COMPREHENSIVE ANNUAL CATCH LIMIT (ACL) AMENDMENT FOR THE U.S. CARIBBEAN

Amendment 6 to the Reef Fish Fishery Management Plan of Puerto Rico and the U.S. Virgin Islands
Amendment 5 to the Fishery Management Plan for the Spiny Lobster Fishery of Puerto Rico and the U.S. Virgin Islands
Amendment 3 to the Fishery Management Plan for the Queen Conch Resources of Puerto Rico and the U.S. Virgin Islands
Amendment 3 to the Fishery Management Plan for Corals and Reef Associated Plants and Invertebrates of Puerto Rico and the U.S. Virgin Islands

Draft Environmental Impact Statement
June 13, 2011

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Table of Contents for DEIS

Please note that this action is presented as an integrated document. It addresses different applicable laws including the National Environmental Policy Act (NEPA). Therefore, the document does not follow a standard DEIS format, however, elements of the DEIS are present and identified in the following table of contents for the DEIS.

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Acronyms/Abbreviations

ABC	acceptable biological catch
ACL	annual catch limit
ACLG	Annual Catch Limit Working Group
ACT	Annual catch target
AM	accountability measure
APA	Administrative Procedure Act
B	Biomass
B1	fish filleted or used for bait but identified by interviewer
B2	fish identified but released alive
$B_{CURRENT}$	current biomass of stock
B_{MSY}	Biomass at MSY
C	Average catch
CCA	Crustose coralline algae
CEA	Cumulative effects analysis
CEQ	Council on Environmental Quality
CFMC	Caribbean Fishery Management Council
CFR	Code of federal regulations
CHTS	Coastal household telephone survey
CPUE	Catch per unit effort
CY	Calendar year
CZMA	Coastal Zone Management Act
DEIS	Draft environmental impact statement
DQA	Data Quality Act
EA	Environmental assessment
EEZ	Exclusive economic zone
EFH	Essential fish habitat
EIS	Environmental impact statement
E.O.	Executive order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
F	Instantaneous fishing mortality rate
FAC	Fisheries Advisory Committee
FAG	Fish aggregation device
FAO	Food and Agriculture Organization (United Nations)
F_{CURR}	Current fishing mortality rate
FEIS	Final environmental impact statement
FL	Fork length
FM	Framework Measures
FMP	Fishery management plan
F_{MSY}	Fishing mortality rate yielding MSY
FMU	Fishery management unit
FONSI	Finding of no significant impact
F_{OY}	Fishing mortality rate yielding OY
FR	Federal regulations
GDP	Gross domestic product

GM	Genetically modified
GNI	Gross national income
GNP	Gross national product
HMS	Highly migratory species
IPT	Interdisciplinary Plan Team
ITCZ	Inter-tropical convergence zone
IRFA	Initial regulatory flexibility analysis
IUCN	International Union for the Conservation of Nature
MCD	Marine conservation district
MFMT	Maximum fishing mortality threshold
MMPA	Marine Mammal Protection Act
MRFSS	Marine Recreational Fisheries Statistics Survey
MRIP	Marine Recreational Information Program
MSA	Magnuson-Steven Fishery Conservation and Management Act (Magnuson-Stevens Act)
MSRA	Magnuson-Stevens Fishery Conservation and Management Reauthorization Act
MSST	Minimum stock size threshold
MSY	maximum sustainable yield
NEPA	National Environmental Policy Act
NGO	Non-governmental Organization
NMFS	National Marine Fisheries Service
NMSA	National Marine Sanctuaries Act
NOAA	National Oceanic and Atmospheric Administration
NS	National standard
OFL	Overfishing level
OMB	Office of Management and Budget
OY	Optimum yield
PCE	Primary constituent element
PR	Puerto Rico
PRA	Paperwork Reduction Act
PRDNER	Puerto Rico Department of Natural and Environmental Resources
PSE	Proportional standard error
RA	Regional Administrator of NMFS
RFA	Regulatory Flexibility Act
RIR	Regulatory impact review
SBA	Small Business Administration
SEAMAP	Southeast Area Monitoring and Assessment Program
SEDAR	Southeast data assessment review (stock assessment)
SEFSC	Southeast Fisheries Science Center
SEIS	Supplemental environmental impact statement
SFA	Sustainable Fisheries Act
SSC	Scientific and Statistical Committee
STFA	St. Thomas Fishermen’s Association
STJ	St. Johns, U.S. Virgin Islands
STT	St. Thomas, U.S. Virgin Islands

STX	St. Croix, U.S. Virgin Islands
TAC	Total allowable catch
TMCT	Technical Monitoring and Compliance Team
U.S. Caribbean	Caribbean islands of Puerto Rico, St. Thomas, St. John, and St. Croix
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
USVI	United States Virgin Islands
VEC	Valued ecosystem component
VIDPNR	Virgin Islands Department of Planning and Natural Resources

DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS) COVER SHEET

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Name of Action

Draft Amendment 6 to the Reef Fish Fishery Management Plan (FMP) of Puerto Rico and the U.S. Virgin Islands, Amendment 5 to the FMP for the spiny lobster fishery of Puerto Rico and the U.S. Virgin Islands, Amendment 3 to the FMP for the queen conch resources of Puerto Rico and the U.S. Virgin Islands and Amendment 3 to the FMP for corals and reef associated plants and invertebrates of Puerto Rico and the U.S. Virgin Islands.

Type of Action:

(X) Administrative ( ) Legislative
(X) Draft ( ) Final

Abstract: This amendment to the FMPs for reef fish, corals and reef associated plants and invertebrates, spiny lobster and conch resources in the U.S. Caribbean is designed to bring those fisheries into compliance with the 2007 revisions to the Magnuson-Stevens Fishery Conservation and Management Act. These alternatives will consider measures to revise management reference points, implement annual catch limits (ACLs) and accountability measures (AMs) to prevent overfishing in both the commercial and recreational sectors, revise management of aquarium trade species and conch resources, establish recreational fishing bag limits, establish exclusive economic zone sub-boundaries for purposes of applying AMs, adjust management measures as needed to constrain harvest to specified ACLs, and minimize to the extent practicable negative socioeconomic impacts. The present amendment focuses on those species with overfishing determination unknown within the FMPs mentioned above.

Date DEIS files: TBD
Date FEIS files:

Date DEIS comments due: TBD
Date FEIS comments due:

1.0 EXECUTIVE SUMMARY

The 2011 Caribbean ACL Amendment to the Fishery Management Plans (FMPs) for the Reef Fish, Corals and Reef Associated Plants and Invertebrates, Spiny Lobster and Conch resources in the U.S. Caribbean is intended to bring those fisheries into compliance with the 2007 revisions to the Magnuson-Stevens Fishery Conservation and Management Act (MSA). Actions analyzed in this Draft Environmental Impact Statement (DEIS) include alternatives to: 1) revise management reference points and overfished and overfishing status determination criteria; 2) implement annual catch limits (ACLs) and accountability measures (AMs) to prevent overfishing in both the commercial and recreational sectors pursuant to MSA National Standard 1 Guidelines; 3) revise management measures for aquarium trade species and conch species within the Reef Fish, Corals and Reef and Associated Plants and Invertebrates and Queen Conch FMPs; 4) establish recreational bag limits; 5) establish exclusive economic zone sub-boundaries for purposes of applying AMs; and 6) establish framework procedures to facilitate future modifications to National Standard 1 harvest parameters and management measures if needed.

Specifically, eight actions are included in the amendment. Actions 1 and Action 2 consider alternatives to revise management reference points for those U.S. Caribbean species in each of the Reef Fish and Spiny Lobster FMPs. The MSA as amended through January 12, 2007, requires specification of ACLs and AMs for all species not determined to be undergoing overfishing to take effect in fishing year 2011. Action 3 considers management alternatives for the aquarium trade species within the Reef Fish and Coral and Reef Associated Plants and Invertebrates FMPs different from those established by the 2005 Comprehensive Sustainable Fisheries Act Amendment (Caribbean SFA Amendment). Action 4 considers alternatives to modify the management regime for conch species within the Queen Conch FMP from those established by the Caribbean SFA Amendment. Action 5 proposes changes to the geographic allocation/management of management reference points by island groups. Action 6 proposes management measures to separate the recreational and commercial sectors; and establish recreational bag limits for spiny lobster and reef fish. Action 7 considered alternatives establishing AMs for the species managed in this amendment. Finally, Action 8 considers alternatives for amending framework measures for the Corals and Reef Associated Plants Invertebrates FMP and establish framework measures for the Spiny Lobster FMPs.

ACTION 1

Action 1 establishes a year sequence of annual landings for each species or species group within the Reef Fish FMP. Action 1 includes two components: Action 1(a) and Action 1(b). Action 1(a) includes five alternatives to establish a year sequence of annual landings data for each of the Puerto Rico (PR), St. Croix (STX) and St. Thomas and St. John (STT/STJ) island groups. **Alternative 1** proposes no changes, thus current management reference points or proxies for species/species groups would be retained from the Caribbean SFA Amendment. **Alternatives 2-5** provide year sequences based on the longest time series (**Alternative 2**), the longest time series pre-Caribbean SFA

Amendment (**Alternative 3**), the longest time series of reliable data (**Alternative 4**) and the most recent five years of available data (**Alternative 5**).

Action 1(b) establishes a maximum sustainable yield (MSY) proxies for species not undergoing overfishing within the Reef Fish FMP. There are three sub-actions within Action 1(b) each establishing MSY proxies for each island group (PR, STX and STT/STJ). Sub-Actions 1, 2 and 3 will establish MSY proxies for the Fishery Management Units (FMUs) within the Reef Fish FMP in Puerto Rico, St. Criox and St.Thomas/St. John, respectiveily. **Alternative 1,** under the Sub-Actions , is the no action alternative to retain the management reference points or proxies for species/species groups as established in the Caribbean SFA Amendment. **Alternative 2** of these Sub-actions would redefine management reference points or proxies based on the time series of catch data as defined in Action 1(a) for the respective island group. Within **Alternative 2**, there are multiple options for establsihing the MSY proxy, overfishing limint (OFL), acceptable biological catch (ABC), optimum yield (OY) and ACL.

ACTION 2

Action 2 establishes a year sequence of annual landings for the Spiny Lobster FMP. Action 2 includes two components: Actions 2(a) and 2(b). Action 2(a) includes five alternatives to establish a year sequence of annual landings data for each of the PR, STX and STT/STJ island groups. **Alternative 1** proposes no action, thus current management reference points or proxies would be retained from the Caribbean SFA Amendment for spiny lobster. **Alternatives 2 through 5** provide year sequences based on the longest time series (**Alternative 2**), the longest time series pre Caribbean SFA Amendment (**Alternative 3**), the longest time series of reliable data (**Alternative 4**), and the most recent five years of available data (**Alternative 5**).

Action 2(b) establishes a maximum sustainable yield (MSY) proxies for the Caribbean spiny losbter. There are three sub-actions within Action 1(b) each establishing MSY proxies for each island group (PR, STX and STT/STJ). Sub-Actions 1, 2 and 3 will establish MSY proxies for the Spiny Losbter FMP in Puerto Rico, St. Criox and St.Thomas/St. John, respectiveily. **Alternative 1,** under the Sub-Actions , is the no action alternative to retain the management reference points or proxies for the Caribbean spiny lobster as established in the Caribbean SFA Amendment. **Alternative 2** of these Sub-actions would redefine management reference points or proxies based on the time series of catch data as defined in Action 1(a) for the respective island group. Within **Alternative 2**, there are multiple options for establsihing the MSY proxy, overfishing limint (OFL), acceptable biological catch (ABC), optimum yield (OY) and ACL.

ACTION 3

Action 3 presents alternatives to redefine the management of aquarium trade species within the Reef Fish and the Coral and Reef Associated Plants and Invertebrates FMP (Coral FMP). There are two components under Action 3: Action 3(a) and 3(b). Under Action 3(a), **Alternative 1** proposes no action to the present arrangement of of aquarium trade species in an FMP as defined in the Caribbean SFA Amendment. This alternative does not comply with the mandates of the 2007 MSA. **Alternative 2** proposes the consolidation of all the federally-managed aquarium trade species into a single FMP, providing three sub-alternatives. These sub-alternatives propose to either move all the species from the Coral FMP into the Reef Fish FMP (**Alternative 2A**), from the Reef Fish FMP to the Coral FMP (**Alternative 2B**), or to move all the species from both FMPs into a new FMP specific to aquarium trade species (**Alternative 2C**). **Alternative 3,** under Action 3(a) proposes to remove all aquarium trade species from both the Coral and Reef Fish FMPs with the result that they will no longer be subject to federal management. **Alternative 4** proposes to keep only those aquarium trade species for which landings data are available during the year sequence chosen in Action 1(a) above, and remove all remaining aquarium trade species from the FMPs. In addition, **Alternative 4** if selected provides the opportunity to rearrange the location of these species between management plans (**Alternatives 4A-4D**). **Alternative 5** would delegate management authority of all aquarium trade species in the Reef Fish and the Coral FMPs to the jurisdiction of the appropriate commonwealth or territory as defined in Action 5 of this document.

Action 3(b) establishes an MSY proxy for aquarium trade species that are kept under federal management after a preferred alternative is selected in Action 3(a). If **Alternatives 3** or **Alternative 5** is selected in Action 3(a), Action 3(b) will not proceed as no management reference points will need to be defined for aquarium trade species. **Alternative 1** under this action is the no action alternative. This alternative would not comply with the 2007 MSA as no management reference points were defined for these species under the "data collection only category". **Alternative 2** would redefine management reference points or proxies based on the time series of catch data as defined in Action 1(a).

ACTION 4

Action 4 presents alternatives to redefine the conch FMU within the Queen Conch FMP. There are five alternatives under this action. **Alternative 1** would retain the present definitions specified in the Caribbean SFA Amendment for species/species groups within the conch FMU. The Caribbean SFA Amendment defines the conch species, except queen conch, as data collection only species and does not establish management reference points for these species. This alternative does not comply with the mandates of the 2007 MSA. **Alternative 2** proposes to remove all conch species, except for the queen conch (*Strombus gigas*), from the conch FMU. **Alternative 3** would delegate management authority for all conch species expect queen conch, to the jurisdiction of the commonwealth or territory as defined in Action 5 of this document. **Alternative 4** proposes to retain all conch species under the Queen Conch FMP and include these

species within the management points and ACL proposed for queen conch in the 2010 Caribbean ACL Amendment public hearing draft.

ACTION 5

Action 5 addresses the opportunity to partition the exclusive economic zone (EEZ) consistent with the allocation of fishing regulations among the islands of PR, STX and the STT/STJ island group. **Alternative 1** proposes no change to the current scenario, which continues to manage the U.S. Caribbean as a single unit. **Alternative 2** proposes the establishment of separate ACLs for the individual U.S. Caribbean islands, based upon the combined territorial and EEZ landings for each island established in Actions 1(a) and 2(a). Within **Alternative 2, Alternative 2A** proposes the use of an equidistant method to partition the U.S. Caribbean EEZ among islands. **Alternative 2B** uses a straight-line method to allocate the U.S. Caribbean EEZ among islands. **Alternative 2C** is identical to **Alternative 2B**, except that the north-south line delineating the boundary between Puerto Rico and St. Thomas follows the 65^{o} 10' line of longitude and is therefore, shifted slightly to the west relative to **Alternative 2B**.

ACTION 6

Action 6 has three components Action 6(a), Action 6(b), and Action 6(c). Action 6(a) presents alternatives to separate the commercial and recreational catch limits for Puerto Rico only as recreational data are not available for the U.S. Virgin Islands. **Alternative 1** of Action 6(a) proposes no change to the present regulations regarding sector specific catch limits. **Alternative 2** proposes the separation of commercial and recreational ACLs based on the preferred management reference point time series selected in Actions 1(b) and 2(b) for Puerto Rico.

Action 6(b) provides a variety of alternatives for establishing recreational bag limits in the U.S. Caribbean for reef fish species not undergoing overfishing. Alternatives include not establishing a bag limit (**Alternative 1**), establishing a 5-fish (**Alternative 2**), or establishing 2-fish (**Alternative 3**) aggregate bag limit per fishing day per person for species not undergoing overfishing in the Reef Fish FMP. Also being considered is a 0-fish aggregate bag limit for species in the surgeonfish FMP (**Alternative 4**). **Alternative 5** provides for an overall aggregate bag limit that allows a fisher a total of 10 fish per day including not more than two surgeonfish per fisher or six surgeonfish per boat, including a vessel limit of not more than 30 fish per day. **Alternative 6** proposes an overall aggregate bag limit of 5 fish per day including not more than two surgeonfish per fisher or six surgeonfish per boat, including a vessel limit of not more than 15 fish per day for species not undergoing overfishing in the Reef Fish FMP.

Action 6(c) provides a variety of alternatives for establishing recreational bag limits in the U.S. Caribbean for spiny lobster. Alternatives include not establishing a bag limit (**Alternative 1**), establishing a 5-spiny lobster (**Alternative 2**), or a 2-spiny lobster (**Alternative 3**) bag limit per fishing day per person. Also being considered is a 0-spiny lobster bag limit (**Alternative 4**). **Alternative 5** proposes a bag limit that allows a fisher a

total of 5 spiny lobster per day including a vessel limit of not more than 15 spiny lobster per day. **Alternative 6** proposes a bag limit of 2 spiny lobster per day per fisher including a vessel limit of not more than 12 spiny lobster per day.

ACTION 7

Action 7 has two components that outline the procedures for triggering and then applying AMs for the species included in this amendment. Action 7(a) specifies the criteria for triggering AMs. Under Action 7(a), the no action **Alternative 1** states that no criteria for triggering AMs would be established. This alternative does not comply with the mandates of the 2007 MSA. Both **Alternative 2** and **Alternative 3** describe the conditions under which AMs would be triggered. These two alternatives differ only in that the latter includes a provision requiring input from the NOAA Fisheries' Southeast Fisheries Science Center, in consultation with the Caribbean Fishery Management Council (Council) and its Scientific and Statistical Committee (SSC), prior to determining that an AM has been triggered. This provision is included to ensure that AMs are implemented because a real change in landings has led to overage of an ACL rather than the overage being due to an administrative or bookkeeping factor such as improved reporting of landings. Otherwise, both **Alternative 2** and **Alternative 3** include three sub-alternatives that provide for AMs to be triggered if the ACL is exceeded based on a single year of landings, the average of the two most recent years of landings, or an average of the three most recent years of landings. Action 7(b) then, provides remedies for an ACL overage. Under Action 7(b), **Alternative 1** does not apply AMs at all, whereas **Alternative 2** and **Alternative 3** provide for the application of AMs if the ACL is exceeded based on the preferred criteria in Action 7(a). **Alternative 2** requires reducing the length of the fishing season in the year following the overage by the amount needed to prevent such an overage from occurring again. Changes implemented by the AM would remain in effect until modified. **Alternative 3** reduces the length of the fishing season following the same protocols as **Alternative 2** but also includes a provision to pay back the overage.

ACTION 8

This action includes framework measures designed to provide a mechanism to expeditiously adjust various reference points and management measures. Action 8 contains two components that are almost identical with the exception that Action 8(a) applies to the Spiny Lobster FMP and Action 8(b) applies to the Corals FMP. Currently there are no framework measures in place for spiny lobster. For both Action 8(a) and 8(b), **Alternative 1** is the no action alternative and no framework measures would be established for spiny lobster, and those already in place for corals and reef and associated plants will not be amended. **Alternative 2** of both actions includes an extensive list of options for adjusting reference points and management measures. **Alternative 3** reiterates the options available in **Alternative 2** but provides the Council with only a subset of the full range of options presented in **Alternative 2**. The options made available by **Alternative 3** are not specified and would be included in the final list at the discretion of the Council.

2.0 PURPOSE AND NEED

2.1 Purpose Statement

The purpose of this amendment is to revise management reference points and status determination criteria for species in the reef fish, coral and reef associated plants and invertebrates, queen conch, and spiny lobster fishery management units that have not been identified as undergoing overfishing (Table 3.1.1.); specify annual catch limits (ACLs) and accountability measures (AMs) to prevent overfishing of these species/species groups; amend current framework measures and establish new ones to facilitate regulatory modifications; adjust management measures as needed to constrain harvest to specified ACLs; and minimize, to the extent practicable, negative socioeconomic impacts that may result from the amendment actions. In addition, proposed provisions include separation of the recreational and commercial sectors in Puerto Rico for the species/species groups in each Fishery Management Plan (FMP) considered in this amendment, bag limits for the U.S. Caribbean recreational reef fish and spiny lobster fisheries, subdivision of the exclusive economic zone for application of AMs, and management of aquarium trade species.

2.2 Need for Action

The Magnuson-Stevens Fishery Conservation and Management Act as revised in 2007 requires that each federal FMP specify ACLs and AMs for managed fisheries. These amendments require such measures be implemented in 2010 for fisheries determined by the Secretary of Commerce to be subject to overfishing, and in 2011 for all other fisheries. Overfishing determinations are documented in the NOAA Fisheries quarterly reports to Congress on the status of U.S. fisheries. The most recent of these reports (first quarter 2011) is accessible online at:
http://www.nmfs.noaa.gov/sfa/statusoffisheries/2011/first/FSSInonFSSIstockstatusQ1_2011.pdf

Definition of Terms
(from NOAA Fish Glossary 2006 unless otherwise noted).

Status Determination Criteria (SDC): Objective and measurable criteria used to determine if a stock is being overfished or is in an overfished state according to National Standard Guidelines.

Annual Catch Limit (ACL): The level of annual catch in pounds or number of individuals of a stock or stock complex that serves as the basis for invoking accountability measures. 50 C.F.R. § 600.310(f)(iv)

Accountability Measure (AM): Management controls to prevent ACLs, including sector-ACLs, from being exceeded, and to correct or mitigate overages of the ACL if they occur. 50 C.F.R. § 600.310(g)(1)

Overfishing: Occurs whenever a stock or stock complex is subjected to a rate or level of fishing mortality that jeopardizes the capacity of a stock or stock complex to produce maximum sustainable yield on a continuing basis.

Overfished: stock or stock complex whose size is sufficiently small that a change in management practice is required to achieve and appropriate level and rate of rebuilding.

Maximum Sustainable Yield (MSY): The largest average catch or yield that can continuously be taken from a stock under existing environmental conditions.

Optimum Yield (OY): The harvest level for a species that achieves the greatest overall benefits, including economic, social, and biological considerations.

3.0 INTRODUCTION

3.1 Background

The President signed HR 5946, the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (MSRA) of 2006, on January 12,2007. While maintaining the requirement that "conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield (OY) from each fishery for the United States fishing industry," the MSRA added new requirements to end and prevent overfishing including the use of annual catch limits (ACLs) and accountability measures (AMs).

Specifically, Fisheries Management Plans (FMPs) are required to "establish a mechanism for specifying ACLs in the plan (including a multi-year plan), implementing regulations, or annual specifications, at a level such that overfishing does not occur in the fishery, including measures to ensure accountability" (MSA Section 303(a)(15)). For fisheries not subject to overfishing, these measures must be implemented in 2011.

This amendment proposes the establishment of ACLs and AMs for the commercial and recreational harvest of U.S. Caribbean (Puerto Rico and the U.S. Virgin Islands) species contained within the Spiny Lobster, Reef Fish, Queen Conch, and Corals and Reef Associated Plants and Invertebrates (Coral FMP) FMPs that have not been identified as undergoing overfishing (Table 3.1.1). Amendments to these FMPs follow the 2010 Caribbean ACL Amendment, which established ACLs and AMs for those U.S. Caribbean species that have been designated as undergoing overfishing. Species or species groups included in the 2010 Caribbean ACL Amendment were queen conch, snappers, groupers, and parrotfish. The present amendment will complete the process of establishing ACLs and AMs for all federally-managed species in the U.S. Caribbean. Also included in this amendment are options to create framework measures for the Spiny Lobster FMP; and amend those already established in the 2010 Caribbean ACL Amendment for Coral FMPs. These framework measures are designed to address future changes to reference points and management measures as needed to respond to changing fishery and environmental conditions. Revised framework measures for the Reef Fish and Queen Conch FMPs were included in the 2010 Caribbean ACL Amendment and therefore, do not require additional consideration in the present amendment.

Management actions in this amendment address a variety of year-sequence baselines used to establish average catch levels, from which an estimate of the maximum sustainable yield (MSY) or its proxy can be derived. Various averages can be calculated and each expresses inherent characteristics that reflect the inter-annual variability in landings among years, changes in harvest practices and the socioeconomic factors investing the fishery, biological and environmental dynamics influencing harvested populations, and other factors that occur within the unique series of years chosen to calculate the average. Accountability measures are designed to respond to annual harvest levels that exceed the established ACLs for each species or species group governed by these amendments. Some AMs could be designed to avoid or prevent ACLs from being exceeded but due to

the significant time lag for when Puerto Rico and USVI can submit their landings data, these in season AMs may be less appropriate for implementation. Alternatives include shortening subsequent fishing seasons, reducing quotas to account for overages, and/or changing capacity in the fishery (e.g. by altering gear or vessel options).

All the reference points considered here are closely interrelated, and the MSA places several key constraints on what can be considered in a reasonable suite of alternatives (Figure 3.1). The OY must be less than or equal to MSY. The ACL must be less than or equal to the acceptable biological catch (ABC) level recommended by the Caribbean Fishery Management Council (Council) SSC or other established peer-review process. In addition, the ABC recommendation must be less than or equal to the overfishing threshold.

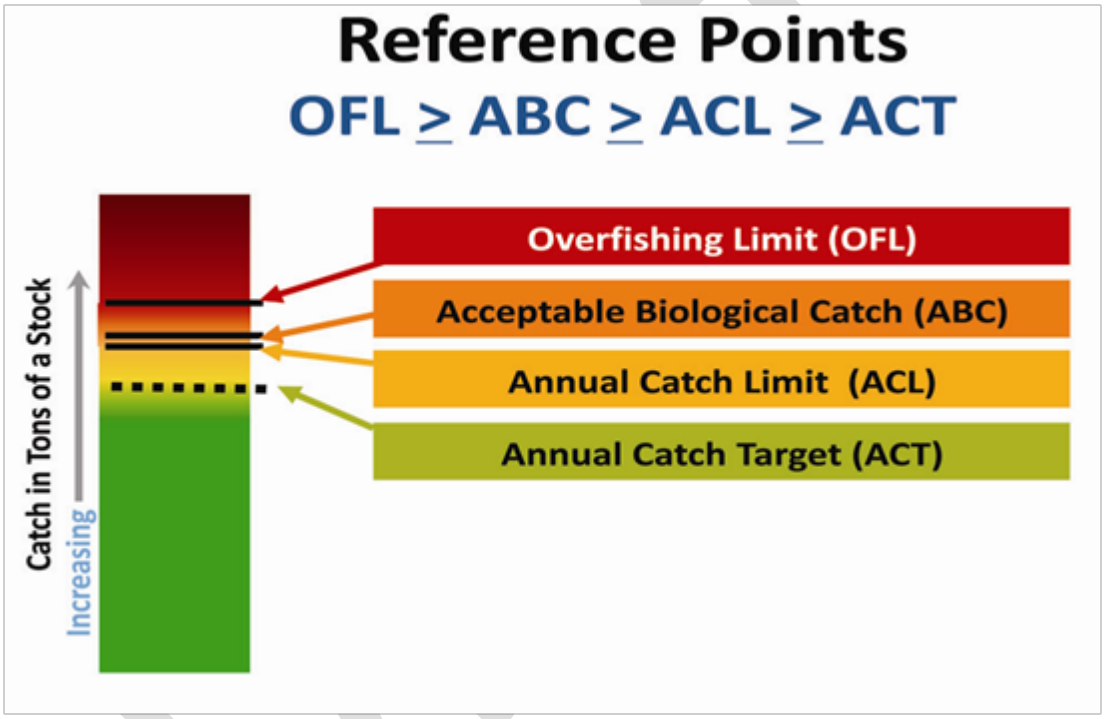


Figure 3.1. The relationship of catch reference points under National Standard 1.

Table 3.1.1. Biological reference points and stock status determination criteria for member species of the Coral and Reef Associated Plants and Invertebrates, Spiny Lobster, Queen Conch, and Reef Fish Fishery Management Units (FMUs) as described in the Caribbean SFA Amendment and for which ACLs were not established in the 2010 Caribbean ACL Amendment. The listed Aquarium Trade species are those included in the Reef Fish FMP. A list of prohibited corals and marine plants, as well as a list of Aquarium Trade species in the Coral FMP, are available in Table 8 of the Caribbean SFA Amendment.

FMU/Sub-Unit	MSY (1,000 lbs)	OY (1,000 lbs)	B_{MSY} (1,000 lbs)	B_{CURR}/B_{MSY}	MSST (1,000 lbs)	B_{CURR}/ MSST	F_{MSY}	F_{CURR}/F_{MSY}	M
Spiny Lobster	547	513	2,217	1.00	1.463	4.52	0.34	1.00	0.34
Lobster, Spiny									
Conch									
Conch, Other	-	-	-	-	-	-	-	-	-
Coral									
Prohibited Corals	0	0	-	-	-	-	-	-	-
Marine Plants	0	0	-	-	-	-	-	-	-
Grunts	195	183	739	1.00	462	1.60	0.38	1.00	0.32
Grunt, White									
Margate									
Tomtate									
Grunt, Bluestriped									
Grunt, French									
Porkfish									
Goatfishes	24	23	58	1.00	29	2.00	0.89	1.00	0.89
Goatfish, Spotted									
Goatfish, Yellow									
Porgies	45	42	118	1.00	59	2.00	0.72	1.00	0.72
Porgy, Jolthead									
Sea Bream									
Porgy, Sheepshead									
Pluma									
Squirrelfishes	27	25	75	1.00	37	2.00	0.64	1.00	0.64
Soldierfish, Blackbar									
Bigeye									
Squirrelfish, Longspined									
Squirrelfish									
Tilefish	3	3	11	1.00	6	1.72	0.42	1.00	0.42
Tilefish, Blackline									
Tilefish, Sand									
Jacks	310	291	1.283	1.00	860	1.49	0.33	1.00	0.33
Blue Runner									
Jack, Horse-Eye									
Jack, Black									
Jack, Almaco									
Jack, Bar									
Amberjack, Greater									
Jack, Yellow									

Table 3.1.1 (continued). Biological reference points and stock status determination criteria for member species of the Coral and Reef Associated Plants and Invertebrates, Spiny Lobster, Queen Conch, and Reef Fish Fishery Management Units (FMUs) as described in the Caribbean SFA Amendment and for which ACLs were not established in the 2010 Caribbean ACL Amendment. The listed Aquarium Trade species are those included in the Reef Fish FMP. A list of prohibited corals and marine plants, as well as a list of Aquarium Trade species in the Coral FMP, are available in Table 8 of the Caribbean SFA Amendment.

FMU/Sub-Unit	MSY (1,000 lbs)	OY (1,000 lbs)	B_{MSY} (1,000 lbs)	B_{CURR}/B_{MSY}	MSST (1,000 lbs)	B_{CURR}/ MSST	F_{MSY}	F_{CURR}/F_{MSY}	M
Surgeonfish	36	34	152	1.00	104	1.47	0.32	1.00	0.32
Tang, Blue									
Surgeonfish, Ocean									
Doctorfish									
Triggerfish and Filefish	196	184	939	1.00	686	1.37	0.27	1.00	0.27
Triggerfish, Ocean									
Triggerfish, Queen									
Triggerfish, Sargassum									
Filefish, Scrawled									
Filefish, Whitespotted									
Durgon, Black									
Boxfish	113	106	386	1.00	216	1.79	0.44	1.00	0.44
Cowfish, Honeycomb									
Cowfish, Scrawled									
Trunkfish									
Trunkfish, Spotted									
Trunkfish, Smooth									
Wrasses	67	63	341	1.00	255	1.33	0.25	1.00	0.25
Hogfish									
Puddingwife									
Hogfish, Spanish									
Angelfish	8	8	28	1.00	16	1.72	0.42	1.00	0.42
Angelfish, Queen									
Angelfish, Gray									
Angelfish, French									
Aquarium Trade	-	-	-	-	-	-	-	-	-
Aquarium Trade species in the Reef Fish FMP include: frogfish, flamefish, conchfish, redlip blenny, peacock flounder, longsnout butterflyfish, foureye butterflyfish, spotfin butterflyfish, banded butteflyfish, redspotted hawkfish, flying gurnard, atlantic spadefish, neon goby, rusty goby, royal gramma, creole wrasse, yellowcheek wrasse, clown wrasse, pearly razorfish, green razorfish, bluehead wrasse, chain moray, green moray, goldentail moray, batfish, goldspotted eel, yellowhead jawfish, dusky jawfish, cherubfish, rock beauty, sargeant major, blue chromis, sunshinefish, yellowtail damselfish, ducky damselfish, beaugregory, bicolor damselfish, threespot damselfish, glasseye snapper, high-hat, jackknife-fish, spotted drum, scorpionfish, butter hamlet, swissguard basslet, greater soapfish, orangeback bass, lantern bass, tobaccofish, harlequin bass, chalk bass, Caribbean tonguefish, seahorses, pipefishes, sand diver, sharpnose puffer, porcupinefish. Conch, other includes: Atlantic triton's trumpet, cameo helmet, green star shell, hawkwing conch, milk conch, roostertail conch, true tulip, and West Indian fighting conch.									

The ACL is the amount of fish in pounds of number of individuals that can be caught by fishers over a period of one year of a stock or stock complex that serves as the basis for invoking AMs. With few exceptions, the MSRA requires the establishment of ACLs for all federally-managed stocks or stock complexes, including those considered data poor. This is particularly pertinent for the aquarium trade species, which historically has been a fish complex with poor landings data. In addition, because catch includes all sources of fishing mortality, an ACL equal to zero should be set even in situations where retention is prohibited in order to account for discard mortality such as species under the Coral and Reef Fish FMPs listed under Table 8 of the 2005 Comprehensive Sustainable Fisheries Act Amendment (Caribbean SFA Amendment). Thus, a primary purpose of this document is to provide options for establishing ACLs for all federally-managed species and species groups that are caught in U.S. Caribbean waters, but that have not been identified as undergoing overfishing in the 1st Quarter 2011 Stock Status Report to Congress:
http://www.nmfs.noaa.gov/sfa/statusoffisheries/2011/first/FSSInonFSSIstockstatusQ1_2011.pdf

Setting ACLs for the U.S. Caribbean will be a multi-step process. The first step in the process is to establish an overfishing limit (OFL). For the U.S. Caribbean, as for the North Pacific (SEDAR 2009, page 169), the OFL can be set to the average catch for a specified period in the absence of a stock assessment and will equal an MSY proxy. The MSY proxy could equal the mean landings plus a standard deviation to account for stock variability. This approach could be considered for species with no assessments available, but landings data exist. The probability of exceeding the overfishing limit in a given year can be approximated from the variance of the mean of recent landings to produce a buffer between the MSY, OFL and acceptable biological catch. The ABC is then established by adding to the mean of annual ladings during a year sequence which could be multiplied by an uncertainty factor (2.0 or 1.0 standard deviation) that addresses data and model limitations in the scientific process. Finally, management uncertainty will be addressed, either separate from or in combination with the scientific uncertainty, and applied to the ABC to arrive at an ACL and consequently an OY.

Uncertainty is inherent in the analysis and management of marine fisheries. It stems from a variety of sources including, but not necessarily limited, to estimates of abundance, developing descriptive population models and parameterizing those models, predicting future environmental conditions that affect fish populations, predicting the response of the fishing sector to changes in harvest regulations and to changes in relative abundance of targeted populations, and anticipating future economic, political, and social conditions (Hilborn and Peterman 1996). The National Standard guidelines emphasize the need to incorporate both scientific and management uncertainty. Management uncertainty occurs because of the lack of sufficient information about catch (e.g., late reporting, underreporting, and misreporting of landings or bycatch). Management uncertainty also exists because of the lack of management precision in many fisheries due to lack of: in-season fisheries landings data, in-season closure authority, or sufficient in-season management in some FMPs when in-season fisheries data are available. Scientific

uncertainty includes uncertainty around the estimate of a stock's biomass and its maximum fishing mortality threshold (MFMT); therefore, any estimate of the OFL has uncertainty (74 FR 3181).

The MSRA requires the establishment of AMs to prevent ACLs from being exceeded and to correct or mitigate for any overages. There are two types of AMs, those that apply preventive in-season management actions (e.g., in-season fishery closure if the target catch limit has been reached) and those that apply corrective post-season management actions (e.g., overage payback in a following fishing year). The AMs must be established for each fishery/stock and can be established for each sector of the fishery/stock. Both in-season and post-season AM alternatives may be available for application in the U.S. Caribbean, the former being more suitable for stocks with relatively high degrees of uncertainty associated with in-season monitoring, which is compounded by the speed at which species are harvested. Species with high degree of biological uncertainty (i.e. lack of reproductive information, life cycles, migration patterns, etc...) have to be closely monitored to assess the impacts of any rapid physical, chemical, biological or geological change in the environment. An in-season alternative would allow for a rapid application of a management response for these high uncertainty species to compensate for these changes.

To respond more quickly to changes in the fisheries addressed in this amendment, it is advisable to include framework measures for modifying ACLs, AMs, and other management measures. Framework actions can be implemented in a shorter period than plan amendments because the procedural requirements are less extensive. Council and public involvement will remain, but the framework procedure will facilitate an efficient response to changes in resource abundance, new scientific information, and changes in fishing patterns among user groups.

3.2 Overview of Data History

The commercial and recreational fishery data available for the U.S. Caribbean are limited and these limitations have been thoroughly described in various documents including: Caribbean SFA Amendment (2005) available at http://www.caribbeanfmc.com, SEDAR 2009 Data Workshop, SEDAR 08A (2005) for spiny lobster, SEDAR 14 (2007) for yellowfin grouper, mutton snapper, queen conch and numerous other reports by the Puerto Rico Department of Natural and Environmental Resources' (PR-DNER) Fisheries Research Laboratory such as the 2000-2004 Shallow-water Reef Fish Monitoring SEAMAP-Caribbean Fisheries Independent Monitoring.

Among the primary concerns regarding the data are the scarce information on fishing effort, the lack of landings data for some federally-managed species, the lack of spatial/geographic information, missing information on life history parameters, and spatially and temporally limited fishery-independent data (SEDAR 2009).

3.2.1 Commercial Data History

Commercial fisheries landings data have been collected since 1974 from St. Thomas/St. John, since 1975 from St. Croix, and since 1967 (but in electronic format since 1983) from Puerto Rico. The U.S. Virgin Islands (USVI) landings data were not recorded to species group with adequate reliability until 1998 (St. Croix) and 2000 (St. Thomas/St. John). At the time of preparation of this document, complete and verified landings data were available through 2008 for USVI and 2009 Puerto Rico. Thus, the range of years available for calculating average landings estimates, for the purpose of setting ACLs for the pertinent commercial fisheries, include 2000-2008 for St. Thomas/St. John (Table 3.2.1), 1998-2008 for St. Croix (Table 3.2.2), and 1983-2009 for Puerto Rico (Table 3.2.3 and Table 3.2.4).

During the years of record for both St. Croix and St. Thomas/St. John, landings were reported at the level of species group or family, for example grunts, triggerfish, spiny lobster, etc. (Tables 3.2.1 and 3.2.2). The USVI landings data cannot be resolved to the level of individual species. Additionally, two reporting categories (finfishes, unclassified, for food and finfishes, unclassified, bait, animal food) may include landings of some species that belong in one of the fishery management units (FMUs) considered in this amendment, but also may include species not included in the pertinent FMUs. Because the relative distribution of landings among FMUs within these two unclassified finfish categories cannot be determined, these unclassified landings are not included in the plots and tables contained within this draft environmental impact statement. For St. Thomas/St. John, from 2000-2008 landings for the first category averaged 2,385 pounds per year and for the second category averaged 25,491 pounds per year. For St. Croix, from 1998-2008 landings for the first category averaged 1,487 pounds per year and for the second category averaged 16,477 pounds per year.

Due to non-reporting, under-reporting, and misreporting of catch, the available landings from Puerto Rico reflect actual fishing activity to a variable degree. PR DNER staff,

working with staff from NOAA Fisheries' Southeast Fisheries Science Center (SEFSC), has developed adjustment factors to account for the lack of complete reporting. Data collected from Puerto Rico, and used in the present amendment for evaluation of various harvest scenarios, have been adjusted to account for reporting problems.

Additionally, fish that are caught but subsequently released rather than harvested (i.e., bycatch) are not accounted for in the landings data. Reasons for discarding catch include risk of ciguatera (a sickness caused by eating toxin-exposed fish), regulatory restrictions, market saturation with a specific species, or (for lobster) individuals in the catch are carrying eggs (Trumble et al. 2006). Discards may represent a substantial proportion of the total catch and may represent an important source of mortality for some species. For example, St. Thomas fishers discard as much as 20% of their total catch (Figure #2, Trumble et al. 2006). Although some discards survive and 20% in this example represents an upper bound, reported landings represent a lower bound and probably underestimate total catch. No suitable method to account for bycatch mortality is presently available. Appendix 3 provides additional details regarding bycatch.

For the sake of consistency in setting ACLs for each island or island group, available landings data for the individual species contained within each FMU have been grouped within each of the commercial and recreational sectors for Puerto Rico. Those groupings are described in Table 3.2.3 and 3.2.4., respectively.

3.2.2 Recreational Data History

The recreational fishery data available from Puerto Rico have been collected since 2000 (Table 3.2.4) under the Marine Recreational Fisheries Statistic Survey (MRFSS), but complementary data are not available for the USVI. These data have been reviewed in the documents cited above and also have been discussed at meetings of working groups designated by the Council such as the Technical and Monitoring Compliance Team, the Annual Catch Limit Working Group (2007, 2008, 2009), the SSC (2007, 2008, 2009, 2011) and at Council meetings (including but not limited to meetings number 127, 132 and 137).

The Trip Interview Program, implemented in Puerto Rico and the USVI since 1985, was thought to provide enough information to obtain species-specific data from the commercial landings. A complete assessment of the data collected (SEDAR 2009) revealed the difficulty of such an approach. It was determined that the samples represented less than 5% (in the best of cases) of the total landings thus making it impossible to assess the contribution of the species of interest to the total catches. Additionally, only in limited cases was there a large enough sample size (e.g., by island, gear) to be usable in an assessment of the fishery and the impact of regulations on the fishery (SEDAR 2009).

Table 3.2.1. St. Thomas/St. John commercial landings during 2000-2008. Also included are averages for 2000-2005 (the longest period prior to implementation of the Comprehensive Sustainable Fisheries Act Amendment), 2000-2008 (for the entire sequence of years of available landings data, and 2004-2008 (the most recent five years of data available for the present amendment). All numbers are in pounds of whole animals. Source-SEFSC 2011 ACL data sets (March 17, 2011).

Year	Angelfish	Boxfish	Goatfish	Grunts	Hogfish	Jacks	Scups and Porgies	Lobster	Squirrelfish	Surgeonfish	Triggerfish
2000	8,022	25,613	726	32,828	*	50,941	19,386	76,279	5,585	31,215	72,091
2001	8,554	29,852	723	41,165	207	67,360	24,809	90,018	7,966	36,552	82,688
2002	10,956	31,127	295	43,727	*	70,273	24,487	116,199	5,358	41,306	97,543
2003	9,600	32,260	274	45,251	215	58,969	26,297	135,760	2,514	42,140	101,558
2004	13,133	33,974	196	48,899	708	54,960	27,084	134,188	5,004	45,823	87,424
2005	12,648	33,204	291	44,947	897	38,890	25,857	124,643	5,159	40,076	76,462
2006	13,342	31,650	423	42,152	1,679	73,522	24,279	135,766	4,628	38,980	70,015
2007	10,342	28,484	205	38,388	1,419	56,988	23,957	119,902	2,489	37,804	73,176
2008	8,168	32,643	74	38,818	615	57,165	22,030	109,234	3,704	37,095	83,514
Avg. 00-05	10,485	31,005	417	42,803	356	56,899	24,653	112,848	5,264	39,519	86,294
Avg. 00-08	10,529	30,978	356	41,797	650	58,785	24,243	115,777	4,712	38,999	82,719
Avg. 04-08	11,527	31,991	238	42,641	1,064	56,305	24,641	124,747	4,197	39,956	78,118

*Confidential Information

Table 3.2.2. St. Croix commercial landings during 1999-2008. Also included are averages for 1999-2005 (the longest period prior to implementation of the Comprehensive Sustainable Fisheries Act Amendment), 1999-2008 (for the entire sequence of years of available landings data), and 2004-2008 (the most recent five years of data available for the present amendment). All numbers are in pounds of whole animals. Source-SEFSC 2011 ACL data sets (March 17, 2011).

Year	Angelfish	Boxfish	Goatfish	Grunts	Hogfish	Jacks	Scups and Porgies	Lobster	Squirrelfish	Surgeonfish	Triggerfish
1999	3,247	7,461	4,273	30,203	*	22,271	1,752	53,329	*	34,596	23,647
2000	242	6,724	3,719	30,767	*	23,074	3,547	89,020	*	36,992	22,815
2001	0	9,643	3,359	38,380	*	33,728	6,349	116,619	*	44,249	29,522
2002	*	10,901	6,971	44,075	*	20,199	9,746	116,273	*	54,632	33,906
2003	0	12,722	5,904	40,615	*	12,135	5,311	106,039	45	42,039	26,902
2004	*	10,581	4,391	45,479	*	13,473	3,941	125,415	*	47,570	27,334
2005	75	8,795	4,417	44,261	*	8,180	4,538	120,929	*	48,853	26,717
2006	*	8,669	4,057	44,862	*	7,777	4,990	147,173	802	51,293	26,010
2007	*	9,783	2,978	51,163	*	22,538	5,514	168,267	*	49,591	27,868
2008	188	8,426	1,775	39,990	*	8,729	5,847	149,234	77	38,229	32,832
Avg. 99-05	522	9,546	4,719	39,111	1	19,003	5,026	103,946	38	44,133	27,263
Avg. 99-08	406	9,370	4,184	40,979	8	17,210	5,153	119,230	134	44,804	27,755
Avg. 04-08	99	9,251	3,524	45,151	14	12,139	4,966	142,204	226	47,107	28,152

*Confidential Information

Table 3.2.3. Puerto Rico commercial landings during 1983-2009. Also included are averages for 1983-2009 (average of the longest available time series), 1999-2005 (the longest period prior to implementation of the Comprehensive Sustainable Fisheries Act Amendment), 1999-2009 (longest time series of reliable catch data for Puerto Rico), 2005-2009 (the most recent five years resently available) and the SSC recommendation of the median of annual landings between 1988-2009 for Puerto Rico commercial. All numbers are in pounds of whole animals. The text box lists the individual species included within each of the FMU categories. Source-SEFSC 2011 ACL data sets (March 17, 2011).

Year	Aquarium Trade	Angelfish	Boxfish	Goatfish	Grunts	Wrasses	Jacks	Scups and Porgies	Spiny Lobster	Tilefish	Squirrelfish	Surgeonfish	Triggerfish and Filefish
1983	11	0	66,242	267,244	664,024	119,181	69,739	137,095	448,788	0	31,429	0	147,424
1984	0	0	65,341	212,891	560,096	120,316	50,842	113,398	420,343	0	21,255	0	123,607
1985	0	0	60,932	104,897	491,181	74,693	61,999	39,433	377,106	0	28,469	0	82,811
1986	5	0	48,234	26,487	242,978	50,229	59,499	24,102	280,130	0	16,660	0	41,387
1987	8,404	0	48,205	13,270	211,837	48,736	61,313	14,210	204,869	59	5,271	39	51,533
1988	5,058	0	66,161	12,589	161,723	53,866	50,197	16,393	252,953	169	8,146	0	51,484
1989	5,148	*	98,242	18,707	157,892	50,247	77,586	19,124	364,764	60	11,378	0	65,789
1990	9,178	0	93,202	26,645	236,051	42,634	63,079	18,407	331,447	103	13,091	0	56,083
1991	11,021	0	96,722	30,850	285,587	60,803	87,217	25,517	415,678	356	18,456	471	61,145
1992	2,776	0	66,892	12,477	198,776	35,302	51,031	16,757	267,853	58	10,760	173	46,272
1993	4,847	0	93,056	13,561	271,505	35,312	69,218	18,634	281,929	150	13,105	0	63,842
1994	8,481	*	83,755	15,712	227,236	50,579	81,341	17,367	301,146	407	14,081	0	73,202
1995	9,431	0	96,475	20,441	206,547	69,638	99,074	26,348	393,576	475	20,382	*	97,675
1996	3,441	0	94,891	29,583	246,160	85,245	85,456	43,194	395,602	451	22,898	317	90,319
1997	3,380	0	105,033	24,131	215,313	87,942	107,306	36,515	363,946	774	27,813	0	95,577
1998	3,537	*	116,569	19,251	148,244	63,593	94,984	34,055	383,349	796	24,468	*	82,767
1999	6,310	0	107,646	33,602	151,602	59,522	100,369	44,338	419,968	1,292	18,868	*	64,155
2000	4,156	611	147,349	36,454	208,041	103,220	150,019	52,088	455,169	417	28,349	0	74,181
2001	6,385	0	112,332	32,584	225,208	100,005	142,896	53,621	413,838	154	25,776	28	88,058
2002	15,422	*	91,893	22,063	171,268	79,726	119,299	43,959	349,826	51	18,572	*	62,447
2003	8,129	0	102,471	17,859	185,531	67,864	122,894	31,430	396,192	*	17,666	*	69,668
2004	6,388	0	114,367	19,783	212,172	87,436	114,605	48,812	476,540	*	21,679	0	97,810
2005	2,142	0	196,613	48,414	298,239	131,251	156,928	81,697	773,732	*	32,605	0	122,434
2006	1,250	0	60,206	10,609	92,943	52,532	59,922	19,553	276,884	*	11,008	0	44,237

*Confidential Information

Table 3.2.3. (Continued). Puerto Rico commercial landings during 1988-2009. Also included are averages for 1988-2009 (average of the longest available time series), 1999-2005 (the longest period prior to implementation of the Comprehensive Sustainable Fisheries Act Amendment), 1999-2009 (longest time series of reliable catch data for Puerto Rico), 2005-2009 (the most recent five years presently available) and the SSC recommendation of the median of annual landings between 1988-2009 for Puerto Rico commercial. . All numbers are in pounds of whole animals. The text box lists the individual species included within each of the FMU categories. Source-SEFSC 2011 ACL data sets (March 17, 2011).

Year	Aquarium Trade	Angelfish	Boxfish	Goatfish	Grunts	Wrasses	Jacks	Scups and Porgies	Spiny Lobster	Tilefish	Squirrelfish	Surgeonfish	Triggerfish and Filefish
2007	279	0	50,527	7,777	66,614	57,916	46,104	16,964	270,614	0	7,418	0	33,409
2008	285	0	51,235	5,206	72,309	54,985	106,621	28,627	329,238	0	21,316	0	56,734
2009	810	0	52,048	7,344	78,666	55,456	96,257	22,978	304,431	0	13,314	0	47,944
Avg. 88-09	5,357	38	95,349	21,166	187,165	67,503	94,655	32,563	373,576	376	18,234	49	70,238
Avg. 99-05	6,990	89	124,667	30,108	207,437	89,861	129,573	50,849	469,324	600	23,359	13	82,679
Avg. 99-09	4,687	57	98,790	21,972	160,236	77,265	110,538	40,370	406,039	406	19,688	8	69,189
Avg. 05-09	953	0	82,126	15,870	121,754	70,428	93,166	33,964	390,980	486	17,132	0	60,952
Median 88-09	4,953	0	95,683	19,517	202,662	60,163	95,621	27,488	364,355	162	18,514	0	64,972

Aquarium Trade: Butterfly fish, drums, unclassified eels, jacknife fish, puffers, spadefish, moray eels, glasseye snapper. **Angelfish**: angelfishes. **Boxfish**: boxfish. **Goatfish**: goatfishes. **Grunts**: bluestriped grunt, French grunt, white grunt, porkfish, margate, tomtate grunt, grunts. **Jacks**: almaco jack, greater amberjack, horse-eye jack, yellow jack, bar jack, black jack, jacks. **Scups and Porgies**: jolthead porgy, unclassified scups and porgies. **Squirrelfish**: bigeye, squirrelfishes. **Surgeonfish**: surgeonfishes. **Tilefish**: blackline tilefish, sand tilefish, unclassified tilefishes. **Triggerfish and Filefish**: ocean triggerfish, queen triggerfish, triggerfishes, filefish. **Wrasses**: hogfish, puddingwife. **Lobster**: spiny lobster, slipper (bulldozer) lobster.

Table 3.2.4. Puerto Rico recreational landings during 2000-2009. Also included are averages for 2000-2005 (the longest time period prior to implementation of the Comprehensive Sustainable Fisheries Act Amendment), 2000-2009 (for the entire sequence of years), and 2005-2009 (the most recent five years presently available). Numbers are in pounds of whole animals (numbers of fish reported are in parentheses). The text box lists the individual species included within each of the FMU categories. Source-SEFSC 2011 ACL data sets (March 17, 2011).

Year	Aquarium Fish	Angelfish	Boxfish	Goatfish	Grunts	Wrasses	Jacks	Scups and Porgies	Tilefish	Squirrelfish	Surgeonfish	Triggerfish and Filefish
2000	27,964 (9,936)	0 (0)	5,119 (2,622)	628 (908)	19,945 (46,391)	8,249 (9,043)	175,631 (90,805)	4,236 (6,300)	147 (1,334)	7,859 (20,617)	975 (1,978)	83,373 (41,458)
2001	8,624 (11,313)	2,556 (1,573)	9,643 (7,580)	2,021 (3,625)	14,815 (30,044)	15,100 (15,091)	233,198 (108,774)	1,426 (846)	3,382 (5,508)	6,332 (15,431)	4,786 (6,341)	77,090 (51,137)
2002	4,626 (14,163)	0 (0)	3,500 (1,294)	387 (3,510)	5,535 (16,774)	4,156 (6,897)	94,988 (108,280)	769 (2,325)	517 (1,373)	2,810 (5,741)	0 (0)	9,905 (8,251)
2003	12,676 (8,689)	5,989 (1,482)	24,091 (14,388)	0 (0)	7,439 (15,396)	7,066 (10,513)	119,477 (128,036)	12,443 (15,786)	5,423 (7,527)	8,907 (22,466)	122 (554)	71,815 (37,930)
2004	12,356 (7,195)	0 (0)	20,895 (12,529)	1,241 (2,088)	3,366 (10,938)	906 (2,438)	51,173 (78,492)	4,733 (5,731)	2,143 (2,590)	2,881 (4,423)	0 (0)	14,911 (5,868)
2005	328 (1,487)	0 (0)	2,141 (2,338)	0 (0)	3,978 (9,922)	1,410 (1,447)	52,327 (49,037)	2,916 (3,856)	576 (1,306)	686 (1,487)	0 (0)	30,893 (22,975)
2006	1,359 (4,991)	0 (0)	5,140 (2,843)	0 (0)	1,018 (2,344)	0 (0)	25,723 (17,123)	803 (836)	0 (0)	345 (1,567)	0 (0)	2,633 (889)
2007	7,214 (2,582)	0 (0)	1,363 (364)	417 (1,261)	4,353 (8,759)	2,792 (352)	24,172 (25,056)	2,809 (1,730)	0 (0)	5,765 (14,466)	0 (0)	2,548 (958)
2008	1,898 (2,494)	0 (0)	5,443 (2,976)	0	6,669 (12,274)	15,406 (7,220)	48,899 (31,008)	2,927 (2,329)	0 (0)	15,470 (25,811)	193 (222)	62,567 (18,037)
2009	1,142 (1,456)	265 (216)	2,718 (1,799)	731 (821)	5,639 (14,025)	7,244 (3,945)	61,009 (23,016)	434 (279)	0 (0)	1,386 (2,685)	94 (121)	17,837 (10,442)
Avg. 00-05	11,096 (8,797)	1,424 (509)	10,898 (6,792)	713 (1,688)	9,180 (21,577)	6,148 (7,571)	121,132 (93,904)	4,420 (5,807)	2,031 (3,273)	4,912 (11,694)	981 (1,479)	47,998 (27,937)

Table 3.2.4. (Continued). Puerto Rico recreational landings during 2000-2009. Also included are averages for 2000-2005 (the longest time period prior to implementation of the Comprehensive Sustainable Fisheries Act Amendment), 2000-2009 (for the entire sequence of years), and 2005-2009 (the most recent five years presently available). Numbers are in pounds of whole animals (numbers of fish reported are in parentheses). The text box lists the individual species included within each of the FMU categories. Source-SEFSC 2011 ACL data sets (March 17, 2011).

Year	Aquarium Fish	Angelfish	Boxfish	Goatfish	Grunts	Wrasses	Jacks	Scups and Porgies	Tilefish	Squirrelfish	Surgeonfish	Triggerfish and Filefish
Avg. 00-09	7,819 (6,430)	881 (327)	8,005 (4,873)	543 (1,221)	7,276 (16,687)	6,233 (5,694)	88,660 (65,963)	3,349 (4,002)	1,219 (1,964)	5,244 (11,469)	617 (922)	37,357 (19,795)
Avg. 05-09	2,388 (2,602)	53 (43)	3,361 (2,064)	230 (416)	4,331 (9,465)	5,370 (2,593)	42,426 (29,048)	1,978 (1,806)	115 (261)	4,730 (9,203)	57 (69)	23,296 (10,660)
Median 00-09	5,920 (6,093)	NA	5,129 (2,733)	402 (864)	5,587 (13,149)	5,611 (5,421)	56,668 (63,764)	2,863 (2,327)	NA	4,323 (10,103)	NA	24,365 (14,239)

Year	Wrasse Family	Drum Family
2000	9,961	67,157
2001	3,000	0
2002	0	3,451
2003	0	1,315
2004	2,679	7,176
2005	0	0
2006	0	1,339
2007	0	0
2008	0	535
2009	0	0
Avg. 00-05	3,910	15,820
Avg. 00-09	3,910	11,567
Avg. 05-09	0	625

Aquarium Fish: Atlantic spadefish, banded butterflyfish, blue chromis, bluehead, chain moray, clown wrasse, damselfish family, dusky damselfish, glasseye snapper, goby family, goldspotted eel, green moray, jackknife fish, lefteye flounder family, moray family, peacock flounder, porcupine fish, sand diver, scorpionfish family, sargeant major, snake eel, yellowtail damselfish. **Angelfish**: French angelfish, gray angelfish. **Boxfish**: boxfish genus, honeycomb cowfish, scrawled cowfish, smooth trunkfish, spotted trunkfish, trunkfish. **Goatfish**: goatfish family, spotted goatfish, yellow goatfish. **Grunts**: bluestriped grunt, French grunt, grunt family, grunt genus, margate, porkfish, tomtate, white grunt. **Jacks**: almaco jack, amberjack genus, bar jack, black jack, blue runner, greater amberjack, horse-eye jack, jack family, jack genus, yellow jack. **Scups and Porgies**: jolthead porgy, pluma porgy, porgy family, sea bream. **Squirrelfish**: bigeye, longspine squirrelfish, squirrelfish, squirrelfish family, squirelfish genus. **Surgeonfish**: blue tang, doctorfish, ocean surgeon, surgeonfish genus. **Tilefish**: blackline tilefish, sand tilefish. **Triggerfish and Filefish**: black durgon, leatherjacket family, ocean triggerfish, queen triggerfish. **Hogfish**: hogfish, puddingwife, Spanish hogfish.

Recorded annual landings vary, sometimes substantially, among years for all species groups within each of the island groups (Figures 3.2.1 - 3.2.4). For example, there is a large increase in the commercial landings of spiny lobster in Puerto Rico waters during 2005 (Figure 3.2.3.). In general, commercial landings of most species on most islands tend to decrease after 2005 (Figures 3.2.1 - 3.2.4). This may be an outcome of measures included in the Caribbean SFA Amendment, which went into effect in 2005 and would be expected to affect U.S. Caribbean fisheries beginning in 2006. Recreational landings recorded from Puerto Rico generally increase in the most recent years. Source-SEFSC 2011 ACL data sets (March 17, 2011).

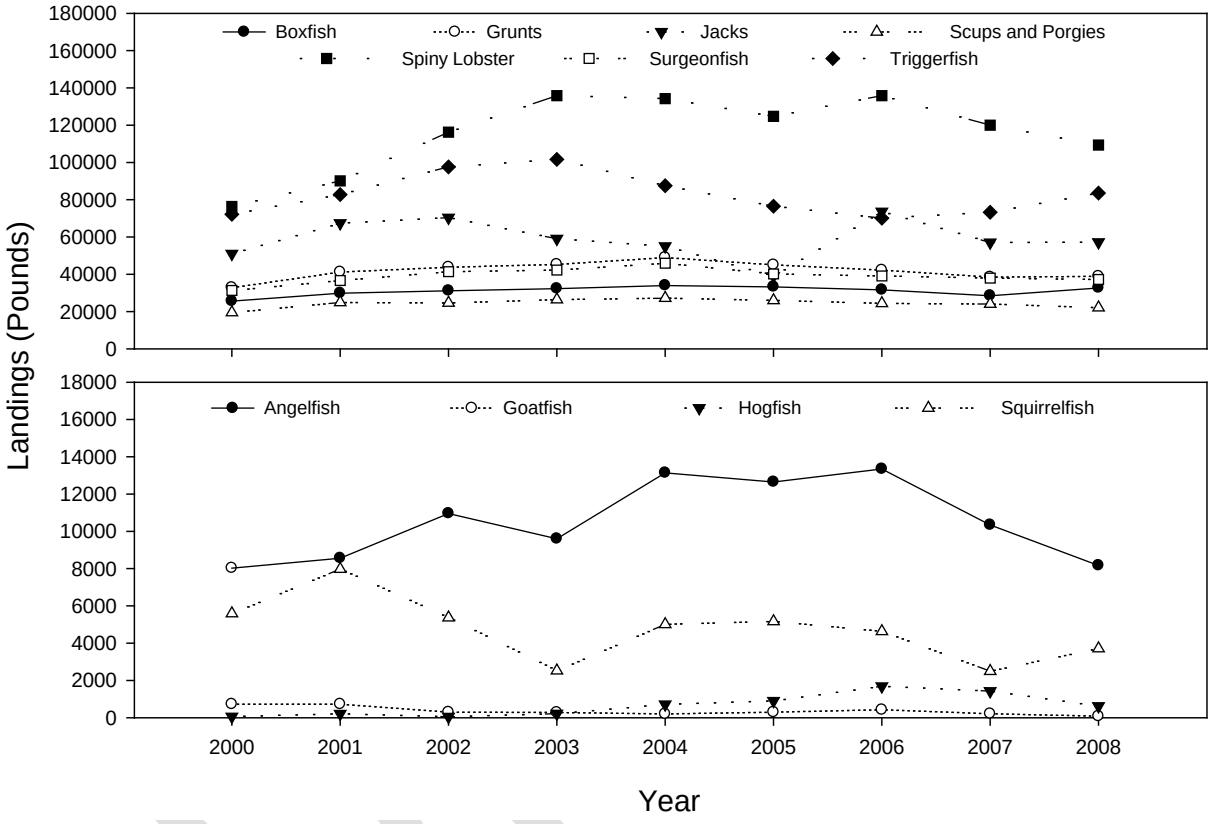


Figure 3.2.1. Commercial landings patterns for various species groups contained within the USVI trip ticket landings reports for the St. Thomas and St. John island group. Note the difference in y-axis scaling between the top and bottom panels, with the landings range in the top panel being 10 times the landing range of the bottom panel. Source-SEFSC 2011 ACL data sets (March 17, 2011).

