (EA), RIR, RFA, and Fisheries Impact Statement (FIS) (CFMC 2013a)

Amendment 4 removed seagrass species from the Coral FMP. The final rule implementing this amendment published in the *Federal Register* on June 4, 2013 (78 FR 33255), with an effective date of July 5, 2013. In this amendment, the Council determined that federal management of seagrass species was unnecessary because there is no known harvest of seagrasses, and these species occur predominantly in Puerto Rico commonwealth and USVI territorial waters. In addition, seagrasses are designated as EFH and HAPCs in all of the Council FMPs, and would continue to be protected by these designations.

QUEEN CONCH

Regulatory Amendment 2 to the Queen Conch FMP of Puerto Rico and the USVI, including EA, RFA, and RIR (CFMC 2013b).

This regulatory amendment modified the commercial trip limit for the harvest of queen conch, in those U.S. Caribbean federal waters where queen conch harvest is allowed, to be compatible with the trip limit in USVI territorial waters. The final rule published in the *Federal Register* on September 12, 2013 (78 FR 56171), with an effective date of October 15, 2013. Regulatory Amendment 2 modified the commercial trip limit in federal waters open to queen conch harvest from 150 queen conch per licensed commercial fisher per day to 200 queen conch per vessel per day. The recreational bag limit for the harvest of queen conch in the U.S. EEZ remained the same.

REEF FISH

Regulatory Amendment 4 to the Reef Fish FMP of Puerto Rico and the USVI (Regulatory Amendment 4), including EA, RFA, and RIR (CFMC 2013c).

Regulatory Amendment 4 established minimum size limits for parrotfish harvest in federal waters off St. Croix, USVI. It did not establish minimum size limits in federal waters off Puerto Rico and St. Thomas/St. John. The final rule published in the *Federal Register* on July 30, 2013 (78 FR 45894), with an effective date of August 29, 2013. Measures in Regulatory Amendment 4 included:

- A commercial and recreational minimum size limit of 8 inches fork length for redband parrotfish (*Sparisoma aurofrenatum*).
- A commercial and recreational minimum size limit of 9 inches fork length for all other allowable parrotfish species: redfin parrotfish (*Sparisoma rubripinne),* redtail parrotfish (*S, chrysopterum,* stoplight parrotfish (*S. viride),* princess parrotfish (*Scarus taeniopterus),* queen parrotfish (*Scarus vetula)*, and striped parrotfish (*Scarus iserti*).

Chapter 2. Proposed Action and Alternatives

2.1 What are the Proposed Actions?

This amendment consists of two actions. Action 1 proposes to modify the timing of accountability measure (AM)-based closures. Action 2 proposes to reevaluate the chosen approach after a specified time period.

ACTION 1: Modify the timing for the implementation of AM-based closures in the U.S. Caribbean exclusive economic zone (EEZ).

ACTION 2: Specify a time period for revisiting the approach to set the timing of AM-based closures selected in Action 1.

2.2 List of Alternatives for Action 1

ACTION 1: Modify the timing for the implementation of AM-based closures in the U.S. Caribbean EEZ.

Alternative 1: No Action. Continue AM-based closures resulting from an annual catch limit (ACL) overage beginning on December 31st of the closure year and extending backward into the year for the number of days necessary to achieve the required reduction in landings.

Alternative 2 (Preferred): Accountability measure-based closures resulting from an ACL overage will begin on September 30th of the closure year and extend backward into the year for the number of days necessary to achieve the required reduction in landings. This closure start date would apply to all fishery management units (FMUs) for each of Puerto Rico commercial and recreational sectors, St. Thomas/St. John, St. Croix, and Caribbean-wide. If for any FMU in any year, the number of available days running from September 30th backward to the beginning of the year is not enough to achieve the required reduction in landings, then the additional days needed would be captured by extending the closure forward, beginning on October 1st and continuing for however many days are needed to fulfill the required reduction.

Alternative 3: Accountability measure-based closures resulting from an ACL overage will begin on January 1st of the closure year and extend forward into the year for the number of days necessary to achieve the required reduction in landings. This closure start date would apply to all FMUs for each of Puerto Rico commercial and recreational sectors, St. Thomas/St. John, St. Croix, and Caribbean-wide.

Alternative 4: Establish a fixed fishing closure start date for the implementation of AMs for each FMU by island/island group (A. Puerto Rico, B. St. Thomas/St. John, C. St. Croix, and D. Caribbean-wide). A different start date may be chosen for each FMU on each island/island group. The start date will begin on the last day of the identified month and go backward towards the beginning of the year. If for any FMU in any year, the number of days left in the year is not enough to achieve the required reduction in landings, then those additional days would be captured by extending the closure forward toward the end of the year.

A. Puerto Rico

I. Commercial

Sub-Alternative 4a. Closure to start the last day of the month that has the highest landings based on the most recent three years of available landings data. A specific date for each FMU is shown in Table 2.2.1 (commercial) below.

Sub-Alternative 4b. Closure to start the last day of the month with lowest landings based on the most recent three years of available landings data. A specific date for each FMU is shown in Table 2.2.1 (commercial) below.

II. Recreational

Sub-Alternative 4c. Closure to start the last day of the month that has the highest landings based on the most recent three years of available landings data. A specific date for each FMU is shown in Table 2.2.2 (recreational) below.

Sub-Alternative 4d. Closure to start the last day of the month with lowest landings based on the most recent three years of available landings data. A specific date for each FMU is shown in Table 2.2.2 (recreational) below.

B. St. Thomas/St. John, USVI (Commercial and Recreational combined)

Sub-Alternative 4e. Closure to start the last day of the month that has the highest landings based on the most recent three years of available landings data. A specific date for each FMU is shown in Table 2.2.3 below.

Sub-Alternative 4f. Closure to start the last day of the month with lowest landings based on the most recent three years of available landings data. A specific date for each FMU is shown in Table 2.2.3 below.

C. St. Croix, USVI (Commercial and Recreational combined)

Sub-Alternative 4g. Closure to start the last day of the month that has the highest landings based on the most recent three years of available landings data (shortest closure time). A specific date for each FMU is shown in Table 2.2.4 below.

Sub-Alternative 4h. Closure to start the last day of the month with lowest landings based on the most recent three years of available landings data. A specific date for each FMU is shown in Table 2.2.4 below.

D. Caribbean-Wide (Commercial and Recreational combined)

Sub-Alternative 4i. Closure to start the last day of the month that has the highest landings based on the most recent three years of available landings data (shortest closure time). A specific date for each FMU is shown in Table 2.2.5 below.

Sub-Alternative 4j. Closure to start the last day of the month with lowest landings based on the most recent three years of available landings data. A specific date for each FMU shown in Table 2.2.5 below.

Table 2.2.1. Closure dates resulting from **Sub-Alternatives 4a and 4b** for Puerto Rico fishery management units in the commercial sector. **Sub-Alternative 4a** and **Sub-Alternative 4b** are based on monthly average landings through time from the most recent three years of available landings data (2011-2013) (2014 data is not currently available, therefore it was not included).

Puerto Rico Commercial FMUs

Alternative 4	**Sub-Alternative 4a** (highest landings)	**Sub-Alternative 4b** (lowest landings)
FMU		
Parrotfish	Mar 31	Jan 31
Snapper Unit 1 (silk, black, blackfin, and vermilion)	Aug 31	Jun 30[1]
Snapper Unit 2 (queen and cardinal)	Sep 30	Mar 31
Snapper Unit 3 (mutton, lane, gray, dog, schoolmaster, and mahogany)	Mar 31	May 31 or Jul 31[2]
Snapper Unit 4 (yellowtail)	Mar 31	Dec 31
Groupers	Aug 31	Dec 31[3]
Angelfish	No Landings[4]	
Boxfish	Jan 31	Jun 31
Goatfish	Nov 30	Apr 30
Grunts	Mar 31	Dec 31
Wrasses	Aug 31	Nov 30
Jacks	Jul 31	Dec 31
Scups & Porgies	Mar 31	Nov 30
Squirrelfish	May 31	Jan 31
Surgeonfish	No Landings[4]	
Triggerfish & Filefish	Aug 31	Dec 31
Spiny Lobster	Sep 30	Jun 30

Note: If for any FMU in any year, the number of days left in the year is not enough to achieve the required reduction in landings, then those additional days would be captured in the opposite direction. However, this table is only used to identify the start date and not the length of the closure because that is determined on an annual basis.

[1]Harvest of Snapper Unit 1 (SU1) is prohibited in federal waters from October 1 – December 31. In Puerto Rico waters, only the harvest of silk and blackfin snappers is prohibited during this date. Lowest landings for SU1 occur during the seasonal closure months (October through December). The next month with lowest landings outside of the seasonal closure is June.

[2] Harvest of mutton and lane snappers from Snapper Unit 3 (SU3) is prohibited in federal waters from April 1 – June 30. These two species are the biggest contributors to SU3 landings. In Puerto Rico state waters, only the harvest of mutton snapper is prohibited during the closure that extends from April 1 through May 31. Lowest landings for SU3 occur during the seasonal closure months of May and June. The next month with lowest landings outside of the seasonal closure is July.

[3]The lowest landings for grouper occur in December, with the majority of landings dominated by misty grouper and red hind. Harvest and possession of red hind is prohibited from December 1 through February 28 in Puerto Rico state waters, and in federal waters of Bajo de Sico (from October 1 through March 31 fishing for Council-managed reef fish prohibited), Abrir La Sierra, and Tourmaline Bank in western Puerto Rico (all fishing prohibited from Dec 1 through Feb 28) and federal waters west of 67º10'W. The next months with the lowest landings are January and

February, when red hind harvest is still closed, and then November. The closure could alternatively be implemented in November 30 backward, which is a month with lower landings.

[4] No landings of angelfish and surgeonfish were reported during 2012-2013.

Table 2.2.2. Closure dates resulting from **Sub-Alternatives 4c** and **4d** for Puerto Rico fishery management units in the *recreational* sector. Recreational landings data are reported in two-month waves. **Sub-Alternative 4c** and **Sub-Alternative 4d** are based on bi-monthly average landings through time from the most recent three years of available landings data (2012-2014).

Puerto Rico Recreational FMUs

Alternative 4	**Sub-Alternative 4c** (highest landings – second month in wave)	**Sub-Alternative 4d** (lowest landings – second month in wave)
FMU		
Parrotfish	Jul/Aug (Aug 31)	Sept/Oct (Oct 31)
Snapper Unit 1	May/Jun (Jun 30)	No landings Nov-Dec[1];
Snapper Unit 2	Jan /Feb (Feb 28)	No landings for the rest of the year
Snapper Unit 3	May /Jun (Jun 30)	Sep/Oct (Oct 31)
Snapper Unit 4	May /Jun (Jun 30)	Sep/Oct (Oct 31)
Groupers	Jan/Feb (Feb 28)	Nov/Dec (Dec 31)
Angelfish	Jan/Feb (Feb 28)	No landings for rest of the year
Boxfish	Sep/Oct (Oct 31)	Jul/Aug (Aug 31)
Goatfishes	May/Jun (Jun 30)	No landings for the rest of the year
Grunts	May/Jun (June 30)	Nov/Dec (Dec 31)
Wrasses	Sep/Oct (Oct 31)	No landings Nov-Dec
Jacks	Jan/Feb (Feb 28)	Sep/Oct (Oct 30)
Porgies	Jul/Aug (Aug 31)	No landings Sep/Oct
Squirrelfish	May/Jun (Jun 30)	No landings Jan/Apr and Sep/Dec
Surgeonfish	No Landings[4]	
Triggerfish & Filefish	Sep/Oct (Oct 31)	No landings Jan-Jun, and Nov-Dec

Note: If for any FMU in any year, the number of days left in the year is not enough to achieve the required reduction in landings, then those additional days would be captured in the opposite direction. However, this table is only used to identify the start date and not the length of the closure because that is determined on an annual basis.

[1] Harvest of silk, black, blackfin, and vermilion snappers in federal waters and only for silk and blackfin in Puerto Rico state waters is closed from October 1 through December 31 each year. Lowest landings for SU1 occur during the seasonal closure months of November and December (zero landings reported).

[2] SU2 only had reported landings during January (highest) and February (lowest).

[3] Harvest of mutton and lane snappers from SU3 is prohibited in federal waters from April 1 through June 30, and in Puerto Rico state waters only for mutton snapper from April 1 through May 31. The month with the highest landings for snappers is May, with catches dominated by lane snapper. The next two month wave with the highest landings outside of the seasonal closure is November-December, with catches from lane snapper dominating the landings.

[4]There were no reported recreational landings of surgeonfish from 2011-2014.

Table 2.2.3. Closure dates resulting from **Sub-Alternatives 4e** and **4f** for St. Thomas/St. John fishery management units. **Sub-Alternative 4e** and **4f** are based on monthly average landings through time from the most recent three years of available landings data (2012-2014).

St. Thomas/St. John FMUs

Alternative 4	**Sub-Alternative 4e** (highest landings)	**Sub-Alternative 4f** (lowest landings)
FMU		
Parrotfish	Apr 30	Dec 31
Snapper	Jul 31	Dec 31 or Jun 30[2]
Grouper	Jan 31 or Oct 31[3]	Dec 31
Angelfish	Jul 31	Dec 31
Boxfish	No reported landings	
Goatfish[4]	No landings for 8 months of the year	
Grunts	Jan 31	Nov 30
Wrasses	Sep 30	Nov 30
Jacks	Jun 30	Dec 31
Scups & Porgies	Jan 31	Dec 31
Squirrelfish	Aug 31	Nov 30
Surgeonfish	May 31	Dec 31
Triggerfish & Filefish	May 31	Nov 30
Spiny Lobster	Mar 31	Sep 30

Note: If for any FMU in any year, the number of days left in the year is not enough to achieve the required reduction in landings, then those additional days would be captured in the opposite direction. However, this table is only used to identify the start date and not the length of the closure because that is determined on an annual basis.

[1]The highest landings for snappers occur in April but this overlaps with the seasonal closure already in place for lane and mutton snappers in federal and USVI waters that runs from April 1 through June 30. The month with the next highest landings is March.

[2]Lowest landings for snappers occur during the silk, black, blackfin, and vermilion snapper seasonal closure months of December, November, and October in federal waters and St. Thomas/St. John waters. The next month with lowest landings outside of the seasonal closure is June.

[3]Highest landings for grouper occur in January. Depending on how long the AM closure needs to be to account for the ACL overage, a January 1 closure will partially overlap with the closure for yellowfin, red, tiger, black, and yellowedge groupers in federal and USVI waters that goes from February 1 – April 30, and with the Grammanik Bank closure during this date. The next month with highest landings outside of the seasonal closure is October.

[4]Landings of Goatfish are very small and amount to less than 20 pounds on average annually for 2012-2014.

Table 2.2.4. Closure dates resulting from **Sub-Alternatives 4g** and **4h** for St. Croix fishery management units. **Sub-Alternatives 4g** and **4h** are based on monthly average landings through time from the most recent three years of available landings data (2012-2014).

St. Croix FMUs

Alternative 4	**Sub-Alternative 4g** (highest landings)	**Sub-Alternative 4h** (lowest landings)
FMU		
Parrotfish	Apr 30	Sep 30
Snappers	Jul 31	May 31[1]
Groupers	Mar 31	Dec 31
Angelfish	May 31	Dec 31
Boxfish	No landings	
Goatfish[2]	Oct 31	Jan 31 or Mar 31
Grunts	Jul 31	Dec 31
Wrasses[2]	May 31	No landings for 9 months of the year
Jacks	Last day in Feb	Dec 31
Scups & Porgies[2]	May 31	Oct 31
Squirrelfish[2]	May 31	Dec 31
Surgeonfish	Jul 31	Dec 31
Triggerfish & Filefish	May 31	Dec 31
Spiny Lobster	Mar 31	Dec 31

Note: If for any FMU in any year, the number of days left in the year is not enough to achieve the required reduction in landings, then those additional days would be captured in the opposite direction. However, this table is only used to identify the start date and not the length of the closure because that is determined on an annual basis.

[1]The lowest landings for snappers occur in December but this overlaps with the seasonal closure already in place for silk, black, blackfin, and vermilion snapper in federal waters from October 1 through December 31. The next month with lowest landings outside of the seasonal closure is May.

[2]Landings of goatfish, squirrelfish, scups & porgies, and wrasses FMUs are very small, amounting to less than 1,000 pounds on average annually for 2012-2014. Both January and March have the lowest average monthly goatfish landings for 2012-2014.

Table 2.2.5. Closure dates resulting from **Sub-Alternatives 4i** and **4j** for Caribbean-wide fishery management units: tilefish and aquarium trade species. **Sub-Alternative 4i** and **4j** are based on monthly average landings through time from the most recent three years of available landings data.

Caribbean-wide FMUs

Alternative 4	**Sub-Alternative 4i** (highest landings)	**Sub-Alternative 4j** (lowest landings)
FMU		
Tilefish[1]	Jul 31	No landings Jan-April, Nov-Dec, May 1 (lowest landings)
Aquarium trade species[2]	Nov 30	No landings May-Aug; Sept 1 (lowest landings)

Note: If for any FMU in any year, the number of days left in the year is not enough to achieve the required reduction in landings, then those additional days would be captured in the opposite direction. However, this table is only used to identify the start date and not the length of the closure because that is determined on an annual basis.

[1]Average annual reported landings of Tilefish totaled less than 200 pounds in 2011-2013.
[2]Average annual reported landings of Aquarium Trade species totaled approximately 1,000 pounds from 2011-2013.

2.2.1 Discussion of Alternatives in Action 1

Alternative 1 – No Action. For all FMUs within each island management area: AM closure start date of December 31st extending backward into the year

The Council could choose to take no action through **Alternative 1**, thus AM-based closures would continue to be implemented beginning on December 31st of the appropriate year and extend backward into the year for the number of days necessary to prevent additional overages. This approach has been identified by fishermen as having negative social and economic effects. Closing the season through December 31st results in the fishery being closed during the important Christmas holiday season. For example, fishers in the USVI have identified this time period as a very important market. On the other hand, AM closures that start on December 31st and extend backward into the year guarantee that the time needed to account for the exceedance of the ACL can be fully accomplished during the year. **Alternative 1**, as well as **Preferred Alternative 2** and **Alternative 3**, propose a single AM closure date that would apply to all FMUs. Having a single AM closure date increases the potential of having multiple AM closures affecting an island/island group at the same time. Effects may vary depending on the species with the AM closures and how much fishers can compensate for the loss of fishing opportunities by fishing for other species, for example. Effects of overlapping closures are discussed in Chapter 4. Section 1.5 discusses the instances where AMs had to be applied for FMUs in Puerto Rico, St. Croix, and St. Thomas/St. John in 2013 and 2014.

Alternative 2 (Preferred) – For all FMUs within each island management area: AM closure start date of September 30th extending backward into the year

Preferred Alternative 2 would establish September 30th as the closure start date for all FMUs within each island/island group. If an FMU exceeds its ACL and AMs need to be applied in the year following an overage determination, the closure would start on the last day of September of the appropriate year and extend backward into the year for the number of days necessary to prevent such an overage from occurring again. This closure start date would apply every year AMs need to be triggered for any FMU, unless and until the chosen closure date is revised as described in Action 2. This fixed start date for all the FMUs would be implemented through regulations. If for any FMU that had AMs applied in any year, the number of days left in the year is not enough to achieve the required reduction in landings, then those additional days would be captured by extending the closure forward, beginning on October 1st.

Preferred Alternative 2 proposes September 30th as the start date for a closure per recommendation of the Caribbean Fishery Management Council (Council) District Advisory Panels (DAPs) from each island/island group. The DAPs for each of Puerto Rico, St. Croix, and St. Thomas/St. John met during March 2015 and unanimously proposed September 30th as the preferred start date for all closures for all FMUs. Proposing September 30th as the start date ensures the time needed to make sure the ACL is not exceeded again is least likely to extend through the Christmas holiday season. This date has been identified as a slow fishing season and also purposely avoids the December holiday season, a time which has been identified by USVI fishers, as economically and culturally important.

This start date is also outside of the time during which most of the spawning seasonal closures occur for some FMUs in the U.S. Caribbean (Table 1.4.2 in Section 1.4). However, depending on the species/species complex that experiences the AM and the length of time required for the closure, an AM closure under **Preferred Alternative 2** may still overlap with existing seasonal or area closures (note that already established seasonal closure dates are excluded from the analysis to determine the extent of the AM closure), particularly those seasonal closures that occur during the summer months, specifically the mutton and lane snapper closure that occurs from April 1 through June 30. This could also occur if a closure needs to move in the opposite direction (move forward from September 30th toward the end of the year) if the number of available days before September 30th is not enough to achieve the required reduction in landings. In this case the AM closure may run into a federal or state spawning closure that occurs later in the year, or the closure could extend into the December holiday season. However, the need for additional 'forward' closure is considered to be highly unlikely based on the history of AM closures.

Similar to **Alternative 1**, a single AM closure date that applies to all FMUs as proposed in **Preferred Alternative 2**, increases the potential for overlapping AM closures. The effects are discussed in Chapter 4.

Alternative 3 – For all FMUs within each island management area: AM closure start date of January 1st extending forward into the year

Alternative 3 would establish January 1st as the closure start date for all FMUs within each island/island group. This closure start date would apply every year AMs are triggered for that particular FMU, unless and until the chosen closure date is revised as described in Action 2. This fixed start date for all FMUs would be implemented through regulations.

Alternative 3 contrasts with **Alternative 1** (no action) in that closures would start in the beginning of the year and go forward toward the end of the year instead of starting at the end of the year and moving backward into the beginning of the year. When compared to **Preferred Alternative 2**, choosing a January 1st start date provides a direct, continuous closure regardless of how long the closure must be. Overlapping AM closures could occur in any of **Alternative 1** through **3** if AMs need to be applied to more than one species/species complexes in a particular island management area in a given year.

Depending on the length of the closure needed for the AM and the FMU to which the AMs would be applied, a January 1st going forward start date has a greater chance of overlapping with spawning seasonal closures for groupers and snappers and with seasonal area closures that occur early in the year. For example, if an AM closure of 32 days or more needs to be applied to the grouper FMU in St. Thomas/St. John, then a January 1st start date would overlap with the seasonal closure for groupers in federal and USVI territorial waters that starts on February 1st and extends through April 30th each year. Because there are no legal landings of the target species during the closure period in federal waters, those seasonal closure dates are excluded from the analysis to determine the length of the AM closure, thus the AM closure would of necessity extend through those seasonal closure months until the required closure time is achieved. This may result in lengthy closures for the affected species/species complex with potential socio-economic and biological effects. These are discussed in Chapter 4.

Alternative 4 – Fixed AM Closure Start Date for each FMU per island management area

Alternative 4 would consist of establishing a closure date specific to each FMU (or a group of FMUs) for each of Puerto Rico, St. Croix, St. Thomas/St. John, and Caribbean-wide. The closure date would apply every year AMs need to be triggered for that particular FMU, unless and until the chosen closure dates are revised as described in Action 2. The Council would have to choose a fixed start date as the preferred closure date for each FMU (or alternatively for a combination of FMUs) per island management area. In the case of Puerto Rico, the Council may choose a different date for each FMU on each of the commercial and recreational fishing sectors.

The selected fixed start date for each FMU will be implemented through regulations. Similar to **Preferred Alternative 2**, if for any FMU in any year the number of days left in the year is not enough to achieve the required reduction in landings, then those additional days would be captured by extending the closure forward. When compared to **Alternatives 1**, **2 (Preferred)**, and **3**, choosing different dates for each FMU or for a group of FMUs in **Alternative 4** (all sub-alternatives) may decrease the possibility of overlapping AM closures for economically important species, for example, in the event that multiple AMs need to be implemented in a particular island management area. The biological, socio-economic, and administrative analyses discussed for all sub-alternatives in **Alternative 4** primarily include a qualitative discussion on the effects of selecting and establishing different dates for each FMU or for a group of FMUs.

Sub-alternatives 4a through **4j** in **Alternative 4** allow the Council to choose a fixed starting date (i.e., month, day) for each FMU or for a combination of FMUs for each of the Puerto Rico commercial and recreational sectors, St. Croix, St. Thomas/St. John, and Caribbean-wide based on specific criteria: month with the highest average landings (**Sub-Alternative 4a** for Puerto Rico commercial; **Sub-Alternative 4c** for Puerto Rico recreational; **Sub-Alternative 4e** for St. Thomas/St. John, **Sub-Alternative 4g** for St. Croix, and **Sub-Alternative 4i** for Caribbean-wide FMUs) or the month with the lowest average landings (**Sub-Alternative 4b** for Puerto Rico commercial; **Sub-Alternative 4d** for Puerto Rico recreational; **Sub-Alternative 4f** for St. Thomas/St. John, **Sub-Alternative 4h** for St. Croix, and **Sub-Alternative 4j** for Caribbean-wide FMUs) (See Tables 2.2.1-2.2.5 above). In contrast to **Preferred Alternative 2,** where the start date results from Council input, the potential dates for **Sub-Alternatives 4a** through **4j** result from an analysis of the most recent three years of available landings data for each FMU per island management area and for each of the Puerto Rico fishing sectors. **Sub-Alternatives 4a** through **4j** propose to start the AM fishery closure on the last day of the identified month because the landings data used for the analysis are based on monthly data. The closure will then move backward into the year for the number of days necessary to achieve the required reduction in landings. The full closure must be achieved, regardless of the start day chosen. These sub-alternatives are discussed below.

For an FMU that exceeds its ACL and AMs need to be applied, **Sub-Alternatives 4a**, **4c**, **4e**, **4g**, and **4i** propose to start the AM closure on the last day of the month that, based on an analysis of recent landings data, realizes the highest landings, and move backward into the year for the number of days necessary to achieve the required reduction in landings. Closing the fishery on that date would theoretically result in the shortest closure time. Reported high landings for a species/species complex may result from factors such as higher market demand (see Table 1.4.1), higher abundance of a species in a certain area or during a specific time (availability), catchability (e.g., increased efficiency of fishing effort), and gear selectivity, among others. Note that in an AM closure the reduction in landings for the affected species/species complex is the same regardless of whether it results in a shorter or a longer closure period. All of the alternatives proposed in Action 1 (**Alternatives 1-4**) only affect the timing of the closure.

Applying AM closures during a period of higher landings of a particular species/species complex may primarily affect the socio-economic environment by interrupting supply to traditional markets and resulting in increased imports. This effect could occur in **Sub-Alternatives 4a**, **4c**, **4e**, **4g**, and **4i,** as well as in those alternatives where the AM closure date falls on the highest landings period for the affected species. For example, as shown in Table 2.2.1, the snapper unit 2 (SU2) and spiny lobster FMUs in the Puerto Rico commercial sector experience the highest average landings during the month of September, as does the wrasses FMU in St. Thomas/St. John (Table 2.2.3). September is also the month for the AM start date proposed for all FMUs across all island management areas in **Preferred Alternative 2** (i.e., September 30th going backward). Thus, **Sub-Alternative 4a** for Puerto Rico commercial SU2 and spiny lobster, **Sub-Alternative 4e** for St. Thomas/St. John wrasses, and **Preferred Alternative 2** (which applies to all FMUs) would then close these fisheries when average landings are higher, resulting in a shorter AM closure for these FMUs. Meanwhile, the boxfish FMU in the Puerto Rico commercial sector (Table 2.2.1), and the grouper and the scups and porgies FMUs in St. Thomas/St. John (Table 2.2.3) exhibit the highest average landings in January, which is also the month for the start date proposed in **Alternative 3** (i.e., January 1st going forward). Again, **Sub-Alternative 4a** for Puerto Rico commercial boxfish FMU, **Sub-Alternative 4e** for the grouper and scups and porgies FMUs in St. Thomas/St. John, and **Alternative 3**, which applies to all FMUs, would then close these fisheries when their average landings are higher, thus resulting in shorter AM closures. The AM start date in **Alternative 1** (December 31st going backward) does not coincide with any of proposed start dates in **Sub-Alternatives 4a**, **4c**, **4e**, **4g**, and **4i.** This suggests that December is not a high landings month, at least for the time frame analyzed (average landings from the three most recent years), for any FMU in any of the island management areas. What can be derived from this is that in general, a closure that occurs in December as in the no action **Alternative 1** could potentially be longer than a closure that occurs in a high landings month, such as those proposed by **Sub-Alternatives 4a**, **4c**, **4e**, **4g**, and **4i**. Table 2.2.1.1 provides examples of the scenarios discussed for some FMUs. The consequences of longer vs shorter closures on the physical, biological/ecological, social, economic, and administrative environments resulting from the different alternatives are discussed in detail in Chapter 4. None of the AM closure dates in **Alternative 1**, **Preferred Alternative 2**, or **Alternative 3** fall within the highest landing months for any FMUs in the Puerto Rico recreational sector, in St. Croix, or Caribbean-wide. It could then be expected that, for a particular species/species complex in these management areas and sectors, a closure that result from selecting any of these alternatives would be longer than if the closure occurred during the start date proposed under **Sub-Alternatives 4c** (Puerto Rico recreational, **4g** (St. Croix), and **4i** (Caribbean-wide)**.**

For an FMU that exceeds its ACL and AMs need to be applied, **Sub-Alternatives 4b, 4d, 4f, 4h,** and **4j** propose to start the AM closure on the last day of the month that, based on analysis of recent landings data, the lowest landings occur and move backward into the year for the number of days necessary to achieve the required reduction in landings. <u>This would result in the longest</u>

closure period but would likely occur at a time during the year when fishing for that particular species/species complex may be relatively less important. As mentioned above, all of the alternatives proposed in Action 1 (**Alternatives 1-4**) only affect the timing of the closure and not how much can be landed, which is bounded by the ACL. Reported low landings for a species/species complex may result from factors such as weather (e.g. hurricane season, fronts), low market demand (see Table 1.4.1), lower abundance of a species in a certain area or during a specific time (availability), low catchability (e.g., decreased efficiency of fishing effort), among others. Effects from a longer closure could occur in **Sub-Alternatives 4b, 4d, 4f, 4h,** and **4j** as well as in those alternatives where the AM closure date falls on the lowest landings period for the affected species. Tables 2.2.1 through 2.2.5 show the resulting dates for the lowest landings for FMUs in all island management areas. For example, several FMUs in the Puerto Rico recreational sector exhibit low landings during the month of September, although none of the Puerto Rico commercial sector FMUs exhibit the lowest landings (**Sub-Alternative 4d**) during that month (**Sub-Alternative 4b**) (Table 2.2.2). Meanwhile, in St. Thomas/St. John spiny lobster exhibits the lowest landings (**Sub-Alternative 4f**) (Table 2.2.3) during the month of September, as does the parrotfish and the wrasses FMUs in St. Croix (**Sub-Alternative 4h**) (Table 2.2.4), and the aquarium trade at the Caribbean-wide level (**Sub-Alternative 4j**) (Table 2.2.5). September is also the month for the AM start date proposed for all FMUs across all island management areas in **Preferred Alternative 2** (i.e., September 30th going backward). Thus, the sub-alternatives mentioned above for those FMUs and **Preferred Alternative 2** (which applies to all FMUs) would then close those fisheries when average landings are lower, resulting in a longer AM closure for these FMUs. Regardless of potentially longer closures for several FMUs, fishers in Puerto Rico and the USVI have expressed in numerous occasions that September is a month with low fishing activity, justifying their preference for AM closures to occur during this time (see Table 1.2.1).

To provide another example, the parrotfish and the squirrelfish FMUs in the Puerto Rico commercial sector (Table 2.2.1), the goatfish FMU in St. Croix (Table 2.2.4), and the tilefish FMU Caribbean-wide (Table 2.2.5) exhibit lower average landings in January, which is also the month for the start date proposed in **Alternative 3** (i.e., January 1st going forward). Thus, **Sub-Alternative 4b, Sub-Alternative 4h**, **Sub-Alternative 4j**, and **Alternative 3**, which applies to all FMUs, would all close these fisheries in Puerto Rico (commercial), St, Croix, and Caribbean-wide, respectively, when their average landings are lower, thus resulting in longer AM closures. Finally, the AM start date in **Alternative 1** (December 31st going backward) coincides with several of the proposed start dates in **Sub-Alternatives 4b**, **4d**, **4f**, **4h**, and **4j** (see Tables 2.2.1-2.2.5). Thus for these FMUs, the status quo closure date (December 31st) would result in longer closures. Table 2.2.1.1 provides examples of the scenarios discussed for some FMUs. The consequences of longer vs shorter closures on the physical, biological/ecological, social, economic, and administrative environments resulting from the different alternatives are discussed in detail in Chapter 4.

Table 2.2.1.1 below shows how long AM closures in federal waters would need to be under each of the alternatives proposed in Action 1 using as examples the five FMUs from Puerto Rico, St. Croix, and St. Thomas/St. John that had AMs applied in the 2013 fishing year under the status quo (**Alternative 1**, December 31st going backward). For example, the 2013 AM closure for the Puerto Rico commercial sector Snapper Unit 2 (SU2) under **Alternative 1** was 102 days. Using the same number of pounds that the ACL was exceeded, under **Preferred Alternative 2** (closure starting September 30th backward) Puerto Rico SU2 for the commercial sector would have been closed for 96 days (6 less days than **Alternative 1**), 172 days if start date was January 1st (**Alternative 3**), 96 days under **Sub-Alternative 4b** (highest reported monthly landings [average]), and 170 days under **Sub-Alternative 4b** (lowest reported monthly landings [average]). Because the effects of the AM closures applied in 2013 have not been assessed, it is difficult to make assumptions as to what would be the impacts of these various closure lengths and dates. However, in general, based on the information provided by the fishing community with respect to important identified market dates and the harvest importance of particular species it could be assumed that longer closures would have the greatest socio-economic effect.

