

Comprehensive Amendment to the U.S. Caribbean Fishery Management Plans: Timing of Accountability Measure-Based Closures (Draft)



Options Paper



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Comprehensive Amendment to the U.S. Caribbean Fishery Management Plans: Timing of Accountability Measure-Based Closures (Draft) - OPTIONS PAPER

Proposed Action:

Modify the timing for the implementation of accountability measures for species managed by the Caribbean Fishery Management Council

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Chapter 1. Introduction

1.1 What Actions are Being Proposed?

Presently in U.S. Caribbean federal waters, accountability measures (AMs) require the National Marine Fisheries Service (NMFS) to shorten the length of the fishing season for a fishery management unit (FMU) for which the annual catch limit (ACL) has been exceeded. The fishing season would be 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 for which the ACL has been exceeded¹, are implemented beginning on December 31st of the appropriate year and extend backwards in 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, actions in this Options Paper propose to implement a mechanism that allows for the establishment of fishery closure dates other than the standard end of the year closure in the event a species or species group exceeds its assigned ACL.

¹See Section 1.6 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 Options Paper. The proposed actions would be implemented through a comprehensive amendment to the four Council fishery management plans (FMPs): Reef Fish, Spiny Lobster, Queen Conch, and Corals and Reef Associated Plants and Invertebrates (Coral). The Council develops the plan 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 Options Paper, NMFS and the Council evaluate potential management options to address identified issues with the current approach to implementing AMs. This may result in changes to the management of federal fisheries in the U.S. Caribbean. This Options Paper is the next step to gather additional information and discuss management options before further development of an amendment to the Council FMPs.



Photo credit: NOAA NCCOS/UNCW – T. Battista

1.3 Where is the Project Located?

The Council is responsible for managing fishery resources in federal waters of the U.S. Caribbean. 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).

1.4 Why is the Council Considering Action?

Fishers in the USVI and Puerto Rico have expressed to the Council that the timing of AM-based closures 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 proposing to develop and implement a mechanism that allows them and NMFS to establish closure dates other than the standard end of the year closures in the event of an overage of the ACL for a species or group of species. The proposed closure dates may occur during times of the year when the economic and/or cultural impacts are less severe. The Council's goals for this action are to remain within the ACL and lessen the socio-economic impact of AMs (Figure 1.4).

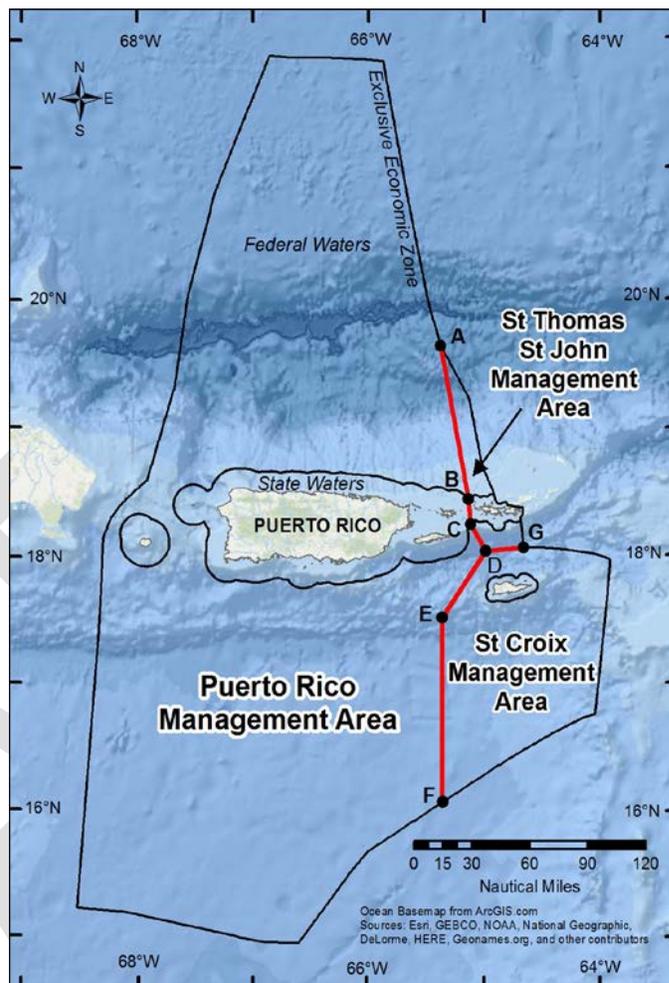


Figure 1.3. Jurisdictional boundaries of the Caribbean Fishery Management Council, the Commonwealth of Puerto Rico, and the Territory of the U.S. Virgin Islands, including management areas.

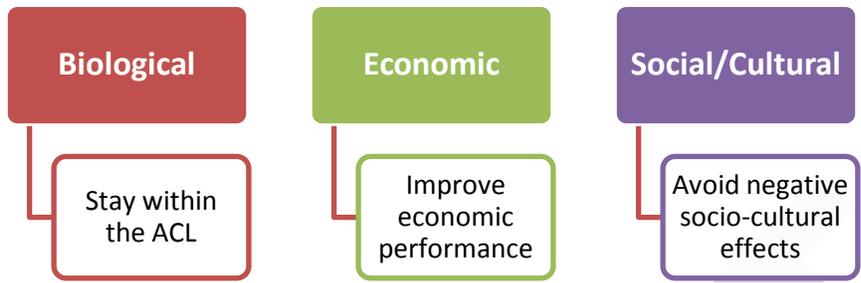


Figure 1.4. Biological, economic, and socio-cultural goals of the proposed action.

Purpose for Action

The purpose of this action is to develop and establish a mechanism that would consider economic and social effects in the protocol to set the timing of accountability measure (AM)-based closures. The ultimate goal of this action is to limit harvest to the annual catch limits (ACLs) while minimizing adverse socio-economic effects of AM-based closures.

Need for Action

There is a need to establish a policy and create an environment that provides the National Marine Fisheries Service and the Caribbean Fishery Management Council with closure options other than an end of the year closure in the event of an ACL overage, thus lessening the socio-economic impact of AMs to fishers.