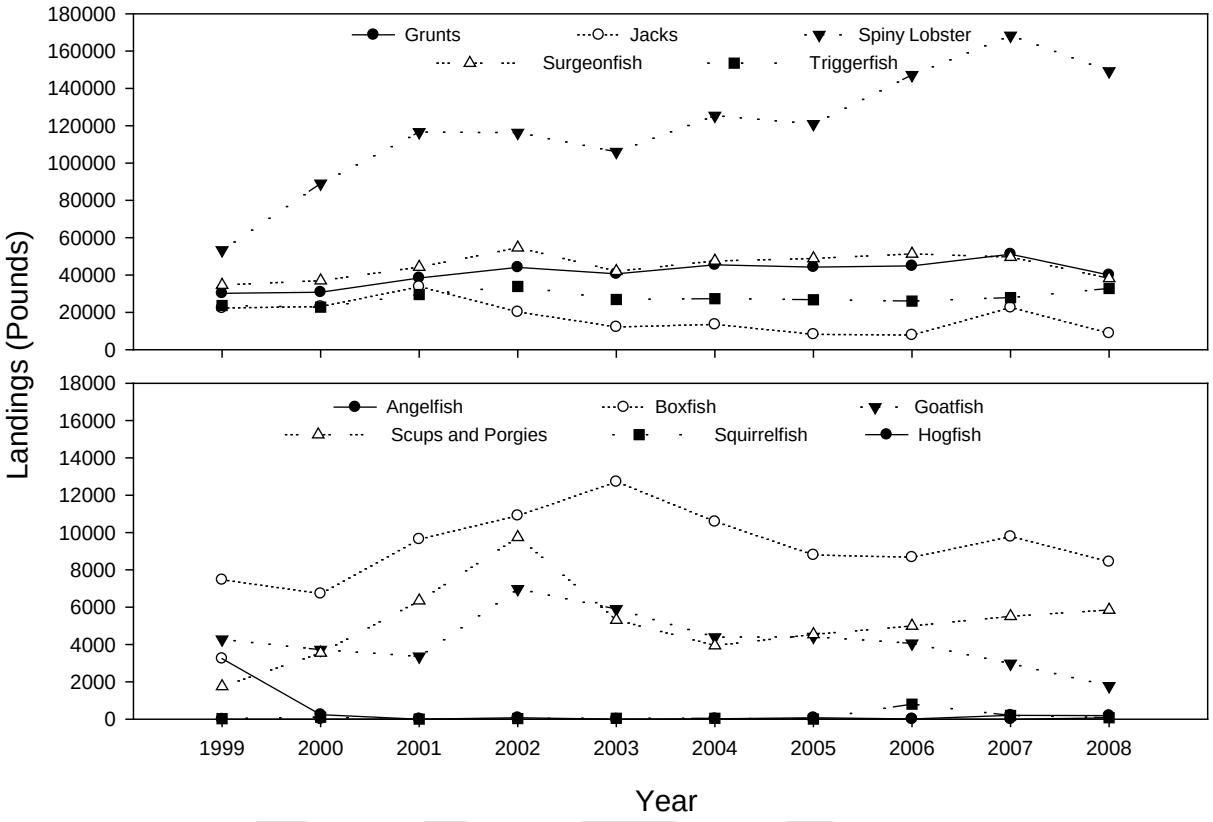


Figure 3.2.2. Commercial landings patterns for various species groups contained within the USVI trip ticket landings reports for St. Croix. Note the difference in y-axis scaling between the top and bottom panels, with the landings range in the top panel being 10 times the landing range of the bottom panel. Source-SEFSC 2011 ACL data sets (March 17, 2011).

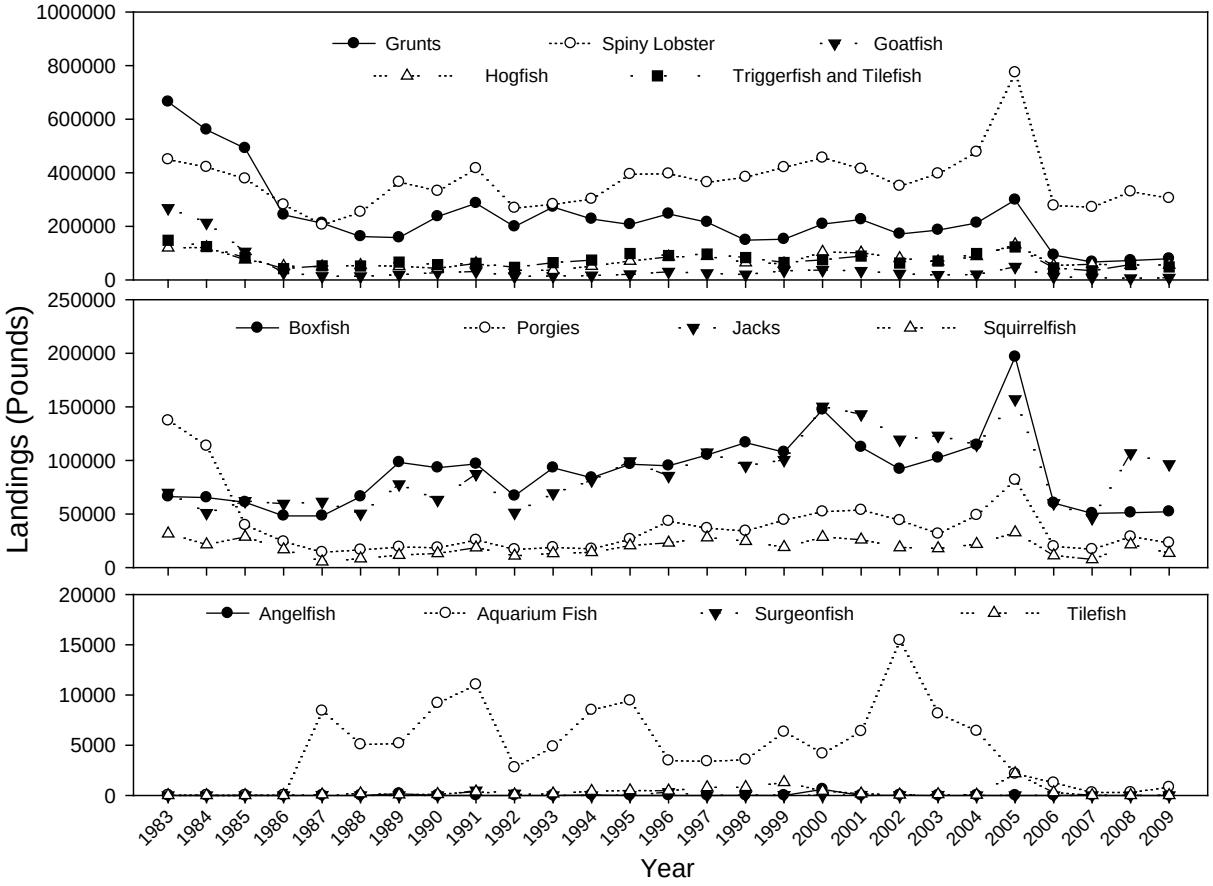


Figure 3.2.3. Commercial landings patterns for various species groups contained within the trip ticket landings reports for Puerto Rico. Note the difference in y-axis scaling between the three panels. Source-SEFSC 2011 ACL data sets (March 17, 2011).

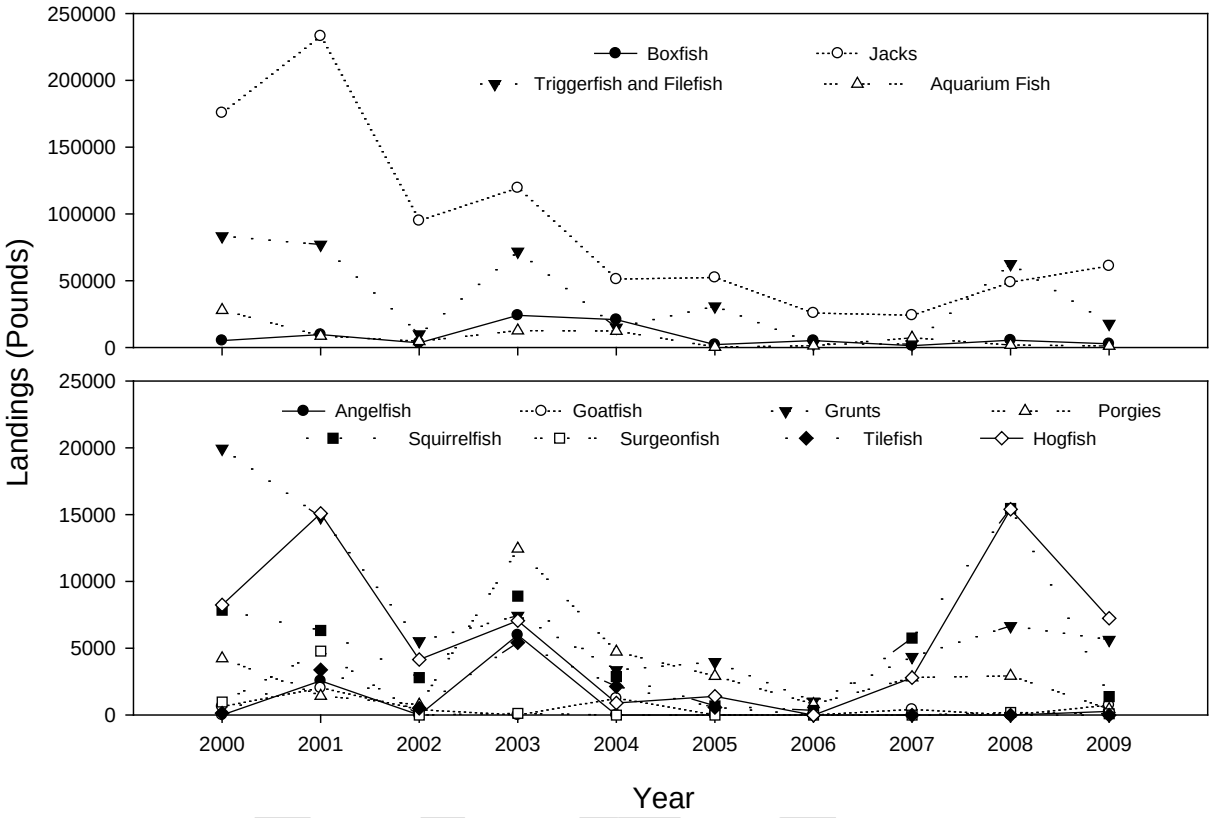


Figure 3.2.4. Recreational landings patterns for various species groups contained within the trip ticket landings reports for Puerto Rico. Note the difference in y-axis scaling between the top and bottom panels, with the landings range in the top panel being 10 times the landing range of the bottom panel. Source-SEFSC 2011 ACL data sets (March 17, 2011).

3.2.2.1 Puerto Rico

Although recreational fishing activities in Puerto Rico are prominent, data on the recreational catch and effort, species composition of the catch, and biological data on the species targeted and harvested are mostly lacking. The only continuous attempt at gathering these data from the recreational fishing sector dates to 2000, when the MRFSS was implemented in Puerto Rico, and which has continued to collect data to date. Recreational fisheries monitoring through the MRFSS follows the same methodology as on the continental U.S. and is briefly described herein. For information on the MRFSS program (now redefined as MRIP), see: https://www.countmyfish.noaa.gov/), which can be accessed through: http://www.st.nmfs.noaa.gov/st1/recreational/overview/overview.html.

In Puerto Rico, the MRFSS program is conducted through the PR-DNER, which generally provides the intercept and interview personnel, although occasionally contracts consultants to carry out the survey. Data are collected on recreational catch and effort targeting reef fish and on coastal and highly migratory pelagic species, but not on invertebrates such as queen conch and spiny lobster (two of the most commercially and recreationally important harvested species). In 2000-2001, the MRFSS program in Puerto Rico included a two-year special survey on conch. This two-year survey information was used to develop the Caribbean SFA Amendment. At the time the Caribbean SFA Amendment was developed, with only two years of data, there was an indication that the recreational catch in Puerto Rico was a significant proportion of the total landings, accounting in some instances for more than 50% of the total landings in Puerto Rico. The proportional participation in the fishery of recreational fishers in Puerto Rico was also significant with over 200,000 participants annually.

The MRFSS program collects data, through telephone interviews, on a two-month wave mode, with six waves per year. The information includes shoreline, charter, and private boat modes to account for most of the recreational fishing activity. However, the survey does not target SCUBA divers, a potential major activity in the U.S. Caribbean (Garcia-Moliner et al. 2001).

The Coastal Household Telephone Survey collects information from participants at the end of each two-month wave. Households are accessed randomly from numbers obtained from the telephone book. Following a brief screening, the respondents are questioned about fishing effort from shore and from private boats. Anglers are queried regarding fishing trips taken over the last two months and asked to provide information on the details of the trips: (http://www.st.nmfs.noaa.gov/st1/recreational/documents/MRFSS%20Telephone/SOW_J.1.pdf). The information requested includes the fishing mode (shore, charter or private boat), the number of trips taken, and the number of people fishing. The household information is then extrapolated to determine total participation as the number of trips by county and then expanded again for the whole Island to arrive at an island wide assessment.

Expanded estimates of the recreational catch (in numbers) and effort (number of trips and participants) are always accompanied by a calculation of the proportional standard error (PSE). As an example, in 2008, the total number of participants was estimated at 149,544 (with 127,863 resident participants and 21,681 out-of-state participants) with a PSE of 11%. These 149,544 participants in the recreational fishery made 798,551 trips (all included: shore, private and

charter) with a PSE of 9% for all modes combined. Landings for 2008 were estimated at 1,910,542 pounds for all finfish species (Table 3.2.5).

The MRFSS includes an at-dock intercept component (Access-Point Angler Intercept Survey), also conducted by PR-DNER personnel. The interviews are conducted at fishing access points to identify species landed, individual length-weight, total numbers by species, and effort information. The intercept points are selected following a random stratified design in proportion to the dates, times, and sites of fishing activity. As stated in the MRFSS overview, funding availability also dictates sampling effort. Intercepts are conducted for each mode separately (private, shore, and charter). Ideally, a catch-per-unit-effort estimate could be determined from these interviews. This survey in Puerto Rico has met with varying degrees of success due in part to a number of changes in personnel and a lack of adequate personnel to cover areas other than the north coast of the island. This has resulted in very minimal or zero samples, poor species identification, few samples per species for length and weight, and geographical bias of the samples. Attempts have been made to use the catch, effort, and length data in stock assessments for a number of species and in the determination of ACLs (e.g., SEDAR 2009). Although no complete evaluation of the MRFSS data for Puerto Rico has been conducted to date, both SEDAR (2007) and SEDAR (2009) assessed the MRFSS data and concluded that the data were not sufficient for use in stock assessments.

Issues of concern with the recreational data include: (1) accurate identification of species, reflected in the large proportion of landed fish attributed to general (i.e., 'unclassified') categories such as "grunts family" or "boxfish genus", (2) limited number of individuals measured and the limited information on complete catches, (3) geographic bias of the samples with most coverage on the north coast of Puerto Rico, and (4) limited validation of the intercept trips (validation is done through follow-up telephone calls on 10% of the interviews). Additionally, there is a need for initiating a validation mechanism to corroborate the harvest areas to determine if the catch comes from state waters or from the exclusive economic zone (EEZ). Finally, the primary source of MRFSS information (telephone surveys) is reported in numbers of fish harvested and discarded. Weight of the catch is then estimated based on individual weight estimates obtained from the intercept survey.

Table 3.2.5. Recreational landings statistics generated from MRFSS intercept program in Puerto Rico from inception (2000) to the most recent available year. MRFSS Database.

Year	Mode	Total	Charter	Private	Shore	Participants
2000	Pounds	4,601,741	48,173	4,195,832	357,736	249,868
	Trips	1,332,703	16,899	522,914	792,890	
2001	Pounds	3,301,922	23,281	2,752,165	526,476	222,128
	Trips	1,411,943	10,919	504,349	896,675	
2002	Pounds	2,452,048	22,438	2,236,507	193,103	237,995
	Trips	1,301,059	34,277	572,844	693,938	
2003	Pounds	3,754,963	28,254	3,320,974	405,735	219,910
	Trips	1,111,405	21,764	471,741	617,900	
2004	Pounds	2,145,475	40,435	1,940,892	164,148	163,833
	Trips	1,050,299	22,028	389,469	638,802	
2005	Pounds	1,971,263	41,689	1,835,863	93,711	141,743
	Trips	866,722	17,969	379,910	468,843	
2006	Pounds	955,123	16,823	431,274	507,026	213,005
	Trips	896,582	16,906	386,111	493,565	
2007	Pounds	2,375,687	43,063	2,197,800	134,824	185,429
	Trips	1,080,096	10,734	453,907	615,455	
2008	Pounds	1,910,542	39,974	1,793,360	77,208	149,544
	Trips	798,552	12,623	362,739	423,190	

The MRFSS data do provide a first attempt at accounting for the recreational harvest, which is generally considered significant. A summary of all available information for Puerto Rico from the recreational sector, including number of participants, number of trips taken by mode (shore, charter and private boat), and the total catch (all species reported) from 2000 to 2008 is presented in Table 3.2.5. A relatively flat trend in number of fishing trips and pounds landed is present from 2000-2008, except for an as-yet unexplained anomaly in 2006. The percent of trips taken to the shore (53-61%) is always higher than the percent of trips taken in private boats (36-45%), which in turn is always higher than the number of charter trips (1-3%). However, the private boats account for a greater proportion of the landings (45-94% of the total) followed by shore landings (4-53%) and finally (as expected from much catch and release in the area) by the charters (1-2%). The total catch corresponds to the Type A+B1+B2 (A = fish that are brought back to shore for identification by the interviewer, B1 = filleted or used for bait but identified by angler, B2 = identified but released alive). Between 2000 and 2008, the total landings from the recreational sector ranged from 955,123 to 4,601,741 pounds (an average of 2,607,640 pounds per year from all finfish species). The number of participants has also varied annually from a low of 141,743 in 2005 to a maximum of 249,868 in 2000.

The MRFSS program also offers information on the total number of trips by mode and area (≤10 miles being roughly equivalent to state waters and ≥10 miles being roughly equivalent to EEZ waters) from 2000 to 2009 (Figure 3.2.5). Twenty percent of the trips taken to EEZ waters were by recreational fishers in private boats, but most recreational trips occur within state waters. The narrowest PSEs are from the private and shore fishing sectors, ranging from 10 to 16%, while for the charter mode PSEs range from 40 to 91%. The MRFSS sampling was based primarily on the

shoreline mode, with limited sampling of private vessels. A specific reporting protocol is being developed for the for-hire sector (G. Rodríguez, PRDNER, pers. comm.). Regardless of its limitations, MRFSS provides useful information on the potential impact of recreational harvest on the finfish species considered in this amendment.

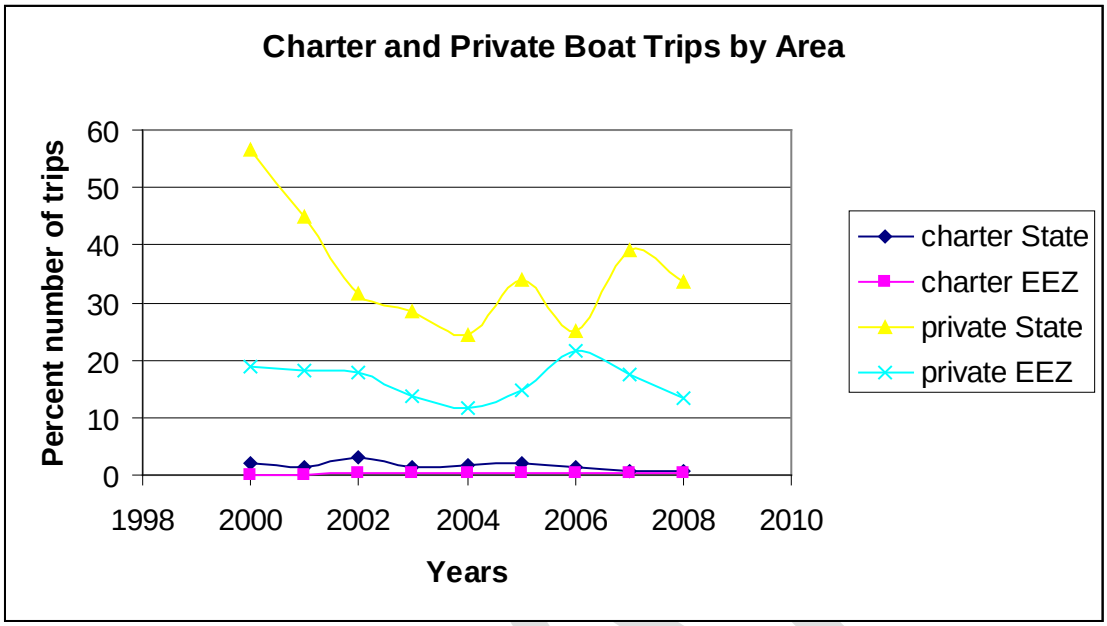


Figure 3.2.5. Charter and private vessel trips occurring within Puerto Rico commonwealth (State) and U.S. Caribbean EEZ waters during 2000-2008. MRFSS Database.

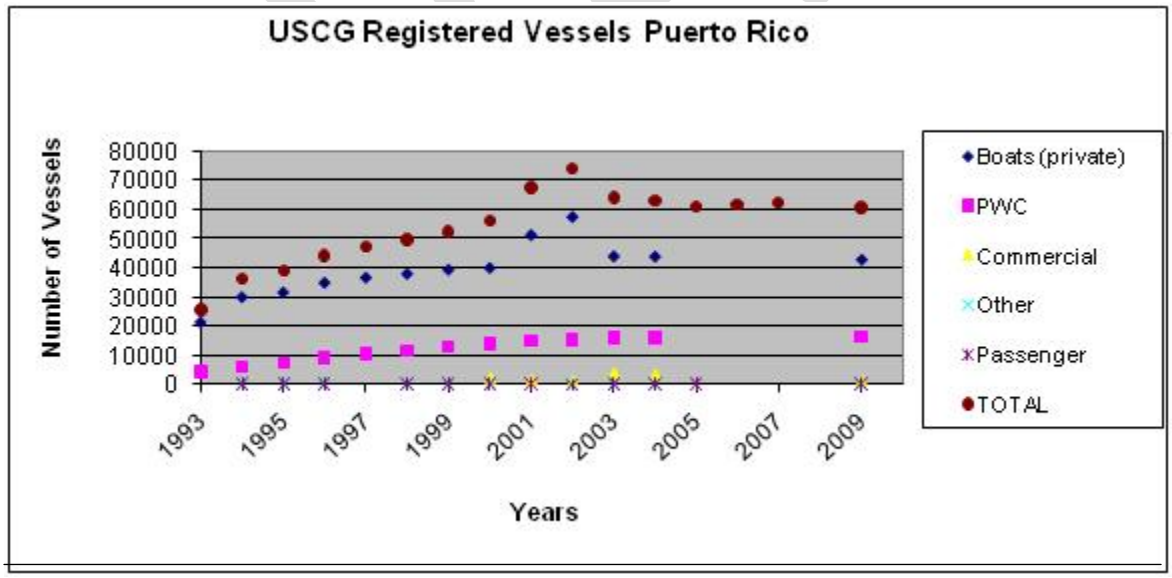


Figure 3.2.6. Recreational and commercial vessel registrations in Puerto Rico as recorded by the United States Coast Guard. PWC = personal watercraft. A. Cruz, PR-DNER, pers. comm.

The number of vessels registered with the United States Coast Guard peaked at 60,640 (Figure 3.2.6) including 1,125 boats registered as commercial fishing vessels in Puerto Rico (A. Cruz, PR-DNER, pers. comm.). This boat registry can be used as an indicator of the potential number of recreational fishers in Puerto Rico. Furthermore, "saltwater recreational fishing in Puerto Rico is an important industry generating $754.8 million in trip and durable goods expenditures" (B. Gentner and J. Agar, SEFSC, pers. comm.).

3.2.2.2 USVI

The most recent report on recreational fishing activity in USVI waters (Tobias and Dupigny 2009) reviews the information available for the area, including the surveys on the recreational fishing activity in general (reef fish) included in the Caribbean SFA Amendment to the FMPs (CFMC 2005) and most recently in the Caribbean Fisheries Data Evaluation workshop (SEDAR 2009).

Most of the information on recreational fisheries for the USVI derives from offshore billfish and other pelagic fisheries since the area is well known for gamefish. Tobias and Dupigny (2009) summarize the information on the latest recreational fishing survey targeting the pelagic fleet. None of the reports on the recreational fishing activity in the USVI target the fleet harvesting reef fish, lobster, or conch.

Telephone surveys targeting boat-based and shore fishers provide an estimate of 10% of the USVI population participating as recreational fishers (Jennings 1992, Mateo 1999). In all cases, pelagic species are the most commonly targeted (Tobias and Dupigny 2009). In St. Thomas/St. John, 7,000 vessels were registered in 20005-2006 and 250 were registered in St. Croix (Tobias and Dupigny 2009), but there is no additional information on the fishing fleet of the USVI targeting reef fish and conch resources.

3.3.2.3 Regulations on licenses and permits

There are no federal licenses or permits issued for the commercial harvest of reef fish, conch species, spiny lobster and aquarium trade species in the EEZ of the U.S. Caribbean. The Government of Puerto Rico requires commercial fishing licenses for fishing in state waters and an additional permit for harvesting conch species, aquarium trade species and spiny lobster. In the USVI, a commercial fishing permit is required for all commercial fishers, if fishing with pots, traps, set-nets, or haul seines, even for personal consumption, for commercial fisherman, and if trading or selling any of the catch. Thus, USVI charter operators who sell their catch must have a commercial fishing permit. In the USVI, a moratorium on new commercial fishing licenses has been in place since 2001.

Since 2010, all anglers fishing recreationally in the U.S. Caribbean EEZ are required to register through the national registry (https://www.countmyfish.noaa.gov/howtoregister/index.htm) if fishing for species other than highly migratory species (HMS) since there are already permits in place for HMS anglers. The National Angler Registry, which began in 2010 as part of the MRIP program, has in its database for fishing year 2010, as of March 23, 2011, 1,389 anglers registered as fishing in the EEZ (1,352 in Puerto Rico and 37 in the USVI) (F. Darby,

NMFS/OFS, pers. Comm..) (Table 3.2.6). Fishing licenses are a legal mandate for recreational harvesters in Puerto Rico. In addition to the license, Puerto Rico recreational fishers must have a permit for the harvest of conch species and spiny lobster. In the USVI, there are no licenses or permits required for recreationally fishing in territorial waters. However, recreational fishers are required to have permits to fish in three special locations. Pots, traps, set-nets and haul seines cannot be used by recreational fishers. The USVI is currently developing regulations for recreational fishing activity.

Table 3.2.6. Recreational fishing effort estimates for the U.S. Caribbean during 2008-2010

		Puerto Rico	USVI		
Recreational*	1/1 – 12/30/2010 National Registry**	1,352	37		
HMS Permits	May 2008***		STX	STT	STJ
	Angling Permit	805	26	28	2
	Charter	21	4	10	7
	General Permit	99	13	6	1
MRFSS	Recreational Participants[$]	149,544			
Vessels	Registered Recreational[#]	60,640			

*Forbes Darby (pers. comm. March 24, 2011 from Scott Sauri)
**Only registered if fishing in the EEZ
***Amendment 4 to the Consolidated Atlantic HMS FMP
[$] http://www.st.nmfs.noaa.gov/st1/recreational/queries/effort/effort_time_series.html
[#]A. Cruz, PRDNER

3.2.2.4 Recreational Vessels and Permits

There are 60,640 recreational vessels registered with the United States Coast Guard in Puerto Rico (Table 3.2.6). A downward trend was detected in the number of private power boats registered in 2003. In 2009, all types of recreational vessels showed a decrease in numbers.

Recreational vessels, except for those targeting HMS, are not required to have any additional permits for fishing in the U.S. Caribbean. The HMS open access permits are issued to the vessel while the recreational angler National Registry registers fishers. The HMS permit applies to both state and federal waters while the registry applies only to fishers fishing in the EEZ. Table 3.2.6 compares the number and types of permits/registry for the recreational sector in the U.S. Caribbean.

4.0 ACTIONS AND ALTERNATIVES

4.1 ACTION 1: Management Reference Points for species not undergoing overfishing within the Reef Fish FMP.

4.1.1 Action 1(a). Establish a year sequence for determining average annual landings for each species or species group within the Reef Fish Fishery Management Plan (FMP).

Alternative 1. No action. Retain the year sequence as defined in the 2005 Comprehensive Sustainable Fisheries Act Amendment (Caribbean SFA Amendment).

Alternative 2. Redefine management reference points or proxies for the Reef Fish FMP based on the longest year sequence of reliable landings data.

Table 4.1.1. Year sequences by island group under Alternative 2.

REFERENCE POINT	Year Sequence
Puerto Rico Commercial	1988-2009
Puerto Rico Recreational	2000-2009
St. Croix	1999-2008
St. Thomas/St. John	2000-2008

Alternative 3. Redefine management reference points or proxies for the Reef Fish FMP based on the longest year sequence of pre-Caribbean SFA Amendment landings data that is considered consistently reliable across all islands.

Table 4.1.2. Year sequences by island group under Alternative 3.

REFERENCE POINT	Year Sequence
Puerto Rico Commercial	1999-2005
Puerto Rico Recreational	2000-2005
St. Croix	1999-2005
St. Thomas/St. John	2000-2005

Alternative 4. Redefine management reference points or proxies for the Reef Fish FMP based on the longest year sequence of recent reliable landings data.

Table 4.1.3. Year sequences by island group under Alternative 4.

REFERENCE POINT	Year Sequence
Puerto Rico Commercial	1999-2009
Puerto Rico Recreational	2000-2009
St. Croix	1999-2008
St. Thomas/St. John	2000-2008

Alternative 5. Redefine management reference points or proxies for the Reef Fish FMP based on the most recent five years of available landings data.

Table 4.1.4. Year sequences by island group under Alternative 5.

REFERENCE POINT	Year Sequence
Puerto Rico Commercial	2005-2009
Puerto Rico Recreational	2005-2009
St. Croix	2004-2008
St. Thomas/St. John	2004-2008

Discussion

Action 1(a) transitions management of the reef fish species not considered to be undergoing overfishing in the U.S. Caribbean from that established by the Caribbean SFA Amendment to that mandated by the MSRA. The former provided a valuable and comprehensive format for fisheries management in the U.S. Caribbean, but was dependent upon data sources of variable accuracy and precision. Moreover, the Caribbean SFA Amendment is not fully compliant with the mandates of the MSRA. The management reference points established in the Caribbean SFA Amendment are considered in **Alternative 1**. Unfortunately, the U.S. Caribbean is considered data poor with regard to fisheries landings information, severely compromising the Caribbean Fishery Management Council's (Council) ability to establish quantitative benchmarks for those reference points. Thus, **Alternatives 2-5** propose to use average landings during various year sequences to establish proxies for maximum sustainable yield (MSY) and, from those MSY proxies, estimates of MSY proxies, overfishing limit (OFL), acceptable biological catch (ABC), optimum yield (OY) and annual catch limits (ACL). The optional sequences described below were chosen to respond to data availability, consistency with year sequences chosen by the Council for the preparation of the 2010 Caribbean ACL Amendment public hearing draft (PHD), and various motions or guidance provided by the Council or its committees for the development of this draft environmental impact statement (DEIS).

Under **Alternative 2**, the Council would select the longest time series of landings data that is available for each island group. The year 1988 is selected as the start year for commercial harvest in Puerto Rico because that was the first year for which a clearly defined method for calculating expansion factors to account for under-reporting, mis-reporting, and non-reporting became available for application to commercial harvest data. Recreational data was collected in Puerto Rico starting in 2000 through the MRFSS program. For St. Croix, species-group level commercial harvest data recorded at the level of the species group (e.g., angelfish, grunts) first became available for a full calendar year in 1998. For the 2010 ACL Amendment, the annual catch limit group (ACLG) recommended 1999 as the most representative start date for analysis of "recent" landings, and the Council and the government of the U.S. Virgin Islands (USVI) requested that average landings estimates be based upon recent landings. Not until 2000 did species-group level commercial harvest data become available for the St. Thomas/St. John island group; the first year for which species-group level commercial harvest data are available for all the three island groups.

Alternative 3 includes the longest pre-Caribbean SFA Amendment data series for the commercial and recreational sectors. In 2005, implementation of the Caribbean SFA Amendment included a suite of management measures designed to curb or end overfishing, including seasonal and area closures. As a result, the management regime changed drastically in 2005. This alternative does not include post-2005 years that could be influenced by those potentially substantial changes in management and resultant reduction in landings. Moreover, Caribbean coral reefs and their associated community experienced a major bleaching event and an above-normal number of hurricanes and storms in 2005 (Wilkinson and Souter 2008), further complicating the interpretation of post-2005 harvest data.

The MSY proxy specified by **Alternative 3** would equate to average landings, calculated using commercial landings data from 1999-2005 for Puerto Rico and St. Croix and from 2000-2005 for St. Thomas/St. John, and recreational landings data from 2000-2005 for Puerto Rico only. The Council, in preparing the 2010 ACL Amendment PHD chose to omit several years of landings data collected in Puerto Rico prior to 1999 in favor of selecting a more consistent baseline across all islands, noting the inclusion of those earlier landings data would not appreciably alter the various reference point estimates.

Alternative 4 would provide year sequences to determine the aggregate management reference points or proxies based on what the Council considers the longest time series of landings data that is consistently reliable across all islands. The MSY proxy defined by **Alternative 4** would equate to average landings, calculated using commercial landings data from 1999-2009 for Puerto Rico and St. Croix and from 2000-2008 for St. Thomas/St. John, and recreational landings data from 2000-2008 for Puerto Rico only. With the exception of some recreational data obtained during 2000 in the USVI, recreational harvest data are available only for Puerto Rico and only for the period beginning in 2000 through 2009.

During deliberations for the 2010 Caribbean ACL Amendment PHD, local governments requested that an option be included that considered only the most recent five years of available commercial landings data at that time (2003-2007) when calculating average landings. **Alternative 5** provides this option requested by the local governments for each island group with the most recent 5 years. The most recent five-year period for Puerto Rico is 2005-2009 for which commercial and recreational data are available. The most recent five-year period for St. Croix, St Thomas and St John is 2004-2008 for which commercial data are available.

4.1.2 Action 1(b). Establish MSY proxy for the reef fish species not undergoing overfishing.

Sub-Action 1. Establish MSY proxy for the reef fish species not undergoing overfishing in Puerto Rico.

Alternative 1: No action. Retain current management reference points or proxies for species/species groups.
Alternative 2(a) through 2(m): Redefine management reference points or proxies based on the year sequence of landings data as defined in Action 1(a) **Alternatives 1-5**.

Sub-Action 2. Establish MSY proxy for the reef fish species not undergoing overfishing in St Croix.

Alternative 1: No action. Retain current management reference points or proxies for species/species groups.
Alternative 2(a) through 2(m): Redefine management reference points or proxies based on the year sequence of landings data as defined in Action 1(a) **Alternatives 1-5**.

Sub-Action 3. Establish MSY proxy for the reef fish species not undergoing overfishing in St. Thomas/St. John.

Alternative 1: No action. Retain current management reference points or proxies for species/species groups.
Alternative 2(a) through 2(m): Redefine management reference points or proxies based on the year sequence of landings data as defined in Action 1(a) **Alternatives 1-5**.

Discussion
The Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires that FMPs specify a number of reference points for managed fish stocks, including:

- Maximum Sustainable Yield (MSY) – The greatest amount or yield that can be sustainably harvested under prevailing environmental conditions.
- Overfishing Threshold – The maximum rate of fishing a stock can withstand (MFMT) or maximum yield a stock can produce (OFL) annually, while still providing MSY on a continuing basis.
- Overfished Threshold (MSST) – The biomass level below which a stock would not be capable of producing MSY.
- Acceptable Biological Catch (ABC) - A term used by a management agency, which refers to the range of acceptable catch for a species or species group.
- Annual Catch Limit (ACL) – The level of annual catch of a stock or stock complex that serves as the basis for invoking accountability measures.

- Optimum Yield (OY) – The amount or yield that provides the greatest overall benefit to the Nation, taking into account food production, recreational opportunities and the protection of marine ecosystems.

Together, these parameters are intended to provide the means to measure the status and performance of fisheries relative to established goals. Available data in the U.S. Caribbean are not sufficient to support direct estimation of MSY and other key parameters. In such cases, the National Standard 1 (NS1) guidelines direct regional fishery management councils to adopt other measures of productive capacity, including long-term average catch, which can serve as reasonable proxies.

This section describes current reference points or proxies for species/species groups comprising the reef fish complex, as well as alternative MSY proxies, MSST, OFL, ABC, ACL and OY definitions, considered by the Council to better comply with the mandates of the MSA. None of the parameter estimates considered here represents empirical estimates derived from a comprehensive stock assessment; rather, all are calculated based on landings data averaged over alternative time series. The MSST of these species/species groups is currently defined based on the default proxy recommended by Restrepo et al. (1998) and is not being revisited here.

All the reference points considered here are closely interrelated, and the MSA places several key constraints on what can be considered in a reasonable suite of alternatives. Optimum yield must be less than or equal to MSY. Annual catch limits must be less than or equal to the ABC level recommended by a Council's SSC or other established peer-review process and the ABC recommendation must be less than or equal to the overfishing threshold (Figure 3.1).

Under each of the three sub-actions under Action 1(b), **Alternative 1** would retain the present MSY proxy, OY, and overfishing threshold definitions specified in the Caribbean SFA Amendment for species/species groups. These definitions are detailed in Table 4.1.4.

The current MSY proxy is based on average catch (C) derived from average landings data and on estimates of where stock biomass and fishing mortality rates are in relation to MSY levels during the period over which landings are averaged (Table 4.1.4). Maximum fishing mortality threshold (MFMT) is defined as a rate of fishing, which exceeds that which would produce MSY. OY is defined as the amount of fish produced by fishing at a rate equal to 75% that would produce MSY. The numerical values associated with these parameters are provided in Appendix 9.

Table 4.1.4. Current MSY proxy, OY and overfishing threshold definitions for species/species groups.

REFERENCE POINT	Alternative 1- STATUS QUO DEFINITION
Maximum Sustainable Yield	MSY proxy = C / [(F_{CURR}/F_{MSY}) x (B_{CURR}/B_{MSY})]; where C is calculated based on commercial landings for the years 1997-2001 for Puerto Rico and 1994-2002 for the USVI, and on recreational landings for the years 2000-2001.
Overfishing Threshold	MFMT = F_{MSY}
Optimum Yield	OY = average yield associated with fishing on a continuing basis at F_{OY}; where $F_{OY} = 0.75F_{MSY}$

The Caribbean SFA Amendment in which these reference points were established pre-dated the MSRA provisions requiring FMPs to specify ACLs; consequently, the Caribbean SFA Amendment did not explicitly specify this parameter for managed species/species groups. However, the ABC estimates derived from the Council's MSY control rule could be considered to represent the ACLs if no additional actions were taken to revise management reference points in this amendment.

The average catch estimate used to calculate the Caribbean-wide MSY proxy for each species/species group was derived from commercial landings data recorded during 1997-2001 and recreational landings data recorded during 2000-2001 for Puerto Rico. In the USVI, commercial landings data between years 1994-2002 were used to determine MSY proxies. These time series were considered to represent the longest periods of consistently reliable data at the time the Caribbean SFA Amendment was approved. Commercial catch data were derived from trip ticket reports collected by the state governments. Recreational data for the USVI were derived by assuming the same commercial-recreational relationship and species composition reported by MRFSS for Puerto Rico. Those data indicated recreational catches averaged about 44% of commercial catch levels during 2000-2001.

Because data are insufficient to estimate biomass and fishing mortality rates in the U.S. Caribbean, the remaining information needed to calculate MSY proxies was derived from the informed judgment of the SFA Working Group regarding whether each species/species group was at risk of overfishing and/or overfished during the period when catches were averaged.[1] This approach followed guidance provided by Restrepo et al. (1998), which notes that "in cases of severe data limitations, qualitative approaches [to determining stock status and fishery status] may be necessary, including [the use of] expert opinion and consensus-building methods." The

[1] The SFA Working Group was a Council-advisory group, which included staff from the Council, NMFS' Southeast Regional Office and SEFSC, USVI and Puerto Rico fishery management agencies, and several environmental non-governmental organizations. The discussion of biomass and fishing mortality rate estimates took place at the October 23-24, 2002 meeting of the SFA Working Group in Carolina, Puerto Rico. Notice of the meeting location, date, and agenda was provided in the *Federal Register* (67 FR 63622).

determinations of the SFA Working Group were based on available scientific and anecdotal information (including anecdotal observations of fishers reported by fishery managers), life history information, and the status of individual species as evaluated in other regions. ABC estimates were developed using the natural mortality rate of each species/species group as a proxy for fishing mortality rate yielding MSY (F_{MSY}). The actual yield associated with the current OY definition was estimated to equal 93% to 100% of MSY.

Alternative 2 for each of the sub-actions under Action 1(b) would define aggregate management reference points or proxies based on what the Council considers the longest time series of landings data that is consistently reliable within the year sequence alternatives presented for each island group in Action 1(a). Specific definitions are detailed in Table 4.1.5.

The MSY proxy specified by **Alternative 2(a)** would equate to mean landings, calculated using commercial landings data and recreational landings data defined in Action 1(a). Under **Alternative 2(b),** the MSY proxy would equal the mean landings plus a standard deviation to account for stock variability. This approach could be considered for species with no assessments available, but landings data exist. The probability of exceeding the overfishing limit in a given year can be approximated from the variance about the mean of recent landings to produce a buffer between the MSY, OFL and acceptable biological catch. Based on expert evaluation of the best scientific information available, recent historical landings are without trend, landings are small relative to stock biomass, or the stock is unlikely to undergo overfishing if future landings are equal to or moderately higher than the mean of recent landings.

Commercial data would be derived from trip ticket reports collected by the state governments. Recreational data for Puerto Rico would be derived from the MRFSS program. The OFL is then defined as the amount of landings corresponding to the MSY proxy, and overfishing would be determined to occur if annual landings exceeded the overfishing threshold (**Alternative 2(c)**) or if annual landings exceeded the overfishing threshold, unless scientists (in consultation with managers) attribute the overage to increased landings versus improved data collection and monitoring (**Alternative 2(d)**).

Section 600.310(f)(4) of the NS 1 guidelines requires that each Council establish an ABC control rule that should be based, when possible, on the probability that an actual landings equal to the stock's ABC would result in overfishing. The ABC would be the mean annual landings for the year sequence selected in Action 1(a) plus a standard deviation (**Alternative 2(e) - 2(g)**) to account for the appropriate level of risk to set between the OFL and ABC. By setting the OFL two standard deviation higher than the mean annual landings, the council could set ABC equal to OFL or choose to set the ABC lower than the OFL, by making the ABC only one standard deviation above the mean annual landings or equal to the mean annual landings, while still allowing for historic (or slightly higher) levels of harvest. The greater the buffer between the OFL and ABC, the less risk there will be in exceeding the OFL in any given year. In all cases, the annual estimate of MSY is the OFL. With less information, there is greater scientific uncertainty, and therefore, the buffer between the OFL and ABC will be greater.

Table 4.1.5. Management reference points or proxies proposed for the reef fish species not undergoing overfishing under Alternative 2.

REFERENCE POINT	Alternative 2
Maximum Sustainable Yield	
Alternative 2(a)	MSY proxy = mean annual landings selected by Council in Action 2(a).
Alternative 2(b)	MSY proxy = mean annual landings selected by Council in Action 2(a) plus 2 standard deviations.
Overfishing Threshold	
Alternative 2(c)	OFL = MSY proxy; overfishing occurs when annual landings exceed the OFL.
Alternative 2(d)	OFL = MSY proxy; overfishing occurs when annual landings exceed the OFL, unless NOAA Fisheries' Southeast Fisheries Science Center (in consultation with the Caribbean Fishery Management Council and its SSC) determines the overage occurred because data collection/monitoring improved, rather than because landings actually increased.
Acceptable Biological Catch/ABC Control Rule	
Alternative 2(e)	ABC = mean of the landings plus 2.0 * standard deviations; this Alternative is only available if alternative 2(b) above is chosen.
Alternative 2(f)	ABC = mean of the landings plus 1.0 * standard deviations; this Alternative is only available if alternative 2(b) above is chosen.
Alternative 2(g)	ABC = mean of the landings
***Alternative 2(h)**	ABC=Recommendation by the Scientific and Statistical Committee
Optimum Yield/Annual Catch Limit	
Alternative 2(i)	OY = ACL = ABC
Alternative 2(j)	OY = ACL = [ABC x (0.85)]
Alternative 2(k)	OY = ACL = [ABC x (0.75)]
Alternative 2(l)	OY = ACL = [ABC x (0.50)]
Alternative 2(m)	OY = ACL = 0

*SSC recommendation for Puerto Rico commercial and recreational is to use median of annual landings between years 1988-2009 for all but surgeonfish, tilefish, angelfish which the maximum recreational landings during any year is the OFL Recreational.
*SSC recemendation for USVI is the mean of annual landings for the longest time series 1999-2008 for St. Croix and 2000-2008 for St. Thomas and St. John.

The species considered under this proposed amendment have not been assessed, but are stable over time, or in the judgment of the SSC, the stock or stock complex is unlikely to undergo overfishing at current average levels or at levels moderately higher than current average levels. Under this determination, the mean landings are recommended as the MSY, and the OFL and ABC are set above the current average. Setting the buffer at some multiple of standard deviations allows the buffer size to vary with the amount of variability of the stock since standard deviation is a measure of variability. Stocks with high variability will have a higher buffer while those with less variability will have a lower buffer. Of the ABC alternatives, setting the ABC at 2.0 standard deviations above the mean annual landings (**Alternative 2(e))** would result in the greatest risk of exceeding the OFL. The risk of exceeding the OFL is reduced if an ABC of 1.0 standard deviations above the mean annual landings (**Alternative 2(d)**) or an ABC equal to the mean annual landings (**Alternative 2(g)**) is chosen. These probabilities assume that the ACL is set equal to the ABC. In reality, the ACL is likely to be set at a lower value that accounts for management uncertainty, which will reduce the probability of overfishing even further.

The OY and ACL would be equal values, and the same socioeconomic and ecological tradeoffs would be considered in the determination of where to set both of these parameters. Most of the alternative ACL definitions considered in this action are more restrictive than the current OY definition and would prevent the fishery from achieving OY as currently defined.

ACL (= OY) **Alternatives 2(i) - 2(l)** would set those parameters equal to some proportion (100-50%) of the ABC to take into account uncertainty, ecological factors, and other concerns. **Alternative 2(m)** would set the ACL (= OY) equal to zero which could be appropriate for surgeonfish and other species which harvest is prohibited under the FMP. The numerical values of each of these alternatives for the different time sequences in Action 1(a) can be found in Appendix 9.

4.1.3 Summary Comparison of Management Reference Points Alternatives

Maximum Sustainable Yield (MSY)

The MSY proxy defined by no action **Alternative 1** of Action 1(b) averages catches over the longest period during which data were considered relatively stable at the time the Council approved the Caribbean SFA Amendment. Because the Council had fewer years of catch data, based on reported landings, to work with at that time, that proxy incorporated Puerto Rico and USVI catch data prior to 1999. The MSY proxies evaluated in **Alternative 2** did not include pre-1999 data collected by gear type rather than by family group. Data from more recent years are collected by family group and therefore, provide a relatively consistent baseline among all of the islands.

Additionally, in contrast to **Alternative 1**, **Alternative 2** does not attempt to incorporate information on recreational landings in the USVI because the MRFSS does not provide this information and no alternative data are available to reliably estimate these landings. As a result, the MSY specified by these alternative proxies are expected to be underestimated to some unknown degree. In general, underestimating MSY can result in foregone yield, whereas overestimating MSY can lead to overfishing.

Overfishing Threshold (MFMT/OFL)

The overfishing threshold defined by **Alternative 1** is a MFMT equal to the F_{MSY}. Because this fishing mortality rate is unknown for U.S. Caribbean species, the Caribbean SFA Amendment adopted natural mortality rate as a proxy for this parameter. However, data are insufficient to evaluate the sustainability of current fishing mortality rates relative to this proxy and make a determination as to whether overfishing is or is not occurring. To remedy this, **Alternative 2** proposes to specify a landings-based, rather than fishing mortality-based, overfishing threshold, called the OFL. Annual landings would be evaluated relative to the OFL to determine whether overfishing is or is not occurring. This approach is consistent with the NS1 guidelines, which provide fishery managers the flexibility to determine if overfishing occurs, based on either fishing mortality rates or on actual annual landings.

Alternative 2 would essentially maintain the same relationship as the no action alternative between the overfishing threshold and MSY. MSY represents the maximum yield a species complex can provide in the long term, while OFL estimates the amount of annual landings above which overfishing is occurring. In theory, the annual OFL would vary above and below the MSY level depending on fluctuations in stock size. Since both MSY and OFL are related to the highest fishing mortality rate that will not result in overfishing, the long-term average of OFLs would be expected to equate to MSY, if stock abundance is high enough to support MSY. However, in practice, the annual OFL proposed in **Alternative 2** would remain constant at the MSY level until stock biomass can be estimated.

Alternative 2(c) would result in an automatic overfishing determination if annual catch exceeded the OFL in any given year. **Alternative 2(d)** would provide scientists (in consultation

with managers) the flexibility to evaluate the cause of the reported landings increase prior to making a determination that a species complex is undergoing overfishing. Specifically, they would consider whether the reported increase represents an actual increase in landings or just improved data collection and monitoring. The intent of this sub-option to encourage the fishers to fully report landings an improve data collection to avoid ACLs overage or triggering associated accountability measures (AMs).

Acceptable Biological Catch (ABC)

Set ABC using a buffer from the OFL that represents an acceptable level of risk due to scientific uncertainty. The ABC rule offers three tiers of guidance for setting the ABC based on the amount of information for a given stock (**Alternatives 2(e)-2(g)**). With less information, there is greater scientific uncertainty, and therefore, the buffer between the OFL and ABC will be greater. The buffer will be predetermined for each stock or stock complex by the Council with advice from the SSC.

Optimum Yield (OY) and Annual Catch Limits (ACLs)

The current OY defined by no action **Alternative 1** is derived from the technical guidance provided by Restrepo et al. (1998), which recommends the target fishing mortality rate be set equal to the average yield available on a continuing basis from fishing at 75% of the fishing mortality rate that would produce F_{MSY}. The authors of that guidance indicate that fishing at this level adds precaution and maintains stocks at higher biomass levels, while sacrificing only a small amount (~ 6.25%) of catch. Because data are insufficient to estimate the fishing mortality rate that would produce MSY, the Caribbean SFA Amendment estimated the OY of each species/species group to equal 93.78% of MSY.

While the no action **Alternative 1** does not explicitly define ACLs for the target species, the ABC estimates specified by the Council's MSY control rule could be considered to represent the ACLs of these species/species groups if no additional action were taken through this amendment to revise management reference points. However, these ABC values are very uncertain, as they were calculated using natural mortality rate as a proxy for the fishing mortality rate that would produce F_{MSY} and informed judgment regarding stock biomass. And, because these values were set well below MSY values to address SFA Working Group determinations regarding overfishing, they would prevent the fishery from achieving OY; even though recent landings data indicate that, in most cases, management controls appear to have effectively reduced catch rates below the overfishing threshold.

To remedy this, **Alternative 2(i)** would set the OY, ACL and ABC as equal values. **Alternatives 2(j) - 2(m)** would allow the Council to reduce the ACLs below the ABC by considering the socioeconomic and ecological components of OY when determining how far ACLs should be reduced below the overfishing threshold to account for scientific uncertainty in estimating the ABC and management uncertainty in effectively constraining harvest over time. This approach leads to OY estimates for the target species that are below those estimated in the Caribbean SFA Amendment, regardless of the OY (= ACL) alternative selected.

4.2 ACTION 2: Management Reference Points for the Caribbean Spiny Lobster

4.2.1 Action 2(a). Establish a year sequence for determining average annual landings for the Caribbean Spiny Lobster.

Alternative 1. No action. Retain the year sequence for Caribbean Spiny Lobster FMP landings as defined in the Caribbean SFA Amendment.

Alternative 2. Redefine management reference points or proxies for the Caribbean Spiny Lobster FMP based on the longest year sequence of reliable landings data.

Table 4.2.1. Year sequences by island group under Alternative 2.

REFERENCE POINT	Year Sequence
Puerto Rico	1988-2009
St. Croix	1999-2008
St. Thomas/St. John	2000-2008

Alternative 3. Redefine management reference points or proxies for the Caribbean Spiny Lobster FMP based on the longest year sequence of pre-Caribbean SFA Amendment landings data that is considered consistently reliable across all islands.

Table 4.2.2. Year sequences by island group under Alternative 3.

REFERENCE POINT	Year Sequence
Puerto Rico	1999-2005
St. Croix	1999-2005
St. Thomas/St. John	2000-2005

Alternative 4. Redefine management reference points or proxies for the Caribbean Spiny Lobster FMP based on the longest year sequence of recent reliable landings data.

Table 4.2.3. Year sequences by island group under Alternative 4.

REFERENCE POINT	Year Sequence
Puerto Rico	1999-2009
St. Croix	1999-2008
St. Thomas/St. John	2000-2008

Alternative 5. Redefine management reference points or proxies for the Caribbean Spiny Lobster FMP based on the most recent five years of available landings data.

Table 4.2.4. Year sequences by island group under Alternative 5.

REFERENCE POINT	Year Sequence
Puerto Rico	2005-2009
St. Croix	2004-2008
St. Thomas/St. John	2004-2008

Discussion

Action 2(a) transitions management of the spiny lobster in the U.S. Caribbean from that established by the Caribbean SFA Amendment to that mandated by the MSA. The former provided a valuable and comprehensive format for fisheries management in the U.S. Caribbean, but was dependent upon data sources of variable accuracy and precision. Moreover, the Caribbean SFA Amendment is not fully compliant with the mandates of the MSA. The management reference points established in the Caribbean SFA Amendment are considered in **Alternative 1**. Unfortunately, the U.S. Caribbean is considered data poor with regard to fisheries landings information, severely compromising the Council's ability to establish quantitative benchmarks for those reference points. Thus, **Alternatives 2-5** proposed to use average landings during various year sequences to establish proxies for MSY and, from those MSY proxies, estimates of MSY proxies, OFL, ABC, OY and ACL. The optional sequences described below were chosen to respond to data availability, consistency with year sequences chosen by the Council for the preparation of the 2010 Caribbean ACL Amendment PHD, and various motions or guidance provided by the Council or its committees for the development of this DEIS. Commercial data would be derived from trip ticket reports collected by the state governments. Spiny lobster recreational data are not collected for Puerto Rico or USVI. Hence, MSY proxies will be determined using commercial harvest data.

Under **Alternative 2**, the Council would select the longest time series of landings data that is available for each island group. The year 1988 is selected as the start year for commercial harvest in Puerto Rico because that was the first year for which a clearly defined method for calculating expansion factors to account for under-reporting, mis-reporting, and non-reporting became available for application to commercial harvest data. For St. Croix, species-group level commercial harvest data recorded at the level of the species group first became available for a full calendar year in 1998. For the 2010 ACL Amendment, the annual catch limit group (ACLG) recommended 1999 as the most representative start date for analysis of "recent" landings, and the Council and the government of the USVI requested that average landings estimates based upon recent landings. Not until 2000 did species-group level commercial harvest data become available for the St. Thomas/St. John island group, so this is the first year for which species-group level commercial harvest data are available for all the three island groups.

Alternative 3 includes the longest pre-Caribbean SFA Amendment data series for the commercial and recreational sectors. In 2005, implementation of the Caribbean SFA Amendment included a suite of management measures designed to curb or end overfishing, including seasonal and area closures. As a result, the management regime changed drastically in 2005. This alternative does not include post-2005 years that were influenced by those potentially substantial changes in management and resultant reduction in landings. Moreover, Caribbean coral reefs and their associated community experienced a major bleaching event and an above-normal number of hurricanes and storms in 2005 (Wilkinson and Souter 2008), further complicating the interpretation of post-2005 harvest data.

The MSY proxy specified by **Alternative 3** would equate to average landings, calculated using commercial landings data from 1999-2005 for Puerto Rico and St. Croix and from 2000-2005 for

St. Thomas/St. John. The Council, in preparing the 2010 ACL Amendment PHD, chose to omit several years of landings data collected in Puerto Rico prior to 1999 in favor of selecting a more consistent baseline across all islands, noting the inclusion of those earlier landings data would not appreciably alter the various reference point estimates.

Alternative 4 would provide year sequences to determine the aggregate management reference points or proxies based on what the Council considers the longest time series of landings data that is consistently reliable across all islands. The MSY proxy defined by **Alternative 4** would equate to average landings, calculated using commercial landings data from 1999-2009 for Puerto Rico and St. Croix and from 2000-2008 for St. Thomas/St. John.

During deliberations for the 2010 Caribbean ACL Amendment PHD, local governments requested that an option be included that considered only the most recent five years of available commercial harvest data available at that time (2003-2007) when calculating average landings. **Alternative 5** provides this option requested by the local governments for each island group with the most recent 5 years. The most recent five-year period for Puerto Rico is 2005-2009 for which commercial data are available. The most recent five-year period for St. Croix, St Thomas and St John is 2004-2008 for which commercial data are available.

4.2.2 Action 2(b). Establish MSY proxy for the Caribbean Spiny Lobster.

Sub-Action 1. Establish MSY proxy for the Caribbean Spiny Lobster in Puerto Rico.

Alternative 1: No action. Retain current management reference points or proxies for spiny losbter.

Alternative 2(a) through 2(l): Redefine management reference points or proxies based on the year sequence of landings data as defined in Action 2(a) **Alternatives 1-5**.

Sub-Action 2. Establish MSY proxy for the Caribbean Spiny Lobster in St Croix.

Alternative 1: No action. Retain current management reference points or proxies for spiny losbter.

Alternative 2(a) through 2(l): Redefine management reference points or proxies based on the year sequence of landings data as defined in Action 2(a) **Alternatives 1-5**.

Sub-Action 3. Establish MSY proxy for the Caribbean Spiny Lobster in St. Thomas / St. John.

Alternative 1: No action. Retain current management reference points or proxies for spiny losbter groups.

Alternative 2(a) through 2(l): Redefine management reference points or proxies based on the year sequence of landings data as defined in Action 2(a) **Alternatives 1-5**.

Discussion

The MSA requires that FMPs specify a number of reference points for managed fish stocks, including:

- Maximum Sustainable Yield (MSY) – The greatest amount or yield that can be sustainably harvested under prevailing environmental conditions.
- Overfishing Threshold – The maximum rate of fishing a stock can withstand (MFMT) or maximum yield a stock can produce (OFL) annually, while still providing MSY on a continuing basis.
- Overfished Threshold (MSST) – The biomass level below which a stock would not be capable of producing MSY.
- Acceptable Biological Catch (ABC) - A term used by a management agency, which refers to the range of acceptable catch for a species or species group.
- Annual Catch Limit (ACL) – The annual level to which catch is limited in order to prevent overfishing from occurring.

- Optimum Yield (OY) – The amount or yield that provides the greatest overall benefit to the Nation, taking into account food production, recreational opportunities and the protection of marine ecosystems.

Together, these parameters are intended to provide the means to measure the status and performance of fisheries relative to established goals. Available data in the U.S. Caribbean are not sufficient to support direct estimation of MSY and other key parameters. In such cases, the NS1 guidelines direct regional fishery management councils to adopt other measures of productive capacity, including long-term average catch, which can serve as reasonable proxies.

This section describes current reference points or proxies for the spiny lobster as well as alternative MSY proxies, MSST, OFL, ABC , ACL and OY definitions, considered by the Council to better comply with new mandates of the MSA. None of the parameter estimates considered here represents empirical estimates derived from a comprehensive stock assessment; rather, all are calculated based on landings data averaged over alternative time series. The MSST of these species/species groups is currently defined based on the default proxy recommended by Restrepo et al. (1998) and is not being revisited here. That default proxy effectively defines a more conservative threshold for less productive species, such as spiny lobster, which are not capable of recovering to B_{MSY} as quickly as other more productive species.

All the reference points considered here are closely interrelated, and the MSA places several key constraints on what can be considered in a reasonable suite of alternatives. Optimum yield must be less than or equal to MSY. Annual catch limits must be less than or equal to the ABC level recommended by a Council's SSC or other established peer-review process and the ABC recommendation must be less than or equal to the overfishing threshold (Figure 3.1).

Under each of the three sub-actions under Action 2(a), **Alternative 1** would retain the present MSY proxy, OY, and overfishing threshold definitions specified in the Caribbean SFA Amendment for spiny lobster. These definitions are detailed in Table 4.2.4.

The current MSY proxy is based on average catch (C) derived from landings data and on estimates of where stock biomass and fishing mortality rates are in relation to MSY levels during the period over which landings are averaged (Table 4.2.4). MFMT is defined as a rate of fishing, which exceeds that which would produce MSY. OY is defined as the amount of fish produced by fishing at a rate equal to 75% that would produce MSY. The numerical values associated with these parameters are provided in Appendix 9.

Table 4.2.4. Current MSY proxy, OY and overfishing threshold definitions for spiny lobster.

REFERENCE POINT	Alternative 1- STATUS QUO DEFINITION
Maximum Sustainable Yield	MSY proxy = C / [(F_{CURR}/F_{MSY}) x (B_{CURR}/B_{MSY})]; where C is calculated based on commercial landings for the years 1997-2001 for Puerto Rico and 1994-2002 for the USVI, and on recreational landings for the years 2000-2001.
Overfishing Threshold	MFMT = F_{MSY}
Optimum Yield	OY = average yield associated with fishing on a continuing basis at F_{OY}; where $F_{OY} = 0.75F_{MSY}$

The Caribbean SFA Amendment in which these reference points were established pre-dated the MSRA provisions requiring FMPs to specify ACLs; consequently, the Caribbean SFA Amendment did not explicitly specify this parameter for spiny lobster. However, the ABC estimates derived from the Council's MSY control rule could be considered to represent the ACLs if no additional actions were taken to revise management reference points in this amendment.

The average catch estimate used to calculate the Caribbean-wide MSY proxy for spiny lobster was derived from commercial landings data recorded during 1997-2001 for Puerto Rico. In the USVI, commercial landings data between years 1994-2002 were used to determine MSY proxies. These time series were considered to represent the longest periods of consistently reliable data at the time the Caribbean SFA Amendment was approved. Commercial catch data were derived from trip ticket reports collected by the state governments

Because data are insufficient to estimate biomass and fishing mortality rates in the U.S. Caribbean, the remaining information needed to calculate MSY proxies was derived from the informed judgment of the SFA Working Group regarding whether the spiny lobster was at risk of overfishing and/or overfished during the period when catches were averaged. This approach followed guidance provided by Restrepo et al. (1998), which notes that "in cases of severe data limitations, qualitative approaches [to determining stock status and fishery status] may be necessary, including [the use of] expert opinion and consensus-building methods." The determinations of the SFA Working Group were based on available scientific and anecdotal information (including anecdotal observations of fishers as reported by fishery managers), life history information, and the status of individual species as evaluated in other regions. ABC estimates were developed using the natural mortality rate of each species/species group as a proxy for F_{MSY}. The actual yield associated with the current OY definition was estimated to equal 93.75% of MSY.

Alternative 2 for each of the three sub-actions under Action 2(b) would define aggregate management reference points or proxies based on what the Council considers the longest time series of landings data that is consistently reliable within the year sequence alternatives presented for each island group in Action 2(a). Specific definitions are detailed in Table 4.2.5.

Table 4.2.5. Management reference points or proxies proposed for spiny lobster under Alternative 2.

REFERENCE POINT	Alternative 2
Maximum Sustainable Yield	
Alternative 2(a)	MSY proxy = mean annual landings selected by Council in Action 2(a).
Alternative 2(b)	MSY proxy = mean annual landings selected by Council in Action 2(a) plus 2 standard deviations.
Overfishing Threshold	
Alternative 2(c)	OFL = MSY proxy; overfishing occurs when annual landings exceed the OFL.
Alternative 2(d)	OFL = MSY proxy; overfishing occurs when annual landings exceed the OFL, unless NOAA Fisheries' Southeast Fisheries Science Center (in consultation with the Caribbean Fishery Management Council and its SSC) determines the overage occurred because data collection/monitoring improved, rather than because landings actually increased.
Acceptable Biological Catch/ABC Control Rule	
Alternative 2(e)	ABC = mean of the landings plus 2.0 * standard deviations; this Alternative is only available if alternative 2(b) above is chosen.
Alternative 2(f)	ABC = mean of the landings plus 1.0 * standard deviations; this Alternative is only available if alternative 2(b) above is chosen.
Alternative 2(g)	ABC = mean of the landings
***Alternative 2(h)**	ABC=Recommendation by the Scientific and Statistical Committee
Optimum Yield/Annual Catch Limit	
Alternative 2(i)	OY = ACL = ABC
Alternative 2(j)	OY = ACL = [ABC x (0.85)]
Alternative 2(k)	OY = ACL = [ABC x (0.75)]
Alternative 2(l)	OY = ACL = [ABC x (0.50)]

*SSC recommendation for Puerto Rico commercial and recreational is to use median of annual landings between years 1988-2009 for all but surgeonfish, tilefish, angelfish which the maximum recreational landings during any year is the OFL Recreational.
*SSC recemendation for USVI is the mean of annual landings for the longest time series 1999-2008 for St. Croix and 2000-2008 for St. Thomas and St. John.

The MSY proxy specified by **Alternative 2(a)** would equate to spiny lobster mean landings, calculated using commercial landings data defined in Action 2(a). Under **Alternative 2(b)** the MSY proxy would equal the mean landings plus a standard deviation to account for stock variability. This approach could be considered for species with no assessments available, but landings data exist. The probability of exceeding the overfishing limit in a given year can be

approximated from the variance about the mean of recent landings to produce a buffer between the MSY, OFL and acceptable biological catch. Based on expert evaluation of the best scientific information available, recent historical landings are without trend, landings are small relative to stock biomass, or the stock is unlikely to undergo overfishing if future landings are equal to or moderately higher than the mean of recent landings.