The grouper FMU in federal waters of the St. Thomas/St. John management area also had an AM-based closure applied in 2013. Similar to SU2 and other FMUs shown in Table 2.2.1.1, different alternatives affect the length and time in the year of the AM closures. In 2013, (status quo **Alternative 1**) grouper harvest was closed in St. Thomas/St. John federal waters for 12 days. Under **Preferred Alternative 2** (September 30th backward), grouper harvest would have been closed for seven days. If the AM closure started in January 1st and moved forward (**Alternative 3**), grouper harvest would have been closed five days. In this particular case for the grouper FMU in St. Thomas, January is also the month with the highest reported average landings, which is the closure start date resulting from **Sub-Alternative 4e**. Lastly, if the closure occurred under **Sub-Alternative 4f**, which identifies the period of lowest average landings, the AM closure for St. Thomas/St. John groupers would have started on December 31st moving backward into the year, and would have lasted 12 days, which is also similar to a closure under the status quo (**Alternative 1**). Under both **Alternative 1** and **Sub-Alternative 4f**, the harvest of the grouper FMU in St. Thomas/St. John federal waters would have been closed during the Christmas holiday period, identified as high demand for all species in St. Thomas/St. John. If this occurred, traditional markets for fish could have been lost if buyers of local fish switched to imports or bought fish from other regions of the U.S.

The physical, biological, economic, social, and administrative effects of all alternatives are discussed in Chapter 4.

Table 2.2.1.1. Potential scenarios under **Alternatives 1** through **4** using as example fishery management units that had accountability measures applied in 2013 in Puerto Rico (PR), St. Croix (STX), and St. Thomas/St. John (STT/STJ) federal waters.

Fishery Management Unit	Annual Catch Limit (pounds [lbs])	Number of Pounds ACL was Exceeded[1]	Days Closure under Alt. 1 (Dec 31 backward)	Days of closure under Preferred Alt. 2 (Sep 30 backward)	Days of closure under Alternative 3 (Jan 1 forward)	Days of closure under Alt. 4: 4a, 4c, 4e, 4g, 4i (date varies by FMU)[2]	Days of closure under Alt 4: 4b, 4d, 4f, 4h, 4j (date varies by FMU)[2]
Snapper Unit 2 (Commercial PR)	145,916	132,063	Sep 21 – Dec 31 = 102 days	Jun 27 – Sep 30 = 96 days	Jan 1 – June 21 = 172 days	***Sub-Alt. 4a***	***Sub-Alt. 4b***
						Sep 30	Mar 31
						96 days	170 days**
Wrasses (Recreational PR)	5,050	489	Oct 21 – Dec 31 = 72 days	Sep 20 – Sep 30 = 11 days	Jan 1 – Mar 8 = 67 days	***Sub-Alt. 4c***	***Sub-Alt. 4d***
						Oct 31	Dec 31*
						11 days	72 days
Triggerfish & Filefish (all sectors, STX)	24,980	1,473	Nov 21 – Dec 31 = 41 days	Aug 30 – Sept 30 = 32 days	Jan 1 – Jan 20 = 20 days	***Sub-Alt. 4g***	***Sub-Alt. 4h***
						May 31	Dec 31*
						18 days	41 days
Spiny Lobster (all sectors, STX)	107,307	2,401	Dec 19 – Dec 31= 13 days	Sep 18 – Sept 30 = 13 days	Jan 1 – Jan 5 = 5 days	***Sub-Alt. 4g***	***Sub-Alt. 4h***
						May 31	Dec 31
						8 days	13 days
Groupers (all sectors, STT/STJ)	51,849	4,984	Dec 20 – Dec 31 = 12 days	Sep 24 – Sept 30 = 7 days	Jan 1 – Jan 5 = 5 days	***Sub-Alt. 4e***	***Sub-Alt. 4f***
						Jan 31	Dec 31
						5 days	12 days

[1]ACL overages were determined from analyses conducted in 2013 using 2011 reported landings for Wrasses (PR recreational sectore), Triggerfish and Filefish (STX), and Spiny Lobster (STX). The average of landings from 2010 and 2011 was used for analyzing ACL overages for SU2 in PR and Groupers in STT/STJ. This same overage was used to estimate days of closures under **Alternatives 2** through **4** in this example.

[2] Dates for **Sub-Alternatives 4a-4j** were identified from the analysis of the most recent landings from 2012-2014 for Puerto Rico (recreational), STX, and STT/STJ, and 2011-2013 for Puerto Rico (commercial).

**Closing the Puerto Rico commercial SU2 fishery from January to March 31st still resulted in landings above the ACL. Therefore, additional closure dates of April 1st to June 19th were necessary to keep the landings below the ACL.

2.3 List of Alternatives for Action 2

Action 2: Specify a time period for revisiting the approach to establish AM-based closures selected in Action 1.

Alternative 1. No action. Do not specify how often the approach chosen should be revisited.

Alternative 2 (Preferred). Review the approach selected no longer than 2 years from implementation and every 2 years thereafter.

Alternative 3. Review the approach selected no longer than 5 years from implementation and every 5 years thereafter.

2.3.1 Discussion of Alternatives in Action 2

The purpose of Action 2 is to provide options to review and possibly revise the approach chosen in Action 1. Under any of the alternatives proposed, the Council has the option to review the approach at any time; however, **Preferred Alternative 2** and **Alternative 3** of Action 2 ensure a reevaluation is conducted within a specified timeframe. Reviewing the approach that sets the timing for AM closures can involve reviewing the dates selected, criteria for choosing the dates, or any other aspect of the rule.

Alternative 1 is the no action alternative, and does not set a specific timeframe to re-evaluate the dates and/or approach chosen in Action 1. Under **Alternative 1**, the AM closure start date(s) selected for FMUs or the process chosen for selection of those dates would continue to be used unless and until the Council takes action to modify it. Any positive, negative, or neutral effects resulting from the chosen closure dates would continue until then. However, the chosen method can be revisited at any time to incorporate new information.

Under **Preferred Alternative 2** and **Alternative 3**, the Council would schedule a review (or re-evaluation) of the approach no longer than 2 years after implementation and every 2 years after that or no longer than 5 years after implementation and every 5 years thereafter, respectively. The purpose of these two alternatives is to ensure that the dates and process selected are reviewed (or re-evaluated) within a specified time frame. When compared to **Alternative 1**, **Preferred Alternative 2** and **Alternative 3** may require the Council to more frequently revisit and re-evaluate the selected method. Similar to **Alternative 1**, any positive, negative, or neutral effects resulting from the chosen closure dates would continue until then. However, the chosen method can be revisited at any time to incorporate new information. If the Council does not take action to revisit before the time limit set in **Preferred Alternative 2** and **Alternative 3**, then any effects from the chosen AM start date(s)/process would continue for a longer time period under **Alternative 3** than **Alternative 2 (Preferred)**. Under **Alternative 1** there is also the possibility

of more time passing before a revision is conducted because there is no time limit, therefore any effects would be prolonged.

Chapter 3. Affected Environment

The action considered in this comprehensive amendment and associated environmental assessment would affect the U.S. Caribbean exclusive economic zone (EEZ) of Puerto Rico and the U.S. Virgin Islands (USVI) (Figure 3.1.1). Species affected by the action in this comprehensive amendment include all species included in the Reef Fish, Queen Conch, Corals and Associated Plants and Invertebrates (Coral FMP), and Spiny Lobster Fishery Management Plans (FMPs) of Puerto Rico and the USVI.

The affected environment is divided into five major components:

- **Physical / Habitat Environment** (Section 3.1)
  General description of physical environment and habitat (essential fish habitat)
- **Biological and Ecological Environment** (Section 3.2)
  Examples include description of the affected species and protected species
- **Description of the Fisheries** (Section 3.3)
  Examples include descriptions of the commercial and recreational fisheries in the U.S. Caribbean
- **Economic and Social Environment** (Section 3.4)
  Examples include fishing communities and economic description of the fisheries
- **Administrative Environment** (Section 3.5)
  Example includes the fishery management process

The physical, biological, economic, social, and administrative environments have been described in detail in the 2010 and 2011 Caribbean Annual Catch Limit (ACL) Amendments (CFMC 2011a, b) and associated environmental impact statements (EIS), and in the most recent Caribbean actions affecting reef fish, queen conch, and coral resources including Regulatory Amendment 4 to the Reef Fish FMP (CFMC 2013c), Regulatory Amendment 2 to the Queen Conch FMP (CFMC 2013b), and Amendment 4 to the Coral FMP (CFMC 2-13a). Information from these documents is incorporated herein by reference. These documents can be found on the National Marine Fisheries Service (NMFS) Sustainable Fisheries, Caribbean Branch website, http://sero.nmfs.noaa.gov/sustainable_fisheries/caribbean/index.html. Summaries of the affected environment can be found in Sections 3.1 through 3.5.

3.1 Physical/Habitat Environment

The physical (including geology and climate) and habitat environments of the U.S. Caribbean were described in detail in the Generic Essential Fish Habitat (EFH) Amendment to FMPs of the U.S. Caribbean, the EFH Final Environmental Impact Statement (EFH-FEIS) (CFMC 1998, 2004), the Five -Year review of EFH in the U.S. Caribbean, Vols.1 and 2 (CFMC 2011c), and Regulatory Amendment 2 to the Queen Conch FMP (CFMC 2013a). These documents are incorporated herein by reference and are summarized below.

The U.S. Caribbean is located in the eastern portion of the Caribbean archipelago, about 1,770 kilometers (km) (1,100 miles [mi]) east-southeast of Miami, Florida (Olcott 1999). It comprises the Commonwealth of Puerto Rico in the Greater Antilles and the Territory of the USVI in the Lesser Antilles island chains (Figure 3.1.1), both of which separate the Caribbean Sea from the western central Atlantic Ocean. The U.S. Caribbean EEZ covers an area of approximately 196,029 square kilometers (km^2) (75,687 square miles [mi^2]).

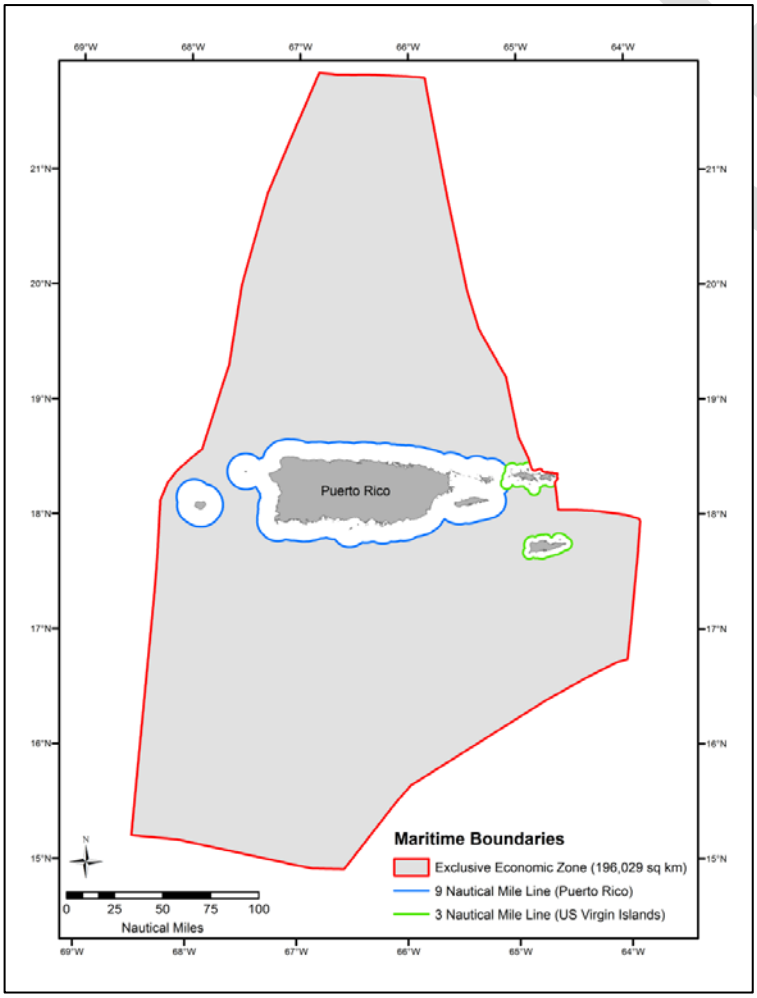

Figure 3.1.1. Boundaries of the U.S. Caribbean EEZ, Puerto Rico waters, and USVI waters.
(Source: NMFS 2014)

The USVI are part of the Virgin Islands chain, which lies in the northeastern Caribbean about 80 km (50 miles) east of Puerto Rico (mainland). The USVI consist of four major islands, St. Thomas, St. John, St. Croix, and Water Island, and about 50 cays (DPNR 2005). Together, the USVI constitutes approximately 347 km^2 (134 mi^2) of land area (Catanzaro et al. 2002).

The islands of St. Thomas and St. John are bordered by the Atlantic Ocean to the north and the Caribbean Sea to the south. Their respective areas are approximately 83 km^2 (32 mi^2) and 52 km^2 (20 mi^2) (Catanzaro et al. 2002). The shelf shared by the islands of St. Thomas and St. John has an area of approximately 1751 km^2 (510 nm^2) with most of the shelf more than 24.4 m (80 ft) deep (Kojis and Quinn 2012).

The island of St. Croix is located about 74 km (46 mi) south of St. Thomas and St. John (CFMC 2004). Covering about 207 km^2 (80 mi^2), St. Croix is entirely surrounded by the Caribbean Sea. The island of St. Croix lies on a different geological platform than the islands of St. Thomas and St. John, and is separated from those islands by a 4 km (2.5 mi) deep trench (CFMC 2004) (Figure 3.1.2). The St. Croix shelf is much narrower and shallower than that of the northern islands (Goenaga and Boulon 1991), extending only 4 km (2.2 nm) wide in the south, less than 0.2 km (0.1 nm) wide on the northwest, and up to several nautical miles wide in the northeast and on Lang Bank (CFMC 2004; CFMC 2011a). In total, the St. Croix shelf has an area of approximately 343 km^2 (99 nm^2) (references in Gordon 2010) with most of the shelf less than 24.4 m (80 ft) deep (Kojis and Quinn 2012).

The island of Puerto Rico is almost rectangular in shape, about 177 by 56 km (110 by 35 mi), and is the smallest and the most eastern island of the Greater Antilles (CFMC 1998, Morelock et al. 2001). Its coast measures approximately 1,227 km (700 mi) and includes the adjacent inhabited islands of Vieques and Culebra. In addition, the Commonwealth of Puerto Rico includes the islands of Mona, Monito, and various other isolated islands without permanent populations. Deep ocean waters fringe Puerto Rico. The Mona Passage, which separates the island from Hispaniola to the west, is about 120 km (75 mi) wide and more than 1,000 m (3,300 ft) deep. Off the northern coast is the 8,500 m (28,000 ft) deep Puerto Rico Trench, and to the south the sea bottom descends to the 16,400 ft (5,000 m) deep Venezuelan Basin of the Caribbean Sea.

Puerto Rico shares the same shelf platform as St. Thomas and St. John, and that shelf also extends east to include the British Virgin Islands. The St. Croix platform connects through a deep submerged mountain range (including Grappler Bank and Investigador, among other banks in the EEZ) to the southeast platform of Puerto Rico (Figure 3.1.2).

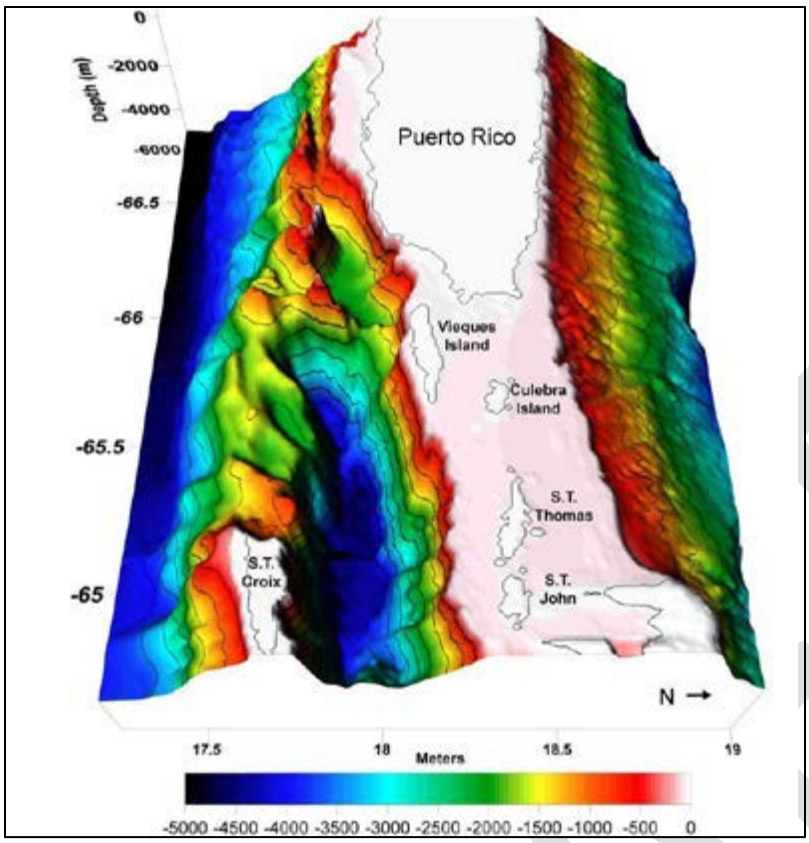

Figure 3.1.2. Shared platform between the east coast of Puerto Rico and St. Thomas/St. John. The deep trough between the Puerto Rico/St. Thomas/St. John platform and St. Croix is clearly seen in this graphic representation of depth (Source: García-Sais et al. 2005).

Habitat

A description of the major habitat types in the U.S. Caribbean EEZ, along with information on their ecological functions and condition, can be obtained in Section 3.2 of the EFH-FEIS (CFMC 2004) and in Section 5.1.3 of the Caribbean Sustainable Fisheries Act (SFA) Amendment (CFMC 2005), are incorporated herein by reference, and are summarized below. A description of the major habitat types of the USVI can be found in the USVI Marine Resources and Fisheries Strategic and Comprehensive Conservation Plan, prepared by the Department of Planning and Natural Resources (DPNR) of the USVI (DPNR 2005) and is incorporated herein by reference. For a description of the major habitat types of Puerto Rico, please see García-Sais et al. (2008). The coastal marine environments of the USVI and Puerto Rico are characterized by a wide variety of habitat types. Kendall et al. (2001) delineated 21 distinct benthic habitats types. The EFH-FEIS (CFMC 2004) summarized the percent distribution for all habitats in the U.S. Caribbean from the 5,494 km^2 (2,121 mi^2) of total bottom area mapped from aerial photographs. This total included both Puerto Rico (5,009 km^2 [1,934 mi^2]) and the USVI (485 km^2 [187 mi^2]), and covered from the shore line to about 20 m (66 ft) depth.

In the USVI, 24 km^2 (9 mi^2) of unconsolidated sediment, 161 km^2 (62 mi^2) of SAV, 2 km^2 (0.8 mi^2) of mangroves, and 300 km^2 (116 mi^2) of coral reef and hard bottom were mapped over an area of 485 km^2 (187 mi^2). In Puerto Rico, 49 km^2 (19 mi^2) of unconsolidated sediment, 721 km^2 (278 mi^2) of SAV, 73 km^2 (28 mi^2) of mangroves, and 756 km^2 (292 mi^2) of coral reef and colonized hard bottom were mapped (CFMC 2013).

Essential Fish Habitat (CFMC 2004; CFMC 2011c)

Essential fish habitat (EFH) is defined in the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) as "those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S. C. 1802(10)). Specific categories of EFH identified in Puerto Rico and the USVI, which are utilized by federally managed fish and invertebrate species, include both estuarine/inshore and marine/offshore areas. Specifically, estuarine/inshore EFH includes estuarine emergent and mangrove wetlands, submerged aquatic vegetation, intertidal flats, palustrine emergent and forested systems, and the estuarine water column. Additionally, marine/offshore EFH includes live/hard bottom habitats, coral and coral reefs, seagrass and algal plains, sand and shell substrate, and the marine water column. Essential fish habitat includes the spawning area in the water column above the adult habitat. EFH utilized by fish and invertebrate species in this region includes coral reefs, live/hard bottom, and submerged aquatic vegetation.

3.2 Biological and Ecological Environment

3.2.1 Description of the Species: Biology/Ecology

The biological environment of the U.S. Caribbean, including the species addressed in this amendment, is described in detail in the 2010 and 2011 Caribbean ACL Amendments (CFMC 2011a, b). Species affected by the action in this amendment include species in the Reef Fish, Coral, and Spiny Lobster FMPs. Species in these FMPs are managed as stocks or stock complexes in fishery management units (FMUs).

Table 3.2.1.1. Species included in the Reef Fish, Coral, and Spiny Lobster FMPs.

Fishery Management Unit	
Reef Fish FMP	
Grouper Unit 1 Nassau grouper, *Epinephelus striatus*	**Goatfish FMU** Spotted goatfish, *Pseudupeneus maculatus;* Yellow goatfish, *Mulloidichthys martinicus*
Grouper Unit 2 Goliath grouper, *Epinephelus itajara*	**Tilefishes FMU** Blackline tilefish, *Caulolatilus cyanops* Sand tilefish, *Malacanthus plumieri*
Grouper Unit 3 Red hind, *Epinephelus guttatus*, coney *Cephalopholis fulvus*, rock hind, *Epinephelus adscensionis*, Graysby, *Cephalopolis cruentata*	**Scups and Porgies FMU** Jolthead porgy, *Calamus bajonado*, Sea bream, *Archosargus rhomboidalis*, Sheepshead porgy, *Calamus penna;* Pluma, *Calamus pennatula*
Grouper Unit 4 Black grouper *Mycteroperca bonaci*; Red grouper, *Epinephelus morio*, Tiger grouper, *Mycteroperca tigris*, Yellowfin grouper, *Mycteroperca venenosa*	**Squirrelfish FMU** Blackbar soldierfish, *Myripristis jacobus,* Bigeye, *Priacanthus arenatus*, Longspine squirrelfish, *Holocentrus rufus; S*quirrelfish, *Holocentrus adscensionis*
Grouper Unit 5 Misty grouper, *Epinephelus mystacinus*, Yellowedge grouper , *Epinephelus flavolimbatus*	**Surgeonfish FMU** Blue tang, *Acanthurus coeruleus*, Ocean surgeonfish, *Acanthurus bahianus;* Doctorfish, *Acanthurus chirurgus*
Snapper Unit 1 Black snapper, *Apsilus dentatus*; blackfin snapper, *Lutjanus buccanella*; Silk snapper , *Lutjanus vivanus*, Vermilion snapper *Rhomboplites aurorubens*, Wenchman, *Pristipomoides aquilonaris*	**Grunts FMU** White grunt, *Haemulon plumierii;* Margate, *Haemulon albu;* Tomtate, *Haemulon aurolineatum;* Bluestriped grunt, *Haemulon sciurus;* French grunt, *Haemulon flavolineatum;* Porkfish, *Anisotremus virginicus*
Snapper Unit 2 Cardinal snapper, *Pristipomoides macrophthalmus*, Queen snapper , *Etelis oculatus*	**Wrasses FMU** Hogfish, *Lachnolaimus maximus;* Puddingwife, *Halichoeres radiates;* Spanish hogfish, *Bodianus rufus*
Snapper Unit 3 Gray snapper, *Lutjanus griseus*, Lane snapper, *Lutjanus synagris*, Mutton snapper, *Lutjanus analis*, Dog snapper *Lutjanus jocu*, Schoolmaster , *Lutjanus apodus*, Mahogany snapper, *Lutjanus mahogoni*	**Jacks FMU** Blue runner, *Caranx crysos;* Horse-eye jack, *Caranx latus*; Black jack, *Caranx lugubris*; Almaco jack, *Seriola rivoliana*; Bar jack, *Caranx ruber*; Greater amberjack, *Seriola dumerili*; Yellow jack, *Caranx bartholomaei*
Snapper Unit 4 Yellowtail snapper, *Ocyurus chrysurus*	**Angelfish FMU** Queen angelfish, *Holacanthus ciliaris;* Gray angelfish, *Pomacanthus arcuatus;* French angelfish, *Pomacanthus paru*
Parrotfish Unit Blue parrotfish , *Scarus coeruleus*, Midnight parrotfish, *Scarus coelestinus*, Princess parrotfish , *Scarus taeniopterus*, Queen parrotfish , *Scarus vetula*, Rainbow parrotfish, *Scarus guacamaia*, Redfin parrotfish, *Sparisoma rubripinne*, Redtail parrotfish, *Sparisoma chrysopterum*, Stoplight parrotfish, ***Sparisoma viride,***	**Boxfish FMU** Honeycomb cowfish, *Acanthostracion polygonius* (formerly Lactophrys polygonia); Scrawled cowfish, *Acanthostracion quadricornis* (formerly *Lactophrys quadricornis*); Trunkfish, *Lactophrys trigonus;* Spotted trunkfish, *Lactophrys bicaudalis;* Smooth

Fishery Management Unit	
Redband parrotfish , *Sparisoma aurofrenatum*, Striped parrotfish, *Scarus iseri* (formerly *Scarus croicencis*)	trunkfish, *Lactophrys triqueter*
Aquarium Trade Species[1]	**Triggerfish and Filefish FMU** Ocean triggerfish, *Canthidermis sufflamen;* Queen triggerfish, *Balistes vetula;* Sargassum triggerfish, *Xanthichthys ringens;* Black durgon, *Melichthys niger;* Scrawled filefish, *Aluterus scriptus;* Whitespotted filefish, *Cantherhines macrocerus*
Spiny Lobster FMP Spiny lobster, *Panulirus argus*	
Corals and Associated Plants and Invertebrates Prohibited corals and invertebrates[1] Aquarium Trade Species[1]	

[1]A comprehensive list of the species included in these FMUs can be found in 50 CFR Part 622, Appendix A to Part 622–-Species Tables, http://sero.nmfs.noaa.gov/sustainable_fisheries/policy_branch/documents/pdfs/current_50cfr622_regulations.pdf

Descriptions of the life history characteristics and ecology of all Council-managed species can be found in the 2005 Caribbean SFA Amendment (CFMC 2005), the 2010 Caribbean ACL Amendment (CFMC 2011a), and the 2011 Caribbean ACL Amendment (CFMC 2011b), and are incorporated herein by reference. The most recent description of the biology and ecology of the parrotfish FMU can be found in Regulatory Amendment 4 to the Reef Fish FMP (CFMC 2013c). The biology and ecology of managed corals and reef associated plants and invertebrates were updated through Amendment 4 to the Coral FMP (CFMC 2013a).

3.2.2 Protected Species

At least seventeen species of whales and dolphins have been reported in or near U.S. waters in the northeastern Caribbean (Mignucci-Giannoni 1998). All seventeen are protected under the Marine Mammal Protection Act (MMPA). Four of these species are also listed as endangered under the Endangered Species Act (ESA) (i.e., sperm, sei, fin, and humpback whales). These four species are known to occur in this area. In addition to those marine mammals, four species of sea turtles (green, hawksbill, leatherback, and loggerhead), and seven coral species (elkhorn coral, staghorn coral [collectively "*Acropora*"], rough cactus coral, mountainous star coral, lobed star coral, boulder star coral, and pillar coral) are also protected under the ESA. Portions of designated critical habitat, for green and leatherback sea turtles and for *Acropora* corals, also occur within the U.S. Caribbean. The potential impacts from the continued authorization of fishing under the Reef Fish, Coral, Spiny Lobster, and Queen Conch FMPs of Puerto Rico and the USVI on all ESA-listed species have been considered in previous ESA Section 7

consultations. Summaries of those consultations and their determination are in Appendix A. Those consultations indicate that one or more of those fisheries are likely to interact with sea turtles and *Acropora* coral and *Acropora* critical habitat; these entities are described briefly below. The non-*Acropora* corals listed above received federal protection in the fall of 2014. An evaluation of the impacts from the continued authorization of fishing under the Caribbean FMPs is underway for these species.

Green sea turtle hatchlings are thought to occupy pelagic areas of the open ocean and are often associated with *Sargassum* rafts (Carr 1987; Walker 1994). Pelagic stage green sea turtles are thought to be carnivorous. Stomach samples of these animals found ctenophores and pelagic snails (Frick 1976; Hughes 1974). At approximately 20 to 25 cm (7.9 to 9.8 in) carapace length, juveniles migrate from pelagic habitats to benthic foraging areas (Bjorndal 1997). As juveniles move into benthic foraging areas a diet shift towards herbivory occurs. They consume primarily seagrasses and algae, but are also know to consume jellyfish, salps, and sponges (Bjorndal 1980, 1997; Paredes 1969; Mortimer 1981, 1982). The diving abilities of all sea turtles species vary by their life stages. The maximum diving range of green sea turtles is estimated at 110 m (360 ft) (Frick 1976), but they are most frequently making dives of less than 20 m (65 ft) (Walker 1994). The time of these dives also varies by life stage. The maximum dive length is estimated at 66 minutes with most dives lasting from 9 to 23 minutes (Walker 1994).

The hawksbill's pelagic stage lasts from the time they leave the nesting beach as hatchlings until they are approximately 22-25 cm (8.7-9.8 in) in straight carapace length (Meylan 1988; Meylan and Donnelly 1999). The pelagic stage is followed by residency in developmental habitats (foraging areas where juveniles reside and grow) in coastal waters. Little is known about the diet of pelagic stage hawksbills. Adult foraging typically occurs over coral reefs, although other hard-bottom communities and mangrove-fringed areas are occupied occasionally. Hawksbills show fidelity to their foraging areas over several years (van Dam and Diéz 1998). The hawksbill's diet is highly specialized and consists primarily of sponges (Meylan 1988). Gravid females have been noted ingesting coralline substrate (Meylan 1984) and calcareous algae (Anderes Alvarez and Uchida 1994), which are believed to be possible sources of calcium to aid in eggshell production. The maximum diving depths of these animals are not known, but the maximum length of dives is estimated at 73.5 minutes. More routinely, dives last about 56 minutes (Hughes 1974).

Leatherbacks are the most pelagic of all ESA-listed sea turtles and spend most of their time in the open ocean. Although, they will enter coastal waters and are seen over the continental shelf on a seasonal basis to feed in areas where jellyfish are concentrated. Leatherbacks feed primarily on cnidarians (medusae, siphonophores) and tunicates. Unlike other sea turtles, leatherbacks' diets do not shift during their life cycles. Because leatherbacks' ability to capture and eat jellyfish is not constrained by size or age, they continue to feed on these species regardless of life stage (Bjorndal 1997). Leatherbacks are the deepest diving of all sea turtles. It is estimated that

these species can dive in excess of 1000 m (3,280 ft) (Eckert et al. 1989) but more frequently dive to depths of 50 m to 84 m (174 to 276 ft) (Eckert et al. 1986). Dive times range from a maximum of 37 minutes to more routines dives of 4 to 14.5 minutes (Standora et al. 1984; Eckert et al. 1986; Eckert et al. 1989; Keinath and Musick 1993). Leatherbacks may spend 74% to 91% of their time submerged (Standora et al. 1984).

Acropora cervicornis and *Acropora palmata*, the only two species of acroporids in the Caribbean, are two of the major reef-building corals in the wider Caribbean. Elkhorn colonies form flattened to near-round branches that typically radiate outward from a central trunk that is firmly attached to the sea floor. Staghorn colonies are stag antler-like, with cylindrical, straight, or slightly curved branches. The branching morphology of these species provides important habitat for other reef organisms. Historically, both acroporid species formed dense thickets at shallow (<5 m [16 ft]) and intermediate (10 to 15 m [33 to 49 ft]) depths in many reef systems, including locations in the Florida Keys, western Caribbean (e.g., Jamaica, Cayman Islands, Caribbean Mexico, Belize), and eastern Caribbean. In the 1960s and 1970s in the USVI, elkhorn coral was the main reef-building coral at depths less than 10 m (33 ft) (Rogers et al. 2002). Elkhorn coral grew in nearly monospecific stands on the reef crest and in the upper and lower forereef zones of well-developed fringing and bank barrier reefs, as well as on isolated patch reefs (Rogers et al. 2002). The maximum range in depth reported for elkhorn coral is <1 to 30 m (<3.28 to 98 ft), but historic data for this coral in the USVI indicate that it was common at depths from 1 to 15 m (3.28 to 49 ft) (Bacle 2002; Rogers et al. 2008). The preferred habitat of elkhorn coral is the seaward face of a reef (turbulent shallow water), including the reef crest, and shallow spur-and-groove zone (Shinn 1963; Cairns 1982; Rogers et al. 1982). Historically, staghorn coral was reported from depths ranging from <1 to 60 m (<3.28 to 197 ft) (Goreau and Goreau 1973). It is suspected that 60 m (197 ft) is an extreme situation and that the coral is relatively rare below 20 m (66 ft) depth. The common depth range at which staghorn coral is currently observed is 5 to 17 m (16 to 56 ft). In the USVI, this species was abundant, but not often found in dense thickets or well-defined zones (Rogers et al. 2002); unlike in areas in the western Caribbean where this species was historically the primary constructor of mid-depth (10 to 15 m [33 to 49 ft]) reef terraces (Adey 1978).