1.5 Management History

The history of federal management until 2011 for managed species in the U.S. Caribbean Reef Fish, Queen Conch, Coral, and Spiny Lobster FMPs can be found in the 2010 and 2011 Caribbean ACL Amendments (CFMC 2011a, b) and is incorporated herein by reference. These two amendments established ACLs and AMs for Council managed species. Management measures included in these amendments are summarized below.

2010 Caribbean ACL Amendment (CFMC 2011a)

Amendment 2 to the FMP for the Queen Conch Fishery of Puerto Rico and the U.S. Virgin Islands and Amendment 5 to the Reef Fish FMP of Puerto Rico and the U.S. Virgin Islands (2010 Caribbean ACL Amendment), including Environmental Impact Statement (EIS), Regulatory Impact Review (RIR), and Regulatory Flexibility Act Analysis (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, acceptable 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 U.S. Virgin Islands (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.

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. In addition, the Council is currently developing an amendment that will affect the Reef Fish and the Spiny Lobster FMPs. This amendment proposes to modify current regulations in the three red hind spawning aggregation areas in western Puerto Rico: Abrir la Sierra Bank, Tourmaline Bank, and Bajo de Sico. The Council is also developing an action to transition fisheries management from species-based FMPs to island-based FMPs.

1.6 Accountability Measures for Council Managed Species

Accountability measures apply to all species except queen conch, prohibited corals, and species with harvest moratoria (e.g., goliath and Nassau groupers). Accountability measures require the NMFS' Assistant Administrator to reduce the length of the fishing season if it has been determined that prior year(s) landings exceeded the ACL for that FMU. For purposes of ACL monitoring, for each FMU a multi-year average of landings is compared against the applicable ACL to identify any overages. The fishing season would be shortened in the year following an overage determination by the amount necessary to constrain

landings to the ACL. These are implemented beginning on December 31st of the appropriate year and extending backwards in the year for the number of days necessary to achieve the required reduction in landings.

If NMFS determines the ACL for an FMU has been exceeded based upon the pre-defined average of landings, scientists (in consultation with managers) evaluate the cause of the reported catch increase prior to making a determination that an FMU has exceeded its assigned ACL. Specifically, they would consider whether the reported

overage represents an actual increase in landings or just improved data collection and monitoring. The intent of this definition is to eliminate any disincentive for fishermen to enhance their reporting behaviors and practice because such enhancement could lead to overages of the ACLs and trigger associated AMs.

In 2013, NMFS determined that several ACLs were exceeded based on the analysis of the average landings for previous years, triggering AMs to reduce the length of the fishing seasons in the 2013 fishing year by the amounts necessary to ensure landings did not again exceed the ACLs. Thus in 2013, the commercial sector of snapper unit 2 (SU2) in Puerto Rico, the recreational sector of wrasses in Puerto Rico, triggerfish and filefish (commercial and recreational) in St. Croix, spiny lobster (commercial and recreational) in St. Croix, and groupers

(commercial and recreational) in St. Thomas/St. John had AM-based closures (FR 78 18247).

In 2014, commercial SU2 in Puerto Rico was found to have exceeded their ACL based on the average landings from the previous three years, but AMs were not applied due to reduced rates of harvest and a resultant prediction that the ACL will not again be exceeded. NMFS determined that the Puerto Rico commercial ACL for wrasses was exceeded, thus triggering AMs that reduced the length of the fishing season in the 2014 fishing year (79 FR 62575). This fishery will be closed from October 20, 2014 through December 31, 2014. None of the USVI FMUs exceeded their corresponding ACLs, and AMs were not triggered in the USVI during 2014.

Chapter 2. Management Options to Modify the Timing of Accountability Measure-Based Closures

2.1 Overview

In 2013, the Caribbean Fishery Management Council (Council) established a committee (Ad Hoc Committee) to evaluate options for choosing accountability measure (AM)-based closure periods that would be more socially and economically advantageous to the fishermen. This committee was composed of representatives from the U.S. Virgin Islands (USVI) and Puerto Rico fishery sectors, and representatives from the Council and the National Marine Fisheries Service (NMFS). For this purpose, the Council's economist prepared a general model (Seasonal Choices Model) that incorporates ecological, economic, and social considerations and which can be used to guide the selection of the most appropriate closure period for each management unit and island. This model was presented to the Ad Hoc Committee as well as to Council members, the Council's Scientific and Statistical Committee (SSC), and the Council's Advisory Panel (AP) as a tool that could be used to address the issue at hand.

Council members and meeting attendees at the 147th Council meeting, held in August 2013, expressed the need to get fishers involved in the process to select potential AM-based closure dates, and to consider that the Seasonal Choices Model as only one component of the process for selecting these dates. Factors such as revenue maximization and least amount of days that a species/species group can be closed are very important to the fishermen. During November 11-14, 2013, the Council's SSC reviewed the model and provided suggestions for improvements. The AP also had the opportunity to review the model and provide feedback on several occasions. The Seasonal Choices Model developed by the Council is considered in this options paper as a tool to assist in the selection of potential closure dates for the implementation of AMs.

The Council is currently developing this action to establish a mechanism that would consider economic and socio-cultural effects when setting AM-based closures. The objectives of this action are 1) to evaluate and consider potential mechanisms to choose AM-based closure dates; 2) to set a new process (if a new mechanism is chosen) to follow when AMs are triggered; and 3) to add a new policy into the Council's fishery management plans (FMPs) to guide when AM closures are implemented consistent with provisions of the framework.

Council members have identified some dates (date ranges) of important economic, cultural, and market conditions that they would like to take into consideration during the analysis of alternate dates for the implementation of AM closures (e.g., higher demand, lower demand) (Table 2.1.1). It is expected that the Council, in cooperation with their APs, will update and finalize this list, considering that not all identified dates may be feasible for exclusion or inclusion in the potential

suite of dates to implement AM closures. Table 2.1.2 shows existing federal and/or state seasonal closures for various species, which will also be considered when determining which dates are appropriate to establish alternate AM closure dates.