Section 600.310(f)(4) of the NS1 guidelines requires that each Council establish an acceptable ABC rule that should be based, when possible, on the probability that an actual landings equal to the stock's ABC would result in overfishing. The ABC would be the mean annual landings for the year sequence selected in Action 2(a) plus a standard deviation (**Alternative 2(e) - 2(g)**) to account for the appropriate level of risk to set between the OFL and ABC. By setting the OFL two standard deviation higher than the mean annual landings, the council could set ABC equal to OFL or choose to set the ABC lower than the OFL, by making the ABC only one standard deviation above the mean annual landings or equal to the mean annual landings, while still allowing for historic (or slightly higher) levels of harvest. The greater the buffer between the OFL and ABC, the less risk there will be in exceeding the OFL in any given year. In all cases, the annual estimate of MSY is the OFL. With less information, there is greater scientific uncertainty, and therefore, the buffer between the OFL and ABC will be greater.

The species considered under this proposed amendment have not been assessed, but are stable over time, or in the judgment of the SSC the stock or stock complex is unlikely to undergo overfishing at current average levels or at levels moderately higher than current average levels. Under this determination, the mean landings are recommended as the MSY, and the OFL and ABC are set above the current average. Setting the buffer at some multiple of standard deviations allows the buffer size to vary with the amount of variability of the stock since standard deviation is a measure of variability. Stocks with high variability will have a higher buffer while those with less variability will have a lower buffer. Of the ABC alternatives, setting the ABC at 2.0 standard deviations above the mean annual landings (**Alternative 2(e))** would result in the greatest risk of exceeding the OFL. The risk of exceeding the OFL is reduced if an ABC of 1.0 standard deviations above the mean annual landings (**Alternative 2(d)**) or an ABC equal to the mean annual landings (**Alternative 2(g)**) is chosen.

These probabilities assume that the ACL is set equal to the ABC. In reality, the ACL is likely to be set at a lower value that accounts for management uncertainty, which will reduce the probability of overfishing even further.

The OY and ACL would be equal values, and the same socioeconomic and ecological tradeoffs would be considered in the determination of where to set both of these parameters. Most of the alternative ACL definitions considered in this action are more restrictive than the current OY definition and would prevent the fishery from achieving OY as currently defined.

ACL (= OY) **Alternatives 2(i) - 2(l)** would set those parameters equal to some proportion (100-50%) of the ABC to take into account uncertainty, ecological factors, and other concerns. The numerical values of each of these alternatives for the different time sequences in Action 2(a) can be found in Appendix 9.

4.2.3 Summary Comparison of Management Reference Points Alternatives

Maximum Sustainable Yield (MSY)

The MSY proxy defined by no action **Alternative 1** of Action 2(b) averages catches over the longest period during which data were considered relatively stable at the time the Council approved the Caribbean SFA Amendment. Because the Council had fewer years of catch data base on reported landings to work with at that time, that proxy incorporated Puerto Rico and USVI catch data prior to 1999. The MSY proxies evaluated in **Alternative 2** did not include pre-1999 data collected by gear type rather than by family group. Data from more recent years are collected by family group and therefore, provide a relatively consistent baseline among all of the islands.

Overfishing Threshold (MFMT/OFL)

The overfishing threshold defined by **Alternative 1** is a MFMT equal to the F_{MSY}. Because this fishing mortality rate is unknown for U.S. Caribbean species, the Caribbean SFA Amendment adopted natural mortality rate as a proxy for this parameter. However, data are insufficient to evaluate the sustainability of current fishing mortality rates relative to this proxy and make a determination as to whether overfishing is or is not occurring. To remedy this, **Alternative 2** proposes to specify a landings -based, rather than fishing mortality-based, overfishing threshold, called the OFL. Annual landings of spiny lobster would be evaluated relative to the OFL to determine whether overfishing is or is not occurring. This approach is consistent with the NS1 guidelines, which provide fishery managers the flexibility to determine if overfishing occurs, based on either fishing mortality rates or on actual annual landings.

Alternative 2 would essentially maintain the same relationship as the no action alternative between the overfishing threshold and MSY. MSY represents the maximum yield a species complex can provide in the long term, while OFL estimates the amount of annual landings above which overfishing is occurring. In theory, the annual OFL would vary above and below the MSY level depending on fluctuations in stock size. Since both MSY and OFL are related to the highest fishing mortality rate that will not result in overfishing, the long-term average of OFLs would be expected to equate to MSY, if stock abundance is high enough to support MSY. However, in practice, the annual OFL proposed in **Alternative 2** would remain constant at the MSY level until stock biomass can be estimated.

Alternative 2(c) would result in an automatic overfishing determination if annual landings exceeded the OFL in any given year. **Alternative 2(d)** would provide scientists (in consultation with managers) the flexibility to evaluate the cause of the reported landings increase prior to making a determination that a species complex is undergoing overfishing. Specifically, they would consider whether the reported increase represents an actual increase in landings or just improved data collection and monitoring. The intent of this sub-option is to encourage the fishers to fully report landings an improve data collection to avoid ACLs overage or triggering associated AMs.

Acceptable Biological Catch

Set ABC using a buffer from the OFL that represents an acceptable level of risk due to scientific uncertainty. The ABC rule offers three tiers of guidance for setting the ABC based on the amount of information for a given stock (**Alternative 2(e) - 2(g)**). With less information, there is greater scientific uncertainty, and therefore, the buffer between the OFL and ABC will be greater. The buffer will be predetermined for spiny lobster by the Council with advice from the SSC

Optimum Yield (OY) and Annual Catch Limits (ACLs)

The current OY defined by no action **Alternative 1** is derived from the technical guidance provided by Restrepo et al. (1998), which recommends the target fishing mortality rate be set equal to the average yield available on a continuing basis from fishing at 75% of the F_{MSY}. The authors of that guidance indicate that fishing at this level adds precaution and maintains stocks at higher biomass levels, while sacrificing only a small amount (~ 6.25%) of catch. Because data are insufficient to estimate the F_{MSY}, the Caribbean SFA Amendment estimated the OY of spiny lobster to equal 93.78% of MSY.

While the no action **Alternative 1** does not explicitly define ACLs for spiny lobster, the ABC estimates specified by the Council's MSY control rule could be considered to represent the ACLs of spiny lobster if no additional action were taken through this amendment to revise management reference points. However, these ABC values are very uncertain, as they were calculated using natural mortality rate as a proxy for the F_{MSY} and informed judgment regarding stock biomass. Further, because these values were set well below MSY values to address SFA Working Group determinations regarding overfishing, they would prevent the fishery from achieving OY; even though recent landings data indicate that, in most cases, management controls appear to have effectively reduced catch rates below the overfishing threshold.

To remedy this, **Alternative 2(i)** would set the OY, ACL and ABC as equal values. **Alternatives 2(j) – 2(l)** would allow the Council to consider the socioeconomic and ecological components of OY when determining how far ACLs should be reduced below the overfishing threshold to account for scientific uncertainty in estimating the ABC and management uncertainty in effectively constraining harvest over time. This approach leads to OY estimates for spiny lobster that is below those estimated in the Caribbean SFA Amendment, regardless of the OY (= ACL) alternative selected.

4.3 ACTION 3: Redefine Management of the Aquarium Trade Species Fishery Management Units (FMUs) within the Reef Fish FMP and the Coral and Reef Associated Plants and Invertebrates FMP (Coral FMP).

4.3.1 Action 3(a): Redefine the management of aquarium trade species FMU.

Alternative 1: No action. Retain aquarium trade species in both the Corals and Reef Associated Plants and Invertebrates FMP (Coral FMP) and the Reef Fish FMP as defined in the Caribbean SFA Amendment.

Alternative 2: Consolidate all aquarium trade species listed in the FMP for Coral FMP and the Reef Fish FMP into a single FMP.

Alternative 2A: Move all aquarium trade species listed in the Coral FMP into the Reef Fish FMP.

Alternative 2B: Move all of the aquarium trade species listed in the Reef Fish FMP into the Coral FMP.

Alternative 2C: Move all of the aquarium trade species listed in both the Coral FMP and the Reef Fish FMPs into a new FMP specific to aquarium trade species.

Alternative 3: Remove all aquarium trade species from both the Coral FMP and from the Reef Fish FMPs.

Alternative 4: Manage only those aquarium trade species listed in either the Coral FMP or the Reef Fish FMP, for which landings data are available during the year sequence chosen in Action 1(a). Remove remaining aquarium trade species from the Coral FMP and the Reef Fish FMP.

Alternative 4A: Aquarium trade species that continue to be federally-managed under this alternative will be retained in either the Coral FMP or the Reef Fish FMP as listed after the Caribbean SFA Amendment (Table 4.3.1).

Alternative 4B: Aquarium trade species that continue to be federally-managed under this alternative will be consolidated and moved into the Coral FMP.

Alternative 4C: Aquarium trade species that continue to be federally-managed under this alternative will be consolidated and moved into the Reef fish FMP.

Alternative 4D: Aquarium trade species that continue to be federally-managed under this alternative will be consolidated and moved into a new FMP specific to aquarium trade species.

Alternative 5: Delegate management authority for all aquarium trade species listed in either the Coral FMP or the Reef Fish FMP to the jurisdiction of the appropriate commonwealth or territory as defined by Action 5 of this document.

Discussion

Aquarium trade species are tropical marine invertebrates, as well as plant species, collected and sold to private, and to a lesser extent, public aquaria (Sadovy 1991). The Aquarium Trade category presently contains a total of 121 species or species groups: 58 species in the Reef Fish FMP and 63 in the Coral FMP (Table 3.1.1). Of those 121 species, commercial landings data are available for eight species or species group (Table 3.2.3) and recreational landings data are available for 22 species or species groups (Table 3.2.4). All of those landings data come from Puerto Rico and mostly if not all from state waters. There are no available landings data for aquarium trade species specific to the USVI. Commercial or recreational harvest of aquarium trade species in USVI is prohibited unless a harvest permit is obtained. To date in the USVI, only educational facilities have been issued these permits. Moreover, based upon information contained within the Caribbean SFA Amendment, including comments heard at the 2011 Caribbean ACL Scoping Hearings in Mayaguez, PR February 9, 2011 "little if any aquarium trade activity has been reported in federal waters off Puerto Rico". For Puerto Rico, it is likely that "the vast majority of aquarium trade species are harvested from the shallower state waters within Puerto Rico's nine-mile boundary" (CFMC 2005).

Action 3 transitions fisheries management in the U.S. Caribbean from that established by the Caribbean SFA Amendment to that mandated by the MSRA. The former provided a valuable and comprehensive format for fisheries management in the U.S. Caribbean, but was dependent upon data sources of variable accuracy and precision. Moreover, the Caribbean SFA Amendment is not fully compliant with the mandates of the MSRA because it does not establish required management reference points for species that were kept in the FMP as "data collection only category". At the time the Caribbean SFA Amendment was developed, the Council determined there was not enough information available to specify biological reference points and/or management measures for aquarium trade species. In addition, the Council determined federal conservation and management of these species was not required because they were primary harvested from state waters and decided to categorized them as data collection only.

Table 4.3.1. List of all species included in the Aquarium Trade category in both the Reef Fish and Coral FMPs. Table contents are extracted from Table 8 of the Comprehensive Amendment to the FMPs of the U.S. Caribbean to Address Required Provisions of the Magnuson-Stevens Fishery Conservation and Management Act (Caribbean SFA Amendment).

Reef Fish FMP

Clepticus parrae, Creole wrasse
Halichoeres garnoti, Yellowhead wrasse
Halichoeres cyanocephalus, Yellowcheek wrasse
Halichoeres maculipinna, Clown wrasse
Thalassoma bifasciatum, Bluehead wrasse
Liopropoma rubre, Swissguard basslet
Gramma loreto, Royal gramma
Microspathodon chrysurus, Yellowtail damselfish
Stegastes adustus, Dusky damselfish
Stegastes partitus, Bicolor damselfish
Stegastes planifrons, Threespot damselfish
Stegastes leucostictus, Beaugregory
Chaetodon capistratus, Foureye butterflyfish
Chaetodon aculeatus, Longsnout butterflyfish
Chaetodon ocellatus, Spotfin butterflyfish
Chaetodon striatus, Banded butterflyfish
Serranus baldwini, Lantern bass
Serranus annularis, Orangeback bass
Serranus tabacarius, Tobaccofish
Serranus tigrinus, Harlequin bass
Serranus tortugarum, Chalk bass
Opistognathus aurifrons, Yellowhead jawfish
Opistognathus whitehursti, Dusky jawfish
Xyrichtys novacula, Pearly razorfish
Xyrichtys splendens, Green razorfish
Echidna catenata, Chain moray
Gymnothorax funebris, Green moray
Gymnothorax miliaris, Goldentail moray
Elacatinus oceanops, Neon goby
Priolepis hipoliti, Rusty goby
Equetus lanceolatus, Jackknife-fish
Equetus punctatus, Spotted drum
Chromis cyanea, Blue chromis
Chromis insolata, Sunshinefish
Abudefduf saxatilis, Sergeant major
Astrapogon stellatus, Conchfish
Apogon maculatua, Flamefish
Amblycirrhitus pinos, Redspotted hawkfish
Antennarius spp., Frogfish
Bothus lunatus, Peacock flounder
Chaetodipterus faber, Atlantic spadefish
Canthigaster rostrata, Sharpnose puffer
Centropyge argi, Cherubfish
Diodon hystrix, Porcupinefish
Dactylopterus volitans, Flying gurnard
Heteropriacanthus cruentatus, Glasseye snapper
Hypoplectrus unicolor, Butter hamlet
Holocanthus tricolor, Rock beauty
Myrichthys ocellatus, Goldspotted eel
Ophioblennius macclurei, Redlip blenny
Pareques acuminatus, High-hat
Rypticus saponaceus, Greater sopafish
Synodus intermedius, Sand diver
Symphurus diomedianus, Caribbean tonguefish
Family Syngnathidae, Pipefishes and Seahorses
Family Ogcocephalidae, Batfish
Family Scorpaenidae, Scorpionfish

Table 4.3.1. (continued). List of all species included in the Aquarium Trade category in both the Reef Fish and Coral FMPs. Table contents are extracted from Table 8 of the Comprehensive Amendment to the FMPs of the U.S. Caribbean to Address Required Provisions of the Magnuson-Stevens Fishery Conservation and Management Act (Caribbean SFA Amendment).

Coral FMP

Aphimedon compressa, Erect rope sponge
Astrophyton muricatum, Giant basket star
Alpheaus armatus, Snapping shrimp
Aiptasia tagetes, Pale anemone
Astropecten spp., Sand stars
Analcidometra armata, Swimming crinoid
Bartholomea annulata, Corkscrew anemone
Cynachirella alloclada, sponge (no common name)
Condylactis gigantea, Giant pink-tipped anemone
Cyphoma gibbosum, Flamingo tongue
Chondrilla nucula, Chicken liver sponge
Diadema antillarum, Long-spined urchin
Davidaster spp., Crinoids
Discosoma spp., False coral
Echinometra spp., Purple urchin
Eucidaris tribuloides, Pencil urchin
Gonodactylus (Neogonodactylus) spp., Smashing mantis shrimp
Geodia neptuni, Potato sponge
Haliclona sp., Finger sponge
Holothuria spp., Sea cucumbers
Hereractis lucida, Knobby anemone
Lima spp., Fileclams
Lima scabra, Rough fileclam
Lytechinus spp., Pin cushion urchin
Lysmata spp., Peppermint shrimp
Linckia guildingii, Common comet star
Lysiosquilla spp., Spearing mantis shrimp
Lebrunia spp., Staghorn anemone
Mithrax spp., Clinging crabs
Mithrax cinctimanus, Banded clinging crab
Mithrax sculptus, Green clinging crab
Myriastra sp., sponge (no common name)
Niphates digitalis, Pink vase sponge
Niphates erecta, Lavender rope sponge
Nemaster spp., Crinoids
Ophiocoma spp., Brittlestars
Ophioderma spp., Brittlestars
Ophioderma rubicundum, Ruby brittlestar
Oreaster reticulatus, Cushion sea star
Ophidiaster guildingii, Comet star
Oliva reticularis, Netted olive
Octopus spp. (except the Common octopus, *O. vulgaris*)
Paguristes spp., Hermit crabs
Paguristes cadenati, Red reef hermit crab
Percnon gibbesi, Nimble spray crab
Periclimenes spp., Cleaner shrimp
Ricordia florida, Florida false coral
Stichodactyla helianthus, Sun anemone
Spirobranchus giganteus, Christmas tree worm
Sabellastarte magnifica, Magnificent duster
Sabellastarte spp., Tube worms
Stenopus scutellatus, Golden shrimp
Stenopus hispidus, Banded shrimp
Stenorhynchus seticornis, Yellowline arrow crab
Spondylus americanus, Atlantic thorny oyster
Spinosella plicifera, Iridescent tube sponge
Spinosella vaginalis, Lavendar tube sponge
Tripneustes ventricosus, Sea egg urchin
Thor amboinensis, Anemone shrimp
Tectitethya (Tethya) crypta, sponge (no common name)
Subphylum Urochordata, Tunicates
Tridachia crispata, Lettuce sea slug
Zoanthus spp., Sea mat

Alternative 1 of Action 3(a) would maintain the current distribution of aquarium trade species under the Coral and Reef Fish FMPs. **Alternative 2**, would consolidate the aquarium trade species into a single FMP. **Alternative 2(A)** would move all aquarium trade species to the Reef Fish FMP. **Alternative 2(B)** would move all aquarium species into the Coral FMP and **Alternative 2(C)** would move the aquarium trade species into a new FMP. Under **Alternative 2,** aquarium trade species would still be required to have management reference points and ACLs.

Alternative 3 proposes to remove all aquarium trade species from federal management. Consequently, these species will not be subject to federal regulations. Gear restrictions and other measures set for the collection of these species in the EEZ will not be applicable anymore.

Alternative 4 would remove the aquarium species for which no landings data are available and those species with available landings data will remain under federal management. **Alternative 4(A)** will retain the species that remain under federal management in the FMP where they are originally listed. **Alternatives 4(B), 4(C)** and **4(D)** would consolidate and move the species that will remain under federal management to either the Coral FMP, the Reef Fish FMP or to a new aquarium trade species specific FMP respectively. Under **Alternative 4,** management reference points and ACLs will be defined for the species that remain in the FMP(s).

Under **Alternative 5,** the aquarium trade species would remain in the Coral and Reef Fish FMPs, but their management would be delegated to the to the jurisdiction of the appropriate commonwealth or territory as defined by Action 5 of this document.

4.3.2 Action 3(b). Establish MSY proxy for the aquarium trade species FMU.

Alternative 1: No action. Keep the aquarium trade species in the "data collection only" category as defined in the Caribbean SFA Amendment.

Alternative 2(a) through 2(k): Establish management reference points or proxies for the aquarium trade species based on alternative selected in Action 3(a) and time series of landings data as defined in Action 1(a) in **Alternatives 1-5**.

Discussion

Action 3(b) proposes to establish an MSY proxy for the aquarium trade species FMU still under federal management after an alternative has been chosen under Action 3(a). This Action will not apply in the case that **Alternative 3** or **5** under Action 3(a) are chosen. **Alternative 1** proposes no change from the Caribbean SFA Amendment, which has these species as data collection only category without defined management reference points. However, this alternative would not be consistent with the new requirements of the MSRA for establishing management reference points for all federally-managed species. **Alternative 2** proposes to use average landings during various year sequences to establish proxies for MSY and, from those MSY proxies, estimates of OFL, ABC, ACL and OY (Table 4.3.2). **Alternative 2** would define aggregate management reference points or proxies based on what the Council considers the longest time series of landings data that is consistently reliable across all islands. The methodology used to define management reference points under Action 3(b) will follow the same approach and methodology as described in Actions 1(b) and 2(b).

Table 4.3.2. Management reference points or proxies proposed for the aquarium trade species under Alternative 2.

REFERENCE POINT	Alternative 2
Maximum Sustainable Yield	
Alternative 2(a)	MSY proxy = mean annual landings selected by Council in Action 2(a).
Alternative 2(b)	MSY proxy = mean annual landings selected by Council in Action 2(a) plus 2 standard deviations.
Overfishing Threshold	
Alternative 2(c)	OFL = MSY proxy; overfishing occurs when annual landings exceed the OFL.
Alternative 2(d)	OFL = MSY proxy; overfishing occurs when annual landings exceed the OFL, unless NOAA Fisheries' Southeast Fisheries Science Center (in consultation with the Caribbean Fishery Management Council and its SSC) determines the overage occurred because data collection/monitoring improved, rather than because landings actually increased.
Acceptable Biological Catch/ABC Control Rule	
Alternative 2(e)	ABC = mean of the landings plus 2.0 * standard deviations; this Alternative is only available if alternative 2(b) above is chosen.
Alternative 2(f)	ABC = mean of the landings plus 1.0 * standard deviations; this Alternative is only available if alternative 2(b) above is chosen.
Alternative 2(g)	ABC = mean of the landings
***Alternative 2(h)**	ABC=Recommendation by the Scientific and Statistical Committee
Optimum Yield/Annual Catch Limit	
Alternative 2(i)	OY = ACL = ABC
Alternative 2(j)	OY = ACL = [ABC x (0.85)]
Alternative 2(k)	OY = ACL = [ABC x (0.75)]
Alternative 2(l)	OY = ACL = [ABC x (0.50)]
Alternative 2(m)	OY = ACL = 0

*SSC recommendation for Puerto Rico commercial and recreational is to use median of annual landings between years 1988-2009

*SSC recemendation for USVI is the mean of annual landings for the longest time series (1999-2008)

4.3.3 Summary Comparison of Redefining Management of the Aquarium Trade Species FMUs within the Reef Fish and Coral FMPs.

The alternatives contained within **Action 3(a)** would change the relationship between aquarium trade species and the FMPs within which they presently reside. **Alternative 1** proposes no change in management of aquarium trade species from that established in the Caribbean SFA Amendment. Within **Alternative 2**, **Alternatives 2A** and **2B** would consolidate all aquarium trade species contained in the Reef Fish and Coral FMPs into a single grouping housed within one or the other of the FMPs. **Alternative 2C** would similarly consolidate all aquarium trade species, but in this case, into a single new FMP specific to the aquarium trade species. **Alternatives 2A** and **2B** may reduce the administrative burden associated with managing these species but would have little effect otherwise by working in a single FMP or location of these species. A**lternative 2C** may benefit management of aquarium trade species by allowing for focused management on those species, separate from management efforts targeted to reef fish harvested for food or from management efforts targeted to corals that primarily consider environmental consequences. **Alternative 3** would result in the removal of all aquarium trade species from both the Reef Fish and Coral FMPs and no longer be under federal management. **Alternative 4** would maintain those species with recorded landings during a specific time period, chosen by the Council in Action 1(a), while entirely removing from federal-management the remaining species. **Alternative 4(A)** would leave the species that will remain under federal management, in the FMP where they are currently listed. Management reference points and ACLs would still be required to be set for the species retained. **Alternatives 4(B), 4(C),** and **4(D)** would consolidate and move the species that will remain under federal management to either the Corals FMP, the Reef Fish FMP or to a new aquarium trade species specific FMP respectively.

Finally, **Alternative 5** would delegate management of aquarium trade species to the respective commonwealth or territory selected in Action 5 of this document.

Under Action 3(b) the no action **Alternative 1** would keep the aquarium trade species in the "data collection only" category with no defined management reference points, including MSY, OFL, OY and ACL. This alternative would not be consistent with the new requirements of the MSRA for establishing management reference points for all federally-managed species.

Maximum Sustainable Yield (MSY) and Overfishing Threshold (MFMT/OFL)

Alternative 2 proposes to specify a landings -based, rather than fishing mortality-based, overfishing threshold, called the OFL. Annual landings would be evaluated relative to the OFL to determine whether overfishing is or is not occurring. This approach is consistent with the NS1 guidelines, which provide fishery managers the flexibility to determine if overfishing occurs based on either fishing mortality rates or actual annual landings.

Under **Alternative 2,** the MSY represents the maximum yield a species complex can provide in the long term, while OFL estimates the amount of annual landings above which overfishing is occurring. In theory, the annual OFL would vary above and below the

MSY level depending on fluctuations in stock size. Since both MSY and OFL are related to the highest fishing mortality rate that will not result in overfishing, the long-term average of OFLs would be expected to equate to MSY, if stock abundance is high enough to support MSY. However, in practice, the annual OFL proposed in **Alternative 2** would remain constant at the MSY level until stock biomass can be estimated.

Alternative 2(c) would result in an automatic overfishing determination if annual landings exceeded the OFL in any given year. **Alternative 2(d)** would provide scientists (in consultation with managers) the flexibility to evaluate the cause of the reported landings increase prior to making a determination that a species complex is undergoing overfishing. Specifically, they would consider whether the reported increase represents an actual increase in landings or just improved data collection and monitoring. The intent of this sub-option is to encourage the fishers to fully report landings an improve data collection to avoid ACLs overage or triggering associated AMs.

Acceptable Biological Catch (ABC)

Set ABC using a buffer from the OFL that represents an acceptable level of risk due to scientific uncertainty. The ABC rule offers three tiers of guidance for setting the ABC based on the amount of information for a given stock (**Alternative 2(e)-2(g)**). With less information, there is greater scientific uncertainty, and therefore, the buffer between the OFL and ABC will be greater. The buffer will be predetermined for each stock or stock complex by the Council with advice from the SSC.

Optimum Yield (OY) and Annual Catch Limits (ACLs)

An OY was not developed for the data collection only species in the Caribbean SFA Amendment. To remedy this, **Alternative 2(h)-2(l)** would set the OY and ACL as equal values, requiring the Council to consider the socioeconomic and ecological components of OY when determining how far ACLs should be reduced below the overfishing threshold to account for scientific uncertainty in estimating the OFL and management uncertainty in effectively constraining harvest over time. This approach leads to OY estimates for the target species that are below those estimated in the Caribbean SFA Amendment, regardless of the OY (= ACL) alternative selected.

4.4 ACTION 4: Redefine the management of conch species FMU within the Queen Conch FMP.

Alternative 1: No action. Do not re-evaluate and revise the conch species FMU.

Alternative 2: Remove all conch species, except for the queen conch (*Strombus gigas*), from the Queen Conch FMP.

Alternative 3: Delegate management authority, for all conch species except queen conch (*Strombus gigas*), listed in the Queen Conch FMP, to the jurisdiction of the appropriate commonwealth or territory as defined by Action 5.

Alternative 4: Retain all conch species under the Queen Conch FMP and define management reference points or proxies based on the ACL established for queen conch in the 2010 Caribbean ACL Amendment public hearing draft.

Discussion

Alternative 1 would retain the present definitions specified in the Caribbean SFA Amendment for species/species groups within the conch FMU (Table 4.4.1). The Caribbean SFA Amendment defines the conch species, except queen conch, as data collection only category and did not establish management reference points for these species. Puerto Rico and the USVI could be reporting landings as general category 'conch' and not differentiating between the nine species of conch in the FMU. The lack of individual species landings data for these eight other species makes it difficult to establish individual ACLs for each. **Alternative 2** would remove all conch species, except queen conch, from the Queen Conch FMP, as there is no targeted or direct harvest of these additional eight species not undergoing overfishing in the FMU. During the Development of the Caribbean SFA Amendment the Council determined that four species of conch needed to be removed from the FMP. The harvest of these four species occured largely in state waters, and the levels of harvest were not significant. This alternative provides for the same approach on the remaining eight species of conch as there is no indication that there is significant harvest of these eight species not removed from the FMP after the Caribbean SFA Amendment.. **Alternative 3** would keep the current nine species of conch in the FMU but delegate management authority for all but *Strombus gigas* to the jurisdiction of the appropriate commonwealth or territory as defined in Action 5 of this document. **Alternative 4** would establish management reference points based on the ACL established for queen conch in the 2010 Caribbean ACL amendment PHD. As mentioned above, fishers in both USVI and Puerto Rico could be reporting these other eight conch species under the queen conch FMP. This reporting issue in conjunction with lack of species-specific data could make species specific ACL difficult to define. To address this issue, **Alternative 4**provides the option to combine those eight remaining conch species that are not designated undergoing overfishing under the 2010 queen conch ACL.

Table 4.4.1. List of conch species within the Queen Conch FMP not undergoing overfishing as established in the Caribbean SFA Amendment.

Scientific Names	**Common Names**
Strombus gigas	Queen conch
Strombus costatus	Milk conch
Strombus pugilis	West Indian Fighting Conch
Strombus gallus	Roostertail Conch
Strombus raninus	Hawkwing Conch
Fasciolaria tulipa	True Tulip
Charonia variegata	Atlantic Triton's Trumpet
Cassis madagascarensis	Cameo Helmet
Astrea tuber	Green Start Shell

4.4.1 Summary Comparison of redefining the conch species FMU within the Queen Conch FMP.

There are currently nine species managed within the Queen Conch FMP (Table 4.4.1). In 2005, the Caribbean SFA Amendment redefined the Queen Conch FMP by removing the Caribbean helmet, *Cassis tuberosa*; Caribbean vase, *Vasum muricatum*; flame helmet, *Cassis flammea*; and whelk (West Indian top shell), *Cittarium pica*, from the conch FMU. The Caribbean conch resource FMP was then defined to include only those nine species that occur in federal waters (Table 4.4.1). Currently, commercial landings data are reported under a 'conch' general category for both Puerto Rico and USVI. No recreational landings data are available for the conch FMU as these data are not collected as part of the MRFSS program. In addition, harvest or possession of queen conch in the EEZ is prohibited with the exception of Lang Bank, east of St Croix.

This action proposes to re-evaluate the conch FMU. The no action **Alternative 1** would maintain the current management structure for conch species as established by the Caribbean SFA Amendment, which defines nine species of conch to be managed under the Queen Conch FMP (Table 4.4.1). **Alternative 2** proposes to remove all other species of conch except queen conch from the Queen Conch FMP as these eight species are not targeted species for harvest and are not collected in significant numbers. **Alternatives 3** would still consider all nine species of conch currently in the FMP but would delegate management of all eight species except queen conch to the territory of jurisdiction. The landings report form that fishers submit in both Puerto Rico and USVI only ask for catch under a general "conch" category and not distinguish catch between the nine species in the FMP. Under **Alternative 4** due to the lack of landings data for the eight species of conch in the FMP, this alternative proposes to add these species to the queen conch ACL established in the 2010 Caribbean ACL Amendment. Fishers could be reporting these other eight conch species under a single conch category and hence the proposed 2010 Caribbean ACL PHD for queen conch could be accounting for these eight species.

4.5 ACTION 5. Geographic allocation/management

Alternative 1. No Action. Maintain U.S. Caribbean-wide reference points.

Alternative 2. Divide and manage ACLs by island group (i.e., Puerto Rico, St. Thomas/St. John, St. Croix) based on the preferred management reference point time series selected by the Council in Actions 1(a) and 2(a).

Alternative 2A. Use a mid-point or equidistant method for dividing the EEZ among islands.
Alternative 2B. Use a straight-line approach for dividing the EEZ among islands.
Alternative 2C. Use the St. Thomas Fishermen's Association recommendation for dividing the EEZ among islands.

Discussion: Action 5 addresses the opportunity to partition the EEZ by island groups (i.e. Puerto Rico, St. Thomas/St. John, and St. Croix). Local fishers, the fishing community, and the local governments have requested partitioning management among the described islands or island groups because of differences in culture, markets, gear, and seafood preferences.

Under **Alternative 1**, the U.S. Caribbean would continue to be managed as a single unit. Resource harvested anywhere within the EEZ could be landed on any of the islands or island groups, as long as the fishers are properly permitted, and would therefore count towards the ACL for that resource. Consequently, one island could have negative impacts on the availability of a target stock on another island by affecting present or future harvest of a particular resource.

Under **Alternative 2,** separate ACLs for the individual U.S. Caribbean islands would be established, based upon the combined territorial and EEZ landings for that island. The applicable year-sequence used to determine ACLs are addressed in Actions 1(a) and 2(a). **Alternative 2** also establishes the boundaries that define the EEZ waters for each island or island group (Figure 4.5.1).

Three alternative EEZ boundary approaches are included in **Alternative 2** and are illustrated in Figure 4.5.1. **Alternative 2A** uses an equidistant method to partition the EEZ among islands (Figure 4.5.2). For this approach, start with the USVI and choose several points equidistant from sections of the southern edge of the territorial boundary of St. Thomas/St. John and the northern edge of the territorial boundary of St. Croix to establish a line separating the two island masses. Draw the line from east, starting at the U.S. Caribbean EEZ boundary, to west toward the Puerto Rico territorial sea boundary. Next, establish several points equidistant from the southeastern edge of the Puerto Rico territorial boundary and the northwestern territorial boundary of St. Croix. Draw the line northeast to southwest. Terminate the line in the northeast where it intersects the previously drawn line separating St. Thomas/St. John and St. Croix. Terminate the line in the southwest upon reaching the 65° 20' meridian. From that point, extend the line due

south to the edge of the U.S. Caribbean EEZ. This described boundary represents the St. Croix portion of the U.S. Caribbean EEZ and the southern portion of the allocated St. Thomas/St. John EEZ.

At the northeastern portion of the Puerto Rico territorial boundary where it intersects with the northwestern potion of the St. Thomas/St. John territorial boundary, establish a line northward parallel with the extreme northeastern boundary of the U.S. Caribbean EEZ and terminate the line where it intersects the edge of the U.S. Caribbean EEZ. This described boundary represents the northern portion of the St. Thomas/St. John EEZ.

The remainder of the EEZ that is not part of the allocated St. Thomas/St. John or St. Croix EEZs will define the allocated Puerto Rico EEZ.

Alternative 2B uses a straight-line method to allocate the U.S. Caribbean EEZ among islands. From the east-west portion of the U.S. Caribbean EEZ boundary south of St. Thomas/St. John, extend a line westward to the Puerto Rico territorial boundary. From that point extend a line south to the southern edge of the U.S. Caribbean EEZ. This described boundary represents the St. Croix EEZ and the southern portion of the St. Thomas/St. John EEZ.

From the intersection of the northeastern Puerto Rico territorial boundary and the northwestern St. Thomas/St. John territorial boundary extend a line due north until it intersects with the U.S. Caribbean EEZ boundary. This described boundary represents the northern portion of the St. Thomas/St. John EEZ.

The remainder of the EEZ that is not part of the allocated St. Thomas/St. John or St. Croix EEZs will define the allocated Puerto Rico EEZ.

The layout of the boundaries for **Alternative 2C** are identical to those for **Alternative 2B**, except that the north-south line delineating the boundary between Puerto Rico and St. Thomas follows the 65^{o} 10' line of longitude and is therefore shifted slightly to the west relative to **Alternative 2B**. The horizontal line defining the boundary between the St. Thomas and Puerto Rico EEZs is parallel to that same line in **Alternative 2B**, except that the **Alternative 2C** line is shifted 3.9 nm (7.2 km) to the west of the **Alternative 2B** line on the north side of those two islands and 1.9 nm (3.5 km) to the west of the **Alternative 2B** line on the south side of those two islands.

Under **Alternative 2**, the fish will be assigned where they are landed to be counted against the ACL for each island. This alternative reflects the need to monitor landings to determine when ACLs are reached in each of the geographic areas.

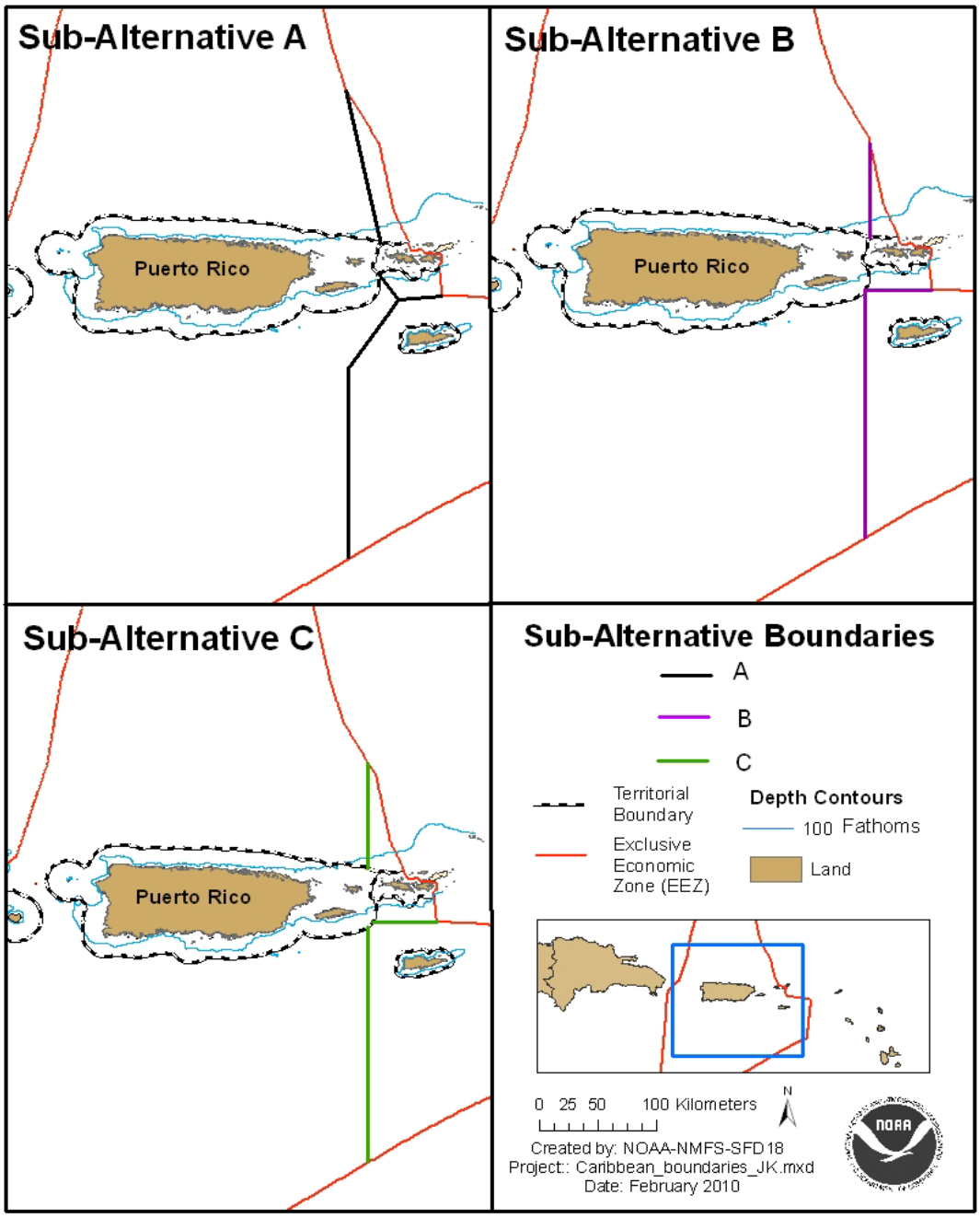
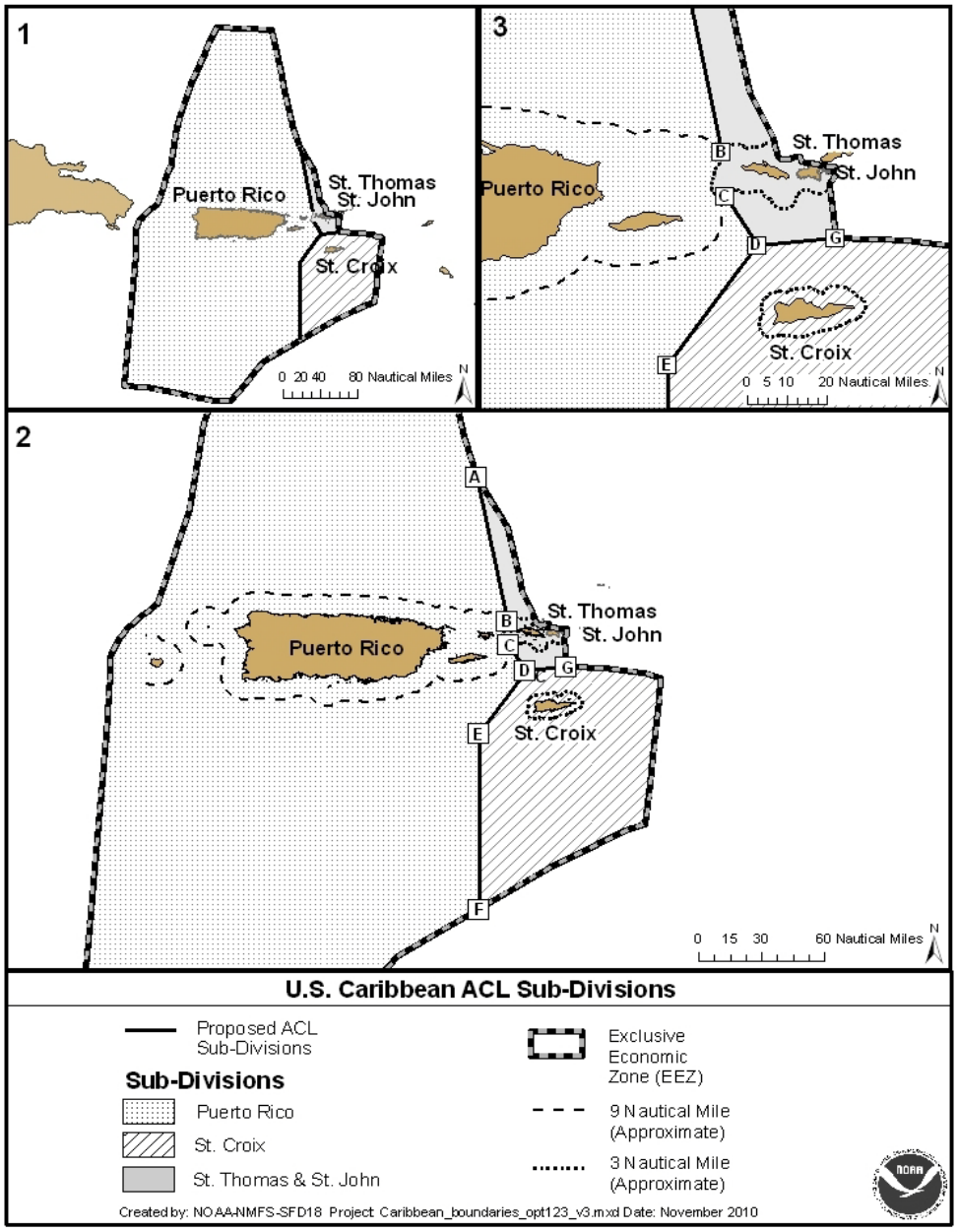


Figure 4.5.1. Alternative proposed boundaries for subdividing the U.S. Caribbean EEZ by island group. Sub-Alternative 2A is the equidistant approach, Sub-Alternative 2B is the straight-line approach, and Sub-Alternative 2C is the St. Thomas Fisherman's Association approach.



Reference Point	Latitude	Longitude	Comments
A	19° 37’ 29”	65° 20’ 57”	Intersects with the International/EEZ boundary
B	18° 25’ 46.3015”	65° 06’ 31.866”	Intersects with the EEZ/Territorial boundary
C	18° 13’ 59.0606”	65° 05’ 33.058”	Intersects with the EEZ/Territorial boundary
D	18° 01’ 16.9636”	64° 57’ 38.817”	
E	17° 30’ 00.000”	65° 20’ 00.1716”	
F	16° 02’ 53.5812”	65° 20’ 00.1716”	
G	18° 03’ 03”	64° 38’ 03”	

Figure 4.5.2. Detailed boundaries, including coordinates, for subdividing the U.S. Caribbean Exclusive Economic Zone by island group using the equidistant approach (**Sub-Alternative A**).

4.5.1 Summary Comparison of Geographic allocation/management of Management Reference Points

Action 5 addresses the conflict between insular-specific management regimes in territorial waters versus a U.S. Caribbean-wide EEZ. This situation creates problems properly attributing harvest from the EEZ to the appropriate island or island group. **Alternative 1** maintains the present situation, allowing harvest from throughout the U.S. Caribbean EEZ with resultant landings being counted against a cumulative quota rather than against a quota that is specific to an island or island group. **Alternative 2** links island-specific quotas with a predefined area, such that upon satisfying an individual species' quota for a particular island or island group, the fishery within that predefined area of the EEZ would be subject to AMs.

Alternative 1, the no action alternative, would maintain Caribbean-wide reference points and could create territorial and/or sector competition in the EEZ. If combined with **Alternative 1** of Action 6(a) (See section 4.6), **Alternative 1** would establish a single ACL for a unit or sub-unit for which commercial and recreational fishers of Puerto Rico and fishers in the USVI would compete. If **Alternative 1** of Action 5 is combined with **Alternative 2** of Action 6(a), recreational fishers of Puerto Rico would be in competition with commercial fishers of the USVI for the U.S. Caribbean-wide recreational ACL. In addition, commercial fishers of Puerto Rico would be in competition with commercial fishers of the USVI for the U.S. Caribbean-wide commercial ACL. Fishers with larger vessels and gears capable of catching more of the fish in the same or a shorter period would be favored over other fishers if there was a race for the catch and overcapacity was allowed.

Alternative 2 of Action 5 would divide the Caribbean EEZ into three parts. It would not prevent fishers from each island group (Puerto Rico, St. Thomas/St. John, and St. Croix) from fishing in the EEZ of the other island groups, but their catch would be charged to the island upon which it is landed. Once the ACL for a species or species group is reached, the fishery in the EEZ would be subject to appropriate AMs. **Alternative 2** would not prevent fishers from fishing for that species or species group elsewhere in the EEZ and landing their catch where the ACL has not been reached, if they are appropriately licensed to do so. It is expected that most fishers who fish in the EEZ do so in waters closest to their home island. It is possible that **Alternative 2** could have a greater beneficial economic and social impact on St. Thomas/St. John and St. Croix fishers than fishers from Puerto Rico because a larger percent of fishable habitat is found in federal waters off St. Thomas/St. John and St. Croix than in federal waters off Puerto Rico. It is also possible that **Alternative 2** will have a larger adverse economic and social impact on Puerto Rico fishers than those in USVI because Puerto Rico does not limit the number of commercial fishing licenses and the USVI does. USVI fishers could buy a Puerto Rico commercial fishing license and land their catches in Puerto Rico after the ACL is met in their USVI island areas, but Puerto Rico's commercial fishers could not similarly buy a USVI commercial license to land their catches in the USVI because of a moratorium on commercial fishing license in the USVI. **Alternative 2** would not have a direct economic or social impact.

4.6 ACTION 6: Annual Catch Limit Allocation and Management.

4.6.1 Action 6(a) Separation of recreational and commercial sectors (Puerto Rico only)

Alternative 1. No action. Do not specify sector-specific ACLs.

Alternative 2. Specify separate commercial and recreational ACLs based on the preferred management reference point time series.

Discussion: Action 6(a) applies only to Puerto Rico waters because recreational harvest data are not available for the USVI. In Puerto Rico, the MRFSS program has been underway since 2000. That program obtains estimates of recreational harvest from statistically based telephone surveys and face-to-face intercepts of recreational fishers, for finfish species such as those in the reef fish FMUs.

The no action alternative (**Alternative 1**) would result in a conglomerate ACL for the recreational and commercial sectors. A single ACL would be established, and when that annual catch is achieved both the recreational and commercial harvest for the specified species or species-group would be subject to application of appropriate AMs. In the future, if data collection for recreational and commercial fisheries improves, in-season management measures could be developed and implemented. Concern has been expressed by the recreational and particularly charter boat interests in the U.S. Caribbean regarding this approach. Specifically, the recreational sector argues that affecting recreational fisheries when a single annual quota is reached is unfair and economically untenable because commercial harvesters would set the catch and rate of catch possibly before recreational fishers could achieve their historic average annual landings. **Alternative 2** avoids that problem by completely separating the commercial and recreational harvest quotas. Each fishery would be assigned an ACL, and as each sector achieves their quota, either fishing activity by that sector would end or sector-specific AMs would apply, with no implications for the other sector. This alternative would function within the constraints of present data collection efforts via AMs applied in subsequent harvest seasons, with fulfillment of the commercial harvest quota being monitored via commercial catch records and fulfillment of the recreational harvest quota being monitored via MRFSS (or MRIP). However, because there is presently no complimentary data being acquired for the USVI recreational fishery, a similar approach will not work there. Instead, at least until a recreational harvest monitoring program is installed in the USVI, a single quota based upon commercial catch records would have to be established for the USVI.

4.6.2 Action 6(b) Establish bag limit restrictions on recreational reef fish harvest.

Alternative 1. No action. Do not establish bag limit restrictions on recreational reef fish harvest.

Alternative 2. Establish a 5-fish aggregate bag limit per person per fishing day (would not apply to a fisher who has a valid commercial fishing license)

Alternative 3. Establish a 2-fish aggregate bag limit per person per fishing day (would not apply to a fisher who has a valid commercial fishing license)

Alternative 4. Prohibits the harvest of species in the surgeonfish FMU (would not apply to a fisher who has a valid commercial fishing license).

Alternative 5. Establish an aggregate bag limit of 10 fish per fisher including not more than two surgeonfish per fisher or six surgeonfish per boat, and 30 aggregate fish per boat on a fishing day (would not apply to a fishers who has a valid commercial fishing license).

Alternative 6. Establish an aggregate bag limit of 5 fish per fisher including not more than two surgeonfish per fisher or six surgeonfish per boat, and 15 aggregate fish per boat on a fishing day (would not apply to a fisher who has a valid commercial fishing license).

Discussion

In Puerto Rico, separate ACLs could be established for the commercial and recreational sectors, (Action 6(a)). In USVI, due to the lack of sector specific landings data, both the commercial and recreational sectors will be competing for the same ACL regardless of a recreational bag limit, and therefore, a bag limit may not be associated with significant biological or economic gains for the species or USVI recreational fishers. If the Council chooses to establish separate ACLs for the recreational and commercial sectors for reef fish in Puerto Rico, a recreational bag limit may help to prevent the recreational reef fish complex ACLs from being exceeded. The goal of implementing bag limits would be to slow the rate of harvest in order to reduce the probability of exceeding the recreational ACLs for each complex. In addition, reducing the probability of exceeding the ACL would have a positive biological effect for the species by reducing fish discards. This action would be more beneficial for the recreational fishers in Puerto Rico than those in the USVI since the reef fish ACL would not be separated by sector in for species in the USVI. The bag limit would apply to the angelfish, boxfish, goatfish, grunts, wrasses, jacks, scups, porgies, tilefish, squirrelfish, surgeonfish, triggerfish and filefish that are the species/species group not considered undergoing overfishing under the Reef Fish FMP. These proposed bag limits would not apply to the aquarium trade species.

Bag limits are a common approach to managing harvest in recreational fisheries. Typically, bag limit regulations are promulgated to extend the length of the recreational fishing season. The ideal outcome is that overfishing is avoided while the fishery resource

is available to the recreational angler for the entire year. As catch rates per angler change, the bag limit can be adjusted to constrain harvest to the quota while ensuring near year-round fishing. Bag limits may be applied on an individual species basis, as an aggregate of a species group, or for an entire fishery.

Deciding at which of those levels the bag limit should be applied depends upon the management objective, the commonalities among species, and the ability of the recreational fishers to distinguish among species. Choosing an individual versus an aggregate bag limit also may reflect data availability. If data are sufficient only to allow monitoring at a group level, then establishing bag limits at a more resolved level is pointless.

Action 6(b) proposes aggregate bag limits for species not identified as undergoing overfishing and for surgeonfish components of the recreational reef fish fishery of the U.S. Caribbean EEZ. In addition to the no action alternative, two alternatives are proposed that specify an individual bag limit, from a relatively restrictive 2-fish bag limit (**Alternative 3**) to the most liberal 5-fish limit in **Alternative 2**. Estimates of percent reduction in harvest for the species in the reef fish that are not undergoing overfishing depend upon the year sequence chosen (Figure 4.6.2.1). Percent reduction is the percent of previous catches that would have been reduced if a bag limit was in place in the specified time period.

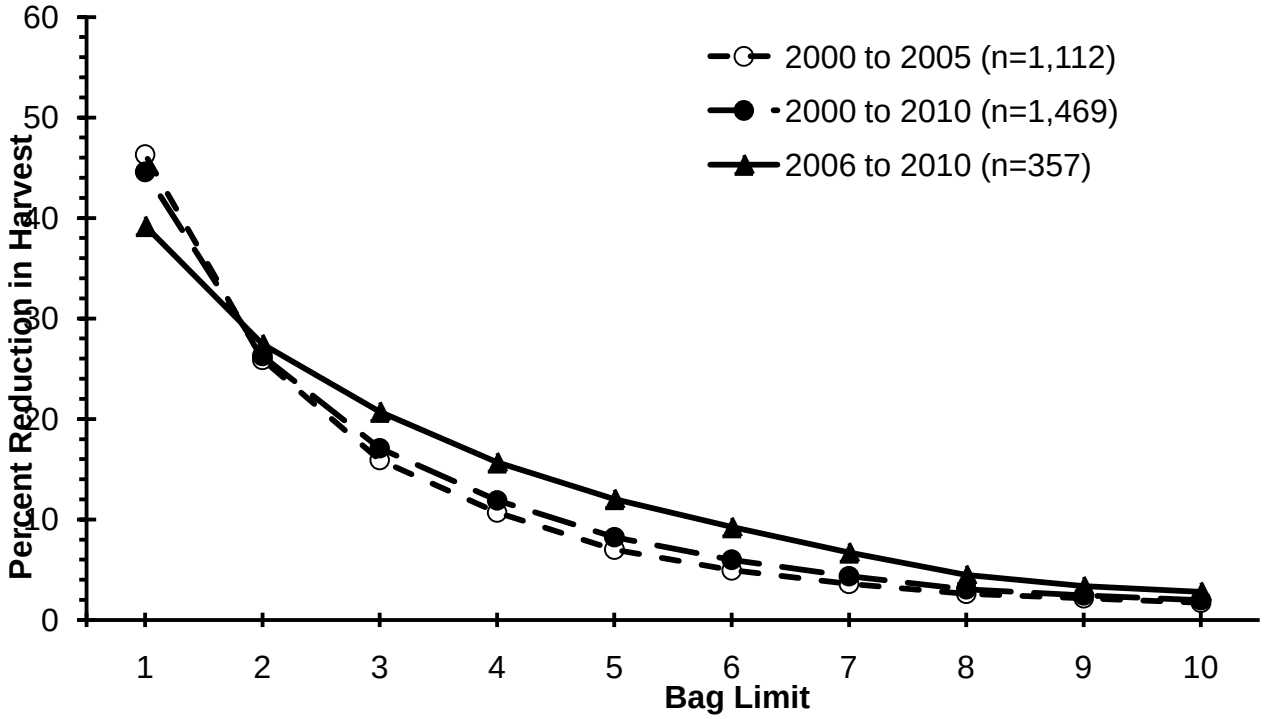


Figure 4.6.2.1. Estimated percent reduction in harvest of fishery management units not undergoing overfishing for Puerto Rico waters in response to implementation of various bag limits. These fishery management units encompass jacks, squirrelfish, boxfish, wrasses, grunts, goatfish, porgies, tilefish, surgeonfish, triggerfish, and angelfish. Each

legend references the three different year sequences considered and, parenthetically, the number of intercepts. Source of data: Puerto Rico MRFSS 2001-2010. No MRFSS data is currently available for the USVI.

Alternative 4 proposes to prohibit recreational harvest for all species of surgeonfish. This alternative focuses specifically on recreational harvest of surgeonfish due to their essential role in the maintenance of a healthy coral reef ecosystem.

Alternative 5 establishes a vessel limit of 30 fish total per fishing day of aggregate of fish but limits the total number of surgeonfish to two per fisher up to a maximum of six surgeonfish per boat independent of the number of fishers onboard. Each fisher on board a recreational fishing vessel is allowed up to 10 fish per fishing day on a combined catch of fish and surgeonfish, but that catch can include no more than two surgeonfish within that 10-fish bag limit.

Alternative 6 establishes a vessel limit of 15 fish total per fishing day of aggregate fish and surgeonfish but limits the total number of surgeonfish to two per fisher up to a maximum of six surgeonfish per boat independent of the number of fishers onboard. Each fisher on board a recreational fishing vessel is allowed up to five fish per fishing day on a combined catch of fish and surgeonfish, but that catch can include no more than two surgeonfish within that five fish bag limit.

4.6.3 Action 6(c) Establish bag limit restrictions on recreational spiny lobster harvest.

Alternative 1. No action. Do not establish bag limit restrictions on recreational lobster harvest.

Alternative 2. Establish a 5-spiny lobster aggregate bag limit per person per fishing day (would not apply to a fisher who has a valid commercial fishing license).

Alternative 3. Establish a 2-spiny lobster bag limit per person per fishing day (would not apply to a fisher who has a valid commercial fishing license).

Alternative 4. Prohibits the harvest of spiny lobster (would not apply to a fishers who has a valid commercial fishing license).

Alternative 5. Establish a bag limit of: 5 spiny lobster per fisher and 15 spiny lobster per boat on a fishing day (would not apply to a fisher who has a valid commercial fishing license).

Alternative 6. Establish a bag limit of: 2 spiny lobster per fisher and 12 spiny lobster per boat on a fishing day (would not apply to a fisher who has a valid commercial fishing license).

Discussion

The goal of implementing bag limits would be to, when coupled with sector-specific (i.e., recreational and commercial) ACLs, ensure that the recreational ACL for spiny lobster is not exceeded until as near as possible to the end of the calendar year. Currently there are no recreational harvest data for spiny lobster in Puerto Rico. In the future, recreational harvest data could be gathered as part of the collection of information by MRFSS in both Puerto Rico and USVI. If a bag limit quota is established under this action, it would count against the overall ACL set for the entire spiny lobster fishery both in Puerto Rico and USVI. As a result, due to the lack of sector specific landings data, both the commercial and recreational sectors will be competing for the same ACL regardless of a recreational bag limit, and therefore, a bag limit would not have significant biological gains for the species or economic gains for PR and USVI recreational fishers.

Bag limits are a common approach to managing harvest in recreational fisheries. Typically, bag limit regulations are promulgated to extend the length of the recreational fishing season. The ideal outcome is that overfishing is avoided while the fishery resource is available to the recreational angler for the entire year. As catch rates per angler change, the bag limit can be adjusted to constrain harvest to the quota while ensuring near year-round fishing. Bag limits may be applied on an individual species basis, as an aggregate of a species group, or for an entire fishery.

Deciding at which of those levels the bag limit should be applied depends upon the management objective, the commonalities among species, and the ability of the recreational fishers to distinguish among species. If data are sufficient only to allow monitoring at a group level, then establishing bag limits at a more resolved level is pointless.

Action 6(c) proposes bag limits for the recreational spiny lobster fishery of the U.S. Caribbean EEZ. In addition to the no action alternative, two alternatives are proposed that specify an individual bag limit, from a relatively restrictive 2-spiny lobster bag limit (**Alternative 3**) to the most liberal 5-spiny lobster limit in **Alternative 2**. **Alternative 4** proposes to establish a zero recreational bag limit for all species within the Spiny Lobster FMP in the U.S. Caribbean. **Alternative 5** allows harvesting of up to 5 spiny lobster per fisher in a recreational vessels but the sum cannot surpass 15 spiny lobster per recreational vessel a day independent of the number of fishers onboard. **Alternative 6** allows harvesting of up to 2 spiny lobster per fisher in a recreational vessels but the sum cannot surpass 12 spiny lobster per recreational vessel a day independent of the number of fishers onboard.

4.6.4 Summary Comparison of Annual Catch Limit Allocation/Management Alternatives and Recreational Bag Limit Management Measures Alternatives

Action 6(a) provides options to allocate ACLs between the commercial and recreational sectors in Puerto Rico. This action is specific to Puerto Rico because adequate recreational harvest data are not available for the USVI. However, recreational landings data are available for Puerto Rico for the years 2000-2009 and commercial landings data are available for that period. **Alternative 1** is the no action alternative; no sector-specific ACLs would be specified. This alternative provides the least precise management of the commercial and recreational fisheries. In **Alternative 1**, although sector-specific harvest data are collected by Puerto Rico, data would be merged (recreational and commercial data) to develop a single ACL for the entire fishery. **Alternative 1** may not establish an allocation that is fair and equitable to all such fishers (i.e. recreational commercial fishers in Puerto Rico). By merging the commercial and recreational data and setting a single ACL for both sectors, it is likely that one sector will exceed what would have been their sector-specific ACL, thereby usurping resource that would otherwise have been assigned to the ACL of the other sector. **Alternative 2** would result in the setting of separate ACLs for the recreational and commercial sectors. This approach has the added advantage of utilizing the data as they are reported. Whereas commercial landings are reported in pounds, recreational landings are reported as number of fish (Table 3.2.4). There is considerable concern among recreational fishers that establishing a single ACL shared by the commercial and recreational sectors may simply act to increase the commercial ACL. Concomitant with that would be an increase in commercial effort to take advantage of that increased opportunity. Upon fulfillment of the quota, both the commercial and recreational sectors of the fishery would be subject to AMs.

With regard to Action 6(a), **Alternative 1**, the no action alternative, would not specify sector-specific reference points, which could cause commercial and recreational fishers to compete for a single ACL. Commercial fishers with larger vessels and gears capable of catching more fish in the same or shorter period would be favored over Puerto Rico's recreational and subsistence fishers if there was a race for a single ACL and overcapacity was allowed. **Alternative 2**, however, would specify separate commercial and recreational ACLs in Puerto Rico that are based on the specifications of the MSY, OFL, and OY that are chosen from combining alternatives from Actions 1(a) and Action 2(a). Such an environment could result in lower long-term benefits that derive from the resource and the ecosystem of which it is part, and a transfer of economic and social benefits from artisanal to industrial fishers. The actual indirect economic and social impacts, however, would be dependent on if the regulatory and economic environments support such competition for an ACL.

There are presently no bag limit restrictions for recreational harvest of lobster or reef fish in Puerto Rico territorial waters or contiguous U.S. Caribbean EEZ waters. **Alternative 1** of Actions 6(b) and 6(c) would maintain this situation. In contrast, implementation of the remaining alternatives would, to various degrees, result in reductions to the daily recreational take of the target species, and the extent of this reduction would depend on the sub-alternative(s) chosen.

Actions 6(b) and 6(c) **Alternative 1** is the no action alternative, which would not establish a recreational bag limit in the EEZ. It would not have an economic or social impact beyond the baseline, although it may result in more frequent ACL overages and resultant implementation of AMs.

Alternative 2 of Actions 6(b) and 6(c) would allow larger recreational catches per person than **Alternative 3. Alternative 2** would likely have the lowest economic and social impact to the recreational fishing of spiny lobster and reef fish including surgeonfish species in federal waters. However, **Alternative 4** would essentially prohibit recreational fishing of spiny lobster and surgeonfish species in federal waters, and would have the largest adverse economic impact.

The largest adverse economic and social impacts of **Alternative 6** and **Alternatives 2 through 5** of Actions 6(b) and 6(c) could be on recreational fishers of St. Croix and St. Thomas/St. John because there is more fishable habitat is in the EEZ off St. Thomas/St. John and St. Croix than in the EEZ off Puerto Rico. Additionally, economic impacts that may result from establishing bag limits for recreational fisheries in the USVI may be perceived as being disproportionate based on the fact that recreational fishers would be limited in their per-trip harvest while commercial fishers would not have similar restrictions placed on them. Boat limits under **Alternatives 5** and **6** could adversely affect charter vessel operations because their catch of spiny lobster, surgeonfish, and combined catch of other reef fish addressed in this amendment would be limited, which could discourage anglers from buying their services.

Both **Alternatives 5** and **6** of Action 6(b) include a combination of a daily personal limit and a daily vessel limit. **Alternative 5** combines personal daily limits of 2 surgeonfish per person and 10 fish and surgeonfish combined per person with vessel limits of 6 surgeonfish per boat and 30 fish and surgeonfish combined per boat per day. **Alternative 6** combines personal daily limits of 2 surgeonfish per person and 5 fish and surgeonfish combined per person with vessel limits of 6 surgeonfish per boat and 15 fish and surgeonfish combined per boat per day.

For Action 6(c), both **Alternative 5** and **Alternative 6** include a combination of a daily personal limit and a daily vessel limit. **Alternative 5** combines personal daily limits of 5 spiny lobster per person with vessel limit of 15 spiny lobster per boat per day. **Alternative 6** combines personal daily limits of 2 spiny lobster per person and with vessel limit of 12 spiny lobster per boat per day.

If the economic and social cost of **Alternatives 1 through 6** is greater than the economic and social cost of obtaining a commercial fishing license, the least costly option for a charter fishing operation or recreational fisher would be to purchase a Puerto Rico commercial license. The cost of a Puerto Rico commercial license for a nonresident is $250, which is good for four years and can be renewed. The cost for a Puerto Rico resident is $10, which may be good for only one year because it considered a beginner's license. A resident must show sales of catch to get a non-beginner license. The most likely least costly option for the average charter fishing operation or recreational fisher

would be to shift fishing effort to territorial waters when their landings of the species would exceed the recreational bag or vessel limit(s).