Pillar coral (*Dendrogyra cylindrus*) forms cylindrical columns on top of encrusting bases. Colonies are generally grey-brown in color and may reach circa 10 ft (3 m) in height. Polyp tentacles remain extended during the day, giving columns a furry appearance. Pillar coral inhabits most reef environments in water depths ranging from ~3-75 ft (1-25 m), but it is most common between ~15-45 ft (5-15 m) depth (Acosta and Acevedo 2006; Cairns 1982; Goreau and Wells 1967). Pillar coral is a gonochoric (separate sexes) broadcast spawning species with relatively low annual egg production for its size. Sexual recruitment of this species is low, and reported juvenile colonies in the Caribbean are lacking. Pillar coral can reproduce by fragmentation following storms or other physical disturbance. Average growth rates of 0.7-0.8 in (1.8-2.0 cm) per year in linear extension have been reported in the Florida Keys compared to

0.8 cm per year in Colombia and Curaçao. Feeding rates (removal of suspended particles in seawater) are low relative to most other Caribbean corals, indicating it is primarily a tentacle feeder rather than a suspension feeder. However, pillar coral has a relatively high photosynthetic rate, and it receives substantial amounts of energy from its symbiotic algae. Pillar coral is uncommon but conspicuous with scattered, isolated colonies. In monitoring studies, cover is generally less than 1%. At permanent monitoring stations in the USVI, pillar coral has been observed in low abundance at 10 of 33 sites and, where present, ranged in cover from less than 0.05-0.22% (Smith 2013). It is rarely found in aggregations.

Rough cactus coral (*Mycetophyllia ferox*) forms a thin, encrusting plate that is weakly attached. Maximum colony size is ~20 inches (50 cm) in diameter. It has been reported in reef environments in water depths of ~15 to 300 ft (5 to 90 m), including shallow and mesophotic habitats. Rough cactus coral is a hermaphroditic (simultaneously both sexes) brooding (fertilization occurs within the parent colony and grows for a period of time before release) species. Colony size at first reproduction is greater than 15 in^2 (100 cm^2). Recruitment of rough cactus coral appears to be very low, even in studies from the 1970s. Rough cactus coral has a lower fecundity compared to other species in its genus (Morales Tirado 2006). Over a 10 year period, no colonies of rough cactus coral were observed to recruit to an anchor-damaged site in the U.S. Virgin Islands although adults were observed on the adjacent reef (Rogers and Garrison 2001). Rough cactus coral is usually uncommon or rare, constituting less than 0.1% of all coral species at generally less than 1% of the benthic cover. Benthic cover of rough cactus coral in the Red Hind Marine Conservation District off St. Thomas, USVI, which includes mesophotic coral reefs, was 0.003 ± 0.004% in 2007, accounting for 0.02% of coral cover, and ranking 20th highest in cover out of 21 coral species (Nemeth et al. 2008; Smith et al. 2010). In the USVI between 2001 and 2012, cover of rough cactus coral appeared in 12 of 33 survey sites and accounted for 0.01% of the bottom, and 0.07% of the coral cover, ranking as 13th most common (Smith 2013).

Boulder star coral (*Orbicella franksi*) is one of the three species [mountainous star coral (*Orbicella faveolata*) and lobed star coral (*Orbicella annularis*) are the others] in the *Orbicella annularis* complex. These three species were formerly in the genus *Montastraea*; however, recent work has reclassified the three species in the *annularis* complex to the genus *Orbicella* (Budd et al. 2012). Boulder star coral is distinguished by large, unevenly arrayed polyps that give the colony its characteristic irregular surface. Colony form is variable, and the skeleton is dense with poorly developed annual bands. Colony diameter can reach up to 16 ft (5 m) with a height of up to 6.5 ft (2 m). Boulder star coral tends to have a deeper distribution than the other two species in the *Orbicella* species complex. It occupies most reef environments and has been reported from water depths ranging from ~16-165 ft (5 to 50 m), with the species complex reported to 250 ft (90 m). *Orbicella* species are a common, often dominant, component of Caribbean mesophotic reefs, suggesting the potential for deep refugia for boulder star coral. Boulder star coral is hermaphroditic (simultaneously having both sexes) broadcast spawners,

with spawning concentrated on 6 to 8 nights following the full moon in late August, September, or early October. Boulder star coral spawning is reported to be about one to two hours earlier than lobed star coral and mountainous star coral. Fertilization success measured in the field was generally below 15% for all three species being closely linked to the number of colonies concurrently spawning. In Puerto Rico, minimum size at reproduction for the star coral species complex was 13 in^2 (83 cm^2). Boulder star coral is reported as common. In the USVI, boulder star coral is the second most abundant species by percent cover at permanent monitoring stations. However, because the species complex, which is the most abundant by cover, was included as a category when individual *Orbicella* species could not be identified with certainty, it is likely that boulder star coral is the most abundant. Population estimates of boulder star coral in the ~19 square mile (49 km^2) Red Hind Marine Conservation District are at least 34 million colonies (Smith 2013). Abundance was stable between 1998-2008 at 9 sites off Mona and Desecheo Islands, Puerto Rico. In 1998, 4% of all corals at six sites surveyed off Mona Island were boulder star coral colonies in 1998 and approximately 5% in 2008; at Desecheo Island, about 2% of all coral colonies were boulder star coral in both 2000 and 2008 (Bruckner and Hill 2009).

Lobed star coral (*Orbicella annularis*) is one of the three species within the *Orbicella* complex. Lobed star coral colonies grow in columns that exhibit rapid and regular upward growth. Unlike the other two star coral species, margins on the sides of columns are typically dead. Live colony surfaces usually lack ridges or bumps. Lobed star coral is reported from most reef environments in depths of ~1.5-66 ft (0.5-20 m). The star coral species complex is a common, often dominant component of Caribbean mesophotic (deeper than ~100 ft) reefs, suggesting the potential for deep refuge across a broader depth range, but lobed star coral is generally described with a shallower distribution. Asexual fission and partial mortality can lead to multiple clones of the same colony. The percentage of unique genotypes is variable by location and is reported to range between 18% and 86% (14-82% are clones). Colonies in areas with higher disturbance from hurricanes tend to have more clonality. Although lobed star coral is still abundant, it may exhibit high clonality in some locations. Like the other species in the complex, lobed star coral is a hermaphroditic broadcast spawners, with spawning concentrated on 6-8 nights following the full moon in late August, September, or early October. Lobed star coral is reported to have slightly smaller egg size and potentially smaller size/age at first reproduction that the other two species of the *Orbicella* genus. In Puerto Rico, minimum size at reproduction for the star coral species complex was 12 in^2 (83 cm^2). Lobed star coral has been described as common overall. Demographic data collected in Puerto Rico over nine years straddling the 2005 bleaching event showed that population growth rates were stable in the pre-bleaching period (2001–2005) but declined one year after the bleaching event. Population growth rates declined even further two years after the bleaching event, but they returned to stasis the following year. Lobed star coral is the third most abundant coral by percent cover in permanent monitoring stations in the USVI. A decline of 60% was observed between 2001 and 2012 primarily due to bleaching in 2005. However, most of the mortality was partial mortality, and colony density in monitoring stations did not change (Smith 2013). At nine sites off Mona and Desecheo Islands, Puerto Rico, no

species extirpations were noted at any site over 10 years of monitoring between 1995 and 2008. In 1998, 8% of all corals at six sites surveyed off Mona Island were lobed star coral colonies, dipping to approximately 6% in 2008. At Desecheo Island, 14% of all coral colonies were lobed star coral in 2000 while 13% were in 2008 (Bruckner and Hill 2009).

Mountainous star coral (*Orbicella faveolata*) is one of the three species within the *Orbicella* complex. Mountainous star coral grows in heads or sheets, the surface of which may be smooth or have keels or bumps. The skeleton is much less dense than in the other two star coral species. Colony diameter can reach up to 33 ft (10 m) with heights of 13-16 ft (4-5 m). Mountainous star coral has been reported in most reef habitats and is often the most abundant coral between 33-66 ft (10-20 m) in fore-reef environments. The depth range of mountainous star coral has been reported as ~1.5-132 ft (0.5-40 m), though the species complex has been reported to depths of 295 ft (90 m), indicating mountainous star coral's depth distribution is likely deeper than 132 ft (40 m). Like the other species in the complex mountainous star coral is a hermaphroditic broadcast spawner with spawning concentrated on 6 to 8 nights following the full moon in late August, September, or early October. Fertilization success measured in the field was generally below 15% for all three species being closely linked to the number of colonies concurrently spawning. In Puerto Rico, minimum size at reproduction for the star coral species complex was 12 in^2 (83 cm^2). In many life history characteristics, including growth rates, tissue regeneration, and egg size, mountainous star coral is considered intermediate between lobed star coral and boulder star coral. Reported growth rates of mountainous star coral range between 0.12 and 0.64 in (0.3-1.6 cm) per year (Cruz-Piñón et al. 2003; Tomascik 1990; Villinski 2003; Waddell 2005). Szmant and Miller (2005) reported low post-settlement survivorship for mountainous star coral transplanted to the field with only 3-15% remaining alive after 30 days. Mountainous star coral is the sixth most abundant species by percent cover in permanent monitoring stations in the USVI. Population estimates in the 19-square-mile (49 kilometers squared) Red Hind Marine Conservation District are at least 16 million colonies (Smith 2013). At nine sites off Mona and Desecheo Islands, Puerto Rico, no species extirpations were noted at any site over 10 years of monitoring between 1998 and 2008 (Bruckner and Hill 2009). Both mountainous star coral and lobed star coral sustained large losses during the period. The number of colonies of mountainous star coral decreased by 36% and 48% at Mona and Desecheo Islands, respectively (Bruckner and Hill 2009). In 1998, 27% of all corals at six sites surveyed off Mona Island were mountainous star coral colonies, but decreased to approximately 11% in 2008 (Bruckner and Hill 2009). At Desecheo Island, 12% of all coral colonies were mountainous star coral in 2000 compared to 7% in 2008.

On November 26, 2008, a final rule designating *Acropora* critical habitat was published in the *Federal Register* and defined the physical or biological features essential to the conservation of the species (also known as essential feature). The essential features to the conservation of *Acropora* species is substrate of suitable quality and availability, in water depths from the mean high water line to 30 m (98 ft), to support successful larval settlement, recruitment, and

reattachment of fragments. Substrate of suitable quality and availability means consolidated hardbottom or dead coral skeletons free from fleshy macroalgae or turf algae and sediment cover. Areas containing these features have been identified in the U.S. Caribbean include Puerto Rico, St. Thomas/St. John, and St. Croix (Figures 3.2.2.1 - 3.2.2.3).

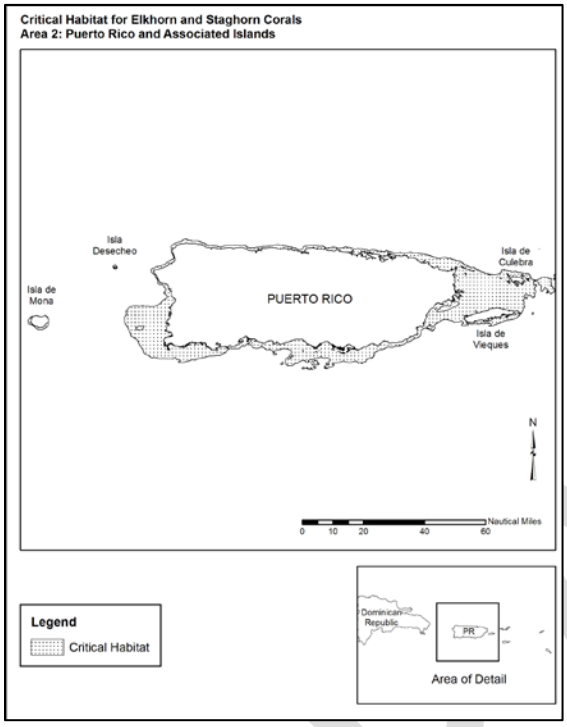

Figure 3.2.2.1. Designated Critical Habitat Area 2 for Elkhorn and Staghorn Corals.

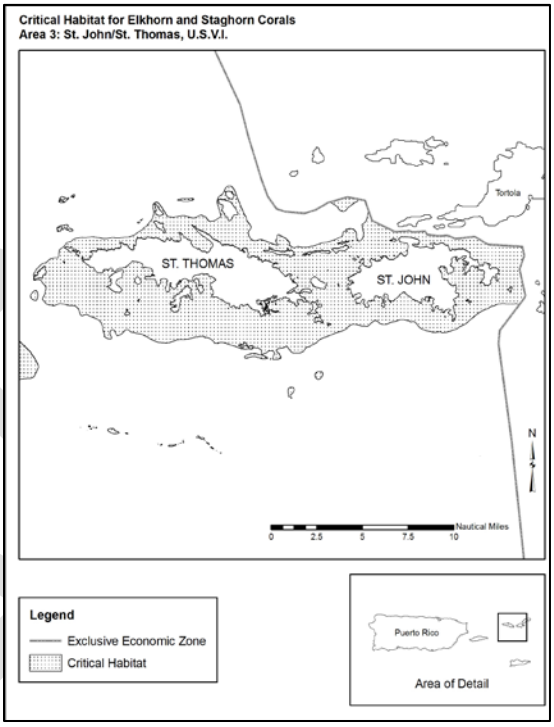

Figure 3.2.2.2. Designated Critical Habitat Area 3 for Elkhorn and Staghorn Coral.

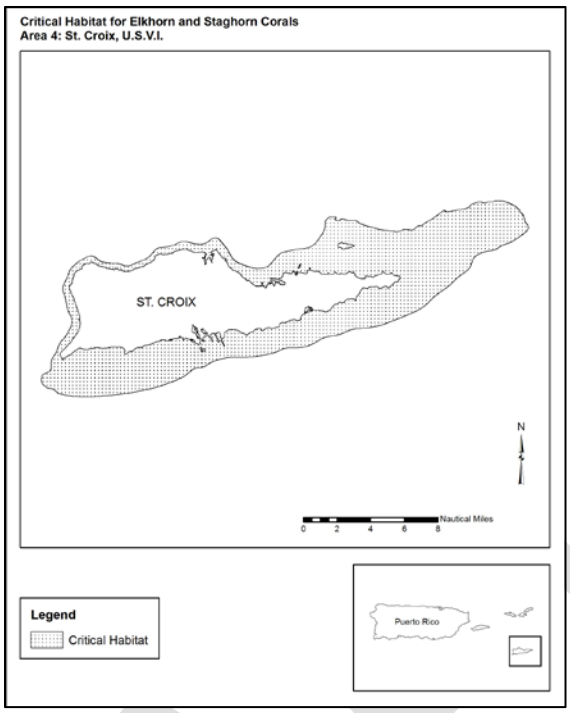

Figure 3.2.2.3. Designated Critical Habitat Area 4 for Elkhorn and Staghorn Corals.

3.3 Description of the Fisheries

In-depth reviews of the commercial and recreational reef fish, spiny lobster, queen conch, and coral fisheries of the U.S. Caribbean are contained in the 2010 and 2011 Caribbean ACL Amendments (CFMC 2011a, b), and are incorporated herein by reference. A summary is provided below.

The fisheries of Puerto Rico and the USVI provide food, livelihoods, and income to Puerto Ricans and U.S. Virgin Islanders. The fisheries in the U.S. Caribbean (federal and state) waters can be divided into commercial, recreational, and subsistence. The commercial fisheries of both Puerto Rico and the USVI have been characterized as "artisanal"[3] because their commercial fishing vessels tend to be less than (and commonly much less than) 45 feet (13.7 m) long, have small crews, participate in multiple fisheries, and yield small revenues.

Fishing vessel permits are not required to commercially harvest any Council-managed species in federal waters of the U.S. Caribbean (CFMC 2013c), although efforts are underway to evaluate

[3] The NOAA Fisheries Glossary Revise Edition June 2006 defines artisanal fishery as a fishery based on traditional or small-scale gear and boats.

the development of a general commercial permit system in federal waters. However, a federal permit may be issued to take or possess Caribbean prohibited coral only as a scientific research activity, exempted fishing, or exempted education activity.

There are no federal licenses or permits issued for the recreational harvest of reef fish, queen conch, spiny lobster, or aquarium trade species in the EEZ of the U.S. Caribbean. Since 2010, all anglers fishing recreationally in U.S. Caribbean federal waters are required to be registered through the National Angler Registry (https://www.countmyfish.noaa.gov/register/).

There are Highly Migratory Species (HMS) permit requirements that apply to the commercial and the recreational sectors fishing in the U.S. Caribbean EEZ. For more information on the HMS permit requirements please visit http://www.nmfs.noaa.gov/sfa/hms/Compliance_Guide/index.htm. For more information about the permit requirements in federal and state waters, please see Section 3.5 of this document.

A detailed description of the fishing gears and methods used in the U.S. Caribbean reef fish, queen conch, spiny lobster, and coral fisheries is provided in the 2010 and 2011 Caribbean ACL Amendments (CFMC 2011a, b). Gears and methods used in the commercial fishery include hook-and-line, bottom lines, troll lines, rod and reel, longlines, SCUBA and skin diving, traps and pots, and nets (Matos-Caraballo and Agar 2008). Two of the most common gears used in the U.S. Caribbean recreational fishery are hook-and-line and SCUBA diving equipment (Griffith et al. 2007).

For more information regarding U.S. Caribbean Fisheries please see Section 3.4.2 (Description of the Social and Cultural Environment).

3.4 Economic and Social Environment

3.4.1 Description of the Economic Environment of the Puerto Rico Commercial and Recreational Fishing Industries

3.4 .1.1 Commercial Fisheries

For a comprehensive description of the Caribbean commercial and recreational fishing industries, please see the Environmental Assessment for the Development of Island-Based FMPs in the U.S. Caribbean (CFMC 2014), as well as the 2010 Caribbean ACL Amendment (CFMC 2011a) and the 2011 Caribbean ACL Amendment (CFMC 2011b). The economic description information contained in these amendments is incorporated herein by reference.

These tables provide background information about the mix of species caught by fishermen in Puerto Rico and the economic benefits derived from those landings. The tables in this section (Table 3.4.1.1 to Table 3.4.1.23) show updated annual and monthly trips, landings, prices and ex-vessel revenues (2014 dollars using CPI deflator) by ACL unit and gear group for Puerto Rico, St. Thomas/St. John, and St. Croix for 2011-2013.

Data caveats: The data presented come from individual trip reports. All reported landings are in pounds whole weight (lbs ww). Puerto Rico historical landings are expanded lbs (see the "Puerto Rico" section below) and ex-vessel revenues for those expanded lbs estimates. Landings come from state and federal waters. When the data show that less than three vessels landed poundage for a particular category, the data is confidential and this is indicated in the table and explained in the notes at the bottom of the table.

Puerto Rico

The number of active fishermen in Puerto Rico is estimated from a fishermen census periodically conducted by the Southeast Fisheries Science Center. The most recent census was conducted in 2008. Current estimates place the number of active fishermen at between 1,000 and 1,200. The Description of the Social and Cultural Environment (Section 3.4.2) below contains a thorough discussion of estimates of the number of fishermen in Puerto Rico and the reader is directed to this section for more information.

Table 3.4.1.1 shows the number of commercial trips, expanded landings (lbs), and estimated associated ex-vessel revenue over the period 2011-2013. Expanded landings (adjusted lbs) are an expansion of reported lbs that deals with non-reporting or inaccurate reporting by commercial fishermen. These expanded lbs were used to establish the ACLs. The estimates of ex-vessel revenue are based on the expanded lbs and reported ex-vessel prices. The number of trips has not been expanded because there is no agreed upon methodology for doing this. Thus, the combination of the estimated landings and revenues with the number of trips to generate average performance measures per trip will not accurately reflect actual performance. Nevertheless, the reported number of trips is included to show possible trends in number of trips taken.

Table 3.4.1.1. Annual number of reported commercial trips, expanded landings (lbs ww) and estimated ex-vessel revenue (2014 dollars) for Puerto Rico, 2011-2013.

Year	Number of Reported Trips	Expanded Landings	Estimated Ex-Vessel Revenue
2011	57,676	2,057,216	$9,851,146
2012	62,020	2,836,841	$7,423,386
2013	66,432	2,104,435	$10,652,900
Average	62,043	2,332,831	$9,309,144

Source: Southeast Fisheries Science Center, May 2015.

Trips

Table 3.4.1.2 shows the number of reported commercial trips by month for 2011-2013. In general, there does not seem to be a consistent pattern indicating a change in the number of trips occurring at any particular time of year. The number of trips is possibly influenced by weather, demand for fish and seasonal labor markets.

Table 3.4.1.2. Number and percentage of reported commercial trips per month for Puerto Rico, 2011-2013.

Month	2011	2012	2013	Average	Average (%)
January	4,487	5,380	5,281	5,049	8.1%
February	4,137	5,986	5,795	5,306	8.6%
March	4,423	5,962	5,773	5,386	8.7%
April	4,992	5,119	5,883	5,331	8.6%
May	5,233	6,191	5,857	5,760	9.3%
June	5,299	4,817	5,684	5,267	8.5%
July	5,388	4,881	6,174	5,481	8.8%
August	4,892	5,251	5,809	5,317	8.6%
September	5,061	5,305	5,834	5,400	8.7%
October	4,791	4,206	5,043	4,680	7.5%
November	4,886	4,814	4,945	4,882	7.9%
December	4,087	4,108	4,354	4,183	6.7%
Total	**57,676**	**62,020**	**66,432**	62,043	100.0%

Source: Southeast Fisheries Science Center, May 2015.

Table 3.4.1.3 shows the number of reported commercial trips that landed a specific species or species group. A fishing trip will typically have landings of multiple species or species groups, for example, spiny lobster and snapper are often landed on the same trip. As a result, this table counts individual trips for each species or species group harvested on the trip. Consequently, the totals by species and species group shown in Table 3.4.1.3 should not be summed since that would result in an overestimation of the number of actual trips taken by fishermen.

Table 3.4.1.3. Number of reported commercial trips by species group/complex for Puerto Rico, 2011-2013.

Species Group/Complex	2011	2012	2013
AQUARIUM TRADE	1	0	0
BOXFISHES	2,820	2,627	2,605
GOATFISHES	335	513	440
GROUPERS	3,142	2,827	2,802

Species Group/Complex	2011	2012	2013
GRUNTS	1,328	1,140	1,156
JACKS	1,235	1,410	1,532
PARROTFISH UNIT	1,565	1,789	2,192
PORGIES	919	1,176	1,229
QUEEN CONCH	5,883	7,070	7,782
SNAPPER UNIT 1	2,819	3,580	3,639
SNAPPER UNIT 2	2,011	1,822	1,584
SNAPPER UNIT 3	5,751	5,856	6,399
SNAPPER UNIT 4	2,879	3,292	3,631
SNAPPER UNIT 5	2,019	1,997	2,046
SPINY LOBSTER	9,336	10,828	11,442
SQUIRRELFISHES	478	495	591
TILEFISHES	0	0	0
TRIGGERFISHES AND FILEFISHES	2,869	2,962	3,652
WRASSES	3,109	3,404	3,554
Non-federally managed species	9,177	9,232	10,156

Source: Southeast Fisheries Science Center, May 2015.

Table 3.4.1.3 shows that spiny lobster, queen conch, species within the snapper unit, and non-federally managed species are caught on the most trips.

Landings, Prices, and Revenue

Table 3.4.1.4 shows expanded annual landings (lbs ww) by ACL unit and Table 3.4.1.5 shows average annual reported ex-vessel prices (2014 dollars) by ACL unit for Puerto Rico for 2011-2013.

Table 3.4.1.4. Expanded annual commercial landings (lbs ww) by species group/complex for Puerto Rico, 2011-2013.

Species Group/Complex	2011	2012	2013	Average
BOXFISHES	40,364	50,020	36,729	42,371
GOATFISHES	6,856	11,585	6,190	8,210
GROUPERS	59,767	73,813	55,359	62,980
GRUNTS	40,074	34,068	24,288	32,810
JACKS	35,546	51,750	40,101	42,466
PARROTFISH UNIT	38,336	61,252	52,104	50,564
PORGIES	19,754	33,145	18,686	23,862
QUEEN CONCH	235,618	391,553	326,087	317,753
SNAPPER UNIT 1	148,707	213,653	172,316	178,225
SNAPPER UNIT 2	218,804	190,600	121,222	176,875

Species Group/Complex	2011	2012	2013	Average
SNAPPER UNIT 3	167,478	220,938	156,890	181,769
SNAPPER UNIT 4	151,218	215,012	159,453	175,228
SPINY LOBSTER	274,271	394,837	291,650	320,253
SQUIRRELFISHES, TILEFISHES, AQUARIUM TRADE	6,761	8,843	7,011	7,538
TRIGGERFISHES AND FILEFISHES	50,801	78,186	67,253	65,413
WRASSES	53,731	70,006	50,643	58,127
Non-federally managed species	470,629	686,750	479,994	545,791
Total	**53,731**	**70,006**	**50,643**	58,127

Source: Southeast Fisheries Science Center, May 2015.

Note: Tilefishes FMU and Aquarium Trade Species FMU were combined with the Squirrelfish FMU to avoid confidentiality issues.

Table 3.4.1.5. Average annual reported commercial ex-vessel prices (2014 dollars) by species group/complex for Puerto Rico, 2011-2013.

Species Group/Complex	2011	2012	2013	Average
BOXFISHES	$2.25	$2.22	$2.24	$2.24
GOATFISHES	$2.33	$2.54	$2.54	$2.47
GROUPERS	$2.59	$2.53	$2.63	$2.58
GRUNTS	$2.00	$1.80	$1.77	$1.86
JACKS	$1.99	$1.86	$1.90	$1.92
PARROTFISH UNIT	$1.82	$1.83	$1.91	$1.85
PORGIES	$2.04	$1.91	$1.91	$1.95
QUEEN CONCH	$4.82	$4.87	$4.93	$4.87
SNAPPER UNIT 1	$3.93	$4.06	$4.39	$4.13
SNAPPER UNIT 2	$4.27	$4.56	$4.90	$4.58
SNAPPER UNIT 3	$2.60	$2.59	$2.73	$2.64
SNAPPER UNIT 4	$2.58	$2.74	$2.87	$2.73
SPINY LOBSTER	$6.51	$6.41	$6.41	$6.44
SQUIRRELFISHES, TILEFISHES, AQUARIUM TRADE	$1.85	$1.67	$1.70	$1.74
TRIGGERFISHES AND FILEFISHES	$1.70	$1.58	$1.59	$1.62
WRASSES	$3.19	$3.05	$3.27	$3.17
Non-federally managed species	$2.52	$2.58	$2.80	$2.63

Source: Southeast Fisheries Science Center, May 2015.

Note: Tilefishes FMU and Aquarium Trade Species FMU were combined with the Squirrelfish FMU to avoid confidentiality issues.

Table 3.4.1.6. Average monthly prices for all Puerto Rico fishery management units, 2011-2013.

Month	2011	2012	2013	Average
1	$2.22	$1.86	$2.41	$2.16
2	$2.18	$1.85	$2.46	$2.16
3	$2.00	$1.76	$2.56	$2.11
4	$2.12	$1.84	$2.54	$2.17
5	$2.21	$1.78	$2.57	$2.19
6	$2.27	$1.73	$2.51	$2.17
7	$2.26	$1.98	$2.39	$2.21
8	$2.15	$1.73	$2.31	$2.06
9	$2.19	$1.64	$2.23	$2.02
10	$2.04	$1.61	$2.15	$1.93
11	$2.13	$1.83	$2.53	$2.16
12	$2.12	$1.72	$2.31	$2.05

Source: Southeast Fisheries Science Center, May 2015.

Table 3.4.1.6 shows average monthly prices for all Puerto Rico fishery management units using the years 2011-2013. There is no indication that there is a higher price during one time of the year than another. Table 3.4.1.7 shows annual commercial ex-vessel revenue (2014 dollars) by ACL unit for 2011-2013.

Table 3.4.1.7. Estimated annual commercial ex-vessel revenue (2014 dollars) by species group/complex for Puerto Rico, 2011-2013.

Species Group/Complex	2011	2012	2013	Average
BOXFISHES	$127,895	$89,520	$112,036	$109,817
GOATFISHES	$15,162	$17,389	$29,465	$20,672
GROUPERS	$239,688	$151,234	$194,379	$195,100
GRUNTS	$131,372	$72,332	$60,291	$87,998
JACKS	$134,058	$66,170	$98,251	$99,493
PARROTFISH UNIT	$80,259	$70,310	$117,228	$89,266
PORGIES	$32,193	$37,822	$63,285	$44,433
QUEEN CONCH	$1,318,408	$1,148,142	$1,930,271	$1,465,607
SNAPPER UNIT 1	$1,087,054	$603,114	$938,066	$876,078
SNAPPER UNIT 2	$1,657,586	$997,851	$933,091	$1,196,176
SNAPPER UNIT 3	$452,594	$433,046	$603,714	$496,451
SNAPPER UNIT 4	$555,630	$414,191	$618,088	$529,303
SPINY LOBSTER	$1,887,277	$1,759,270	$2,530,572	$2,059,040
SQUIRRELFISHES, TILEFISHES,	$13,969	$11,282	$15,067	$13,439

Species Group/Complex	2011	2012	2013	Average
AQUARIUM TRADE				
TRIGGERFISHES AND FILEFISHES	$77,391	$80,277	$124,427	$94,032
WRASSES	$189,915	$164,054	$228,723	$194,231
Non-federally managed species	$1,722,386	$1,212,276	$1,919,759	$1,618,140

Source: Southeast Fisheries Science Center, May 2015.

Note: Tilefishes Unit and Aquarium Trade Unit were combined with the Squirrelfish Unit to avoid confidentiality issues.

Gear Usage

Tables 3.4.1.8 and 3.4.1.9 show expanded landings and estimated ex-vessel revenue (2014 dollars), respectively, by gear type for 2011-2013. Handline, spearfishing, and pots and traps have historically been used to bring in the most landings and ex-vessel revenue.

Table 3.4.1.8. Expanded annual commercial landings (lbs ww) by gear type for Puerto Rico, 2011-2013.

Gear Type	2011	2012	2013	Average
Seine Nets	44,108	27,342	37,845	36,432
Pots and Traps	317,296	455,849	271,032	348,059
Gill Nets	130,193	198,591	143,651	157,478
Trammel Nets	16,407	32,799	40,640	29,949
Hand Line	793,030	875,936	625,814	764,927
Rod and Reel	1,227	0	64,417	21,881
Troll	83,378	278,959	125,936	162,758
Longline	34,758	28,972	23,471	29,067
Cast Net	26,787	72,631	44,557	47,992
Spearfishing	573,077	735,505	569,733	626,105
Snare	31,577	127,043	155,636	104,752
By Hand	5,378	3,214	1,703	3,432

Source: Southeast Fisheries Science Center, May 2015.

Table 3.4.1.9. Estimated annual commercial ex-vessel revenue (2014 dollars) by gear type for Puerto Rico, 2011-2013.

Gear Type	2011	2012	2013	Average
Seine Nets	$110,603	$47,817	$92,208	$83,543
Pots and Traps	$1,102,625	$1,666,481	$1,030,269	$1,266,458
Gill Nets	$282,475	$425,693	$318,484	$342,217
Trammel Nets	$52,933	$102,984	$139,311	$98,409
Hand Line	$2,099,181	$2,467,190	$1,886,530	$2,150,967
Rod and Reel	$2,634	$0	$0	$878

Gear Type	2011	2012	2013	Average
Troll	$149,059	$614,307	$280,835	$348,067
Longline	$110,975	$98,803	$73,825	$94,534
Cast Net	$38,259	$101,881	$67,230	$69,123
Spearfishing	$2,040,927	$2,765,794	$2,449,398	$2,418,706
Snare	$185,653	$801,483	$955,294	$647,477
By Hand	$23,815	$16,393	$9,019	$16,409

Source: Southeast Fisheries Science Center, May 2015.

St. Thomas/St. John

The number of active fishermen on St. Thomas and St. John is estimated at about 120. The Description of the Social and Cultural Environment below (Section 3.4.2) contains more detail regarding numbers of fishermen.

Table 3.4.1.10. Annual number of reported commercial trips, reported landings (lbs ww), and estimated ex-vessel revenue (2014 dollars) for St. Thomas/St. John, 2011-2013.

Year	Number of Reported Trips	Reported Landings	Average Lbs per Trip	Estimated Ex-Vessel Revenue
2011	16,292	468,778	28.8	$2,696,281
2012	15,980	392,581	24.6	$2,356,765
2013	13,458	348,106	25.9	$2,080,919
Average	15,243	403,155	26.4	$2,377,988

Source: Southeast Fisheries Science Center, May 2015.

As Table 3.4.1.10 shows, the number of reported trips, landings, and ex-vessel revenue (2014 dollars) has declined over the three years 2011 to 2013. The number of reported trips by months shows no consistent pattern of a greater number of trips in some months over others. Table 3.4.1.11 shows the number of reported commercial trips per month from 2011-2013 while Tables 3.4.1.12 and 3.4.1.13 show annual landings and ex-vessel revenues (2014 dollars) by ACL unit. Annual reported commercial landings are highest for triggerfishes and filefishes, snappers and groupers. These same species provide the greatest ex-vessel revenue in addition to jacks.