Table 2.1.1. Example of important market dates identified by Caribbean Fishery Management Council members 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 2.1.2. 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

2.2 Options for the Establishment of Accountability Measure-Based Closures

This comprehensive amendment would consist of two actions. Action 1 deals with an approach to modify the timing of AM-based closures. In this action, the Council could choose to implement a mechanism that allows them and NMFS to establish closure dates other than the standard end of the year closures in the event of an overage of an ACL. Action 2 would specify how often the approach chosen should be revisited.

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

Option 1 – No action. Continue AM-based closures resulting from an ACL overage beginning on December 31st of the appropriate year and extending backwards in the year for the number of days necessary to achieve the required reduction in landings.

Option 2 - Modify the AM-based closure date so that for those fishery management units (FMUs) to which AMs need to be applied in a particular year, the Council will choose the preferred date to close the fishing season based on a specific analysis and criteria (“Customized” Approach). For each island/island group (Puerto Rico, St. Thomas/St. John, St. Croix, Caribbean-wide) choose a method from the following options for selecting the fishing season closure date that would apply to all or selected FMUs:

Sub-Option 2a. Use the Seasonal Choices Model to choose a date that maximizes ex-vessel revenue².

Sub-Option 2b. Use the Seasonal Choices Model to choose a date that maximizes ex-vessel revenue that also excludes, to the extent possible, important economic and socio-cultural events that may be occurring at the same time.

Sub-Option 2c. Use the Seasonal Choices Model to choose a date that would close the fishery for the least number of days.

Sub-Option 2d. Use the Seasonal Choices Model to choose a date that would close the fishery for the least number of days that also excludes, to the extent possible, important economic and socio-cultural events that may be occurring at the same time.

Sub-Option 2e. Choose a date (not model input) to close the fishery based on input from the Council’s advisory groups.

² Ex-vessel revenue or ex-vessel value is the amount of money the fishermen get paid when they sell their catch.

Option 3. Modify the AM-based closure date by selecting and establishing a fixed fishing closure start date for the implementation of AMs. A different start date may be chosen for each FMU on each island/island group, but that start date would apply every year AMs need to be triggered for that FMU on that island.

Sub-Option 3a. Choose a fixed start date that would apply to all FMUs for each island/island group (Puerto Rico (commercial and recreational), St. Thomas/St. John, St. Croix, Caribbean-wide) from the following options based on information describing fishing community participation (*The dates shown below are examples. Actual dates will be provided by the Council and in consultation with their APs. Dates may be different for each island/island group):

A. Puerto Rico

Sub-Option 3a(i). December 31 (to go backwards)

Sub-Option 3a(ii). November 30 (to go backwards)

Sub-Option 3a(iii). October 30 (to go backwards)

Sub-Option 3a(iv). *Enter any other date late in the year (to go backwards)

B. St. Thomas/St. John, USVI

Sub-Option 3a(i). December 31 (to go backwards)

Sub-Option 3a(ii). November 30 (to go backwards)

Sub-Option 3a(iii). October 30 (to go backwards)

Sub-Option 3a(iv). *Enter any other date late in the year (to go backwards)

C. St. Croix, USVI

Sub-Option 3a(i). December 31 (to go backwards)

Sub-Option 3a(ii). November 30 (to go backwards)

Sub-Option 3a(iii). October 30 (to go backwards)

Sub-Option 3a(iv). *Enter any other date late in the year (to go backwards)

D. Caribbean-Wide

Sub-Option 3a(i). December 31 (to go backwards)

Sub-Option 3a(ii). November 30 (to go backwards)

Sub-Option 3a(iii). October 30 (to go backwards)

Sub-Option 3a(iv). *Enter any other date late in the year (to go backwards)

Sub-Option 3b. Choose a fixed start date for each FMU by island/island group (Puerto Rico, St. Thomas/St. John, St. Croix, Caribbean-wide) from the options below. The start date will either begin on the first day of the identified month and go forward, or begin on the last day of the identified month and go backwards.

A. Puerto Rico (Commercial; Recreational)

Sub-Option 3b(i). Closure to start either the first day or the last day of the month that has the highest landings/ex-vessel revenues 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) and Table 2.2.2 (recreational) below.

Sub-Option 3b(ii). Closure to start either the first day or the last day of the month with lowest landings/ex-vessel revenues 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) and Table 2.2.2 (recreational) below.

Sub-Option 3b(iii). Closure to start either the first day or the last day of the month with least negative economic, social, and cultural effects. A specific date for each FMU is shown in Table 2.2.1 (commercial) and Table 2.2.2 (recreational) below.

B. St. Thomas/St. John, USVI

Sub-Option 3b(i). Closure to start either the first day or the last day of the month that has the highest landings/ex-vessel revenues 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-Option 3b(ii). Closure to start either the first day or the last day of the month with lowest landings/ex-vessel revenues 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-Option 3b(iii). Closure to start either the first day or the last day of the month with least negative economic, social, and cultural effects. A specific date for each FMU is shown in Table 2.2.3 below.

C. St. Croix, USVI

Sub-Option 3b(i). Closure to start either the first day or the last day of the month that has the highest landings/ex-vessel revenues 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-Option 3b(ii). Closure to start either the first day or the last of the month with lowest landings/ex-vessel revenues 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.

Sub-Option 3b(iii). Closure to start either the first day or the last day of the month with least negative economic, social, and cultural effects. A specific date for each FMU is shown in Table 2.2.4 below.

D. Caribbean-Wide

Sub-Option 3b(i). Closure to start either the first day or the last day of the month that has the highest landings/ex-vessel revenues 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-Option 3b(ii). Closure to start either the first day or the last of the month with lowest landings/ex-vessel revenues based on the most recent three years of available landings data. A specific date for each FMU shown in Table 2.2.5 below.

Sub-Option 3b(iii). Closure to start either the first day or the last day of the month with least negative economic, social, and cultural effects. A specific date for each FMU is shown in Table 2.2.5 below.