4.7 ACTION 7: Accountability Measures for species considered in this amendment

Accountability measures (AMs) are defined as management controls to prevent ACLs, including sector-specific ACLs, from being exceeded, and to correct or mitigate overages of the ACL if they occur (50 C.F.R. § 310(g)(1)).

4.7.1 Action 7(a) Triggering accountability measures

Actions 1, 2, 3, and 4 include alternatives to establish and allocate ACLs. If an ACL is exceeded, AM alternatives are provided to address overages. Action 7 alternatives are presented in two parts, the first addresses the triggering of AMs and the second addresses the actual actions needed to redress overages.

Alternative 1. No Action. Do not establish criteria for triggering AMs.

Alternative 2. Trigger AMs if the ACL is exceeded based upon:

> **Alternative 2A:** A single year of landings beginning with landings from 2011.
>
> **Alternative 2B:** A single year of landings beginning with landings from 2011, then a 2-year running average of landings in 2012 (average of 2011+2012) and thereafter (i.e., 2011, 2011-2012, 2012-2013, etc.).
>
> **Alternative 2C:** A single year of landings beginning with landings from 2011, a 2-year average of landings in 2012 (average of 2011+2012), then a 3-year running average of landings in 2013 (average of 2011+2012+2013) and thereafter (i.e., 2011, 2011-2012, 2011-2013, 2012-2014, etc.).

Discussion

Alternative 1 would maintain present status and would not establish criteria for triggering corrective actions. Consequently, **Alternative 1** would not achieve MSA compliance. **Alternative 2** would establish criteria to trigger AMs. **Alternative 2A** would trigger AMs based on a single year of landings beginning in 2011. By adopting this alternative, the decision as to whether the ACL has been exceeded would be based on one year of landings data. Currently, the process used to consolidate or summarize landings data (i.e., available for use) takes approximately two years. The landings data are initially acquired from fishers through each local government's fishery statistics program (often referred to as trip tickets in Puerto Rico and Commercial Catch Reports in the USVI). Later the landings are proofed by the local government, and electronically transferred to the NOAA Fisheries' Southeast Fisheries Science Center (SEFSC). The Puerto Rico Department of Natural and Environmental Resources (PR-DNER) and the Virgin Islands Department of Planning and Natural Resources (VI-DPNR) require commercial fishers to report landings or trip tickets monthly. Upon receipt, the SEFSC formats and stores landings data files and provides them to scientists and managers upon request for analysis or decision-making. There may be as much as a two-year lag between the time catches are submitted

to the local government and the data are released for management applications. For **Alternative 2A**, when landings data become available, they represent a single point of comparison to the established ACL. Consequently, the first one-year comparison to the originally established ACL should occur in 2013 or 2014. After that point in time, annual single-point comparisons can be made to existing ACLs.

In order to overcome the challenges of monitoring highly variable landings, **Alternative 2B** would trigger AMs based on a single year of landings beginning in 2011, and then a 2-year running average of landings in 2012 (average of 2011+2012) and thereafter (2011, 2011-2012, 2012-2013, etc.). Using the process described for **Alternative 2A**, the information might not be available for consideration until 2013 or 2014. By adopting this alternative, the decision as to whether the ACL has been exceeded would initially be based on landings from a single year but subsequent year comparisons would be based on two-year landing sets. Landings data can be highly variable; therefore, comparing average landings with the ACL can buffer peaks in landings, which may be a function of sampling or reporting rather than true estimation of actual harvest. While such a comparison is more robust than **Alternative 2A**, a two-year average provides little information with regard to precision of the comparison.

Similar to **Alternative 2B, Alternative 2C** would trigger AMs based on a single year of landings beginning in 2011, then a 2-year average of landings in 2012 (average of 2011+2012), then a 3-year average of landings effective 2013 and thereafter (i.e., 2011, 2011-2012, 2011-2013, 2012-2014, etc.). Using the process described for **Alternative 2A**, the information might not be available for consideration until 2013 or 2014. By adopting this alternative, the decision as to whether the ACL for each species/species group has been exceeded would initially be based on landings from a single year but in 2012 the comparison would be based on a two-year landing set (2011-2012), and subsequent comparisons would be based on 3-year landing sets (2011-2013, 2012-2014, etc.). Such a comparison is more robust than **Alternatives 2A** and **2B** because it provides more information than a 1- or 2-year landings average with regard to precision of the comparison. **Alternatives 2B** and **2C** prescribe a sound method for dealing with data uncertainty and provide a means by which any ACL overages may be accounted for in subsequent fishing years.

Alternative 3. Trigger AMs if the ACL is exceeded as defined below unless NOAA Fisheries' SEFSC (in consultation with the Council and its SSC) determines the overage occurred because data collection/monitoring improved rather than because catches actually increased:

Alternative 3A: A single year of landings effective beginning 2011.

Alternative 3B: A single year of landings effective beginning 2011, then a 2-year running average of landings effective 2012 and thereafter (i.e., 2011, 2011-2012, 2012-2013, etc.).

Alternative 3C: A single year of landings effective beginning 2011, a 2-year running average of landings effective 2012, then a 3-year running average of landings effective 2013 and thereafter (i.e., 2011, 2011-2012, 2011-2013, 2012-2014, etc.).

Discussion

The rational for **Alternative 3** is similar to that for **Alternative 2** with the addition of a consultation between the SEFSC, the SSC, and Council prior to the decision to determine whether an overage occurred. A data collection improvement program is under development by the SEFSC and is focused on providing more precise and accurate fishery landings information for the U.S. Caribbean, resulting in more accurate and comprehensive landings data collected for each island mass. For **Alternatives 3A through 3C,** a determination will have to be made to examine whether an overrun of the ACL was due to increased catches by fishers or to improved data collection/monitoring efforts. The SEFSC and the SSC will provide an analysis of the information and consult with the Council before any determination is made. A single year of landings beginning in 2011 will be the basis for the initial consultation and subsequent determination regarding the cause of any ACL overage.

Alternative 3B is similar to **Alternative 3A** except that after the initial single-year comparison (2011 information with established ACLs), then a 2-year running average of landings will begin in 2011 and thereafter (i.e., 2011, 2011-2012, 2012-2013, etc.).

Alternative 3C is similar to **Alternative 3B** except that after the initial single-year comparison (2011 information with established ACLs), and a 2-year running average of landings comparison will be made in 2012 (i.e., 2011, 2011-2012), after which a 3-year running average of landings will begin in 2013 and thereafter (i.e., 2011, 2011-2012, 2011-2013, 2012-2014, etc.). Using two or three year running averages of landings (**Alternative 3B** and **Alternative 3C**) would provide a mechanism to deal with data uncertainty that may be due to reporting errors, under reporting, and highly variable landings.

4.7.2 Action 7(b) Applying accountability measures

Alternative 1. No Action. Do not apply AMs.

Alternative 2. If AMs are triggered, based upon the preferred criteria chosen in Action 7(a), reduce the length of the fishing season for that species or species group the year following the trigger determination by the amount needed to prevent such an overage from occurring again. The needed changes will remain in effect until modified.

Alternative 3. If AMs are triggered based upon the preferred criteria chosen in action 7(a), reduce the length of the fishing season for that species or species group the year following the trigger determination by the amount needed to prevent such an overage from occurring again and to pay back the overage. The needed changes will remain in effect until modified.

Discussion

Alternative 1 would not apply AMs when the ACL is exceeded and, consequently, would not comply with the MSA. Reducing the length of the fishing season by the amount needed to pay back the overage in addition to shortening the season length to prevent a future overage (**Alternative 3**) would likely have a greater biological benefit than only reducing the length of the fishing season as specified in **Alternative 2**.

4.7.3 Summary comparisons of accountability measures alternatives

Action 7 consists of two parts: Action 7(a), which addresses triggering of AMs; and Action 7(b), which addresses the actual actions, needed to address overages. For Action 7(a), three alternatives are presented for triggering AMs. **Alternative 1** is the no action alternative, which would retain the status quo and no trigger to put into place corrective action (i.e., AMs) would be set. Consequently, MSRA compliance would not be achieved by **Alternative 1**.

Alternatives 2A, 2B, and **2C** would trigger AMs based on a single year, a 2-year running average, and a 3-year running average of landings, respectively. **Alternatives 2A through 2C**, all use the single-year-based trigger as a start to trigger AMs but **Alternative 2A** would be based on the least amount of information and be susceptible to the largest level of uncertainty. If landings were extremely high one year because of resource abundance, while effort remained constant, the AM might be triggered although fish populations was not in jeopardy. On the other hand, if landings remained constant in the light of very high fishing effort, fish populations may decrease to dangerously low levels and no AMs would be triggered. Consequently, management based on a single year of information may have a high degree of error and may suffer the consequence of triggering AMs prematurely or not at all. Such an approach may not be reliable and could result in significant resource shortage or exacerbate overfishing conditions.

Alternative 2B represents a trigger based on a 2-year running average of landings rather than a single-year, so uncertainty, while still high, would be better than in **Alternative 2A**. **Alternative 2C** relies on 3-years of information rather than a single-year or only 2-years and would, therefore, be expected to provide the most reliable indicator that AMs need to be applied.

Alternatives 3A and **3B**, and **Alternative 3C**, are similar to **Alternatives 2A through 2C** but prior to triggering an AM based on a single-, 2-, or 3-year average of landings, scientific advice (from the SEFSC and the Council SSC) would be needed to determine whether the ACL was exceeded due to increased catches versus an improved data collection/monitoring effort. The addition of such a scientific review could result in a more reliable and defensible decision by the Council to take further management action by triggering an AM to redress ACL overages.

Action 7(b) **Alternative 1** would not apply AMs when the ACL is exceeded and, consequently, would not comply with MSA provisions. Therefore, the no action alternative is not a viable option when considering AMs. Reducing the length of the fishing season by the amount needed to pay back the overage, in addition to shortening the season length to prevent a future overage (**Alternative 3**), would likely have a greater biological benefit than only reducing the length of fishing season as specified in **Alternative 2**.

4.8 ACTION 8: Framework Measures

4.8.1 Action 8(a): Establish Framework Measures for Spiny Lobster FMP

Alternative 1: No Action. Do not establish framework measures for the Spiny Lobster FMP.

Alternative 2: Amend the framework procedures for the Spiny Lobster FMP to provide a mechanism to expeditiously adjust the following reference points and management measures through framework action:

a. Quota Requirements
b. Seasonal Closures
c. Area Closures
d. Fishing Year
e. Trip/Bag Limit
f. Size Limits
g. Gear Restrictions or Prohibitions
h. . Fishery Management Units (FMUs)
i. Total Allowable Catch (TAC)
j. Annual Catch Limits (ACLs)
k. Accountability Measures (AMs)
l. Annual Catch Targets (ACTs)
m. Maximum Sustainable Yield (MSY)
n. Optimum Yield (OY)
o. Minimum Stock Size Threshold (MSST)
p. Maximum Fishing Mortality Threshold (MFMT)
q. Overfishing Limit (OFL)
r. Acceptable Biological Catch (ABC) control rules
s. Actions to Minimize the Interaction of Fishing Gear with Endangered Species or Marine Mammals

Alternative 3: Amend the framework procedures for the Spiny Lobster FMP to provide the Council with a mechanism to expeditiously adjust a subset of management measures outlined in **Alternative 2**.

4.8.2 Action 8 (b): Establish Framework Measures for Corals and Reef Associated Plants and Invertebrates FMP.

Alternative 1: No Action. Do not amend the current framework measures for the Corals FMP.

Alternative 2: Amend the framework procedures for the Coral FMP to provide a mechanism to expeditiously adjust the following reference points and management measures through framework action:

a. Quota Requirements
b. Seasonal Closures
c. Area Closures
d. Fishing Year
e. Trip/Bag Limit
f. Size Limits
g. Gear Restrictions or Prohibitions
h. . Fishery Management Units (FMUs)
i. Total Allowable Catch (TAC)
j. Annual Catch Limits (ACLs)
k. Accountability Measures (AMs)
l. Annual Catch Targets (ACTs)
m. Maximum Sustainable Yield (MSY)
n. Optimum Yield (OY)
o. Minimum Stock Size Threshold (MSST)
p. Maximum Fishing Mortality Threshold (MFMT)
q. Overfishing Limit (OFL)
r. Acceptable Biological Catch (ABC) control rules
s. Actions to Minimize the Interaction of Fishing Gear with Endangered Species or Marine Mammals

Alternative 3: Amend the framework procedures for the Coral FMP to provide the Council with a mechanism to expeditiously adjust a subset of management measures outlined in **Alternative 2**.

Discussion for Action 8(a) and 8(b):

In order to modify regulations, the Council generally must follow the FMP amendment procedure, which takes longer to implement than if the Council had the availability of a framework process, which includes a pre-determined set of management measures that may modified through the framework actions. This amendment would modify the current framework procedures for the Coral FMP. The current framework measures for the coral reef resources allow the NOAA Fisheries Southeast Regioanl Administrator (RA) to modify Species for which management measures may be specified; prohibited species; harvest limitations, including quotas, trip, or daily landing limits; and gear restrictions. There are no framework measures in place for the Spiny Lobster FMP.. Framework measures can be implemented via regulatory amendments, which are implemented in a

shorter period than plan amendments because the procedural requirements are less extensive than for the full plan amendment process. In order to adjust ACLs and AMs via framework, those harvest parameters must be added to the existing framework procedure.

Action 8 lists the framework measures, which may be adjusted under a regulatory amendment. This discussion section describes a framework procedure and how each might be achieved. Such a procedure will provide the Council with a mechanism to make management changes in the Spiny Lobster and Coral FMP amendment process. Three alternatives are proposed for each of the Spiny Lobster and Coral FMPs. If **Alternative 1** of action 8(a) is selected no framework measures will be established for the Spiny Lobster FMP. If Alternative 1 of Action 8(b) is selected, the RA will have the ability to adjust only the limited management measures that are currently included in the Coral FMP framework. . **Alternative 2** of both actions, provides a substantial list of reference points and management measures that may be adjusted via a regulatory rather than a plan amendment. These options provide the Council with the flexibility to respond to changing conditions in a relatively rapid manner. **Alternative 3** allows the Council to select a subset of reference points and management measures to include in the framework.

Establish an assessment group and adjustments:
The following discussion outlines the procedure by which the Council may make management changes through regulatory amendment. As previously discussed, the purpose of frameworks and regulatory amendments is to provide the most responsive and efficient modifications to management measures. If an additional review process was included, there could be substantial delays, thus resulting in a longer lag time between identification of a problem and implementation of a response.

1. When the Council determines that management measures require modification, the Council will appoint an assessment group (Group) that will assess the condition of species in the corals and reef associated plants and invertebrates or spiny lobster management units (including periodic economic and sociological assessments as needed). The Group will present a report of its assessment and recommendations to the Council.

2. The Council may consider the report and recommendations of the Group and may hold public hearings at a time and place of the Council's choosing to discuss the Group's report. The Council may convene its SSC to provide advice prior to taking final action. After receiving public input, the Council will make decisions on the need for change.

3. If changes to management regulations are needed, the Council will advise the Regional Administrator (RA) in writing of its recommendations accompanied by the Group's report (where appropriate), relevant background material, draft regulations, Regulatory Impact Review, and public comments.

4. The RA will review the Council's recommendations, supporting rationale, public comments, and other relevant information. If the RA concurs that the Council's recommendations are consistent with the goals and objectives of the FMP, the national

standards, and other applicable laws, the RA will recommend that the Secretary of Commerce (Secretary) take appropriate regulatory action for the corals and reef associated plants and invertebrates or spiny lobster fisheries on such date as may be agreed upon with the Council.

5. Should the RA reject the recommendations, the RA will provide written reasons to the Council for the rejection, and existing measures will remain in effect until the issue is resolved.

6. Appropriate adjustments that may be implemented by the Secretary include:

   a. Specification of Maximum Sustainable Yield (MSY) or MSY proxy and subsequent adjustment where this information is available;

   b. Specification of an Acceptable Biological Catch (ABC) control rule and subsequent adjustment where this information is available;

   c. Specification of Total Allowable Catch (TAC) and subsequent adjustment where this information is available;

   d. Specification of Annual Catch Limits (ACLs) and subsequent adjustment;

   e. Specification of Accountability Measures (AMs) and subsequent adjustment;

   f. Specification of Optimum Yield (OY) and subsequent adjustment where this information is available;

   g. Specification of Minimum Stock Size Threshold (MSST) and subsequent adjustment;

   h. Specification of Maximum Fishing Mortality Threshold (MFMT) or Overfishing Level (OFL) and subsequent adjustment;

   i. Specification (or modification) of quotas (including zero quotas), trip limits, bag limits (including zero bag limits), minimum size limits, gear restrictions (ranging from modifying current regulations to a complete prohibition), season/area closures (including spawning closures), and fishing year;

   j. Initial specification and subsequent adjustment of biomass levels and age structured analyses.

Authority is granted to the RA to close any fishery, (i.e. revert any bag limit to zero and close any commercial fishery), once a quota has been established through the procedure described above and such quota has been filled.

If NOAA Fisheries decides not to publish the proposed rule of the recommended management measures, or to otherwise hold the measures in abeyance, then the RA must notify the Council of its intended action and the reasons for NOAA Fisheries' concern, along with suggested changes to the proposed management measures that would alleviate the concerns. Such notice shall specify: 1) The applicable law with which the amendment is inconsistent; 2) the nature of such inconsistencies; and 3) recommendations concerning the action that could be taken by the Council to conform the amendment to the requirements of applicable law.

4.8.3 Summary Comparison of Framework Measures Alternatives

Alternative 1 (No Action) for Action 8(a) would not establish framework procedures for the Spiny Lobster FMP, and Alternative 1 (No Action) under Action 8(b) would not augment the Coral FMP framework procedures to include NS1 harvest parameters. This would maintain the current procedure for modifying each FMP, potentially extending the time to achieve necessary changes relative to that provided for via a regulatory amendment.

Under **Alternative 2** for both Action 8(a) and 8(b) adjustments to everything listed within this alternative could be made with relative ease as new fishery and stock assessment information becomes available. However, it should be noted that formation of an assessment group and drafting of the assessment group report could potentially take a significant amount of time. Therefore, the potential does exist for regulatory amendments developed under the subject frameworks to take as long, or longer than development of FMP amendments. If the establishment of framework procedures for spiny lobster and modification to current framework procedures for corals, reef associated plants, and invertebrates does result in a more streamlined process for changing harvest parameters, **Alternative 2** would likely be biologically beneficial for those species. By establishing and modifying framework procedures to allow for periodic adjustments to various management measures, modifications could theoretically be effected in a timely manner to implement necessary changes in response to stock assessment results.

Alternative 3 under both Actions 8(a) and 8(b) would provide a framework procedure for spiny lobster and modify the current framework procedure for corals, reef associated plants, and invertebrates, but would not encompass all items that could be adjusted via framework specified under **Alternative 2.** Under **Alternative 3**, the Council may choose which management measures they want to allow modified through regulatory amendment. This list may include one management measure or multiple measures, depending on what the Council deems appropriate.

Alternative 1 would not support more efficient and effective management of the Spiny Lobster and Coral and Reef Associated Plants and Invertebrate fisheries. **Alternative 2** and **Alternative 3** would be expected to increase the efficiency and effectiveness of management change, potentially allowing less severe corrective action when necessary, or the quicker receipt of social and economic benefits associated with less restrictive and more responsive management. **Alternative 2** would provide a more complete framework than **Alternative 3** with which the Council can implement regulatory changes. However,

under both **Alternative 2** and **Alternative 3**, positive social and economic effects would be expected in the long term, relative to the no action alternative, from more timely management adjustments.

Alternative 1 is the no action alternative and would have no direct economic and social impacts. It would not establish a framework to authorize setting, adjusting, and implementing ACLs and AMs that could be deemed necessary to improve management of the resource, and hence, could indirectly result in lower long-term net economic and social benefits that derive from exploitation of the resources.

Because **Alternative 2** and **Alternative 3** would establish such a framework, it is expected that the indirect long-term net economic and social benefits of **Alternative 2** and **Alternative 3** would be larger than those of **Alternative 1**. The benefits of **Alternative 3** relative to **Alternative 2** would depend upon the subset of measures within **Alternative 3** that were chosen by the Council.

5.0 AFFECTED ENVIRONMENT

5.1 Physical Environment

The 2011 Caribbean ACL Amendment will set catch levels for those managed species not determined to be undergoing overfishing.. A full detailed description of the physical environment for the island groups in consideration in this amendment can be found in Section 5.1 of the 2010 Caribbean ACL Amendment that sets catch levels for species undergoing overfishing and are incorporated by reference. The 2010 Caribbean ACL public hearing draft amendment can be found at: http://www.regulations.gov/#!docketDetail;dct=FR+PR+N+O+SR;rpp=10;po=0;D=NOAA-NMFS-2010-0028, and is hereby incorporated by reference.

5.1.1 Geology

Detailed information about the geology of Puerto Rico and U.S. Virgin Islands (USVI) in this amendment can be found in Section 5.1.1 of the 2010 Caribbean ACL public hearing draft amendment and are incorporated by reference. The 2010 Caribbean ACL public hearing draft amendment can be found at: http://www.regulations.gov/#!docketDetail;dct=FR+PR+N+O+SR;rpp=10;po=0;D=NOAA-NMFS-2010-0028, and is hereby incorporated by reference.

5.1.2 Oceanography and Climate

Detailed information about the oceanography and climate of Puerto Rico and USVI in this amendment can be found in Section 5.1.2 of the 2010 Caribbean ACL public hearing draft amendment and are incorporated by reference. The 2010 Caribbean ACL public hearing draft amendment can be found at: http://www.regulations.gov/#!docketDetail;dct=FR+PR+N+O+SR;rpp=10;po=0;D=NOAA-NMFS-2010-0028, and is hereby incorporated by reference.

5.1.3 Major Habitat Types

Detailed information about the major habitat types of Puerto Rico and USVI for this amendment can be found in Section 5.1.3 of the 2010 Caribbean ACL public hearing draft amendment and are incorporated by reference. The 2010 Caribbean ACL public hearing draft amendment can be found at: http://www.regulations.gov/#!docketDetail;dct=FR+PR+N+O+SR;rpp=10;po=0;D=NOAA-NMFS-2010-0028, and is hereby incorporated by reference.

5.2 Biological Environment

Detailed information about the biology of the species considers in this amendment can be found in Section 5.1.1 and 5.2.2 of the 2010 Caribbean ACL public hearing draft amendment and are incorporated by reference. The 2010 Caribbean ACL public hearing draft amendment can be found at: http://www.regulations.gov/#!docketDetail;dct=FR+PR+N+O+SR;rpp=10;po=0;D=NOAA-NMFS-2010-0028, and is hereby incorporated by reference.

5.2.1 Species Most Impacted by this FMP Amendment

Species most likely to be impacted by actions in the Comprehensive ACL Amendment include species in the reef fish, corals and associated plants and invertebrates, conch, and spiny lobster fishery units not identified as undergoing overfishing (Table 1). A complete description of the life history characteristics of these species can be found in Section 5.2 Biological Environment of the 2005 Comprehensive Amendment to the FMPs of the U.S. Caribbean (CFMC 2005) available at http://caribbeanfmc.com/SCANNED%20FMPS/06%20FINAL%20SFA%20-%20MAY%2003,2005/SFA-FMP.htm

5.2.2 Protected Species, Including Threatened and Endangered Species

Detailed information about the protected species, including threatened and endangered species of Puerto Rico and USVI for this amendment can be found in Section 5.2.3 of the 2010 Caribbean ACL Amendment that can be found at: http://www.regulations.gov/#!documentDetail;D=NOAA-NMFS-2010-0028-0002,, and is hereby incorporated by reference.

5.3 Description of the Economic and Social Environment

5.3.1 Introduction

The fisheries of Puerto Rico and the USVI provide food, livelihoods and income to Puerto Ricans and U.S. Virgin Islanders. The two territories' commercial fisheries have been characterized as "artisanal" because their commercial fishing vessels tend to be less than (and commonly much less than) 45 feet long, have small crews, participate in multiple fisheries, and yield smaller revenues and/or their seafood processors are small-scale producers. Fishing vessel permits are not required to commercially harvest any species in federal waters of the U.S. Caribbean. More information about the general economic and social characteristics of the Puerto Rico and USVI commercial, recreational and subsistence fisheries can be found in the Description of the Fisheries and descriptions of the social and economic environments for Puerto Rico and USVI in the 2010 ACLs Amendment PHD and are incorporated by reference.

5.3.2 Puerto Rico Commercial Fisheries

5.3.2.1 Reported and adjusted commercial landings

Puerto Rico Law Number 278 of November 29, 1998, authorized the Puerto Rico Department of Natural and Environmental Resources (PR-DNER) to require commercial fishers to report commercial fishing statistics; however, the implementing regulation (Fishing Regulation 6768 that established a trip-ticket system) did not occur until March 11, 2004 (SEDAR 2007: 11). As an incentive to encourage voluntary reporting, fishers received discounted mooring fees if they submitted their catch records, and they did. However, the 2004 reporting requirement has met much resistance. Other regulations have also motivated commercial fishers not to report their landings and engage in other acts of civil disobedience (Kirkley et al. 2008).

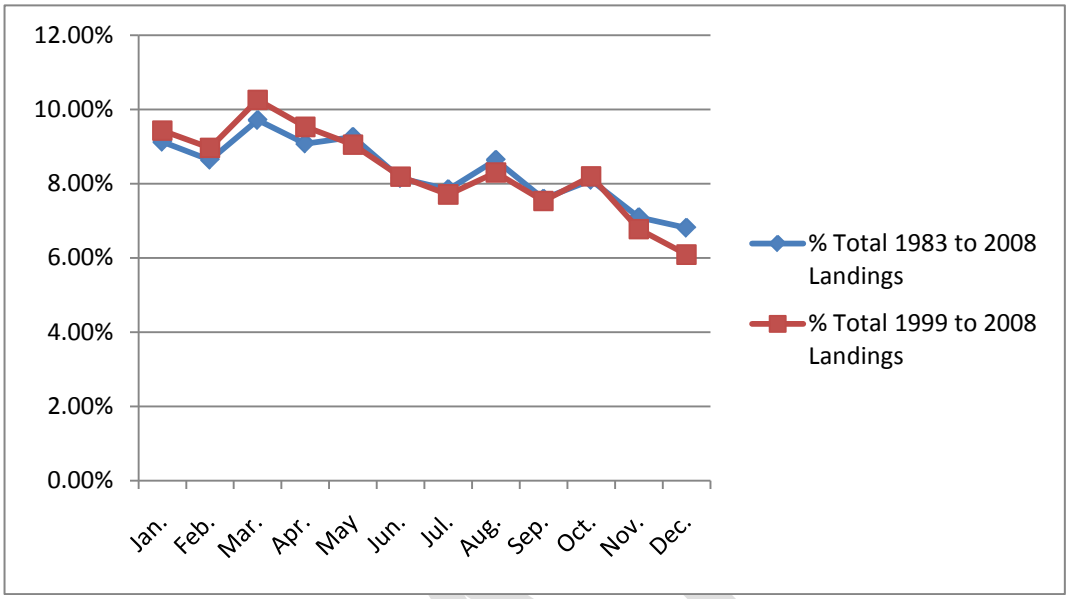
Various methods have been used to adjust the voluntary (before March 11, 2004) and compulsory (since March 11, 2004) reported landings in Puerto Rico in order to generate a more accurate account of commercial fishing activity (Matos-Caraballo 2001, 2007). Without such an adjustment, the significance of existing commercial fishing activity and its impacts on local fisheries and economies would be underestimated and understated. Thus, adjustment (or expansion) factors have been developed and applied to voluntarily reported landings and required trip-ticket reported landings in order to generate more accurate estimates of commercial landings for Puerto Rico's fisheries, including the five fisheries experiencing overfishing. Adjustment factors are used are to estimate actual commercial landings by weight and value in Puerto Rico for the analysis of economic and social impacts of this amendment (Table 5.3.1). Note that the adjustment (expansion) factors are the same for each year's landings by weight and dollars. The table compares reported and adjusted landings according to updated NOAA Fisheries' Southeast Fisheries Science Center (SEFSC) data and that reported in the 2010 ACLs Amendment PHD.

Table 5.3.1. Reported and adjusted (expanded) annual commercial landings (pounds) and adjustment factors, 1983-2009. Sources: SEFSC updated data and 2010 ACLs Amendment.

Year	Pounds (2011 Updated Figures)			Pounds (2010 ACLs Amendment)		
	Reported	Expanded (Adjusted)	Average Exp.(Adj.) Factor	Reported	Expanded (Adjusted)	Average Exp.(Adj.) Factor
1983	3,916,688	6,421,617	1.6396	3,916,688	6,420,800	1.6393
1984	3,154,298	5,346,203	1.6949	3,154,298	5,346,268	1.6949
1985	2,855,085	5,099,979	1.7863	2,855,085	5,098,366	1.7857
1986	2,535,417	3,380,625	1.3334	2,535,388	3,380,517	1.3333
1987	2,082,933	2,777,100	1.3333	2,081,941	2,775,921	1.3333
1988	2,014,697	3,599,614	1.7867	2,013,663	3,595,827	1.7857
1989	2,291,221	4,494,815	1.9618	2,290,865	4,491,892	1.9608
1990	2,180,841	4,278,429	1.9618	2,179,705	4,273,931	1.9608
1991	2,459,904	4,825,963	1.9619	2,458,664	4,820,910	1.9608
1992	2,045,294	3,408,973	1.6667	2,043,970	3,406,616	1.6667
1993	2,496,521	4,160,833	1.6667	2,495,161	4,158,601	1.6667
1994	2,710,947	4,238,381	1.5634	2,708,878	4,232,622	1.5625
1995	3,689,885	5,193,718	1.4076	3,687,686	5,193,924	1.4085
1996	3,583,128	5,042,921	1.4074	3,581,209	5,043,956	1.4085
1997	3,805,891	4,879,384	1.2821	3,804,030	4,876,962	1.2821
1998	3,455,082	4,429,709	1.2821	3,452,976	4,426,892	1.2821
1999	3,329,448	4,268,443	1.2820	3,325,991	4,264,092	1.2821
2000	3,275,083	5,751,494	1.7561	3,244,005	5,691,236	1.7544
2001	3,391,241	4,986,359	1.4704	3,387,748	4,981,983	1.4706
2002	3,274,578	3,805,677	1.1622	3,271,960	3,804,605	1.1628
2003	2,390,998	4,237,780	1.7724	2,387,974	4,230,409	1.7715
2004	1,867,511	4,011,819	2.1482	1,864,679	4,002,550	2.1465
2005	1,569,189	6,087,158	3.8792	1,440,024	5,725,259	3.9758
2006	1,341,420	2,419,224	1.8035	1,311,981	2,380,695	1.8146
2007	1,256,664	2,200,783	1.7513	1,254,156	2,198,377	1.7529
2008	1,266,232	3,400,660	2.6857			
2009	1,155,414	2,937,243	2.5422			

Historically, commercial landings in Puerto Rico have been at their highest during the months of March and April, which coincides with the Christian season of Lent. This increase is illustrated in Figure 5.3.1.

Figure 5.3.1. Percent of total reported landings by month, 1983 to 2008.



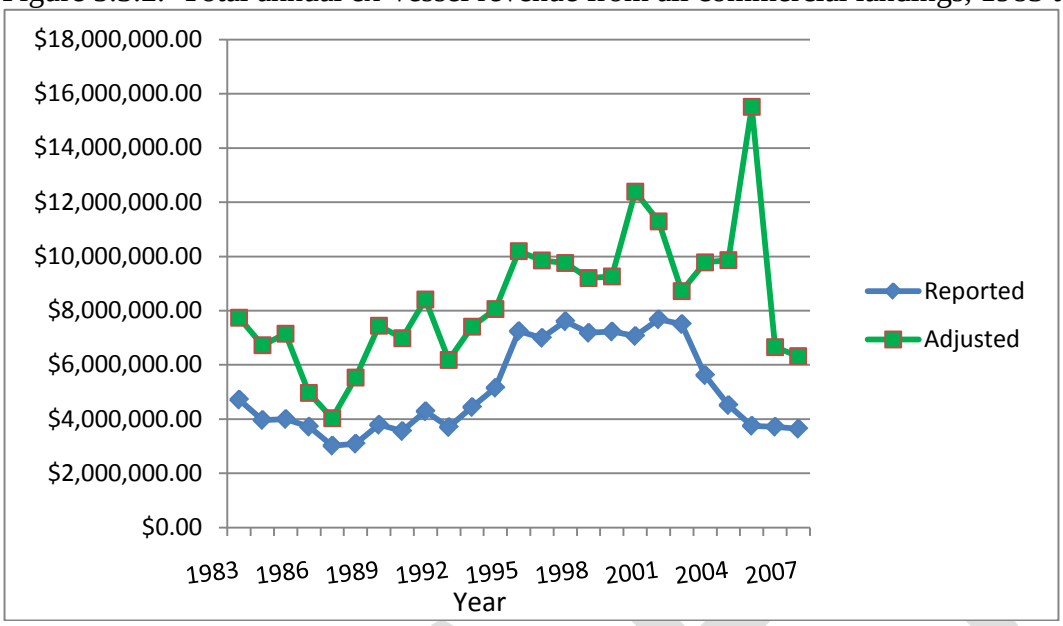
5.3.2.2 Puerto Rico Combined Finfish and Invertebrate Commercial Landings

Finfish landings account for the majority of Puerto Rico's annual commercial landings, representing from 73 percent to 87 percent of annual reported landings of all species (in pounds) from 1983 to 2009. However, the proportion of all reported commercial landings attributed to invertebrate landings has increased over this 25-year period as a result of declining finfish landings (Table 5.3.11). From 1983 to 2003, reported and adjusted invertebrate landings represented approximately 17 percent of annual landings on average, whereas from 2004 to 2009, they represented, on average, 26 percent of reported and 23 percent of adjusted annual landings. The reported value of commercial landings peaked at approximately $7.68 million in 2001 (adjusted to $11.29 million) and declined to approximately $3.65 million (adjusted to $6.32 million) in 2007 (Figure 5.3.2).

Table 5.3.2. Adjusted annual commercial landings of finfish and invertebrate landings, 1983 to 2009, updated and 1983 to 2007 from 2010 ACLs Amendment data.

Year	Adjusted Pounds (updated data)			Adjusted Pounds (2010 ACLs data)		
	Finfish	Invertebrates	% Finfish	Finfish	Invertebrates	% Finfish
1983	5,194,182	1,227,435	80.89%	5,193,583	1,227,216	80.89%
1984	4,311,374	1,034,829	80.64%	4,311,391	1,034,876	80.64%
1985	4,141,547	958,432	81.21%	4,140,207	958,159	81.21%
1986	2,823,787	556,838	83.53%	2,823,720	556,797	83.53%
1987	2,362,335	414,765	85.06%	2,361,536	414,385	85.07%
1988	2,888,193	711,421	80.24%	2,885,366	710,511	80.24%
1989	3,766,661	728,154	83.80%	3,764,336	727,556	83.80%
1990	3,677,967	600,462	85.97%	3,674,407	599,524	85.97%
1991	4,142,072	683,891	85.83%	4,137,999	682,911	85.83%
1992	2,960,998	447,975	86.86%	2,958,902	447,714	86.86%
1993	3,559,593	601,240	85.55%	3,557,855	600,747	85.55%
1994	3,603,678	634,703	85.02%	3,599,259	633,363	85.04%
1995	4,440,372	753,346	85.50%	4,440,924	753,003	85.50%
1996	4,215,779	827,142	83.60%	4,217,090	826,870	83.61%
1997	4,136,315	743,069	84.77%	4,134,807	742,156	84.78%
1998	3,630,177	799,532	81.95%	3,628,313	798,580	81.96%
1999	3,495,295	773,148	81.89%	3,492,140	771,953	81.90%
2000	4,686,154	1,065,340	81.48%	4,633,117	1,058,122	81.41%
2001	4,128,594	857,765	82.80%	4,125,735	856,251	82.81%
2002	3,127,017	678,660	82.17%	3,126,522	678,084	82.18%
2003	3,435,255	802,525	81.06%	3,429,955	800,455	81.08%
2004	3,070,520	941,299	76.54%	3,064,287	938,265	76.56%
2005	4,478,380	1,608,778	73.57%	4,199,370	1,525,889	73.35%
2006	1,847,459	571,765	76.37%	1,812,117	568,579	76.12%
2007	1,621,312	579,471	73.67%	1,620,054	578,324	73.69%
2008	2,774,850	625,810	81.60%			
2009	2,377,898	559,345	80.96%			

Figure 5.3.2. Total annual ex-vessel revenue from all commercial landings, 1983 to 2009.



Finfish landings also represent the majority of the ex-vessel revenue from commercial landings, although the contribution has declined since peaking in 1993. In 2007, finfish landings accounted for 55.2 percent of reported and 56.5 percent of adjusted ex-vessel revenues from all commercial landings. Finfish landings tend to be highest during the Christian season of Lent and lowest from October to December. August finfish landings increased in significance from approximately 8 percent of annual finfish landings in 1999 to 11 percent of annual landings in 2008. Preliminary results for 2009 suggest August landings represented approximately 6 percent of all finfish landings that year. Invertebrate commercial landings tend to be at their lowest during the months of July, August and September and highest in March or October.

5.3.2.3 Commercial Fisheries directly affected by amendment

5.3.2.3.1 Spiny lobster commercial fishery

The spiny lobster FMU is composed of one species, Caribbean spiny lobster (*Panulirus argus*). On average, annual landings of Caribbean spiny lobster represent approximately 49 percent of all invertebrate landings (Table 5.3.3). Commercial Caribbean spiny lobster landings have shown a generally decreasing trend. One explanation for such a trend is the decreasing use of traps and pots, which are gears that require a significant amount of a fisher's time to build, repair, and maintain. Traps and pots also require land to store them, which is increasingly limited by privatization of the shoreline.

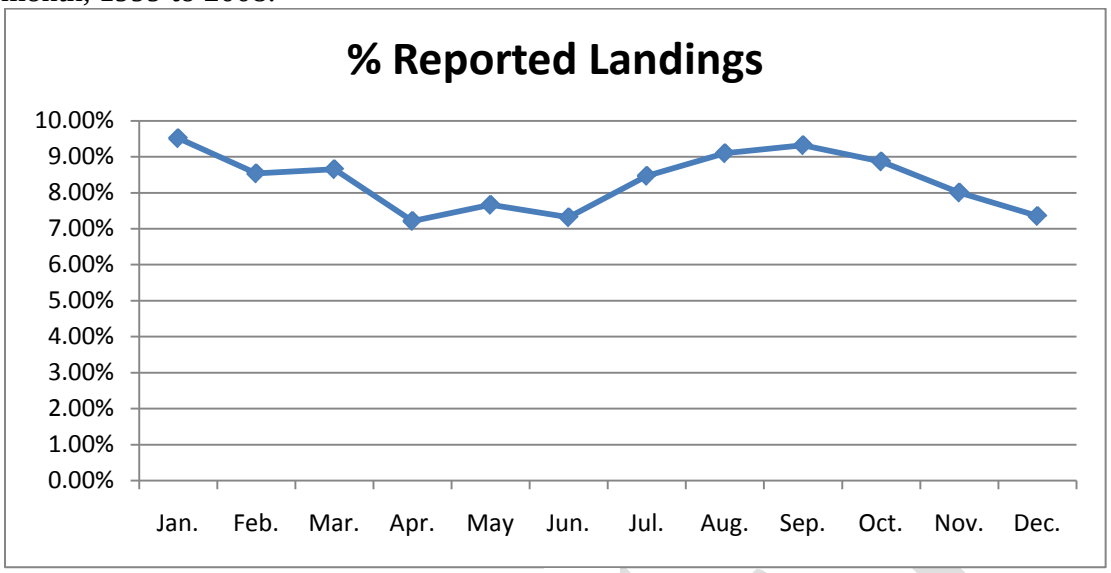
Table 5.3.3. Commercial landings (pounds) of Caribbean Spiny Lobster, 1999 to 2009.

Year	Pounds			
	Reported	Adjusted	Average Adjustment Factor	% Adjusted Invertebrates
1999	327,560	419,968	1.28	54.32%
2000	259,138	455,169	1.76	42.73%
2001	281,511	413,838	1.47	48.25%
2002	301,081	349,833	1.16	51.55%
2003	242,600	396,192	1.63	49.37%
2004	213,077	476,540	2.24	50.63%
2005	173,445	773,732	4.46	48.09%
2006	169,722	276,899	1.63	48.43%
2007	160,708	270,614	1.68	46.70%
2008	167,701	329,238	1.96	52.61%
2009	159,121	304,431	1.91	54.43%
Ave. 1999-2008	229,654	416,202	1.81	48.94%
Ave. 1999-2003	282,378	407,000	1.44	48.71%
Ave. 2004 - 2008	176,931	425,405	2.40	49.16%
Ave. 2006 to 2008	166,044	292,250	1.76	49.34%

The average price of spiny lobster varied from $5.10 to $6.09 per pound from 1999 to 2008. Preliminary data suggests an average price of $6.13 per pound in 2009. In the February 9, 2011, scoping meeting, a public comment was made that suggests there are recreational spiny lobster fishermen, particularly those that fish during weekends, who sell their lobsters to restaurants at prices below their commercial counterparts.

Commercial landings of Caribbean spiny lobster tend to show no strong seasonal trend; however, in 2005 and 2006, landings were significantly higher from July to September than in other months (Figure 5.3.3). Typically the lowest landings occur in December, but in 2009, October had the lowest landings.

Figure 5.3.3. Percent of total reported commercial landings of Caribbean Spiny Lobster by month, 1999 to 2008.



After 2006, more than half of all reported landings (pounds) of Caribbean spiny lobster were harvested using diving outfits (Table 5.3.4). Pots and traps represented 62 percent in landings in 2005, but then dropped to less than 38 percent after that year. Trammel net landings also decreased in significance. The use of combined gears to harvest the species increased substantially in 2009. Other gears accounted for no more than approximately 2 percent of landings after 2001.

Table 5.3.4. Average percent of adjusted annual commercial landings (pounds) of Caribbean Spiny Lobster by gear(s), 1999 to 2009.

Gear	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Average
Diving	39.9%	49.7%	47.3%	49.4%	40.9%	44.1%	34.3%	48.0%	60.8%	63.9%	52.9%	48.3%
Fish Pots & Traps	39.8%	36.3%	35.8%	36.1%	40.1%	29.6%	41.6%	32.2%	25.4%	20.3%	21.4%	32.6%
Lobster Pots & Traps	9.2%	7.3%	11.4%	10.7%	11.3%	21.0%	20.8%	14.4%	10.1%	11.1%	16.1%	13.0%
Trammel Nets	7.1%	3.0%	2.0%	1.6%	6.1%	3.5%	1.3%	2.9%	2.0%	2.5%	1.2%	3.0%
Combined Gears	0.0%	0.1%	0.3%	0.5%	0.1%	0.2%	0.7%	1.2%	0.4%	0.2%	7.7%	1.0%
Subtotal	96.0%	96.4%	96.8%	98.3%	98.5%	98.4%	98.6%	98.7%	98.6%	97.9%	99.2%	98.0%
Other	4.0%	3.6%	3.2%	1.7%	1.5%	1.6%	1.4%	1.3%	1.4%	2.1%	0.8%	2.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

There are more landings of spiny lobster on the west coast than any other coast. From 2004 to 2006, for example, the west coast accounted for approximately 47 percent of annual landings each year. The south coast ranks second in annual landings, followed by the east and north coasts. This is not to suggest, however, that lobster landings are not important to any of the municipalities along the east or north coast. Lobster was the most landed species in the north coast municipality of Isabela from 1998 to 2003, representing approximately 21 percent of all landings (Table 5.3.5). Lobster was the most landed species in 11 municipalities, and six of these municipalities are on the south coast. Lobster was the second most landed species in five municipalities and the third most landed species in four municipalities.

Table 5.3.5. Municipalities where lobster landings represent one of the top three commercial species landed, 1993 to 2003. Source: Griffith et al. 2007.

Lobster Landings			
Coast	**Municipality**	**% Total Landings**	**Rank Lobster**
North	**Arecibo**	8.0	3rd
	Isabela	20.7	1st
South	**Arroyo**	10.4	2nd
	Guánica	14.0	1st
	Guayama	9.0	1st
	Juana Diaz	32.2	1st
	Lajas	8.2	1st
	Patillas	11.8	1st
	Peñuelas	26.0	1st
	Salinas	9.0	3rd
	Santa Isabel	9.3	2nd
East	**Ceiba**	7.7	2nd
	Culebra	15.4	2nd
	Fajardo	7.7	2nd
	Humacao	13.7	1st
	Maunabo	9.3	3rd
	Naguabo	18.7	1st
	Vieques	15.4	1st
West	**Añasco**	6.0	3rd
	Cabo Rojo	17.8	1st

3.2.3.2a Queen conch and other conch commercial fisheries

There are nine species in the Queen Conch FMU: queen conch, milk conch (*Strombus costatus*), West Indian fighting conch (*S. pugilis*), roostertail conch (*S. gallus*), hawkwing conch (*S. raninus*), true tulip (*Fasciolaria tulipia*), Atlantic triton's trumpet (*Charonia variegate*), cameo helmet (*C. madagascarensis*), and green star shell (Astrea tuber). Originally, flame helmet (*Cassis flammea*), Caribbean helmet (*C. tuberosa*), West Indian top shell or whelk (*Cittaerium pica*), and Caribbean vase (*Vasum muricatum*) were in the FMU, but they were removed in 2005. All but queen conch are presently in a data-collection status only. The proposed 2011 amendment would not have a direct impact on queen conch fishing because the ACL for that fishery is established in the 2010 ACL Amendment PHD.

Over the 10-year period from 1999 to 2008, reported conch landings ranged from 131,409 pounds to 281,378 pounds (Table 5.3.6). Puerto Rico's reporting form specifies conch and whelk. In the description of the queen conch fishery and corresponding analysis for the 2010 ACL Amendment, all conch landings were assumed to be queen conch landings and that assumption is continued here. Therefore, the remainder of the description of the commercial conch fishery is incorporated by reference (see 2010 ACL Amendment PHD).

Table 5.3.6. Commercial landings (pounds) of conch, 1999 to 2009.

Year	Pounds	
	Reported	**Adjusted**
1999	214,100	274,492
2000	281,378	493,706
2001	244,947	360,208
2002	235,697	274,054
2003	188,164	346,996
2004	216,192	378,094
2005	195,701	733,224
2006	153,684	242,242
2007	144,429	258,738
2008	131,409	240,220
2009	122,936	207,961

5.3.2.3.3 Coral and reef associated plants and invertebrates commercial fisheries

The Fishery Management Plan (FMP) for corals and reef-associated plants and invertebrates includes over 100 species of coral (including stony corals, sea fans and gorgonians) and over 60 species of plants (including seagrasses) and invertebrates. Corals and coral reefs are important habitats for reef fishes, conch and lobster and are popular sites for fishing, diving, snorkeling, and viewing from glass bottom boats. Presently, extraction and possession of any hydrocorals, anthozoans, gorgonian corals, hard corals, black corals and sea grasses, alive or dead (including live rock) that are included in the

FMU are prohibited in the U.S. Caribbean exclusive economic zone (EEZ) unless a permit for scientific research, education and/or restoration is obtained. The same prohibition applies in territorial waters of Puerto Rico.

The FMU is divided into two parts: those species harvested commercially predominantly for the marine aquarium trade and those species that are not so harvested. The invertebrate species, particularly live rock, have been highly valued by aquarists because live rock is used to establish 'living reef' or 'mini-reef' systems, generally in private aquaria, or as a substrate 'base' in aquaria. The following eight invertebrate species are also targeted for the aquarium trade: snapping shrimp (*Alpheus armatus*), emerald crab (*Mithrax sculptus*), olive snail (*Oliva reticularis*), cushion sea star or West Indies starfish (*Oreaster reticulatus*), banded shrimp (*Stenopus hispidus*), golden shrimp (*S. scutellatus*), yellow arrow crab (*Stenorhynchus seticornis*), and anemone shrimp (*Thor amboinensis*).

According to LeGore et al. (2005), collection of invertebrates for the aquarium trade usually occurs in shallow waters from half to two meters deep in seagrass and mangrove habitats. Therefore, it is presumed that the marine invertebrate fishery does not extend into federal waters off Puerto Rico.

5.3.2.3.4 Reef Fish

The 2010 ACLs Amendment concerned the following units/subunits within the Caribbean Reef Fish FMU: Snapper Units 1, 2, 3 and 4; Sea basses and Grouper, and Parrotfishes. This amendment concerns the remainder of the FMU: Grunts, Goatfishes, Porgies, Squirrelfishes, Tilefishes, Jacks, Surgeonfishes, Triggerfishes, Filefishes, Boxfishes, Wrasses, and Angelfishes.

Commercial Grunt Fisheries

The following species are in the Grunt Unit: white grunt (*Haemulon plumier*), margate (*H. album*), tomtate (*H. aurolineatum*), bluestriped grunt *(H. sciurus*), French grunt (*H. flavolineatum*), and porkfish (*Anisotremus virginicus*). From 1999 to 2009, reported commercial annual landings of white grunt, margate, tomtate, bluestriped grunt, French grunt, and porkfish varied from 32,006 to 152,884 pounds, while adjusted landings ranged from 66,602 to 224,761 pounds annually (Tables 5.3.7 and 5.3.8). White grunt accounts for 99 percent of each year's total grunt landings. It is possible that some landings of the above Grunt Unit species may have been reported in other categories; however, landings outside the above six species categories are not included in the totals for the Unit below. If other grunt landings are considered, total Unit landings represent at least 99.8 percent of all annual grunt landings and, on average, represent 99.90 percent of annual landings from 1999 to 2005 and 99.97 percent from 2006 to 2008.

Table 5.3.7. Reported annual pounds of commercial Grunt Unit landings, 1999 to 2009.

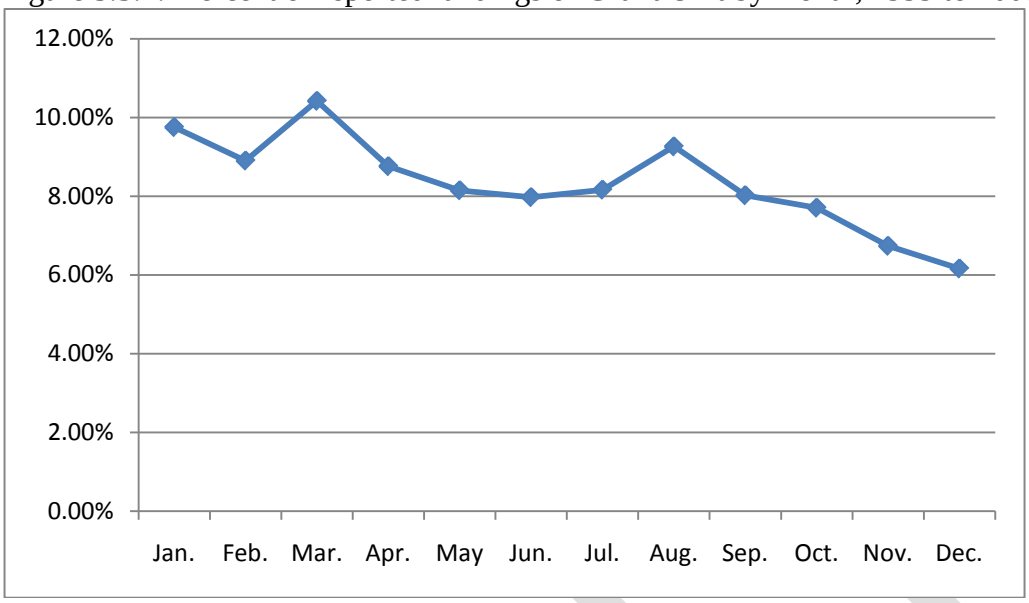
Species	Reported Pounds										
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
White Grunt	117,124	117,293	152,442	147,179	107,620	89,357	53,701	51,742	35,097	32,006	37,169
Margate	990	864	437	27	0	18	32	0	363	0	8
Tomtate	0	0	0	0	0	0	0	0	0	0	0
Bluestriped Grunt	109	12	5	53	100	0	0	0	0	228	0
French Grunt	0	0	0	0	0	0	0	0	0	0	0
Porkfish	0	0	0	0	0	8	0	0	0	0	0
Grunt Unit Total	118,223	118,169	152,884	147,259	107,720	89,383	53,733	51,742	35,460	32,234	37,177

Table 5.3.8. Adjusted annual pounds of commercial Grunt Unit landings, 1999 to 2009.

Species	Adjusted Pounds										
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
White Grunt	150,154	206,141	224,111	224,111	185,303	212,076	297,964	92,884	66,077	71,779	78,652
Margate	1,268	1,516	643	31	0	67	175	0	525	0	14
Tomtate	0	0	0	0	0	0	0	0	0	0	0
Bluestriped Grunt	139	21	7	61	150	0	0	0	0	530	0
French Grunt	0	0	0	0	0	0	0	0	0	0	0
Porkfish	0	0	0	0	0	12	0	0	0	0	0
Grunt Unit Total	151,561	207,678	224,761	224,203	185,453	212,155	298,139	92,884	66,602	72,309	78,666

Monthly reported landings of the Grunt Unit species, particularly white grunt, show an annual trend with increases in January, March and August, and significant declines in November and December (Figure 5.3.4). The spike in March corresponds with general increases in landings and demand for seafood during the Christian season of Lent.

Figure 5.3.4. Percent of reported landings of Grunt Unit by month, 1999 to 2008.



The top four gears to harvest grunt are fish pots and traps, gill nets, hand lines and trammel nets (Table 5.3.9). Collectively, they accounted for 91 percent of annual landings of the Grunt Unit from 1999 to 2008. Diving is increasing as a means of harvesting grunt, especially since 2006.

Table 5.3.9. Percent of commercial landings of white grunt by gear, 1999 to 2008.

Gear	Share of Total Landings
Fish Pots & Traps	36.98%
Gill Nets	23.45%
Trammel Nets	13.84%
Hand Lines	16.76%
Long Haul Seines	5.58%
Diving	1.82%
Other Gears	1.56%
Total	100.00%

Commercial Angelfish Fishery

The following three species make up the Angelfish Unit: queen angelfish (*Holacanthus ciliaris*), gray angelfish (*Pomacanthus arcuatus*), and French angelfish (*Pomacanthus paru*). Over the 10-year period from 1999 to 2008, an average of 63 pounds (adjusted) were commercially landed annually; however, there have been no commercial landings of these species since 2003 (Table 5.3.10). All of the gray angelfish landings and approximately 32 percent of queen angelfish landings were caught in fish pots and traps. Diving accounted for approximately 68 percent of the remaining queen angelfish landings.

Table 5.3.10. Commercial landings (pounds) of the Angelfish Unit, 1999 to 2009.

Year	Reported Pounds				Adjusted Pounds			
	Queen	Gray	French	Total	Queen	Gray	French	Total
1999	0	0	0	0	0	0	0	0
2000	4	343	0	347	7	604	0	611
2001	0	0	0	0	0	0	0	0
2002	13	0	0	13	15	0	0	15
2003	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0

Boxfishes

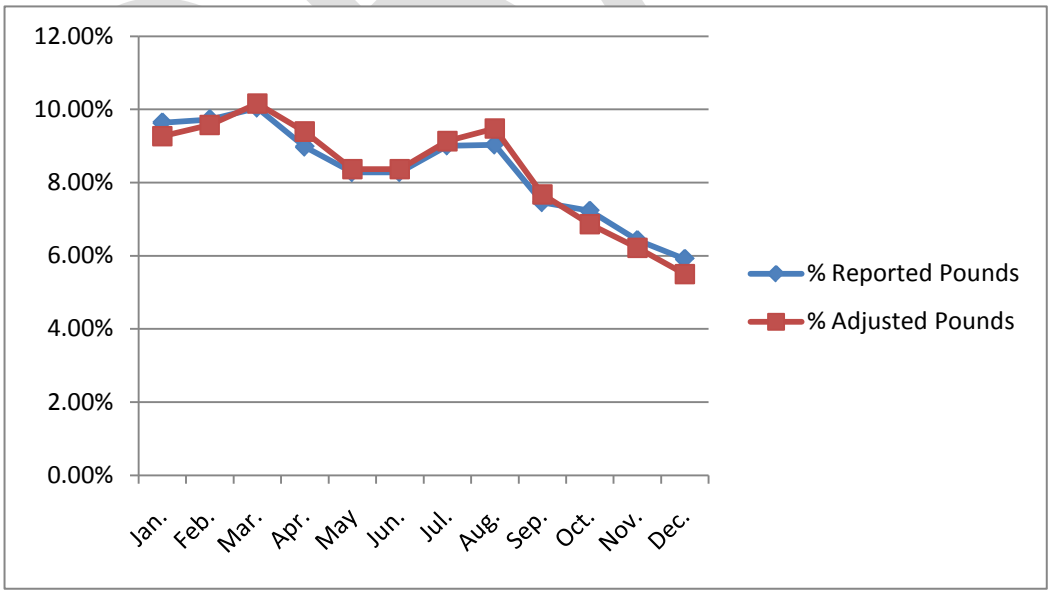
The Boxfishes Unit is composed of honeycomb cowfish (*Lactophrys polygonia*), Scrawled cowfish (*L. trigonus*), spotted trunkfish (*L. bicaudalis*), and smooth trunkfish (*L. triqueter*). The reporting form has categories for honeycomb cowfish and trunkfish, but all to almost all of annual landings are reported in the broad category of boxfishes. From 1999 to 2008, total annual reported landings of boxfishes ranged from 30,156 pounds to 83,854 pounds (Table 5.3.11).

Table 5.3.11. Commercial landings (Pounds) of boxfishes, 1999 to 2009.

Year	Reported Pounds				Adjusted Pounds			
	Honeycomb Cowfish	Trunk-fish	Boxfishes	Total	Honeycomb Cowfish	Trunk-fish	Boxfishes	Total
1999	0	175	83,758	83,933	0	226	107,420	107,646
2000	0	0	83,854	83,854	0	0	147,349	147,349
2001	0	505	75,881	76,386	0	742	111,590	112,332
2002	5	1	79,119	79,125	6	1	91,886	91,893
2003	0	0	58,654	58,654	0	0	102,471	102,471
2004	0	4	52,410	52,414	0	6	114,361	114,367
2005	0	0	44,654	44,654	0	0	196,613	196,613
2006	0	0	40,057	40,057	0	0	60,206	60,206
2007	0	0	31,931	31,931	0	0	50,527	50,527
2008	0	0	30,156	30,156	0	0	51,235	51,235
2009	0	0	31,199	31,199	0	0	52,048	52,048

Monthly landings of boxfishes have the same general trend as grunts and landings as a whole. There are increases in March and August and a sharp decline at the end of the calendar year (Figure 5.3.5).

Figure 5.3.5. Percent of commercial landings (pounds) of boxfishes by month, 1999 to 2008.



The two top means to harvest boxfishes are fish pots and traps and diving (Table 5.3.12). Together the two represented from approximately 72 percent to 84 percent of annual landings from 1999 to 2008. Trammel and gill nets rank third and fourth, respectively by landings.

Table 5.3.12. Percent of annual reported landings of boxfish by gear, 1999 to 2008.

Gear	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Fish Pots & Traps	67.14%	66.10%	69.57%	68.74%	74.79%	61.76%	54.12%	47.50%	54.41%	45.70%
Diving	10.48%	10.08%	10.17%	12.37%	9.61%	21.73%	23.45%	24.22%	22.47%	31.62%
Trammel Nets	11.28%	10.40%	3.86%	2.59%	3.34%	5.08%	5.21%	14.46%	10.77%	10.26%
Gill Nets	5.83%	6.56%	8.45%	8.93%	5.30%	4.61%	3.61%	2.98%	3.83%	5.56%
Hand Lines	4.14%	4.05%	4.16%	3.60%	3.26%	1.78%	4.82%	6.07%	4.58%	4.01%
Lobster Pots & Traps	0.78%	0.59%	0.69%	0.78%	1.30%	2.62%	7.50%	3.89%	2.59%	2.23%
Other Gears	0.35%	2.21%	3.09%	3.00%	2.39%	2.43%	1.29%	0.88%	1.34%	0.64%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Goatfishes

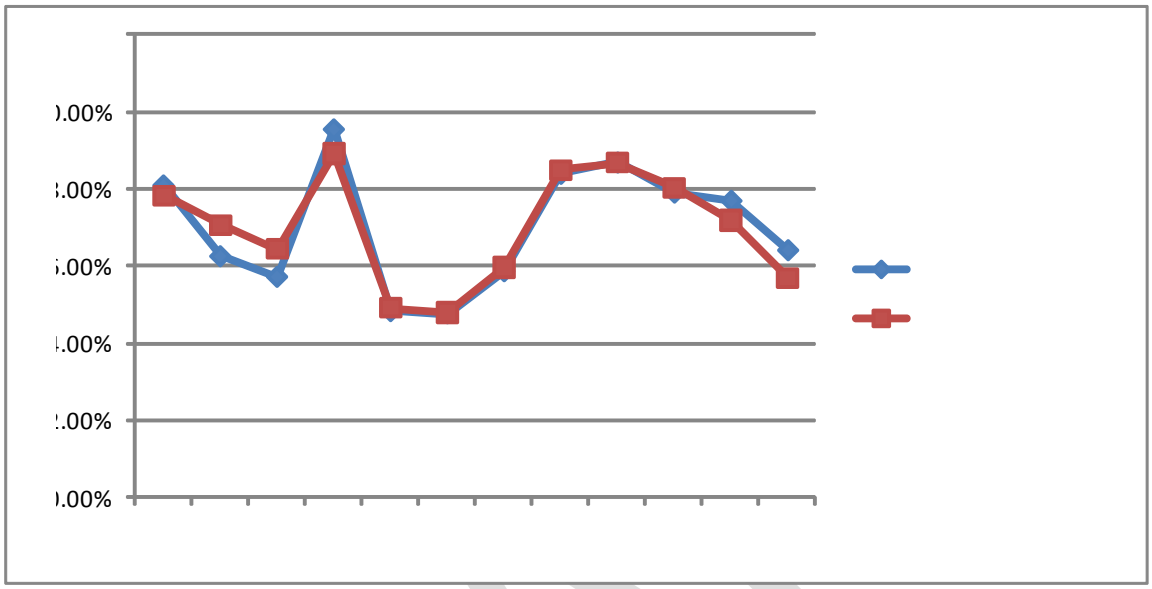
Two species make up the Goatfish Unit: spotted goatfish (*Pseudopeneus maculatus*) and yellow goatfish (*Mulloidichthys martinicus*). Spotted goatfish tend to dominate landings of the Unit. From 1999 to 2008, spotted goatfish represented from 68 percent to 87 percent of annual landings of the Unit (Table 5.3.13). Annual landings of the Goatfish Unit have declined substantially since 1999: from 26,206 reported pounds to 2,483 reported pounds in 2008. Commercial fishers also reported landings of unclassified or unspecified goatfishes, which averaged to 44 pounds annually.

Table 5.3.13. Commercial landings (Pounds) of goatfish, 1999 to 2009.

Year	Reported Pounds					Adjusted Pounds				
	Spotted	Yellow	Total Unit	Goatfishes	All	Spotted	Yellow	Total Unit	Goatfishes	All
1999	22,340	3,866	26,206	0	26,206	28,636	4,966	33,602	0	33,602
2000	16,108	4,500	20,608	103	20,711	28,337	7,936	36,273	181	36,454
2001	15,921	6,158	22,079	75	22,154	23,434	9,039	32,473	111	32,584
2002	13,357	5,516	18,873	141	19,014	15,507	6,393	21,900	163	22,063
2003	8,677	4,092	12,769	31	12,800	11,298	6,494	17,792	67	17,859
2004	6,806	1,432	8,238	32	8,270	15,595	4,141	19,736	47	19,783
2005	4,783	1,137	5,920	27	5,947	42,622	5,756	48,378	36	48,414
2006	3,913	789	4,702	27	4,729	8,882	1,700	10,582	27	10,609
2007	2,363	716	3,079	0	3,079	6,268	1,509	7,777	0	7,777
2008	2,152	331	2,483	0	2,483	4,579	627	5,206	0	5,206
2009	2,337	33	2,370	33	2,403	4,950	49	4,999	49	5,048
Total 99 - 08	96,420	28,537	124,957	436	125,393	185,158	48,561	233,719	632	234,351
Ave. 99 - 08	9,642	2,854	12,496	44	12,539	18,516	4,856	23,372	63	23,435

Goatfish landings tend to spike in April and again in August and September (Figure 5.3.5). Like the other fisheries discussed in this document, landings decline at the end of the calendar year.