Trips

Table 3.4.1.11. Number of reported commercial trips per month for St. Thomas/St. John, 2011-2013.

Month	2011	2012	2013	Average	Average (%)
January	1,511	1,456	1,397	1,455	9.5%
February	1,143	1,522	1,075	1,247	8.2%
March	1,430	1,364	1,160	1,318	8.6%
April	1,279	1,224	996	1,166	7.7%
May	1,273	1,482	1,236	1,330	8.7%
June	1,274	1,344	930	1,183	7.8%
July	1,314	1,245	1,305	1,288	8.4%
August	1,387	1,387	1,277	1,350	8.9%
September	1,386	1,375	1,243	1,335	8.8%
October	1,544	1,342	1,276	1,387	9.1%
November	1,419	1,203	784	1,135	7.4%
December	1,332	1,036	779	1,049	6.9%
Total	16,292	15,980	13,458	15,243	**100%**

Source: Southeast Fisheries Science Center, May 2015.

Landings, Prices and Revenue

Table 3.4.1.12. Annual reported commercial landings (lbs ww) by species group/complex for St. Thomas/St. John, 2011-2013.

Species Group/Complex	2011	2012	2013	Average
Angelfishes	18,337	16,077	16,202	16,872
Boxfishes	15,757	12,303	10,975	13,012
Groupers	53,170	41,412	38,675	44,419
Grunts	25,402	16,113	11,562	17,692
Jacks	35,049	45,551	25,430	35,343
Parrotfish	23,289	17,224	17,653	19,389
Aquarium Trade, Goatfishes & Porgies	8,515	145	132	2,931
Queen Conch	1,930	592	88	870
Snappers	76,258	53,965	36,462	55,562
Squirrelfishes	6,510	9,817	9,502	8,610
Surgeonfishes	19,294	15,093	12,575	15,654
Triggerfishes and Filefishes	57,067	46,047	45,039	49,384
Wrasses	1,959	1,823	1,903	1,895
Non-federally managed species	41,903	33,045	37,611	37,520

Source: Southeast Fisheries Science Center, May 2015.

Note: Aquarium Trade, Goatfishes and Porgies units have been combined to avoid confidentiality issues.

Table 3.4.1.13. Estimated annual commercial ex-vessel revenue (2014 dollars) by species group/complex for St. Thomas/St. John, 2011-2013.

Species Group/Complex	2011	2012	2013	Average
Angelfishes	$57,908	$49,754	$49,413	$52,358
Boxfishes	$67,856	$53,302	$46,844	$56,001
Groupers	$335,760	$256,208	$235,813	$275,927
Grunts	$142,753	$96,350	$68,151	$102,418
Jacks	$168,051	$234,843	$129,213	$177,369
Parrotfish	$109,990	$88,811	$89,708	$96,170
Aquarium Trade, Goatfishes & Porgies	$35,880	$869	$571	$12,440
Queen Conch	$14,219	$4,273	$626	$6,373
Snappers	$481,545	$333,869	$222,326	$345,913
Squirrelfishes	$26,201	$40,159	$38,311	$34,890
Surgeonfishes	$89,927	$77,818	$63,905	$77,217
Triggerfishes and Filefishes	$268,401	$237,404	$228,849	$244,885
Wrasses	$11,832	$11,277	$11,600	$11,570
Non-federally managed species	$223,559	$184,847	$210,494	$206,300

Source: Southeast Fisheries Science Center, May 2015.
Note: Aquarium Trade, Goatfishes and Porgies units have been combined to avoid confidentiality issues.

Table 3.4.1.14. Average monthly prices for all St. Thomas/St. John fishery management units, 2011-2013.

Month	2011	2012	2013	Average
1	$5.22	$5.85	$6.01	$5.69
2	$5.28	$5.87	$6.02	$5.72
3	$5.24	$5.92	$5.87	$5.68
4	$5.32	$5.93	$5.93	$5.73
5	$5.20	$5.72	$5.83	$5.58
6	$5.21	$5.67	$5.77	$5.55
7	$5.72	$5.69	$5.83	$5.75
8	$5.77	$5.75	$5.66	$5.73
9	$5.59	$5.75	$5.73	$5.69
10	$5.60	$5.75	$5.75	$5.70
11	$5.81	$5.92	$6.17	$5.97
12	$5.88	$6.13	$6.12	$6.04

Source: Southeast Fisheries Science Center, May 2015.

Table 3.4.1.14 shows average monthly prices for all St. Thomas/St. John fishery management units from 2011-2013. The table indicates a decline in prices during the summer months with a peak in prices in December, a period of high demand as people celebrate Christmas. January through March are high tourism months while March and April are months with high demand due to Lent.

Gear Usage

Tables 3.4.1.15 and 3.4.1.16 show annual commercial landings and ex-vessel revenue (2014 dollars) from 2011-2013 by gear group. Traps and line fishing gear provide the greatest amount of landings and ex-vessel revenues.

Table 3.4.1.15. Annual reported commercial landings (lbs ww) by gear type for St. Thomas/St. John, 2011-2013.

Gear Type	2011	2012	2013	Average
Line Fishing	70,580	59,324	51,036	60,313
Traps	337,197	285,855	270,464	297,839
By Hand	3,409	944	2,011	2,121
Seine Net	35,768	33,689	14,286	27,914
SCUBA	3,589	2,716	923	2,409
Nets	2,638	9,167	8,430	6,745
Castnet	1,213	536	955	901
Free Diving	1,829	0	0	610
Gillnet	29	350	0	126
Unknown	12,526	0	0	4,175

Source: Southeast Fisheries Science Center, May 2015.

Table 3.4.1.16. Estimated annual commercial ex-vessel revenue (2014 dollars) by gear type for St. Thomas/St. John, 2011-2013.

Gear Type	2011	2012	2013	Average
Line Fishing	$418,077	$351,236	$306,331	$358,548
Traps	$1,942,184	$1,743,128	$1,626,778	$1,770,697
By Hand	$18,148	$5,699	$10,995	$11,614
Seine Net	$191,583	$184,537	$80,058	$152,059
SCUBA	$22,690	$17,507	$6,017	$15,405
Nets	$13,685	$50,014	$45,562	$36,420
Castnet	$4,966	$2,840	$5,178	$4,328
Free Diving	$9,287	$0	$0	$3,096
Gillnet	$92	$1,804	$0	$632
Unknown	$75,570	$0	$0	$25,190

Source: Southeast Fisheries Science Center, May 2015.

St. Croix

As with Puerto Rico, the number of active commercial fishermen in St. Croix is somewhat elusive, but recent estimates place the number of active fishermen in the range of 200-250. Section 3.4.2 contains more detail regarding numbers of fishermen.

Table 3.4.1.17 shows the annual number of trips, landings and ex-vessel revenue (2014 dollars from 2011-2013. The reported number of commercial fishing trips in St. Croix declined from 2011-2013, as did landings and ex-vessel revenue.

Table 3.4.1.17. Annual number of reported commercial trips, reported landings (lbs ww), average lbs per trip, and estimated ex-vessel revenue (2014 dollars) for St. Croix, 2011-2013.

Year	Number of Reported Trips	Reported Landings (Whole Pounds)	Average Lbs per Trip	Estimated Ex-Vessel Revenue (2014 Dollars)
2011	24,272	629,025	26	$3,709,266
2012	22,551	478,604	21.2	$2,956,653
2013	18,712	427,345	22.8	$2,588,949
Average	21,845	511,658	23.3	$3,084,956

Table 3.4.1.18 shows the number of commercial trips each month from 2011-2013. There does not appear to be any pattern to indicate that a greater number of trips occur in any one month or range of months than another. The decision of whether to take a trip or not is likely largely determined by the weather.

Trips

Table 3.4.1.18. Number of reported commercial trips per month for St. Croix, 2011-2013.

Month	2011	2012	2013	Average	Average (%)
January	2,211	1,759	1,856	1,942	8.9%
February	2,081	1,777	1,568	1,809	8.3%
March	2,163	2,033	1,782	1,993	9.1%
April	2,513	1,959	1,720	2,064	9.4%
May	2,129	2,123	1,682	1,978	9.1%
June	1,727	1,944	1,334	1,668	7.6%
July	1,909	1,913	1,722	1,848	8.5%
August	2,047	2,118	1,590	1,918	8.8%
September	1,695	1,684	1,309	1,563	7.2%
October	2,296	1,841	1,654	1,930	8.8%
November	1,768	1,862	1,463	1,698	7.8%
December	1,733	1,538	1,032	1,434	6.6%
Total	**24,272**	**22,551**	**18,712**	**21,845**	**100.0%**

Source: Southeast Fisheries Science Center, May 2015.

Reported Landings and Prices and Estimated Revenue

Tables 3.4.1.19 and 3.4.1.20 show annual landings and ex-vessel revenues (2014 dollars) by ACL unit from 2011-2013. Parrotfish, snapper, and spiny lobster catches dominate landings and ex-vessel revenues.

Table 3.4.1.19. Annual reported commercial landings (lbs ww) by species group/complex for St. Croix, 2011-2013.

Species Group/Complex	2011	2012	2013	Average
Angelfishes	8,174	13,358	8,137	9,890
Boxfishes	3,941	1,729	1,669	2,446
Groupers	29,732	27,553	20,985	26,090
Grunts	33,711	22,875	17,111	24,566
Jacks	8,179	7,226	11,565	8,990
Parrotfish	151,649	110,810	97,029	119,829
Queen Conch	52,785	34,684	19,547	35,672
Snapper	84,261	62,373	60,363	68,999
Spiny Lobster	108,159	81,279	54,714	81,384
Surgeonfishes	31,523	20,232	11,450	21,068
Triggerfishes and Filefishes	25,960	21,160	12,529	19,883
Aquarium Trade, Goatfishes, Porgies, Squirrelfishes, and Wrasses	3,990	1,157	1,045	2,064
Non-federally managed species	86,391	73,172	110,961	90,175

Source: Southeast Fisheries Science Center, May 2015.
Notes: Aquarium Trade, Goatfishes, Porgies, Squirrelfishes, and Wrasses units have been combined to avoid confidentiality issues.

Table 3.4.1.20. Estimated annual commercial ex-vessel revenue (2014 dollars) by species group/complex for St. Croix, 2011-2013.

Species Group/Complex	2011	2012	2013	Average
Angelfishes	$25,808	$41,321	$24,807	$30,645
Boxfishes	$16,958	$7,467	$7,115	$10,513
Groupers	$187,749	$170,465	$127,952	$162,055
Grunts	$190,695	$136,845	$100,866	$142,802
Jacks	$39,013	$37,258	$58,763	$45,011
Parrotfish	$694,733	$571,284	$493,015	$586,344
Queen Conch	$388,876	$250,338	$139,051	$259,422
Snapper	$532,086	$385,892	$368,062	$428,680
Spiny Lobster	$834,868	$670,461	$444,813	$650,047
Surgeonfishes	$147,575	$104,307	$58,179	$103,354

Species Group/Complex	2011	2012	2013	Average
Triggerfishes and Filefishes	$118,719	$109,090	$63,659	$97,156
Aquarium Trade, Goatfishes, Porgies, Squirrelfishes, and Wrasses	$15,107	$5,523	$4,440	$8,357
Non-federally managed species	$514,048	$461,547	$697,061	$557,552

Source: Southeast Fisheries Science Center, May 2015.

Notes: Aquarium Trade, Goatfishes, Porgies, Squirrelfishes, and Wrasses units have been combined to avoid confidentiality issues.

Table 3.4.1.21. Average monthly prices for all St. Croix fishery management units, 2011-2013.

Month	2011	2012	2013	Average
1	$5.58	$6.08	$6.06	$5.91
2	$5.39	$5.95	$5.96	$5.77
3	$5.45	$6.09	$6.09	$5.88
4	$5.51	$6.14	$6.02	$5.89
5	$5.51	$6.11	$6.02	$5.88
6	$5.21	$5.91	$5.89	$5.67
7	$5.74	$5.82	$5.78	$5.78
8	$5.81	$5.76	$5.79	$5.79
9	$5.90	$5.85	$5.83	$5.86
10	$5.83	$5.80	$5.90	$5.84
11	$5.98	$6.09	$6.02	$6.03
12	$6.00	$6.11	$6.05	$6.05

Source: Southeast Fisheries Science Center, May 2015.

Table 3.4.1.21 shows St. Croix average monthly prices for all fishery management units for 2011-2013. The data indicates a slight increase in prices in March and April, possibly due to increased demand for Lent, and an increase in November and December, likely due to increased demand for the holidays.

Gear Usage

Tables 3.4.1.22 and 3.4.1.23 show annual commercial landings and ex-vessel revenues (2014 dollars) by gear type for 2011-2013. SCUBA, line fishing, and traps are the gear being used to land the greatest number of pounds and bring in the highest ex-vessel revenues.

Table 3.4.1.22. Annual reported commercial landings (lbs ww) by gear type for St. Croix, 2011-2013.

Gear Type	2011	2012	2013	Average
Line Fishing	118,425	90,360	119,701	109,495
Traps	99,495	77,675	66,490	81,220
By Hand	17,792	27,870	21,273	22,312
Seine Net	15,759	2,612	1,465	6,612
SCUBA	367,326	298,294	231,226	298,949
Nets	925	2,567	6,717	3,403
Castnet	1,806	3,363	5,008	3,392
Free Diving	8,399	0	0	2,800
Gillnet	1,682	8,871	17,828	9,460
Unknown	13,568	0	0	4,523

Source: Southeast Fisheries Science Center, May 2015.

Table 3.4.1.23. Annual commercial ex-vessel revenue (2014 dollars) by gear type for St. Croix, 2011-2013.

Gear Type	2011	2012	2013	Average
Line Fishing	$740,974	$582,965	$774,814	$699,584
Traps	$574,692	$474,743	$394,050	$481,162
By Hand	$113,258	$177,108	$132,918	$141,095
Seine Net	$67,381	$13,466	$7,444	$29,430
SCUBA	$2,140,556	$1,834,772	$1,382,468	$1,785,932
Nets	$4,876	$13,234	$34,130	$17,413
Castnet	$9,504	$17,339	$25,444	$17,429
Free Diving	$50,101	$0	$0	$16,700
Gillnet	$8,847	$45,727	$90,586	$48,387
Unknown	$95,301	$0	$0	$31,767

Source: Southeast Fisheries Science Center, May 2015.

3.4.1.2 Recreational Fishery

This section presents information from the Marine Recreational Information Program (MRIP) from the NOAA Office of Science and Technology website found at http://www.st.nmfs.noaa.gov/recreational-fisheries/access-data/run-a-data-query/index in May 2015. Data from MRIP is not available for the USVI because the program is not conducted there, nor is data from any other systematic recreational data collection program available. As a result, the following discussion only addresses recreational fishing activity in Puerto Rico.

Puerto Rico

In general, there has been a steady increase over the past five years in estimates of number of fish caught and released with a huge jump in numbers of fish caught last year. Estimates of the total number of angler trips and recreational fishing participation (coastal residents only) has seen a decrease in 2011 and 2012 followed by a steady increase over the past two years to 2010 levels. Some of the most recent increases could result from the recent decrease in gas prices, making fishing excursions less expensive.

Catch and Harvest

Table 3.4.1.24 shows the number of fish caught and released through recreational fishing.

Table 3.4.1.24. Total recreationally caught and released numbers of fish in Puerto Rico, 2010-2014.

Year	Caught	Released
2010	392,623	156,115
2011	387,306	58,980
2012	477,723	48,664
2013	497,202	101,692
2014	1,164,740	173,376

Source: MRIP (http://www.st.nmfs.noaa.gov/recreational-fisheries/access-data/run-a-data-query/index)

Effort (Angler Trips)

Table 3.4.1.25 shows the total number of angler (recreational fishing) trips in Puerto Rico while Table 3.4.1.26 breaks down the number of angler trips by mode (shore, charter boat and private/rental boat).

Table 3.4.1.25. Total angler trips in Puerto Rico, 2010-2014.

Year	Angler Trips
2010	536,183
2011	424,587
2012	350,568
2013	510,262
2014	534,500

Source: MRIP, May 2015 (http://www.st.nmfs.noaa.gov/recreational-fisheries/access-data/run-a-data-query/index)

Table 3.4.1.26. Total angler trips by mode in Puerto Rico, 2010-2014.

Year	Shore	For-Hire Boat	Private/Rental Boat
2010	219,651	4,113	312,419
2011	232,917	4,730	186,939
2012	140,266	1,839	208,462
2013	275,132	6,470	228,661
2014	275,636	Unavailable	258,864

Source: MRIP, May 2015 (http://www.st.nmfs.noaa.gov/recreational-fisheries/access-data/run-a-data-query/index)

Participation

Table 3.4.1.27 shows individual participation in recreational fishing in Puerto Rico.

Table 3.4.1.27. Recreational fishing participation by region (individuals) in Puerto Rico, 2009-2013.

Year	Coastal Resident of PR	Non-Puerto Rico
2009	110,236	22,352
2010	92,191	11,096
2011	98,662	13,795
2012	83,837	10,003
2013	122,002	5,515

Source: Marine Recreational Information Program (MRIP), May 2015 (http://www.st.nmfs.noaa.gov/recreational-fisheries/access-data/run-a-data-query/index)

Economic Value, Expenditures, and Business Activity

There is no information at this time regarding the total economic value, expenditures, or business activity associated with recreational fishing in the U.S. Caribbean for Council-managed species.

3.4.2 Description of the Social and Cultural Environment

Descriptions of the social environment of reef fish, spiny lobster, and coral fisheries are included in CFMC (2011a) and CMFC (2011b) and are incorporated by reference. In addition, a detailed description of the social environment for the reef fish fisheries is included in a recent amendment CFMC (2013a) (Reef Fish FMP) and is incorporated herein by reference. Detailed descriptions of USVI and Puerto Rican fishing communities are included in Stoffle et al. (2009; 2011), Impact Assessment Inc. (IAI) (2007), and Griffith et al. (2007) and are incorporated herein by reference; however, some elements of these reports are summarized in the following text.

This amendment proposes changes to the timing of AM-based closures for the reef fish, coral, and spiny lobster FMPs (including snappers, groupers, spiny lobster, boxfish, goatfish, grunts, wrasses, jacks, scups and porgies, squirrelfish, triggerfish and filefish, tilefish, angelfish, surgeonfish, parrotfish, and aquarium trade species). Therefore, this section includes a description of fishermen and fishing communities in Puerto Rico and the USVI in relation to their involvement in the included fisheries. Additional fisheries not included in this amendment (queen conch) and additional fisheries not managed by the Caribbean Council (such as highly migratory species) are also included in the narrative to provide context on the dependence on Council-managed species. Additional narratives on the impacted fisheries, which can be used to supplement this section, are included in Section 3.3 (Description of the Fisheries) of this document.

Data are presented at the community level, when possible, in order to meet the requirements of National Standard 8 (NS 8) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). The National Standard 8 requires the consideration of the importance of fishery resources to human communities when changes in fishing regulations are considered. For the following analysis, the majority of data are presented at the island, commonwealth, or territory level because these data are not available at the place-based community level of analysis.

Puerto Rico Fishing Community

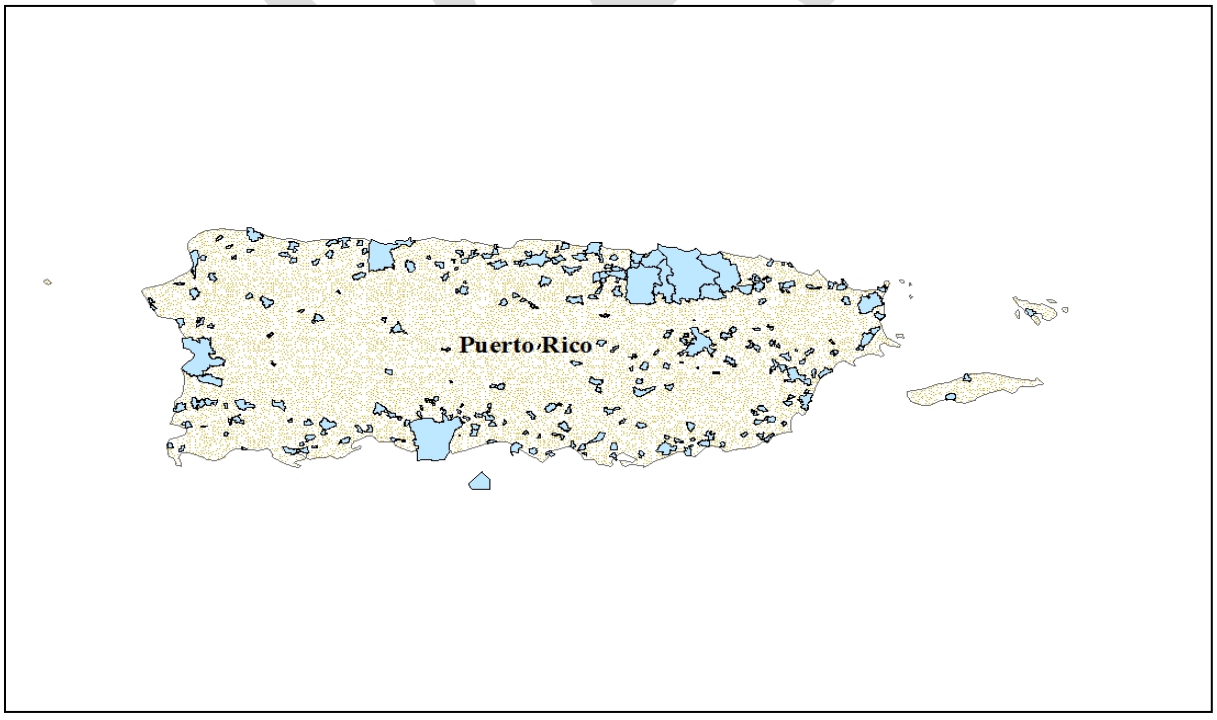

Figure 3.4.2.1. Map of Puerto Rico with census designated places.
Source: NMFS SERO Fisheries Social Science Branch, M. Jepson.

Fishing traditions in coastal communities in Puerto Rico are visible through the celebration of the Vírgen del Carmen, the patron saint of fishers, which derives from the fishing and maritime tradition of Spain. In addition, more recent traditions are visible through the Festival Del Pescao (Seafood Festival) in Cabo Rojo, a festival which was created during the 1970s and occurs during Lent. Fish are important and culturally significant to the Puerto Rican diet. Fish are particularly important among Catholics during Lent, which includes one of the most brisk seasons for seafood sales. Fish is both a high-priced food enjoyed by tourists and coastal visitors and a low-cost and high quality protein which is sold to working people (Griffith et al. 2007).

As with most island coastal economies, there are three main types of fisheries in Puerto Rico: commercial, recreational, and subsistence. The commercial sector is responsible for the majority of landings. Puerto Rico's commercial sector has been referred to as "artisanal" and can be considered small-scale and family-based (Griffith et al. 2007). Most fishing operations are multi-gear and multi-species according to Griffith et al. (2007) with nearly two-thirds utilizing at least three gear types. A number of different gear types are used by Puerto Rican fishermen, including: handline, rod and reel, longline, bottomline, fish traps, lobster traps, gill nets, trammel nets, cast nets and SCUBA gear (Matos-Caraballo and Agar 2011).
Determining the number of active commercial fishermen has proven difficult. According to the most recent census conducted in Puerto Rico, there were approximately 868 active commercial fishermen in 2008 (Matos-Caraballo and Agar 2011). However, after completing the 2008 survey, Matos-Caraballo and Agar received an additional report in February of 2009 from the Puerto Rico Department of Natural and Environmental Resources (PRDNER), the agency responsible for the administration of the commonwealth fishing licenses, with a database of commercial fishing licenses showing 1,129 valid licenses. The number of active fishers has been highly contested, as pointed out in Griffith et al. (2007), and in the past even a range of 1,500 to 2,500 has been suggested too low by fishermen. The confusion could be attributed to what an active fisherman is considered to be. Nevertheless, the number of fishermen has decreased from an earlier census conducted in 1988 when there were over 1,700 fishermen or the 2003 census which counted 1,132.

In 2011 and 2012, the number of licensed commercial fishermen in Puerto Rico greatly increased (E. Piñeiro, personal communication). Two factors may have contributed to that increase in the number of licensed commercial fishermen including: 1) a relaxation of the requirement to submit tax forms when applying for a full or part-time commercial license and 2) an extension of the beginner fisher license to an additional year of eligibility. These factors appear to have allowed fishermen in the recreational sector to move into the commercial sector so that they are able to use additional fishing gear (such as bandit gear) and are able to sell their catch, both of which are prohibited for recreational fishers. Historically, commercial fishermen in Puerto Rico were required by PRDNER to show their tax return forms when applying for a full- or part-time

commercial fishing license. PRDNER would use the tax forms to determine what amount of each fisher's income originated from commercial fishing and determine which license (part or full) the fisher could apply. However, the 2010 Puerto Rico fishing regulations relaxed the tax return requirement for applying for a commercial license, allowing the applicant to show, instead, an affidavit if tax returns could not be provided. Also in 2010, beginner fishers, who after one year had to apply for the commercial fishing license, now had the opportunity to extend the beginner permit for one more year if they were not able to comply with the requirements to obtain a full/part- time license. The relaxation of these requirements may have led to the entry of a new cohort of fishers into the commercial sector. Currently, the number of active fishers in the Puerto Rico commercial sector is estimated to be between 1,000 and 1,200 fishers (Personal communication, PRDNER 2015).

During the 2008 census, nearly 7% of fishermen reported that they worked full-time as fishermen; whereas 25% reported that they worked part-time as fishermen and held other occupations or received retirement benefits (Matos-Caraballo and Agar 2011).

Out of the 868 commercial fishermen interviewed in 2008, reef fish was the top category in terms of importance with 77.3% of respondents targeting reef fish (Table 3.4.2.1) (Matos-Caraballo and Agar 2011). Deepwater snapper was the second most commonly targeted category (55.5%), and spiny lobster was the third (49.3%). Ornamental fish were targeted to a much lesser degree with only 1.6% of fishermen reporting that they targeted ornamental fish.

The number of commercial fishermen targeting specific species varied by coastal region with top species (species targeted by more than half of respondents) for the north coast including reef fish (88.3%), deep-water snapper (71.6%), and pelagic species (65.4%). Whereas, top species for the east coast included reef fish (75.5%), deep-water snapper (71.6%), pelagic species (66.5%), and spiny lobster (64.5%). Along the south coast, the top species were reef fish (88.0%) and spiny lobster (57.1%). Along the west coast of Puerto Rico, the top species were reef fish (64.8%) and deep-water snapper (51.3%).

Table 3.4.2.1. Target species by coastal region. Source: Matos-Caraballo and Agar (2011).

Percentage of commercial fishermen who target the following species	**North Coast**	**East coast**	**South coast**	**West coast**	**Puerto Rico**
Reef fish	88.3%	75.5%	88.0%	64.8%	77.3%
Deep-water snapper	71.6%	71.6%	39.5%	51.3%	55.5%
Pelagic species	65.4%	66.5%	30.0%	26.4%	41.8%
Spiny lobster	27.8%	64.5%	57.1%	47.2%	49.3%
Queen conch	13.0%	34.8%	45.1%	34.6%	33.4%

Percentage of commercial fishermen who target the following species	North Coast	East coast	South coast	West coast	Puerto Rico
Baitfish	53.1%	32.9%	30.9%	17.9%	30.7%
Octopus	1.9%	0.0%	19.3%	1.3%	6.0%
Sirajo goby	8.0%	0.0%	0.9%	0.0%	1.7%
Land crab	9.3%	10.3%	6.0%	2.2%	6.0%
Ornamental fish	0.6%	1.9%	0.9%	2.5%	1.6%

The top ten municipalities by commercial landings include, in order, Cabo Rojo, Lajas, Vieques, Aguadilla, Guánica, Fajardo, Naguabo, Rincón, Juana Díaz, and Ponce (for years 1999-2003, Griffith et al. 2007). Puerto Rico fishermen target multiple species and a variety of species are important to each municipality. Rarely did more than one to two species account for more than 10% of the landings in a specific municipality, and in many cases the third most important species listed accounted for less than 10% of the landings (Tables 3.4.2.2).

Table 3.4.2.2. Three most important species by municipality, 1999-2003. Percentages of landings by species are included as the numerical value. Source: Griffith et al. (2007).

Municipality	1st Species	2nd Species	3rd Species
San Juan	Yellowtail Snapper 15.0	Jacks 8.0	Lane Snapper 6.4
Cataño	Jacks 7.9	Mojarras 6.9	White Grunt 5.5
Toa Baja	Jacks 7.9	Mojarras 6.9	White Grunt 5.5
Mayagüez	Yellowtail Snapper 12.6	Lane Snapper 11.1	King Mackerel 7.5
Añasco	Silk Snapper 41.0	Lane Snapper 9.6	Lobster 6.0
Rincón	Queen Snapper 28.6	Silk Snapper 25.1	Dolphin 5.1
Ponce	Yellowtail Snapper 18.1	Lane Snapper 13.5	Snappers (generic) 9.1
Juana Díaz	Lobster 32.2	Lane Snapper 17.5	Other fishes 7.5
Santa Isabel	Lane Snapper 22.2	Lobster 9.3	Yellowtail and Mutton Snappers 8.7
Salinas	Lane Snapper 15.7	Yellowtail and Mutton Snappers 9.5	White Grunt/Lobster 9.0
Guayama	Lobster 9.0	White Grunt 8.4	Lane Snapper 8.3

Municipality	1st Species	2nd Species	3rd Species
Patillas	Lobster 11.8	Lane Snapper 6.8	Parrotfish 6.0
Arroyo	Parrotfish 15.1	Lobster 10.4	Ballyhoo 7.0
Peñuelas	Lobster 26.0	Hogfish 16.3	Octopus 11.6
Guayanilla	White Grunt 12.1	Mutton Snapper 8.6	Lane Snapper 8.4
Guánica	Lobster 14.0	Yellowtail Snapper 12.0	Hogfish 9.0
Isabela	Lobster 20.7	Nasau Grouper 14.1	Silk Snapper 12.1
Camuy	Yellowtail Snapper 18.1	Mutton Snapper 10.5	King Mackerel 9.2
Arecibo	Silk Snapper 32.9	King Mackerel 8.7	Lobster 8.0
Barceloneta	Silk Snapper 14.3	Triggerfish 8.8	Lane Snapper 7.1
Manatí	Herrings 5.7	White Mullet 5.6	Jacks 4.9
Vega Baja	Silk Snapper 10.2	Red Hind 7.4	Bar Jack 5.7
Vega Alta	Silk Snapper 10.3	Bar Jack 6.4	Red Hind 6.2
Dorado	Silk Snapper 10.0	Triggerfish 6.8	Schoolmaster 6.4
Carolina	Jacks 8.0	White Mullet 7.6	Yellowtail Snapper 7.6
Loíza	Silk Snapper 10.5	Vermilion Snapper 8.5	Yellowtail Snapper 6.6
Rio Grande	Yellowtail Snapper 11.1	Vermilion Snapper 9.9	White Grunt 9.3
Luquillo	White Grunt 10.3	Lane Snapper 7.2	King Mackerel 6.2
Fajardo	Yellowtail Snapper 17.9	Lobster 7.7	King Mackerel 5.4
Ceiba	White Grunt 12.5	Lobster 7.7	Boxfishes 5.4
Vieques	Lobster 15.4	Yellowtail Snapper 8.7	Triggerfish 6.5
Culebra	Nasau Grouper 17.2	Lobster 15.4	Triggerfish 15.1
Naguabo	Lobster 18.7	1st class fish 16.1	3rd class fish 13.7
Humacao	Lobster 13.7	Yellowtail Snapper 9.3	White Grunt 7.8
Yabucoa	Yellowtail Snapper 12.7	Lane Snapper 10.8	White Grunt 10.8
Maunabo	Lane Snapper 12.3	White Grunt 11.9	Lobster 9.3
Lajas	Lobster 8.2	White Grunt 7.8	Lane Snapper 6.5
Cabo Rojo	Lobster 17.8	Boxfishes 9.8	Lane Snapper 6.7

Municipality	1st Species	2nd Species	3rd Species
Aguada	Silk Snapper 13.0	Skipjack Tuna 8.5	King Mackerel 7.6
Aguadilla	Silk Snapper 12.9	Skipjack Tuna 10.0	King Mackerel 9.9

Puerto Rico's recreational fishing sector involves for-hire fishing businesses to individuals who fish with a can, line, and a hook. As reported in Section 3.4.1.2 (Recreational), an estimated total of 127,517 marine recreational participants embarked on 510,262 fishing trips in 2013. The majority of trips were conducted on the shore (53.9%), followed by private or rental boat (44.8%), and charter boat (1.3%, Tables 3.4.1.22 -3.4.1.24). Coastal residents made up the majority of participation in the marine recreational sector (95.7% in 2013); whereas a smaller portion of recreational participation included those from outside Puerto Rico (4.3%, Table 3.4.1.24).