Table 2.2.1. Closure dates resulting from **Sub-Options 3b(i)** through **3b(iii)** for Puerto Rico fishery management units in the commercial sector. **Sub-Option 3b(i)** and **3b(ii)** are based on monthly average landings and ex-vessel value through time from the most recent years of available landings data (2011-2012) (2013 data is not currently available, therefore it was not included). Dates in **Sub-Option 3b(iii)** will be based on input from the Council’s AP.

Puerto Rico Commercial FMUs

Sub-Option 3b	Sub-Option 3b(i) (highest landings/ex-vessel revenues)	Sub-Option 3b(ii) (lowest landings/ex-vessel revenues)	Sub-Option 3b(iii) (least negative economic, social, and cultural effects)
FMU			
Parrotfish	Mar 1	Dec 1	TBD
Snapper Unit 1 (silk, black, blackfin, and vermilion)	Jan 1	October 1 or Jun 1 ¹	TBD
Snapper Unit 2 (queen and cardinal)	Jan 1	Nov 1	TBD
Snapper Unit 3 (mutton, lane, gray, dog, schoolmaster, and mahogany)	Dec 1	May 1 or Jul 1 ²	TBD
Snapper Unit 4 (yellowtail)	Mar 1	Dec 1	TBD
Groupers	Mar or Aug 1 ³	Dec 1 ⁴	TBD
Angelfish ⁵	No Landings		
Boxfish	Feb 1	Jun 1	TBD
Goatfish	Feb 1	May 1	TBD
Grunts	Feb 1	Nov 1	TBD
Wrasses	Sept 1	Nov 1	TBD
Jacks	Mar 1	No 1	TBD
Scups & Porgies	Mar 1	Nov 1	TBD
Squirrelfish	Mar 1	Aug 1	TBD
Surgeonfish ⁵	No Landings		
Triggerfish & Filefish	Aug 1	Nov 1	TBD
Spiny Lobster	Feb 1	May 1	TBD

Note: A closure can start on the first day of the month and go forward or start on the last day of the month and go backwards. If the proposed AM closure month in Sub-Options 3b(i) or 3b(ii) is December, then the Council may choose to begin this closure starting from November 30th backwards to ensure enough time is available for the closure and to avoid socio-economic impacts during the holiday season.

¹Harvest 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.

²Harvest 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 and the closure goes 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.

³The highest landings for groupers occur in March. This date partially overlaps with the February 1 through April 31 seasonal closure for yellowfin, black, red, and tiger groupers in federal waters, and the closure for yellowfin only in Puerto Rico state waters. However, most of the landings in March are dominated by red hind grouper, whose season just opened (seasonal closure goes from December 1 – February 28 in Puerto Rico waters and in federal

portions of Tourmaline, Abrir La Sierra, and Bajo de Sico). The next month with highest landings outside of the seasonal closure is August.

⁴The lowest landings for grouper occur in December, with the majority of landings dominated by misty grouper and red hind. Harvest of red hind is prohibited from December 1 through February 28 in Puerto Rico state waters, and in federal waters of Bajo de Sico, Abrir La Sierra, and Tourmaline Bank in western Puerto Rico. The next months with the lowest landings are January and February, when red hind harvest is closed, and then November. The closure could be implemented in November 30 backwards, which is a month with low landings.

⁵No landings of angelfish and surgeonfish were reported during 2011 and 2012.

Table 2.2.2. Closure dates resulting from **Sub-Options 3b(i)** through **3b(iii)** for Puerto Rico fishery management units in the recreational sector. Recreational landings data are reported in two-month waves. **Sub-Option 3b(i)** and **Sub-Option 3b(ii)** are based on bi-monthly average landings and ex-vessel value through time from the most recent three years of available landings data (2011-2013). Dates in **Sub-Option 3b(iii)** will be based on input from the Council’s AP.

Puerto Rico Recreational FMUs

Sub-Option 3b	Sub-Option 3b(i) (highest landings – first month in wave)	Sub-Option 3b(ii) (lowest landings – first month in wave)	Sub-Option 3b(iii) (least negative economic, social, and cultural effects)
FMU			
Parrotfish	Jan 1	Jul 1	TBD
Snapper Unit 1	Mar 1	No landings Nov-Dec ¹ ; Jul 1 (lowest landings)	TBD
Snapper Unit 2	Jan 1	No landings from Mar-Dec ² ; Feb 1 (lowest landings)	TBD
Snapper Unit 3	May 1 ³ or Nov 1	Jul 1	TBD
Snapper Unit 4	Mar 1	Sept 1	TBD
Groupers	Mar 1 ⁴ or Sep 1	Nov 1	TBD
Angelfish	Jan 1	No landings Mar-Jun and Sept-Dec; Jul 1 (lowest landings)	TBD
Boxfish	Jan 1	Jul 1	TBD
Goatfishes	Sept 1	No landings Jan-Apr, Nov-Dec; Jul 1 (lowest landings)	TBD
Grunts	Mar 1	July 1	TBD
Wrasses	Mar 1	No landings Nov-Dec; May 1 (lowest landings)	TBD
Jacks	Mar 1	Jan 1	TBD
Porgies	Nov 1	Jul 1	TBD
Squirrelfish	Nov 1	Jan 1	TBD
Surgeonfish		No Landings ⁵	
Triggerfish & Filefish	Mar 1	No landings July-Aug, Nov-Dec; Sept 1 (lowest landings)	TBD

Note: A closure can start on the first day of the month and go forward or start on the last day of the month and go backwards. If the proposed AM closure month in Sub-Options 3bi or 3bii is December, then the Council may choose to begin this closure starting from November 30th backwards to ensure enough time is available for the closure and to avoid socio-economic impacts during the holiday season.

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). The next two-month wave with lowest landings outside of the seasonal closure is July-August.