Figure 5.3.5. Percent of commercial landings (Pounds) of Goatfish Unit by month, 1999 to 2008.



The top two gears to harvest goatfishes are fish pots and traps and gill nets. Together, they account for an average of approximately 88 percent of annual reported landings from 1999 to 2008 (Table 5.3.14). The harvest from the use of fish pots and traps to harvest goatfish has increased over the above 10-year period. In 1999, fish pots and traps accounted for approximately 45 percent of the reported catch, whereas in 2008, they accounted for approximately 89 percent of the annual catch. The use of gill nets dropped significantly and the landings from gill net use dropped from 42 percent of the annual catch in 1999 to under 3 percent in 2008.

Table 5.3.14. Percent of annual reported landings of goatfishes by gear, 1999 to 2008.

Gear	Average	Range
Fish Pots & Traps	74.64%	44.97% to 90.47%
Gill Nets	13.47%	2.94% to 42.13%
Hand Lines	7.75%	0.94% to 12.86%
Diving	1.91%	0.33% to 4.09%
Long Haul Seines	0.76%	0% to 2.88%
Other Gear	1.46%	0.51% to 2.86%
Total	100.00%	100.00%

Wrasses

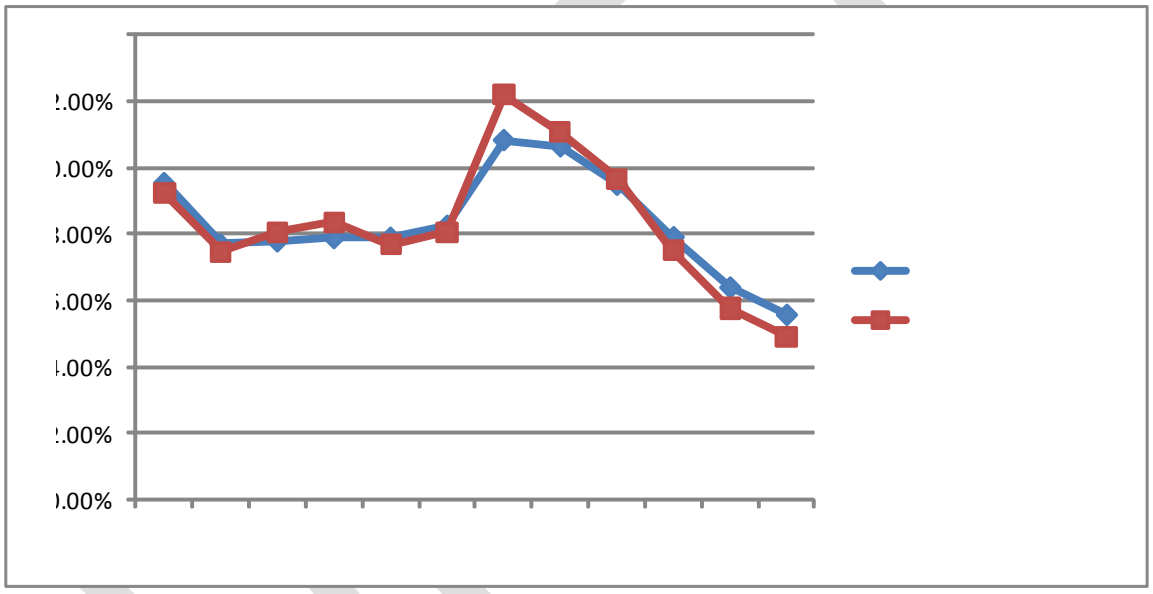
Hogfish (*Lachnolaimus maximus*), puddingwife (*Halichoeres radiatus*), and Spanish hogfish (*Bodianus rufus*) are the Wrasse Unit. The primary target of this Unit is hogfish, which dominates landings year after year. Over the 10-year period from 1999 to 2008, less than 170 pounds of puddingwife were reported and there have been no landings since 2006 (Table 5.3.15). There were more landings of Spanish hogfish; however, there were no landings from 2004 to 2008. Hogfish landings represent 99 percent to 100 percent of annual landings of the Wrasse Unit.

Table 5.3.15. Commercial landings (pounds) of Wrasse Unit, 1999 to 2009.

Year	Reported Pounds				Adjusted Pounds			
	Hogfish	Sp. Hogfish	Pudding-wife	Total Unit	Hogfish	Sp. Hogfish	Pudding-wife	Total Unit
1999	46,390	218	0	46,608	59,522	279	0	59,801
2000	58,653	31	19	58,703	103,187	54	33	103,274
2001	67,947	11	104	68,062	99,852	16	153	100,021
2002	68,581	285	32	68,898	79,689	331	37	80,057
2003	47,032	42	0	47,074	67,864	61	0	67,925
2004	40,135	0	0	40,135	87,436	0	0	87,436
2005	26,048	0	9	26,057	131,239	0	12	131,251
2006	28,427	0	0	28,427	52,532	0	0	52,532
2007	30,927	0	0	30,927	57,916	0	0	57,916
2008	29,019	0	0	29,019	54,985	0	0	54,985
2009	29,447	57	0	29,504	55,456	666	0	56,122
Total 99 - 08	443,159	587	164	443,910	794,222	741	235	795,198
Ave. 99 - 08	44,316	59	16	44,391	79,422	74	24	79,520
Ave. 99 - 05	50,684	84	23	50,791	89,827	106	34	89,966
Ave. 03 - 07	34,514	8	2	34,524	79,397	12	2	79,412
Ave. 06 - 08	29,458	0	0	29,458	55,144	0	0	55,144

There have been landings of unspecified or unclassified wrasses. Although landings of unspecified or unclassified wrasses are infrequent, in 2002 and 2003, fishermen reported landing 12 pounds (18 adjusted pounds) and 9,139 pounds (21,253 adjusted pounds), respectively. From 2004 to 2008, only 22 pounds were reported over the five years. Because hogfish represent 99% to 100% of the landings of the Wrasse Unit, the remainder of this section on the commercial Wrasse fishery is limited to hogfish only. Landings of hogfish vary considerably, like most other reef fish, throughout the calendar year; they tend to spike up in July and August and fall substantially after September, only to increase again in January (Figure 5.3.6).

Figure 5.3.6. Percent of commercial landings (pounds) of hogfish by month, 1999 to 2008.



The two primary means to catch wrasses are diving and fish pots and traps. Together, these two account for an average of 89 percent of hogfish commercial landings each year (Table 5.3.16).

Table 5.3.16. Percent of reported hogfish landings (pounds) by gear, 1999 to 2008.

Gear	Average	Range
Diving	66.06%	44.48% to 74.34%
Fish Pots & Traps	23.43%	11.71% to 44.48%
Hand Lines	4.49%	3.04% to 7.78%
Gill Nets	2.12%	0.59% to 3.32%
Troll Lines	1.55%	0.14% to 5.31%
Trammel Nets	1.44%	0.89% to 2.65%
Other Gear	0.90%	0.06% to 2.24%
All Gears	100.00%	100%
Top Two Gears	89.49%	85.96% to 92.71%
Top Three Gears	93.98%	89.30% to 96.73%
Top Six Gears	99.10%	97.76% to 99.94%

Porgies

The following four species are the Porgies Unit: jolthead porgy (*Calamus bajonado*), sheepshead porgy (*C. penna*), pluma (*C. pennatula*) and sea bream (*Archosargus rhomboidalis*). From 1999 to 2008, an average of 321 pounds of these species were reported to be landed annually (Table 5.3.17).

Table 5.3.17. Commercial landings (Pounds) of species in Porgy Unit, 1999 to 2009.

Year	Reported Pounds					Adjusted Pounds				
	Jolthead	Sheeps-head	Pluma	Sea Bream	Total Porgies Unit	Jolthead	Sheeps-head	Pluma	Sea Bream	Total Porgies Unit
1999	0	0	0	0	0	0	0	0	0	0
2000	11	0	30	0	41	21	0	53	0	74
2001	619	0	31	0	650	910	0	45	0	955
2002	2,271	0	27	0	2,298	2,645	0	30	0	2,675
2003	0	14	6	0	20	0	33	9	0	42
2004	0	0	0	0	0	0	0	0	0	0
2005	0	0	7	34	41	0	0	88	170	258
2006	0	0	28	0	28	0	0	28	0	28
2007	0	0	0	0	0	0	0	0	0	0
2008	81	0	0	47	128	143	0	0	70	213
2009	2	0	0	0	2	4	0	0	0	4
Total 99 - 08	2,982	14	129	81	3,206	3,719	33	253	240	4,245
Ave. 99 - 08	298	1	13	8	321	372	3	25	24	425
Ave. 99 - 05	414	2	14	5	436	511	5	32	24	572
Ave. 03 - 07	0	3	8	7	18	0	7	25	34	66
Ave. 06 - 08	27	0	9	16	52	48	0	9	23	80

The landings of Porgy Unit species are dwarfed by landings reported in the broader category of porgies. From 1999 to 2008, landings of other porgies represented from approximately 94 percent to 100 percent of all porgies (Table 5.3.18).

Table 5.3.18. Commercial landings (pounds) of other porgies and all porgies, 1999 to 2009.

Year	Reported Landings			Adjusted Landings			
	Total Porgies Unit	Total Other	All	Total Porgies Unit	Total Other	All	% Other
1999	0	34,586	34,586	0	44,338	44,338	100.00%
2000	41	29,539	29,580	74	52,014	52,088	99.86%
2001	650	35,830	36,480	955	52,676	53,631	98.22%
2002	2,298	41,284	43,582	2,675	41,284	43,959	93.91%
2003	20	20,889	20,909	42	31,388	31,430	99.87%
2004	0	17,913	17,913	0	48,812	48,812	100.00%
2005	41	12,051	12,092	258	81,439	81,697	99.68%
2006	28	8,961	8,989	28	19,525	19,553	99.86%
2007	0	9,148	9,148	0	16,964	16,964	100.00%
2008	128	13,703	13,831	213	28,414	28,627	99.26%
2009	2	12,298	12,300	4	22,974	22,978	99.98%
Total 99 - 08	3,206	223,904	227,110	4,245	416,854	421,099	98.99%
Ave. 99 - 08	321	22,390	22,711	425	41,685	42,110	99.07%
Ave. 99 - 05	436	27,442	27,877	572	50,279	50,851	98.79%
Ave. 03 - 07	18	13,792	13,810	66	39,626	39,691	99.88%
Ave. 06 - 08	52	10,604	10,656	80	21,634	21,715	99.70%

Landings of porgy, like for many of the previously described species and Units, tend to be highest during the first quarter and lowest during the final quarter of the calendar year (Figure 5.3.7).

Gill nets and fish pots and traps have been the top two gears for catching porgies. Together from 1999 to 2008, the two gears accounted for an average of approximately 81 percent of annual reported landings (Table 5.3.19). Hand lines took approximately 10 percent of the landings and ranked third.

Figure 5.3.7. Percent of commercial landings (pounds) of porgy by month, 1999 to 2008.

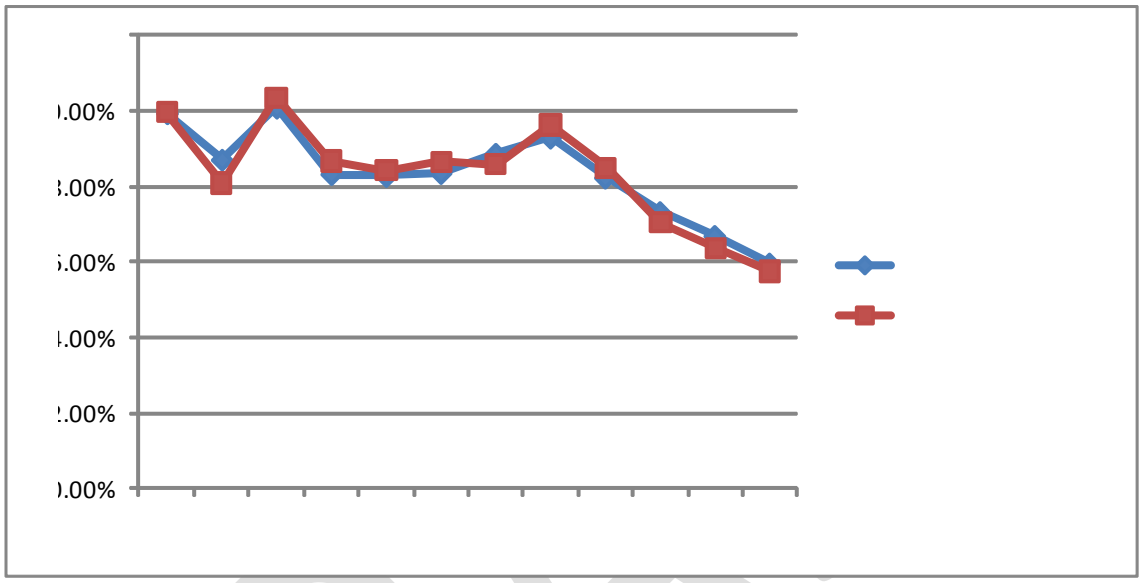


Table 5.3.19. Percent of annual reported landings (pounds) of porgies by gear, 1999 to 2009.

Gear	Average	Range
Fish Pots & Traps	45.71%	29.88% to 72.94%
Gill Nets	35.04%	16.21% to 54.59%
Hand Lines	10.40%	5.16% to 15.75%
Trammel Nets	3.25%	0.59% to 7.89%
Diving	2.62%	0.50% to 5.33%
Long Haul Seines	2.13%	1.26% to 3.60%
Other Gear	0.85%	0.41% to 1.94%
Top Two Gears	80.75%	76.99% to 89.15%
Top Three Gears	91.15%	84.10% to 94.32%
Top Six Gears	99.15%	98.06% to 99.60%

Squirrelfishes

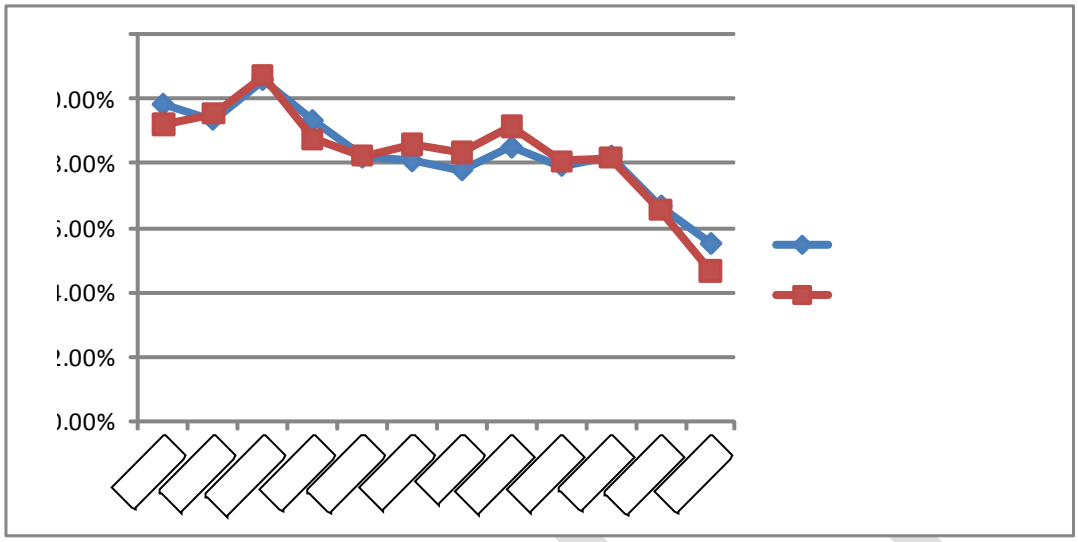
Blackbar soldierfish (*Myripristis jacobus*), bigeye (*Priacanthus arenatus*), longspine squirrelfish (*Holocentrus rufus*), and squirrelfish (*H. adscensionis*) are the Squirrelfishes Unit. From 1999 to 2008, fishers reported landing an average of 9,993 pounds annually (20,326 adjusted pounds). The annual average dropped significantly from 2006 to 2008 (Table 5.3.20).

Table 5.3.20. Commercial landings (pounds) of Squirrelfish Unit species, 1999 to 2009.

Year	Reported Pounds			Adjusted Pounds		
	Squirrel-fishes	Bigeye	Total	Squirrel-fishes	Bigeye	Total
1999	14,703	0	14,703	18,868	0	18,868
2000	16,041	49	16,090	28,263	86	28,349
2001	17,553	1	17,554	25,775	1	25,776
2002	16,007	6	16,013	18,565	7	18,572
2003	10,715	79	10,794	17,541	125	17,666
2004	7,117	13	7,130	21,660	19	21,679
2005	5,885	20	5,905	32,578	27	32,605
2006	4,528	0	4,528	11,008	0	11,008
2007	3,723	0	3,723	7,418	0	7,418
2008	3,493	0	3,493	21,316	0	21,316
2009	3,014	0	3,014	13,314	0	13,314
Total 1999 - 2008	99,765	168	99,933	202,992	265	203,257
Ave. 1999 - 2008	9,977	17	9,993	20,299	27	20,326
Ave. 1999 - 2005	12,574	24	12,598	23,321	38	23,359
Ave. 2003 - 2007	6,394	22	6,416	18,041	34	18,075
Ave. 2006 - 2008	3,915	0	3,915	13,247	0	13,247

Commercial landings for squirrelfish tend to peak in March and be at their lowest in November and December (Figure 5.3.8).

Figure 5.3.8. Percent of commercial squirrelfish landings (pounds) by month, 1999 to 2008.



Various gears are used to harvest squirrelfish; however, over the 10-year period from 1999 to 2008, fish pots and traps have caught more squirrelfish, followed by hand lines (Table 5.3.21). These top three gears accounted for approximately 93 percent of annual landings of squirrelfish on average.

Table 5.3.21. Percent of reported landings (pounds) of squirrelfish by gear, 1999 to 2008.

Gear	Average	Range
Fish Pots & Traps	51.39%	40.81% to 65.95%
Hand Lines	30.77%	24.53% to 37.63%
Gill Nets	10.48%	3.69% to 14.75%
Long Haul Seines	2.41%	0.27% to 6.51%
Troll Lines	1.94%	0.00% to 7.94%
Other Gears	3.01%	0.35% to 6.47%
All Gears	100.00%	100.00%
Top Two	82.16%	70.47% to 86.36%
Top Three	92.64%	83.82% to 97.32%
Top Five	96.99%	93.53% to 99.65%

Tilefishes

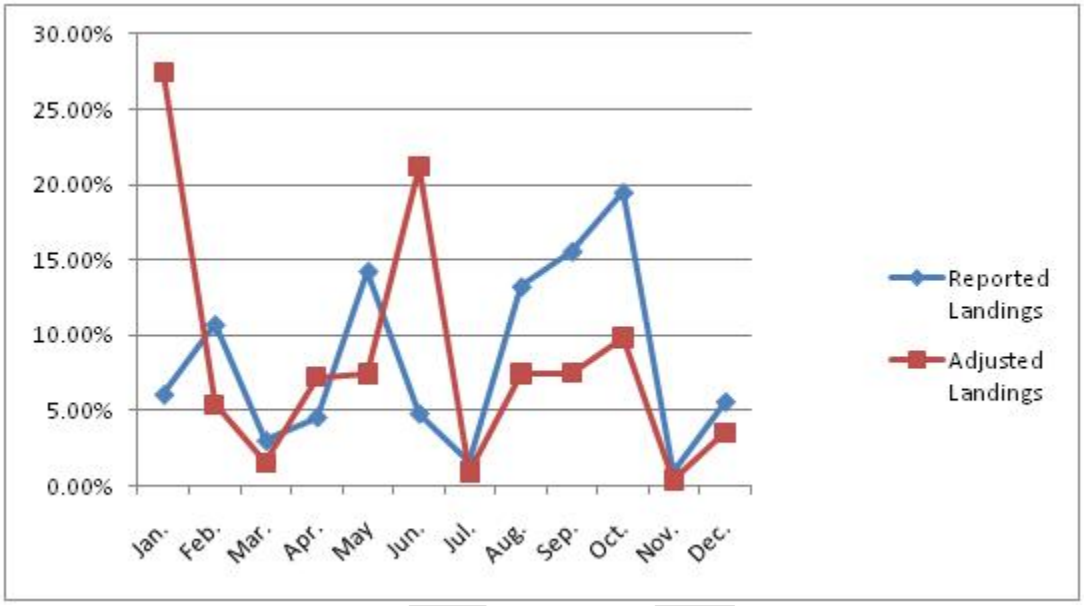
The Tilefish Unit is composed of two species: blackline tilefish (*Caulolatilus cyanops*) and sand tilefish (*Malacanthus plumier*). Over the 10-year period from 1999 to 2008, a total of 1,660 pounds of tilefish were reported t be commercially landed; however, none of these landings occurred after 2006 (Table 5.3.22). Approximately 11 percent of these landings were of unclassified tilefish, and on average 148 reported pounds and 229 adjusted pounds were landed annually.

Table 5.3.22. Commercial landings (pounds) of tilefish, 1999 to 2009.

Year	Reported Pounds				Adjusted Pounds				Adjustment Factor
	Blackline	Sand	Unclassified	Total	Blackline	Sand	Unclassified	Total	
1999	996	12	0	1,008	1,277	15	0	1,292	1.28
2000	209	18	10	237	367	32	18	417	1.76
2001	105	0	0	105	154	0	0	154	1.47
2002	26	18	0	44	30	21	0	51	1.16
2003	40	4	0	44	78	9	0	87	1.98
2004	14	0	0	14	37	0	0	37	2.64
2005	0	0	173	173	0	0	2,163	2,163	12.50
2006	35	0	0	35	269	0	0	269	7.69
2007	0	0	0	0	0	0	0	0	NA
2008	0	0	0	0	0	0	0	0	NA
Total 99 - 08	1,425	52	183	1,660	2,212	77	2,181	4,470	2.69
2009	0	0	0	0	0	0	0	0	NA
Ave. 99 - 08	143	5	0	148	221	8	0	229	1.55
Ave. 99 - 05	199	7	0	206	278	11	0	289	1.40
Ave. 03 - 07	18	1	0	19	77	2	0	79	4.23
Ave. 06 - 08	12	0	0	12	90	0	0	90	7.69

Landings have been the highest during the months of March and June and from August to October during the years when there have been landings (Figure 5.3.9).

Figure 5.3.9. Percent of commercial tilefish landings (pounds) by month, 1999 to 2009.



Hand lines tend to be the primary gear used to harvest tilefish, and from 1999 to 2006, when there were landings, hand lines accounted for approximately 65 percent of annual landings, on average. of reported landings. Lobster traps and pots took the second most tilefish to be landed (Table 5.3.23).

Table 5.3.23. Reported tilefish landings (pounds) by gear, 1999 to 2008.

Gear	Average	Range
Fish Pots & Traps	2.25%	0.00% to 15.91%
Lobster Pots & Traps	12.50%	0.00% to 100.00%
Gill Nets	9.61%	0.00% to 47.73%
Hand Lines	64.60%	0.00% to 100.00%
Diving	9.64%	0.00% to 77.14%
Rod & Reel	1.39%	0.00% to 11.11%
Total	100.00%	100%

Jacks

The following seven species make up the Jacks Unit: blue runner (*Caranx crysos*), horse-eye jack (*C. latus*), black jack (*C. lugubris*), bar jack (*C. ruber*), yellow jack (*C. bartholomaei*), almaco jack (*Seriola rivoliana*) and greater amberjack (*S. dumerili*). The most frequently landed of the species is bar jack. Over the 10-year period from 1999 to 2008, commercial landings of bar jack represented approximately 84 percent of the Unit landed over that period. Commercial fishers reported landing an annual average of 34,246 pounds (65,177 adjusted pounds) of bar jack (Tables 5.3.24a and 5.3.24b). The second most landed species in the Unit was horse-eye jack, representing 8.7 percent of all reported landings and 9.4 percent of all adjusted landings of the Unit. Yellow and almaco jack were the third and fourth most landed species, each accounting for approximately 3 percent of adjusted landings of the Unit.

Table 5.3.24a. Commercial landings (pounds) of Jack Unit species, 1999 to 2009.

Year	Blue Runner		Greater Amberjack		Horse-Eye Jack		Black Jack	
	Rep.	Adj.	Rep.	Adj.	Rep.	Adj.	Rep.	Adj.
1999	1	1	151	193	5,109	6,548	0	0
2000	0	0	7	12	7,568	13,306	0	0
2001	0	0	8	12	6,535	9,603	0	0
2002	74	86	213	249	4,830	5,617	70	81
2003	0	0	9	18	4,195	8,571	21	49
2004	341	538	245	361	1,903	3,817	0	0
2005	130	1,626	31	42	1,727	4,584	0	0
2006	0	0	0	0	998	2,818	18	27
2007	0	0	0	0	918	1,772	0	0
2008	3	50	191	281	1,592	16,031	103	152
2009	0	0	27	450	959	12,154	0	0
Ave. 1999-2008	55	230	86	117	3,538	7,267	21	31
Ave. 1999-2005	78	322	95	127	4,552	7,435	13	19
Ave. 2003-2007	94	433	57	84	1,948	4,312	8	15
Ave. 2006-2008	1	17	64	94	1,169	6,874	40	60

The commercial landings reporting form includes a generic category for jacks and other jacks, such as leatherjack. Total annual reported landings for these other jacks ranged from 3,462 pounds to 36,355 pounds from 1999 to 2008 (Table 5.3.25). Landings of species within the Jacks Unit represent from approximately 62 percent to 85 percent of annual reported landings during the 10-year period. Average annual landings from 2006 to 2008 are less than average annual landings for the other time periods for both total other jacks and the Jacks Unit.

Table 5.3.24b. Commercial landings (pounds) of Jack Unit species, 1999 to 2009.

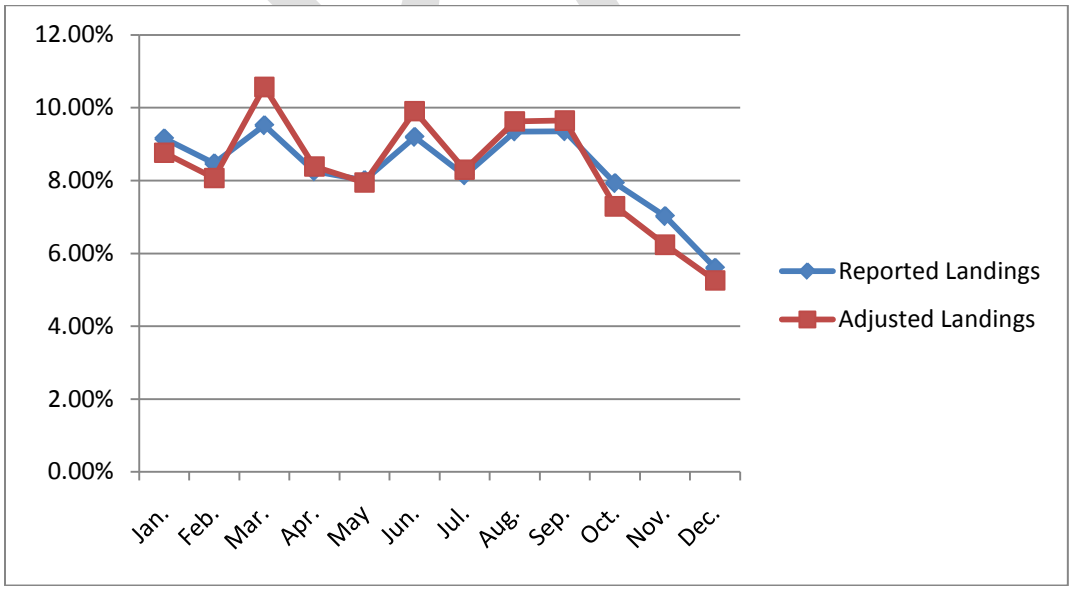
Year	Bar Jack		Yellow Jack		Almaco Jack		Jacks Unit		Ave. Adj.
	Rep.	Adj.	Rep.	Adj.	Rep.	Adj.	Rep.	Adj.	Factor
1999	40,913	52,449	2,021	2,588	17	22	48,212	61,801	1.28
2000	45,281	79,578	2,460	4,326	0	0	55,316	97,222	1.76
2001	49,847	73,283	3,726	5,481	735	1,082	60,851	89,461	1.47
2002	63,168	73,377	3,215	3,736	471	548	72,041	83,694	1.16
2003	37,112	65,386	829	1,846	509	1,072	42,675	76,942	1.80
2004	33,821	74,433	706	1,368	2,467	5,165	39,483	85,682	2.17
2005	22,658	116,677	527	1,108	1,931	6,463	27,004	130,500	4.83
2006	16,695	32,215	250	508	1,706	3,639	19,667	39,207	1.99
2007	15,003	29,324	785	1,327	1,515	2,122	18,221	34,545	1.90
2008	17,963	55,043	481	1,393	1,118	2,923	21,451	75,873	3.54
2009	20,473	52,549	1,317	2,123	214	319	22,990	67,595	2.94
Ave. 99-08	34,246	65,177	1,500	2,368	1,047	2,304	40,492	77,493	1.91
Ave. 99-05	41,829	76,455	1,926	2,922	876	2,050	49,369	89,329	2.07
Ave. 03-07	25,058	63,607	619	1,231	1,626	3,692	29,410	73,375	2.54
Ave. 06-08	16,554	38,861	505	1,076	1,446	2,895	19,780	49,875	2.48

Table 5.3.25. Commercial landings (pounds) of all jacks, 1999 to 2009.

Year	Jacks Unit		Total Other Jacks		All Jacks		% Jacks Unit	
	Rep.	Adj.	Rep.	Adj.	Rep.	Adj.	Rep.	Adj.
1999	48,212	61,801	30,082	38,568	78,294	100,369	61.58%	61.57%
2000	55,316	97,222	30,049	52,797	85,365	150,019	64.80%	64.81%
2001	60,851	89,461	36,355	53,435	97,206	142,896	62.60%	62.61%
2002	72,041	83,694	30,635	35,605	102,676	119,299	70.16%	70.15%
2003	42,675	76,942	22,937	45,952	65,612	122,894	65.04%	62.61%
2004	39,483	85,682	13,682	28,923	53,165	114,605	74.27%	74.76%
2005	27,004	130,500	7,979	26,428	34,983	156,928	77.19%	83.16%
2006	19,667	39,207	7,040	20,715	26,707	59,922	73.64%	65.43%
2007	18,221	34,545	4,989	11,407	23,210	45,952	78.50%	75.18%
2008	21,451	75,873	3,462	30,900	24,913	106,773	86.10%	71.06%
2009	22,990	67,595	5,799	28,662	28,789	96,257	79.86%	70.22%
Ave. 1999-2008	40,492	77,493	18,721	34,473	59,213	111,966	68.38%	69.21%
Ave. 1999-2005	49,369	89,329	24,531	40,244	73,900	129,573	66.80%	68.94%
Ave. 2003-2007	29,410	73,375	11,325	26,685	40,735	100,060	72.20%	73.33%
Ave. 2006-2008	19,780	49,875	5,164	21,007	24,943	70,882	79.30%	70.36%

Commercial landings of species within the Jack Unit show three spikes during the calendar year: March, June and August to September (Figure 5.3.10). Landings tend to be at their lowest during the last three months of the year.

Figure 5.3.10. Percent of commercial landings (pounds) of the Jack Unit by month, 1999 to 2008.



Together, hand lines and gill nets account for approximately 60 percent to 88 percent of annual reported landings of species within the Jack Unit (Table 5.3.26). The other top six gears are long haul seines, fish pots and traps, trammel nets and troll lines.

Table 5.3.26. Percent of reported annual reported landings of Jack Unit by gear, 1999 to 2008.

Gear	Average	Range
Hand Lines	39.26%	32.14% to 45.91%
Gill Nets	35.52%	11.84% to 44.46%
Long Haul Seines	7.83%	0.60% to 18.63%
Fish Pots & Traps	7.76%	4.71% to 17.30%
Trammel Nets	3.69%	0.18% to 8.68%
Troll Lines	2.73%	0.90% to 4.79%
Other Gear	3.22%	1.63% to 5.73%
All Gear	100.00%	100.00%
Top Two	74.78%	59.75% to 87.62%
Top Three	82.61%	68.70% to 88.22%
Top Six	96.78%	94.27% to 98.37%

Surgeonfishes

There are three species in the Surgeonfishes Unit: blue tang (*Acanthurus coeruleus*), ocean surgeonfish (*A. bahianus*) and doctorfish (*A. chirurgus*). During the 10-year period from 1999 to 2008, a total of 35 pounds of ocean surgeonfish were reported to be landed by commercial fishers (Table 5.327). Another 24 pounds were reported in the category of "surgeonfishes," for a total of 59 pounds (91 adjusted pounds). All of these landings occurred before 2004.

Table 5.3.27. Commercial landings (pounds) of surgeonfishes, 1999 to 2009.

Year	Reported Pounds			Adjusted Pounds			Adjustment Factor
	Ocean Surgeonfish	Surgeon-fishes	Total	Ocean Surgeonfish	Surgeon-fishes	Total	
1999	9	4	13	12	5	17	1.31
2000	0	0	0	0	0	0	NA
2001	0	20	20	0	28	28	1.40
2002	6	0	6	7	0	7	1.17
2003	20	0	20	39	0	39	1.95
2004 - 2008	0	0	0	0	0	0	NA
2009	0	0	0	0	0	0	NA
1999 - 2008	35	24	59	58	33	91	1.54

Triggerfishes

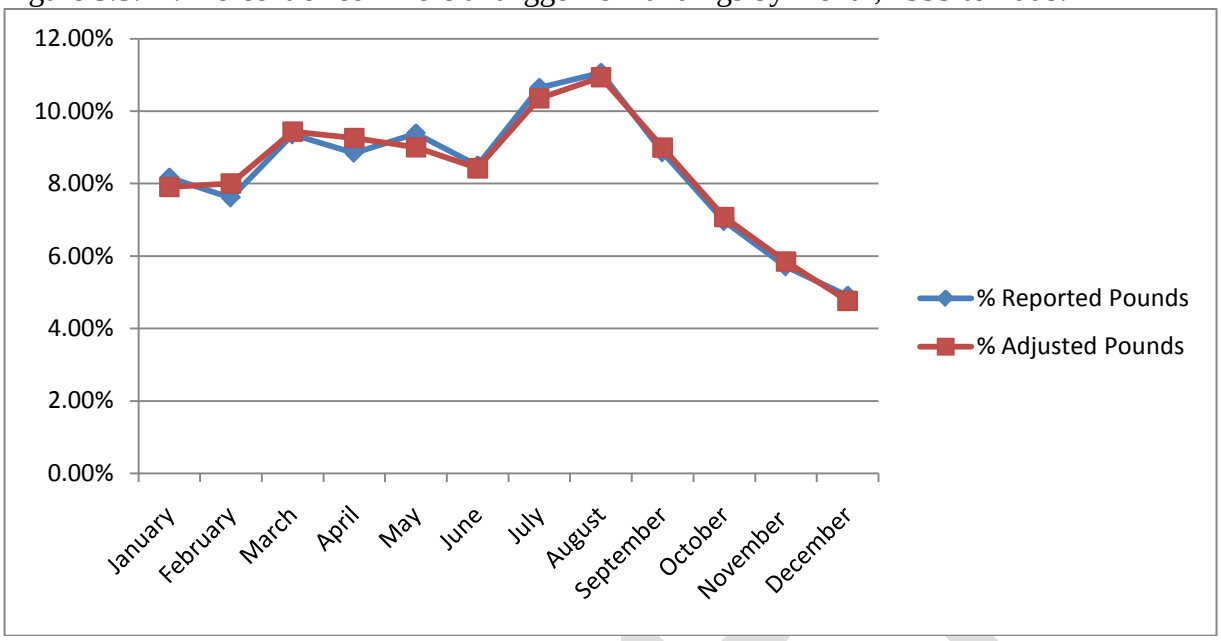
Ocean triggerfish (*Canthidermis sufflamen*), queen triggerfish (*Balistes vetula*), and sargassum triggerfish (*Xanthichtys ringens*) make up the Triggerfishes Unit. From 1999 to 2008, a total of 394,944 pounds (711,094 adjusted) of the three species were reported to be landed by commercial fishermen. Another 282 pounds were reported in the generic, triggerfishes, category (Table 5.3.28). Queen triggerfish represent 99.9 percent to 100 percent of the landings each year, and for that reason, the remainder of this description of the triggerfish fishery focuses solely on queen triggerfishes.

Table 5.3 28. Commercial landings (pounds) of triggerfishes, 1999 to 2009.

Year	Reported Pounds						Adjusted Pounds					
	Ocean	Queen	Sargassum	Total Unit	Trigger-fishes	All	Ocean	Queen	Sargassum	Total Unit	Trigger-fishes	All
1999	293	49,591	92	49,976	28	49,976	375	63,607	118	64,100	36	64,100
2000	5	41,295	0	41,300	102	41,300	9	72,711	0	72,720	179	72,720
2001	0	59,803	18	59,821	53	59,821	0	87,910	26	87,936	78	87,936
2002	0	53,574	0	53,574	53	53,574	0	62,187	0	62,187	62	62,187
2003	0	42,032	16	42,048	29	42,048	0	69,611	16	69,627	30	69,627
2004	0	43,213	0	43,213	17	43,213	0	97,721	0	97,721	44	97,721
2005	0	32,273	0	32,273	0	32,273	0	122,423	0	122,423	0	122,423
2006	0	27,621	0	27,621	0	27,621	0	44,237	0	44,237	0	44,237
2007	0	21,242	0	21,242	0	21,242	0	33,409	0	33,409	0	33,409
2008	0	23,865	11	23,876	0	23,876	0	56,715	19	56,734	0	56,734
2009	0	26,018	6	26,024	0	26,024	0	47,782	9	47,791	0	47,791
Total 99 - 08	298	394,509	137	394,944	282	394,944	384	710,531	179	711,094	429	711,094
Ave. 99 - 08	30	39,451	14	39,494	28	39,494	38	71,053	18	71,109	43	71,109
Ave. 99 - 05	43	45,969	18	46,029	40	46,029	55	82,310	23	82,388	61	82,388
Ave. 03 - 07	0	33,276	3	33,279	9	33,279	0	73,480	3	73,483	15	73,483
Ave. 06 - 08	0	24,243	4	24,246	0	24,246	0	44,787	6	44,793	0	44,793

More queen triggerfish tend to be landed in July and August than in any other two months. Another but smaller peak tends to occur in March (Figure 5.3 11).

Figure 5.3.11. Percent of commercial triggerfish landings by month, 1999 to 2008.



The top three gears by reported annual landings are fish pots and traps, diving and hand lines, together representing at least 90 percent of each year's annual landings from 1999 to 2008 (Table 5.3.29). Triggerfish landings by diving have shown a generally increasing trend, while landings associated with gill nets and hand lines have shown similarly decreasing trends.

Table 5.3.29. Percent of annual commercial triggerfish landings by gear, 1999 to 2008.

Gear	Average	Range
Fish Pots & Traps	47.50%	39.15% to 58.41%
Diving	29.31%	23.92% to 37.53%
Hand Lines	17.06%	13.69% to 20.73%
Gill Nets	1.63%	0.22% to 3.80%
Trammel Nets	1.37%	0.62% to 2.48%
Other Gears	3.13%	1.34% to 5.64%
All Gears	100.00%	100.00%
Top Two	76.81%	70.20% to 81.63%
Top Three	93.87%	90.14% to 97.09%
Top Five	96.87%	94.36% to 98.66%

Filefishes

The three species in the Filefishes Unit are scrawled filefish (*Aluterus scriptus*), whitespotted filefish (*Cantherhines macrocerus*), and black durgon (*Melichthys niger*). From 1999 to 2008, a total of 736 pounds of black durgon were reported to be landed; however, none of these landings occurred after 2002 (Table 5.3.30). Neither scrawled nor whitespotted filefish were landed during that time; however, there were reported landings for pygmy and orangespot filefish. Less than 1 percent of the landings happened after 2004. In 2009, no landings of species in the Filefish Unit were reported; however, 87 pounds of pygmy filefish were reported to be landed (153 adjusted pounds).

Table 5.3.30. Commercial landings (pounds) of black durgon and other filefish, 1999 to 2009.

Year	Reported Pounds				Adjusted Pounds			
	Black Durgon	Pygmy Filefish	Orange-spot Filefish	Total	Black Durgon	Pygmy Filefish	Orange-spot Filefish	Total
1999	0	0	15	15	0	0	19	19
2000	731	0	0	731	1,282	0	0	1,282
2001	0	0	30	30	0	0	44	44
2002	5	0	165	170	6	0	192	198
2003	0	0	11	11	0	0	11	11
2004	0	0	30	30	0	0	45	45
2005	0	0	8	8	0	0	11	11
2006	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0
2009	0	87	0	87	0	153	0	153
Ave. 99 - 08	74	0	26	100	129	0	32	161
Ave. 99 - 05	105	0	37	142	184	0	46	230
Ave. 03 - 07	0	0	10	10	0	0	13	13
Ave. 06 - 08	0	0	0	0	0	0	0	0
Total 99 - 08	736	0	259	995	1,288	0	322	1,610

Aquarium Trade Species:

The following 18 species in the Reef Fish FMU are targeted for the marine aquarium trade: navajón blue tang (*Acanthurus coeruleus*), red spotted hawkfish (*Amblycirrhitus pinos*), flame cardinal (*Apogon maculates*), spanish hogfish (*Bodianus rufus*), pygmy angelfish (*Centropyge argi*), blue chromis (*Chromis cyanea*), royal gramma (Gramma loreto), yellowhead wrasse (*Halichoeres garnoti*), rock beauty (*Holacanthus tricolor*), yellowtail damselfish (*Microspathodon chrysurus*), blackbar soldierfish (*Myripristis jacobus*), redlip blenny (*Ophioblennius atlanticus),* yellowhead jawfish (*Opistognathus aurifrons*), dusky jawfish (*Opistognathus whitehurstii*), french angelfish (*Pomacanthus paru*), harlequin bass (*Serranus tigrinus*), bluehead wrasse (*Thalassoma bifasciatum*), and sargassum triggerfish (*Xanthichthys ringens*).

The export fishery for marine ornamentals has been almost entirely on the west coast from Arecibo to La Parguera; however, there is potential for similar capture and trade from the east coast of the main island (LeGore et al. 2005). Fishers usually capture the species in territorial waters to minimize transport costs and time to return to shore. Diving with SCUBA gear tends to be primary method of collecting ornamental species. Such gear gives longer bottom time. Those who use SCUBA typically collect their specimens in water from 12 to 15 meters deep and act to minimize dive time for collection. Snorkeling gear is also used, but those who snorkel start at shallower depths. Trap fishers on the eastern shore have been reported to incidentally catch ornamentals and collectors have been occasionally observed near Culebra. It is most likely that the ornamental fishery rarely, if ever, extends in to federal waters off Puerto Rico.

53.3 Puerto Rico's recreational fishery

5.3.3.1 Introduction

In 2007, an estimated 1,272,006 individual fish were caught by recreational (including subsistence) fishers. Approximately 10% of these fish were caught in federal waters. Not all of the fish caught are landed. For example, 17 bar jacks were reported to be caught in federal waters, but none of them were landed. The only other species caught in the EEZ of concern of this amendment was queen triggerfish. Seventeen queen triggerfish were caught in federal waters and landed. There are no data regarding recreational landings of spiny lobster or conch because the Marine Recreational Fisheries Statistic Survey (MRFSS) does not include the species. The 9-nautical mile limit suggests the recreational fishery is located in territorial, not federal, waters.

5.3.3.2 Recreational Landings

5.3.3.2.1 Recreational Grunt Fishery

Recreational fishers catch and land Grunt Unit species. Over the 9-year period from 1999 to 2008, 16,215 individuals within the Unit were landed annually on average; however, there has been a significant decline since 2001 (Table 5.3.31). After 2000, there is an annual average of 12,700 individuals landed annually. The most frequently caught species were white grunt and tomtate. It is anticipated that almost all to all of these landings were of individuals caught in territorial waters.

Table 5.3.31. Recreational landings of grunt, 2000 to 2009.

Year	Individuals								
	White Grunt	Margate	Tomtate	Blue-striped Grunt	French Grunt	Porkfish	Total Grunt Unit	Other Grunt	All Grunt
2000	5,839	772	12,303	10,102	12,596	2,725	44,336	2,055	46,391
2001	17,920	0	3,448	2,651	0	4,149	28,168	1,876	30,044
2002	4,227	0	8,447	919	741	1,858	16,193	581	16,774
2003	5,950	0	4,237	1,773	1,168	2,268	15,396	0	15,396
2004	4,445	0	4,527	0	1,966	0	10,938	0	10,938
2005	4,060	0	3,977	0	0	712	8,749	1,173	9,922
2006	1,400	0	944	0	0	0	2,344	0	2,344
2007	6,362	0	356	2,041	0	0	8,759	0	8,759
2008	6,793	846	0	3,410	0	0	11,050	1,224	12,274
2009	2,957	0	5,253	813	1,890	1,709	12,621	1,404	14,025
Total	59,953	1,618	43,492	21,709	18,361	13,421	158,554	8,312	166,866

5.3.3.2.2 Recreational Angelfish Fishery

Recreational landings of angelfish occur infrequently. Over the 10-year period from 2000 to 2009, a total of 3,271 individual angelfish were landed by recreational fishers. Most of these landings occurred before 2004. For the past six years, only 216 were landed (Table 5.3.31).

Table 5.3.31. Recreational landings of angelfish, 2000 to 2009.

Year	French Angelfish	Gray Angelfish	Total Angelfish
2000	0	0	0
2001	537	1,036	1,573
2002	0	0	0
2003	1,482	0	1,482
2004	0	0	0
2005	0	0	0
2006	0	0	0
2007	0	0	0
2008	0	0	0
2009	216	0	216
Total	2,235	1,036	3,271

5.3.3.2.3 Recreational Boxfish Fishery

Recreational landings of boxfish have been irregular. The annual average after 2005 is significantly smaller than for years before that year (Table 5.3.32).

Table 5.3.32. Recreational landings (individuals) of boxfish, 2000 to 2009.

Year	Individuals						
	Honey-comb Cowfish	Scrawled Cowfish	Smooth Trunk-fish	Spotted Trunk-fish	Trunk-fish	Boxfish Unspec.	Total Boxfish
2000	0	0	0	0	2,622	0	2,622
2001	928	250	647	2,075	1,928	1,752	5,828
2002	0	0	0	0	1,294	0	1,294
2003	234	0	836	0	13,318	0	14,388
2004	0	0	0	0	12,529	0	12,529
2005	0	0	712	712	913	0	2,338
2006	0	0	0	988	1,856	0	2,843
2007	0	0	0	0	364	0	364
2008	0	0	0	0	2,976	0	2,976
2009	0	0	362	0	1,437	0	1,799
Total	1,161	250	2,557	3,775	39,237	1,752	46,980
Ave. 2000-08	129	28	244	419	4,200	195	5,020
Ave. 2000-05	194	42	366	465	5,434	292	6,500
Ave. 2006-08	0	0	0	329	1,732	0	2,061

5.3.3.2.4 Recreational Goatfish Fishery

Annual recreational landings have shown a general decline over the last decade. There were no landings of spotted goatfish since 2005 or only one year of landings of unclassified/unspecified species of goatfish over ten years. Yellow goatfish makes up most of the landings of goatfish as a whole (Table 5.5.33).

Table 5.3.33. Recreational landings (individuals) of goatfish, 2000 to 2009.

Year	Individuals			
	Spotted Goatfish	Yellow Goatfish	Goatfish Unspec.	Total
2000	386	522	0	908
2001	1,446	2,179	0	3,625
2002	0	3,510	0	3,510
2003	0	0	0	0
2004	727	1,361	0	2,088
2005	0	0	0	0
2006	0	0	0	0
2007	0	1,261	0	1,261
2008	0	0	0	0
2009	0	762	59	821
Total	2,558	9,596	59	12,213
Ave. 2000-08	284	981	0	1,266
Ave. 2000-05	426	1,262	0	1,688
Ave. 2006-08	0	420	0	420

5.3.3.2.5 Recreational Wrasses Fishery

Annual recreational landings of wrasses varied considerably the past decade from zero to over ten thousand (Table 5.3.34). Average annual landings of hogfish have increased in the past few years.

Table 5.3.34. Recreational landings (individuals) of wrasses, 2000 to 2009.

Year	Individuals			
	Spotted Goatfish	Yellow Goatfish	Goatfish Unspec.	Total
2000	386	522	0	908
2001	1,446	2,179	0	3,625
2002	0	3,510	0	3,510
2003	0	0	0	0
2004	727	1,361	0	2,088
2005	0	0	0	0
2006	0	0	0	0
2007	0	1,261	0	1,261
2008	0	0	0	0
2009	0	762	59	821
Total	2,558	9,596	59	12,213
Ave. 2000-08	284	981	0	1,266
Ave. 2000-05	426	1,262	0	1,688
Ave. 2006-08	0	420	0	420

5.3.3.2.6 Recreational Porgies Fishery

Recreational landings of species within the Porgy Unit are jolthead porgy, pluma, and sea bream. There have been no landings of sheepshead porgy; however, there are landings of unspecified species of porgies. In more recent years, the average of annual recreational landings of jolthead and pluma porgy have increased (Table 5.3.35).

Table 5.3.35. Recreational landings (individuals) of porgies, 2000 to 2009.

Year	Individuals				
	Jolthead Porgy	Pluma Porgy	Sea Bream	Porgy Unspec.	Total Porgies
2000	2,101	382	3,817	0	6,300
2001	0	518	0	328	846
2002	0	0	2,325	0	2,325
2003	296	14,156	443	891	15,786
2004	0	4,309	1,422	0	5,731
2005	0	3,856	0	0	3,856
2006	0	557	0	279	836
2007	1,091	638	0	0	1,730
2008	378	707	0	1,244	2,329
2009	0	0	0	279	279
Total	3,867	25,123	8,007	3,021	40,017
Ave. 2000-08	430	2,791	890	305	4,415
Ave. 2000-05	400	3,870	1,334	203	5,807
Ave. 2006-08	490	634	0	508	1,631

5.3.3.2.7 Recreational Squirrelfishes Fishery

The Squirrelfish Unit is composed of blackbar soldierfish, bigeye, longspine squirrelfish and squirrelfish. From 2000 to 2009 there were recreational landings of three of these four species. There were no landings of blackbar soldierfish (Table 5.3.36)

Table 5.3.36. Recreational landings (individuals) of squirrelfishes, 2000 to 2009.

Year	Individuals				
	Bigeye	Longs-pine Squirrel-fish	Squirrel-fish	Squirrel-fish Unspec.	Total
2000	0	2,210	18,408	0	20,617
2001	786	535	13,702	408	15,431
2002	0	0	3,011	2,730	5,741
2003	4,425	3,711	14,330	0	22,466
2004	944	0	3,479	0	4,423
2005	0	0	1,487	0	1,487
2006	0	0	1,567	0	1,567
2007	0	0	14,466	0	14,466
2008	0	756	25,056	0	25,811
2009	326	0	2,358	0	2,685
Total	6,482	7,212	97,862	3,138	114,694
Ave. 2000-08	684	801	10,612	349	12,446
Ave. 2000-05	1,026	1,076	9,069	523	11,694
Ave. 2006-08	0	252	13,696	0	13,948

5.3.3.2.8 Recreational Tilefish Fishery

The Tilefish Unit is composed of blackline tilefish and sand tilefish. Although there were recreational landings of the two species from 2000 to 2008, there were no landings after 2005 (Table 5.3.37).

Table 5.3.37. Recreational landings of tilefish, 2000 to 2009.

Year	Individuals		
	Blackline	Sand	Total
2000	0	1,334	1,334
2001	0	5,508	5,508
2002	0	1,373	1,373
2003	0	7,527	7,527
2004	944	1,646	2,590
2005	0	1,306	1,306
2006	0	0	0
2007	0	0	0
2008	0	0	0
2009	0	0	0
Total	944	18,694	19,639
Ave. 2000-08	105	2,077	2,182
Ave. 2000-05	157	3,116	3,273
Ave. 2006-08	0	0	0

5.3.3.2.9 Recreational Surgeonfish Fishery

There have been recreational landings of all three species that make up the Surgeonfishes Unit; however, landings after 2002 have been intermittent (Table 5.3.38).

Table 5.3.38. Recreational landings of surgeonfish, 2000 to 2009.

Year	Individuals		
	Blackline	Sand	Total
2000	0	1,334	1,334
2001	0	5,508	5,508
2002	0	1,373	1,373
2003	0	7,527	7,527
2004	944	1,646	2,590
2005	0	1,306	1,306
2006	0	0	0
2007	0	0	0
2008	0	0	0
2009	0	0	0
Total	944	18,694	19,639
Ave. 2000-08	105	2,077	2,182
Ave. 2000-05	157	3,116	3,273
Ave. 2006-08	0	0	0

5.3.3.2.10 Recreational Triggerfishes Fishery

The Triggerfish Unit is composed of ocean triggerfish, queen triggerfish and sargassum triggerfish, and there have been recreational landings of the first two. There were also recreational landings of individuals in the leatherjacket family.

Table 5.3.39. Recreational landings of triggerfishes, 2000 to 2009.

Year	Individuals			
	Ocean Trigger-fish	Queen Trigger-fish	Subtotal	Leather-jacket Family
2000	8,667	4,844	13,512	0
2001	402	8,995	9,397	3626
2002	0	891	891	0
2003	3,492	1,789	5,281	445
2004	2,752	558	3,311	0
2005	2,177	4,472	6,650	0
2006	0	308	308	0
2007	190	392	582	0
2008	0	17,045	17,045	0
2009	523	4,380	4,902	0
Total	18,203	43,677	61,879	4072
Ave. 2000-08	1,964	4,366	6,331	452
Ave. 2000-05	2,915	3,592	6,507	679
Ave. 2006-08	63	5,915	5,979	0

5.3.3.2.11 Recreational Filefishes Fishery

The only known recreational landings of species that are specific to the Filefish Unit are those of black durgon. Annual landings fell substantially in 2006 and 2007, then rebounded in 2009 (Table 5.3.40).

Table 5.3.40. Recreational landings (individuals) of filefishes, 2000 to 2009.

Year	Individuals
	Black Durgon
2000	27,946
2001	38,114
2002	7,360
2003	32,203
2004	2,558
2005	16,326
2006	581
2007	375
2008	992
2009	5,539
Total	131,994
Ave. 2000-08	14,051
Ave. 2000-05	20,751
Ave. 2006-08	649

5.3.3.2.12 Recreational Jacks Fishery

Jacks are a popular recreational species, especially blue runner (Table 5.3.41). On average, 69,053 individuals in the Jack Unit were landed annually from 2000 to 2008.

Table 5.3.41. Recreational landings (individuals) of jacks, 2000 to 2009.

Year	Individuals									
	Blue Runner	Horse-eye Jack	Black Jack	Almaco Jack	Bar Jack	Greater Amber-jack	Yellow Jack	Total Unit	Jack Family	Amber-jack Genus
2000	16,274	18,376	522	0	3,368	3,720	46,580	88,839	1,966	0
2001	53,858	27,330	4,054	250	5,328	5,473	8,131	104,423	4,350	0
2002	28,826	57,024	0	0	9,430	1,276	9,985	106,542	0	1,738
2003	74,323	28,283	816	0	12,723	296	6,084	122,525	5,277	234
2004	56,306	12,884	0	472	7,915	235	679	78,492	0	0
2005	28,792	7,790	690	0	2,537	1,355	7,873	49,037	0	0
2006	8,594	2,971	0	0	581	0	3,411	15,557	1,567	0
2007	6,172	10,666	0	0	4,877	838	2,502	25,056	0	0
2008	17,945	579	6,373	0	4,791	0	1,321	31,008	0	0
2009	11,979	3,661	1,439	0	2,609	0	1,665	21,352	1,664	0
Total	303,070	169,564	13,893	722	54,158	13,193	88,230	642,830	14,824	1,972
Ave. 2000-08	32,343	18,434	1,384	80	5,728	1,466	9,618	69,053	1,462	219
Ave. 2000-05	43,063	25,281	1,014	120	6,884	2,059	13,222	91,643	1,932	329
Ave. 2006-08	10,904	4,739	2,124	0	3,416	279	2,411	23,874	522	0

5.3.3 U.S. Virgin Islands Fisheries

5.3.3.1 Combined commercial landings

During the last decade, USVI commercial landings have varied considerably, ranging from a low of under a million pounds in 2009 to a high of over two million pounds in 2006 (Table 5.3.42). Landings in St. Croix varied from over half a million pounds in 2009 to approximately 1.3 million pounds in 2006, while those in St. Thomas/St. John ranged from under 400,000 pounds to over 800,000 pounds. St. Croix's share of USVI landings has shown a general increase over the decade, from approximately 56 percent to over 60 percent, while that of St. Thomas/St. John has declined. Note that landings in 2009 are substantially lower, approximately 48 percent from landings the previous year.

Table 5.3.42 . All commercial landings (pounds) in USVI, 1998 to 2009.

Year	Pounds Landed				
	St. Croix	St. Thomas/ St. John	USVI	% STX	% STT/ STJ
1998	660,857				
1999	683,016				
2000	802,254	618,806	1,421,060	56.45%	43.55%
2001	1,003,635	758,689	1,762,325	56.95%	43.05%
2002	1,112,137	821,448	1,933,585	57.52%	42.48%
2003	992,490	817,093	1,809,582	54.85%	45.15%
2004	1,033,448	811,864	1,845,312	56.00%	44.00%
2005	1,149,190	744,528	1,893,718	60.68%	39.32%
2006	1,338,326	786,691	2,125,017	62.98%	37.02%
2007	1,232,922	711,356	1,944,278	63.41%	36.59%
2008	1,042,687	686,825	1,729,512	60.29%	39.71%
2009	547,320	359,824	907,144	60.33%	39.67%

The mostly likely cause of the decline in landings beginning in 2007 is federal and state regulatory actions since 2005. Federal regulatory actions implemented since the 2005 Comprehensive Sustainable Fisheries Act Amendment (Caribbean SFA Amendment) and by the USVI government in 2006 undoubtedly have resulted in reduced commercial landings of all species and reef fish in the territory.

Finfish landings are substantially larger than invertebrate landings. In St. Croix, finfish landings represent from approximately 72 percent to 84 percent of annual commercial landings, while in St. Thomas/St. John, finfish landings represent from approximately 81 percent to 87 percent of all commercial landings (Table 5.3.43). Both finfish and invertebrate landings in both Districts have dropped consistently since 2006.

Table 5.3.43. Total commercial finfish and invertebrate landings (pounds), 1998 to 2009.

Year	Finfish (Pounds)			Invertebrates (Pounds)			% Finfish	
	STX	STT/STJ	USVI	STX	STT/STJ	USVI	STX	STT/STJ
1998	553,113			107,744			83.70%	
1999	576,252			106,764			84.37%	
2000	635,190	538,557	1,173,747	167,064	80,249	247,313	79.18%	87.03%
2001	773,170	659,085	1,432,255	230,466	99,605	330,070	77.04%	86.87%
2002	876,431	698,991	1,575,422	235,707	122,457	358,163	78.81%	85.09%
2003	776,564	672,195	1,448,759	215,926	144,898	360,823	78.24%	82.27%
2004	779,882	673,878	1,453,760	253,566	137,986	391,552	75.46%	83.00%
2005	866,061	617,050	1,483,110	283,130	127,478	410,608	75.36%	82.88%
2006	960,102	643,261	1,603,363	378,224	143,430	521,654	71.74%	81.77%
2007	916,172	577,039	1,493,211	316,750	134,317	451,067	74.31%	81.12%
2008	769,520	567,067	1,336,586	273,167	119,759	392,925	73.80%	82.56%
2009	418,383	292,205	710,589	128,937	64,088	193,025	76.44%	82.01%

5.3.3.6 FMUs directly affected by proposed actions

5.3.3.6.1 Spiny Lobster commercial fishery

Spiny lobster landings represent most of invertebrate landings in St. Thomas/St. John. From 2000 to 2009, spiny lobster landings represented an average of approximately 94 percent of invertebrate landings. Spiny lobster landings represent, on average, approximately 49 percent of St. Croix's invertebrate landings; however, since 2007, the percent has increased (Table 5.3.44).

Table 5.3.44. Commercial spiny lobster landings (pounds), 1998 to 2009.

Year	Invertebrate Landings (Pounds)					
	St. Thomas/St. John			St. Croix		
	Spiny Lobster	All	% Spiny Lobster	Spiny Lobster	All	% Spiny Lobster
1998				42,718	107,744	39.65%
1999				53,329	106,764	49.95%
2000	76,279	80,249	95.05%	89,020	167,064	53.28%
2001	90,018	99,605	90.38%	116,619	230,466	50.60%
2002	116,199	122,457	94.89%	116,273	235,707	49.33%
2003	135,760	144,898	93.69%	106,039	215,926	49.11%
2004	134,188	137,986	97.25%	125,415	253,566	49.46%
2005	124,643	127,478	97.78%	120,929	283,130	42.71%
2006	135,766	143,430	94.66%	147,173	378,224	38.91%
2007	119,902	134,317	89.27%	168,267	316,750	53.12%
2008	109,234	119,759	91.21%	149,234	273,167	54.63%
2009	62,284	64,088	97.19%	73,898	128,937	57.31%
Ave. 2000-08	115,776	123,353	93.80%	126,552	261,555	49.02%
Ave. 2000-05	112,848	118,779	94.84%	112,382	230,976	49.08%
Ave. 2006-08	121,634	132,502	91.71%	154,891	322,714	48.89%

Traps are the top ranked gear for taking spiny lobsters in St. Thomas/St. John, but not in St. Croix. Traps represent approximately 92 percent of annual landings of spiny lobster landed in St. Thomas/St. John (Table 5.3.45), whereas most landings on St. Croix (Table 5.3.46) result from diving (free and scuba combined).

Table 5.3.45. Percent of St. Thomas/St. John's spiny lobster landings (pounds) by gear, 2000 to 2009, for landings with known gear.

Year	Castnet	Diving	Traps	Line Fishing	Seine Net	Trammel Net	Unknown	Total
1998								
1999								
2000	0.17%	6.12%	93.64%	0.03%	0.00%	0.00%	0.04%	100.00%
2001	0.04%	8.76%	90.82%	0.04%	0.00%	0.00%	0.34%	100.00%
2002	0.00%	10.44%	89.42%	0.10%	0.01%	0.00%	0.04%	100.00%
2003	0.00%	7.46%	92.50%	0.05%	0.00%	0.00%	0.00%	100.00%
2004	0.00%	2.55%	97.34%	0.12%	0.00%	0.00%	0.00%	100.00%
2005	0.00%	2.31%	87.22%	10.47%	0.00%	0.00%	0.00%	100.00%
2006	0.00%	2.59%	83.73%	13.67%	0.01%	0.00%	0.00%	100.00%
2007	0.00%	2.42%	90.58%	6.99%	0.00%	0.00%	0.00%	100.00%
2008	0.00%	2.28%	97.27%	0.28%	0.00%	0.05%	0.12%	100.00%
2009	0.00%	4.22%	94.07%	1.30%	0.00%	0.00%	0.41%	100.00%
Average	0.02%	4.92%	91.66%	3.30%	0.00%	0.00%	0.10%	100.00%

Table 5.3.46. Percent of St. Croix's spiny lobster landings (pounds) by gear, 1998 to 2009, for landings with known gear.

Year	Castnet	Diving	Traps	Line Fishing	Seine Net	Trammel Net	Gillnet	Unknown	Total
1998	0.01%	84.52%	10.00%	0.74%	1.48%	0.00%	1.77%	1.48%	100.00%
1999	0.00%	85.44%	12.80%	0.40%	0.20%	0.00%	1.17%	0.00%	100.00%
2000	0.00%	92.28%	4.81%	0.06%	1.13%	0.00%	1.73%	0.00%	100.00%
2001	0.00%	94.16%	3.01%	0.63%	0.67%	0.00%	1.52%	0.01%	100.00%
2002	0.00%	93.73%	3.35%	0.78%	0.29%	0.00%	1.82%	0.04%	100.00%
2003	0.00%	94.81%	3.00%	0.29%	0.10%	0.00%	1.81%	0.00%	100.00%
2004	0.00%	94.57%	3.30%	0.05%	0.00%	0.01%	1.25%	0.82%	100.00%
2005	0.00%	96.46%	2.11%	0.07%	0.00%	0.32%	1.03%	0.00%	100.00%
2006	0.00%	95.99%	2.71%	0.14%	0.00%	0.44%	0.73%	0.00%	100.00%
2007	0.48%	86.90%	3.88%	7.80%	0.19%	0.50%	0.25%	0.00%	100.00%
2008	0.02%	94.31%	4.92%	0.41%	0.33%	0.00%	0.00%	0.00%	100.00%
2009	0.03%	94.95%	4.89%	0.14%	0.00%	0.00%	0.00%	0.00%	100.00%
Average	0.05%	92.34%	4.90%	0.96%	0.37%	0.11%	1.09%	0.20%	100.00%

5.3.3.6.2 Queen Conch Fishery Management Unit

In the descriptions of the St. Croix and St. Thomas/St. John queen conch fisheries and corresponding analysis for the 2010 ACL Amendment, all St. Croix and St. Thomas/St. John conch landings were assumed to be queen conch landings. The description of the conch fishery is incorporated by reference (see 2010 ACL Amendment).