Subsistence fishing, people who fish primarily for food for their households, in Puerto Rico is primarily a working class family activity and fish are considered a source of high quality protein for their family (Griffith et al. 2007). Subsistence fishermen differ in some respects from their commercial and recreational counterparts with regards to key aspects in that they may often be retired or unemployed (Griffith et al. 2007). Subsistence fishermen target snapper-grouper species (40%) and pelagic species including species such as dolphin (7.4%) and king mackerel (5.9%), but nearly no shellfish. The varieties of gear used by subsistence fishers are similar to those of recreational fishers; however few use SCUBA gear (Griffith et al. 2007). It is clear that many Puerto Ricans participate in subsistence fishing. However, without more detailed research, it is difficult to know how pervasive this activity is on the island or their household's dependence upon fish as a food source.

Griffith et al. (2007) found that in terms of fishing communities there were both place-based and network-based communities in Puerto Rico. Although fishermen were spread out considerably across the island, there were certain locations that seemed to provide key features of a place-based fishing community including fishing infrastructure and social interactions on a daily basis. Overall, they were able to identify 38 place-based fishing communities on the island (Griffith et al. 2007).

St. Croix Fishing Community

Fishing on the island of St. Croix has a long history. Historically, it has been a "marginal" activity to the larger backdrop of other economic sectors on the island. However, fishing has been a core value and important to the identity of the Cruzan population (Valdés-Pizzini et. al 2010).

Commercial fishing on St. Croix is much like that of Puerto Rico in that is "artisanal." Most fishermen construct and repair their gear and boats, as well as market their fish (Kojis and Quinn 2012; Valdés-Pizzini et. al 2010). The number of active commercial fishers is elusive, as in Puerto Rico, but recent estimates place the number of active fishermen in the range of 200-250. This does not include those who may provide support services for registered fishermen or those who may not be registered to fish (Valdés-Pizzini et. al 2010). The commercial fisher registration list placed the number of St. Croix licensed commercial fishermen at 177 as of March 2011 (Kojis and Quinn 2012).

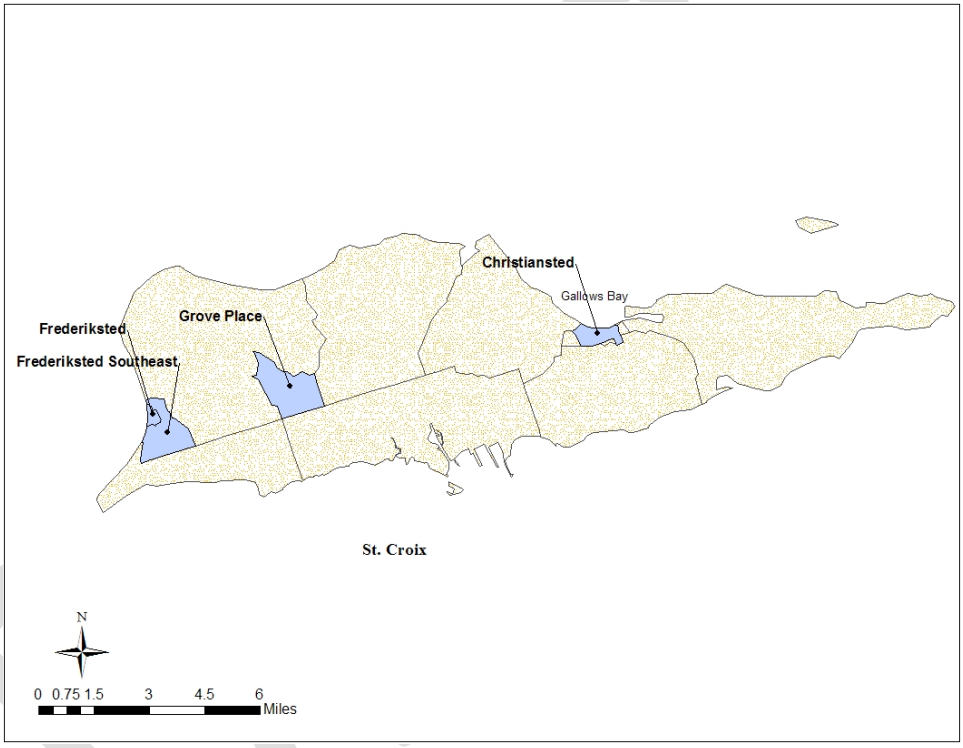

Figure 3.4.2.2. Map of St. Croix with census designated places.
Source: NMFS SERO Fisheries Social Science Branch, M. Jepson.

The majority of St. Croix commercial fishermen classify themselves as Hispanic with the next largest ethnic group identified as West Indian. The most frequent racial designation is Black. About 41 percent are full-time fishermen putting in over 36 hours a week (Kojis and Quinn 2012). Many seek work outside of fishing, as it is increasingly difficult to make a living from just fishing (Valdés-Pizzini et. al 2010); however, it has been reported that it is difficult for fishermen to find other paid work (58.2% of fishermen interviewed indicated it was very hard or hard to find other paid work [Kojis and Quinn 2012]). Many fishers hold other occupations in addition to fishing. These fishers continue to fish in addition to their other occupations and

intend to continue to engage in fishing for as long as they are physically capable (Grace-McCaskey 2012).

The dominant gear type used is hook and line with diving second. Trap fishing is third, and many fishermen indicated that they fish several gear types throughout the year (Kojis and Quinn 2012). Vessels are usually small and are hauled on trailers transported to different parts of the island according to the type of fishery prosecuted seasonally.

Licensed fishermen land their fish at many landing locations around the island (16 different locations on St. Croix were reported by interviewed fishermen); however, the top three most important landing sites by the number of fishers using the site as their primary landing site were Altona Lagoon in Christiansted, the Molasses Pier, and Frederiksted Fish Market (Kojis and Quinn 2012). St. Croix fishermen commonly market their fish themselves (Kojis and Quinn 2012).

Commonly in St. Croix, commercial fishermen keep part of their catch to be consumed by their families. Fishermen also commonly give away part of their catch to friends (Kojis and Quinn 2012).

A variety of species are caught by commercial fishermen in St. Croix and fishermen commonly target more than one category of fish. Out of the 154 fishermen interviewed in a recent census, reef fish was the top category in terms of importance with 79.9% of respondents targeting reef fish (Table 3.4.2.3). Spiny lobster was the second most commonly targeted category with 57.8 % of interviewed fishermen targeting spiny lobster, deep pelagic was the third most commonly targeted category with 48.1% of fishermen targeting deep pelagic species, and queen conch was the fourth most commonly targeted category with 42.2% of fishermen targeting queen conch (Table 3.3.2.3).

Table 3.4.2.3. Relative importance of categories of fish, mollusks, and crustaceans to St. Croix licensed commercial fishers. Frequency includes the number of fishermen who answered that they harvest a particular category. Percentages can equal more than 100% because fishermen harvested more than one category. Source: Kojis and Quinn (2012).

Categories of Fish	Frequency	Percent
Reef fish	123	79.9%
Coastal pelagic	48	31.2%
Deep pelagic	74	48.1%
Deepwater snapper	58	37.7%
Bait fish	10	6.5%

Categories of Fish	Frequency	Percent
Queen conch	65	42.2%
Whelk/West Indian top shell	20	13.0%
Spiny lobster	89	57.8%
Total # of fishers	154	316.2%

Most of the deepwater snapper are fished off the eastern and southeastern end of the island, while the major trap grounds are off the southwestern part of the island according to Valdés-Pizzini et al. (2010). Dive fishing occurs mostly off the eastern end of the island and along the southern shore, which are the most productive fishing grounds and the focus of conservation initiatives (Valdés-Pizzini et al. 2010).

While there has been limited research on the recreational fishing sector of St. Croix, a few reports provide a brief glimpse of related activities. Several categories of recreational fishing in the USVI have been identified, for-hire (charter boat), private boat (both inshore and offshore), and shore and pier (Jennings 1992; Mateo 2004, in Arnold and García-Moliner 2012). In one survey of fishing clubs, tuna, dolphin, and wahoo were identified as the primary target species of recreational fishermen from St. Croix (Messineo and Uwate 2004). The recreational line fishery in the USVI targets offshore and inshore and reef fish fisheries, as well as invertebrates (Adams 1996; Mateo et. al. 2000; Toller et al. 2005, in Arnold and García-Moliner 2012). Valdés-Pizzini et al. (2010) report that about 11% of St. Croix residents participate in recreational fishing. The sport fishing tournaments are becoming increasingly important to the St. Croix economy, but the St. Croix offshore fleet is modest compared that of St. Thomas and St. John (Valdés-Pizzini et al. 2010). The ongoing effort to conduct the MRIP in the USVI is expected to improve the collection of recreational data.

In terms of fishing communities on the island, it seems to be the consensus of Valdés-Pizzini et al. (2010) that the geographical dispersion of fishermen throughout the island and a similar dispersion of their fishing activities make it difficult to identify any particular community as a fishing community. Gallows Bay historically has been considered a fishing community, but has recently undergone significant change including impacts from government programs, gentrification, and the geographic distribution of its dwellers who now engage in various occupations. These changes bring to question whether this area could be considered a fishing community. Fishermen land fish on the community beach and there's an open air market in the community; however most fishermen that land fish in Gallows Bay do not live in the community, although most grew up there (Valdés-Pizzini et al. 2010). Fishermen commonly trailer their vessels, providing the flexibility to move to a different location based on weather conditions, target species, target area, or gear preference (Stoffle et al. 2009). Commercial fishermen in St.

Croix do not typically live in areas that are close to the coast but instead tend to live along a "diagonal line that extends from the north to the southwest coinciding with the Centerline Road." The current pattern of commercial fishers' residences is based on historical factors, such as the process of homesteading after 1936 where the government provided land to farmers in order to try to revitalize the sugar industry (Valdés-Pizzini et al. 2010). Alternatively, the current pattern of residence may represent a decision to move to a newly developed area or other preferred location. Stoffle et al. (2009) discuss that factors such as these fishermen residence patterns throughout the island, the sites of fishing locations, the locations of launching and landing sites and the ability to trailer vessels and move locations, direct and indirect ties of commercial fishing to other industries, and the fact that nearly 100 % of marine resources harvested in St. Croix are landed, purchased, and consumed in St. Croix provides a rationale for recommending the island of St. Croix to be designated as a fishing community.

St. Thomas and St. John Fishing Community

Both commercial and recreational fishing are important aspects of the island economies of St. Thomas and St. John, although the tourism sector may significantly dwarf their contributions in terms of economic activity. Still, there are important remnants of commercial fishing communities that exist on the islands and newer spaces for recreational fishing that are growing in importance (IAI 2007). Whether they are fishing communities in the true sense or fishing activity is so spread across the island that the entire geography should be considered a fishing community, as has been suggested (Stoffle et al. 2011), is still undetermined.

Two areas where concentrations of commercial fishing activity are located on St. Thomas are the north side and south side of the island. Hull Bay on the north side provides a protected area with a boat ramp where many commercial vessels are moored. Frenchtown on the south side has docking facilities along with a covered market that has considerable activity throughout the week but especially on Saturdays (IAI 2007). The top reported commercial landing sites in St. Thomas include Frenchtown, Hull Bay, and Water Bay (Kojis and Quinn 2012). Top commercial landing sites for St. John include Coral Bay and Cruz Bay (Kojis and Quinn 2012). The top ports for boat storage in St. Thomas and St. John include Frenchtown, Hull Bay, and Water Bay in St. Thomas and Coral Bay in St. John. A sizable portion of fishermen keep their boat stored at home (6.9% of St. Thomas and St. John fishers) (Kojis and Quinn 2012). Full-time commercial fishermen in St. Thomas and St. John spend a lot of time harvesting, offloading, and marketing their seafood and preparing, maintaining, and repairing their vessels and gear. These tasks may be completed at different locations on the island and do not necessarily relate to residence or fishing related business (IAI 2007).

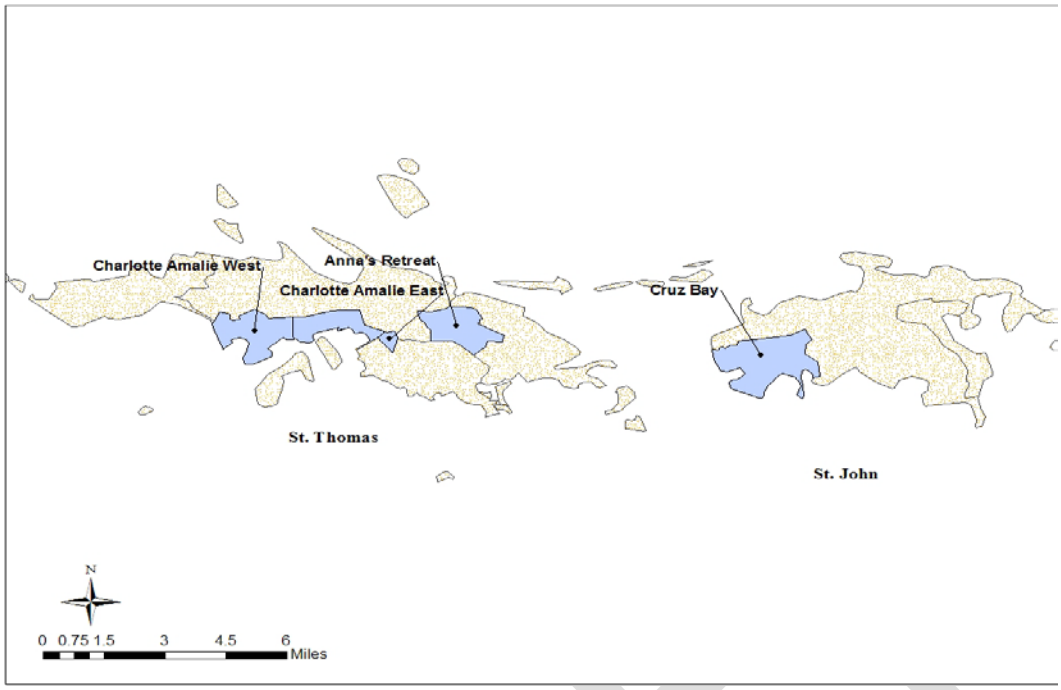

Figure 3.4.2.3. Map of St. Thomas and St. John with census designated places.
Source: NMFS SERO Fisheries Social Science Branch, M. Jepson.

Like St. Croix and Puerto Rico, commercial fishing on St. Thomas and St. John is much like that of the other islands in that is likely "artisanal." Most fishermen construct and repair their gear and boats, as well as market their fish (Kojis and Quinn 2012). The recent census places the number of active fishermen at around 102 on both islands combined (Kojis and Quinn 2012).

The majority of commercial fishermen of St. Thomas and St. John classify themselves as of French descent with the next largest ethnic group identified as West Indian. The most frequent racial designation is White. The time spent fishing is split almost evenly between full-time fishermen putting in over 36 hours a week, those putting in 15-36 hours a week, and those spending less than 15 hours a week (Kojis and Quinn 2012).

The dominant gear type used is hook and line, with traps second. Dive gear fishing is third, but many fishermen, as in St. Croix, indicated that they fish several gear types throughout the year (Kojis and Quinn 2012). Vessels are also small and hauled on trailers to different parts of the island according to the type of fishery prosecuted seasonally. However, both the north side and south side provide mooring and dockage, as do other marinas and protected bays around the island where vessels are kept (IAI 2007).

According to IAI (2007), the primary trap fishing areas for lobster and finfish are located to the south and north of the islands. The primary handline fishing area is to the south, with a small

area north of St. Thomas, while net fishing is almost exclusively conducted on the north side of St. Thomas (IAI 2007). The primary target of fishermen from St. Thomas/St. John was reef fish (84.6%). Coastal pelagics were second (50.5%), with spiny lobster third (29.7%, Table 3.4.2.4).

Table 3.4.2.4. Relative importance of categories of fish, mollusks, and crustaceans to St. Thomas/St. John interviewed licensed commercial fishers. Frequency includes the number of fishermen who answered that they harvest a particular species category. Percentages can equal more than 100% because fishermen harvest more than one category. Source: Kojis and Quinn (2012).

Categories of Fish	Frequency	Percent
Reef fish	77	84.6%
Coastal pelagic	46	50.5%
Deep pelagic	9	9.9%
Deepwater snapper	7	7.7%
Bait fish	3	3.3%
Queen conch	8	8.8%
Whelk/West Indian top shell	9	9.9%
Spiny lobster	27	29.7%
Total # of fishers	91	204.4%

Recreational fishing is likely more important in St. Thomas than on the other islands in the USVI. Recreational fishing infrastructure on St. Thomas is provided through eight marinas, four on the southside and four on the eastside (Crown Bay Marina, Frenchtown Marina, Yacht Haven Marina, American Yacht Harbor Marina, Sapphire Beach Marina, Saga Haven Marina, Pirate's Cove Marina, and Boater's Haven) and twelve anchorage sites (Benner Bay, Charlotte Amalie Harbor, Red Hook, Cowpet Bay, Water Bay, Hull Bay, Jersey Bay, Long Bay, Vessup Bay, Bolongo Bay, Elephant Bay, and Secret Harbor) (Stoffle et al. 2011). In contrast to commercial fishermen, recreational fishermen are more likely to target coastal pelagic fish, which explains the highly disperse fishing area for charter fishermen, which extends well beyond the north sides of both islands and far south of St. Thomas (IAI 2007). Again, there seems to be little, if any, description of subsistence fishing in either St. Thomas or St. John, although subsistence fishing does exist and is likely an important source of food for many, we do not have sufficient information to provide a complete description.

In terms of fishing communities on the island, it seems that the geographical dispersion of fishermen throughout the island and the similar dispersion of their fishing activities has led some to suggest that the entire island should be designated a fishing community (Stoffle et al. 2011).

Some parts of St. Thomas have been identified as having substantial fishing activity and it has been suggested that they could be considered a place-based fishing community (IAI 2007). Nevertheless, fishing has been identified as an important component of the culture and livelihood of many individuals on the islands, whether commercial, recreational or subsistence.

3.4.3 Environmental Justice Considerations

Executive Order 12898 requires federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the U.S. and its territories. This executive order is generally referred to as environmental justice (EJ).

Minority populations: The Hispanic origin group which is considered a minority in the continental U.S. is the majority ethnic group in Puerto Rico. In the year 2010, 16.3% of the population of the continental U.S. was comprised of residents that identified itself as Hispanic or Latino; however, for the same year, 99% of the population of Puerto Rico identified as Hispanic or Latino (U.S. Census Bureau, 2010 Census). In the USVI the majority of the population is Black or African American (72% including those of two or more races) according to the year 2000 Census, whereas the percentage of the population comprised of Black or African American residents of the continental U.S. was 12.9% for the same year. The minority (minority is commonly interpreted for the U.S. as White, non-Hispanic) rates for all of Puerto Rico and the USVI are substantially higher than that of the continental United States.

Low-income populations: Low-income populations in the U.S. Caribbean make up a much greater percentage of the general population than in the continental United States. The percentage of people below poverty included 45.2% of the population in Puerto Rico for the year 2010, significantly higher than that of the continental U.S. which included 15.3% of the population below poverty (U.S. Census Bureau, 2010 Census). For the year 2010 the poverty rate for the USVI was 22.2%, also significantly higher than the rate for the continental U.S. (U.S. Census Bureau, 2010 Census). These overall higher poverty rates indicate that the U.S. Caribbean includes more individuals that are likely to be more vulnerable and experience higher levels of effects when changes in fisheries management are conducted.

Because this proposed action is expected to impact fishermen in the U.S. Caribbean, and information is not available in most cases to link these fishermen to the communities in which they reside, all communities in Puerto Rico and the USVI have been examined using census data to see if they have poverty rates that exceed EJ thresholds.

The threshold for comparison that was used was 1.2 times the average of the USVI or Puerto Rico such that, if the value for the community was greater than or equal to 1.2 times the average of the greater area, then the community was considered an area of potential EJ concern (EPA 1999).

As mentioned above, the poverty rate for Puerto Rico for the year 2010 was 45.2%. This value translates into an EJ poverty threshold of approximately 54.2%. The communities listed in table 3.4.3.1 exceeded this poverty threshold and are the most likely to be vulnerable to EJ concerns.

Table 3.4.3.1. Puerto Rico communities which exceeded poverty threshold for year 2010. Source: U.S. Census Bureau 2010.

Community	Percent of Population Below Poverty Level
Adjuntas	57.2
Aguada	56.5
Barranquitas	54.7
Ciales	59.3
Coamo	55.8
Comerío	58.4
Corozal	58.4
Guánica	58.2
Guayanilla	56.5
Isabela	57.1
Lajas	55.7
Lares	58.1
Las Marías	58.2
Maricao	65.7
Maunabo	55.6
Moca	57.0
Morovis	62.0
Naranjito	55.3
Orocovis	62.6
Patillas	57.0
Peñuelas	57.7
Quebradillas	60.6
Salinas	58.5
San Sebastián	58.5

Community	Percent of Population Below Poverty Level
Utuado	57.6
Villalba	57.1
Yauco	56.8

As mentioned above, the poverty rate for the USVI in 2010 was 22.2%. This value translates into an EJ poverty threshold of approximately 26.6%. The communities listed in Table 3.4.3.2 exceeded this poverty threshold and are likely the most vulnerable to EJ concerns.

Table 3.4.3.2. U.S. Virgin Islands communities which exceeded poverty threshold for year 2010. Source: U.S. Census Bureau 2010.

Community	Poverty Rate
Charlotte Amalie	27.3
Charlotte Amalie East	30.7
Christiansted	41.1
Frederiksted	45.9
Frederiksted Southeast	38.9

Based on the information provided above, Puerto Rico and the USVI have minority or economic profiles that include higher rates than that of the continental United States. Environmental Justice issues could arise if FMUs or species experience long closures (because fishermen would not have access to the fish for a greater amount of time) as a result of AM required closures. Food insecurity is a large issue in the U.S. Caribbean and these vulnerable low-income populations could be impacted to a greater extent because of their dependence on the fish they receive through fishing efforts and utilize as food to supplement their income. However, AM required closures are the result of previous amendments and rulemaking and not this proposed amendment. The alternatives in this proposed amendment are intended to reduce the adverse economic and social effects of AM-induced closures by increasing the flexibility of their timing, allowing the closures to occur when least disruptive of economic, social, or cultural needs. As a result, because the expected effects of this proposed amendment would be positive, no EJ issues are expected to arise.

The general participatory process used in the development of fishery management measures (e.g., public hearings and open Caribbean Council meetings) is expected to provide opportunity for meaningful involvement by potentially affected individuals to participate in the development

process of this amendment and have their concerns factored into the decision process. In addition, the proposed actions section of this amendment will be translated into Spanish to provide local populations with access to the information and the ability to participate in the development of this amendment.

3.5 Administrative Environment

3.5.1 Federal Fishery Management

Federal fishery management is conducted under the authority of the Magnuson-Stevens Act (16 U.S.C. 1801 et seq.), originally enacted in 1976 as the Fishery Conservation and Management Act. The Magnuson-Stevens Act claims sovereign rights and exclusive fishery management authority over most fishery resources within the U.S. EEZ, an area extending from the seaward boundary of each coastal state to 200 nautical miles from shore, as well as authority over U.S. anadromous species and continental shelf resources that occur beyond the U.S. Caribbean EEZ.

In the 2005 Caribbean SFA Amendment (CFMC 2005), fishable habitat was defined as those waters less than or equal to 100 fathoms (600 ft; 183 m). The majority of fishing activity for Council-managed species occurs in that area, except for fishing for deep-water snappers, which occurs primarily in the EEZ at depths greater than 100 fathoms (600 ft; 183 m) (CFMC 2005). In the 2005 SFA Amendment, the total area of fishable habitat in the U.S. Caribbean was estimated to be approximately 2,467 square nautical miles (nm^2) (8,462 km^2). The fishable habitat within the EEZ is 1,218 km^2 (355 nm^2) or 14.39% of the U.S. Caribbean total, with 398 km^2 (116 nm^2) (4.7%) occurring off Puerto Rico and 823 km^2 (240 nm^2) (9.7%), occurring off the USVI. The vast majority of the fishable habitat in federal waters off Puerto Rico is located off the west coast. The vast majority of the fishable habitat in federal waters off the USVI is located off the north coast of St. Thomas (CFMC 2005). .

Responsibility for federal fishery management decision-making in the U.S. is divided between the Secretary of Commerce and eight regional fishery management councils that represent the expertise and interests of constituent states/territories. Regional councils are responsible for preparing, monitoring, and revising management plans for fisheries needing management within their jurisdiction. The Secretary is responsible for promulgating regulations to implement plans and amendments after ensuring management measures are consistent with the Magnuson-Stevens Act and with other applicable laws. In most cases, the Secretary has delegated this authority to NMFS.

The Caribbean Fishery Management Council (Council) consists of seven voting members: four public members appointed by the Secretary, one each from the fishery agencies of Puerto Rico

and the USVI, and one from NMFS. The Council is responsible for fishery resources in federal waters of the U.S. Caribbean. These waters extend to 200 nautical miles offshore from the nine-mile seaward boundary of the Commonwealth of Puerto Rico and the three-mile seaward boundary of the Territory of the USVI.

Public interests are also involved in the fishery management process through participation on advisory panels and through Council meetings that, with few exceptions for discussing personnel matters, are open to the public. In addition, the regulatory process is in accordance with the Administrative Procedures Act, in the form of "notice and comment" rulemaking, which provides extensive opportunity for public scrutiny and comment, and requires consideration of and response to those comments.

Regulations that implement the management measures in the FMPs are enforced through actions of NOAA's Office of Law Enforcement, the U.S. Coast Guard, and various Puerto Rico commonwealth and USVI territory authorities. To better coordinate enforcement activities, federal and commonwealth and territory enforcement agencies have developed cooperative agreements to enforce the Magnuson-Stevens Act. However, enforcement in the Caribbean region is severely underfunded. Because personnel and equipment are limited, compliance with federal regulations depends largely on voluntary compliance (Heinz Center 2000).

The Fishery Conservation Amendments of 1990 (P.L. 101-627) conferred management authority for Atlantic highly migratory species (HMS), including tunas, oceanic sharks, marlins, sailfishes, and swordfish, to the Secretary from the Fishery Management Councils. In 2012, Amendment 4 to the Consolidated Atlantic Highly Migratory Species Fishery Management Plan: Caribbean Fishery Management Measures re-evaluated the management measures for commercial and recreational HMS fisheries operating in the U.S. Caribbean. The rule implementing this amendment became effective on January 2, 2013. This rule had the purpose of improving permitting of and data collection from vessels operating in the U.S. Caribbean to better manage the traditional small-scale commercial HMS fishing fleet in the U.S. Caribbean Region, enhance fishing opportunities, and improve profits for the fleet, and to provide improved capability to monitor and sustainably manage those fisheries. For additional information regarding the HMS management process and authority in the Caribbean, please refer to the Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks (HMS FMP, http://www.nmfs.noaa.gov/sfa/hms/) and Amendment 4 to the HMS FMP (http://www.nmfs.noaa.gov/sfa/hms/FMP/AM4.htm).

Recreational fishing in the EEZ requires fishermen register in the National Registry. For information, please visit the Recreational Fisheries Statistics Web site at http://www.countmyfish.noaa.gov/.

3.5.2 Territory and Commonwealth Fishery Management

The governments of the Territory of the USVI and the Commonwealth of Puerto Rico have the authority to manage their respective state fisheries. The USVI is an organized, unincorporated territory of the United States[4] (House Report 113-110) with a locally-elected government. Residents born in the USVI are citizens of the United States and they elect a Governor, unicameral (15-member) Legislature, and Delegate to Congress (DOI 1997). The USVI has jurisdiction over fisheries in waters extending up to three nautical miles from shore, with the exception of about 5,650 acres of submerged lands off St. John which are owned and managed by the National Park Service (Goenaga and Boulon 1991). The Department of Planning and Natural Resources (DPNR) is the USVI's agency responsible for the administration and enforcement of all laws pertaining to the preservation and conservation of fish and wildlife, trees and vegetation, coastal zones, cultural and historical resources, water resources, and air, water and oil pollution, among other responsibilities (DPNR 2015). Commercial and recreational fishing activities are regulated with the advice of the DPNR's Division of Fish and Wildlife and the St. Thomas/St. John and St. Croix Fisheries Advisory Committees (Uwate 2002 in DPNR 2005). The DPNR/Division of Environmental Enforcement is responsible for enforcing regulations within USVI waters (Uwate 2002 in DPNR 2005).

The Estado Libre Asociado de Puerto Rico (i.e., Commonwealth of Puerto Rico) is a self-governing commonwealth in association with the United States. Residents born in Puerto Rico are citizens of the United States and they elect a Governor, two legislative chambers: the House of Representatives (51 seats) and the Senate (27 seats), and a Resident Commissioner, a non-voting member of the United States House of Representatives. Puerto Rico has jurisdiction over fisheries in waters extending up to nine nautical miles from shore. Those fisheries are managed by Puerto Rico's Department of Natural and Environmental Resources (DNER). Section 19 of Article VI of the Constitution of the Commonwealth of Puerto Rico provides the foundation for the fishery rules and regulations. Puerto Rico Law 278 of 1998 establishes public policy regarding fisheries.

Each of the USVI and Puerto Rico fishery management agencies has a designated seat on the Council. The purpose of local government representation at the council level is to ensure local participation in federal fishery management decision-making. The state governments have the authority to manage their respective state fisheries. Each of the states exercises legislative and regulatory authority over their natural resources through discrete administrative units. Although each agency is the primary administrative body with respect to the states' natural resources, both

[4] "The USVI is an organized territory because Federal legislation - an organic act - has established the institutions of local government. It is an unincorporated territory because not all the provisions of the U.S. Constitution apply to the USVI. The territorial court system has jurisdiction for all local legal issues." (DOI 1997)

Puerto Rico and the USVI cooperate with numerous state and federal regulatory agencies when managing marine resources.

Both Puerto Rico and the USVI require commercial fishing licenses, permits for some species, and reporting. Puerto Rico has license categories for full-time, part-time, beginner, and non-resident commercial fishers, ornamental fisheries, and owners of rental boats, including charter and party/head boats. Additional commercial permits are required for the harvest of spiny lobster, queen conch, common land crab, incidental catch, and sirajo goby (i.e., cetí) fisheries. Although Puerto Rico fishing regulations state that a license for all recreational fishermen 13 years and older (excluding fishermen on charter or head boats) is required, this requirement is not currently enforced. Recently, the PRDNER announced that a pilot recreational fishing license program will start during the summer of 2015.

In the USVI, any person that trades any part of his catch, including charter boat operators who sell or trade their catch, must obtain a commercial license (DPNR 2012). USVI commercial fishermen are required to report their catch (all species) and effort for every trip (CFMC 2010). Catch report forms must be submitted to the DPNR on a monthly basis, no later than 15 days after the end of the fishing month. The level of non-reporting, under-reporting, and delayed reporting is not well known. However, the DPNR has been working with the fishermen to improve accuracy of reports and the reporting rate. A moratorium on new commercial fishing licenses has been in place since 2001.

In the USVI, permits are not required for recreational fishing. Recreational fishers are not allowed to sell their catch or to use certain fishing gears to catch fish (i.e., traps, pots, haul seines and set-nets). Subsistence fishermen that do not use pots, traps, haul seines, and set-nets (commercial gear) are not required to have a license (DPNR 2012). However, fishing permits are required to fish in some areas in the USVI (DPNR 2012). A recreational shrimp permit is needed to fish in Altona Lagoon and in Great Pond on St. Croix (commercial fishing not allowed). Permits are also required for fishing activities in the Great St. James Marine Reserve and Cas Cay/Mangrove Lagoon Marine Reserves in St. Thomas.

Additional information regarding fishery management in state or federal waters can be found in Section 2.1 of the 2005 Caribbean SFA Amendment (CFMC 2005), and in the 2010 Caribbean ACL Amendment (CFMC 2011a). Additional information about commercial and recreational fisheries in the USVI and Puerto Rico can be found in Sections 3.3 and 3.4.2.

Chapter 4. Environmental Effects

Chapter 4 describes the effects to the physical, biological and ecological, economic, social, and administrative environments from the alternatives in the proposed actions**.** In the following sections, the terms fishery management unit (FMU) and species/species complex may be used interchangeably.

4.1 Environmental Effects of Action 1: Modifying the timing of Accountability Measure (AM)-based closures

Action 1: Select an approach to modify the timing for the implementation of AM-based closures in the U.S. Caribbean exclusive economic zone.

Summary of Management Alternatives

Alternative 1

No Action. Continue AM-based closures beginning on December 31st of the closure year and extending backward in the year for the number of days necessary to achieve the required reduction in landings.

Alternative 2 (Preferred)

AM-based closures resulting from an ACL overage will begin on September 30th of the closure year and would extend backward into the year for the number of days necessary to achieve the required reduction in landings.

Alternative 3

AM-based closures resulting from an ACL overage will begin on January 1st of the closure year and would extend forward into the year for the number of days necessary to achieve the required reduction in landings.

Alternative 4

Modify the AM-based closure date by selecting and establishing a fixed fishing closure start date for the implementation of AMs for each FMU by island/island group (Puerto Rico, St. Thomas/St. John, St. Croix, and Caribbean-wide).

Sub-Alternatives 4a and 4b provide different parameters for selection of dates.

4.1.1 Direct and Indirect Effects on the Physical Environment

Proposed Action 1 would not have any direct physical effects. However, indirect effects on the physical environment are expected depending on the alternative, as described below. These effects depend on the degree to which the proposed action results in changes to the fishing effort for a particular species/species complex. Modifying the start date for AM closures as proposed in **Alternatives 2-4** would not change the ACL, it would redistribute harvest of the ACL throughout the year.