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 groupers 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 The highest landings for groupers occur in March. This date partially overlaps with the February 1 through April 31 seasonal closure for yellowfin, black, red, and tiger groupers in federal waters, and the closure for yellowfin only in Puerto Rico state waters. However, most of the landings in March are dominated by red hind grouper, whose season goes from December 1 – February 28 in Puerto Rico waters and in the federal portions of Tourmaline, Abrir La Sierra, and Bajo de Sico). The next two-month wave with highest landings outside of the seasonal closure is September-October with catches dominated by red hind and to a much lesser extent, by coney.

⁵ There were no reported recreational landings of surgeonfish from 2011-2013.

Table 2.2.3. Closure dates resulting from **Sub-Options 3b(i)** through **3b(iii)** for St. Thomas/St. John fishery management units. **Sub-Option 3b(i)** and **3b(ii)** are based on monthly average landings and ex-vessel value through time from the most recent three years of available landings data (2011-2013). Dates in **Sub-Option 3b(iii)** will be based on input from the Council’s AP.

St. Thomas Commercial FMUs

Sub-Option 3b	Sub-Option 3b(i) (highest landings/ex-vessel revenues)	Sub-Option 3b(ii) (lowest landings/ex-vessel revenues)	Sub-Option 3b(iii) (least negative economic, social, and cultural effects)
FMU			
Parrotfish	Mar 1	Nov 1	TBD
Snapper	Apr 1 or Sept 1 or Sept 30 ¹	Dec 1 or Aug 1 ²	TBD
Grouper	Jan 1 or Oct 1 ³	Apr 1 or Dec 1 ⁴	TBD
Angelfish	Aug 1	Feb 1	TBD
Boxfish	Jan 1	Dec 1	TBD
Goatfish ⁵	Jan 1 or May 1	No landings Feb-Apr, June, and Aug-Dec; Jul 1(lowest landings)	TBD
Grunts	Jan 1	Dec 1	TBD
Wrasses	Aug 1	Feb 1	TBD
Jacks	May 1	Dec 1	TBD
Scups & Porgies	Jan 1	Feb 1	TBD
Squirrelfish	Aug 1	Apr 1	TBD
Surgeonfish	Jan 1	Dec 1	TBD
Triggerfish & Filefish	Jan 1	Dec 1	TBD
Spiny Lobster	Jan 1	Sept 1	TBD

Note: A closure can start on the first day of the month and go forward or start on the last day of the month and go backwards. If the proposed AM closure month in Sub-Options 3bi or 3bii is December, then the Council may choose to begin this closure starting from November 30th backwards to ensure enough time is available for the closure and to avoid socio-economic impacts during the holiday season.

¹The 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 September. If the AM closure needs to be longer than 30 days, then the closure could instead begin in September 30 and go backwards to avoid overlapping with the seasonal closure already in place for silk, black, blackfin, and vermillion in federal waters which begins on October 1 through December 31. The next month with highest landings outside of the seasonal closure is March, followed by June.

²Lowest 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 August.

³Highest 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.

⁴Lowest landings for grouper occur in April. This proposed AM closure will partially overlap with the closure for yellowfin, red, tiger, black, and yellowedge groupers in federal and USVI waters from February 1 – April 30, and with the Grammanik Bank closure during this date. The next month with lowest landings outside of the seasonal closure is December, followed by November.

⁵Landings of Goatfish are very small and amount to less than 20 pounds on average annually for 2011-2013.

Table 2.2.4. Closure dates resulting from **Sub-Options 3b(i)** through **3b(iii)** for St. Croix fishery management units. **Sub-Option 3b(i)** and **3b(ii)** are based on monthly average landings and ex-vessel value through time from the most recent three years of available landings data (2011-2013). Dates in **Sub-Option 3b(iii)** will be based on input from the Council’s AP.

St. Croix Commercial FMUs

Sub-Option 3b	Sub-Option 3b(i) (highest landings/ex-vessel revenues)	Sub-Option 3b(ii) (lowest landings/ex-vessel revenues)	Sub-Option 3b(iii) (least negative economic, social, and cultural effects)
FMU			
Parrotfish	Mar 1	Sept 1	TBD
Snappers	July 1	Sept 1 or Sept 30 ¹	TBD
Groupers	Jul 1	Dec 1	TBD
Angelfish	Oct 1	Jun 1	TBD
Boxfish	June 1	Jan 1	TBD
Goatfish ²	Feb 1 or Nov 1	Aug 1	TBD
Grunts	Jul 1	Dec 1	TBD
Wrasses ²	Nov 1	No landings in Feb – Apr, Jun, Aug, and Oct; Jan 1 or Sept 1 (lowest landings)	TBD
Jacks	Feb 1	Dec 1	TBD
Scups & Porgies	Jan 1	Oct 1	TBD
Squirrelfish ²	Jul 1	Jan 1 or Apr 1	TBD
Surgeonfish	Jul 1	Dec 1	TBD
Triggerfish & Filefish	Mar 1	Dec 1	TBD
Spiny Lobster	Mar 1	Sept 1	TBD

Note: A closure can start on the first day of the month and go forward or start on the last day of the month and go backwards. If the proposed AM closure month in Sub-Options 3bi or 3bii is December, then the Council may

choose to begin this closure starting from November 30th backwards to ensure enough time is available for the closure and to avoid socio-economic impacts during the holiday season.

¹The 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 September. If the AM closure needs to be longer than 30 days, then the closure could instead begin in September 30 and go backwards to avoid overlapping with the October 1 seasonal closure.

²Landings of goatfish, squirrelfish, and wrasses FMUs are very small, amounting to less than 1,000 pounds on average annually for 2011-2013.

Table 2.2.5. Closure dates resulting from **Sub-Options 3b(i)** through **3b(iii)** for Caribbean-wide fishery management units: tilefish and aquarium trade species. **Sub-Option 3b(i)** and **3b(ii)** are based on monthly average landings and ex-vessel value through time from the most recent three years of available landings data. Dates in **Sub-Option 3b(iii)** are based on input from the Council’s AP.