5.3.2.6.3 Coral and Reef Associated Plants and Invertebrates Fisheries

The Virgin Islands Department of Planning and Natural Resources prohibits the unpermitted harvest of live-rock and all corals (Cnidaria) for commercial or recreational purposes. Hence, there are no harvests of these species in federal waters off the USVI.

There are reported commercial landings of sponges in St. Thomas/St. John, but not St. Croix. Landings of sponges varied from zero to 636 pounds from 2000 to 2009 (Table 5.3.47). These landings represented less than one percent of all invertebrate landings.

Table 5.3.47. Commercial landings (pounds) of sponges in St. Thomas/St. John, 2000 to 2009.

Year	Invertebrate Landings (Pounds)		
	Sponges	All	% Sponges
2000	24	80,249	0.03%
2001	636	99,605	0.64%
2002	482	122,457	0.39%
2003	374	144,898	0.26%
2004	0	137,986	0.00%
2005	62	127,478	0.05%
2006	55	143,430	0.04%
2007	60	134,317	0.04%
2008	90	119,759	0.08%
2009	0	64,088	0.00%
Average	178	117,426	0.15%
Median	61	124,967	0.05%

5.3.2.6.4 Grunt Fisheries

Grunt landings represent under 7 percent of finfish landings in St. Thomas/St. John and under 6 percent in St. Croix (Table 5.3.48). On average, 41,797 pounds were landed annually from 2000 to 2008 in St. Thomas/St. John and 42,177 pounds were landed annually in St. Croix during the same years. Landings fell significantly in 2009.

Table 5.3.48. Commercial grunt landings (pounds), 1998 to 2009.

Year	Pounds					
	St. Thomas/St. John			St. Croix		
	Grunts	Finfish	% Grunts	Grunts	Finfish	% Grunts
1998				32,563	553,113	5.89%
1999				30,203	576,252	5.24%
2000	32,828	538,557	6.10%	30,767	635,190	4.84%
2001	41,165	659,085	6.25%	38,380	773,170	4.96%
2002	43,727	698,991	6.26%	44,075	876,431	5.03%
2003	45,251	672,195	6.73%	40,615	776,564	5.23%
2004	48,899	673,878	7.26%	45,479	779,882	5.83%
2005	44,947	617,050	7.28%	44,261	866,061	5.11%
2006	42,152	643,261	6.55%	44,862	960,102	4.67%
2007	38,388	577,039	6.65%	51,163	916,172	5.58%
2008	38,818	567,067	6.85%	39,990	769,520	5.20%
2009	17,709	295,736	5.99%	24,009	418,383	5.74%
Ave. 2000-08	41,797	627,458	6.66%	42,177	817,010	5.16%
Ave. 2000-05	42,803	643,293	6.64%	40,596	784,550	5.17%
Ave. 2006-08	39,786	595,789	6.68%	45,338	881,931	5.15%

Approximately 95 percent of commercial gruntfish landed in St. Thomas/St. John are harvested using traps (Table 5.3.49). Traps are the primary gear Cruzan fishers use for catching grunts; however, traps account for less of a share of landings in St. Croix. In 2009, there was a significant reduction in the use of nets to catch grunts in St. Croix. Scuba gear has been increasingly used by Cruzan fishers.

Table 5.3.49. Percent of gruntfish landings (pounds) by gear, 1998 to 2009, for landings with known gear.

Gear	St. Croix		St. Thomas/St. John	
	1998-2008	2009	2000-2008	2009
Castnet	0.03%	0.00%	0.01%	1.61%
Free Diving	4.80%	7.59%	0.36%	0.12%
Gillnet	7.45%	0.00%	0.00%	0.00%
Line Fishing	11.42%	6.06%	2.51%	0.44%
Longline	0.00%	0.00%	0.02%	0.00%
Seine Net	2.92%	0.00%	2.40%	0.00%
Scuba Diving	22.73%	59.85%	0.13%	2.56%
Traps	49.35%	26.51%	94.56%	95.27%
Trammel Net	1.30%	0.00%	0.00%	0.00%
Total	100.00%	100.00%	100.00%	100.00%

5.3.2.6.5 Goatfishes Fisheries

Goatfish landings represent less than a tenth of a percent of finfish landings in St. Thomas/St. John and under one percent in St. Croix (Table 5.3.50). Goatfish landings fell significantly after 2006 in both Districts.

Table 5.3.50. Commercial goatfish landings (pounds), 1998 to 2009.

Year	Pounds					
	St. Thomas/St. John			St. Croix		
	Goatfish	Finfish	% Goatfish	Goatfish	Finfish	% Goatfish
1998				4,096	553,113	0.74%
1999				4,273	576,252	0.74%
2000	726	538,557	0.13%	3,719	635,190	0.59%
2001	723	659,085	0.11%	3,359	773,170	0.43%
2002	295	698,991	0.04%	6,971	876,431	0.80%
2003	274	672,195	0.04%	5,904	776,564	0.76%
2004	196	673,878	0.03%	4,391	779,882	0.56%
2005	291	617,050	0.05%	4,417	866,061	0.51%
2006	423	643,261	0.07%	4,057	960,102	0.42%
2007	205	577,039	0.04%	2,978	916,172	0.32%
2008	74	567,067	0.01%	1,775	769,520	0.23%
2009	54	295,736	0.02%	776	418,383	0.19%
Ave. 2000-08	356	627,458	0.06%	4,174	817,010	0.51%
Ave. 2000-05	417	643,293	0.07%	4,793	784,550	0.61%
Ave. 2006-08	234	595,789	0.04%	2,937	881,931	0.33%

In both St. Thomas/St. John and St. Croix, the primary gear to harvest goatfish are traps. (Table 5.3.51). St. Thomas/St. John fishers rely more on traps, while a substantial number of Cruzan fishers use scuba gear. St. Thomas/St. John fishers have used line fishing to catch goatfish, but line fishing for goatfish has essentially ended since 2007.

Table 5.3.51. Commercial goatfish landings (pounds) by gear, 1998 to 2009, for landings with known gear.

Gear	St. Croix		St. Thomas/St. John	
	1998-2008	2009	2000-2008	2009
Castnet	0.14%	0.00%	0.00%	0.00%
Free Diving	0.03%	0.39%	0.00%	0.00%
Gillnet	0.00%	0.00%	0.00%	0.00%
Line Fishing	0.08%	0.00%	26.71%	0.00%
Longline	0.00%	0.00%	0.00%	0.00%
Seine Net	1.41%	0.00%	0.37%	0.00%
Scuba Diving	28.75%	31.83%	0.03%	0.00%
Traps	68.19%	67.78%	72.89%	100.00%
Trammel Net	1.40%	0.00%	0.00%	0.00%
Total	100.00%	100.00%	100.00%	100.00%

5.3.2.6.6 Angelfishes Fisheries

Commercial landings of angelfishes are substantially higher in St. Thomas/St. John than in St. Croix. From 2000 to 2008, St. Thomas/St. John fishers landed an average of over ten thousand pounds annually as compared to the less than one hundred pounds landed by their counterparts in St. Croix (Table 5.3.52).

Table 5.3.52. Commercial landings (pounds) of angelfish, 1998 to 2009.

Year	Pounds					
	St. Thomas/St. John			St. Croix		
	Angelfish	Finfish	% Angelfish	Angelfish	Finfish	% Angelfish
1998				6,971	553,113	1.26%
1999				3,247	576,252	0.56%
2000	8,022	538,557	1.49%	242	635,190	0.04%
2001	8,554	659,085	1.30%	0	773,170	0.00%
2002	10,956	698,991	1.57%	76	876,431	0.01%
2003	9,600	672,195	1.43%	0	776,564	0.00%
2004	13,133	673,878	1.95%	15	779,882	0.00%
2005	12,648	617,050	2.05%	75	866,061	0.01%
2006	13,342	643,261	2.07%	12	960,102	0.00%
2007	10,342	577,039	1.79%	203	916,172	0.02%
2008	8,168	567,067	1.44%	188	769,520	0.02%
2009	3,531	295,736	1.19%	63	418,383	0.02%
Ave. 2000-08	10,529	627,458	1.68%	90	817,010	0.01%
Ave. 2000-05	10,485	643,293	1.63%	68	784,550	0.01%
Ave. 2006-08	10,617	595,789	1.77%	134	881,931	0.02%

St. Thomas/St. John fishers catch most of their angelfish landings using traps. Cruzan fishers get angelfish as incidental catch in traps; however, there was a substantial increase in the share of landings from diving, both free and scuba, in 2009 (Table 5.3.53).

Table 5.3.53. Percent of angelfish landings (pounds) by gear, 1998 to 2009, for landings with known gear.

Gear	St. Croix		St. Thomas/St. John	
	1998-2008	2009	2000-2008	2009
Castnet	0.00%	0.00%	0.00%	0.00%
Free Diving	8.83%	55.56%	1.51%	1.16%
Gillnet	8.93%	0.00%	0.00%	0.00%
Line Fishing	6.69%	0.00%	0.09%	0.00%
Longline	0.00%	0.00%	0.00%	0.00%
Seine Net	4.04%	0.00%	0.20%	0.00%
Scuba Diving	17.82%	44.44%	1.29%	1.76%
Traps	53.56%	0.00%	96.91%	97.08%
Trammel Net	0.14%	0.00%	0.00%	0.00%
Total	100.00%	100.00%	100.00%	100.00%

5.3.2.6.7 Boxfish Fisheries

Substantially more boxfish are landed in St. Thomas/St. John than in St. Croix. Approximately 31,000 pounds were landed in St. Thomas/St. John annually from 2000 to 2008 as opposed to 9,582 pounds in St. Croix (Table 5.3.54). Boxfish landings represent approximately 5 percent of finfish landings in St. Thomas/St. John and approximately 1 percent of finfish landings in St. Croix during those years. Preliminary data suggest finfish landings fell significantly in both Districts in 2009.

Table 5.3.54. Commercial landings (pounds) of boxfish, 1998 to 2009.

Year	Pounds					
	St. Thomas/St. John			St. Croix		
	Boxfish	Finfish	% Boxfish	Boxfish	Finfish	% Boxfish
1998				6,317	553,113	1.14%
1999				7,461	576,252	1.29%
2000	25,613	538,557	4.76%	6,724	635,190	1.06%
2001	29,852	659,085	4.53%	9,643	773,170	1.25%
2002	31,127	698,991	4.45%	10,901	876,431	1.24%
2003	32,260	672,195	4.80%	12,722	776,564	1.64%
2004	33,974	673,878	5.04%	10,581	779,882	1.36%
2005	33,204	617,050	5.38%	8,795	866,061	1.02%
2006	31,650	643,261	4.92%	8,669	960,102	0.90%
2007	28,484	577,039	4.94%	9,783	916,172	1.07%
2008	32,643	567,067	5.76%	8,426	769,520	1.09%
2009	15,145	295,736	5.12%	4,003	418,383	0.96%
Ave. 2000-08	30,978	627,458	4.95%	9,582	817,010	1.18%
Ave. 2000-05	31,005	643,293	4.83%	9,894	784,550	1.26%
Ave. 2006-08	30,925	595,789	5.20%	8,959	881,931	1.02%

Traps account for almost all landings of boxfish in St. Thomas/St. John (Table 5.3.55). Although over half of boxfish landings in St. Croix originate from traps, there has been increasing use of diving, both free and scuba, to take the species. Although gillnets contributed to over ten percent of St. Croix's boxfish landings from 2000 to 2008, there were no landings from the use of gillnets in 2009.

Table 5.3.55. Percent of commercial landings (pounds) of boxfish by gear, 1998 to 2009, for landings with known gear.

Gear	St. Croix		St. Thomas/St. John	
	1998-2008	2009	2000-2008	2009
Castnet	0.01%	0.00%	0.00%	0.00%
Free Diving	3.42%	15.56%	0.13%	0.07%
Gillnet	11.92%	0.00%	0.00%	0.00%
Line Fishing	3.47%	0.45%	0.29%	0.00%
Longline	0.00%	0.00%	0.00%	0.00%
Seine Net	1.40%	0.00%	0.05%	0.00%
Scuba Diving	17.05%	26.06%	0.09%	1.17%
Traps	61.69%	57.92%	99.44%	98.76%
Trammel Net	1.04%	0.00%	0.00%	0.00%
Total	100.00%	100.00%	100.00%	100.00%

5.3.2.6.8 Wrasses (Hogfish) Fisheries

Hogfish are not a directly targeted species, but are incidental catch. An average of 9 pounds were landed annually in St. Croix and 650 pounds in St. Thomas/St. John from 2000 to 2008, Landings in St. Croix vary considerably, with most years having zero landings (Table 5.3.56). St. Croix's highest landings in the 2000s occurred in 2008, with a peak of 70 pounds. All of the hogfish landings in St. Croix and almost all of the landings in St. Thomas/St. John are catch taken from traps.

Table 5.3.56. Commercial hogfish landings (pounds), 1998 to 2009.

Year	Pounds					
	St. Thomas/St. John			St. Croix		
	Hogfish	Finfish	% Hogfish	Hogfish	Finfish	% Hogfish
1998				0	553,113	0.00%
1999				0	576,252	0.00%
2000	57	538,557	0.01%	0	635,190	0.00%
2001	207	659,085	0.03%	8	773,170	0.00%
2002	50	698,991	0.01%	0	876,431	0.00%
2003	215	672,195	0.03%	0	776,564	0.00%
2004	708	673,878	0.11%	0	779,882	0.00%
2005	897	617,050	0.15%	2	866,061	0.00%
2006	1,679	643,261	0.26%	0	960,102	0.00%
2007	1,419	577,039	0.25%	0	916,172	0.00%
2008	615	567,067	0.11%	70	769,520	0.01%
2009	456	295,736	0.15%	0	418,383	0.00%
Ave. 2000-08	650	627,458	0.11%	9	817,010	0.00%
Ave. 2000-05	356	643,293	0.06%	2	784,550	0.00%
Ave. 2006-08	1,238	595,789	0.21%	23	881,931	0.00%

5.3.2.6.9 Jacks Fisheries

Commercial fishers in St. Thomas/St. John land considerably more jacks than their counterparts in St. Croix. Over the nine-year period from 2000 to 2008, St. Thomas/St. John fishers landed an average of 58,785 pounds of jacks annually, while those in St. Croix landed 16,648 pounds (Table 5.3.57).

Table 5.3.57. Commercial landings (pounds) of jacks, 1998 to 2009.

Year	Pounds					
	St. Thomas/St. John			St. Croix		
	Jacks	Finfish	% Jacks	Jacks	Finfish	% Jacks
1998				14,600	553,113	2.64%
1999				22,271	576,252	3.86%
2000	50,941	538,557	9.46%	23,074	635,190	3.63%
2001	67,360	659,085	10.22%	33,728	773,170	4.36%
2002	70,273	698,991	10.05%	20,199	876,431	2.30%
2003	58,969	672,195	8.77%	12,135	776,564	1.56%
2004	54,960	673,878	8.16%	13,473	779,882	1.73%
2005	38,890	617,050	6.30%	8,180	866,061	0.94%
2006	73,522	643,261	11.43%	7,777	960,102	0.81%
2007	56,988	577,039	9.88%	22,538	916,172	2.46%
2008	57,165	567,067	10.08%	8,729	769,520	1.13%
2009	42,221	295,736	14.28%	6,104	418,383	1.46%
Ave. 2000-08	58,785	627,458	9.37%	16,648	817,010	2.10%
Ave. 2000-05	56,899	643,293	8.83%	18,465	784,550	2.42%
Ave. 2006-08	62,558	595,789	10.46%	13,015	881,931	1.47%

Seine nets and line fishing account for the large majority of jack landings, especially in St. Thomas/St. John (Table 5.3.58). Cruzan fishers used to use gillnets to catch many jacks in St. Croix, but gillnets are no longer legal gear.

Table 5.3.58. Percent of commercial jacks landings (pounds) by gear, 1998 to 2009, for landings with known gear.

Gear	St. Croix		St. Thomas/St. John	
	1998-2008	2009	2000-2008	2009
Castnet	0.02%	0.00%	0.06%	0.87%
Free Diving	0.23%	0.15%	0.02%	0.00%
Gillnet	10.01%	0.00%	0.05%	0.00%
Line Fishing	32.40%	9.17%	35.04%	41.10%
Longline	0.00%	0.00%	0.00%	0.00%
Seine Net	33.03%	66.14%	61.89%	56.66%
Scuba Diving	17.50%	10.80%	0.46%	0.00%
Traps	6.58%	13.75%	2.49%	1.36%
Trammel Net	0.24%	0.00%	0.00%	0.00%
Total	100.00%	100.00%	100.00%	100.01%

5.3.2.6.10 Porgies Fisheries

Annual commercial landings of scups and porgies represent less than one percent of all commercial finfish landings in St. Croix, while they represent approximately 4 percent of all commercial finfish landings in St. Thomas/St. John (Table 5.3.59). Preliminary data suggests a significant decrease in landings in 2009.

Table 5.3.59. Commercial landings (pounds) of scups and porgies, 1998 to 2009.

Year	Pounds					
	St. Thomas/St. John			St. Croix		
	Scups &Porgies	Finfish	% Scups & Porgies	Scups &Porgies	Finfish	% Scups & Porgies
1998				0	553,113	0.00%
1999				1,752	576,252	0.30%
2000	19,386	538,557	3.60%	3,547	635,190	0.56%
2001	24,809	659,085	3.76%	6,349	773,170	0.82%
2002	24,487	698,991	3.50%	9,746	876,431	1.11%
2003	26,297	672,195	3.91%	5,311	776,564	0.68%
2004	27,084	673,878	4.02%	3,941	779,882	0.51%
2005	25,857	617,050	4.19%	4,538	866,061	0.52%
2006	24,279	643,261	3.77%	4,990	960,102	0.52%
2007	23,957	577,039	4.15%	5,514	916,172	0.60%
2008	22,030	567,067	3.88%	5,847	769,520	0.76%
2009	10,749	295,736	3.63%	2,179	418,383	0.52%
Ave. 2000-08	24,243	627,458	3.87%	5,531	817,010	0.68%
Ave. 2000-05	24,653	643,293	3.83%	5,572	784,550	0.70%
Ave. 2006-08	23,422	595,789	3.94%	5,450	881,931	0.63%

Almost all of landings of scups and porgies in St. Thomas/St. John are of individuals caught in traps (Table 5.3.60). The share of Cruzan landings due to diving, both free and scuba, has increased, while gillnet landings have ended.

Table 5.3.60. Percent of commercial scups and porgies landings (pounds) by gear, 1998 to 2009, for landings with known gear.

Gear	St. Croix		St. Thomas/St. John	
	1998-2008	2009	2000-2008	2009
Castnet	0.00%	0.00%	0.00%	0.00%
Free Diving	3.14%	10.65%	0.22%	0.19%
Gillnet	15.97%	0.00%	0.00%	0.00%
Line Fishing	6.09%	0.32%	1.79%	0.56%
Longline	0.00%	0.00%	0.00%	0.00%
Seine Net	2.84%	0.00%	0.15%	0.18%
Scuba Diving	44.55%	76.04%	0.07%	2.89%
Traps	25.98%	12.99%	97.77%	96.18%
Trammel Net	1.42%	0.00%	0.00%	0.00%
Total	100.00%	100.00%	100.00%	100.00%

5.3.2.6.11 Squirrelfish Fisheries

Commercial landings of squirrelfish typically represent less than one percent of St. Croix's and St. Thomas/St. John's finfish landings (Table 5.3.61). Preliminary data indicates significant decreases in squirrelfish landings in 2009 in both Districts.

Table 5.3.61. Commercial landings (pounds) of squirrelfish, 1998 to 2009.

Year	Pounds					
	St. Thomas/St. John			St. Croix		
	Squirrel-fish	Finfish	% Squirrel-fish	Squirrel-fish	Finfish	% Squirrel-fish
1998				6	553,113	0.00%
1999				26	576,252	0.00%
2000	5,585	538,557	1.04%	104	635,190	0.02%
2001	7,966	659,085	1.21%	6	773,170	0.00%
2002	5,358	698,991	0.77%	238	876,431	0.03%
2003	2,514	672,195	0.37%	314	776,564	0.04%
2004	5,004	673,878	0.74%	49	779,882	0.01%
2005	5,159	617,050	0.84%	6	866,061	0.00%
2006	4,628	643,261	0.72%	802	960,102	0.08%
2007	2,489	577,039	0.43%	195	916,172	0.02%
2008	3,704	567,067	0.65%	77	769,520	0.01%
2009	1,503	295,736	0.51%	22	418,383	0.01%
Ave. 2000-08	4,712	627,458	0.75%	199	817,010	0.02%
Ave. 2000-05	5,264	643,293	0.83%	120	784,550	0.02%
Ave. 2006-08	3,607	595,789	0.60%	358	881,931	0.04%

From 2000 to 2008, approximately 70 percent of squirrelfish landings derived from trap fishing and almost 30 percent from line fishing in St. Croix, but in 2009, 98 percent to 100 percent of the pounds landed came from line fishing. From 2000 to 2008, 99 percent of squirrelfish landings came from traps and in 2009, all squirrelfish landings were from individuals caught in traps.

5.3.2.6.12 Triggerfish Fisheries

Triggerfish represent a significant part of finfish landings in St. Thomas/St. John. From 2000 to 2009, triggerfish landings represented from approximately 12 percent to 15 percent of St. Thomas/St. John's finfish landings (Table 5.3.62). During those same years, triggerfish represented from approximately 3 percent to 4 percent of finfish landings in St. Croix. Landings in St. Thomas/St. John varied from 72,091 pounds to over 100 thousand pounds from 2000 to 2003. Landings in both Districts fell substantially in 2009.

Table 5.3.62. Commercial landings (pounds) of triggerfish, 1998 to 2009.

Year	Pounds					
	St. Thomas/St. John			St. Croix		
	Trigger-fish	Finfish	% Trigger-fish	Trigger-fish	Finfish	% Trigger-fish
1998				24,900	553,113	4.50%
1999				23,647	576,252	4.10%
2000	72,091	538,557	13.39%	22,815	635,190	3.59%
2001	82,688	659,085	12.55%	29,522	773,170	3.82%
2002	97,543	698,991	13.95%	33,906	876,431	3.87%
2003	101,558	672,195	15.11%	26,902	776,564	3.46%
2004	87,424	673,878	12.97%	27,334	779,882	3.50%
2005	76,462	617,050	12.39%	26,717	866,061	3.08%
2006	70,015	643,261	10.88%	26,010	960,102	2.71%
2007	73,176	577,039	12.68%	27,868	916,172	3.04%
2008	83,514	567,067	14.73%	32,832	769,520	4.27%
2009	38,810	295,736	13.12%	18,648	418,383	4.46%
Ave. 2000-08	82,719	627,458	13.18%	28,212	817,010	3.48%
Ave. 2000-05	86,294	643,293	13.39%	27,866	784,550	3.56%
Ave. 2006-08	75,568	595,789	12.76%	28,903	881,931	3.34%

St. Thomas/St. John's landings of triggerfish mostly derive from trap fishing (Table 5.3.63). Cruzan fishers have increasingly used scuba gear to harvest triggerfish.

Table 5.3.63. Percent of commercial triggerfish landings (pounds) by gear, 1998 to 2009, for landings with known gear.

Gear	St. Croix		St. Thomas/St. John	
	1998-2008	2009	2000-2008	2009
Castnet	0.00%	0.00%	0.00%	0.00%
Free Diving	7.19%	9.98%	0.37%	0.23%
Gillnet	6.31%	0.00%	0.00%	0.00%
Line Fishing	12.79%	2.10%	1.33%	1.53%
Longline	0.00%	0.00%	0.00%	0.00%
Seine Net	1.48%	0.00%	0.02%	0.12%
Scuba Diving	35.14%	74.38%	0.47%	0.87%
Traps	36.59%	13.53%	97.80%	97.26%
Trammel Net	0.49%	0.00%	0.00%	0.00%
Total	100.00%	100.00%	100.00%	100.00%

5.3.2.6.13 Surgeonfish Fisheries

St. Croix commercial fishers land slightly more surgeonfish than their counterparts in St. Thomas/St. John. From 2000 to 2008, Cruzan fishers landed an average of 45,939 pounds annually and St. Thomas/St. John fishers landed 38,999 pounds annually (Table 5.3.64). Like in other fisheries, landings fell substantially in 2009.

Table 5.3.64. Commercial landings (pounds) of surgeonfish, 1998 to 2009.

Year	Pounds					
	St. Thomas/St. John			St. Croix		
	Surgeon	Finfish	% Surgeon	Surgeon	Finfish	% Surgeon
1998				41,020	553,113	7.42%
1999				34,596	576,252	6.00%
2000	31,215	538,557	5.80%	36,992	635,190	5.82%
2001	36,552	659,085	5.55%	44,249	773,170	5.72%
2002	41,306	698,991	5.91%	54,632	876,431	6.23%
2003	42,140	672,195	6.27%	42,039	776,564	5.41%
2004	45,823	673,878	6.80%	47,570	779,882	6.10%
2005	40,076	617,050	6.49%	48,853	866,061	5.64%
2006	38,980	643,261	6.06%	51,293	960,102	5.34%
2007	37,804	577,039	6.55%	49,591	916,172	5.41%
2008	37,095	567,067	6.54%	38,229	769,520	4.97%
2009	15,469	295,736	5.23%	19,748	418,383	4.72%
Ave. 2000-08	38,999	627,458	6.22%	45,939	817,010	5.63%
Ave. 2000-05	39,519	643,293	6.14%	45,722	784,550	5.82%
Ave. 2006-08	37,960	595,789	6.38%	46,371	881,931	5.24%

Almost all surgeonfish landings in St. Thomas/St. John derive from trap fishing. From 2000 to 2008, gillnets represented approximately 22 percent of surgeonfish commercial landings, but more recently they account for no landings (Table 5.3.65).

Table 5.3.65. Percent of commercial landings (pounds) of surgeonfish, 1998 to 2009, for landings with known gear.

Gear	St. Croix		St. Thomas/St. John	
	1998-2008	2009	2000-2008	2009
Castnet	0.05%	0.00%	0.00%	0.00%
Free Diving	3.26%	6.10%	0.52%	0.20%
Gillnet	21.65%	0.00%	0.00%	0.00%
Line Fishing	2.50%	0.60%	0.77%	0.11%
Longline	0.00%	0.00%	0.00%	0.00%
Seine Net	5.14%	0.00%	0.53%	0.13%
Scuba Diving	16.10%	60.90%	0.03%	0.13%
Traps	49.11%	32.40%	98.15%	99.42%
Trammel Net	2.18%	0.00%	0.00%	0.00%
Total	100.00%	100.00%	100.00%	100.00%

5.3.2.6.14 Tilefish and Filefish Fisheries

There are no records of commercial landings of either tilefish or filefish in the USVI.

5.3.3.7 U.S. Virgin Islands Recreational Fisheries

The MRFSS program began in 1979 and was conducted in 1979 and 1981 in the USVI; however, it was discontinued in 1982 because of lack of funding. MRFSS was re-initiated in the USVI in 2000, but subsequently has not been continued.

5.4 Administrative Environment

5.4.1 Federal Fishery Management

Federal fishery management is conducted under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.), originally enacted in 1976 as the Fishery Conservation and Management Act. The MSA 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, and authority over U.S. anadromous species and continental shelf resources that occur beyond the U.S. EEZ.

Responsibility for federal fishery management decision-making is divided between the Secretary of Commerce (Secretary) 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 proposed plans and amendments after ensuring management measures are consistent with the MSA and with other applicable laws summarized in Appendix 6. In most cases, the Secretary has delegated this authority to NOAA Fisheries.

The Caribbean Fishery Management Council (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.

The total area of fishable habitat in the U.S. Caribbean is about 2,467 nm^2. The fishable habitat within the EEZ is 355 nm^2 or 14.39% of the U.S. Caribbean total, with 116 nm^2 (4.7%) occurring off Puerto Rico and 240 nm^2 (9.7%), occurring off the USVI (Figure 5.4.1). 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. Due to the steep continental slopes that occur off Puerto Rico and the USVI, fishable habitat is defined as those waters less than or equal to 100 fathoms. The majority of fishable habitat occurs in that area, as does the majority of fishing activity for Council-managed species, except for fishing for deep water snappers, which occurs primarily in the EEZ (at depths greater than 100 fathoms). Although the seabed drops off dramatically beyond 100 fathoms and is difficult to fish, the fisheries that occur beyond this depth account for more than 10% of the total landings in Puerto Rico.

The 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 NOAA Fisheries. 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 contained within FMPs are enforced through actions of NOAA's Office of Law Enforcement, the United States Coast Guard, and various territorial authorities. To better coordinate enforcement activities, federal and territory enforcement agencies have developed cooperative agreements to enforce the MSA. However, enforcement in the Caribbean region is severely underfunded. Because personnel and equipment are limited, enforcement depends largely on voluntary compliance (The 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. 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/).

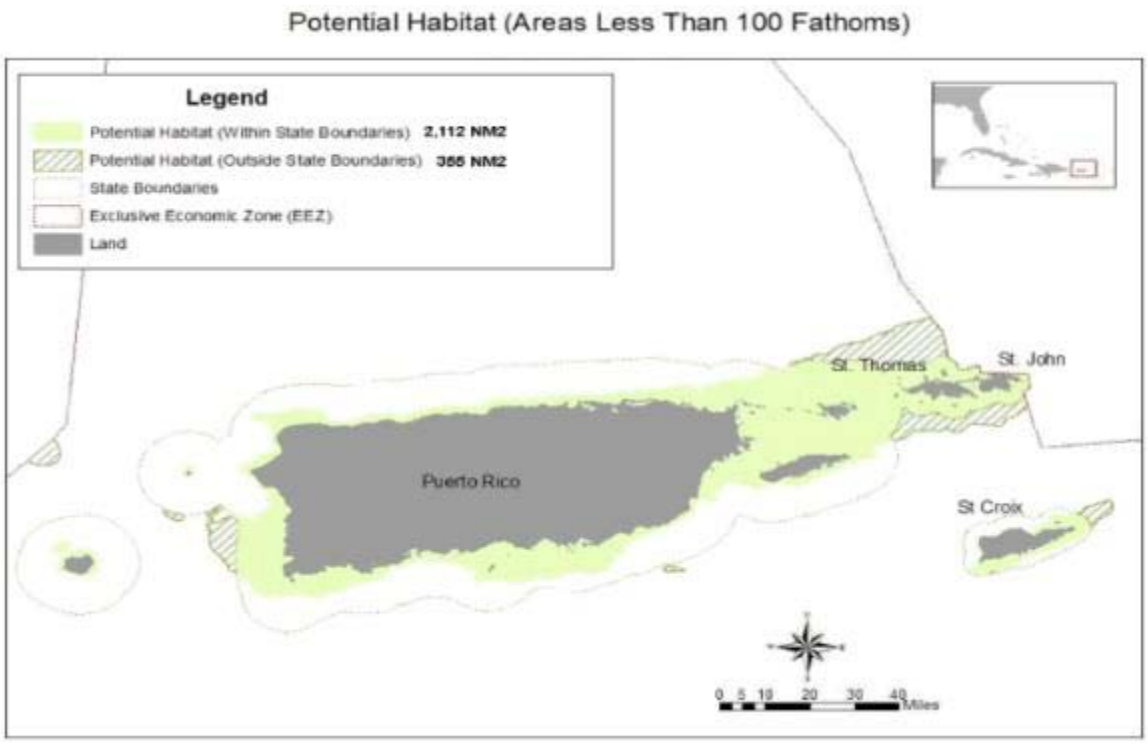


Figure 5.4.1. Map of the U.S. Caribbean and the 100-Fathom Contour. 2010 Caribbean ACL Amendment.

5.4.2 Territory Fishery Management

The governments of the Commonwealth of Puerto Rico and the Territory of the USVI have the authority to manage their respective state fisheries. As a Commonwealth, Puerto Rico has an autonomous government, but is voluntarily associated with the United States. The USVI is an unincorporated territory with a semi-autonomous government and its own constitution (OTA 1987).

Puerto Rico has jurisdiction over fisheries in waters extending nine nautical miles from shore. Those fisheries are managed by the Fisheries Research Laboratory of Puerto Rico's Department of Natural and Environmental Resources. Section 19 of Article 6 of the Constitution of Puerto Rico provides the foundation for the fishery rules and regulations. PR Law 278 of 1998, establishes public policy regarding fisheries.

The USVI has jurisdiction over fisheries in waters extending 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 VI-DPNR is the USVI's fishery management agency.

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

Both Puerto Rico and the USVI require commercial fishing licenses, permits and reporting. Puerto Rico requires a license for commercial fishers, and has categories for full-time, part-time, novice, 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., ceti) fisheries. Puerto Rico also requires a license for all recreational fishermen 13 years and older (excluding fishermen on charter or head boats). Additional recreational permits are required for the harvest of spiny lobster, queen conch, common land crab, billfish (HMS), freshwater shrimp, and sirajo goby. All fishers fishing recreationally in the EEZ must have registered in the National Registry (http://www.countmyfish.noaa.gov/index.html). The USVI only has a license requirement for commercial fishers who are permanent USVI residents, with the exception of a recreational shrimp permit for Altona Lagoon and Great Pond on St. Croix, and for fishing activities in the Great St. James Marine Reserve off St. Thomas. The USVI government is currently developing recreational fishing regulations for the Territory.

Additional information regarding fishery management in territorial or federal waters can be found in Section 2.1 of the Caribbean SFA Amendment (CFMC 2005).

6.0 ENVIRONMENTAL CONSEQUENCES

6.1 ACTION 1: Management Reference Points for species not undergoing overfishing within the Reef Fish Fishery Management Plan (FMP).

6.1.1 Direct and Indirect Effects on the Physical and Biological Environment.

Most fishery interactions with the physical environment are caused by fishing gear impacts to bottom habitat. Management reference points can influence the extent of these interactions by guiding decisions regarding appropriate catch levels. However, the management measures implemented to manage catches (e.g., bag limits, trip limits, and gear restrictions) have a much more substantial impact on the number, nature, and extent of habitat interactions than do the catch levels themselves.

The primary gear types used in the reef fish fisheries under federal management are described in Appendix 7. 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, which offer significant benthic structure in the U.S. Caribbean (Barnette 2001). And the cumulative effects of repeated anchoring by fishermen using any harvest method, including spear guns and hand harvest, also can damage (e.g., reduce vertical relief) hard bottom areas where fishing occurs (Barnette 2001).

The management reference point effectively limiting catch levels and, therefore, having the greatest indirect impact on these habitat interactions is the annual catch limit (ACL). ACLs limit the total catch of a species, species group or complex that may be taken in any given year without requiring fishery managers to impose additional management controls. As a result, larger ACLs are likely to result in less restrictive management controls and increased habitat interactions relative to smaller ACLs.

While the Caribbean Fishery Management Council (Council) did not explicitly specify ACLs for reef fish in the 2005 Comprehensive Sustainable Fisheries Act Amendment (Caribbean SFA Amendment), the acceptable biological catch (ABC) estimates derived from the Council's maximum sustainable yield (MSY) control rule could be considered to represent the ACLs of these species, species groups or complexes if no additional action were taken through this amendment to revise management reference points. These ABC values are equal or higher than the ACL alternatives considered here for the reef fish and consequently would be expected to benefit less the physical environment by supporting higher catch levels than a lower ACL.

The range of ACL values specified by the different year sequences for the reef fish do not differ enough to notably effect habitat interactions to varying degrees. The ACL values specified by **Alternatives 2(i)** through **2(l)** become progressively smaller as the precautionary buffers they propose become increasingly larger. The values associated with MSY and overfishing limit (OFL) are the same across all alternatives as the OFL will equal the MSY proxy selected by the council in either Alternative 2(a) or 2(b). If the Council adds 2 standard deviation to the mean annual landings to determine MSY proxy

(Alternative 2(b)) this choice could increase the interactions of fishing gear with the physical environment as landings levels are increased. There is no expected biological effect with this alternative as overfishing is unlikely if future landings are moderately higher than the mean of recent landings.

Alternatives 2(g) through **2(e)** would progressively increase habitat interactions, with **Alternatives 2(e)** supporting the highest langings levels and, thus, the largest number of interactions.

The primary difference between alternative reference point (or proxy) definitions is the time series of landings data on which they are based. Alternatives for each island group under Action 1(a) would average landings over the longest period for which the Council considers data to be consistently reliable across all islands. These year sequences alternatives also include recent years in which harvest was further constrained by management controls.

Management reference points affect the biological and physical environments by defining fishery management objectives regarding the amount of fish that can or should be removed from a population. MSY represents largest average catch or yield that can continuously be taken from a stock under existing environmental conditions. The overfishing threshold (specified as maximum fishing mortality threshold (MFMT) or OFL) represents the fishing rate or catch level above which overfishing is occurring, meaning the fishery's ability to produce MSY is at risk. An ABC is a term used by a management agency, which refers to the range of allowable catch for a species or species group. ACL represents the annual catch level specified by the Council to prevent overfishing and avoid the implementation of accountability measures (AMs). Optimum yield (OY) is the catch level that provides the greatest overall benefit to the nation, taking into account food production recreational opportunities, and the protection of marine ecosystems.

Together, these parameters provide fishery managers with reference points against which to measure fishery performance. When data are insufficient to specify these parameters, the National Standard 1 (NS1) guidelines direct regional fishery management councils to estimate them using reasonable proxies, like long-term average catch, and to consider scientific and management uncertainty in determining the appropriateness of alternative proxies.

Uncertainty is inherent in the fishery management process and stems from a variety of sources, including but not necessarily limited to: catch, abundance, and other parameter estimates; development and parameterization of descriptive population models; and prediction of future environmental conditions affecting fish populations, as well as fisheries' response to changing regulations and anticipated economic, political, and social conditions (Hilborn and Peterman 1996). While it is generally difficult to quantify the degree of uncertainty surrounding specific scientific and/or management decisions, accounting for this uncertainty is essential to effective management particularly in U.S. Caribbean fisheries that are considered data poor.

The management reference point alternatives considered here incorporate various degrees of precaution to account for the scientific and management uncertainty underlying fishery management decision-making in the U.S. Caribbean.

The parameter estimates defined by the no action **Alternative 1** of Action 1(b) proxies for species/species groups considered under this amendment are generally the lowest of all those considered under scenarios that incorporate a moderate amount of precaution. Consequently, this alternative would be expected to support relatively low reef fish catch rates relative to the action alternatives.

The primary differences between the reference points (or proxies) defined by the no action **Alternative 1** and those evaluated under the action **Alternative 2** are: (1) the no action reference points require estimates of catch, stock biomass, and fishing mortality rates, whereas **Alternative 2** require only landings estimates; and (2) the no action alternative estimates reference points at a smaller scale/finer resolution (i.e., for distinct units within the reef fish complex such as grunts, boxfish, wrasses, etc..), whereas **Alternative 2** estimate aggregate reference points or proxies for the reef fish complex as a whole.

Theoretically, the biomass based and fishing-mortality-rate based reference points specified by the no action alternative would be more precise and more effective in preventing overfishing. However, because data are insufficient to estimate biomass and fishing mortality rates in the U.S. Caribbean, these reference points must be calculated based on informed judgment regarding stock status in relation to MSY. As a result, the actual values associated with current definitions are highly uncertain. In some cases (i.e., MFMT), such values have not even been estimated.

The present practice of defining management reference points at the finest resolution possible could also be considered the ideal approach to monitoring fishery performance. Aggregate reference points would make it more difficult for fishery scientists and managers to monitor the status of individual reef fish species. These reef fish species (grunts, angelfish, wrasses, tilefish) are classified as not undergoing overfishing in NOAA Fisheries' report to Congress on the status of U.S. Fisheries.

Additionally, the proxies defined by no action **Alternative 1** average landings over the longest time period during which data were considered to be relatively reliable at the time the Council approved the Caribbean SFA Amendment. The NS1 guidelines support using data collected over a long time series to capture the fishery's response to changing conditions. Because fewer years of landings data were available at that time, those proxies incorporated Puerto Rico and U.S. Virgin Islands (USVI) catch data prior to 1999. The proxies evaluated under the other year sequence alternatives under Action 1(a) for the different island groups might propose not using data prior to 1999 for catch calculations because the Council no longer considers USVI data collected prior to 1999 to be reliable and favors using a relatively consistent baseline across all islands.

The overfishing threshold defined by no action **Alternative 1** under Action 1(b) is an MFMT equal to the fishing mortality rate at MSY. Because this fishing mortality rate is unknown for U.S. Caribbean species, the Caribbean SFA Amendment adopted natural mortality rate as a proxy for this parameter. However, data are insufficient to evaluate the sustainability of current fishing mortality rates relative to this proxy and make a determination as to whether overfishing is or is not occurring.

Alternative 2 would specify a landings -based overfishing threshold, called the OFL, and annual landings based on the year sequences selected in Action 1(a), would be evaluated relative to the OFL to determine whether overfishing is or is not occurring. This approach is consistent with the NS1 guidelines, which provide fishery managers the flexibility to determine if overfishing occurs based on either fishing mortality rates or actual annual landings.

Both the ranking and range of the OFL values specified by **Alternative 2** of Action 1(b) is equal to that described for MSY values as these alternatives would set OFL equal to MSY.

While the no-action **Alternative 1** under Action 1(b) does not explicitly define reef fish ACLs, the ABC estimates specified by the Council's MSY control rule could be considered to represent ACLs if no additional action were taken through this amendment to revise management reference points. However, these ABC values are very uncertain, as they were calculated using natural mortality rate as a proxy for the fishing mortality rate that would produce MSY and informed judgment regarding stock biomass. The aggregate value is relatively low compared to the ACL values specified by year sequences alternatives under Action 1(a), and would prevent the fishery from achieving OY as currently defined, even though recent data indicates management controls appear to have effectively reduced aggregate catches below the overfishing threshold.

The current OY provides a slight precautionary buffer between landings targets and limits. **Alternative 2(i)-2(l)** would set the OY and ACL as equal values, requiring the Council to consider the socioeconomic and ecological components of OY when determining how far ACLs should be reduced below the overfishing threshold to account for scientific uncertainty in estimating the OFL and management uncertainty in effectively constraining harvest over time.

Management precaution needs to be maintained to make sure that the species are not overfished. Overfishing reduces stock biomass and can reduce the size/age distribution of a population, depress the mean size/age at maturity, and decrease genetic diversity, ultimately resulting in growth overfishing and/or in recruitment failure. Overfishing also may alter the community structure and ecological functions of the supporting reef ecosystem. Reef Fish are part of a complex reef ecosystem, in which co-occurring species compete for resources, such as habitat and food. Effects realized by one species or the complex as a whole are likely to impact in some way the ecological community.

Conversely, excessive precaution could lead fishery managers to constrain catches more than needed to prevent overfishing. This would result in higher biomass levels, reducing

the potential for overexploitation and maintaining the age and size structure, sex ratio, and genetic integrity of reef fish stocks at levels that better approximate natural conditions. Recruitment is generally highly variable due to natural variability in environmental factors that affect the survival of eggs and larvae. A stock maintained at a high biomass level can generally withstand several years of poor recruitment that may occur due to natural factors, but a stock subjected to overfishing for multiple years would find it more difficult to recover from such a situation.

6.1.2 Direct and Indirect Effects on the Economic and Social Environments

Action 1(a) has two alternatives. **Alternative 1**, the no action alternative, would continue the current management reference points as established by the Caribbean SFA Amendment and there would be no economic or social impacts beyond the baseline. **Alternatives 2, 3, 4 and 5** would establish the year sequences of landings that are used by Action 1(b) to estimate new management reference points. **Alternatives 2** through **5** would not have any direct economic or social impacts; however, the year sequences that are chosen would affect **Alternatives 2(a)** through **2(m)** of Action 1(b), which establish the MSY Proxy, OFLs, ABCs and ACLs, which in turn could motivate regulatory action to change existing fishing practices in federal waters.

Alternatives 2 through **5** of Action 1(a) divide the U.S. Caribbean sequences of landings by island group. Thus, they consist of different year sequences for Puerto Rico, St. Croix and St. Thomas/St. John (Table 6.1.2.1). These alternatives also have different year sequences for Puerto Rico's commercial and recreational landings because of data differences across sectors. Sequences of landings for St. Croix and St. Thomas/St. John are strictly commercial because recreational landings data are not collected in the USVI. **Alternative 2** has the highest number of years, while **Alternative 5** has the fewest. The year sequences for **Alternatives 2** and **4** are the same for St. Croix, St. Thomas/St. John and Puerto Rico recreational landings; hence, they would have the same indirect economic and social impacts.

Table 6.1.2.1. Comparison of Alternatives 2 through 5 of Action 1(a).

Alternative	Years			
	Puerto Rico		St. Croix	St. Thomas/St. John
	Commercial	Recreational	Commercial	Commercial
2	1988 - 2009	2000 - 2009	1999 - 2008	2000 - 2008
3	1999 - 2005	2000 - 2005	1999 - 2005	2000 - 2005
4	1999 - 2009	2000 - 2009	1999 - 2008	2000 - 2008
5	2005 - 2009	2005 - 2009	2004 - 2008	2004 - 2008

Alternative 1 of Action 1(b) is the no-action alternative, which would not change existing management reference points. **Alternative 2** of Action 1(b) would change existing management reference points and it is divided into 13 sub-alternatives. The first two alternatives, **Alternatives 2(a)** and **2(b)** would specify the MSY Proxy by using the mean of the sequence of annual landings chosen for Action 1(a). **Alternative 2(a)** would set the

MSY Proxy to equal the mean and **Alternative 2(b)** would set the MSY Proxy to equal the mean plus two standard deviation. **Alternative 2(a)** would establish a smaller MSY Proxy that would likely establish a smaller OFL and ACL, which in turn would more likely motivate regulatory change to decrease fishing for species in federal waters. Therefore, **Alternative 2(a)** is more likely to have an adverse indirect economic and social impact than **Alternative 2(b);** however, the actual indirect impact, if any, is dependent on subsequent regulatory action.

The MSY Proxies established by **Alternatives 2(a)** and **2(b)** of Action 1(b) are dependent on the alternative chosen for Action 1(a); however, the MSY Proxy that would be established by Alternative 2(b) would always be larger than the MSY Proxy that would be established by Alternative 2(a), except when the mean of landings is zero. For example, if **Alternative 3** of Action 1(a) is chosen for Puerto Rico's commercial sector, **Alternative 2(a)** would set the MSY Proxies for Triggerfish & Filefish at 82,679 pounds and **Alternative 2(b)** would set it at 126,133 pounds (Tables 6.1.2.2 and 6.1.2.3). The MSY Proxy would be highest for all units except Surgeonfish if **Alternative 3** of Action 1(a) is coupled with either **Alternative 2(b)** of Action 1(b). The MSY Proxy for Surgeonfish would be highest if **Alternative 2** of Action 1(a) is coupled with **Alternative 2(b)** of Action 1(b). Conversely, the MSY Proxy would be smallest if **Alternative 5** of Action 1(a) and either **Alternative 2(a)** of Action 1(b) are chosen for the Angelfish, Boxfish, Goatfish, Grunts, Jacks, Squirrelfish, Surgeonfish, and Triggerfish & Filefish Units.

Table 6.1.2.2. MSY Proxy for Puerto Rico Commercial Sector if Alternative 2(a) of Action 1(b) and Alternatives 2 through 5 of Action 1(a).

Alternative of Action 1(a)	Alternative 2(a) of Action 1(b): MSY Proxy = Average Annual Pounds Landed by Puerto Rico Commercial Fishermen										
	Angelfish	Boxfish	Goatfish	Grunts	Wrasses	Jacks	Scups & Porgies	Tilefish	Squirrel-fish	Surgeon-fish	Trigger-fish & Filefish
2 (88 - 09)	38	95,349	21,166	187,165	68,099	94,655	32,563	376	18,233	49	70,238
3 (99 - 05)	89	124,667	30,108	207,437	89,861	129,573	50,849	600	23,359	13	82,679
4 (99 - 09)	57	98,790	21,972	160,236	77,265	110,538	40,370	406	19,688	8	69,189
5 (05 - 09)	0	82,126	15,870	121,754	70,428	93,166	33,964	486	17,132	0	60,952

Table 6.1.2.3. MSY Proxy for Puerto Rico Commercial Sector if Alternative 2(b) of Action 1(b) and Alternatives 2 through 5 of Action 1(a).

Alternative of Action 1(a)	Alternative 2(b) of Action 1(b): MSY Proxy = Ave. Annual Pounds Landed by PR Commercial Fishermen + 2 Std. Dev.										
	Angel-fish	Boxfish	Goatfish	Grunts	Wrasses	Jacks	Scups & Porgies	Tilefish	Squirrel-fish	Surgeon-fish	Trigger-fish & Filefish
2 (88 - 09)	303	161,896	42,819	320,502	116,513	158,091	65,883	1,403	32,125	289	113,578
3 (99 - 05)	550	196,804	51,942	302,268	138,216	170,973	81,746	2,240	34,748	44	126,133
4 (99 - 09)	425	189,910	50,286	310,918	128,553	179,936	78,434	1,794	34,629	36	120,630
5 (05 - 09)	0	210,365	52,458	320,044	138,567	180,208	88,041	2,375	37,216	0	131,698

The MSY Proxies for Puerto Rico's recreational sector are highest for all but the Wrasses and Squirrelfish Units if **Alternative 3** of Action 1(a) is chosen in combination with **Alternative 2(b)** of Action 1(b). If **Alternative 5** of Action 1(a) and **Alternative 2(a)** of Action 1(b) are chosen, the MSY Proxies would be the lowest for all Units (Table 6.1.2.3). Note that if **Alternative 5** is chosen for both the commercial and recreational

sectors, the MSY Proxies for the Angelfish and Surgeonfish Units for the recreational sector would be larger than the corresponding MSY Proxies for the commercial sector that would be zero pounds.

Table 6.1.2.4. MSY Proxy for Puerto Rico Recreational Sector if Alternative 2(a) or 2(b) of Action 1(b) and Alternatives 2 through 5 of Action 1(a).

Alternative of Action 1(a)	Alternative 2(a) of Action 1(b): MSY Proxy = Ave. Annual Pounds Landed by PR Recreational Fishermen										
	Angel-fish	Boxfish	Goatfish	Grunts	Wrasses	Jacks	Scups & Porgies	Tilefish	Squirrel-fish	Surgeon-fish	Trigger-fish & Filefish
2 (00-09)	881	8,005	543	7,276	6,233	88,660	3,350	1,219	5,244	617	37,357
3 (00-05)	1,424	10,898	713	9,180	6,148	121,132	4,421	2,031	4,913	981	47,998
4 (00-09)	881	8,005	543	7,276	6,233	88,660	3,350	1,219	5,244	617	37,357
5 (05-09)	53	3,361	230	4,331	5,370	42,426	1,978	115	4,730	57	23,296
Alternative of Action 1(a)	**Alternative 2(b) of Action 1(b): MSY Proxy = Ave. Annual Pounds Landed by PR Recreational Fishermen + 2 Std. Dev.**										
	Angel-fish	**Boxfish**	**Goatfish**	**Grunts**	**Wrasses**	**Jacks**	**Scups & Porgies**	**Tilefish**	**Squirrel-fish**	**Surgeon-fish**	**Trigger-fish & Filefish**
2 (00-09)	4,809	24,025	1,865	18,771	17,292	226,316	10,386	4,943	14,612	3,607	102,734
3 (00-05)	6,342	29,668	2,293	22,591	16,704	264,920	12,861	6,159	11,428	4,786	114,351
4 (00-09)	4,809	24,025	1,865	18,771	17,292	226,316	10,386	4,943	14,612	3,607	102,734
5 (05-09)	290	7,021	896	8,607	17,836	75,554	4,475	630	17,505	229	73,167

Alternatives 2 and **4** of Action 1(a) use the same sequence of years to generate the same means. Therefore, given either Alternative 2(a) or 2(b) of Action 1(b), the MSY Proxy for Alternatives 2 and 4 of Action 1(a) are identical (Tables 6.1.2.5 and 6.1.2.6). The MSY Proxies for Angelfish, Boxfish, Goatfish, and Jacks for St. Croix are highest if **Alternative 3** is chosen for Action 1(a) and Alternative 2(b) is chosen for Action 1(b), whereas the MSY Proxy is highest for Grunts, Scups & Porgies, Surgeonfish and Tiggerfish if **Alternative 2(b)** is chosen with either **Alternative 2** or **4** is chosen for Action 1(a) for St. Croix. The MSY Proxies for Boxfish, Goatfish, Grunts, Scups & Porgies, Squirrelfish, and Triggerfish for St. Thomas/St. John are highest if **Alternative 3** of Action 1(a) is coupled with **Alternative 2(b)** of Action 1(b). Conversely, if Alternative 2(a) is coupled with Alternative 5 of Action 1(a), the MSY Proxies for the Angelfish, Boxfish, Goatfish, Jacks, and Scups & Porgies Units would be lowest.

Table 6.1.2.5. MSY Proxy for St. Croix if Alternative 2(a) or 2(b) of Action 1(b) and Alternatives 2 through 5 of Action 1(a).

Alternative of Action 1(a)	Alternative 2(a) of Action 1(b): MSY Proxy = Ave. Annual Pounds Landed by STX Fishermen									
	Angel-fish	Boxfish	Goatfish	Grunts	Wrasses	Jacks	Scups & Porgies	Squirrel-fish	Surgeon-fish	Trigger-fish
2 (00-08)	406	9,371	4,184	40,980	8	17,210	5,154	134	44,804	27,755
3 (00-05)	522	9,547	4,719	39,111	1	19,009	5,026	38	44,133	27,263
4 (00-08)	406	9,371	4,184	40,980	8	17,210	5,154	134	44,804	27,755
5 (04-08)	99	9,251	3,524	45,151	14	12,139	4,966	226	47,107	28,152
Alternative of Action 1(a)	Alternative 2(b) of Action 1(b): MSY Proxy = Ave. Annual Pounds Landed by STX Fishermen + 2 Std. Dev.									
	Angel-fish	Boxfish	Goatfish	Grunts	Wrasses	Jacks	Scups & Porgies	Squirrel-fish	Surgeon-fish	Trigger-fish
2 (00-08)	2,411	12,876	7,090	54,106	52	34,238	9,327	617	58,172	34,844
3 (00-05)	2,931	13,700	7,265	51,852	7	36,143	10,088	105	58,053	34,681
4 (00-08)	2,411	12,876	7,090	54,106	52	34,238	9,327	617	58,172	34,844
5 (04-08)	283	11,062	5,802	53,136	77	24,639	6,486	885	57,392	33,565

Table 6.1.5.6. MSY Proxy for St. Thomas/St. John if Alternative 2(a) or Alternative 2(b) of Action 1(b) and Alternatives 2 through 5 of Action 1(a).

Alternative of Action 1(a)	Alternative 2(a) of Action 1(b): MSY Proxy = Ave. Annual Pounds Landed by STT/STJ Fishermen									
	Angelfish	Boxfish	Goatfish	Grunts	Wrasses	Jacks	Scups and Porgies	Squirrel-fish	Surgeon-fish	Trigger-fish
2 (00-08)	10,529	30,979	356	41,797	650	58,785	24,243	4,712	38,999	82,719
3 (00-05)	10,486	31,005	418	42,803	356	56,899	24,653	5,264	39,519	86,294
4 (00-08)	10,529	30,979	356	41,797	650	58,785	24,243	4,712	38,999	82,719
5 (04-08)	11,527	31,991	238	42,641	1,064	56,305	24,641	4,197	39,956	78,118
Alternative of Action 1(a)	Alternative 2(b) of Action 1(b): MSY Proxy = Ave. Annual Pounds Landed by STT/STJ Fishermen + 2 Std. Dev.									
	Angel-fish	Boxfish	Goatfish	Grunts	Wrasses	Jacks	Scups & Porgies	Squirrel-fish	Surgeon-fish	Trigger-fish
2 (00-08)	14,774	36,227	814	51,217	1,836	80,005	28,925	8,092	47,201	105,102
3 (00-05)	14,727	37,048	898	53,786	1,072	79,810	30,156	8,735	49,633	109,484
4 (00-08)	14,774	36,227	814	51,217	1,836	80,005	28,925	8,092	47,201	105,102
5 (04-08)	15,978	36,262	496	51,440	1,991	80,855	28,497	6,416	46,899	92,559

Alternatives 2(c) and **2(d)** would equate the OFL to the MSY Proxy, with the difference being that **Alternative 2(d)** would allow for the possibility that an estimated overage could be due to improved data collection/monitoring, rather than due to increases in landings, and **Alternative 2(c)** would not. Neither alternative would have a direct economic or social impact. If an overage were due to improved collection and/or monitoring instead of increases in landings, **Alternative 2(c)** would likely motivate subsequent regulatory action to reduce landings, whereas **Alternative 2(d)** would not. Hence, **Alternative 2(d)** could have less of an adverse indirect economic or social impact than **Alternative 2(c)**.

Alternatives 2(e), 2(f), and **2(g)** of Action 1(b) would specify ABC as largely to entirely dependent on the mean of landings. The ABC of **Alternative 2(g)** would be equal to the MSY Proxy of **Alternative 2(a)**; the ABC of **Alternative 2(e)** would equal the MSY Proxy of **Alternative 2(b),** and the ABC of **Alternative 2(f)** would equal the MSY Proxy of Alternative 2(a) plus a standard deviation. Thus, **Alternative 2(e)** would yield the largest ABC, followed by **Alternative 2(f),** then **Alternative 2(g)** (Table 6.1.2.7 as example)**.** The lower the ABC, the more likely the lower of the ACL, which would more

likely motivate regulatory action that reduces fishing in federal waters. Of the three alternatives, **Alternative 2(g)** is more likely to have an adverse indirect economic and social impact than **Alternative 2(f),** which is turn is more likely to have an adverse indirect economic impact than **Alternative 2(e).**

Alternative 2(h) would set the ABC for the commercial sector for each Unit to equal the ABC recommended by the SSC, and the SSC presently recommends the ABC equal the median of landings. If **Alternative 2** or **3** is selected for Action 1(a), **Alternative 2(h)** would set the smallest ABC for Angelfish, Goatfish, Wrasses, Scups & Porgies, Tilefish, Surgeonfish and Triggerfish & Filefish. If **Alternative 4** of Action 1(a) is selected, **Alternative 2(h)** would set the smallest ABC for Angelfish, Tilefish, and Surgeonfish. If Alternative 5 is selected for Action 1(a), **Alternative 2(h)** would set the lowest ABC for Boxfish, Goatfish, Grunts, Wrasses, Scups & Porgies, Tilefish, Squirrelfish, and Triggerfish & Filefish and be tied with **Alternatives 2(g)**, **2(f)** and **2(e)** with ABCs of zero for Angelfish and Surgeonfish.

Table 6.1.2.7. Comparison of Alternatives 2(e), 2(f), 2(g) and 2(h) of Action 1(b) if Alternative 2, 3 4 or 5 of Action 1(a), Puerto Rico Commercial Sector.

Alternative of Action 1(a)	Alternative 2(g) of Action 1(b): ABC = Ave. Annual Pounds Landed by PR Commercial Fishermen										
	Angelfish	Boxfish	Goatfish	Grunts	Wrasses	Jacks	Scups & Porgies	Tilefish	Squirrel-fish	Surgeon-fish	Trigger-fish & Filefish
2 (88 - 09)	38	95,349	21,166	187,165	68,099	94,655	32,563	376	18,233	49	70,238
3 (99 - 05)	89	124,667	30,108	207,437	89,861	129,573	50,849	600	23,359	13	82,679
4 (99 - 09)	57	98,790	21,972	160,236	79,493	110,538	40,370	406	19,688	8	69,189
5 (05 - 09)	0	82,126	15,870	121,754	74,289	93,166	33,964	486	17,132	0	60,952
Alternative of Action 1(a)	Alternative 2(f) of Action 1(b): ABC = Ave. Annual Pounds Landed by Puerto Rico Commercial Fishermen + Std Dev.										
	Angelfish	Boxfish	Goatfish	Grunts	Wrasses	Jacks	Scups & Porgies	Tilefish	Squirrel-fish	Surgeon-fish	Trigger-fish & Filefish
2 (88 - 09)	171	128,623	31,992	253,833	92,306	126,373	49,223	890	25,179	169	91,908
3 (99 - 05)	319	160,735	41,025	254,852	114,038	150,273	66,298	1,420	29,053	29	104,406
4 (99 - 09)	241	144,350	36,129	235,577	102,909	145,237	59,402	1,100	27,158	22	94,909
5 (05 - 09)	0	146,245	34,164	220,899	104,483	136,687	61,002	1,431	27,174	0	96,325
Alternative of Action 1(a)	Alternative 2(e) of Action 1(b): ABC = Ave. Annual Pounds Landed by PR Commercial Fishermen + (2 x Std. Dev.)										
	Angelfish	Boxfish	Goatfish	Grunts	Wrasses	Jacks	Scups & Porgies	Tilefish	Squirrel-fish	Surgeon-fish	Trigger-fish & Filefish
2 (88 - 09)	303	161,896	42,819	320,502	116,513	158,091	65,883	1,403	32,124	289	113,577
3 (99 - 05)	550	196,804	51,942	302,268	138,216	170,973	81,746	2,240	34,747	44	126,133
4 (99 - 09)	425	189,910	50,286	310,918	131,262	179,936	78,434	1,794	34,629	36	120,630
5 (05 - 09)	0	210,365	52,458	320,044	150,366	180,208	88,041	2,375	37,216	0	131,698
Alternative of Action 1(a)	Alternative 2(h) of Action 1(b): ABC = Median Annual Pounds Landed by PR Commercial Fishermen										
	Angelfish	Boxfish	Goatfish	Grunts	Wrasses	Jacks	Scups & Porgies	Tilefish	Squirrel-fish	Surgeon-fish	Trigger-fish & Filefish
2 (88 - 09)	0	95,683	19,517	202,662	60,163	95,621	27,488	162	18,514	0	64,972

Alternatives 2(i) to **2(m)** would establish the OY and ACL, and the OY and ACL of **Alternative 2(i)** are greater than the OY and ACL of **Alternative 2(j)**, which are greater than the OY and ACL of **Alternative 2(k)**, and so on. **Alternative 2(m)** would set the smallest OY and ACL, which would be zero. The smaller the OY and ACL, the more likely there would be an overage and subsequent regulatory action that reduces fishing in

federal waters. Thus, **Alternative 2(i)** is expected to have the smallest adverse indirect economic and social impact and **Alternative 2(m)** the largest (Table 6.1.2.7).

6.1.3 Direct and Indirect Effects on the Administrative Environment.

Management reference points impact the administrative environment by triggering management review and action. While all the reference points considered here have some influence on fishery management decision-making, the primary parameter guiding management action is the ACL. ACLs effectively limit the total catch of a species, species group or complex that may be taken in any given year without requiring fishery managers impose additional management controls. As a result, more conservative ACL values would generally be expected to be more administratively burdensome than less conservative values because they would trigger management review and action more frequently.

Excluding consideration of sub-alternatives, the range of ACL values specified by the different alternatives for the year sequences under each island group for the Reef Fish FMP do not differ enough to notably effect the administrative environment to varying degrees. Action 1(b) **Alternative 2(l)** is expected to be the most administratively burdensome option because it would support the lowest catch levels relative to the other alternatives and, therefore, trigger management review and action most frequently. **Alternatives 2(l)** through **2(i)** would progressively reduce the frequency with which management action was triggered. **Alternative 2(i)** would trigger management action less frequently, but could have adverse administrative effects if it led to stocks becoming overfished, requiring the development of resource-intensive MSA rebuilding provisions. An ACL of zero suggested under **Alternative 2(m)** for surgeonfish would benefit the administrative environment by supporting the current catch prohibitions.

6.2 ACTION 2: Management Reference Points for the Spiny Lobster FMP.

6.2.1 Direct and Indirect Effects on the Physical and Biological Environment.

Most fishery interactions with the physical environment are caused by fishing gear impacts to bottom habitat. Management reference points can influence the extent of these interactions by guiding decisions regarding appropriate catch levels. However, the management measures implemented to manage catches (e.g., bag limits, trip limits, gear restrictions) have a much more substantial impact on the number, nature, and extent of habitat interactions than do the catch levels themselves. The primary gear types used in federal of spiny lobster fisheries are described in Appendix 7.

The management reference point effectively limiting catch levels and, therefore, having the greatest indirect impact on these habitat interactions is the ACL. ACLs effectively limit the total catch of a species, species group or complex that may be taken in any given year without requiring fishery managers to impose additional management controls. As a result, larger ACLs are likely to result in less restrictive management controls and increased habitat interactions relative to smaller ACLs.