Management actions that affect the physical environment mostly relate to the interactions of fishing gear with the sea floor. The degree or magnitude of the effects will depend on whether an action increases or decreases fishing gear interactions with the bottom habitat. It also depends on the vulnerability of a particular habitat to disturbance and the rate at which the habitat can recover from such disturbances (Barnette 2001). The primary gear types used in the reef fish, spiny lobster, and coral fisheries are described in Section 3.3. These include vertical line gear, traps, spear fishing, and hand harvest. Vertical line gear has the potential to snag and entangle bottom structures, which can result in breakage and abrasions (Barnette 2001). Traps can break and damage vulnerable corals, including Endangered Species Act (ESA) listed species, which offer significant benthic structure and essential fish habitat (EFH) in the U.S. Caribbean (Barnette 2001). Hand harvest while free diving or SCUBA diving, used to some extent in the spiny lobster fishery, and spear fishing, are expected to have little to no adverse direct effects on the physical environment in general. The proposed action would not change the primary gears or how they are currently used in the reef fish, spiny lobster, and coral fisheries.

The cumulative effects of repeated anchoring by fishermen using any harvest method, including spear guns and hand harvest, as well as the use of fishing traps, can also damage (e.g., reduce vertical relief) hard bottom areas where fishing occurs (Barnette 2001 in CFMC 2011a). The cumulative effects of anchoring and trap fishing will depend on how much the proposed action causes an increase or decrease in the quantity and time spent in fishing activities (fishing effort). Increases in fishing effort increase the interaction of fishing gear with the bottom. However, traps in the U.S. Caribbean are not usually removed from the water during a closure, thus the interactions between traps and the bottom are not expected to change under any of the alternatives proposed.

Alternative 1 is the no action alternative and would continue the status quo. The starting date for the implementation of AMs in U.S. Caribbean federal waters continues to be December 31st going backwards. **Alternative 1** would not have direct physical effects because it would not change current fishing activities, no changes in fishing effort from the baseline are expected, and interactions between fishing gear and habitat would remain unchanged.

Indirect physical effects resulting from the application of AMs in general are expected from **Alternative 1** and all other alternatives proposed (**Alternatives 2 (Preferred), 3**, and **4**). These effects were evaluated in the 2010 and 2011 Caribbean ACL Amendments (CFMC 2011 a,b), which established and implemented AMs for Council managed species. Effects were discussed in those amendments and are incorporated herein by reference and summarized as follows. Indirect physical effects from the application of AMs reflect the reduction in fishing effort resulting from reducing the length of the fishing season for a particular species/species complex when AMs are applied. Reducing fishing effort reduces the opportunity for interactions from non-trap fishing gear and anchors with the sea bottom, benefiting the physical environment.

In general, under any of the alternatives proposed, when compared to a shorter AM closure, a longer AM closure (shorter fishing season) could potentially result in additional minor indirect positive effects on the physical environment by reducing anchoring activities from fishing for that particular species experiencing the AM. However, these benefits on the physical environment would not be attained if fishers frequent the same areas and continue to anchor to fish for other species. Benefits may also be limited if fishers, while trying to harvest the entire ACL during the open season, increase the intensity of fishing, thus continuing or increasing interactions with the bottom from fishing gear.

An AM closure that occurs during a period of high landings for the species may reduce anchoring activities during a period with otherwise high fishing activity for that species potentially benefiting the physical environment. For example, the month of December has been identified as a period of high landings for some species/species complexes in the U.S. Virgin Islands (USVI) (see Table 1.4.1) because of a higher demand during the Christmas holiday season. An AM closure that includes December, such as in **Alternative 1,** could then be more beneficial to the physical environment for that species/species complex in the USVI than if the AM closure occurred during a period of lower landings for that particular species because of the expected reduction in anchoring activities in the areas where fishing for these species occurs.

The indirect physical effects of a December 31st going backward AM closure (**Alternative 1**) in Puerto Rico may not be as tangible as in the USVI because December is not a high demand month for marine species in Puerto Rico, thus any changes in fishing effort during that time should be negligible, with no additional positive or negative effects on the physical environment.

Similar to **Alternative 1**, **Preferred Alternative 2** would not have any direct physical effects because it would not directly modify current fishing activities. Also similar to **Alternative 1**, indirect effects from the establishment of AMs would apply to **Preferred Alternative 2**. Because the month of September (going backward) is traditionally recognized as a low fishing month in Puerto Rico and the USVI, in general, any additional benefits on the physical environment from the application of AMs during this period should be minimal because effort is

expected to be lower during a low fishing month when compared to the rest of the year. If the closures extend through the low fishing months into a period of traditionally high fishing activity for the affected species, then the reduction in fishing effort during that period would reduce anchoring from fishing activities for that species benefiting the physical environment. When compared to **Alternative 1**, changing the AM closure start date from December 31st going backward to September 30th going backward into the year for all FMUs in an island/island group is not expected to substantially change how fishing effort is distributed throughout the year. A September 30th going backward date may make the AM closure longer or shorter depending on the landing patterns for the affected species. If an AM closure under **Preferred Alternative 2** results in a longer closure than the status quo (**Alternative 1**, December 31st), it may result in additional indirect minor positive effects on the physical environment as discussed above, by reducing anchoring activities from fishing for that particular species.

Alternative 3 would implement AMs starting on January 1st and go forward into the year, which would apply to all FMUs in an island/island group. Indirect effects on the physical environment would depend on if this start date at the beginning of the year results in changes to the distribution of fishing effort throughout the year. The indirect effects on the physical environment discussed above for **Alternative 1** and **Preferred Alternative 2** related to longer versus shorter AM closures would also apply to an AM closure start date under **Alternative 3**. If an AM closure under **Alternative 3** is longer than a closure starting on September 30th or December 31st going backward (**Preferred Alternative 2** or **Alternative 1**, respectively)**,** additional indirect positive effects on the physical environment would be expected from the reduction on anchoring activities for example, or reduced interactions with non-trap gears used for that particular species and the sea bottom. If on the contrary the AM closure results in a shorter closure than under **Alternative 1** or **Preferred Alternative 2**, the benefits would be less because the fishing season would be open longer, increasing the potential for these interactions with the physical environment.

The start dates for AM closures proposed under each of **Alternative 1**, **Preferred Alternative 2**, and **Alternative 3** would apply to all FMUs in an island management area and Puerto Rico fishing sector, thus several FMUs could potentially have AM closures applied at the same time in a given year. Multiple overlapping AM closures would in theory provide some minor benefit to the physical environment by simultaneously reducing fishing activities for the affected species. The physical environment may benefit from the potential reduction in anchoring or from the reduced potential for interaction between the sea bottom and gears used to fish for the affected species. Although these potential benefits would not be expected from species harvested with trap gear because regardless of the closures, traps in the U.S. Caribbean are usually left in the water, thus they continue to interact with the bottom.

Alternative 4, Sub-Alternatives 4a through **4j** would establish different AM closure dates for individual FMUs on each island/island group. Compared to **Alternatives 1**, **2 (Preferred)**, and **3**, different AM closure start dates could result in less potential for overlapping AM closures if these are spaced out throughout the year. Thus, in the event of multiple AM closures in a year, any potential benefits to the physical environment from reduced fishing for those species with different AM closures dates (e.g., reduction in anchoring, fishing gear interactions) would be less than if those AM closures overlapped as discussed above for **Alternatives 1-3**.

As discussed in Section 2.2.1, **Alternative 4**, **Sub-Alternatives 4a** through **Sub-Alternative 4j** propose AM closure start dates that occur during the month with highest or lowest reported landings. The effects discussed above for **Alternatives 1-3** regarding the effects of longer versus shorter closures (i.e., reduction/increase in anchoring, fishing gear interactions with the bottom) also apply to **Sub-Alternatives 4a** through **4j**, and the effects would vary depending on the FMU and island/island group and the closure date selected for each one.

4.1.2 Direct and Indirect Effects on the Biological and Ecological Environment

Although this action would affect all Council-managed fisheries conducted in the U.S. Caribbean EEZ, it is not expected to have direct biological or ecological effects or substantially modify fishing activities in federal waters. In an AM closure, the reduction in landings for the affected species/species complex is the same regardless of whether it results in a shorter or a longer closure period. Thus the biological/ecological effects of a shorter versus a longer closure on the species/species complex experiencing the AM are not expected to be different. Any indirect effects on the biological and ecological environment would depend then on how much the proposed alternative result in an increase or decrease in the quantity and time spent in fishing activities (fishing effort). The biological/ecological environment of a species/species complex to which an AM is applied would in general benefit positively from the AM by constraining landings to the ACL and preventing an overage in future years. The proportion of this expected benefit is equivalent across all the alternatives proposed in this action (**Alternatives 1, 2 (Preferred)**, **3**, and **4** (**Sub-Alternatives 4a-4j**).

Indirect effects on the biological/ecological environment expected from **Alternative 1** are those indirect effects evaluated in the 2010 and 2011 Caribbean ACL Amendments (CFMC 2012 a,b), which established AMs for Caribbean Council-managed species. Those are incorporated herein by reference and summarized as follows. In the 2010 Caribbean ACL Amendment, the establishment of AMs was expected to result in positive indirect biological and ecological effects by reducing fishing effort on species that were at the time undergoing overfishing. The general effects anticipated as a result were a more natural size distribution of individuals and an increase

in the abundance of individuals in the population. However, the rate and extent of those changes could not be determined at that time. An additional positive indirect effect expected from a shortened fishing season due to AMs for all Council-managed species was a reduction in the incidental catch of other co-occurring species. Another expected indirect effect, although negative, was the potential increase in regulatory discards resulting from bycatch of species caught during the closure while fishers continue harvest of legally available species.

Both **Preferred Alternative 2** and **Alternative 3** are also not expected to have any direct biological/ecological effects because none would directly modify current fishing activities. **Preferred Alternative 2** and **Alternative 3** should have the same indirect effects on the biological and ecological environment discussed above for **Alternative 1** from the shortening of the season from AMs.

Alternative 4 would establish different closure dates for FMUs on each of the island management areas (**Sub-Alternatives 4a -4j**). Direct effects on the biological/ecological environment are not expected, and indirect effects would be similar to those baseline indirect effects expected under **Alternatives 1-3**. As discussed at the beginning of this section, there is no difference between the biological/ecological effects expected from a shorter closure (**Sub-Alternatives 4a**, **4c**, **4e**, **4g**, and **4i**, highest landings) versus a longer closure (**Sub-Alternatives 4b, 4d, 4f, 4h,** and **4j**, lowest landings) on the species/species complex experiencing the AM, because the reduction in landings for the affected species/species complex is the same.

As discussed in Section 2.2.1, under any of **Alternatives 1** through **4** (including all sub-alternatives), depending on the length of the closure needed for the AM and the FMU to which the AMs would be applied, if an AM closure for a species needs to extend through the seasonal closure months of a species (species seasonal closure dates are excluded from the analysis to determine the length of the AM closure, thus an AM closure would of necessity extend through those seasonal closure months until the required closure time is achieved) or if the AM closure ends or starts close to the species seasonal closure start/end date, this may result in lengthy closures for the affected species/species group. This may result in potentially beneficial biological effects for the species, at least for potential spawners, which would be left undisturbed for a longer period of time. Also, any spawning that falls outside of the species seasonal closure could be captured during this AM closure time.

4.1.3 Direct and Indirect Effects on the Economic Environment

Current regulations stipulate that when an ACL overage is determined to have occurred, an AM-based closure is implemented the year following that determination. The extent to which fishing seasons are shortened to account for any overages equals the number of days necessary to constrain landings to the ACL. Accountability measure-based closures are designed to end on December 31st of the closure year and extend backward into the year for the number of days necessary to ensure the ACL is not again exceeded. In calculating the length of the closure, NMFS assumes future fishing effort will resemble the most recent years of fishing effort and shortening the fishing season will decrease fishing effort and, therefore, landings. The actual closure length will vary depending on historical daily landings and the overage amount. Because there are potential economic drawbacks to a closure during December for some areas (see below), the Council has developed alternative start dates for consideration.

None of the proposed **Alternatives 2-4** would affect the quantity of harvest being reduced. **Alternatives 2-4** would only affect the timing of the closure. The harvest reduction (equal to the overage) would be expected to occur regardless of when the closure occurs. The expected economic effects for **Alternatives 2-4** will vary depending on the actual closure start date, the closure length, and the ex-vessel prices associated with the pounds that would have been landed had the closure instead occurred from December 31st going backward. Theoretically, ex-vessel prices increase during periods of high demand and decrease during periods of low demand. Table 1.4.1 shows the high market demand times for seafood for each of the three islands/island groups over the course of a calendar year. High demand periods for all three islands/island groups include Lent (Holy Week, in particular), which changes when it occurs year to year, and Christmas for the USVI, among other high demand periods in the USVI like the tourism season.

Method of Analysis: An analysis to estimate the direct short-term economic effects of **Alternatives 2-4** compared to **Alternative 1** (No Action) would typically involve estimating the ex-vessel revenue that has historically accrued during a closure using a start date of September 30th going backward toward the beginning of the year (**Preferred Alternative 2**), January 1st going forward toward the end of the year (**Alternative 3**), and various start dates depending on the FMU (**Alternative 4, sub-alternatives**) compared to the economic effects of a closure using a start date of December 31st going backward (**Alternative 1**). However, because the amount of future overages and the FMU that would be closed is unknown, this analysis focuses instead on expected future variability in monthly landings and expected ex-vessel prices across a typical year. If the ex-vessel prices are invariant across the months of a typical year, there would be no difference in short-term economic effects under the various alternatives. The following graphs (Figures 4.1.3.1, 4.1.3.2, and 4.1.3.3) show the variation in average monthly landings and ex-vessel revenue for each island/island group in order to enable a discussion of periods of high

landings and ex-vessel price variability, because ex-vessel price data is not collected across all areas of the U.S. Caribbean.

Historical landings and nominal ex-vessel revenue variability by region: Figure 4.1.3.1 shows average monthly landings and ex-vessel revenue of all species for Puerto Rico from 2011-2013. The data indicate relatively small variations in landings and nominal ex-vessel revenue from month to month. In Puerto Rico, historical landings and revenue are highest during the first five months of the year with fluctuations of about 50,000 pounds (25% of average monthly landings) between the highest and lowest landings months. Nominal ex-vessel revenues fluctuate $137,000 (34% of average monthly ex-vessel revenue) between the highest and lowest landings months of the year. The higher landings during the first five months of the year are likely due to increased sales during Lent and Holy Week. Lower landings during December could be influenced by substitution of pork for fish. In Puerto Rico, unlike the USVI, pork is often the preferred protein served during the holiday period of Christmas through "Three Kings Day" or "Feast of the Epiphany" which occurs January 6th. Average monthly ex-vessel prices vary little, between $1.92 in October to $2.20 in July, or 9% of average monthly ex-vessel prices.

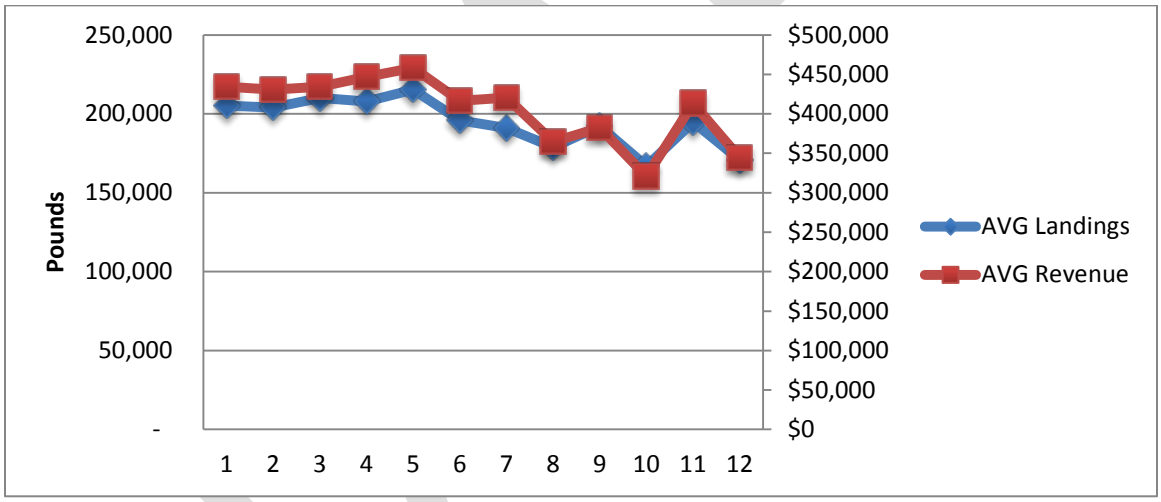

Figure 4.1.3.1. Puerto Rico Average Monthly Landings and Nominal Ex-Vessel Revenue, 2011-2013. Source: SERO, May 2015.
Note: More recent data is not yet available.

Figures 4.1.3.2 and 4.1.3.3 show average monthly landings and revenue of all species for St. Thomas/St. John and St. Croix, respectively. St. Thomas/St. John landings vary by 12,729 pounds (38% of average monthly landings) and $60,000 in ex-vessel revenues (31% of average monthly ex-vessel revenues). St. Croix landings vary by almost 29,000 pounds (68% of average monthly landings) and $169,000 in ex-vessel revenues (68% of average monthly ex-vessel revenues). The figures both indicate some variation in landings and ex-vessel revenue from month to month. The small deviations between landings and ex-vessel revenue indicate very

little variation in ex-vessel prices. One perceptible difference occurs in November and December in St. Thomas/St. John. During that time, there is a smaller decline in ex-vessel revenue than the decrease, which occurs with landings, indicating an increase in average price for November and December. Average monthly prices in October are $5.69. In November, prices rise to $5.95 and to $6.03 in December, a high market demand month. In St. Croix, ex-vessel prices vary to a lesser degree over the same months, going from $5.85 in October to $6.05 in December. Overall, average monthly prices on St. Thomas/St. John vary by $0.52 (9% of average monthly price) and $0.35 (6% of average monthly price) on St. Croix. While price fluctuations occur among different fishermen (Kojis 2014), fish prices are largely stable throughout the year (fluctuations are considered relatively small), though are slightly lower in July through November on St. Thomas. The Kojis study surmises that sale prices were discounted during July to November due to a tourism low season, residents leaving the island for vacation elsewhere, and residents saving their money in July and August to pay for school expenses.

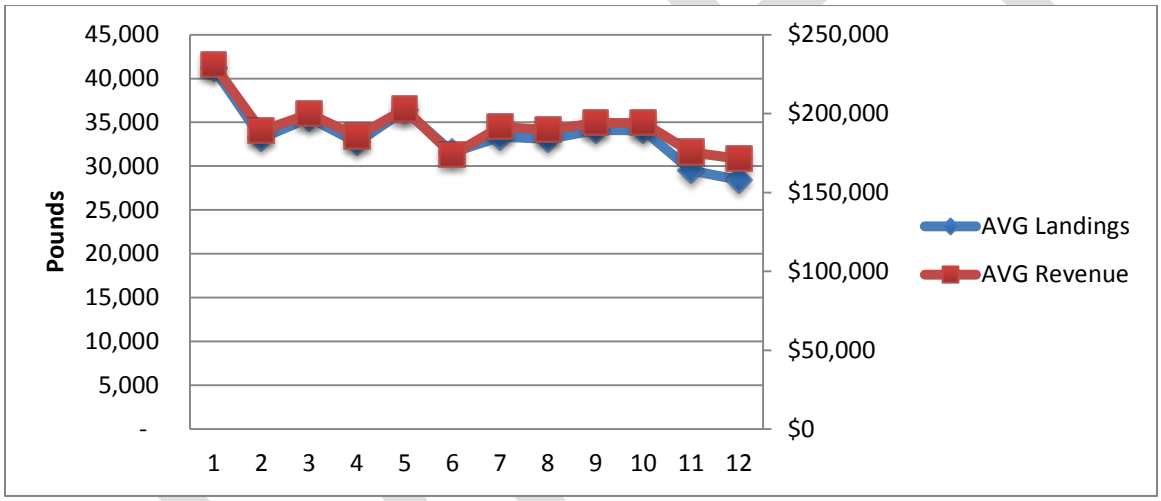

Figure 4.1.3.2. St. Thomas/St. John Average Monthly Landings and Nominal Ex-Vessel Revenue, 2011-2013**.**
Source: SERO, May 2015.
Note: More recent data is not yet available.

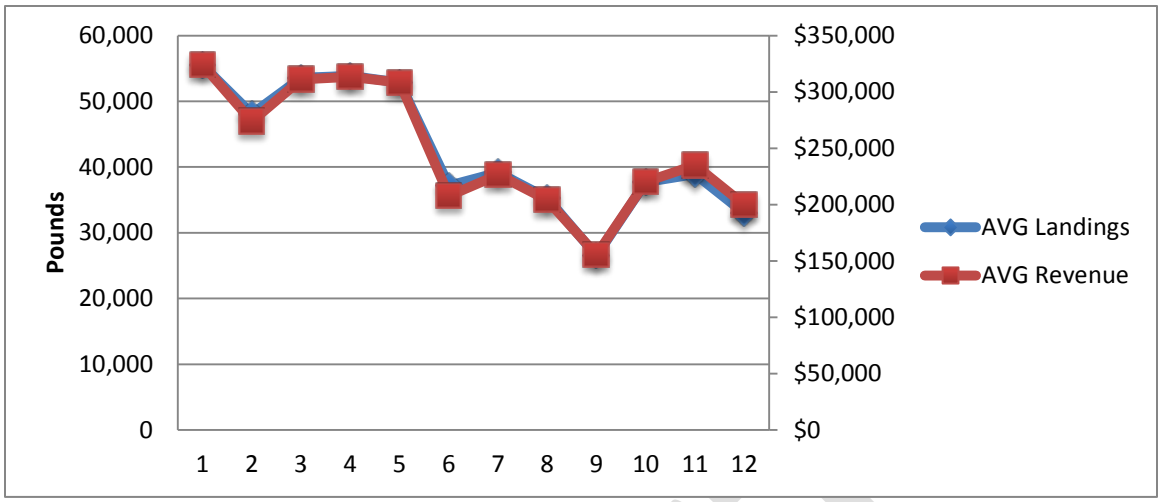

Figure 4.1.3.3. St. Croix Average Monthly Landings and Nominal Ex-Vessel Revenue, 2011-2013. Source: SERO, May 2015.
Note: More recent data is not yet available.

In general, closures occurring during high demand times are more likely to have a greater negative economic effect than closures occurring during low demand times due to potentially higher ex-vessel revenue prices offered during high demand periods and the risk associated with losing seafood markets during high demand periods. Closures during historically high demand periods are also expected to be shorter than closures during historically low demand periods because of the higher daily harvest rates during high demand periods. As discussed above, the poundage removed from the fishery under an AM-based closure is expected to be the same regardless of when the start date occurs under each of the **Alternatives 2-4**. There may also be differences among the alternatives with regard to the potential for species substitution. Closures during a certain time of the year may result in greater application of fishing effort on another FMU than might otherwise occur under the **Alternative 1**. Unfortunately, at this time, there is not enough information known about the behavioral reactions of fishermen to closures during different times of the year with regard to species substitution. Another economic effect that could occur is an increase in the cost of labor if fishing patterns are forced to change as a result of AM-based closures. That is, currently, it is assumed that fishermen fish the various FMUs when it is most cost effective to do so. Imposing a closure at a different time than under the No Action alternative could result in an increase in labor costs as fishermen move from one fishery to another (one that has a lower catch rate for the time spent fishing and therefore more costly). Ultimately, future estimated economic effects in this analysis will vary depending on: 1) the slight variations in ex-vessel price associated with historical landings during the closure under consideration compared to the December 31st start date moving backward and, 2) the risk associated with losing seafood markets due to closures during single, alternating, or consecutive years (although this is less likely) for the same FMU. Other factors that would likely influence

the economic effects of the action proposed here include the changes in cost associated with fishing, species substitution, and opportunities for alternative employment if fishermen can't go fishing.

Economic effects of alternatives: Under **Alternative 1** (No Action), if an AM closure occurs, it will always result in a closure going backward from December 31st. The length of the closure varies depending on the historic daily rate of harvest and amount of the overage for each FMU. A closure starting in December and going backward toward the beginning of the year results in direct economic effects that can be significant. Commercial fishermen from St. Thomas/St. John and St. Croix have reported/stated that the month of December is an important time for fish sales due to the Christmas holiday demand for seafood on those islands. Similar sentiments regarding the potential for closures in December have not been voiced by Puerto Rico fishermen because pork is the traditional and preferred protein for the Christmas holiday. However, in the USVI, loss or interruptions of seafood supply to the markets during the month of December from AM-based closures results in direct negative *short-term* economic effects to fishermen and local communities in the form of lost ex-vessel revenues. Direct negative *long-term* economic effects are also possible if market supply is consistently interrupted year after year and consumers substitute with other protein sources, purchase imported fish, or purchase fish from sources outside the region. However, the closures should not be persistent since, if a closure is effective, then there would be no closure the year following. But, even inconsistent closures could result in market loss due to species substitution or purchase of imports.

Preferred Alternative 2 proposes a September 30th closure start date extending backward toward the beginning of the year if an AM-based closure is implemented as the result of an ACL overage. The September 30th closure start date would be used *for any FMU* with an ACL overage. **Alternative 3** specifies a January 1st start date for a closure and moves forward toward the end of the year. **Alternative 3** would also be used *for any FMU* with an ACL overage. Unlike **Alternatives 2** and **3**, **Alternative 4, Sub-Alternatives 4a-4j** propose a *different closure start date for each FMU or for a combination of FMUs.* The implementation date under **Sub-Alternatives 4a, 4c, 4e, 4g,** and **4i** would be calculated based on the reported highest landings month on average over the past three years. A closure during a period of high landings would yield a shorter closure but that closure could occur at a time during the year when demand for that particular species/species group is higher or when supply is more plentiful. T The implementation date under **Sub-Alternatives 4b, 4d, 4f, 4h,** and **4j** would be calculated based on the reported lowest landings month on average over the past three years. A closure during a period of lower landings would result in a longer closure but that closure could occur at a time during the year when demand is lower than other times during the year.

Under **Preferred Alternative 2** and **Sub-Alternatives 4a-4j**, AM closures would move backward toward the beginning of the year. If, for any FMU in any year, the number of days left

in the year going backward toward the beginning of the year (under **Preferred Alternative 2** and **Sub-Alternatives 4a-4j**) is not enough to achieve the required reduction in landings, then those additional days would be captured in the opposite direction. Also, under any of the alternatives, a closure can potentially begin and be halted for a spawning season closure before beginning again once the spawning season closure has ended. Table 2.2.1.1 shows the closure lengths under each of the alternatives of five example FMUs. The example FMUs and amount of the overage used are some of the FMUs that had overages in 2012 and had AM-Based closures implemented in 2013. The case of Snapper Unit 2 is an example of what would happen if an AM closure was not long enough to cover an overage. Closing the Puerto Rico commercial Snapper Unit 2 (SU2) fishery from January to March 31st for **Sub-Alternative 4b**, still results in landings above the ACL. Therefore, in this example, additional closure dates of April 1st to June 19th would be necessary to keep the landings below the ACL.

If the 2011-2013 landings and ex-vessel revenue data, shown in the three graphs above, is representative of typical fluctuations across the fishing year, in general, **Preferred Alternative 2** (September 30th start date going backward toward the beginning of the year) would be expected to result in a longer closure than **Alternative 3** (January 1st start date going toward the end of the year) because June to September are lower landing months than January to May. For all of the FMUs in Puerto Rico, in general, **Alternative 1** (December 31st start date going backward) would likely result in a longer closure period than **Alternative 3** (January 1 start date going forward) but an equally long or longer closure period than **Preferred Alternative 2** (September 30th going backward). However, a longer closure period does not necessarily indicate greater negative short-term economic effects because the reduction in landings will be the same as a shorter closure. Major fluctuations in ex-vessel prices across months, however, could result in differences in short-term economic effects between the alternatives but, as Figure 4.1.3.1 shows, landings and ex-vessel revenues follow quite closely to each other, implying relatively small overall differences in prices across the year. Relatively small changes in prices indicate potentially small short-term economic gains or losses of each of the **Alternatives 2-4** compared to **Alternative 1**.

In Puerto Rico, while short-term economic effects are likely relatively small, negative long-term economic effects are possible and could be the result of lost markets due to supply shortages. If closures occur for several consecutive years for desired species during Lent (and during Holy Week, in particular), consumers may substitute imported seafood for local seafood and regional long-term negative economic effects would ensue. A closure during March and/or April would likely have the greatest risk of short-term and long-term (if repeated in consecutive or multiple years for desired species) negative economic effects to the Puerto Rico seafood market. A closure that continues through or includes March and/or April could occur under any of the alternatives but is most likely to occur under **Alternative 3** (January 1 start date going forward) or **Alternative 4** (in any of the sub-alternatives) for select FMUs (if the closure includes the

months of March and/or April) and least likely to occur under **Alternative 1** (December 31st closure going backward).

With regard to the **Alternative 4**, it is unknown whether the Puerto Rico commercial **Sub-alternative 4a** would provide a positive or negative economic effect compared to **Alternative 1** (No Action). This determination depends on when the closure occurs, for the particular FMU. It may occur at the same time as the closure under **Alternative 1** (No Action) or at another time. Furthermore, the dates that a closure will occur under **Sub-alternative 4a** will change over time since the closure implementation dates are based on the three most recent years of data. Table 2.2.1 shows the implementation date of a Puerto Rico commercial closure for **Sub-alternatives 4a** and **4b** based on historical data but this may or may not be the implementation date used in the future. Likewise, **Sub-alternative 4b** may or may not provide an economic benefit compared to **Alternative 1** (No Action) because it depends on when the closure occurs and this will change over time. As stated previously in this document, in general, **Sub-alternative 4a** could provide a shorter closure than **Sub-alternative 4b** since **Sub-alternative 4a** proposes a closure implementation date during the historically highest landings month while **Sub-alternative 4b** proposes a closure implementation date during the historically lowest landings month. While the closure may be shorter under **Sub-alternative 4a**, the economic effect could be larger or smaller compared to **Sub-alternative 4b** since factors other than the date of closure influence ex-vessel revenues and profit.

Similarly, it is unknown whether the Puerto Rico recreational **Sub-Alternative 4c** would provide a positive or negative economic effect compared to **Alternative 1** (No Action) for the reasons stated in the previous paragraph. Likewise, it is unknown whether **Sub-Alternative 4d** would provide a positive or negative economic effect compared to **Alternative 1** (No Action). Table 2.2.2 shows the implementation date of a Puerto Rico recreational closure for **Sub-Alternatives 4c** and **4d** based on historical data but this may or may not be the implementation date used in the future since the three most recent years are used. However, in general, it is expected that **Sub-Alternative 4c** would provide a shorter closure than a closure that would occur under **Sub-Alternative 4d** due to the higher historical landings used to determine an implementation date under **Sub-Alternative 4c**. While the closure may be shorter under **Sub-Alternative 4c**, the economic effect could be larger or smaller compared to **Sub-Alternative 4d** since factors other than the date of closure influence recreational value.

Under **Alternative 4**, **Sub-Alternatives 4e** and **4f** propose methodologies for determining closure implementation dates for St. Thomas/St. John. Similar to the above discussion for Puerto Rico, it is not known whether **Sub-Alternative 4e** or **4f** would result in a positive or negative economic effect compared to **Alternative 1** (No Action). Under **Alternative 4**, **Sub-Alternatives 4g** and **4h** propose methodologies for determining closure implementation dates for St. Croix. Similar to the above discussion for Puerto Rico, it is not known whether **Sub-**

Alternative 4g or **4h** would result in a positive or negative economic effect compared to **Alternative 1** (No Action). **Alternative 4**, **Sub-Alternatives 4i** and **4j** propose methodologies for determining closure implementation dates for two Caribbean-wide species groups. Again, it is not possible to determine whether **Sub-Alternatives 4i** and **4j** will have a positive or negative economic effect compared to **Alternative 1** (No Action) because the implementation dates under the sub-alternatives will change over time and the economic effects depend on when the closures occur.

Comparisons between islands/island groups are not logical since each island/island group has closures independent of other islands/island groups. However, there are some general effects that it makes sense to acknowledge. In Puerto Rico, as stated previously, unlike the USVI, pork is often the preferred protein served during the holiday period of Christmas through "Three Kings Day" or "Feast of the Epiphany" which occurs January 6th. Therefore, there would be less pronounced negative economic effects that result from **Alternative 1** (No Action) in Puerto Rico compared to the USVI.

Although there would be short-term economic differences between Alternatives 1-4, they are expected to be small. Again, because the future overage amounts and the FMU to which AMs would be applied to are both unknown, no further meaningful quantitative analysis of short-term economic effects can be done; any example of possible effects using a prior overage would be speculative, incapable of capturing the potential behavioral and market changes that may occur, and any overage would not be persistent if the AM-based closure is effective in eliminating any overage.