Caribbean-wide FMUs

Sub-Option 3b	Sub-Option 3b(i) (highest landings)	Sub-Option 3b(ii) (lowest landings)	Sub-Option 3b(iii) (least negative economic, social, and cultural effects)
FMU			
Tilefish ¹	Jul 1	No landings Jan-April, Nov-Dec May 1 (lowest landings)	TBD
Aquarium trade species ²	Nov 1	No landings May-Aug; Sept 1(lowest landings)	TBD

Note: A closure can start on the first day of the month and go forward or start on the last day of the month and go backwards.

¹Average annual reported landings of Tilefish totaled less than 200 pounds in 2011-2013.

²Average annual reported landings of Aquarium Trade species totaled approximately 1,000 pounds from 2011-2013.

Discussion of Options in Action 1

Option 1 – No Action

The Council could choose to take no action through **Option 1**, thus AM-based closures would continue to be implemented beginning on December 31st of the appropriate year and extending backwards in the year for the number of days necessary to achieve the required reduction in landings. This current approach of closing the season from December 31st backwards has been identified by fishermen as having negative social and economic effects. One disadvantage of the current approach is that if several units exceed their ACL during the same year and AMs are required, the resultant closures overlap for at least some period of time, negatively affecting fishermen particularly in the multi-species fishery of the U.S. Caribbean. In addition, closing the season from December 31st backwards results in the fishery being closed during the culturally

and economically 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 and go backwards into the year guarantee that the time needed to account for the exceedance of the ACL can be fully accomplished during the year.

Option 2 – “Customized” Approach

In this approach, the Council would make decisions on an annual basis regarding the best fishing closure dates for those FMUs that exceeded their ACL in a particular year. The approach proposed in **Option 2** to set the timing of an AM closure would consist of performing an analysis every year for those units to which AMs need to be applied, and choosing the best date to close the season for the next year based on the outcomes of that analysis as evaluated by the Council. The analytical approaches that would be applied may include the Council-developed Seasonal Choices Model and expert opinion. For example, the proposed closure dates could be based upon dates identified by the Seasonal Choices Model as optimal based on particular criteria as presented in **Sub-Options 2a** through **2d**, or dates could be selected by the Council without model input as proposed in **Sub-Option 2e**.

Sub-Options 2a through **2e** allow for identification of a methodology to use on an annual basis as needed for FMUs for which AMs need to be triggered. **Sub-Options 2a** through **2e** allow the Council to choose customized AM closure dates for each FMU per island/island group resulting from the different methods. The Council could choose for example, the shortest closure date (**Sub-Option 2c**) or the date that maximizes revenue (**Sub-Option 2a**), among others.

While **Sub-Option 2a** (“Ex-vessel revenue maximizing result”) would provide the short-term economically optimal option, **Sub-Option 2b** (“Ex-vessel revenue maximizing result without important economic and cultural events occurring at the same time”) would take into consideration long-term economic, social, and cultural effects. **Sub-Option 2c** (“Least number of days closure occurs”) would provide an option that allows for the shortest closure possible. However this scenario may not account for some economic, social, and cultural considerations. **Sub-Option 2d** allows for the shortest closure time while excluding important economic and cultural events that may be occurring at the same time. Lastly, **Sub-Option 2e** would incorporate anecdotal information from the Council AP that has not been picked up by the data and therefore cannot be reproduced in the Seasonal Choices Model. For all of these sub-options, the Council would previously identify and establish which cultural and economic events they would like to have excluded from the available suite of dates for AM closures.

Tables 2.2.6, 2.2.7, and 2.2.8 below show the different date options resulting from **Sub-Option 2a** through **2d** (**Sub-option 2e** not included) using as examples some of the FMUs that had AMs applied in 2013 in each of Puerto Rico, St. Thomas/St. John, and St. Croix, as discussed in

Section 1.6. Any of these methods could be applied for an FMU for which AMs need to be triggered in a particular year.

Table 2.2.6. Example of potential dates for accountability measure-based closures for the snapper unit 2 fishery management unit of the Puerto Rico commercial sector. The dates were derived from the Seasonal Choices Model for each of **Sub-Options 2a** through **2d**.

FMU: Puerto Rico Snapper Unit 2 (Commercial)				
ACL Reduction: 72,938 pounds				
Sub-Options	Start Date	Days Closure Lasts/Days Going Forward	Pounds Cut	Ex-Vessel Revenue Decrease Compared to Status Quo Year
Sub-Option 2a – Ex-vessel revenue maximizing result	5/27	95	72,960	\$283,986
Sub-Option 2b - Ex-vessel revenue maximizing result w/o important economic and cultural events happening at the same time	All 20 results take place in May and June when increased summer sales are occurring due to summer vacation.			
Sub-Option 2c - Least number of days a closure occurs of the top 20 revenue maximizing results	5/20	92	72,961	\$286,255
Sub-Option 2d – Least number of days a closure occurs of the top 20 revenue maximizing results w/o important economic and cultural events happening at the same time	All 20 results take place in May and June when increased summer sales are occurring due to summer vacation.			

Table 2.2.7. Example of potential dates for accountability measure-based closures for the groupers fishery management unit in St. Thomas/St. John. The dates were derived from the Seasonal Choices Model for each of **Sub-Options 2a** through **2d**.

FMU: St. Thomas Groupers				
ACL Reduction: 3,316 pounds				
Sub-Options	Start Date	Days Closure Lasts/Days Going Forward	Pounds Cut	Ex-Vessel Revenue Decrease Compared to Status Quo Year
Sub-Option 2a – Ex-vessel revenue maximizing result	12/17	16	3,403	\$17,291
Sub-Option 2b - Ex-vessel revenue maximizing result w/o important economic and cultural events happening at the same time	8/26	23	3,358	\$20,146
Sub-Option 2c - Least number of days a closure occurs of the top 20 revenue maximizing results	12/17	16	3,403	\$17,291

Sub-Option 2d – Least number of days a closure occurs of the top 20 revenue maximizing results w/o important economic and cultural events happening at the same time	8/26	23	3,358	\$20,146
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Table 2.2.8. Example of potential dates for accountability measure-based closures for the triggerfish and filefish fishery management unit in St. Croix. The dates were derived from the Seasonal Choices Model for each of **Sub-Options 2a** through **2d**.