While the Council did not explicitly specify ACLs for spiny lobster in the Caribbean SFA Amendment, the ABC estimates derived from the Council's MSY control rule could be considered to represent the ACLs of these species if no additional action were taken through this amendment to revise management reference points. These ABC values are lower than the ACL alternatives considered here for spiny lobster and consequently would be expected to best benefit the physical environment by supporting lower catch levels than the action alternatives.
The range of ACL values specified by the different year sequences for the spiny lobster complex do not differ enough to notably effect habitat interactions to varying degrees. The ACL values specified by **Alternatives 2(i)** through **2(l)** of Action 2(b) become progressively smaller as the precautionary buffers they propose become increasingly larger,. The values associated with MSY and overfishing limit (OFL) are the same across all alternatives as the OFL will equal the MSY proxy selected by the council in either Alternative 2(a) or 2(b). If the Council adds 2 standard deviation to the mean annual landings to determine MSY proxy (Alternative 2(b)) this choice could increase the interactions of fishing gear with the physical environment as landings levels are increased. There is no expected biological effect with this alternative as overfishing is unlikely if future landings are moderately higher than the mean of recent landings.

Alternatives 2(l) through **2(i)** would progressively increase habitat interactions, with **Alternative 2(i)** supporting the highest catch levels and, thus, the largest number of interactions.

The primary difference between alternative reference point (or proxy) definitions is the time series of landings data on which they are based. Alternatives for each island group under Actions 2(a) would average landings over the longest time period for which the Council considers data to be consistently reliable across all islands. These year sequence alternatives also include recent years in which harvest was further constrained by management controls.

Management reference points impact the biological environments by defining fishery management objectives regarding the amount of fish that can or should be removed from a population. MSY represents the largest average catch that can be temporally sustained under average environmental conditions. The overfishing threshold (specified as MFMT or OFL) represents the fishing rate or catch level above which overfishing is occurring, meaning the fishery's ability to produce MSY is at risk. ACL represents the annual catch level specified by the Council to prevent overfishing and avoid the implementation of AMs. OY is the catch level that provides the greatest overall benefit to the nation, taking into account food production, recreational opportunities, and the protection of marine ecosystems.

Together, these parameters provide fishery managers with reference points against which to measure fishery performance. When data are insufficient to specify these parameters, the NS1 guidelines direct regional fishery management councils to estimate them using reasonable proxies, like long-term average landings, and to consider scientific and management uncertainty in determining the appropriateness of alternative proxies.

Uncertainty is inherent in the fishery management process and stems from a variety of sources, including but not necessarily limited to: catch, abundance, and other parameter estimates; development and parameterization of descriptive population models; and prediction of future environmental conditions affecting fish populations, as well as fisheries' response to changing regulations and anticipated economic, political, and social conditions (Hilborn and Peterman 1996). While it is generally difficult to quantify the degree of uncertainty surrounding specific scientific and/or management decisions, accounting for this uncertainty is essential to effective management particularly in U.S. Caribbean fisheries that are considered to be data poor.

The management reference point alternatives considered here incorporate various degrees of precaution to account for the scientific and management uncertainty underlying fishery management decision-making in the U.S. Caribbean.

The parameter estimates defined by the no action **Alternative 1** of Action 2 (b) proxies for spiny lobster are generally the lowest of all those considered under scenarios that incorporate a moderate amount of precaution. Consequently, this alternative would be expected to support relatively low spiny lobster catch rates relative to the action alternatives.

The primary differences between the reference points (or proxies) defined by the no action **Alternative 1** and those evaluated under the action **Alternative 2** are: (1) the no action reference points require estimates of catch, stock biomass, and fishing mortality rates, whereas **Alternative 2** require only catch estimates; and (2) the no action alternative estimates reference points at a smaller scale/finer resolution (i.e., just for the spiny lobster), whereas alternatives estimate aggregate reference points or proxies for the lobster complex as a whole.

Theoretically, the biomass based and fishing-mortality-rate based reference points specified by the no action alternative would be more precise and more effective in preventing overfishing. However, because data are insufficient to estimate biomass and fishing mortality rates in the U.S. Caribbean, these reference points must be calculated based on informed judgment regarding stock status in relation to MSY. As a result, the actual values associated with current definitions are highly uncertain. In some cases (i.e., MFMT), such values have not even been estimated.

The present practice of defining management reference points at the finest resolution possible could also be considered the ideal approach to monitoring fishery performance. Aggregate reference points would make it more difficult for fishery scientists and managers to monitor the status of spiny lobster. The spiny lobster is classified as not undergoing overfishing in NOAA Fisheries' report to Congress on the status of U.S. Fisheries.

Additionally, the proxies defined by no action **Alternative 1** of Action 2(b) average landings over the longest time period during which data were considered to be relatively

reliable at the time the Council approved the Caribbean SFA Amendment. The NS1 guidelines support using data collected over a long time series to capture the fishery's response to changing conditions. Because fewer years of landings data were available at that time, those proxies incorporated Puerto Rico and USVI landings data prior to 1999. The proxies evaluated under the other **Alternatives** under Action 2(a) for the different island groups might propose not using data prior to 1999 for landings calculations because the Council no longer considers USVI data collected prior to 1999 to be reliable and favors using a relatively consistent baseline across all islands.

The overfishing threshold defined by no action **Alternative 1** under Action 2(b) is an MFMT equal to the fishing mortality rate at MSY. Because this fishing mortality rate is unknown for U.S. Caribbean species, the Caribbean SFA Amendment adopted natural mortality rate as a proxy for this parameter. However, data are insufficient to evaluate the sustainability of current fishing mortality rates relative to this proxy and make a determination as to whether overfishing is or is not occurring.

Alternative 2 under Action 2(b) would specify a landings -based overfishing threshold, called the OFL, and annual catches based on the year sequences selected in Action 2(a), would be evaluated relative to the OFL to determine whether overfishing is or is not occurring. This approach is consistent with the NS1 guidelines, which provide fishery managers the flexibility to determine if overfishing occurs based on either fishing mortality rates or actual annual catch.

Both the ranking and range of the OFL values specified by **Alternative 2** of Action 2(b) is equal to that described for MSY values as these alternatives would set OFL equal to MSY.

While the no action **Alternative 1** does not explicitly define spiny lobster ACLs, the ABC estimates specified by the Council's MSY control rule could be considered to represent ACLs if no additional action were taken through this amendment to revise management reference points. However, these ABC values are very uncertain as they were calculated using natural mortality rate as a proxy for the fishing mortality rate that would produce MSY and informed judgment regarding stock biomass. The aggregate value is relatively low compared to the ACL values specified by year sequences alternatives under Action 2(a), and would prevent the fishery from achieving OY as currently defined, even though recent data indicates management controls appear to have effectively reduced aggregate landings below the overfishing threshold.

The current OY provides a slight precautionary buffer between catch targets and limits. **Alternative 2(i) through 2(l)** would set the OY and ACL as equal values, requiring the Council to consider the socioeconomic and ecological components of OY when determining how far ACLs should be reduced below the overfishing threshold to account for scientific uncertainty in estimating the OFL and management uncertainty in effectively constraining harvest over time.

Management precaution needs to be maintained to make sure that the species are not overfished. Overfishing reduces stock biomass and can reduce the size/age distribution of

a population, depress the mean size/age at maturity, and decrease genetic diversity, ultimately resulting in growth overfishing and/or in recruitment failure. Overfishing also may alter the community structure and ecological functions of the supporting reef ecosystem. Spiny Lobster are part of a complex reef ecosystem, in which co-occurring species compete for resources, such as habitat and food. Effects realized by one species or the complex as a whole are likely to impact in some way the ecological community.

Conversely, excessive precaution could lead fishery managers to constrain catches more than needed to prevent overfishing. This would result in higher biomass levels, reducing the potential for overexploitation and maintaining the age and size structure, sex ratio, and genetic integrity of spiny lobster stocks at levels that better approximate natural conditions. Recruitment is generally highly variable due to natural variability in environmental factors that affect the survival of eggs and larvae. A stock maintained at a high biomass level can generally withstand several years of poor recruitment that may occur due to natural factors, but a stock subjected to overfishing for multiple years would find it more difficult to recover from such a situation.

6.2.2 Direct and Indirect Effects on the Economic and Social Environments.

Action 2(a) has five alternatives. **Alternative 1**, the no action alternative, would continue the current management reference points for Caribbean spiny lobster as established by the Caribbean SFA Amendment and there would be no economic or social impacts beyond the baseline. **Alternatives 2** through **5** would specify the time series of annual commercial landings used to redefine the management reference points for the species. None of these alternatives would directly affect the social or economic environment, but either one could have indirect impacts if it motivates subsequent regulatory action that affects fishing for Caribbean spiny lobster in federal waters. The series would not include recreational landings because that data is not available.

Table 6.2.2.1. Comparison of Alternatives 2 through 5 of Action 2(a).

Alternative	Years		
	Puerto Rico	St. Croix	St. Thomas/St. John
2	1988 - 2009	1999 - 2008	2000 - 2008
3	1999 - 2005	1999 - 2005	2000 - 2005
4	1999 - 2009	1999 - 2008	2000 - 2008
5	2005 - 2009	2004 - 2008	2004 - 2008

Alternative 1 of Action 2(b) is the status quo alternative, which would not change existing management reference points for Caribbean spiny lobster. **Alternatives 2(a)** and **2(b)** would establish the MSY Proxy for each island area based on the mean annual catch, and **Alternative 2(b)** would yield the largest MSY Proxy of the two alternatives because its MSY Proxy is two standard deviations above that of **Alternative 2(a)** (Table 6.2.2.2). If **Alternative 3** of Action 2(a) is chosen in combination with **Alternative 2(b)** of Action 2(b), the MSY Proxy would be its highest for Puerto Rico and St. Thomas/St. John, but third from the highest for St. Croix. The highest MSY Proxy for St. Croix would occur if

either **Alternative 2** or **4** of Action 2(a) were selected along with **Alternative 2(b)** of Action 2(b). Conversely, the MSY Proxies for St. Croix and St. Thomas/St. John would be lowest if **Alternative 3** of Action 2(a) is coupled with **Alternative 2(a)** of Action 2(b), and lowest for Puerto Rico if **Alternative 2** of Action 2(a) is joined with **Alternative 2(a)** of Action 2(b).

Table 6.2.2.2. Alternatives 2(a) and 2(b) of Action 2(b).

Alternative of Action 2(a)	MSY Proxy (Pounds)					
	Alternative 2(a) of Action 2(b)			Alternative 2(b) of Action 2(b)		
	Puerto Rico	St. Croix	St. Thomas/ St. John	Puerto Rico	St. Croix	St. Thomas/ St. John
2 (88 - 09)	373,756	119,230	115,777	765,281	184,454	157,610
3 (99 - 05)	469,324	103,946	112,848	749,870	154,616	161,749
4 (99 - 09)	406,962	119,230	115,777	686,993	184,454	157,610
5 (05 - 09)	390,980	142,204	124,747	821,454	180,777	146,534

Alternatives 2(c) and **2(d)** would base the OFL on the MSY Proxy; however, **Alternative 2(d)** allows for the possibility that an estimated overage could be due to improved data collection/monitoring, rather than due to increases in landings, and **Alternative 2(c)** would not. Neither alternative would have a direct economic or social impact. If an overage were due to improved collection and/or monitoring instead of increases in landings, **Alternative 2(c)** would likely motivate subsequent regulatory action to reduce landings, whereas **Alternative 2(d)** would not. Hence, **Alternative 2(d)** could have less of an adverse indirect economic or social impact than **Alternative 2(c)**.

Alternatives 2(e), 2(f), and **2(g)** of Action 1(b) would specify ABC as largely to entirely dependent on the mean of landings. The ABC of **Alternative 2(g)** would be equal to the MSY Proxy of **Alternative 2(a)**; the ABC of **Alternative 2(e)** would equal the MSY Proxy of **Alternative 2(b),** and the ABC of **Alternative 2(f)** would equal the MSY Proxy of Alternative 2(a) plus a standard deviation.

Alternative 2(e) would yield the largest ABC, followed by **Alternative 2(f),** then **Alternative 2(g)** (Table 6.2.2.3)**.** The lower the ABC, the more likely the lower of the ACL, which would more likely motivate regulatory action that reduces fishing in federal waters. Of the three alternatives, **Alternative 2(g)** is more likely to have an adverse indirect economic and social impact than **Alternative 2(f),** which is turn is more likely to have an adverse indirect economic impact than **Alternative 2(g).** The actual indirect economic and social impacts, however, are dependent on subsequent regulatory action and the extent that Caribbean spiny lobster fishing occurs in federal waters.

Table 6.2.2.3. Alternatives 2(e) through 2(g) of Action 2(b).

Alternative of Action 2(a)	ABC (Pounds)		
	Alternative 2(e) of Action 2(b)		
	Puerto Rico	St. Croix	St. Thomas/ St. John
2 (88 - 09)	593,100	184,454	157,610
3 (99 - 05)	749,870	154,616	161,749
4 (99 - 09)	686,993	191,776	157,610
5 (05 - 09)	821,454	180,777	146,534

Alternative of Action 2(a)	ABC (Pounds)		
	Alternative 2(f) of Action 2(b)		
	Puerto Rico	St. Croix	St. Thomas/ St. John
2 (88 - 09)	483,338	159,164	136,693
3 (99 - 05)	609,597	129,281	137,299
4 (99 - 09)	546,516	159,164	136,693
5 (05 - 09)	606,217	161,490	135,640

Alternative of Action 2(a)	ABC (Pounds)		
	Alternative 2(g) of Action 2(b)		
	Puerto Rico	St. Croix	St. Thomas/ St. John
2 (88 - 09)	374,035	119,230	115,777
3 (99 - 05)	469,324	103,946	112,848
4 (99 - 09)	406,039	119,230	115,777
5 (05 - 09)	390,980	142,204	124,747

Alternative 2(h) would set the ABC for Puerto Rico to equal the ABC recommended by the SSC, and the SSC presently recommends the ABC equal the median of landings. **Alternative 2(h)** would set the smallest ABC if selected in combination with **Alternative 5** of Action 2(a) (Table 6.2.2.4). **Alternative 2(h)** would likely have a larger indirect adverse economic and social impact than **Alternatives 2(e), 2(f)**, and **2(g)** because the smaller the ABC, the more likely the ACL would be smaller.

Table 6.2.2.4. Alternative 2(h) of Action 2(b).

Alternative of Action 2(a)	ABC (Pounds)
	Alternative 2(h) of Action 2(b)
	Puerto Rico
2 (88 - 09)	364,346

Alternatives 2(i) through **2(l)** would establish the ACL and OY. The ACL and OY established by **Alternative 2(i)** would equal the ABC established by **Alternative 2(e), 2(f)**, **2(g)** or **2(h).** The OY and ACL set by **Alternative 2(j)** would be 85% of those specified by **Alternative 2(i);** those set by **Alternative 2(k)** would be 75%, and the OY and ACL set by **Alternative 2(l)** would be 50% of the OY and ACL specified by Alternative 2(i). Because **Alternative 2(l)** would produce the smallest OY and ACL, it is more likely to motivate regulatory action that reduces fishing for Caribbean spiny lobster in federal waters. Therefore, the adverse indirect economic and social impacts of **Alternative 2(l)** would likely be higher than those of **Alternative 2(k),** which in turn would be higher than **Alternative 2(k),** and so on. **Alternative 2(i)** would have the least adverse economic and social impacts among **Alternatives 2(i)** through **2(l).** The actual indirect impacts would be dependent on subsequent regulatory change and the extent that Caribbean spiny lobster fishing occurs in federal waters.

6.2.3 Direct and Indirect Effects on the Administrative Environment.

Management reference points impact the administrative environment by triggering management review and action. While all the reference points considered here have some influence on fishery management decision-making, the primary parameter guiding management action is the ACL. ACLs effectively limit the total catch of a species, species group or complex that may be taken in any given year without requiring fishery managers impose additional management controls. As a result, more conservative ACL values would generally be expected to be more administratively burdensome than less conservative values because they would trigger management review and action more frequently.

Excluding consideration of sub-alternatives, the range of ACL values specified by the different alternatives for the year sequences under each island group for the Spiny Lobster FMP do not differ enough to notably effect the administrative environment to varying degrees. **Alternative 2(l)** is expected to be the most administratively burdensome option because it would support the lowest catch levels relative to the other sub-alternatives and, therefore, trigger management review and action most frequently. **Alternatives 2(l)** through **2(i)** would progressively reduce the frequency with which management action was triggered. **Alternative 2(i)** would trigger management action less frequently, but could have adverse administrative effects if it led to stocks becoming overfished, requiring the development of resource-intensive MSA rebuilding provisions.

6.3 ACTION 3: Redefine Management of the Aquarium Trade Species Fishery Management Units (FMUs) within the Reef Fish FMP and Coral and Reef Associated Plants and Invertebrates FMP (Coral FMP).

6.3.1 Direct and Indirect Effects on the Physical and Biological Environment.

No substantial changes in the direct or indirect effects to the physical environment are expected as an outcome of changes to the management of aquarium trade species. Management actions or inactions that affect the physical environment mostly relate to the interactions of fishing gears with bottom habitat. The change in location or deletion of the aquarium trade species FMU from the Coral or Reef Fish FMPs proposed by this action is not expected to affect such interactions. While this action would result in the re-arrangement or elimination of regulations requiring the monitoring of aquarium trade species, coral habitat would continue to be protected by regulations prohibiting the use of poisons, drugs, and other chemicals and explosives to take reef fish, and by the MSA mandate to minimize to the extent practicable the adverse effects of fishing gear on essential fish habitat (EFH).

Under Action 3(a) **Alternative 1** is the no action alternative and is not expected to directly affect the physical and biological environment in a positive or negative way. A decision to retain aquarium species in a data-collection only category of the Reef Fish and Coral FMP would indicate that the Council believes these species may require more active conservation and management in federal waters in the future, or that it is likely to have more influence over state management of these species if it retains management authority over these species in federal waters.

Alternative 2 would have no significant physical and biological impact as this will merely be a paper exercise of moving the location of aquarium managed species between FMPs.
Alternative 3 will remove these species from the purview of federal fishery management and is not expected to result in a significant direct effect to the biological or ecological environment because the vast majority of aquarium trade collection activity occurs in state waters of Puerto Rico and in the USVI due to the depth limitations faced by divers in the EEZ waters. The aquarium trade species collection off the USVI is heavily regulated through that territory permit program. Deleting the aquarium trade species from the Reef Fish and Coral FMP could potentially result in an indirect effect by reducing the Council's ability to act in a timely fashion to conserve those species in the future should the need arise. However, the need for federal involvement in the management of these species is not anticipated.

Alternative 4 would acknowledge the Council’s conservation mandate by retaining those species for which landing data are available but would recognize that there is little need to manage these species in federal waters at this time because the majority of harvest activity occurs in state waters. There is a general lack of specific landings information on almost all of the 121 species in the aquarium trade. If the Council decides to retain the management of a number of aquarium trade species, management reference points and ACLs would be established under Action 3(b) based on the time series of catch data as defined in Action 1(a) of this amendment.

Retaining management authority for all or part of the aquarium trade species in the reef fish and coral reef resource FMU would be expected to provide indirect benefits to the biological and ecological environment, as it would enable the Council to manage the take of these species. The Council has prohibited the harvest, possession, and sale of gorgonians, stony corals, and any species in the coral reef resource FMU if attached or existing upon live rock, and has established regulations requiring that only dip nets, slurp guns, hands, and other non-habitat destructive gear types be used to harvest allowable corals. The Council also has required that those individuals harvesting allowable corals obtain a permit from the local or federal government. Because the affected species are generally sedentary, these regulations are believed to be effective in protecting those coral reef communities that occur in federal waters from the impacts of fishing.

However, the states also have implemented regulations that afford protection to coral reef resources. The USVI requires permits for aquarium species collection, and have only issued such permits to educational entities. Furthermore, Puerto Rico amended their fishing regulations in 2004 to restrict the harvest, possession, and exportation of invertebrates included in the coral reef resource FMU to eight species.

Alternative 5 would delegate the management of the aquarium trade to Puerto Rico and the USVI. Aquarium trade species will remain in their respective FMPs, but the territory or state must have appropriate laws and regulations in place consistent with the FMP. Current management measures regulating the harvest of these species in federal waters would no longer be applicable.

6.3.2 Direct and Indirect Effects on the Economic and Social Environments.

6.3.2 Direct and Indirect Effects on the Economic and Social Environments

Alternative 1 of Action 3(a) is the status quo alternative, which would keep the Aquarium Trade Species Fishery Management Units found in the Reef Fish FMP and Corals and Reef Associated Plants and Invertebrates FMP in a data-collection only category without management reference points, although that does not comply with the MSA as amended in 2007. Any regulations that may presently affect fishing for aquarium trade species in the U.S. Caribbean EEZ derive from regulations that affect other or any fishing. **Alternatives 2** through **5** of Action 3(a) would comply with the MSA as amended and vary from the removal of aquarium trade species from the FMPs to placing them within one or two FMPs and establishing management reference points for the species.

Alternative 3 would remove all of the 121 aquarium trade species from the two FMPs, which would not affect existing federal regulations. Presently, the USVI does not allow for harvesting of aquarium trade species with exception for educational institutions and Puerto Rico's aquarium trade fishery is found entirely or almost entirely in territorial waters. That suggests **Alternative 3** would have no adverse or beneficial economic or social impacts. However, if the USVI regulations changed and/or Puerto Rico's fishery expanded into federal waters, **Alternative 3** would not allow the Council or a delegated management authority to respond to possible changes and increasing changes in

aquarium-trade fishing practices in a timely fashion. **Alternative 3** would require an amendment of one or more FMPs to re-include the species in one or more FMPs in order to regulate fishing for the species in the EEZ. Consequently, **Alternative 3** could have larger adverse economic and social impacts than **Alternatives 2, 4** and **5** if an aquarium trade fishery in federal waters were to emerge in the future.

Alternative 2a would move all of the 63 aquarium trade species currently in the Coral FMP and place them into the Reef Fish FMP. **Alternative 2b** would remove the 58 aquarium trade species within the Reef Fish FMP and place them in the Coral FMP, and **Alternative 2c** would place all 121 species into a newly created Aquarium Trade Species FMP. The economic and social benefits of **Alternatives 2a** through **2c** would derive from the time and resources saved by not having to amend more than one FMP when an amendment to any FMP that contains the species would be required to effectively manage the fishery.

Alternative 4a would keep aquarium trade species that have landings data during the year sequence chosen in Action 1(a) in the two FMPs and remove those that do not have such landings data (Table 6.3.2.1). **Alternative 4b** would place all aquarium trade species with landings data during the year sequence chosen in Action 1(a) into the Coral FMP; **Alternative 4c** would put them in the Reef Fish FMP, and **Alternative 4d** would place them in the new Aquarium Trade Species FMP. **Alternatives 4a** through **4d** would allow for timely and less costly management action than **Alternative 3** if harvesting of historically targeted species expanded into the EEZ, and that in turn could produce higher long-term economic and social benefits and reduced adverse impacts from the exploitation of these species.

Table 6.3.2.1. Alternatives 2 through 5 for Action 1(a).

Alternative	Years	
	Commercial	Recreational
2	1988 - 2009	2000 - 2009
3	1999 - 2005	2000 - 2005
4	1999 - 2009	2000 - 2009
5	2005 - 2009	2005 - 2009

Alternative 5 would delegate management authority for all 121 aquarium trade species listed in the two FMPs to the jurisdiction of the appropriate commonwealth or territory as defined in Action 5. If **Alternative 5** is combined with the **Alternative 1**, the status quo alternative, of Action 5, there would be management reference points that apply to the entire U.S. Caribbean and no guidance as to how the authority should be distributed. Because there is no fishery in the USVI and all landings used to establish Caribbean-wide management reference points occurred in Puerto Rico, delegating all management authority to Puerto Rico would not be a problem if the fishery remained in its present state. However, if the USVI were to allow fishing for aquarium trade species and fishing expanded into federal waters, it would be unreasonable to expect Puerto Rico could or would be able to effectively manage the species, which could have long-term adverse economic and social impacts.

Alternative 1 of Action 3(b) would keep the aquarium trade species in the data collection only category, which as stated before, contradicts the MSA as amended, whereas **Alternative 2** would not. **Alternative 2(a)** would equate the MSY Proxy to the mean of the sequence of annual landings chosen for Action 1(a), whereas **Alternative 2(b)** would add two standard deviations to that figure. The highest MSY Proxy for the two sectors would occur if **Alternative 2(b)** is coupled with **Alternative 3** of Action 1(a) (Table 6.3.2.2).

Table 6.3.2.2. Alternative MSY Proxy for Commercial and Recreational Sectors.

MSY Proxy (Pounds)					
Commercial			Recreational		
Alternative of Action 1(a)	Alt. 2(a)	Alt. 2(b)	Alternative of Action 1(a)	Alt. 2(a)	Alt. 2(b)
2 (88 - 09)	5,357	12,964	**2 (00 - 09)**	7,819	24,667
3 (99 - 05)	6,990	15,362	**3 (00 - 05)**	11,096	30,123
4 (99 - 09)	4,687	13,806	**4 (00 - 09)**	7,819	24,667
5 (05 - 09)	953	2,510	**5 (05 - 09)**	2,388	7,900

Alternatives 2(c) and **2(d)** would equate the OFL to the MSY Proxy, with the difference being that **Alternative 2(d)** would allow for the possibility that an estimated overage could be due to improved data collection/monitoring, rather than due to increases in landings, and **Alternative 2(c)** would not. Neither alternative would have a direct economic or social impact. If an overage were due to improved collection and/or monitoring instead of increases in landings, **Alternative 2(c)** would likely motivate subsequent regulatory action to reduce landings, whereas **Alternative 2(d)** would not. Hence, **Alternative 2(d)** could have less of an adverse indirect economic or social impact than **Alternative 2(c)**.

Alternatives 2(e), 2(f), and **2(g)** of Action 1(b) would specify ABC as largely to entirely dependent on the mean of landings. The ABC of **Alternative 2(g)** would be equal to the MSY Proxy of **Alternative 2(a)**; the ABC of **Alternative 2(e)** would equal the MSY Proxy of **Alternative 2(b),** and the ABC of **Alternative 2(f)** would equal the MSY Proxy of Alternative 2(a) plus a standard deviation. Alternative 2(h) would set ABC for the commercial sector at the median of landings from 1988 to 2009.

Alternative 2(e) would yield the largest ABC for both sectors, while **Alternative 2(g)** would set the lowest for the recreational sector and **Alternative 2(h)** for the commercial sector (Table 6.3.2.3)**.** The lower the ABC, the more likely the lower of the ACL, which would more likely motivate regulatory action that reduces fishing in federal waters. **Alternative 2(h)** is more likely to have an adverse indirect economic and social impact than **Alternative 2(g),** which is turn is more likely to have an adverse indirect economic impact than **Alternative 2(f)**, and so for the commercial sector. Similarly, **Alternative 2(g)** is more likely to have an adverse indirect economic and social impact than **Alternative 2(f),** and **Alternative 2(f)** is more likely to have an adverse indirect economic

and social impact than **Alternative 2(e)** in the recreational sector. The actual indirect economic and social impacts, however, are dependent on subsequent regulatory action and the extent that aquarium trade fishing occurs in federal waters. If little to no aquarium trade fishing occurs in federal waters, there would be little to no difference in impacts.

Table 6.3.2.3. ABC for Aquarium Trade Species if Alternative 2, 3, 4 or 5 of Action 1(a).

ABC (Pounds)								
Commercial					Recreational			
Alternative of Action 1(a)	Alt. 2(e)	Alt. 2(f)	Alt. 2(g)	Alt. 2(h)	Alternative of Action 1(a)	Alt. 2(e)	Alt. 2(f)	Alt. 2(g)
2 (88 - 09)	12,964	9,161	5,357	4,953	2 (00 - 09)	24,667	16,243	7,819
3 (99 - 05)	15,362	11,176	6,990	NA	3 (00 - 05)	30,123	20,609	11,096
4 (99 - 09)	13,806	9,247	4,687		4 (00 - 09)	24,667	16,243	7,819
5 (05 - 09)	2,510	1,731	953		5 (05 - 09)	7,900	5,144	2,388

Alternatives 2(i) to **2(m)** would establish the OY and ACL, and the OY and ACL of **Alternative 2(i)** are greater than the OY and ACL of **Alternative 2(j)**, which are greater than the OY and ACL of **Alternative 2(k)**, and so on. **Alternative 2(m)** would set the smallest OY and ACL, which would be zero. The smaller the OY and ACL, the more likely there would be an overage and subsequent regulatory action that reduces fishing in federal waters. Thus, **Alternative 2(i)** is expected to have the smallest adverse indirect economic and social impact and **Alternative 2(m)** the largest. However, the actual indirect impacts are dependent on the extent that aquarium trade fishing occurs in federal waters.

6.3.3 Direct and Indirect Effects on the Administrative Environment.

Under Action 3(a), the no action **Alternative 1** is not expected to affect the administrative environment in a positive or negative way. Inclusion in a data collection only category as proposed in **Alternative 1,** would result in no specification of MSY, OY, ACL or other stock status determination criteria for these species. **Alternative 2** would require the Council and NOAA Fisheries to define management reference points and status determination criteria for aquarium trade species based on limited catch data, and to manage those species consistent with defined biological goals. As noted previously, it is unlikely that federal management would have much effect on aquarium trade species in the Caribbean reef fish FMU due to the predominance of the species, and the fisheries that rely on those species, in state waters. Further, since the USVI strictly regulates aquarium trade collection to only two permit holders, and Puerto Rico amended their fishing regulations in 2004 to permit the collection of only 21 reef fish species and 8 invertebrates, the impact of any federal management on reef fish and coral species in the aquarium trade is expected to be minor.

Retaining management authority for the aquarium trade species in the Caribbean coral reef resource FMU would theoretically be expected to provide indirect benefits to the administrative environment, as it would enable the Council to manage the harvest of these

species and protect EFH. However, the states also have implemented regulations that afford protection to coral reef resources. The USVI requires permits for aquarium species collection, and have only issued such permits to educational entities. Therefore, any administrative effects related to EFH management stemming from this alternative are expected to be minor.

Removing these species entirely from the Reef Fish and Coral FMP, as presented in **Alternative 3**, could delay management action to conserve these species in the future should the need arise, although the need for federal management of these species is not anticipated.

Alternative 4, would retain management of aquarium trade species with available landing data listed in the Coral and Reef fish FMPs and removing the species without landings data. This alternative would require the Council and NOAA Fisheries to define management reference points and status determination criteria for the species retained in the plan based on limited catch data. In addition, these species would have to be managed consistent with defined biological goals. Eliminating species will decrease the administrative load. **Alternative 4(D)** would increase the administrative load as a new FMP will have to be developed for these species.

Alternative 5, Removing aquarium trade species from the purview of federal fishery management would relieve the Council and NOAA Fisheries of the burden of defining management reference points and measures for these species based on limited, or no, catch data.

Management reference points impact the administrative environment by triggering management review and action. While all the reference points considered here have some influence on fishery management decision-making, the primary parameter guiding management action is the ACL. ACLs effectively limit the total catch of a species, species group or complex that may be taken in any given year without requiring fishery managers impose additional management controls. As a result, more conservative ACL values would generally be expected to be more administratively burdensome than less conservative values because they would trigger management review and action more frequently.

For Action 3(b) excluding consideration of sub-alternatives, the range of ACL values specified by the different alternatives for the year sequences under each island group for the aquarium trade species do not differ enough to notably effect the administrative environment to varying degrees. **Alternative 2(m)** is expected to be the most administratively burdensome option because it would support the lowest catch levels relative to the other sub-alternatives and, therefore, trigger management review and action most frequently. **Alternatives 2(l)** through **2(i)** would progressively reduce the frequency with which management action was triggered. **Alternative 2(i)** would trigger management action less frequently, but could have adverse administrative effects if it led to stocks becoming overfished, requiring the development of resource-intensive MSA rebuilding provisions.

6.4 ACTION 4: Redefine the management of the conch species FMU within the Queen Conch FMP.

6.4.1 Direct and Indirect Effects on the Physical and Biological Environment.

Under **Alternative 1**, the no action alternative definition of the conch FMUs is not expected to directly affect the physical and biological environment in a positive or negative way. In addition, the Queen Conch FMP does not include species that provide EFH. The same can be said of **Alternatives 2, 3** and **4**. **Alternative 2** would retain queen conch (*Strombus gigas*) in the Queen Conch FMP. It also would remove from the FMU eight other species of gastropods which are identified in CFMC (1996a) and 50 CFR §622.2, classified after the Caribbean SFA Amendment as "data collection only". These are the:

- Atlantic triton's trumpet (*Charonia variegata*),
- Cameo helmet (*Cassis madagascarensis*),
- Green star shell (*Astrea tuber*),
- Hawkwing conch (*Strombus raninus*),
- Milk conch (*Strombus costatus*),
- Roostertail conch (*Strombus gallus*),
- True tulip (*Fasciolaria tulipa*), and
- West Indian fighting conch (*Strombus pugilis*).

The queen conch is the focal point of the Queen Conch FMP. This snail is a staple food in many Caribbean nations (including the U.S. Caribbean) and its shell is utilized in the ornamental trade. The other eight species are not believed to be of great commercial significance. In addition, there is a general lack of specific biological information on these species. Additionally, catches of those species are believed to be minor.

Alternative 2 would make inapplicable to all conch species, excluding queen conch, the federal regulation requiring that all conch species be landed with meat and shell intact. In addition, it would preclude these species of having ACLs or AMs established. This would not be expected to adversely affect the biological or physical environment because these species are believed to be landed in minimal numbers, if at all.

While the Council originally included in the queen conch resource FMU virtually all conch species that could be harvested and marketed, management is not always necessary simply because a resource is utilized and there is no indication that the species is overharvested. It is likely that any exploitation of these species that does occur would be sporadic, at low levels, and confined to state waters. This is because most of these conch species occur in shallow water, and the fisheries that may exploit them would be constrained due to the depth limitations confronted by divers in federal waters. Therefore, the removal of these lesser conch species from conch resource FMU would be expected to have little direct or indirect effect on the biological or physical environment, or on the species themselves.

Alternative 3 would likely have a significant environmental impact. Given that the harvest of these species occur largely in state waters, and the levels of harvest are not significant for all of these species except for queen conch.

Alternative 4 would have little effect to the physical and biological environment as these eight species would be considered within the proposed 2010 ACL established for queen conch. The eight species will be tracked and managed under federal regulations making sure that their harvest does not affect their habitat.

6.4.2 Direct and Indirect Effects on the Economic and Social Environments.

Alternative 1, the status quo alternative, of Action 4 would keep the conch species, except for queen conch, without management reference points and in a data-collection category only. As stated in Section 6.3.2, such an alternative is inconsistent with the MSA as amended. **Alternative 2** of Action 4 would remove all but queen conch from the Queen Conch FMP. There are a total of nine species of conch in the FMP, one being queen conch. There are no recreational landings data for conch, and the commercial landings forms for both Puerto Rico and the USVI do not differentiate species of conch. It is presumed here, as it was in the 2010 ACLs Amendment, that all commercial landings of conch are queen conch. Thus, **Alternative 2** would remove all but queen conch from the FMP, which would not affect existing federal regulations. Because there are no commercial fisheries for these eight species of conch, **Alternative 2** would not have an economic or social impact on commercial fishermen, their families or communities. Without recreational landings data, the impacts of **Alternative 2** on recreational fishermen, their families and communities, if any, are uncertain. However, if fishing for any of these eight species were to increase and occur in federal waters, **Alternative 2** would not allow the Council to respond to these changes in a timely fashion. Either alternative would require an amendment of the FMP to re-include the species in order to regulate fishing for the species in the EEZ. Consequently, **Alternatives 2** could have larger adverse economic and social impacts than **Alternatives 3** and **4** if fishing for any of the eight conch species were to expand and occur in federal waters in the future.

Alternative 3 would keep the nine conch species in the FMP, but would delegate management authority of the above eight species to the appropriate commonwealth or territory as defined by Action 5. **Alternative 4** would retain all conch species in the Queen Conch FMP and define management reference points based on the ACL set for queen conch in the 2010 Caribbean ACL Amendment public hearing draft. If **Alternative 3** is combined with the **Alternative 1**, the status quo alternative, of Action 5, there would be no guidance as to how the authority should be distributed among the territories. If fishing for these species were to occur and expand into federal waters, it would be unreasonable to expect that one or both of the territories could effectively manage the fishery in waters that possibly extend to federal waters off the other territory. If **Alternative 3** is coupled with **Alternative 2(a), 2(b)** or **2(c)** of Action 5, there would be a division of the management reference points based on territorial landings. Therefore, **Alternative 3** of Action 4 in combination with **Alternative 1** of Action 5 could have larger adverse economic and social impacts than when combined with a non-status quo alternative of Action 5. **Alternative 4** would equate the conch ACL to the ACL that is

specified by the 2010 ACL Amendment public hearing draft. If **Alternative 4** is coupled with **Alternative 2** of Action 5, the St. Croix ACL for conch would be the same as the ACL for queen conch, which would be 50,000 pounds. Since 2008, the USVI government has specified a 50,000-pound annual quota in the St. Croix District of the queen conch fishery. St. Croix landings data do not differentiate conch by species. Therefore, the 50,000 pound limit applies to all conch species. Present regulation prohibits fishing for or possession of queen conch in federal waters off Puerto Rico, St. Thomas or St. John, and **Alternative 4** would not affect that prohibition. The only queen conch fishery in federal waters is off St. Croix, and any landings of queen conch taken from those waters must occur in St. Croix. The fishery closes in both federal and territorial waters when the 50,000-pound landings limit is met and the season remains closed until November 1, where after the new season begins. **Alternative 4** would not have an economic or social impact on Puerto Rico, St. Croix or St. Thomas/St. John conch fishermen, their families or communities.

6.4.3 Direct and Indirect Effects on the Administrative Environment.

The administrative effects of the no action definitions of the conch resource are expected to be negative because it would require continued federal management for the conch resource FMU including species that seldom (and possibly never) are targeted for harvest in federal waters.

The all-inclusive no action definition of the Caribbean conch resource FMU could indirectly benefit federal fishery administrators by providing for their participation in fishery management decision making at the state level. The Council has a long history of making recommendations to the governments of Puerto Rico and the USVI related to better protecting fish stocks and habitat.

The new definitions of the Caribbean conch resource FMU proposed by Action 4 is expected to provide positive administrative effects. These new definitions would streamline and make more cost-effective the fishery management process by enabling fishery managers to focus their attention and limited resources only on those species that are believed to benefit from federal fishery management.

Additionally, the Council would identify species in the FMU that could be managed together with others in multispecies complexes to assist federal fishery managers in achieving legal mandates related to defining management reference points and preventing overfishing while achieving, on a continuing basis, the OY from these fisheries.

On the downside, eliminating eight gastropods from the conch resource FMU could delay federal management action to conserve those species in the future should the need arise. Furthermore, such an action would likely reduce or eliminate, the Council's ability to affect management of these species at the state level. Nevertheless, the need for federal involvement in the management of these eight species is not anticipated.

Data deficiencies of these eight species would make it virtually impossible to define reliable biological reference points and stock status determination criteria, should they be

retained in the FMU for active management. This would result in additional administrative burden as new methodology would need to be developed to track the harvest of these specific species. Inclusion of these species within the ACL proposed for queen conch in the 2010 Caribbean ACL Amendment public hearing draft could reduce the administrative burden. Management reference points and other stock status determination criteria was determined for queen conch in the Council approved 2010 Caribbean ACL Amendment.

6.5 ACTION 5: Geographic allocation/management.

6.5.1 Direct and Indirect Effects on the Physical and Biological Environment.

No substantial change in the direct or indirect effects to the physical environment would be expected as an outcome of changes to geographic allocation and management of reference points between Puerto Rico and the USVI. As noted above, differential harvest of species within each species complex, depending upon whether the catch is aggregated, may result in changes in usage patterns of fishing gear. However, any other direct or indirect impacts to the physical environment are not anticipated. Establishing sub-regions within the U.S. Caribbean EEZ will require that fishermen land and report catch within more restrictive boundaries than was the previous case, assuming that **Alternative 2** is chosen, but there is no reason to expect that fishing effort will be increased, reduced, or spatially reallocated as a result of that requirement.

Direct and indirect effects to the biological and ecological environment that result from Action 5 could be substantial. **Alternative 1** will maintain the current situation with the result that no changes to the biological or ecological environment would be detected. **Alternative 2**, by structuring harvest within each of three U.S. Caribbean island groups, would be expected to better distribute harvest among the island groups according to historic catch patterns. That outcome would result in a substantial reduction in the likelihood that U.S. Caribbean-wide harvest opportunities could be focused within one of the subregions (i.e., island groups) causing overharvest in some areas and underharvest in others. Spreading harvest effort would be expected to facilitate sustainable harvest throughout the U.S. Caribbean, thereby minimizing direct and indirect effects due to that harvest.

6.5.2 Direct and Indirect Effects on the Economic and Social Environments.

Alternative 1 of Action 5 would maintain Caribbean-wide reference points. Thus, Puerto Rico and USVI landings would be combined to produce a single MSY Proxy, OFL, ABC, ACL and OY for each of the species or species groups previously discussed. Puerto Rico, St. Croix and St. Thomas/St. John fishermen would be in competition with each other because landings on one island group would count against a common ACL for each species and species group. **Alternative 1** would allow fishermen of an island group to land more than **Alternatives 2A, 2B and 2C**; however, the economic and social benefits from those additional landings would be coupled with a loss of landings to one or two island groups because the common ACL establishes a zero-sum game. The common ACL would favor industrial-scale commercial fishing operations with larger vessels and gears capable of catching more fish in the same or a shorter period of time and so encourage a

shift from the U.S. Caribbean's historic small-scale commercial fishing vessels. Such an environment could result in lower long-term economic benefits that derive from the species and the ecosystem of which they are part, and a transfer of economic benefits from traditional artisanal fishermen to new industrial-scale fishing operations. The actual impacts of **Alternative 1** on Puerto Rico and USVI commercial fishermen, however, would be dependent on if the regulatory, economic and social environments support industrial-scale operations and such a race. It may be more likely from economic and social standpoints that commercial fishermen maintain historic rates of fishing when the federal season is open then switch to fishing for other species when and if the federal seasons end and/or move into territorial waters if the federal seasons end to target the species.

Alternative 2 would specify separate ACLs for the three island groups, which would negate the inter-island conflicts and transfer of economic and social benefits from artisanal fishermen, their families and communities to industrial fishing interests that could result from **Alternative 1**. **Alternatives 2A**, **2B** and **2C** would specify the same ACLs, but would differ by how the U.S. Caribbean EEZ is divided into the Puerto Rico EEZ, St. Croix EEZ and St. Thomas/St. John EEZ. None of the alternatives would restrict fishing in an EEZ area to fishermen who live or land their catch in that island area. However, once an EEZ area is closed to fishing for a particular species, no fishermen, regardless of which island group they belong, would be able to fish in the area.

6.5.3 Direct and Indirect Effects on the Administrative Environment.

The no action **Alternative 1** would not directly affect the administrative environment. Although reef fish, conch species, spiny lobster, and coral and reef associated plants and invertebrates landings in the U.S. Caribbean are reported by island group, quotas and regulations are applied on a pan-U.S. Caribbean basis rather than by island group. Choosing **Alternative 1** would maintain this situation. Because no geographic division lines would be developed to demarcate sub-regions within the U.S. Caribbean EEZ, no additional effort would be required to establish those boundaries or to monitor them.

An increase in the administrative burden would be expected in response to implementation of **Alternative 2**. With regard to actual harvest, ACLs would be established for the EEZ of each island group. To ensure that annual harvest is maintained within those ACLs, additional effort will be required to track landings independently for each island group, to identify potential overages in a timely manner, and to efficiently and effectively reduce harvest to achieve but not exceed the quota. This additional administrative burden may be offset to some degree by the smaller universe of stakeholders that need to be modified. For example, if the St. Croix spiny lobster quota is met, only the fishers on St. Croix will have to be notified. An increase in administrative effort also will be required to establish the formal dividing lines, to distribute that information and to ensure that it is understood by all members of the affected user groups, and to enforce access to those sub-regions on the EEZ or at the dock. A fully effective monitoring and enforcement program could be a substantial undertaking. However, it is not likely that there would be any noticeable difference among sub-alternatives with regard to the added administrative burden. Those sub-alternatives simply provide slightly

different approaches to drawing the lines. Geographic differences among sub-alternatives are not large, but still the enforcement for these defined boundaries will result in an increase in the administrative requirements.

6.6 ACTION 6: Annual Catch Limit Allocation/Management.

6.6.1 Direct and Indirect Effects on the Physical and Biological Environment.

Action 6(a) Sector allocation/management (Puerto Rico only).

Decisions regarding sector allocation and management potentially could affect the physical environment particularly of U.S. Caribbean coral reefs. Traps are commonly used in the commercial harvest of U.S. Caribbean reef fish including grunts, wrasses, and goatfish. In contrast, recreational fishing is oriented more towards hook-and-line or spear fishing. Traps have the potential to be more damaging to the physical environment, through direct contact with reef structure, than do hook-and-line or spear fishing activities. A study conducted by Garrison et al., 2004, in near shore waters of St. John indicated that approximately 16% of traps deployed were on coral reefs. Though the percentage of traps deployed on coral reefs in St. John may not be analogous to the exact percentage of traps deployed on coral reefs in waters off Puerto Rico, the study does confirm there is indeed trap effort in areas where corals exist in Caribbean waters.

Alternative 1 would maintain the present situation where commercial harvest is not differentiated from recreational harvest on the island of Puerto Rico (recreational harvest is not monitored in the USVI so Action 6(a) is specific to Puerto Rico). This may result in an increase in commercial harvesting activity as commercial fishers maximize harvest until the aggregate (commercial and recreational) quota is achieved. This could result in more traps in the water and therefore, more direct impacts to the reef relative to **Alternative 2**, which would segregate commercial from recreational harvest quotas and monitoring.

Specifying separate commercial and recreational ACLs for Puerto Rico would not be expected to have substantial direct or indirect effects on the biology or ecology of U.S. Caribbean coral reef communities. Although **Alternative 2** would separate the tracking and management of commercial and recreational harvest, the overall allowable harvest for each species complex would remain the same. If commercial trap effort is reduced from its current level due to the commercial sector being allocated a smaller portion of the annual catch limit compared to the status quo, it is possible that such action could result in fewer direct interactions between gear and substrate and thereby, fewer impacts on essential habitat for coral reef community members.

Action 6(b) Recreational bag limits for recreational reef fish harvest.

To the extent that bag limits reduce the targeting of certain species, direct and indirect effects on the physical environment may be realized. Those direct and indirect effects would emanate from reduced interaction between fishing gear and the benthic substrate, especially living coral if overall effort is reduced as a result of bag limits. The primary effects of recreational fishing on the physical environment of the coral reef generally result from fishing gear interactions with the sea floor; however, recreational fishing gear and habitat interactions are likely to occur to a lesser extent than trap interactions discussed in the precious action. Some recreational fishing gear can damage or disturb

bottom structure, and living coral is particularly sensitive to such damage and disturbance. No action **Alternative 1** would maintain the status quo and therefore, would not be expected to elicit change. **Alternative 2** and **3**, propose 5-fish and 2-fish bag limits respectively, and would be expected to slow the rate of reef fish harvest for the recreational sector. For Puerto Rico, the larger the bag limit the less time it is expected to take for the sector to reach or exceed their sector ACL. For the USVI, the smaller the bag limit the more likely the commercial sector is to capitalize on a larger percentage of the total ACL before it is reached. **Alternative 4** reiterates the prohibition on take of species of surgeonfish in the U.S. Caribbean EEZ that is proposed in **Alternative 2(h)** of Action 1(b) and therefore, reiterates the direct and indirect benefits discussed under Action 1(b). It should be noted that more than one alternative may be chosen, and therefore, an aggregate bag limit such as those under **Alternatives 2** and **3** could be chosen in combination with the total prohibition on take of species within the surgeonfish FMU, and the biological benefits of both choices could be realized simultaneously. **Alternatives 5** and **6** would provide the greatest flexibility to the individual fishers but would allow for the continued harvest of ecologically important surgeonfish. However, in combination with **Alternative 2(h)** of Action 1(b), harvest of the surgeonfish would not be allowed. If **Alternative 2(h)** of Action 1(b) is implemented, the surgeonfish will no longer be available for harvest. Therefore, the reduction in surgeonfish harvest would be greater than the reduction achived through implementation of a recreational bag limit. The physical, biological, and ecological benefits provided by surgeonfish because of the accrued actions would be enhanced accordingly.

Action 6(c) Establish bag limits restrictions on recreational spiny lobster harvest.

To the extent that bag limits reduce recreational targeting of spiny lobster, direct and indirect effects on the physical environment may be realized. Those direct and indirect effects would emanate from reduced interaction between fishing gear and the benthic substrate, especially living coral. The primary effects of recreational fishing on the physical environment of the coral reef generally result from fishing gear (i.e. traps) interactions with the sea floor. Fishing gear can damage or disturb bottom structure, and living coral is particularly sensitive to such damage and disturbance. No action **Alternative 1** would maintain the status quo and therefore, would not be expected to elicit change. **Alternatives 2** and **3** would be expected to progressively enhance the direct and indirect effects of this action by reducing harvest. **Alternative 4** reiterates the prohibition on harvest of species of spiny lobster in the U.S. Caribbean EEZ that is proposed in **Alternative 2(h)** of Action 2(b) and therefore reiterates the direct and indirect benefits discussed above. **Alternatives 5** and **6** would provide the greatest flexibility to the individual fishers and would allow for the continued harvest of ecologically important spiny lobster. If **Alternative 2(h)** of Action 2(b) is implemented, the spiny lobster will no longer be available for commercial or recreational harvest, in which case the reduction in spiny lobster takes would be greater than the reduction achieved through implementation of a recreational bag limit.

6.6.2 Direct and Indirect Effects on the Economic and Social Environments.

Alternative 1 of Action 6(a) would create a combined commercial and recreational ACL, which would be higher than each of the separate ACLs of **Alternative 2**. The common ACL could create sector competition in the EEZ because a single ACL for a Unit or Sub-unit would apply to recreational, subsistence and commercial fishermen of Puerto Rico. Such competition would favor those fishers with larger vessels and gears capable of catching more of the fish in the same or a shorter period of time. Hence, there could be a transfer of economic and social benefits from recreational and subsistence fishermen to commercial fishermen. **Alternative 2** would separate the commercial and recreational sectors and would eliminate the possibility of such sector conflict and transfers of benefits.

Alternatives 2 though 6 of Action 6(b) would establish daily bag limits on recreational reef fish harvest. **Alternative 2** would likely have less of an adverse economic and social impact than **Alternative 3** because the daily bag limit would be higher. In turn, **Alternative 5** would likely have less of an adverse economic and social impact than **Alternative 2** because it would have a higher daily bag limit of 10 fish per person. However, **Alternative 5** would restrict the number of surgeonfish within that bag limit to no more than two. **Alternative 6** adds to Alternative 2 the added restriction of no more than two surgeonfish per day per person. **Alternative 4** would prohibit the landing of species in the surgeonfish FMU. From 2000 to 2009, three species of surgeonfish were landed by recreational fishers in Puerto Rico: blue tang, doctorfish and ocean surgeonfish (Table 6.6.2.1). From 2004 to 2007 there were no recreational landings of surgeonfish, and from 2008 to 2009 a total of 121 doctorfish and 222 ocean surgeonfish were landed in Puerto Rico. **Alternative 4** would eliminate future benefits that derive from recreational harvesting of surgeonfish in the EEZ. This could suggest a transfer of benefits from recreational fishermen to commercial fishermen who would not face the same prohibition. In Puerto Rico from 2000 to 2009, a total of 74 pounds of surgeonfish were landed by commercial fishermen, and a commercial ACL for surgeonfish (**Alternatives 2(i)** to **2(m)** of Action 1(b) and **Alternative 2** of Action 6(b)) would limit commercial fishermen's ability to increase landings. It is unknown how many surgeonfish are landed by recreational fishers of the USVI; however, there are significant commercial landings in both St. Croix and St. Thomas/St. John (Tables 6.2.15 and 6.2.1.6). **Alternative 4** could have a significant adverse economic and social impact on recreational fishers of St. Croix and St. Thomas/St. John.

Table 6.6.2.1. Individual Surgeonfish Landed in Puerto Rico by Recreational Fishers.

Year	Individuals			
	Blue Tang	Doctor-fish	Ocean Surgeon	Total
2000	0	1,428	551	1,978
2001	323	6,018	0	6,341
2002	0	0	0	0
2003	554	0	0	554
2004	0	0	0	0
2005	0	0	0	0
2006	0	0	0	0
2007	0	0	0	0
2008	0	0	222	222
2009	0	121	0	121
Total	878	7,567	772	9,217
Ave. 2000-09	88	757	77	922
Ave. 2000-05	146	1,241	92	1,479
Ave. 2005-09	0	24	44	69

Alternatives 5 and **6** would add daily vessel limits to the daily individual limits that could potentially have larger adverse economic and social impacts than **Alternatives 2 and 3** if the vessel limit is met before the individual bag limit is reached. Recreational fishers of St. Thomas/St. John could experience the largest adverse economic and social impacts of **Alternative 2, 3 4, 5 or 6** because there is more fishable habitat is in the EEZ off St. Thomas/St. John than in the EEZ off St. Croix and substantially more than in the EEZ off Puerto Rico.

Alternative 1, the status quo alternative, of Action 6(c) would not impose either personal or vessel bag limit restrictions on recreational lobster harvest in federal waters. **Alternative 4** would prohibit recreational fishing for Caribbean spiny lobster in federal waters and would have the greatest adverse economic and social impact of the alternatives. **Alternative 2** would establish an personal daily bag limit of 5 lobsters in the EEZ and **Alternative 5** would add to that restriction a vessel limit of 15 spiny lobsters per day. Similarly, **Alternative 3** would establish a personal daily bag limit of 2 lobsters in the EEZ and **Alternative 6** would add a vessel limit of 12 spiny lobsters per day. Among **Alternatives 2, 3, 5** and **6**, **Alternative 6** could have the largest adverse economic and social impact, followed by **Alternative 3**, **Alternative 5** and **Alternative 2**. The actual impacts, however, are dependent on the significance of recreational spiny lobster fishing in federal waters. It is more likely that a recreational bag limit would adversely affect fishermen of the USVI than those of Puerto Rico because Puerto Rico's territorial waters cover a larger area and extend farther away from its coastline.

6.6.3 Direct and Indirect Effects on the Administrative Environment.

Action 6(a) Sector allocation/management (Puerto Rico only).

Alternative 1 of Action 6(a) would maintain the current management of commercial and recreational harvest sectors in Puerto Rico. An initial administrative burden would be expected because, at present, there are no harvest quotas or guidelines for the recreational fishery in Puerto Rico. Quotas would have to be established, and that effort will require modeling and/or analysis of the presently available data. However, because the establishment of an ACL for the recreational fishery in Puerto Rico is inherent within Actions 1(a) and 2(a), and that action calls for a combined commercial and recreational quota, **Alternative 1** adds no additional administrative burden beyond that resulting from implementation of Actions 1(a) and 2(a).

Alternative 2 requires separation of the commercial and recreational catches, establishment of separate ACLs for each sector, and implementation of separate monitoring and AMs for each sector. Additional administrative burdens would be realized as a result. Because catch data are presently obtained, for the commercial sector, via the commercial trip ticket effort, and for the recreational sector via the Marine Recreational Fisheries Statistic Survey (MRFSS; also called MRIP) program, acquiring and separating the data would require no additional administrative effort. However, monitoring what portion of the ACLs has been landed at any given time during each year may be administratively difficult given current time lags and data deficiencies for the subject fisheries. Therefore, the largest burden would result from separately monitoring and enforcing the ACLs, separately identifying that harvest is approaching the sector-specific ACLs, and applying sector-specific AMs as necessary. These administrative burdens would be offset to some degree by more effective and appropriate management of the individual sectors. In particular, separating management of the two sectors will directly reduce competition for a limited resource between the two sectors and will eliminate the dependence of one sector on the harvest activities of the other.

Action 6(b) Establish bag limit restrictions on recreational reef fish harvest.

Administrative obligations would be increased by the implementation of bag limits, but those obligations would increase by the same degree regardless of which alternatives are selected, other than the no action alternative, since there either is, or is not, a limit on the number of fish able to be possessed by a vessel or person per day. The actual number established for a given bag limit does not impact the administrative environment. The initial increase would result from the increased effort required of law enforcement agents to monitor catch and to properly identify the appropriate species. Finally, violations of any new bag limit would constitute a new source of administrative effort, in the form of ticketing and prosecution, relative to the no action alternative.

Action 6(c) Establish bag limit restrictions on recreational spiny lobster harvest.

Administrative obligations would be increased by the implementation of bag limits, but those obligations would increase only marginally with increasingly restrictive bag limits

or with a vessel limit. The initial increase would result from the increased effort required of law enforcement agents to monitor catch. However, little additional effort would be required to determine if the bag limits were met or exceeded. Some effort would be required to ensure that the number of fishers on the vessel is adequate to account for the harvest of multiple individual limits. Finally, violations of any new bag limit would constitute a new source of administrative effort, in the form of ticketing and prosecution, relative to the no action alternative.

6.7 ACTION 7: Accountability Measures

6.7.1 Direct and Indirect Effects on the Physical and Biological Environment.

Action 7(a) Triggering accountability measures.

The alternatives under this action will not have a direct effect on the physical or biological environments. These alternatives provide the Council with a mechanism to assess overruns of the ACL proxies established and described in this amendment under Actions 1(b) to 2(b). Indirect effects to the biological environment; however, would vary depending on the alternative selected as preferred. No effects to the physical environment are expected with any of these alternatives. **Alternative 1**, the no action alternative, would maintain the current management status and no mechanism for determining whether or not AMs should be triggered would be specified. While this alternative would have no direct biological or ecological effect beyond the status quo, it also would not satisfy compliance with the MSA mandates.

Alternative 2A would trigger AMs to be considered based on landings from a single-year. Such a process is the least precise among **Alternatives 2A through 2C**, and probably the least accurate, and may result in triggering AMs when, if more data were available, AMs might not need to be triggered. On the other hand, because such a one-year process is not very accurate, **Alternative 2A** may result in a situation where AMs should have been triggered and were not. Consequently, using a single-year trigger for AMs will result in a generally higher frequency of triggering AMs and adjusting the ACLs than a multi-year approach (i.e., **Alternatives 2B** and **2C**).

Alternative 2B of Action 7(a) is more precise method of estimating when AMs should or should not be triggered than **Alternatives 1** and **2A** because it is based on a 2-year average rather than data from single year. Because averaging data from two years would smooth anomalous spikes or drops in landings, AMs are more likely to be triggered when appropriate, which would benefit the biological environment. However, using an average of two years of data could help prevent AMs from being triggered when they are not needed. Triggering AMs when it is most appropriate to do so is likely to result in overall benefits to the species by providing harvest protections when they are most needed.

Alternative 2C of Action 7(a) is the most precise method of determining when AMs should and should not be triggered compared to **Alternatives 2A,** and **2B** because it is based on a 3-year time period average. Averaging landings from 3 years would ensures that anomalous spikes and landings would not disproportionately impact the decision to

trigger an AM, while still accounting for increased and decreased landings events. In terms of biological benefit, triggering AMs when they are most necessary would restrict harvest only when it is needed. This system of triggering AMs balances the need to protect stocks at vulnerable times, i.e., when their respective ACLs have been exceeded, without incurring unnecessary socioeconomic impacts on the fishing community. Overall, when compared to the status quo, the resource would be managed more conservatively than when AMs are not triggered.

Alternatives 3A through 3C will have similar direct and indirect biological effects as **Alternatives 2A through 2C**. Prior to triggering an AM based on a single-, 2-, or 3-year average of landings, scientific advice (from NOAA Fisheries' Southeast Fisheries Science Center (SEFSC) and the Council Scientific and Statistical Committee (SSC) would be needed to determine whether the ACL was exceeded due to increased catch, due to an improved data collection/monitoring effort, or due to a combination of the two. Such a consultation would assist the Council in its determination that catches actually exceeded the ACL. A Commercial Data Collection Improvement Program is under development by the SEFSC and is focused on providing more precise and accurate commercial fishery landings information for the U.S. Caribbean. For **Alternatives 3A through 3C**, a determination will have to be made whether an overrun of the ACL was due to increased catches by fishers or through improved data collection/monitoring efforts. The SEFSC and the SSC will provide an analysis of the information and consult with the Council before any determination is made. A single year of landings beginning in 2010 will be the basis for the initial consultation and subsequent determination whether an ACL was exceeded or not. The addition of such a scientific review would result in a more reliable and defensible decision by the Council to take further management action by triggering an AM to address ACL overages.

Action 7(b) Applying accountability measures.

The alternatives discussed in this section include alternative measures to address overruns of the ACL proxies proposed in this amendment under Actions 1(b) to 2(b). The corrective actions taken when an ACL has been exceeded is one of the primary directives set forth in the NS1 guidelines. **Alternative 1**, the no action alternative, would maintain the status quo and no AMs would be triggered. Under **Alternative 1**, no action would be taken to correct for an ACL overage should one occur. A lack of accountability for such an overage, especially on a repeated basis, could cause harvest to continue at unsustainable levels, which would result in negative biological impacts such as overfishing. Furthermore, **Alternative 1** would not satisfy compliance with MSRA mandates.

The indirect biological and ecological effects of **Alternative 2**, which would shorten the season length to prevent a future overage, would result in reduction of fishing effort for the subject species. When fishing effort on a population is reduced, the general effect is an increase in individual size and abundance of individuals in the population, but the rate and extent of these changes cannot be determined at this time. **Alternative 2** could result in fishers being restricted to a shorter harvesting season, with the intent of restricting their

harvest to the ACL. In such a case, regulatory discards (i.e., fish discarded due to harvest restrictions) may result in increased discard mortality. Additionally, periods of time when fishing for certain species is prohibited may result in indirect benefits to other co-occurring species that would have otherwise been incidentally caught, which could reduce bycatch mortality and injury rates for non-target species.

Fish and coral reef habitats would be indirectly affected by **Alternative 2** and **Alternative 3** because they would not be subjected to the same degree of pre-AM interaction with fishers or gear.

The biological and ecological indirect effects of **Alternative 3**, which would shorten the length of the fishing season by the amount needed to pay back the overage in addition to shortening the season length to prevent a future overage, would likely have a greater biological benefit than only reducing the length of fishing season as specified in **Alternative 2**. However, like **Alternative 2**, AMs that shorten the fishing season can increase the magnitude of regulatory discards and may not be as effective as AMs that lower the target level but still allow some catch of the target species rather than totally prohibiting harvest during a portion of the fishing year.

A shortened season length as a result of **Alternative 3** (i.e., AM implementation to prevent a future overage) will have a positive biological effect as it would reduce the length of interactions of the fishing gears with the ecosystem. As explained for **Alternative 2**, controlling fishing effort, achieved through the implementation of AMs, generally supports a natural size distribution of individuals and a larger number of individuals in the population. In addition, similar to indirect effects of **Alternative 2**, fishers would not be allowed to harvest as much fish as before the ACL overrun; therefore, shortening the season is expected to compensate for a previous ACL overage. It is important to note that NS1 guidelines include a performance standard provision, whereby the entire system of ACLs and AMs for a particular species or species group shall be assessed in the event the ACL is exceeded more than once over a four-year period. Including the NS1 harvest parameters in the framework procedures contained in this amendment would facilitate such a review and subsequent modifications to ACLs and AMs if needed in the future.

6.7.2 Direct and Indirect Effects on the Economic and Social Environments.

Alternative 1 of Action 7(a) would not establish criteria for triggering the accountability measures, and would have no economic or social impact beyond the baseline. **Alternative 2A** would trigger the accountability measures if the proposed ACL were exceeded by a single year of landings, **Alternative 2B** would if the ACL were exceeded by a single year in 2011 then a 2-year average after that, and **Alternative 2C** would if the ACL were exceed by a single year in 2011, the 2-year average from 2011 to 2012, then a 3-year average after that. There would be more overages (shaded in orange) under **Alternative 2A** than **Alternative 2B,** and **Alternative 2B** would have more overages than **Alternative 2C** as illustrated in the scenario in Table 6.7.2.1. The actual economic and social impacts of these overages, however, are dependent on the application of the

accountability measures (Action 7(b)) and the extent that fishing for the species occurs in federal waters.

Table 6.7.2.1. Comparison of Alternatives 2A, 2B, and 2C.