However, it is worthwhile to discuss potential long-term economic effects. For the USVI, in general, **Preferred Alternative 2** (September 30th start date going backward toward the beginning of the year) is expected to result in a longer closure than **Alternative 3** (January 1st start date going forward toward the end of the year) because June to September are lower landing months than January to May. January to May are higher landing months in the USVI because this is when the islands experience high demand periods such as peak tourism, Lent, and Carnival. Christmas is also an important high demand time for seafood in the USVI, particularly St. Croix (Kojis 2014). Therefore, **Alternative 1** (No Action), **Alternative 3,** and the sub-alternatives within **Alternative 4** that include closures in January to April or December are expected to result in greater risk of long-term negative economic effects than **Preferred Alternative 2**. The negative long-term economic effects are expected in the form of increased risk of loss of seafood markets if consumers switch to purchasing seafood imports and/or substitution for more readily available sources of protein during Lent and Christmas.

Summary

In summary, there will likely be relatively small short-term economic effects between the alternatives as measured by differences in ex-vessel revenues. Because ex-vessel prices in Puerto Rico increase slightly in April (Lent) through July compared to other months, short-term economic benefits are expected to be greatest under **Preferred Alternative 2** followed by **Alternative 1** (No Action), **Alternative 4 sub-alternatives** that have closures that avoid closing fishing in March and April, and lastly, **Alternative 3**.

Because ex-vessel prices in the USVI increase slightly in November and December (Christmas market), compared to other months, short-term economic benefits are expected to result from any alternative that avoids Lent and November and December. Economic benefits are expected to result from **Preferred Alternative 2**, **sub-alternatives** of **Alternative 4** that have closures that avoid closing fishing in November and December, **Alternative 3**, and lastly, **Alternative 1** (No Action).

There will likely be long-term economic benefits from **Preferred Alternative 2** and any of the **sub-alternatives** of **Alternative 4** that avoid a closure during tourism season (January to March), Lent (March and April), and Christmas (December) in the USVI and Lent (March and April) in Puerto Rico. **Alternative 3** is expected to have a greater risk of long-term negative economic effects for the USVI (but not Puerto Rico) because it stipulates for a closure to begin in January, a peak tourism month in the USVI, and could extend to Lent (March and April). Long-term benefits would result from a decrease in the risk of losing a market as a result of consecutive closures during high market demand times.

4.1.4 Direct and Indirect Effects on the Social Environment

Effects from fishery management changes on the social environment are difficult to analyze due to complex human-environment interactions and a lack of quantitative data about that interaction. Generally, social effects can be categorized according to changes in: human behavior (what people do), social relationships (how people interact with one another), and human-environment interactions (how people interact with other components of their environment, including enforcement agents and fishery managers). It is generally accepted that a positive correlation exists between economic effects and social effects. Thus, in Section 4.1.3 (Economic Effects), alternatives predicting positive or negative economic effects are expected to have correlating positive or negative social effects.

Future AM-based closures of the Caribbean FMUs will not be the result of this proposed amendment, but will be a result of the 2010 and 2011 Caribbean ACL Amendments (CFMC

2011a, b), which established AMs. Therefore, the general or baseline effects of a closure will not be attributable to this proposed amendment. Instead, this proposed amendment is expected to lessen the potential adverse social effects of the status quo (**Alternative 1**) closures that would result from the application of the AMs.

General social effects are expected for any AM-based closure. The severity of the effects will likely be dependent on the length of the closure necessary to achieve the required reduction in landings, whether the closure overlaps with important market dates (based on economic, social, and cultural factors), whether the closure occurs during a time period of traditionally high landings or low landings, the cumulative effects of interacting with other closures for that FMU (such as a spawning closure), and whether multiple FMUs experience AM-based closures at the same time.

The need for and extent of future closures is unknown. However, examples of potential closure scenarios under each of the alternatives for FMUs which had AMs applied in 2013 in Puerto Rico, St. Croix, and St. Thomas/St. John SU2 (commercial Puerto Rico), Wrasses (recreational Puerto Rico), Triggerfish and Filefish (commercial and recreational St. Croix), spiny lobster (commercial and recreational St. Croix), and groupers (commercial and recreational St. Thomas/St. John)) are shown in Table 2.2.1.1 in Section 2.2.1. Included in the table are estimates of the number of days that were closed (under **Alternative 1**) or would have been closed had the closures occurred under the provisions of **Alternatives 2-4**.

Alternative 1 (No action) would retain the current timing for the implementation of AM-based closures in the U.S. Caribbean EEZ. AM-based closures resulting from an ACL overage for all FMUs would continue to begin on December 31st of the closure year and would extend backward into the year for the number of days necessary to achieve the required reduction in landings. **Preferred Alternative 2** would establish September 30th as the closure start date for all FMUs within each island and island group and would extend backward into the year for the number of days necessary to prevent another overage. If the number of days available in the year is not enough to achieve the required landings reduction, then additional days would be closed in the opposite direction. **Alternative 3** would establish January 1st as the closure start date for all FMUs within each island and island group and would extend forward into the year for the number of days necessary to prevent another overage. Finally, **Alternative 4** would establish a fixed closure date for each FMU by island or island group. The closure would extend backward toward the beginning of the year and if the number of days left in the year is not enough to receive the required landings reduction, then additional days would be closed in the opposite direction. Under **Alternative 4**, a different start date could be selected for each FMU, or any combination of FMUs, on each island or island group (Tables 2.2.1-2.2.5). **Sub-Alternatives 4a**, **4c**, **4e**, **4g**, and **4i** would establish a closure start date on the last day of the month that has the

highest landings; whereas **Sub-Alternatives 4b**, **4d**, **4f**, **4h**, and **4j** would establish a closure start date on the last day of the month with the lowest landings.

Important market dates identified by the fishing communities: direct negative impacts could be experienced by fishermen if important market dates fall within the AM closure. As explained in section 4.1.3, examples of important market dates include high demand periods, such as Lent for all three islands/island groups and Christmas for the USVI, as well as other times such as the tourism season (see Table 1.4.1). If a particular fishery is closed during important market dates for that FMU, commercial fishermen could lose money from the inability to fish for and sell those species during these important times. If the dates are important for recreational fishermen, individual anglers targeting those species could lose access to fishing, and recreational guides could lose the ability to make money from fishing trips for that particular species during this time. This could negatively impact fishing communities associated with these fishermen and guides. Also, these dates identified by the fishing communities are important socially and culturally to individuals and communities in the U.S. Caribbean and the availability of fish to customers during this time is important. If particular species of fish are important during these times and these fish are not available because of an AM-based closure, then customers would be negatively impacted by the inability to harvest or consume these fish.

Any AM-based closure that would occur under the status quo (**Alternative 1**) would begin on December 31st and extend backward. This would continue the problem of AM closures overlapping with the Christmas holiday season and tourism season in the USVI (Table 1.4.1). These dates have been identified as being important to fishermen and are dates of higher demand. Accountability measure-based closures implemented so far in the USVI have lasted from 12 to 41 days and have overlapped with much, if not all of the Christmas holiday (Table 2.2.1.1). Fishermen and fishing communities in the USVI might be impacted the most negatively by maintaining the status quo closure start date of December 31st for AM-based closures because of the likelihood that the closure of any species would overlap with these identified important market dates of higher demand.

Important market dates are not as likely to fall within an AM closure for Puerto Rico FMUs in the status quo (**Alternative 1**) because the first important market period of higher demand when extending backward from December 31st has been identified as summer vacation. Summer vacation runs from approximately May 1st through July 31st (Table 1.4.1). In order to impact the summer season, an AM-based closure in Puerto Rico under **Alternative 1** would have to be longer than 153 days (December through August) and, based on historic harvest patterns (the two Puerto Rican FMU AM closures which have occurred so far have lasted for 72 days and 102 days (Recreational Wrasses and Snapper Unit 2, Table 2.2.1.1), it is unlikely that an AM closure would last that long. Thus, **Alternative 1** would likely continue to cause fewer negative impacts to Puerto Rican fishermen and fishing communities than in the USVI.

The negative effects of an AM closure would be expected to be reduced under **Preferred Alternative 2** compared to **Alternative 1** (No Action) because the **Preferred Alternative 2** closure start date of September 30th purposely avoids conflict with times of greater demand, cultural importance, and social importance. The proposed closure start date of September 30th was identified by the DAPs for Puerto Rico, St. Croix, and St. Thomas/St. John as the preferred start date for all FMUs. The September 30th date, and preceding days, was identified as a time of slow fishing and lower demand, particularly in the USVI (Table 1.4.1). Therefore, there is a higher likelihood that important market dates would not be included in an AM closure under **Preferred Alternative 2**. As shown in Table 2.2.1.1, had **Preferred Alternative 2** been previously in effect, only one FMU closure in 2013 would have overlapped with important market dates (Puerto Rico Commercial SU2). However, if AM closures for a particular unit extend past July 31st for Puerto Rico, April 30th for St. Thomas/St. John, and April 30th for St. Croix, additional important dates of higher demand or cultural importance (such as Lent) could be included in the closure (Table 1.4.1). Thus, if harvest overages are high enough, although **Preferred Alternative 2** would eliminate the adverse social effects of a closure overlapping with the culturally and economically important Christmas season, the likelihood of affecting significant periods during summer and spring would increase. However, the endorsement of **Preferred Alternative 2** by the DAPs suggests that the benefits associated with open fisheries in December will exceed those that may be lost if overlap with these other important periods occurs.

Under **Alternative 3**, some identified important market days of higher demand are expected to overlap with a January 1st going forward start date and fishermen could be negatively impacted**.** Under **Alternative 3**, it is certain that an AM closure would overlap with several important times in the USVI. For example, in St. Thomas/St. John there is a higher demand for lobster and yellowtail snapper from January 1 through June 30 due to tourism. In St. Croix there is a higher demand for all species from January 1 through May 31 also due to tourism (Table 1.4.1). In Puerto Rico, the earliest identified example of higher demand begins March 1st (March 1- April 30) for Lent (Table 1.4.1), which would be affected if a closure lasts for more than 59 or 60 (in a leap year) days. Some species in particular, such as queen snapper, have been identified as having the highest demand and being very important during particular times such as during Lent in northern communities in Puerto Rico (this was mentioned during recent Puerto Rico coastline visits). If these species were not available because of an AM closure under **Alternative 3**, then customers might be negatively impacted by the inability to acquire these fish. If **Alternative 3** had been in effect in 2013, both the Snapper Grouper Unit 2 commercial and Wrasses recreational closures in Puerto Rico FMUs would have overlapped with Lent (Table 2.2.1.1).

Because **Sub-Alternatives 4a** through **4j** in **Alternative 4** would establish AM-based closures on harvest rates without consideration of important demand periods, AM closures under all

alternatives could overlap these culturally or economically important periods. As an example of one FMU for which an AM-based closure has occurred, Puerto Rico commercial SU2 would have been closed on September 30th under **Sub-Alternative 4a** and March 31st under **Sub-Alternative 4b** had these alternatives been in effect in 2013 (Table 2.2.1.1). In this example, Puerto Rico commercial SU 2 would be closed for 96 days under **Sub-Alternative 4a,** which would overlap with summer vacation for five days (Table 1.4.1), whereas, it would be closed for 170 days under **Sub-Alternative 4b** (including January through March 31 and April 1 through June 19, which would overlap with all of Lent and part of the summer vacation (Table 1.4.1).

High landings: direct negative social impacts could be experienced by fishermen if the closure falls within a time period where landings for the particular species/species group are traditionally high. A period of high landings could correspond to a period of high demand or a period in which the species are more available or easily caught and fishermen could be negatively impacted by the loss of income associated social effects if access to those fish during these periods is reduced. The particular type of fish might be seasonally more abundant and commercial fishermen might not have to exert as much effort or use as many resources (such as fuel) to catch the same amount of fish as they would during a time where the species were less available. This could negatively impact the income earned by fishermen and result in negative social consequences. In addition, recreational fishermen could be negatively impacted in that they might not be able to encounter their preferred species at the same rate as they would during the closure period of traditionally high landings. This could result in reduced satisfaction with their fishing experience. Fishing guides could also be negatively impacted by an inability to retain fish during periods of high catch rates if forced to shift effort to periods of lower catch rate and they have to use more resources to search for these species to satisfy their customers. Conversely, it is likely that a closure occurring during periods of high landings would be shorter in duration than a closure occurring during a period with low landings, which could possibly result in fewer negative impacts. A shorter closure could benefit both commercial and recreational fishermen in that they would lose fewer days on the water fishing for the affected species.

Under **Alternative 1**, fishermen targeting those species in FMUs with the highest landings occurring in the month closest to December 31st when extending the closure backward would continue to experience these possible negative or positive impacts to the greatest extent. These impacts could continue to occur because of the greater likelihood that the closure will extend through the months with higher landings for that species/species group; however no FMUs include their highest month of landings in December (see Tables 2.2.1-2.2.5 for the month of highest landings by FMU). Several FMUs include periods of high landings in January or February and fishermen targeting these FMUs would be the most likely to experience effects in the status quo (**Alternative 1**).

Under **Preferred Alternative 2**, the September 30th going backward date has been identified as a slow fishing period. However, several FMUs include periods of high landings in months close to or in September (Tables 2.2.1-2.2.5) and fishermen targeting species in these FMUs would be more likely to experience impacts resulting from a closure under **Preferred Alternative 2**.

Under **Alternative 3,** fishermen targeting FMUs with months of highest landings closest to January 1st and extending forward into the year could experience the greatest effects related to high landings, and several FMUs include periods of high landings during January and February (Tables 2.2.1-2.2.5). Because **Sub-Alternatives 4a, 4c**, **4e**, **4g**, and **4i** would establish a closure start date on the last day of the month that has the highest landings, fishermen would be expected to experience the most substantial social effects related to high landings under this alternative. Alternatively, because **Sub-Alternatives 4b**, **4d**, **4f**, **4h**, and **4j** would establish a closure start date on the last day of the month with the lowest landings, fishermen would be expected to experience the fewest social effects related to high landings.

Low landings: a closure that occurs during a time of traditionally low landings could have fewer direct negative impacts on fishermen (than if the closure occurred during times of traditionally high landings). A period of lower landings could correspond to a period of lower demand or to a period of time during which fishing effort is low for other reasons, such as during bad weather. However, an AM closure that occurs during a time of low landings for that particular species would last longer. A lengthy closure could negatively impact commercial fishermen that fish for that species to a greater degree during the closure time period because they would lose the ability to fish and earn income from the fishery for a greater amount of time. This extended period of income loss could result in social consequences. A lengthy closure period could particularly negatively impact fishermen who depend on a portion of their catch for personal and family consumption; however this is only relevant if the fishermen are particularly dependent on keeping those species affected by an AM closure and lack the ability to substitute other species. Recreational guides that target a particular species might also be particularly negatively impacted by a lengthy AM closure for that species because of the longer duration of a loss of access to the species for their customers. Customers may be willing to pay for a trip as long as there is hope of catching and retaining a certain species, but if retention is not allowed (closure) fishing demand may decline. Private recreational anglers would also likely be negatively impacted by a lengthy closure because of the lengthier loss of access to that particular fishery.

Under **Alternative 1**, fishermen targeting those species in FMUs with the lowest landings occurring in the month closest to December 31st would continue to experience these negative or positive impacts to the greatest extent and a large number of FMUs have their lowest landings during December (see Tables 2.2.1-2.2.5). Under **Preferred Alternative 2**, fishermen engaged in fishing for those FMUs with the lowest landings in the months closest to September and extending backward could be impacted and some FMUs, including many Puerto Rican

recreational FMUs that have their lowest landings in September (Tables 2.2.1-2.2.5). Under **Alternative 3**, establishing the January 1st closure start date and extending forward could impact fishermen engaged in fishing for those FMUs with the lowest landings reported in the months closest to January; however only a few FMUs have their lowest landings during January or in the months following January (Tables 2.2.1-2.2.5). Because **Sub-Alternatives 4a, 4c**, **4e**, **4g**, and **4i** would establish a closure start date on the last day of the month that has the highest landings, so the fewest fishermen would be expected experience the effects associated with lowest landings periods. The low landings effects would, however, be the greatest under **Sub-Alternatives 4b**, **4d**, **4f**, **4h**, and **4j** because they would establish a closure start date on the last day of the month with the lowest landings.

Seasonal closures: In addition, FMUs with additional same species-specific closures which already occur during the time period of the AM-based closure could experience longer closures, such as if an AM-based closure overlaps with a spawning closure for that same species. In these cases, the AM-based closure would extend past the species-specific closure making that continuous closure lengthier. As previously stated, lengthening a closure would be expected to increase the negative social impacts to fishermen and their associated fishing communities because of greater loss of access to, income from, and food provided by the respective species. Examples of non-AM-based closures are provided in Table 1.4.2

Unless the AM-based closure was particularly long (extending into the spring and winter months), **Preferred Alternative 2** would only overlap with the year-round closure of all species in the Hind Bank in St. Thomas (Table 1.4.2). Therefore, it is likely that the cumulative effects of a lengthier continuous closure resulting from overlapping with other same species or FMU closures would be avoided for the majority of the areas in the U.S. Caribbean under **Preferred Alternative 2**. However, if the number of days left in the year when going backward from September 30th is not enough to include the necessary number of days needed for the closure, then additional days would be captured by moving forward into the year and these days could overlap with some spawning seasonal closures and the negative cumulative social effects increased. Under **Alternative 3**, several seasonal closures overlap with the AM-based closure start date of January 1st and extending forward in the year (Table 1.4.2). Thus, the adverse social effects associated with overlapping same species/FMU closures would be expected to be higher under **Alternative 3** compared to **Alternative 1** and **Preferred Alternative 2**. For **Sub-Alternative 4a** through **4j,** the overlap of highest and lowest harvest months with the periods of seasonal closure can be determined by comparison of Table 1.4.2 (seasonal closures) with Tables 2.2.1-2.2.5 (highest and lowest harvest months). The combinations of closures with highest/lowest harvest months for all the FMUs are too numerous to detail; in some instances overlaps would definitely or be likely to occur, whereas in others overlap may be unlikely at all or less likely to be encountered, and increased social losses would be expected where overlap occurs. However, to the extent that most of the seasonal closures occur more during the early

parts of the year (before June) than later, whereas most of the FMUs have their lowest landings later in the year (June or later), **Sub-Alternatives 4b, 4d**, **4f**, **4h**, and **4j** would appear to be better suited to avoiding overlap of AM-based closures with seasonal closures and incurring the compounded social effects of extended closures. As a result, **Sub-Alternatives 4b**, **4d**, **4f**, **4h**, and **4j** may result in less adverse social effects than **Sub-Alternatives 4a, 4c**, **4e**, **4g**, and **4i** and **Alternative 3**.

Concurrent closures: If multiple FMUs experience concurrent closures, the effects could be more severe for fishermen and fishing communities because fishing would be allowed for fewer species. This would allow for fewer available species in which to switch effort during the closure period and would include the loss of income (and resulting social effects) from more species during the closure period. Under **Alternatives 1-3**, multiple FMUs would continue to and/or could experience AM-based closures at the same time because all AM closures would start on the same date under each alternative. Under **Alternative 4**, however, a different start date could be selected for each FMU, or any combination of FMUs, on each island or island group (Table 2.2.1-2.2.5), reducing the likelihood of overlap. If different AM-based closure dates are established for each FMU under **Alternative 4**, then it could be possible to avoid having multiple fisheries closed at the same time, which could greatly benefit fishermen. Although, fishers have expressed that they don't want multiple closures.

4.1.5 Direct and Indirect Effects on the Administrative Environment

Alternative 1 (no action) would not require additional rulemaking; therefore it would not have additional effects on the administrative environment.

Alternatives 2 (Preferred), **3**, and **4** would all have direct administrative effects because they all require rulemaking to modify the start date for AMs that would apply to all FMUs on each of Puerto Rico, St. Croix, St. Thomas/St. John, and Caribbean-wide. These effects are expected to be minor, although the effects of **Alternative 4**, which would establish individual AM closure dates for each FMUs per island/island group, would be larger than the other alternatives proposed. **Alternative 4** (all sub-alternatives) would also add the administrative burden of monitoring different dates in the event various FMUs have AMs applied during a particular year and this administrative effect is expected to be minor to moderate. There would be an additional moderate administrative burden for NMFS law enforcement under any of **Sub-Alternatives 4a** through **4i i**f different closure start dates are implemented because they will have to keep track of all of the different closure dates and provide training to their officers. The length of the AM closure(s) would still need to be estimated under all alternatives proposed, so this negative effect on the administrative environment would be similar for all alternatives.

In summary, **Preferred Alternative 2, Alternative 3,** and **Sub-Alternatives 4a** through **4i** in **Alternative 4** would all have direct minor to moderate (i.e., all sub-alternatives of **Alternative 4**) negative effects on the administrative environment because they would add an administrative burden to the Council and NMFS to modify the start dates for AMs in the U.S. Caribbean EEZ through rulemaking. Because **Preferred Alternative 2** and **Alternative 3** propose a single AM closure start date that applies to all FMUs, these effects are expected to be similar across these alternatives. However, and as discussed above, the overall negative administrative effects of **Alternative 4**, which are equal across **Sub-Alternatives 4a** through **4i**, may be larger than the other alternatives because of the establishment of individual dates for each FMU on each island management area and Puerto Rico fishing sectors, which requires additional monitoring, enforcement, and temporary rulemaking to implement different AMs if needed.

4.2 Environmental Effects of Action 2: Revisiting the approach to set AM-based Closures

Action 2: Specify how often the approach to set the timing of AM-based closures selected in Action 1 should be revisited

Summary of Management Alternatives

Alternative 1

No Action. Do not specify how often the approach chosen should be revisited

Alternative 2 (Preferred)

Review the chosen approach no longer than 2 years from implementation, and every 2 years thereafter

Alternative 3

Review the chosen approach no longer than 5 years from implementation, and every 5 years thereafter

4.2.1 Direct and Indirect Effects on the Physical Environment

The purpose of Action 2 is to provide options to review the approach/dates chosen for FMUs in Action 1. Action 2 is not expected to have any direct effects on the physical environment. Indirect effects expected for Action 2 could be that any positive, negative, or neutral effects that the chosen AM closure start date in Action 1 has on the physical environment would continue for an undetermined (**Alternative 1**), shorter (**Preferred Alternative 2**, no longer than two years), or longer (**Alternative 3**, no longer than five years) period of time until the Council revisits the decision.

4.2.2 Direct and Indirect Effects on the Biological and Ecological Environment

Action 2 is not expected to have any direct effects on the biological/ecological environment. Indirect effects that could result from Action 2 could be that any positive, negative, neutral

effects that the chosen AM closure start date in Action 1 has on the biological/ecological environment would be continued for an undetermined (**Alternative 1**), shorter (**Preferred Alternative 2**, no longer than two years), or longer (**Alternative 3**, no longer than five years) period of time until the Council revisits the decision.

4.2.3 Direct and Indirect Effects on the Economic Environment

Action 2 provides alternatives regarding if and how often the Council would review the approach taken under Action 1. **Alternative 1** (No Action) proposes that the Council not specify how often the approach chosen under Action 1 be revisited. **Preferred Alternative 2** proposes that the chosen approach be reviewed no longer than two years from implementation and every two years thereafter, while **Alternative 3** proposes to review the chosen approach no longer than five years from implementation and every five years thereafter.

Although the Council can make a change to the approach adopted in Action 1 at any time, **Preferred Alternative 2** and **Alternative 3** ensure that there is a maximum time limit on how often the approach adopted will be revisited, a process which costs time and money, the amount of which could vary depending on the depth of analysis undertaken and the changes made. This analysis assumes that any change, whether developed and adopted under **Alternative 1**, **Preferred Alternative 2,** or **Alternative 3,** would result in the same increased economic benefits because the alternatives only vary in the potential timing of review and are invariant in the time allowable to identify and implement the beneficial change. The actual timing of review could, in practice, be coincident because the adoption of maximum review periods would not preclude earlier review. It would, further, be illogical to expect that any subsequent change in the AM timing approach would result in reduced benefits and, absent a prescribed maximum period for completing the review and implementing the change (e.g., any review and change may take no more than 15 months), the expected benefits would be expected to be invariant to the required frequency of review. The logic behind these statements is that the need for change would not be expected to require mandatory review to be identified; review and change can be initiated as early as necessary/appropriate regardless of any mandatory review cycle; and the process can take as long as necessary to identify, develop, and implement the best change/outcome. Thus, the three alternatives would not be expected to result in different economic benefits.

The three alternatives vary, however, in the imposition of mandatory process costs. As stated above, any management review has attendant time and money costs. These costs increase with the frequency and depth of review. Mandatory review under a specified schedule will increase these costs the more frequent a review is required. Although, as stated above, actual review may occur more frequently than specified, the shorter the mandatory period, the more frequent

reviews would be expected to be occur and the greater the associated total costs. Thus, **Preferred Alternative 2** would be expected to result in more frequent review, and associated costs, than **Alternative 3** and **Alternative 1**, and **Alternative 3** would be expected to result in more frequent review than **Alternative 1**. Although these costs would be justified if change is needed (the benefits of review and change would be expected to exceed the costs, and a net gain in economic benefits would be expected to result), if a change is not needed, mandatory review would simply impose costs with no accompanying benefits. Thus, from this perspective and examining net benefits (benefits minus costs), **Preferred Alternative 2** could result in lower net economic benefits compared to **Alternative 3** and **Alternative 1**, and **Alternative 3** lower net economic benefits than **Alternative 1**. The differences may be minimal, however, depending on the required depth of review. If simple discussion at a council meeting is sufficient to determine that the current AM approach does not need to be changed, then only trivial routine council process costs would be incurred. If, however, the review involves extensive data review and analysis, multiple public meetings and other forms of outreach and information exchange, spread over many months, as the resultant process, the associated cost, on a recurring basis, could become substantial. Mandatory review may engender greater confidence in responsible management and, if so, more frequent review would be expected to result in greater confidence compared with less frequent review; however, confidence is not an economic benefit or metric.

4.2.4 Direct and Indirect Effects on the Social Environment

Alternative 1 would continue not to specify how often the approach used to select an AM-based closure date would be revisited. Under **Alternative 1**, whatever the AM closure date and approach selected in Action 1 would continue to be used unless some future action is taken by the Council. This could result in the continuation of any social effects from the chosen method, including unintended consequences that may not have been considered. However, the Council has the discretion to revisit the chosen method at any time. Under **Alternative 1**, fishermen could change their behavior based on the perception that the current approach used to select a closure date will continue and thus resulting social effects will continue to be experienced.

Preferred Alternative 2 would require the Council to review the chosen approach for selecting an AM-based closure start date no longer than two years from implementation and every two years thereafter. This could result in the continuation of social effects from the chosen method for up to two years and then could allow for the ability to change that method to incorporate new information (such as how fishermen are actually impacted by the selected method rather than presenting the expected impacts). Under **Preferred Alternative 2**, fishermen could change their behavior based on the perception that the current approach used to select a closure date will continue for up to two years and thus resulting social effects will continue to be experienced during that time**. Preferred Alternative 2** would include a mandatory review which may result

in greater confidence in responsible management. If so, a more frequent review would be expected to result in greater confidence compared with less frequent review and thus **Preferred Alternative 2** could result in greater confidence than **Alternative 3** and **Alternative 1** (which does not include a mandatory review).

Alternative 3 would review the chosen approach for selecting an AM-based closure start date no longer than five years from implementation and every five years thereafter. This could result in the continuation of social effects from the chosen method for up to five years and then could allow for the ability to change that method to incorporate new information. Because the required period of review occurs later under **Alternative 3** than in **Preferred Alternative 2**, social effects experienced from the AM-based closure start date selection method could continue for a longer time period under **Alternative 3**, including any possible unintended negative consequences. Under **Alternative 3**, fishermen could change their behavior based on the perception that the current approach used to select a closure date will continue for up to five years. **Alternative 3** would include a mandatory review which may result in greater confidence in responsible management than under **Alternative 1** which does not include a mandatory review. However, the review period is less frequent under **Alternative 3** than under **Preferred Alternative 2** and thus could result in less confidence than under **Preferred Alternative 2.**

Regardless of whether **Alternative 1-3** is selected, fishermen and managers would have the opportunity to comment or initiate efforts to change the closure start date or dates whenever it is called for and not under some specified time frame. Under **Alternatives 1-3** it is expected that the regulatory process would take at least a year for changes to go into effect after action is initiated.

4.2.5 Direct and Indirect Effects on the Administrative Environment

Because **Alternative 1** does not specify how often the approach used to select an AM-based closure date should be revisited, the administrative effects of this alternative would be unknown. If the Council revisits the action and implements changes to the dates or the approach for implementing AMs, then this will add the minor administrative burden of amending the appropriate FMP and creating the applicable regulations.

In **Preferred Alternative 2** revisiting the approach selected in Action 1 no longer than two years following implementation and every two years thereafter would require the Council potentially re-evaluate the selected method earlier and more frequent than under **Alternative 3** (no longer than five years, and every five years thereafter), although this could also happen under **Alternative 1**, because the Council could revisit at any time. The negative and minor

administrative effects would be the same as those for **Alternative 1** and would involve amending the FMPs and creating new rulemaking if changes are to be made at the time. Although these effects are expected to be larger in **Preferred Alternative 2** than in **Alternative 3** because of the frequency that the Council would have to review the approach chosen in Action 1.

In **Alternative 3** revising the approach selected in Action 1 no longer than five years from implementation and every five years thereafter would also have minor negative effects on the administrative environment similar to those expected for both **Alternative 1** and **Preferred Alternative 2** and would involve amending the FMPs and creating new rulemaking if changes are to be made at the time. Although, as mentioned above, these effects are expected to be less frequent than in **Preferred Alternative 2**.

In summary, in all three alternatives the Council maintains the discretion to revisit their decision at any time, and then effects would be unknown and not really different among alternatives. In this case, under any of the alternatives, if the Council revisits the approach and determines that changes are not necessary, then no additional negative administrative effects would be expected. Given that both **Preferred Alternative 2** and **Alternative 3** add a non-specified review requirement every 2 or 5 years, respectively, minor negative effects are expected when compared to **Alternative 1**, which does not have a review requirement.

4.2 Cumulative Effects Assessment

The Cumulative Effects Assessment (CEA) included in the 2010 Caribbean ACL Amendment (CFMC 2011a) analyzed cumulative effects to the reef fish, and the CEA included in the 2011 Caribbean ACL Amendment (CFMC 2011b) analyzed cumulative effects to the spiny lobster and coral resources, in the U.S. Caribbean EEZ. Both of these CEAs also described baseline economic and social conditions for fishing communities in Puerto Rico and the USVI. These CEAs described the effects of the establishment of ACLs, AMs, and the redefinition of management reference points for reef fish, spiny lobster, corals and reef associated plants and invertebrates, as well as queen conch in U.S. Caribbean federal waters and how those actions would serve to restore and stabilize natural trophic and competitive relationships, rebuild species abundances, re-establish natural sex ratios, contribute to the long-term health of the ecosystem, and reinvigorate sustainable fisheries while minimizing to the extent practicable negative socioeconomic impacts. The analyses of cumulative effects listed in each of the 2010 and 2011 Caribbean ACL Amendments are still considered to be accurate and useful at the present time and are incorporated herein by reference.

Additional pertinent actions are summarized in the history of management (Section 1.6). The Council is considering two present and reasonably foreseeable future actions that would directly affect Council managed species and the application of AMs. The Council is currently developing island-based FMPs for the U.S. Caribbean. These will replace the present Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs. This action could affect the way the queen conch, reef fish, spiny lobster, and coral resources are managed in the U.S. Caribbean, as management could be tailored to each island or island group. It is likely that through these FMPs, management reference points, ACLs, and/or AMs will be revisited and possibly revised. How the action proposed in this amendment would be affected by the creation of Island-based FMPs is currently unknown.

The Council is also presently developing a comprehensive amendment that would modify language in the four Council FMPs regarding AM applicability. This action would directly affect AMs, however, the action would just adjust language in the FMPs and would not change the regulations and thus the way AMs are currently implemented in the EEZ. The action in that comprehensive amendment is not expected to contribute to the effects expected from this action, and vice-versa.

The affected area of this proposed action encompasses federal waters of the U.S. Caribbean as well as the fishing communities of Puerto Rico and the USVI dependent on fishing for reef fish, spiny lobster, and coral resources and the ecosystem services they provide. The proposed actions would modify the timing for the application of AMs for council-managed species in the Reef Fish, Spiny Lobster, and Coral FMPs and how often a review of the chosen approach should be conducted. Modifying the start date for AM closures as proposed in Action 1 would not change the ACL; it would redistribute harvest of the ACL throughout the year. These actions are not expected to have significant beneficial or adverse cumulative effects on the physical or biological/ecological environments as they would minimally affect fishing practices (Action 1) (see Sections 4.1.1 and 4.1.2) or have no effect at all on fishing practices (Action 2).
In general, the biological/ecological environment of a species/species complex to which an AM is applied would benefit positively from the AM by constraining landings to the ACL and preventing an overage in future years. The socio-economic environment experience short-term adverse effects from the application of AMs in general. However, in the long term, the social and economic effects are expected to be positive through healthier fish stocks. These are expected general effects from this amendment. Moreover, the social and economic environments are expected to benefit from this amendment because a change to the current date on which AM-based closures are applied is expected to decrease the negative socio-economic effects that AM based closures occurring close to the end of the calendar year inevitably have on fishers.

In summary, the actions in this amendment, combined with past and reasonably foreseeable future actions are not expected to result in significant effects when considered in combination

with other relevant past, present, and reasonably foreseeable actions because the manner in which the fishery is conducted will not be substantially changed. These actions are also not expected to have substantial adverse effects on public health or safety.