FMU: St. Croix Triggerfish and Filefish				
ACL Reduction: 1,484 pounds				
Sub-Options	Start Date	Days Closure Lasts/Days Going Forward	Pounds Cut	Ex-Vessel Revenue Decrease Compared to Status Quo Year
Sub-Option 2a – Ex-vessel revenue maximizing result	1/20	18	1,506	\$6,024
Sub-Option 2b - Ex-vessel revenue maximizing result w/o important economic and cultural events happening at the same time	6/13	21	1,504	\$6,098
Sub-Option 2c - Least number of days a closure occurs of the top 20 revenue maximizing results	4/6	12	1,527	\$6,108
Sub-Option 2d – Least number of days a closure occurs of the top 20 revenue maximizing results w/o important economic and cultural events happening at the same time	6/8	19	1,528	\$6,112

If the Council chooses (and NMFS implements) the approach in **Option 2** and AMs need to be triggered for an FMU, staff will develop a table like the ones shown above that contains the dates identified as potential closure dates for that particular FMU based on the sub-option chosen by the Council in this amendment. These dates would be presented to the Council to choose a date for the closure. The approximate time needed to set a closure date through the “customized” approach in **Option 2** should consider the timing needed to conduct National Environmental Policy Act (NEPA) analysis, economic analyses, and proposed and final rule preparation and publishing.

Although the “customized” approach proposed in **Option 2** would provide annual flexibility when applying AMs, it has several caveats that could make it unfeasible given the time it would take to implement this approach. For example, one such caveat is that the revised landings data (for the previous year) that are needed to make the closure determination are usually not available until late in the following year. The fishing management year in federal waters runs

from January 1 through December 31, while the fishing year in the USVI runs from July 1 through June 30. This creates delays in the availability of the landings data needed to make AM closure determinations. Although the fishing year in Puerto Rico runs from January 1 through December 31, delays in the availability of the data are also common. Other issues arise from the timing needed to conduct required analyses and administrative items as well as timing for public comment periods. As a result, the final rule may not be published and implemented until well into the action year, with the result that the actual closure period would be confined to only those months available following the publication of the rule.

Option 3 – Pre-determined AM Closure Dates

The approach proposed in **Option 3** would consist of establishing a pre-determined closure date, either a single closure date established for all FMUs or, alternatively, a separate closure date established on an FMU by FMU basis. In either case, the closure date would apply every year AMs need to be triggered for that particular FMU, unless and until the chosen closure dates is revised as described in Action 2. In **Option 3**, the Council would choose a fixed start date as the preferred closure date for each FMU per island/island group and in the case of Puerto Rico, separately for each of the commercial and recreational fishing sectors. The selected fixed start date for each FMU will be implemented through regulations.

Under **Sub-Option 3a**, **Sub-Options 3a(i)** through **3a(iv)** provide options for setting an AM-closure start date that would apply equally to all FMUs in a particular island/island group. The Council with input from their AP would need to provide guidance on which dates to include in these sub/sub-options (i.e., month, day, closure to go backward or forward). **Sub-Options 3a(i)** through **3a(iv)** can be set so that the time needed to make sure the ACL is not exceeded again does not extend through a desired holiday season or any other socio-culturally important date, as identified beforehand by the Council with public input. For example, the Council can choose a fixed start date that purposely avoids the December holiday season, a time which has been identified by USVI fishers as economically and culturally important. These sub/sub-options would also need to account for spawning seasonal closures that apply to some FMUs in the U.S. Caribbean.

Sub-Option 3b allows the Council to choose a fixed starting date (i.e., month, day, closure to go backward or forward) for each FMU or for a combination of FMUs for each of Puerto Rico (commercial and recreational sectors), St. Croix, and St. Thomas/St. John based on specific criteria (highest landings/ ex-vessel revenue, lowest landings/ex-vessel revenue, least economic, social, and/or cultural effects). In contrast to **Sub-Options 2a** through **2d** in **Option 2**, where the potential dates result from the application of the Seasonal Choices Model, the potential dates on **Sub-Option 3b** result from an analysis of the most recent three years of available landings data for all FMUs per island/island group and for each of the Puerto Rico fishing sectors. Depending

on the date resulting from the sub/sub-option chosen, the Council would determine if the AM closure will go forward or backward. For example, a closure can start the first day of the identified month and go forward (e.g., closure starting on March 1) or could start the last day of the identified month and go backwards (e.g., closure starting on November 30). If there are not enough days for a closure to go forward, then, the closure must extend backward. The exception is December, a month for which the Council may want to avoid any closure in consideration of socio-economic impacts. In addition, for all sub/sub-options proposed in **Sub-Option 3b**, if the length of the closure exceeds the amount of days left in the year (or days available in the year) then the Council may want to establish a default date for the closure to begin and go backwards into the year for the number of days needed.

At the Council's request, other options could be developed by staff showing when closures occur across the various FMUs in an effort to ensure that some fisheries will be open when others are not. The Council can also explore the possibility of establishing multiple closure dates, occurring during discrete periods of time throughout the year.

For an FMU that exceeds its ACL, **Sub-Option 3b(i)** proposes to close the fishery on the first day or the last day of the month that, based on an analysis of recent landings data, results in the highest landings/ex-vessel revenues. Closing the fishery on that date would theoretically result in the shortest closure time. **Sub-Option 3b(ii)** proposes to close the fishery on the first or the last day of the month that, based on analysis of landings data, results in the lowest landings/ex-vessel revenues. This would result in the longest closure period but will likely occur at a time during the year when fishing for that particular fishery may be relatively less important. Lastly **Sub-Option 3b(iii)** proposes to close the fishery on either the first day or the last day of the month that is identified as having the least negative economic, social, and cultural effects. To populate **Sub-Option 3b(iii)**, input from the Council AP will be needed. All of the sub/sub-options propose to start the AM fishery closure on either the first day or the last day of the identified month because the landings data used for the analysis are based on monthly data.