Stresses affecting fishery resources and protected resources as well as the human communities that depend on those resources include but are not limited to natural events, habitat quality, human population growth, and anthropogenic threats (e.g., habitat loss and degradation, sedimentation, pollution, water quality, overharvest, climate change). Some managed species may be more sensitive to the quality of their environment than others. For example, any changes in benthic conditions resulting from land based increases in sedimentation or turbidity will adversely affect the available productive habitat for queen conch (Appeldoorn et al. 2011) and corals.

Other factors directly affecting human communities include high fuel costs, increased seafood imports, restricted access to traditional fishing grounds, and regional economies. Increased seafood imports are significant as it relates to market competition, where a glut of fish products can flood the market and lower ex-vessel prices. Once market channels are lost to imported seafood products it may be hard for fishery participants to regain those channels (WPFMC 2009). Effects on the regional economy, for example the closure of the Hovensa Petroleum Refinery Plant of St. Croix in 2012, which left more than 1,200 people without work, may increase the community dependence on local fisheries as their main source of income and food.

Environmental changes (e.g., potential threats from climate change, ocean acidification) can also affect fishery populations, protected resources, and the people and communities that depend on those resources. New and recent information about climate change has begun to shed light on how global climate change will affect, and is already affecting, reef fish, spiny lobster, queen conch, and coral resources. Climate change can affect marine ecosystems through ocean warming by increased thermal stratification, changes to upwelling patterns, sea level rise, increases in wave height and frequency, loss of sea ice, and increased risk of diseases in marine biota, among other things. Potential vulnerabilities for coastal zones include increased shoreline erosion leading to alteration of the coastline, loss of coastal wetlands, and changes in the profiles of fish and other marine life populations (Lorde et al. 2013). Changes in ocean temperatures have been linked to shifting fish stock distributions and abundances in many marine ecosystems, and these impacts are expected to increase in the future (NMFS 2014). Any of these could affect the local or regional seafood output and thus the local economy (Carter et al. 2014). In the U.S. Caribbean region and throughout the southeastern U.S., the major climate induced ecosystem concerns are: 1) Threats to coral reef ecosystems - coral bleaching, disease, and ocean acidification; 2) Threats to habitat from sea level rise – loss of essential fish habitat; and 3) Climate induced changes to species phenology and distribution (Osgood 2008).

Climate variability is also a factor that needs to be considered when addressing climate effects, and in the reasonable foreseeable future it may be far more influential than unidirectional climate change (B. Arnold, personal communication). For example, inter-annual or El Niño scale changes in the ocean environment may result in changes in the distribution patterns of migratory fishes and can affect reproduction and recruitment in other species (NOAA PFL Climate Variability and Marine Fisheries, http://www.pfeg.noaa.gov/research/climatemarine/cmffish/cmffishery.html, accessed May 2015). Additionally, cyclical water temperature patterns may result in relatively short-term (i.e., decadal) decreases in water temperature despite the evident long-term pattern of temperature increase. Such decadal-scale events may be far more influential with respect to fishery management regulations such as those included in this amendment than are long-term climate change events, because these decadal-scale events operate on the time frame of the fishery management action.

Extreme weather events in the Caribbean, such as hurricanes and storms, in combination with poor land-use planning and deficient ecosystem management and restoration, can be a source of additional pressure to marine ecosystems and to species affected by the proposed action. Moreover, climate change impacts appear to be more substantial or at least more noticeable so far, as one moves away from the equator. Thus, impacts of climate change may be less measurable in the Caribbean than in the higher latitudes (B. Arnold, personal communication), although impacts could be greater in the tropics due to organisms being less well adapted to temperature fluctuations. Nevertheless, when the potential effects of the proposed actions in this amendment are considered within the context of climate change, the interactive effects are considered to be insignificant relative to other impacts of the proposed action.

Excess carbon dioxide (CO_2) dissolves into the ocean and is converted to corrosive carbonic acid, resulting in the phenomenon known as "ocean acidification" (Oceanus 2013). At the same time, the CO_2 also supplies carbon that combines with calcium already dissolved in seawater to provide the main ingredient for shells, calcium carbonate ($CaCO_3$) (Oceanus 2013). The net responses of organisms to rising CO_2 concentration will vary depending on often opposing sensitivities to decreased seawater pH, carbonate concentration, and carbonate saturation state, and to elevated oceanic total inorganic carbon and gaseous CO_2 (Cooley and Doney 2009). Increased ocean acidity caused by elevated CO_2 could directly damage organisms by partially dissolving their shells (Oceanus 2013, https://www.whoi.edu/oceanus/viewArticle.do?id=52990) or by decreasing growth rates. Other species with more protective coverings on their shells and skeletons, such as crustaceans, temperate urchins, mussels, and coralline red algae may be less vulnerable to decreasing seawater pH (Oceanus 2013). However, the specifics of how ocean acidification affects these species are not well understood.

In general, specific levels of impacts resulting from climate change, climate variation, and ocean acidification cannot be quantified at this time, nor is the exact timeframe known in which these impacts will occur. However, projections based on the Intergovernmental Panel on Climate Change's (IPCC) Special Report on Emissions Scenarios (SRES) give a reduction in average global surface ocean pH of between 0.14 and 0.35 units during the 21st century (Climate Change 2007).

None of the actions proposed in this amendment are expected to increase or decrease the potential impacts of climate change and ocean acidification on fishery resources and other protected resources. Other anthropogenic impacts to reef fish, spiny lobster, and coral resources in the affected area may be more pressing than climate change or even decadal-scale climate variability. Continued monitoring of the effects of climate change, climate variability, and ocean acidification should be a priority of national and local programs. For more information about climate impacts in U.S. marine living resources concerning NMFS, see Osgood (2008). For additional information about climate change in the Caribbean and Southeast region, please see Chapter 17 of the Third National Climate Assessment: *Climate Change Impacts in the United States*; http://nca2014.globalchange.gov/report/regions/southeast, (Carter et al. 2014).

The effects of the proposed actions will be monitored through collection of fisheries-dependent and fisheries-independent data by NMFS and the Puerto Rico and USVI governments. In the USVI, commercial landings data are collected by the Department of Planning and Natural Resources. Recreational landings data for managed species are not currently collected in the USVI. In Puerto Rico, commercial and recreational landings data are collected by the Department of Natural and Environmental Resources. Additional information of the effects of these actions will be obtained through stock assessments and stock assessment updates, life history studies, economic and social analyses, and other scientific observations, and by direct communication with affected constituents.

Chapter 5. List of Preparers

Table 5-1. List of Interdisciplinary Plan Team (IPT) Members

Name	Agency	Title
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Scott Crosson	NMFS/SEFSC	Economist
Lynn Rios	NOAA/OLE	Enforcement Officer

NMFS = National Marine Fisheries Service, CFMC = Caribbean Fishery Management Council, SF = Sustainable Fisheries Division, PR = Protected Resources Division, SERO = Southeast Regional Office, SER = Southeast Region, HC = Habitat Conservation Division, GC = General Counsel, SEFSC = Southeast Fisheries Science Center, OLE= Office of Law Enforcement

Chapter 6. List of Agencies, Organizations and Persons Consulted

Responsible Agencies

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National Marine Fisheries Service (NMFS), Southeast Region 263 13th Avenue South
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List of Agencies, Organizations, and Persons Consulted

Department of Commerce Office of General Counsel
National Marine Fisheries Service Office of General Counsel
National Marine Fisheries Service Office of General Counsel Southeast Region
National Marine Fisheries Service Southeast Regional Office
National Marine Fisheries Service Southeast Fisheries Science Center
National Marine Fisheries Service Silver Spring Office
National Marine Fisheries Service Office of Law Enforcement Southeast Division
United States Coast Guard
United States Department of the Interior
U.S. Virgin Islands Department of Planning and Natural Resources
Puerto Rico Department of Natural and Environmental Resources
Puerto Rico Junta de Calidad Ambiental (Puerto Rico Environmental Quality Board)

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Appendices

Appendix A. Other Applicable Law

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (16 U.S.C. 1801 et seq.) provides the authority for fishery management in federal waters of the exclusive economic zone. However, fishery management decision-making is also affected by a number of other federal statutes designed to protect the biological and human components of U.S. fisheries, as well as the ecosystems that support those fisheries. Major laws affecting federal fishery management decision-making are summarized below.

Administrative Procedures Act (APA)
All federal rulemaking is governed under the provisions of the APA (5 U.S.C. Subchapter II), which establishes a "notice and comment" procedure to enable public participation in the rulemaking process. Under the APA, the National Marine Fisheries Service (NMFS) is required to publish notification of proposed rules in the *Federal Register* and to solicit, consider and respond to public comment on those rules before they are finalized. The APA also establishes a 30-day wait period from the time a final rule is published until it takes effect.

Coastal Zone Management Act (CZMA)
The CZMA of 1972 (16 U.S.C. 1451 et seq.) encourages state and federal cooperation in the development of plans that manage the use of natural coastal habitats, as well as the fish and wildlife those habitats support. When proposing an action determined to directly affect coastal resources managed under an approved coastal zone management program, NMFS is required to provide the relevant State agency with a determination that the proposed action is consistent with the enforceable policies of the approved program to the maximum extent practicable at least 90 days before taking final action. NMFS may presume State agency concurrence if the State agency's response is not received within 60 days from receipt of the agency's consistency determination and supporting information as required by 15 C.F.R. §930.41(a).

Data Quality Act
The Data Quality Act (Public Law 106-443), which took effect October 1, 2002, requires the government for the first time to set standards for the quality of scientific information and statistics used and disseminated by federal agencies. Information includes any communication or representation of knowledge such as facts or data, in any medium or form, including textual,

numerical, cartographic, narrative, or audiovisual forms (includes web dissemination, but not hyperlinks to information that others disseminate; does not include clearly stated opinions). Specifically, the Act directs the Office of Management and Budget (OMB) to issue government wide guidelines that "provide policy and procedural guidance to federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information disseminated by federal agencies." Such guidelines have been issued, directing all federal agencies to create and issue agency-specific standards to: 1) Ensure information quality and develop a pre-dissemination review process; 2) establish administrative mechanisms allowing affected persons to seek and obtain correction of information; and 3) report periodically to OMB on the number and nature of complaints received.

Scientific information and data are key components of fishery management plans (FMPs) and amendments and the use of best available information is the second national standard under the Magnuson-Stevens Act. To be consistent with the Act, FMPs and amendments must be based on the best information available. They should also properly reference all supporting materials and data, and be reviewed by technically competent individuals. With respect to original data generated for FMPs and amendments, it is important to ensure that the data are collected according to documented procedures or in a manner that reflects standard practices accepted by the relevant scientific and technical communities. Data will also undergo quality control prior to being used by the agency and a pre-dissemination review.

Endangered Species Act (ESA)

The ESA of 1973 (16 U.S.C. Section 1531 et seq.) requires federal agencies to ensure actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of threatened or endangered species or the habitat designated as critical to their survival and recovery. The ESA requires NMFS to consult with the appropriate administrative agency (itself for most marine species, and the U.S. Fish and Wildlife Service for all remaining species) when proposing an action that may affect threatened or endangered species or adversely modify critical habitat. Consultations are necessary to determine the potential impacts of the proposed action. They are concluded informally when proposed actions may affect but are "not likely to adversely affect" threatened or endangered species or designated critical habitat. Formal consultations, resulting in a biological opinion, are required when proposed actions may affect and are "likely to adversely affect" threatened or endangered species or adversely modify designated critical habitat.

NMFS has completed ESA Section 7 consultations on the continued authorization of the Spiny Lobster, Corals and Reef Associated Plants and Invertebrates, and Reef Fish fisheries under their respective FMPs. In 2011, NMFS completed separate biological opinions evaluating the impacts of the continuing authorization of the reef fish (NMFS 2011d) and spiny lobster

fisheries (NMFS 2011e) on ESA-listed species. The reef fish biological opinion stated the fishery was not likely to adversely affect loggerhead sea turtles, sea turtle critical habitat, or marine mammals (see NMFS 2011d for discussion on these species and entities). However, the opinion did state that reef fish fishery would adversely affect green, hawksbill, and leatherback sea turtles and *Acropora* coral but would not jeopardize their continued existence. The opinion also stated the reef fish fishery would adversely affect *Acropora* critical habitat but would not destroy or adversely modify it. An incidental take statement was issued for green, hawksbill, and leatherback sea turtles, as well as *Acropora* corals. Reasonable and prudent measures to minimize the impact of these incidental takes were specified, along with terms and conditions to implement them.

The spiny lobster biological opinion stated the fishery was not likely to adversely affect elkhorn coral, loggerhead sea turtles, sea turtle critical habitat, or marine mammals (see NMFS 2011e, for discussion on these species and entities). However, the opinion did state that the spiny lobster fishery would adversely affect green, hawksbill, and leatherback sea turtles and staghorn coral but would not jeopardize their continued existence. The opinion also stated the spiny lobster fishery would adversely affect *Acropora* critical habitat but would not destroy or adversely modify it. An incidental take statement was issued for green, hawksbill, and leatherback sea turtles, as well as staghorn coral. Reasonable and prudent measures to minimize the impact of these incidental takes were specified, along with terms and conditions to implement them.

NMFS met the ESA Section 7 consultation requirements to evaluate the potential impacts to listed species from the continued authorization of the Corals and Reef Associated Plants and Invertebrate fisheries via informal consultations. In a consultation memorandum dated February 8, 2013, NMFS concurred with the determination that the continued authorization of the fishery was not likely to adversely affect any listed species or critical habitat. That determination was based primarily on the fact that the vast majority of the fishery does not operate in federal waters and because the fishery is highly selective and fishers can easily avoid listed species. The memorandum also concurred with the determination that the essential feature of *Acropora* critical habitat (i.e., consolidated hardbottom or dead coral skeleton that is free from fleshy macroalgae cover and sediment cover, occurring in water depths from the mean high water line to 30 meters (98 feet)), was not likely to be adversely affected by the continued authorization of fishery. The memorandum agreed with the determination that coral reef fishers would not cause consolidated hardbottom to become unconsolidated and would not cause the growth of macroalgae or sedimentation; therefore, any adverse were unlikely to occur and are discountable.

NMFS is evaluating potential effects of the action proposed and will complete any required Section 7 analysis prior to promulgation of a final rule implementing this amendment.

Marine Mammal Protection Act (MMPA)

The MMPA established a moratorium, with certain exceptions, on the taking of marine mammals in U.S. waters and by U.S. citizens on the high seas. It also prohibits the importing of marine mammals and marine mammal products into the United States. Under the MMPA, the Secretary of Commerce (authority delegated to NMFS) is responsible for the conservation and management of cetaceans and pinnipeds (other than walruses). The Secretary of the Interior is responsible for walruses, sea otters, polar bears, manatees, and dugongs.

In 1994, Congress amended the MMPA, to govern the taking of marine mammals incidental to commercial fishing operations. The MMPA requires a commercial fishery to be placed in one of three categories, based on the relative frequency of incidental serious injuries and mortalities of marine mammals. Category I designates fisheries with frequent serious injuries and mortalities incidental to commercial fishing; Category II designates fisheries with occasional serious injuries and mortalities; Category III designates fisheries with a remote likelihood or no known serious injuries or mortalities. To legally fish in a Category I and/or II fishery, a fisherman must obtain a marine mammal authorization certificate by registering with the Marine Mammal Authorization Program (50 CFR 229.4) and accommodate an observer if requested (50 CFR 229.7(c)) and they must comply with any applicable take reduction plans.

NMFS has determined that fishing activities conducted under this amendment will have no adverse impact on marine mammals. According to the List of Fisheries for 2015 published by NMFS, all gear (dive, hand/mechanical collection fisheries) used in the reef fish, queen conch, spiny lobster, and coral resources fisheries are considered Category III (79 FR 77919), meaning annual mortality and serious injury of marine mammals in these fisheries is less than or equal to one percent of the potential biological removal level.

Paperwork Reduction Act

The Paperwork Reduction Act (PRA) of 1995 (44 U.S.C. 3501 et seq.) regulates the collection of public information by federal agencies to ensure that the public is not overburdened with information requests, that the federal government's information collection procedures are efficient, and that federal agencies adhere to appropriate rules governing the confidentiality of such information. The PRA requires NMFS to obtain approval from the Office of Management and Budget before requesting most types of fishery information from the public. This action does not contain a collection-of-information requirement for purposes of the PRA.

Small Business Act

The Small Business Act of 1953, as amended, Section 8(a), 15 U.S.C. 634(b)(6), 636(j),

637(a) and (d); Public Laws 95-507 and 99-661, Section 1207; and Public Laws 100-656 and 101-37 are administered by the Small Business Administration. The objectives of the act are to foster business ownership by individuals who are both socially and economically disadvantaged; and to promote the competitive viability of such firms by providing business development assistance including, but not limited to, management and technical assistance, access to capital and other forms of financial assistance, business training and counseling, and access to sole source and limited competition federal contract opportunities, to help the firms to achieve competitive viability. Because most businesses associated with fishing are considered small businesses, NMFS, in implementing regulations, must assess how those regulations will affect small businesses.

Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat (EFH) Provisions

The Magnuson-Stevens Act includes EFH requirements, and as such, each existing, and any new FMPs must describe and identify EFH for the fishery, minimize to the extent practicable adverse effects on that EFH caused by fishing, and identify other actions to encourage the conservation and enhancement of that EFH.

The areas affected by the proposed action have been identified as EFH for queen conch, spiny lobster, corals, and reef fish. As specified in the Magnuson-Stevens Act, EFH consultation is required for federal actions which may adversely affect EFH.

National Environmental Policy Act

The National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 et seq.) requires federal agencies to consider the environmental and social consequences of proposed major actions, as well as alternatives to those actions, and to provide this information for public consideration and comment before selecting a final course of action. This document contains an Environmental Assessment to satisfy the NEPA requirements. The Purpose and Need can be found in Section 1.4, Alternatives are found in Chapter 2, the Environmental Consequences are found in Chapter 4, the List of Preparers is in Chapter 7, and a list of the agencies/people consulted is found in Chapter 8.

Regulatory Flexibility Act (RFA)

The purpose of the Regulatory Flexibility Act (RFA 1980, 5 U.S.C. 601 et seq.) is to ensure that federal agencies consider the economic impact of their regulatory proposals on small entities, analyze effective alternatives that minimize the economic impacts on small entities, and make their analyses available for public comment. The RFA does not seek preferential treatment for small entities, require agencies to adopt regulations that impose the least burden on small entities, or mandate exemptions for small entities. Rather, it requires agencies to examine public

policy issues using an analytical process that identifies, among other things, barriers to small business competitiveness and seeks a level playing field for small entities, not an unfair advantage.

After an agency determines that the RFA applies, it must decide whether to conduct a full regulatory flexibility analysis (Initial Regulatory Flexibility Analysis [IRFA] and Final Regulatory Flexibility Analysis [FRFA]) or to certify that the proposed rule will not "have a significant economic impact on a substantial number of small entities." In order to make this determination, the agency conducts a threshold analysis, which has the following 5 parts: 1) Description of small entities regulated by the proposed action, which includes the SBA size standard(s), or those approved by the Office of Advocacy, for purposes of the analysis and size variations among these small entities; 2) descriptions and estimates of the economic impacts of compliance requirements on the small entities, which include reporting and recordkeeping burdens and variations of impacts among size groupings of small entities; 3) criteria used to determine if the economic impact is significant or not; 4) criteria used to determine if the number of small entities that experience a significant economic impact is substantial or not; and 5) descriptions of assumptions and uncertainties, including data used in the analysis. If the threshold analysis indicates that there will not be a significant economic impact on a substantial number of small entities, the agency can so certify.

Executive Orders

E.O. 12630: Takings

The Executive Order on Government Actions and Interference with Constitutionally Protected Property Rights, which became effective March 18, 1988, requires that each federal agency prepare a Takings Implication Assessment for any of its administrative, regulatory, and legislative policies and actions that affect, or may affect, the use of any real or personal property. Clearance of a regulatory action must include a takings statement and, if appropriate, a Takings Implication Assessment. The NOAA Office of General Counsel will determine whether a Takings Implication Assessment is necessary for this amendment.

E.O. 12866: Regulatory Planning and Review

Executive Order 12866, signed in 1993, requires federal agencies to assess the costs and benefits of their proposed regulations, including distributional impacts, and to select alternatives that maximize net benefits to society. To comply with E.O. 12866, NMFS prepares a Regulatory Impact Review (RIR) for all fishery regulatory actions that either implement a new fishery management plan or significantly amend an existing plan. RIRs provide a comprehensive analysis of the costs and benefits to society associated with proposed regulatory actions, the problems and policy objectives prompting the regulatory proposals, and the major alternatives

that could be used to solve the problems. The reviews also serve as the basis for the agency's determinations as to whether proposed regulations are a "significant regulatory action" under the criteria provided in E.O. 12866 and whether proposed regulations will have a significant economic impact on a substantial number of small entities in compliance with the Regulatory Flexibility Act analysis.

E.O. 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations

This Executive Order mandates that each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions. See Section 3.4.3 for Environmental Justice considerations as they relate to this regulatory amendment.

E.O. 12962: Recreational Fisheries

This Executive Order requires federal agencies, in cooperation with States and Tribes, to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities through a variety of methods including, but not limited to, developing joint partnerships; promoting the restoration of recreational fishing areas that are limited by water quality and habitat degradation; fostering sound aquatic conservation and restoration endeavors; and evaluating the effects of federally-funded, permitted, or authorized actions on aquatic systems and recreational fisheries, and documenting those effects.

Additionally, it establishes a seven-member National Recreational Fisheries Coordination Council responsible for, among other things, ensuring that social and economic values of healthy aquatic systems that support recreational fisheries are considered by federal agencies in the course of their actions, sharing the latest resource information and management technologies, and reducing duplicative and cost-inefficient programs among federal agencies involved in conserving or managing recreational fisheries. The Council also is responsible for developing, in cooperation with federal agencies, States and Tribes, a Recreational Fishery Resource Conservation Plan - to include a five-year agenda. Finally, the Order requires NMFS and the U.S. Fish and Wildlife Service to develop a joint agency policy for administering the ESA.

E.O. 13089: Coral Reef Protection

The Executive Order on Coral Reef Protection (June 11, 1998) requires federal agencies whose actions may affect U.S. coral reef ecosystems to identify those actions, utilize their programs and authorities to protect and enhance the conditions of such ecosystems; and, to the extent permitted

by law, ensure that actions they authorize, fund or carry out not degrade the condition of that ecosystem. By definition, a U.S. coral reef ecosystem means those species, habitats, and other national resources associated with coral reefs in all maritime areas and zones subject to the jurisdiction or control of the United States (e.g., federal, state, territorial, or commonwealth waters).

The action in this amendment will have no direct impacts on coral reefs. Regulations are already in place to limit or reduce impacts to coral reef habitat in the U.S. Caribbean EEZ. In addition, NMFS approved and implemented the 2011 Annual Catch Limit (ACL) Amendment, which established ACLs and accountability measures for species within the Corals and Reef Associated Plants and Invertebrates FMP. These actions aim to prevent overfishing of coral reef resources, which contain species that play important roles on coral reef ecosystems of the U.S. Caribbean.

E.O. 13132: Federalism

The Executive Order on Federalism requires agencies, when formulating and implementing policies, to be guided by the fundamental Federalism principles. The Order serves to guarantee the division of governmental responsibilities between the national government and the states that was intended by the framers of the Constitution. Federalism is rooted in the belief that issues not national in scope or significance are most appropriately addressed by the level of government closest to the people. This Order is relevant to FMPs and amendments given the overlapping authorities of NMFS, the states, and local authorities in managing coastal resources, including fisheries, and the need for a clear definition of responsibilities. It is important to recognize those components of the ecosystem over which fishery managers have no direct control and to develop strategies to address them in conjunction with appropriate international, State, Tribal, and local entities. No Federalism issues have been identified relative to the action proposed in this regulatory amendment. Therefore, consultation with state officials under Executive Order 13132 is not necessary.

E.O. 13112: Invasive Species

This Executive Order requires agencies to use their authority to prevent introduction of invasive species, respond to and control invasions in a cost effective and environmentally sound manner, and to provide for restoration of native species and habitat conditions in ecosystems that have been invaded. Further, agencies shall not authorize, fund, or carry out actions that are likely to cause or promote the introduction or spread of invasive species in the U.S. or elsewhere unless a determination is made that the benefits of such actions clearly outweigh the potential harm; and that all feasible and prudent measures to minimize the risk of harm will be taken in conjunction with the actions. The actions undertaken in this amendment will not introduce, authorize, fund, or carry out actions that are likely to cause or promote the introduction or spread of invasive species in the U.S. or elsewhere.

E.O. 13158: Marine Protected Areas (MPAs)

Executive Order 13158 (May 26, 2000) requires federal agencies to consider whether their proposed action(s) will affect any area of the marine environment that has been reserved by Federal, State, territorial, Tribal, or local laws or regulations to provide lasting protection for part or all of the natural or cultural resource within the protected area. This action is not expected to affect any MPA in federal waters of the U.S. Caribbean.

Appendix B. Considered but Rejected Alternatives

This section describes a sub-alternative proposed for Action 1 that the Caribbean Fishery Management Council (Council) considered in developing this document, but decided not to pursue.

During the 153rd Regular Meeting held on August 19-20, 2015 in Mayaguez, Puerto Rico, the Council reviewed the alternatives and sub-alternatives proposed for both Action 1 and Action 2. The Council decided to not pursue **Sub-Alternative 4c** of **Alternative 4** in Action 1: Modify the timing for the implementation of AM-based closures in the U.S. Caribbean exclusive economic zone (EEZ). **Sub-Alternative 4c** proposed to establish a fixed start date to apply an accountability measure-based closure for each fishery management unit (FMU) on each of Puerto Rico, St. Croix, St. Thomas/St. John, and Caribbean-wide management areas:

A. Puerto Rico, B. St. Thomas/St. John, C. St. Croix, and D. Caribbean-Wide:

Sub-Alternative 4c. Closure to start the last day of the month with the least negative economic, social, and cultural effects.

Sub-Alternative 4c was eliminated following a discussion by the Council where it was recognized that determining the optimal time of the year for a closure for each FMU within each of the management areas that would have the least negative socio-economic and cultural effects would likely not be feasible.

Appendix C. Summary of Regulations in Federal, U.S. Virgin Islands, and Puerto Rico Waters

Revised 8.3.2015 – NMFS/Sustainable Fisheries/Caribbean Branch. This is a summary of current regulations for informational purposes only. For current official regulations go to: http://sero.nmfs.noaa.gov/sustainable_fisheries/policy_branch/documents/pdfs/current_50cfr622_regulations.pdf

QUEEN CONCH	Closed	Open
Federal (only applies to Lang Bank, STX. Season closes when STX territorial limit is reached)	Jun 1 – Oct 31	Nov 1 – May 31
Puerto Rico	Aug 1 – Oct 31	Nov 1 – Jul 31
USVI (50,000 lbs STX & 50,000 lbs STT/STJ) Season closes when limit is reached	Jun 1 – Oct 31	Nov 1 – May 31

SNAPPERS		
Snapper Unit 1: (1) silk, (2) black, (3) blackfin, (4) vermillion, (5) wenchman*		
	Closed	**Open**
Federal	Oct 1 – Dec 31	Jan 1 – Sept 30
Puerto Rico (only applies to silk and blackfin)	Oct 1 – Dec 31	Jan 1 – Sept 30
USVI (only applies to STT/STJ)	Oct 1 – Dec 31	Jan 1 – Sept 30
*Wenchman was transferred from Snapper Unit 2 to Snapper Unit 1 (Effective January 30, 2012. Seasonal closure does not apply to wenchman).		
Snapper Unit 2: (1) queen , (2) cardinal [*new]		
Federal	No restrictions	
Puerto Rico		
USVI		
*Cardinal was added to Snapper Unit 2 (Effective January 30, 2012)		
Snapper Unit 3: (1) mutton, (2) lane, (3) gray, (4) dog, (5) schoolmaster, (6) mahogany		
	Closed	**Open**
Federal (only applies to mutton and lane)	Apr 1 – Jun 30	July 1 – Mar 31
Puerto Rico (only applies to mutton)	Apr 1 – May 31	June 1 – Mar 31
USVI (only applies to mutton and lane)	Apr 1 – Jun 30	July 1 – Mar 31
Snapper Unit 4: (1) yellowtail snapper		
No seasonal closures. Size limits apply year-round		
Federal	12 inches (in) Total Length (TL)	
Puerto Rico	10.5 in Fork Length (FL)	
USVI	No size limit	

PARROTFISH	
Federal	• No harvest of midnight, blue, and rainbow parrotfish. • 8 in (FL) min. size for redband parrotfish only applies to STX • 9 in (FL) min. size all other parrotfish (princess, queen, striped, redtail, stoplight, redfin) only applies to STX
Puerto Rico	No restrictions
USVI	No harvest of midnight, blue, and rainbow parrotfish [*unofficial]

GROUPERS		
Grouper Unit 1: (1) Nassau grouper		
Federal	**PROHIBITED SPECIES**	
Puerto Rico		
USVI		
Grouper Unit 2: (1) goliath grouper		
Federal	**PROHIBITED SPECIES**	
Puerto Rico		
USVI		
Grouper Unit 3: (1) red hind, (2) coney, (3) rock hind, (4) graysby		
	Closed	**Open**
Federal (only applies to red hind fishing and possession west of 67°10' W. longitude)	Dec 1 – Last day Feb	Mar 1 – Nov 30
Puerto Rico (only applies to red hind)	Dec 1 – Feb 28	Mar 1 – Nov 30
USVI	------	--------
*Creole fish was removed from Grouper Unit 3 and from federal management (Effective January 30, 2012).		
Grouper Unit 4*: (1) yellowfin, (2) red, (3) tiger, (4) black		
	Closed	**Open**
Federal	Feb 1 – Apr 30	May 1 – Jan 31
Puerto Rico (only applies to yellowfin)	Feb 1 – Apr 30	May 1 – Jan 31
USVI	Feb 1 – Apr 30	May 1 – Jan 31
*Yellowedge and misty groupers were transferred from Grouper Unit 4 to Grouper Unit 5. Black grouper was added into Grouper Unit 4 (Effective January 30, 2012).		
Grouper Unit 5*: (1) yellowedge, (2) misty		
	Closed	**Open**
Federal (only applies to yellowedge)	Feb 1 – Apr 30	May 1 – Jan 31
Puerto Rico	No restrictions	
USVI (only applies to yellowedge)	Feb 1 – Apr 30	May 1 – Jan 31
*New unit (Effective January 30, 2012)		

CORALS	
Federal	No harvest of corals allowed (stony corals, octocorals, live rock), except by permit for scientific, educational purposes.
Puerto Rico	
USVI	

SPINY LOBSTER	
Federal	No seasonal closures. Must be landed whole.
Puerto Rico	Size limit (> 3.5 in (8.9 cm) carapace length) and gear restrictions apply. No harvest of egg bearing females.
USVI	

AQUARIUM TRADE SPECIES	
Federal	List of allowed species
Puerto Rico	List of allowed species; state permit required
USVI	Territorial permit required

FEDERAL RECREATIONAL BAG LIMITS	
Aggregate bag limit for:	**Allowed quantity:**
snapper grouper parrotfish	5 fish per person/day, or if 3 or more persons are aboard, 15 fish from aggregate per vessel/day; but not to exceed: 2 parrotfish per person/day or 6 parrotfish per vessel/day.
Angelfish, boxfish, goatfish, grunts, wrasses, jacks, scups and porgies, squirrelfish, triggerfish and filefish, tilefish	5 fish per person/day or, if 3 or more persons are aboard, 15 fish from aggregate per vessel/day, but not to exceed: 1 surgeonfish per person/day or 4 surgeonfish per vessel/day.
Spiny lobster	3 spiny lobsters per fisher/day, no more than 10 spiny lobsters per vessel/day.

QUEEN CONCH RECREATIONAL AND COMMERCIAL LIMITS	
RECREATIONAL BAG LIMIT	
Federal	3 conch per person/day, or if > than 4 persons aboard, 12 conchs per vessel
Puerto Rico	3 conch per person/day, 12 per vessel/day
USVI	6 conch per fisher/day, no more than 24 per vessel/day
COMMERCIAL LIMIT	
Federal	200 conch per vessel per day
Puerto Rico	150 conch person/day, 450 per vessel/day
USVI	200 conch per vessel/day

OTHER SPECIES RESTRICTIONS		
		Min. Size (FL)
Puerto Rico	White grunt (*Haemulon plumieri*)	8 in (203 mm)
	Honeycomb cowfish (*Acanthostracion polygonia*)	7 in (78 mm)
	Scrawled cowfish (*A. quadricornis*)	7 in (78 mm)
	Cero (*Scomberomorus regalis*)	16 in (406 mm)
	King mackerel (*S. cavalla*)	20 in (508 mm)
	Snook (*Centropomus undecimalis*)	22 in (559 mm)

SEASONAL AREA CLOSURES

Grammanik Bank, STT – NO fishing any fish from **Feb 1 - Apr 30**, except for HMS
Hind Bank, STT - Closed year-round to all fishing and anchoring
Mutton Snapper Spawning Aggregation, STX – NO fishing any fish from **Mar 1 - Jun 30**
Bajo de Sico , PR – NO fishing of Council managed reef fish species from **Oct 1 - Mar 31**
NO anchoring year-round
Tourmaline Bank and Abrir la Sierra Bank, PR – NO fishing any fish from **Dec 1 - Feb 28**