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

Option 1. Do not specify how often the approach chosen should be revisited.

Option 2. Review the approach selected no longer than 3 years from implementation.

Option 3. Review the approach selected no longer than 5 years from implementation.

Discussion of Options in Action 2

The purpose of Action 2 is to provide options to review the approach chosen. Under any of the options proposed, the Council could choose to review the approach at any time; however, **Option 2** and **Option 3** ensure a reevaluation is conducted within a specified timeframe. **Option 1** is the no action option, and does not set a timeframe for the action to be reviewed. Under **Option 2** and **Option 3**, the Council should schedule a review of the approach no longer than 3 years or 5 years after implementation, respectively. 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.

Chapter 3. References

CFMC. 2011a. Amendment 2 to the Fishery Management Plan for the Queen Conch Fishery of Puerto Rico and the U.S. Virgin Islands and Amendment 5 to the Reef Fish Fishery Management Plan of Puerto Rico and the U.S. Virgin Islands. Caribbean Fishery Management Council, San Juan, Puerto Rico. September 22, 2011. 523 pp + Appendices. Available at: http://sero.nmfs.noaa.gov/sustainable_fisheries/caribbean/2010_acl/index.html

CFMC. 2011b. Comprehensive Annual Catch Limit (ACL) Amendment for the Fishery Management Plans of the U.S. Caribbean. Caribbean Fishery Management Council, San Juan, Puerto Rico. October 25, 2011. 407 pp. Available at: http://sero.nmfs.noaa.gov/sustainable_fisheries/caribbean/2011_acl/index.html

CFMC. 2013a. Amendment 4 to the Fishery Management Plan for Corals and Reef Associated Plants and Invertebrates of Puerto Rico and the U.S. Virgin Islands: Seagrass Management. Including Final Environmental Assessment, Regulatory Impact Review, and Regulatory Flexibility Act Analysis. Caribbean Fishery Management Council, San Juan, Puerto Rico. May 2013. 88 pp. Available at: http://sero.nmfs.noaa.gov/sustainable_fisheries/caribbean/coral/am4/index.html

CFMC. 2013b. Regulatory 2 to the Fishery Management Plan for the Queen Conch Resources of Puerto Rico and the U.S. Virgin Islands: Compatibility of Trip and Bag Limits in the Management Area of St. Croix, U.S. Virgin Islands. Including Final Environmental Assessment, Regulatory Impact Review, and Regulatory Flexibility Act Analysis. Caribbean Fishery Management Council, San Juan, Puerto Rico. August 2013. 133 pp. Available at: http://sero.nmfs.noaa.gov/sustainable_fisheries/caribbean/conch/index.html.

CFMC. 2013c. Regulatory Amendment 4 to the Fishery Management Plan for the Reef Fish Resources of Puerto Rico and the U.S. Virgin Islands: Parrotfish Minimum Size Limits. Including Final Environmental Assessment, Regulatory Impact Review, and Regulatory Flexibility Act Analysis. Caribbean Fishery Management Council, San Juan, Puerto Rico. February 2013. 188 pp. Available at: http://sero.nmfs.noaa.gov/sustainable_fisheries/caribbean/reef_fish/reg_am4/index.html.

APPENDIX A

Overview of the Seasonal Choices Model

The Seasonal Choices Model is an Excel based model that uses past commercial landings and other information to illustrate how a future fishing year might best be structured to ensure maximum cultural and economic yield while preventing overfishing of the target resource. There is a different Seasonal Choices Model developed for each island/island group and each species/species group. Each year, each Seasonal Choices Model is updated with revised landings data and holiday schedules. The model uses the average of the last three years of daily commercial landings and commercial ex-vessel revenue data from trip reports (when available) to create a picture of what the next year (on a daily basis) might look like. It is important to note, that fishing trip cost data are not currently collected and therefore, ex-vessel revenue data are used as a proxy for fishermen profits (ex-vessel revenue less fixed and operating costs).

With regard to determining a closure, the model first determines if the average of the total of the last three years of commercial landings data indicate an exceedance of the ACL. Second, the model calculates how long the default closure (starting at the end of the year and counting backward) would need to be to reduce the landings by the number of pounds the ACL was exceeded on average over the past three years. Thirdly, the model calculates how long a closure would have to be, to achieve the required harvest reduction. The model does this for each and every day of the year. All closure options present a scenario where the ACL is not exceeded. Each closure option has an ex-vessel revenue loss associated with it. The revenue loss is calculated by adding together the daily ex-vessel revenue that occurred on average over the past three years during the time of the closure (for each day of the year). Fourth, the model ranks the closure options from the least to the greatest ex-vessel revenue loss.

The ex-vessel revenue results are displayed alongside the number of days the closure lasts, start and end dates of the closure, a listing of biological information pertaining to those dates (e.g., spawning aggregations), economic information (e.g., historical price fluctuations and market changes), and social and cultural events that affect markets for fish (e.g., festivals). This information is gathered from biologists, fishermen, and community members and is displayed in order to make Council members and others aware of the effect that a closure might have on markets and communities. In this way, the Council may conclude that while a high ranking closure option might satisfy biological (adhere to the ACL) and economic (maximize profitability) goals, it could disrupt fish markets or community life and result in more severe economic and social effects than predicted.

For these reasons, the socio-cultural information is very important and will change through time. It is important that the socio-cultural information is island-specific and that fisherman and seafood industry contributions to this category of data are incorporated.

Some things that the model does not incorporate *directly* include 1) weather events (due to lack of predictive capability, 2) effort increases that might occur before or after a closure, and 3) changes in market demand due to a closure in a previous year.

One important aspect of Council discussion regarding the Seasonal Choices Model concerned the consideration of effort shifting to harvest other species that are not experiencing a closure. Effort shifts may occur regardless of how the required AM closure is established or when it goes into effect. Decision-makers will likely try to predict how a closure might result in effort shifts to other fisheries. That information could be used to attempt to distribute closures to minimize negative biological and socio-economic effects. Fishermen input will be particularly helpful in making these decisions.