Year	Pounds						
	Landings	ACL	Alt. 2A Overage	2-Year Average Landings	Alt. 2B Overage	3-Year Average Landings	Alt. 2C Overage
2011	225	200	25				
2012	190	200	-10	207.5	7.5		
2013	205	200	5	197.5	-2.5	206.7	6.7
2014	175	200	-25	190.0	-10.0	190.0	-10.0
2015	210	200	10	192.5	-7.5	196.7	-3.3
2016	205	200	5	207.5	7.5	196.7	-3.3
2017	185	200	-15	195.0	-5.0	200.0	0.0
2018	195	200	-5	190.0	-10.0	195.0	-5.0
2019	215	200	15	205.0	5.0	198.3	-1.7
2020	205	200	5	210.0	10.0	205.0	5.0

It is possible that an overage in the above scenario could be the result of improved monitoring and/or data collection and not increased landings. However, none of the **Alternative 2** scenarios would include such consideration. **Alternatives 3A, 3B and 3C** would include consideration that an estimated overage was not due to increased catches, but actually was due to improved data collection and monitoring of landings. Therefore, **Alternatives 3A, 3B** and **3C** could have less of an adverse indirect impact than **Alternatives 2A, 2B** and **2C**.

Alternatives 2 and **3** of Action 7(b) would apply by accountability measures by reducing the federal fishing season in the fishery that experienced the overage. They differ by the length of the reduction. **Alternative 2** would reduce the season following the determination of an overage by the length of time necessary to prevent the overage from being repeated. **Alternative 3** would reduce the length of the season by the length of time set by **Alternative 2** plus additional time to payback the overage. For example, if 12,000 pounds were landed in 2011 and the ACL were 11,000 pounds, there would be an overage of 1,000 pounds. **Alternative 2** would reduce the 2012 season by a month to prevent the 1,000-pound overage in 2012, whereas **Alternative 3** would reduce the season by two months to prevent the 1,000-pound overage in 2012 and to pay back the 1,000-pound overage in 2011. Therefore, **Alternative 3** would have a larger adverse economic and social impact on fishers, their families and fishing communities than **Alternative 2**; however, the actual impacts of either **Alternative 2 or 3** are greatly dependent upon the percent of landings that derive from fishing in the EEZ and the chosen ACLs relative to current landings. With more fishable habitat in their territorial waters, Puerto Rican fishers are most able to mitigate for any losses of landings due to a shortened federal fishing season by shifting into territorial waters, assuming the territorial season remains open. With the least amount of fishable habitat in territorial waters off St. Thomas/St.

John, it is expected that St. Thomas/St. John fishers would be least able to mitigate for lost landings due to a shortened federal fishing season.

6.7.3 Direct and Indirect Effects on the Administrative Environment

Action 7(a) Triggering accountability measures

Alternative 1 is the no action alternative, and would not have an effect on the administrative environment. **Alternatives 2A through 2C** and **Alternatives 3A through 3C** would define the trigger to AMs if the ACL were exceeded; however, they do not apply those measures. Without regulations that implement the AMs, **Alternatives 2** and **3** would not change existing fishing practices and would have no impact to the administrative environment. **Alternatives 3A, 3B**, and **3C** would require the SEFSC to tally yearly landings and provide those numbers to the Council SSC, resulting in some administrative effect, albeit minor.

Action 7(b) Applying accountability measures

Alternative 1, the no action alternative, would not apply AMs. It would not have an effect on the administrative environment. **Alternative 2** and **Alternative 3** would reduce the length of the fishing season in the EEZ for a species or species group if the annual or average annual catch exceeded the ACL for the species or species group.

Alternative 2 would reduce the length of the fishing season in the EEZ for the species or species group by the amount of time needed to prevent overage. **Alternative 3** would require a shorter fishing season than **Alternative 2** in the next fishing year in order to pay-back any overages. Both **Alternative 2** and **Alternative 3** would have similar administrative environment to management because regulatory actions would have to be developed to implement AMs. In addition, **Alternative 2** and **Alternative 3** would have minimal, if any, impact on the administrative environment.

6.8 ACTION 8: Framework Measures

6.8.1 Direct and Indirect Effects on the Physical and Biological Environment.

The Council currently has at its disposal, three different regulatory vehicles for addressing fishery management issues. First, a full amendment may be developed to implement or modify management measures as necessary. The amendment process can take anywhere from one to three years dependent upon the type of National Environmental Policy Act document needed to support the amendment actions. Second, the Council may vote for an interim or emergency rule that could remain effective for 180 days with the option to extend it for an additional 186 days. Interim, and/or emergency rules can be implemented only under limited circumstances and act as short-term management tools while permanent regulations are being developed through the amendment process. Third, the Council may prepare a regulatory amendment based on framework procedures. Typically, framework actions can take about nine months to implement, and are effective until modified.

The no action **Alternative 1** would not establish framework procedures for spiny lobster and would not modify the current framework procedures for corals, reef associated plants and invertebrates to allow for adjustments to various management measures. This would maintain the current procedure for modifying management regulations, potentially causing delays in important changes. Often, when a modification to management measures is needed, corrective action is required quickly. Not allowing regulations to be adjusted through framework would most likely lead to extended delays in implementation of necessary changes. Such a scenario could be biologically detrimental since unsustainable fishing practices would persist until the appropriate modifications could be put in place through a plan amendment. Alternately, if new data shows a stock is doing better than previous assessments indicate and more restrictive management measures are maintained, unnecessary harvest restrictions could prevent the fishery from harvesting its optimum yield.

Under **Alternative 2** and **Alternative 3**, adjustments to management measures could be made with relative ease as new fishery and stock abundance information become available. It should be noted that formation of an assessment group and drafting of the assessment group report could require a significant amount of time to complete. Therefore, the potential does exist for regulatory amendments developed under the subject frameworks to take as long, or longer, than development of FMP amendments. However, if the establishment of framework procedures for spiny lobster, and modifications to the current framework for corals, reef associated plants and invertebrates does result in a more streamlined process for changing harvest parameters, **Alternative 2** and **Alternative 3** would likely be biologically beneficial for species included in the subject FMPs as it would allow more timely adjustment to the management reference points and management measures. However, **Alternative 2** would provide better protection because the framework under **Alternative 2** is more comprehensive and will provide a larger framework for the Council to work under than **Alternative 3**. **Alternative 3** may inadvertently leave out some management measures that may be needed in the future. If changes to omitted measures are needed, a full plan amendment would be required. During the development of the full plan amendment, the measures that require change will still be in effect, potentially harming the spiny lobster and coral and associated plants and invertebrates populations for a longer period.

Framework actions require less public and Council participation when compared to the lengthy amendment process. Framework procedures allows for periodic adjustments to management measures that could be implemented in a timely manner. Allowing management adjustments to be made through framework actions could eliminate the need to prepare FMP amendments for each adjustment needed.

6.8.2 Direct and Indirect Effects on the Economic and Social Environments

Alternative 1 of Action 8(a) and **Alternative 1** of 8(b) are the no action alternatives and would have no direct economic and social impacts. They would not establish a framework to authorize setting, adjusting, and implementing of ACLs and accountability

measures that could be deemed necessary to improve management of the resource, and hence, could indirectly result in lower long-term net economic and social benefits that derive from exploitation of the resources. **Alternative 2** of Action 8(a) and **Alternative 2** of Action 8(b) would amend the framework procedures for the Spiny Lobster FMP and Coral FMP, respectively, to provide a mechanism to adjust reference points and management measures. It is expected that the indirect long-term net economic and social benefits of **Alternative 2** would be larger than those of **Alternative 1**. **Alternative 3** of Action 8(a) and **Alternative 3** of Action 8(b) would add to the amended frameworks a mechanism to adjust a subset of the measures of both **Alternative 2s**, which would allow for more timely action and yield larger long-term net economic and social benefits.

6.8.3 Direct and Indirect Effects on the Administrative Environment

Alternative 1 would be the most administratively burdensome of the three alternatives being considered, because all modifications to the management measures outlined in Actions 8(a) and 8(b) under Alternatives 2 (measures **a through s**) would need to be implemented through an FMP amendment, which is a more laborious and time consuming process than a framework action. **Alternative 2** would incur less of an administrative burden than **Alternatives 1** or **3** since several steps in the lengthy amendment process would be eliminated if the Council were given the latitude to adjust certain management regulations through framework actions. **Alternative 3** could potentially leave out important management measures and if they need to be changed in the future, developing a full plan amendment would be burdensome to managers. **Alternative 2** provides for a more comprehensive framework and will prevent that type of burden on managers.

6.9 Cumulative Effects Analysis

The National Environmental Policy Act (NEPA) requires federal agencies to assess not only the indirect and direct impacts associated with regulatory actions, but also the cumulative impacts associated with those actions. NEPA defines a cumulative impact as the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time, and can either be additive or synergistic. A synergistic impact is when the combined impacts are greater than the sum of the individual impacts.

The following cumulative effects analysis (CEA) is based upon guidance offered in CEQ (1997). The report outlines 11 items for consideration in drafting a CEA for a proposed action. These items are:

1. Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals.
2. Establish the geographic scope of the analysis.
3. Establish the timeframe for the analysis.
4. Identify the other actions affecting the resources, ecosystems, and human communities of concern.
5. Characterize the resources, ecosystems, and human communities identified in scoping in terms of their response to change and capacity to withstand stress.
6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds.
7. Define a baseline condition for the resources, ecosystems, and human communities.
8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities.
9. Determine the magnitude and significance of cumulative effects.
10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.
11. Monitor the cumulative effects of the selected alternative and adapt management.

Cumulative effects on the biophysical environment, socio-economic environment, and administrative environments are analyzed below.

1. Identify the significant cumulative impacts issues associated with the proposed action and define the assessment goals.

The Council on Environmental Quality (CEQ) cumulative impacts guidance states this step is accomplished through three activities. The three activities are as follows:

I. Identifying the direct and indirect impacts of the proposed actions.

Direct and indirect impacts of the proposed actions are summarized in Sections 6.1 through 6.9. Establishing ACLs, AMs, and redefining management reference points for reef fish, spiny lobster, conch resources, and coral and reef associated plants and invertebrates in the U.S. Caribbean will serve to restore and stabilize natural trophic and competitive relationships, rebuild species abundances, re-establish natural sex ratios, and contribute to the long-term health of the ecosystem while reinvigorating sustainable fisheries.

II. Identifying which resources, ecosystems, and human communities are affected.

The resources, ecosystems, and human communities affected by this action are described in Sections 5.0 and 6.0. These include:

1. Managed resources (reef fish, spiny lobster, conch resources, and coral and reef associated plants and invertebrates);
2. Habitat, including EFH;
3. Protected resources including marine mammals and corals; and
4. Puerto Rico and USVI fishing communities

III. Identifying impacts that are important from a cumulative impacts perspective.

The effects most important from a cumulative impacts perspective are described in this CEA.

2. Establish the geographic scope of the analysis.

The immediate areas affecting managed resources, non-target fisheries, habitat, and protected resources are federal waters of the U.S. Caribbean. The immediate areas affecting humans would include fishing communities of Puerto Rico and the USVI.

The following is a summary description of the distribution of reef fish, spiny lobster, conch resources, and coral and reef associated plants and invertebrates species affected by this proposed amendment. More detailed descriptions of these species can be found in section 5.2.

Reef Fish

Reef fish species addressed in this amendment are aquarium trade species, angelfish, boxfish, goatfish, grunts, wrasses, jacks, scups and porgies, tilefish, squirrelfish, surgeonfish, triggerfish, and filefish. In general, these species are found in tropical and subtropical waters of the western Atlantic stretching from the southeastern United States and Bermuda south through the Gulf of Mexico and Caribbean Sea to Brazil. Specific information on the distribution of these species is found in Section 5.2.1.

In general, reef fish are widely distributed in the Caribbean, occupying both pelagic and benthic habitats during their life cycle. Habitat types and life history stages are summarized in the Caribbean SFA Amendment (2005) Section 5.2.1, and are incorporated by reference.

Commercial, recreational, and subsistence fishers of Puerto Rico and the USVI harvest species within aquarium trade species, angelfish, boxfish, goatfish, grunts, wrasses, jacks, scups and porgies, tilefish, squirrelfish, surgeonfish, triggerfish and filefish. For more detailed descriptions of Puerto Rico and USVI commercial and recreational spiny lobster fisheries, see Sections 5.3.2.9.1 of the 2010 Caribbean ACL Amendment.

Spiny Lobster

The Caribbean spiny lobster, *P. argus* (hereafter referred to as spiny lobster), occurs in the Western Central and South Atlantic Ocean, including the Caribbean Sea and the Gulf of Mexico. North Carolina marks its northernmost limit; Brazil, its southernmost limit (Bliss 1982). This species is taken in commercial, subsistence, and recreational fisheries. The spiny lobster occurs from the extreme shallows of the littoral fringe to depths of at least 100 m (Kanciruk 1980; Munro 1974a). CFMC (1981) reports that its distribution off Puerto Rico extends to the edge of the shelf, which is described as the 100-fathom contour (183 m).

In general, spiny lobster has a wide distribution in the Caribbean, occupying both pelagic and benthic habitats during their life cycle. Habitat types and life history stages are summarized in the Caribbean SFA Amendment (2005) Section 5.2.1, and are incorporated by reference.

Commercial, recreational, and subsistence fishers of Puerto Rico and the USVI harvest spiny lobster. For more detailed descriptions of Puerto Rico and USVI commercial and recreational spiny lobster fisheries, see Sections 5.3.2.9.1 of the 2010 Caribbean ACL Amendment.

Conch Resources

The conch species occur in semi-tropical and tropical waters of the Atlantic Ocean, ranging from North Carolina and Bermuda to northern South America, including the Caribbean Sea and Gulf of Mexico (The Academy of Natural Sciences of Philadelphia 2002). Some of these species have also been recorded in the eastern Mediterranean Sea, off the Cape Verde Islands, and off St. Helena (Colin 1978).

The conch species generally occur on expanses of shelf to about 165 ft (55 m) depth. They are commonly found on sandy flats and sea grass meadows that support the growth of seagrasses, primarily turtle grass (*Thalassia testudinum*), manatee grass (*Syringodium filiforme*), shoal grass (*Halodule wrightii*), and epiphytic algae upon which it feeds (CFMC 1996a, Randall 1964, Stoner and Waite 1990). Some of these species such as the true tulip, a carnivorous snail, are commonly found in shallow grassy areas and often stranded by the receding tide (Zeiller 1974). More information about habitat types and life history stages are summarized in the Caribbean SFA Amendment (2005) Section 5.2.1, and are incorporated by reference.

Less is known about the biology and status of the eight other Caribbean conch species under consideration in this amendment than is known about queen conch. The Council

included these species in the management unit because they are occasionally marketed, but they are not generally of economic importance to U.S. Caribbean fisheries. Some, such as the milk conch (*Strombus costatus*) and West Indian fighting conch (*Strombus pugilis*), are used for food, but to a lesser extent than queen conch. Others, such as the Atlantic triton's trumpet (*Charonia variegata*) are collected for the ornamental trade (CFMC 1996a).

For more detailed descriptions of Puerto Rico and USVI commercial and recreational conch species fisheries, see Sections 5.3.2.9.1 of the 2010 Caribbean ACL Amendment.

Coral and Reef Associated Plants and Invertebrates

The Caribbean coral reef resource comprises more than 160 species of invertebrates and plants. This diverse group of organisms includes sponges, a variety of reef-building (hermatypic) and non-reef building (ahermatypic) corals, anemones, annelid worms, mollusks, arthropods, bryozoans, echinoderms, tunicates, algae, and seagrasses.

The conglomerate of species considered in this amendment have a geographic distribution that extends to semi-tropical and tropical waters of the Atlantic Ocean, ranging from North Carolina and Bermuda to northern South America, including the Caribbean Sea and Gulf of Mexico (The Academy of Natural Sciences of Philadelphia 2002). They can also be found in depths that range from intertidal to abyssal depths in the ocean. For example, *Chondrilla Nucula* (Chicken liver sponge), is found in shallow waters of reef areas, where it sometimes overgrows large areas of corals. *Haliclona rubens* (finger sponge) occurs from 1-20 m depth (Colin 1978) on shallow to deep reefs, where it may intertwine with other species of finger sponge (Sefton and Webster 1986). Two species of sea whips (octocorals), *Ellisella barbadensis* and *E. elongata*, reach sizes of nearly 2 m and can occur in dense stands on rocky, often vertical substrates at about 20 to at least 250 m. More information about habitat types and life history stages are summarized in the Caribbean SFA Amendment Section 5.2.1, and are incorporated by reference.

3. Establish the timeframe for the analysis.

The timeframe for this analysis starts when each of the FMPs for each of the species under consideration was created. The species in this amendment have been federally-managed since each of their FMP's were developed. The timeframe should be initiated when data collection began for each of the species. For species in this amendment, data through 2008 for the USVI and 2009 for Puerto Rico was used.

4. Identify the other actions affecting the resources, ecosystems, and human communities of concern.

The Council published on April 29, 2011, a final rule to establish compatible closures for Queen Conch in the U.S. Caribbean. The purpose of the regulatory amendment is to implement federal regulations compatible with the USVI regulations to close the queen conch fishery in federal waters once the territorial government has determined the quota in St. Croix has been reached. When harvest is allowed in territorial and not in federal waters or vice versa, there is an added cost to law enforcement to prove that a catch was taken illegally. Compatible closures benefit both federal and territorial law enforcement and fishers because agents could simply inspect the catch at the docks, versus conducting operations in territorial and/or federal waters, and fishers do not incur any added cost of providing proof that conch were legally caught. In combination with this proposed amendment, there should be little to no added impact to spiny lobster and coral and reef associated plants and invertebrates fisheries of Puerto Rico and the USVI or their families. For a detail description of other actions affecting the resources, ecosystems, and human communities of concern please refer to Appendix 7.

5. Characterize the resources, ecosystems, and human communities identified in scoping in terms of their response to change and capacity to withstand stress.

This step should identify the trends, existing conditions, and the ability to withstand stresses of the environmental components. According to the CEQ guidance, two types of information are needed to describe stress factors. The first are the socioeconomic-driving variables that identify the types, distribution, and intensity of key social and economic activities within the region(s). The second are the indicators of stress on specific resources, ecosystems, and communities.

CEA factor 4 above describes the various stresses affecting the resources, ecosystems, and human communities of concern. Fishers face numerous economic stresses, such as additional costs to fishing or lower ex-vessel prices for harvested fish. Added costs include higher prices for fuel, insurance, dock fees, ice, replacement gear, and food. Factors reducing ex-vessel prices for fishers include market gluts, increases in imported fish, or fish health issues. Changes in revenue and increased operating costs are two indicators of socioeconomic stress. In recent years, the additional stresses of overfishing, hurricanes, and fuel prices have resulted in marginal profits and losses in revenue forcing many fishers to leave fisheries and seek more stable sources of employment. Fishers targeting healthier and a larger number of stocks and with lower expenses are more resilient to the stresses described above. In contrast, those fishers relying on stocks that are frequently subject to overfishing and stringent management regulations, or that have greater expenses relative to other fishers, are less resilient to various stresses making them more likely to seek other jobs.

Indicators of stress to the biological environment include reductions in population abundance and habitat degradation. The Council and NOAA Fisheries evaluate the status

of wild stocks relative to various pre-defined benchmarks and implement necessary management measures to maintain sustainable resources. This proposed amendment would improve those benchmarks and the management measures that result from them. The susceptibility to stress depends on a species' productivity and life history. In general, longer-lived and slower-growing species, such as many reef fishes, are more susceptible to stresses (overfishing, becoming overfished), than shorter-lived and more fecund species. As a result, the time to rebuild these populations is often much longer and reductions in harvest are much greater.

Puerto Rico and USVI commercial fisheries have been characterized as "artisanal" because their commercial fishing vessels tend to be less than 45 feet long, have small crews, participate in multiple fisheries, and yield smaller revenues and/or their seafood processors are small-scale producers. Fishing areas shift with regulatory change, land use and development, land-based pollution, and other factors, such as climate change. For example, water temperature increased in both Guyanilla and Tallaboa Bays of Puerto Rico as a result of hot water discharged by the Central Costa Sur Power Plant, and clorox was discharged by PPG Industries that had a significant adverse impact on marine and coastal resources on the south coast (Pérez 2005: 235). Fishers that operated in the bays had difficulty selling their catches because buyers and consumers feared the fish were tainted with clorox or another contaminant. In response, some fishers went into deeper waters, which was difficult for those with small vessels and modest fishing gear to do. Access to fisheries also has been challenged in both Puerto Rico and the USVI, and privatization of beachfront areas continues to reduce public access to fisheries.

Commercial fishing tends not to be a full-time job in Puerto Rico. Pérez's (2005: 225) survey found that "full-time fishing is not an option for any small-scale fishermen's household in southern Puerto Rico." During economic downturns, fishers are more likely to combine fishing with other occupations in the pursuit of maintaining household incomes. That may require fishers to move to urban areas on the island or to the U.S. mainland. However, that does not mean they abandon or do not return to fishing. Puerto Rican commercial fishers depend more upon fishing when industrial unemployment rises (Pérez 2000: 4). McCaffrey (1999: 112) describes fishing as an "occupational safety net," and according to Griffith et al. (2007), fishing "absorbs the unemployed and poor during difficult economic times and on the other subsidizes individuals working part-time or full-time in the formal economy." Griffith et al.'s (2007) ethnographic work found that between 40 percent and 45 percent of commercial fishers listed other occupations that were held to supplement fishing incomes. If fishers are more likely to combine fishing with other occupations in the pursuit of maintaining household incomes during an economic downturn, a graphical comparison of the number of active fishers and the unemployment rate do not suggest such a relationship. Nonetheless, during times of recession, depression or other economic downturns, such as experienced from 2007 to 2010 in Puerto Rico, commercial fishing increases in importance for fishing households. Given this economic downturn, former commercial fishers may be returning to fishing, whether they are licensed or not.

USVI commercial fishers tend not to derive all of their income from fishing. The average St. Thomas/St. John commercial fisher derives 74 percent of his/her income from fishing, while 60.2 percent of the average St. Croix fishers' annual income derives from fishing (Kojis 2004). Some of the commercial fishers stated that none of their income derives from fishing. This suggests these fishers may be participants in an unreported subsistence fishery. Seventy-five percent of St. Thomas/St. John's commercial fishers obtain more than half of their income from fishing, while 54 percent of St. Croix commercial fishers are similarly reliant on fishing. The recent economic downturn may be increasing the importance of fishing to fishers, their families, and fishing communities.

The ability of these fishers and their communities to withstand any potential adverse impacts caused by the proposed amendment is greatly dependent on their reliance on fishing in federal waters. With more fishable habitat in their state waters, Puerto Rican fishers are most able to mitigate for any losses of landings due to a shortened federal fishing season by shifting into territorial waters, assuming the territorial season remains open. With the least amount of fishable habitat in territorial waters off St. Thomas/St. John, it is expected that St. Thomas/St. John fishers would be least able to mitigate for lost landings due to a shortened federal fishing season because of a Caribbean-wide ACL.

6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds.

This section examines whether resources, ecosystems, and human communities are approaching conditions where additional stresses could have an important cumulative effect beyond any current plan, regulatory, or sustainability threshold (CEQ 1997). Sustainability thresholds can be identified for some resources, which are levels of impact beyond which the resources cannot be sustained in a stable state. Other thresholds are established through numerical standards, qualitative standards, or management goals. The CEA should address whether thresholds could be exceeded because of the contribution of the proposed action to other cumulative activities affecting resources.

The MSA requires federal FMPs to prevent overfishing and achieve OY on a continuing basis. This proposed amendment is intended to improve federal managers' ability to prevent overfishing and achieve long-term optimal yield. Stresses affecting each of these resources include directed fishing mortality, habitat loss and degradation, increasing demand for food and feed, and environmental changes (e.g., hurricanes, changes in temperature, climate change, etc.). For example, how global climate changes will affect Caribbean fisheries is unclear. Climate change can affect marine ecosystems through ocean warming by increased thermal stratification, reduced upwelling, and sea level rise; and through increases in wave height and frequency, loss of sea ice, and increased risk of diseases in marine biota. Decreases in surface ocean pH due to absorption of anthropogenic CO_2 emissions may impact a wide range of organisms and ecosystems, particularly organism that absorb calcium from surface waters, such as corals and crustaceans (IPCC 2007, and references therein).

The status of many of these species is not regularly assessed, as they are not considered undergoing overfishing. Even if overfishing is not occurring, MSRA requires NOAA

Fisheries and/or the Councils to implement conservation and management measures to prevent these species to become overfished. States and interstate compacts may also impose regulations to control fishing mortality and harvest. For endangered and threatened species, the ESA prohibits take, import or export, shipment, or sale of any endangered species and most threatened species.

Stresses affecting fishing communities include additional regulatory restrictions, competition from foreign seafood imports, coastal development, loss of infrastructure, and rising fuel prices. All of these stresses have placed a greater burden on fishers and fishing communities that threaten their short- and long-term sustainability. In the past several years, the Council has implemented numerous regulations to keep reef fish, spiny lobster, conch resources, and coral and reef associated plants and invertebrates from undergoing overfishing. These regulations have resulted in lower acceptable catch levels, gear restrictions, and limited access. Although the net benefit of these regulations is expected to maintain and increase the abundance and stable fisheries in the long-term, they have the unavoidable adverse effect of negatively affecting socioeconomic benefits in the short-term. As a result, the cumulative effect of more restrictive regulations, coastal development, higher fuel prices, economic downturns, and natural disasters has led many fishers to increase non-fishing employment in recent years.

There are also unexpected human impacts such as the BP/Deepwater Horizon MC252 oil spill event, which occurred in the Gulf of Mexico on April 20, 2010. These non-management stressors can have large effects on fishing communities. Although the BP/Deepwater Horizon MC252 oil spill did not directly affect the Caribbean, fishers and dealers may have experienced hardship from reduced consumer confidence in seafood from the region. Because of the continuing rise in the cost of fishing, including increases in the cost of fuel and insurance, many fishers are having a more difficult time making a living fishing. Accountability measures could result in shorter seasons for the recreational and/or commercial sectors. This may also affect the businesses that are dependent on the commercial and recreational fishery in that they will have fewer days to sell charter services, ice, fuel, tackle, hotel rooms, and other services to people participating in the fishery.

Although the intent of this proposed amendment is to improve the targets and thresholds of reef fish, spiny lobster, conch resources, and coral and plants and associated invertebrates units, it may cause additional stresses (e.g., lower landings). It is expected that the Council will choose the least-cost alternatives that accomplish the purpose of the amendment.

7. Define a baseline condition for the resources, ecosystems, and human communities.

The purpose of defining a baseline condition for the resource and ecosystems in the area of the proposed action is to establish a point of reference for evaluating the extent and significance of expected cumulative effects.

The status of Council managed resources are summarized in the annual status report to Congress on the Status of U.S. Fisheries (NMFS 2009). The baseline status of Council managed species is also described in Section 5.0. The remainder of Council managed species are either healthy or their status is unknown.

The status and health of EFH has been extensively described (CFMC 1998, 2004) and it is currently under review. The Council, NOAA Fisheries, and other federal agencies have designated numerous areas in the Caribbean to protect and conserve EFH. These areas protect EFH from a wide variety of direct impacts, including loss of fishing gear, restricted use of certain fishing gears, and damage from anchors.

Section 5.3 describes baseline economic and social conditions for fishing communities in Puerto Rico and the USVI. The Generic Essential Fish Habitat Amendment (CFMC 1998), FEIS (CFMC 2004), Griffith et al. (2007), and Stoffle et al. (2009) provide more extensive characterization of fishing-dependent communities. St. Thomas, St. John, St. Croix, and Puerto Rican fishing communities would be affected as a result of the various actions and alternatives proposed herein; however, until the set of alternatives is chosen, it is impossible to quantify the combined impacts, such as expected net losses of annual landings, ex-vessel revenues, and income.

8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities.

Cause-and-effect relationships for various aspects of reef fish, spiny lobster, conch resources, and coral and plants and associated invertebrates fisheries and measures proposed in this Amendment to address these potential effects are described in Sections 5 and 6. Actions considered in this amendment should not have adverse effects on public health or safety since these measures should not alter actual fishing practices, just where or when activities can occur. Depending on the preferred alternatives, fishing may still occur, just limited to the extent allowed by the management measures adopted. Unique characteristics of the geographic area are highlighted in Section 5. Effects of fishing activities on the physical environment are described in detail in Section 6.1-6.8 of the actions.

Past actions affecting the reef fish, spiny lobster, conch resources, and coral and plants and associated invertebrates fisheries are summarized in Tables 6.9.1, 6.9.2, and 6.9.3 and described in Appendix 7. ACLs and AMs are intended to prevent or greatly reduce the risk of overfishing and are expected to have positive biological benefits. However, they may also impose more restrictive catch levels on fisheries resulting in negative social and economic impacts over the short-term. To the extent that catch limits and AMs prevent overfishing and assist in rebuilding overfished stocks, they should have positive long-term benefits to both the biological and socioeconomic environments.

Table 6.9.1. Federal regulations affecting reef fish, coral and reef associated plants and invertebrates, queen conch, and spiny lobster.

Multiple Caribbean Stock Complexes (including the five stocks/stock complexes considered herein)
Permanent Area Closures:
Fishing for any species and anchoring is prohibited year-round in the Hind Bank Marine Conservation District off St. Thomas.
Seasonal Area Closures:
From March 1 through June 30 each year, all fishing is prohibited in the Mutton Snapper Spawning Aggregation Area off St. Croix.
From December 1 through last day of February each year, fishing is prohibited in the Red Hind Spawning Aggregation Areas (Lang Bank east of St. Croix, and in Tourmaline Bank, and Abrir La Sierra Bank off western Puerto Rico).
From October 1 through March 31 each year, no person may fish or posess any Council managed reef fish in the EEZ portion of Bajo de Sico, off western Puerto Rico. Fishing for spiny lobster, HMS and other non-HMS coastal migratory pelagics is allowed.
From February 1 through April 30 each year, no person may fish for or possess any species of fish, except for highly migratory species, in or from the Grammanik Bank closed area off St. Thomas.
Gear Prohibitions and/or Restrictions:
Fishing with pots, traps, bottom longlines, gillnets, or trammel nets is prohibited year-round in the four Red Hind Spawning Aggregation Areas (Lang Bank, Bajo de Sico, Tourmaline and Abrir la Sierra), Grammanik Bank closed area, Mutton Snapper Spawning Aggregation Area. In Bajo de Sico, anchoring is prohibited year-round, and spearfishing is allowed for commercial fishing.
An explosive may not be used in the U.S. Caribbean EEZ.
A powerhead may not be used in the U.S. Caribbean EEZ to harvest Caribbean reef fish.
A poison, drug, or other chemical may not be used to fish for Caribbean reef fish in the U.S. Caribbean EEZ. These also cannot be used to harvest corals.
A gillnet or trammel net may not be used in the U.S. Caribbean EEZ.
A fish trap used or possessed in the U.S. Caribbean EEZ must have an escape mechanism as defined and must comply with minimum mesh size regulations.
REEF FISH
Seasonal EEZ Closure:
Snapper Unit 1 (silk, black, vermilion, blackfin)
From October 1 through December 31 each year, no person may fish for or possess vermilion, black, silk, or blackfin snapper in or from the U.S. Caribbean EEZ.
Snapper Unit 3 (gray, lane, dog, mutton, schoolmaster, mahogany)
From April 1 through June 30 each year, no person may fish for or possess mutton or lane snapper in or from the U.S. Caribbean EEZ.
Grouper Unit 4 (red, misty, tiger, yellowedge, and yellowfin) and black grouper
From February 1 through April 30 each year, no person may fish for or possess red, tiger, yellowfin, yellowedge or black grouper in or from the Caribbean EEZ.
Permanent EEZ Species Closure:
Grouper Unit 1 and 2 (Nassau and goliath grouper)
No person may fish for or possess Nassau or goliath grouper in or from the U.S. Caribbean EEZ. Such fish caught must be released immediately with a minimum of harm.
AQUARIUM TRADE SPECIES
Aquarium trade species can only be collected with slurp guns, hand held dipnets, by hand and other non-habitat destructive gear.
CORALS
Harvest or possession of stony corals, soft corals, sea fans, gorgonians and any species of the FMU if attached or existing upon live-rock is prohibited.
QUEEN CONCH (queen conch)
Seasonal EEZ and/or Area Closures:
Fishing for or possession of queen conch in the EEZ is prohibited, with the exception of Lang Bank, St. Croix, USVI (east of 64º 34'W).

Fishing for queen conch in Lang Bank is prohibited from June 1 through October 31 each year (will become effective May 31, 2011).

Table 6.9.1. (Continued) Federal regulations affecting reef fish, coral and reef associated plants and invertebrates, queen conch, and spiny lobster.

Landing Restrictions:
Queen conch in or from the U.S. Caribbean EEZ must be maintained with meat and shell intact.
Minimum Size Limit:
Min. size limit is 9" (22.9 cm) in length and 3/8" (9.5 mm) in lip thickness at its widest point.
Commercial and Recreational Catch Limits:
A fisherman who has a valid commercial fishing license may not possess in or from the US Caribbean EEZ more than 150 conchs per day when permitted fishing is allowed. Daily recreational bag limit of 3 conchs per day, and 12 per vessel per day.
Gear prohibitions:
Hookah gear cannot be used while harvesting queen conch.
Spiny lobster
Spiny lobster in or from the U.S. Caribbean EEZ must be landed whole. Egg-bearing lobsters cannot be retained.
Spiny lobster less than 6 ounces tail weight cannot be imported into Puerto Rico or the U.S. Virgin Islands.
Minimum Size Limit:
Spiny lobster should have a carapace length of 3.5" or greater.
Gear Prohibitions:
Poisons, drugs, or other chemicals, and spears, hooks, explosives, or similar devices may not be used to take spiny lobsters.
Traps and pots should include a self-destruct panel and/or self-destruct door fastenings . Traps, pots, buoys, and boats should be identified and marked.

The Council worked on a regulatory amendment to the Reef Fish FMP to extend the seasonal closure of Bajo de Sico, which is off the west coast of Puerto Rico (the final rule published in the *Federal Register* on November 2, 2010; 75 FR 67247), and the provisions were effective December 2, 2010. Bajo de Sico has been identified as an important spawning site, especially for red hind and possibly other resident grouper including Nassau and yellowfin, as well as an important foraging site for these and other Caribbean reef fish. The Bajo de Sico closed area has been described as a well-developed and diverse coral and sponge habitat that provides EFH for Caribbean reef fish. The purpose of the regulatory amendment is to protect red hind spawning aggregations and large snapper and grouper from directed fishing mortality. An extended seasonal closure of the Bajo de Sico area in combination with previous actions and this proposed amendment could have significant cumulative adverse economic and social impacts on fishers and fishing communities on Puerto Rico's west coast if there is a geographic allocation (**Alternative 2** of Action 5). Thirty-six percent of the Puerto Rican commercial fishers interviewed by Griffith et al. (2007) in 2005 reported that the Bajo de Sico Marine Protected Area had directly caused adverse socioeconomic impacts on them and their families; and approximately 54 percent reported that the closure indirectly adversely affected their local communities. Some of the adverse socioeconomic effects were increases in transiting time and associated fuel costs associated with avoiding Bajo de Sico while it is closed. However, approximately 21 percent of the interviewed fishers stated that the 3-month seasonal closure created employment and investment opportunities in their communities. Other previous federal actions that have affected these fisheries are summarized in Table 6.10.1. Griffith et al. (2007) estimate that between 250 and 300 fishing families were adversely affected by the combination of the Bajo de Sico and Tourmaline Bank seasonal closures.

Griffith et al. (2007) emphasize that there have been cumulative social and economic effects resulting from the various area closures on the west coast (i.e., Tourmaline Bank, Bajo de Sico, Abrir la Sierra, and Desecheo, and Islas de La Mona/Monito Natural Reserve), as well as the other seasonal closures for numerous commercially important species (e.g., several deepwater snapper species between October and December and several grouper species between February and April). Similar to the Bajo de Sico closure, these latter closures are meant to protect these species during their spawning season.

The seasonal closure of Bajo de Sico avoided the imposition of more restrictive size limits, which fishers dislike more than any other regulation because they believe such rules result in the wasteful discarding of fish (Griffith et al. 2007). Some fishers have avoided the adverse impacts of the closures by not complying with the various area closures (e.g., Bajo de Sico) and other regulations (e.g., licensing and reporting requirements), which reduces the ability to accurately assess the fishery. With insufficient enforcement on the water, non-compliance was reported to have increased, causing resentment on the part of compliant fishers. This may in turn further reduce compliance. Compliance with the actions and alternatives proposed in this amendment would allow for improved management of reef fish, spiny lobster, conch resources, and coral and reef associated plants and invertebrates fisheries and larger net long-term economic and social benefits. Griffith et al. (2007) note that, as long as imports of undersized fish continues to be allowed, it is easier for illegally harvested undersized fish to be mixed with fish of the same size that have been legally imported.

Table 6.9.2. Puerto Rico regulations that affect reef fish, coral and reef associated plants and invertebrates, queen conch, and spiny lobster.

All Fishing
Permanent Area Closures:
No fishing in one mile around Mona and Monito Islands Natural Reserves, except by hook (one) and line in designated areas in Playa Pajaros and Playa Sardinera.
No fishing in the Luis Peña Channel Natural Reserve, in Culebra Island. No fishing in ½ mile around Isla de Desecheo Marine Reserve, and in a specified area in Isla Caja de Muerto Natural Reserve.
No fishing in no-take zone of Tres Palmas Marine Reserve.
Seasonal Area Closures:
From December 1 through last day of February each year, fishing is prohibited in the three Red Hind Spawning Aggregation Areas west of Puerto Rico (Bajo de Sico, Tourmaline Bank, Abrir La Sierra Bank). Fishing for HMS and other non-HMS coastal migratory pelagics is allowed.
Gear Prohibitions and/or Restrictions:
Fishing with pots, traps, bottom longlines, gill nets, trammel nets, and anchoring are prohibited year-round in the Red Hind Spawning Aggregation Areas.
No fishing by means of explosives; traps and nets have specific minimum mesh size requirements (trammel, gill nets); nets have length limits; HOOKAH gear not allowed; no combined use of SCUBA and spearfishing by recreational fishers. Nets cannot be combined with SCUBA by commercial fishers.
Snapper Unit 1 (silk, black, vermilion, blackfin)
Seasonal Territorial Closure:
From October 1 through December 31, no person can commercially or recreationally fish for silk or blackfin snapper in Puerto Rico waters.
Snapper Unit 3 (gray, lane, dog, mutton, schoolmaster, mahogany)
From April 1 through May 31 each year, no person may fish for or possess mutton snapper in or from PR waters. Incidental catch while in closure (daily limit of 5 individuals, no more than 10 per boat) allowed only for personal consumption.
Snapper Unit 4 (yellowtail)
Minimum Size Limit:
Minimum size limit of 10.5" (26.7 cm) fork length (FL)
Grouper Unit 1 (Nassau) and 2 (goliath)
Permanent Territorial Closures:
No person may commercially or recreationally fish for or possess Nassau or goliath grouper in or from waters of Puerto Rico.
Grouper Unit 3 (red hind, coney, rock hind, graysby, creole-fish)
From December 1 through the last day of February each year, no person may commercially or recreationally fish for or possess red hind grouper in or from PR waters.
Grouper Unit 4 (red, misty, tiger, yellowedge, yellowfin)
From Feb. 1 to April 30 no person can commercially or recreationally fish for yellowfin grouper in Puerto Rico waters.
AQUARIUM TRADE SPECIES
Collection of aquarium trade species is prohibited. Collection of tropical fish for aquarium purposes requires special permit.
CORALS
Collection of corals for commercial purposes is prohibited, except by permit (education and research).
Queen Conch
Seasonal and/or Area Closures:
No person may fish for, or possess on board a fishing vessel, a queen conch in or from Puerto Rico waters from August 1 through October 31 each year.
Minimum Size Limit:
The minimum size limit for queen conch is 9" (22.9 cm) in length and 3/8" (9.5 mm) lip width at its widest point.
Commercial and Recreational Catch Limits:
Daily commercial limit of 150 conch per person and 450 per boat, and daily recreational bag limit of 3 per person and 12 per boat if more than four people on the boat.
Gear Prohibitions and/or Restrictions:
No use of surface supplied (i.e. hookah) gear.
Recreational: no use of combined SCUBA and spears.

Table 6.9.2. (Continued) Puerto Rico regulations that affect reef fish, coral and reef associated plants and invertebrates, queen conch, and spiny lobster.

SPINY LOBSTER
Landing Restrictions:
Spiny lobster in or from Puerto Rico waters must be landed whole. Egg-bearing lobsters cannot be retained.
Minimum Size Limit:
Spiny lobster should have a carapace length of 3.5" or greater.
Gear Prohibitions:
Poisons, drugs, or other chemicals, and spears, hooks, explosives, or similar devices may not be used to take spiny lobsters.
Traps and pots should include a self-destruct panel and/or self-destruct door fastenings. Traps, pots, buoys, and boats should be identified and marked.

Puerto Rico and the USVI have implemented regulations to manage reef fish, spiny lobster, conch resources, and coral and reef associated plants and invertebrates in their state and territorial waters. See Tables 6.9.2 and 6.9.3 for state and territorial regulations that affect these fisheries. If Puerto Rico and/or the USVI established landings quotas consistent with the ACLs that would be established by this amendment, there could be cumulative adverse impacts on fishers, their families, and fishing communities; however, that would be dependent on the ACLs and the levels of annual landings at the time such quotas could be established. If the ACLs are greater than or equal to annual landings, there would be no additional adverse impact.

Regulations that alter the allowable harvest of other managed species in the U.S. Caribbean or alter importation of seafood into the U.S. Caribbean territories may alter recreational and commercial reef fish, spiny lobster, conch resources, and coral and reef associated plants and invertebrates fishing. When reduction in harvest of other managed species or in imports of substitute species occurs, a positive economic effect on reef fish, spiny lobster, conch resources, and coral and reef associated plants and invertebrates fisheries could occur, while conversely, increases in levels of wild and/or imported substitute species would be expected to create a depressed economic value of reef fish, spiny lobster, conch resources, and coral and reef associated plants and invertebrates. However, it is difficult to say with certainty if these trends would hold true for all, some, or even none of the species. Changes in economic value would largely depend on the health and status of the fisheries and the amount of substitute species caught and imported.

Natural and human induced disasters, as well as socioeconomic changes, can also affect resources, ecosystems, and communities. Such events include hurricanes, earthquakes, tropical storms, flooding, tsunamis, water pollution, coral bleaching, disease outbreaks, invasive species (e.g., lionfish), high fuel prices, economic recessions and depressions, and gentrification of island coasts. These events can negatively affect the revenues and profits of Puerto Rico and USVI fishers. They can also damage existing infrastructure and reduce resource availability.

Table 6.9.3. USVI regulations that affect reef fish, coral and reef associated plants and invertebrates, queen conch, and spiny lobster.

ALL SPECIES
Permanent Area Closure:
All fishing, except bait fishing and fishing for blue runner, is prohibited in the Virgin Island Coral Reef National Monument.
No fishing in the Buck Island National Monument (U.S. Department of Interior).
No fishing in St. James Reserve or Cay Mangrove Lagoon Reserve, except for bait fry in limited areas.
No fishing permitted in Compass Point Marine Reserve, St. Thomas, Salt River Marine Reserve, St. Croix, and The Small Pond at Frank Bay Wildlife and Marine Sanctuary, St. John.
Seasonal Area Closures:
From December 1 through last day of February each year, fishing is prohibited in the Red Hind Spawning Aggregation Area east of St. Croix (Lang Bank).
No harvest of any species from March 1 through June 30 each year, within the Mutton Snapper Spawning Area.
Area prohibitions and limitations on fishing in the East End Marine Park off St. Croix.
Gear Prohibitions and /or Restrictions:
Fish trap restrictions in St. Croix and St. Thomas/St. John districts. Nets have specific size requirements.
Prohibition on the use of gill and trammel nets in territorial waters.
Fishing with pots, traps, bottom longlines, gillnet, or trammel nets is prohibited year-round in the Red Hind and Mutton Snapper Spawning Aggregation Areas.
Filleting of fish in Territorial/Federal waters is prohibited. Fish captured or possessed in territorial waters must be landed with heads and fins intact.
Snapper Unit 1 (silk, black, blackfin, vermilion)
The possession of silk, black, blackfin, and vermilion snapper is prohibited from October 1 through December 31 in St. Thomas/St. John territorial waters only, not St. Croix.
Grouper Unit 1 (Nassau) and 2 (goliath)
Permanent Territorial Closure:
No person may commercially or recreationally fish for, or possess, Nassau and goliath grouper in or from waters of the USVI.
Snapper Unit 3 (gray, lane, dog, mutton, schoolmaster, mahogany)
From April 1 through June 30, each year, fishing for or possession of mutton and lane snapper is prohibited in USVI territorial waters.
Grouper Unit 4 (red, misty, tiger, yellowedge, yellowfin) and black grouper
The possession of red, tiger, yellowedge, and yellowfin grouper is prohibited from February 1 through April 30 each year in territorial waters. Possession of black grouper is also prohibited during the closure.
AQUARIUM TRADE SPECIES
Collection of aquarium trade species is prohibited. Collection of tropical fish for aquarium purposes requires special permit.
CORALS
Collection of corals for commercial purposes is prohibited, except by permit (education and research).
QUEEN CONCH (queen conch)
Seasonal and/or Area Closure:
No person may fish for, or possess onboard a fishing vessel, a queen conch in or from USVI waters from June 1 through October 31 each year.
Minimum Size Limit:
Minimum of 9" (22.9 cm) total length or 3/8" (9.5 mm) lip thickness. No possession of conch meats smaller than 2 per pound (un-cleaned) or 3 per pound (cleaned).
Annual Total Catch Limit:
50,000 pounds in the St. Croix district and 50,000 pounds in the St. Thomas/St. John district. Thereafter, the season will be closed until November 1 of that year. All conch must be landed and reported in the district from which they were harvested.
Commercial and Recreational Catch Limits:
Daily commercial limit of 200 conch per boat (having a licensed commercial fisher on board), and daily recreational bag limit of six conch per person and a total of 24 conch per boat.
Catch Restrictions:
All conchs must be landed alive and whole in shell. Transport of conch meat over open water is prohibited.

Table 6.9.3. (Continued) USVI regulations that affect reef fish, coral and reef associated plants and invertebrates, queen conch, and spiny lobster.

SPINY LOBSTER
Landing Restrictions:
Spiny lobster in or from the USVI waters must be landed whole. Egg-bearing lobsters cannot be retained.
Minimum Size Limit:
Spiny lobster should have a carapace length of 3.5" or greater.
Gear Prohibitions:
Poisons, drugs, or other chemicals, and spears, hooks, explosives, or similar devices may not be used to take spiny lobsters.
Traps and pots should include a self-destruct panel and/or self-destruct door fastenings. Traps, pots, buoys, and boats should be identified and marked.

9. Determine the magnitude and significance of cumulative effects.

Since formal management of species addressed in this amendment has occurred, all regulatory actions implemented have put in place to promote sustainable fisheries for the Caribbean region. Overall, cumulative impacts of past, present and future management measures are expected to have a positive effect on the biological environment.

The process of protecting reef fish, spiny lobster, conch resources, and coral and plants and associated invertebrates species through the specification of management targets, thresholds, and AMs, and regulations that implement those AMs, is expected to have a short-term adverse impact on the social and economic environment, and will create a burden on the administrative environment. The no action alternatives being considered would avoid these negative effects, but they would not comply with the amendments to the MSA that require each FMP specify ACLs and AMs for managed fisheries. The range of alternatives has varying degrees of economic and social costs and administrative burdens, starting at zero. However, and for example, if there was a Caribbean-wide ACL for lobster, the largest adverse economic and social impact could be on St. Thomas/St. John fishers because less fishable habitat occurs in territorial waters off St. Thomas/St. John. The next largest adverse economic and social impact could be felt by St. Croix fishers who have more fishable habitat in territorial waters than St. Thomas/St. John, but substantially less than their counterparts in Puerto Rico. Recreational and commercial fishers of Puerto Rico, St. Croix, and St. Thomas/St. John would be in competition for the single ACL, which would favor fishers with larger vessels and gears capable of catching more of the fish in the same or a shorter period over recreational and historic artisanal fishers (Section 6.3.2).

To ensure stocks are not overharvested, periodic monitoring of the fisheries is needed to estimate the condition of the stocks. This monitoring should be designed to incorporate new information and to address unanticipated developments in the respective fisheries and would be used to make appropriate adjustments in the reef fish, spiny lobster, conch resources, and coral and plants and associated invertebrates regulations should fishery practices not achieve needed take reductions. Additionally, NOAA Fisheries and other

government agencies support research on these species by federal, state, academic, and private research entities.

10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.

The process of protecting reef fish, spiny lobster, conch resources, and coral and plants and associated invertebrates species through the specification of management targets, thresholds, and AMs, and regulations that implement those AMs could have a short-term adverse impact on the social and economic environment, and could create a burden on the administrative environment. The no action alternatives being considered would avoid these negative effects, but they would not achieve the goal of establishing ACLs for all managed species and would not be in compliance with new amendments of the MSA that require each FMP to specify ACLs and AMs for managed fisheries. The range of alternatives has varying degrees of economic and social costs and administrative burdens, starting at zero. The Council chose alternatives intended to balance biological benefit with socioeconomic impacts. The alternatives chosen are those that are expected to result in the lowest socioeconomic impact possible while still complying with the mandates of the MSRA.

11. Monitor the cumulative effects of the selected alternatives and adapt management.

The effects of the past, present, and future actions affecting Caribbean fisheries are, and will continue to be, monitored through collection of fisheries data by NOAA Fisheries and the state and territorial governments, stock assessments and stock assessment updates, life history studies, economic and social analyses, and other scientific observations. Commercial landings data is collected by Puerto Rico Department of Natural and Environmental Resources in Puerto Rico and by Virgin Islands Department of Planning and Natural Resources in the USVI. Recreational data is collected through MRFSS, which has not been conducted in the USVI.

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8.0 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE STATEMENT ARE SENT

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
National Marine Fisheries Service Office of Law Enforcement Southeast Division
Angela Somma NOAA/NMFS Endangered Species Division
Galen Tromble NOAA/NMFS Domestic Fisheries Division
United States Coast Guard
United States Fish and Wildlife Service
United States Army Corps of Engineers
United States Department of the Interior
United States Department of Homeland Security
United States Department of State
United States Environmental Protection Agency Headquarters
United States Environmental Protection Agency New York Region
United States Environmental Protection Agency Virgin Islands Field Office
Marine Mammal Commission
Caribbean Environmental Protection Division
Division of Coastal Zone Management
USVI Department of Planning and Natural Resources Division of Fish and Wildlife
USVI Department of Planning and Natural Resources St. Thomas Office
USVI Department of Planning and Natural Resources St. Croix Office
Puerto Rico Department of Natural and Environmental Resources
Puerto Rico Department of Agriculture
Puerto Rico Junta de Calidad Ambiental (Environmental Quality Board)
Puerto Rico Junta de Planificación (Planning Board)
PEW Environmental Foundation
Environmental Defense
Ocean Conservancy
Surfrider Foundation
St. Thomas Fishermen's Association
St. Croix Commercial Fishermen's Association

9.0 REFERENCES

Agar, J.J. 2010. Personal Communication, March 9, 2010.

Agar, J.J., J. Waters, M. Valdés-Pizzini, M. Shivlani, T. Murray, J. Kirkley and D. Suman. 2008. U.S. Caribbean fish trap fishery socioeconomic study. Bull. Mar. Sci. 82: 315-331.

Allen, G.R. 1985. Butterfly and Angelfishes of the World, Volume 2. Mergus Publishers, Melle, Germany.

America's Second Harvest-The Nation's Food Bank Network. 2007. The almanac of hunger and poverty in Puerto Rico 2007. Obtained online at: http://feedingamerica.org/our-network/the-studies/~media/Files/research/almanac/WEBAlmanac_PR-ashx.

[The] Annie E. Casey Foundation and The Population Reference Bureau. 2002. A first look at children in the U.S. Virgin Islands. A Kids Count/PRB report on Census 2000. Obtained online at: http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/1a/97/e5.pdf.

[The] Annie E. Casey Foundation and The Population Reference Bureau. 2003. Children in Puerto Rico: Results from the 2000 Census. A Kids Count/PRB Report on Census 2000. Obtained online at: www.kidscount.org.

Appeldoorn, R.S. 1994. Queen conch management and research: Status, needs and priorities. In: R.S. Appeldoorn and B. Rodríguez (Eds.), Queen Conch Biology, Fisheries and Mariculture. Fundación Científica Los Roques, Caracas, Venezuela, pp. 301-320.

Aranda, E.M. 2007. Emotional Bridges to Puerto Rico: Migration, Return Migration and the Struggles of Incorporation. Rowman & Littlefield Publishers, Inc., NY.

[The] Associated Press. 2007. Virgin Islands extends conch fishing ban due to overfishing concerns.July 27, 2007.

Ault, J.S., J.A. Bohnsack and G.A. Meester. 1998. A retrospective (1979-1996) multispecies assessment of coral reef fish stocks in the Florida Keys. Fish. Bull. 96: 395-414.

Ault, J.S., S.G. Smith, G.A. Meester, J. Luo, J.A. Bohnsack and S.L. Miller. 2002. Baseline multispecies coral reef stock assessment for the Dry Tortugas. NOAA Technical Memorandum NMFS-SEFSC-487. 117 pp.

Ayala, C.J. 1999. American Sugar Kingdom. University of North Carolina Press, Chapel Hill, NC.

Ayala, C.J. and R. Bernabe. 2007. Puerto Rico in the American Century: A History Since 1898. University of North Carolina Press, Chapel Hill, NC.

Barnette, M.C. 2001. A review of the fishing gear utilized within the Southeast Region and their potential impacts on essential fish habitat. NOAA Technical Memorandum NMFS-SEFSC-449.

Beanlands G.E. and P.N. Duinker. 1983. An ecological framework for environmental impact assessment in Canada. Institute for Resource and Environmental Studies, Dalhousie University, Halifax, Nova Scotia, and Federal Environmental Assessment Review Office, Hull, Quebec, 132 pp.

Behrman, J.R., H. Alderman and J. Hoddinott. 2004. Hunger and malnutrition. In: J. Lomborg (ed.), Global Crises,Global Solutions. Cambridge University Press, Cambridge, UK.

Bel, G. 2009. The first privatization policy in a democracy: Selling State-owned enterprises in 1948-1950 Puerto Rico. Research Institute of Applied Economics Working Papers 2009/15. Obtained online at: www.ub.edu/irea/working_papers/2009/200915.pdf.

Bennett, J. 2007. Procedures used in creation of price tables for the U.S. Virgin Islands commercial landings. NOAA-SEFSC.

Berg, C.J. and D.A. Olsen. 1989. Conservation and management of queen conch (*Strombus gigas*) fisheries in the Caribbean. In: J.F. Caddy (Ed.), Marine Invertebrate Fisheries: Their Assessment and Management. John Wiley and Sons, New York, pp. 421-422.

Böhlke, J.E. and C.C.G. Chaplin. 1993. Fishes of the Bahamas and Adjacent Tropical Waters, 2nd Edition. University of Texas Press, Austin, Texas.

Bohnsack, J.A. 1999. Incorporating no-take marine reserves into precautionary management and stock assessment. In: V.R. Restrepo (Ed.), Providing Scientific Advice to Implement Precautionary Approach Under the Magnuson-Stevens Fishery Conservation and Management Act. NOAA Tech. Memorandum NMFS-F/SPO-40: 8-16.

Boris, E. 1996. Needlewomen under the New Deal in Puerto Rico, 1920-1945. In: A. Ortiz (Ed.), Puerto Rican Women and Work: Bridges in Transnational Labor. Temple University Press, Pennsylvania, PA, pp. 33-54.

Bram, J., F.E. Martínez and C. Steindel. 2008. Trends and developments in the economy of Puerto Rico. Current Issues in Economics and Finance, Vol. 14, No. 2. Obtained online at: http://www.newyorkfed.org/research/current_issues/ci14-2.pdf

Bryant, D., L. Burke, J. McManus and M. Spalding. 1998. Reefs at risk: A map-based indicator of threats to the world's coral reefs. World Resources Institute, Washington, D.C. 59 pp.

Bullock, L. and G. Smith. 1991. Memoirs of the Hourglass cruises VIII(2). Florida Department of Natural Resources, Florida Marine Research Institute, St. Petersburg, Florida. 223 pp.

Bullock, L.H., M.D. Murphy, M.F. Godcharles and M.E. Mitchell. 1992. Age, growth, and reproduction of the jewfish *Epinephelus itajara* in the eastern Gulf of Mexico. Fish. Bull. 90: 243-249.

Bush, D.M., R.M.T. Webb, J.G. Liboy, L. Hyman and W.J. Neal. 1995. Living with the Puerto Rico Shore. Duke University Press, Durham, NC.

Caribbean Fishery Management Council (CFMC). 1981. Fishery management plan, final environmental impact statement, and regulatory impact review for the spiny lobster fishery of Puerto Rico and the U.S. Virgin Islands. Caribbean Fishery Management Council, San Juan, Puerto Rico. 43 pp. + Appendices.

Caribbean Fishery Management Council (CFMC). 1985. Fishery management plan, final environmental impact statement, and draft regulatory impact review for the shallow-water reef fish fishery of Puerto Rico and the U.S. Virgin Islands. Caribbean Fishery Management Council, San Juan, Puerto Rico. 69 pp. + Appendices.

Caribbean Fishery Management Council (CFMC). 1990a. Amendment number 1 to the fishery management plan for the shallow-water reef fish fishery, preliminary environmental assessment and regulatory impact review. Caribbean Fishery Management Council, San Juan, Puerto Rico. 51 pp. + Appendices.

Caribbean Fishery Management Council (CFMC). 1990b. Amendment number 1 to the fishery management plan for the spiny lobster fishery of Puerto Rico and the U.S. Virgin Islands. Caribbean Fishery Management Council, San Juan, Puerto Rico. 24 pp.

Caribbean Fishery Management Council (CFMC). 1991. Regulatory amendment to the shallow water reef fish fishery management plan. Caribbean Fishery Management Council, San Juan, Puerto Rico. 24 pp. + Appendix.

Caribbean Fishery Management Council (CFMC). 1993. Amendment 2 to the fishery management plan for the shallow-water reef fish fishery of Puerto Rico and the U.S. Virgin Islands. Caribbean Fishery Management Council, San Juan, Puerto Rico. 29 pp. + Appendices.

Caribbean Fishery Management Council (CFMC). 1994. Fishery management plan, final environmental impact statement, and regulatory impact review for corals and reef associated plants and invertebrates of Puerto Rico and the United States Virgin Islands. 107 pp. + Appendices.

Caribbean Fishery Management Council (CFMC). 1996. Regulatory amendment to the fishery management plan for the reef fish fishery of Puerto Rico and the United States Virgin Islands concerning red hind spawning aggregation closures including a regulatory impact review and an environmental assessment. Caribbean Fishery Management Council, San Juan, Puerto Rico. 27 pp. + Appendices.

Caribbean Fishery Management Council (CFMC). 1996. Fishery Management Plan, Regulatory Impact Review and Final Environmental Impact Statement for the Queen Conch Resources of Puerto Rico and the U. S. Virgin Islands. Obtained at: http://caribbeanfmc.com/SCANNED%20FMPS/qcpdfs/qconch%20plan.htm

Caribbean Fishery Management Council (CFMC). 1998. Essential fish habitat (EFH) generic amendment to the fishery management plans (FMPs) of the U.S. Caribbean including a draft environmental assessment. Caribbean Fishery Management Council, San Juan, Puerto Rico. 169 pp + Appendices.

Caribbean Fishery Management Council (CFMC). 1999. Amendment number 1 to the fishery management plan for corals and reef associated plants and invertebrates of Puerto Rico and the United States Virgin Islands for establishing a marine conservation district, including regulatory impact review and initial regulatory flexibility analysis and a final supplemental environmental impact statement. Caribbean Fishery Management Council, San Juan, Puerto Rico. 47 pp. + Appendices.

Caribbean Fishery Management Council (CFMC). 2001. Draft amendment 2 to the fishery management plan, queen conch resources of Puerto Rico and the United States Virgin Islands including a regulatory impact review and initial regulatory flexibility analysis and draft supplemental environmental impact statement. Caribbean Fishery Management Council, San Juan, Puerto Rico. 35 pp. + Appendices.

Caribbean Fishery Management Council (CFMC). 2004. Final environmental impact statement for the generic essential fish habitat amendment to: Spiny lobster fishery management plan (FMP), queen conch FMP, reef fish FMP, and coral FMP for the U.S. Caribbean, Vol. I and II. Caribbean Fishery Management Council, San Juan, Puerto Rico.

Caribbean Fishery Management Council (CFMC). 2005. Comprehensive amendment to the fishery management plans (FMPs) of the U.S. Caribbean to address required provisions of the Magnuson-Stevens Fishery Conservation and Management Act: Amendment 2 to the FMP for the spiny lobster fishery of Puerto Rico and the U.S. Virgin Islands; Amendment 1 to the FMP for queen conch resources of Puerto Rico and the U.S. Virgin Islands; Amendment 3 to the FMP for the reef fish fishery of Puerto Rico and the U.S. Virgin Islands; Amendment 2 to the FMP for the corals and reef associated

invertebrates of Puerto Rico and the U.S. Virgin Islands. Caribbean Fishery Management Council, San Juan, Puerto Rico. 533 pp. + Appendices. Obtained online at: http://www.caribbeanfmc.com/SCANNED%20FMPS/06%20FINAL%20SFA%20-%20MAY%2003,2005/SFA-FMP.htm

Caribbean Fishery Management Council (CFMC). 2008. Final Amendment 4 to the fishery management plan for the spiny lobster fishery of Puerto Rico and the U.S. Virgin Islands and Amendment 8 to the fishery management plan for the spiny lobster fishery of the Gulf of Mexico and South Atlantic. Caribbean Fishery Management Council, San Juan, Puerto Rico. 155 pp. + Appendices

Caribbean Fishery Management Council (CFMC). 2010. Regulatory amendment to the fishery management plan for the reef fish fishery of Puerto Rico and the U.S. Virgin Islands modifying the Bajo de Sico seasonal closure including a regulatory impact review and an environmental assessment. Caribbean Fishery Management Council, San Juan, Puerto Rico. 198 pp. + Appendices.

Caribbean Fishery Management Council (CFMC). 2011. Regulatory amendment to the fishery management plan for queen conch resources of Puerto Rico and the U.S. Virgin Islands establishing compatible closures including a regulatory impact review and an environmental assessment. Caribbean Fishery Management Council, San Juan, Puerto Rico. 61 pp.

Caribbean Fishery Management Council (CFMC). Nassau Grouper Initiative. Caribbean Fishery Management Council, San Juan, Puerto Rico. Obtained online at: http://www.caribbeanfmc.com/NASSAU%20GROUPER/NASSAU%20GROUPER.htm

Caribbean Fishery Management Council (CFMC). International Queen Conch Initiative. Caribbean Fishery Management Council, San Juan, Puerto Rico. Obtained online at: http://www.strombusgigas.com/

Caribbean Fishery Management Council CARICOM Fisheries Resource Assessment and Management Program (CFMC CFRAMP). 1999. Report on the queen conch stock assessment and management workshop, Belize City, Belize.

Caribbean Update. September 1, 2007. Obtained online at: www.caribbeanupdate.org.

Carpenter, R.C. 1990. Mass mortality of *Diadema antillarum*. II. Effects on population densities and grazing intensity of parrotfishes and surgeonfishes. Mar. Biol. 104: 79-86.

Center for Integrative Environmental Research. 2007. The U.S. economic impacts of climate change and the costs of inaction.

Cervigón, F., R. Cipriani, W. Fischer, L. Garibaldi, M. Hendrickx, A.J. Lemus, R. Márquez, J.M. Poutiers, G. Robaina and B. Rodriguez. 1992. Fichas FAO de identificación de especie para los fines de la pesca. Guia de campo de las especies comerciales marina y de aguas salobres de la costa septentrional de Sur América. Rome,

Italy: FAO. Preparado con el financiamiento de la Comisión de Comunidad Europeas y de NORAD.

Chakalall, B., R. Mahon and P. McConney. 1998. Current issues in fisheries governance in the Caribbean Community (CARICOM). Mar. Policy 22: 29-44.

Children's Defense Fund. 2010. The state of America's children. Obtained online at: http://www.childrensdefense.org/child-research-data-publications/data/state-of-americas-children.pdf

CIA. 2009. CIA-The world factbook. Obtained online at: www.cia.gov/library/publications/the-world-factbook/geos/rq,html.

Clay, P.M, S. Steinbeck and K. Wallmo. 2007. Assessing subsistence on a recreational scale: Results from a Marine Recreational Fisheries Statistics Add-on Survey for the Northeast U.S. NEED COMPLETE REFERENCE

Colin, P.I. 1978. Caribbean Reef Invertebrates and Plants. T.F.H. Publications, Inc., Ltd., Hong Kong. 512 pp.

Collazo, J. and Calderón, J.A. 1987/88. Status of fisheries in Puerto Rico 1979-1982. Corporation for the Development & Administration of the Marine, Lacustrine & Fluvial Resources of Puerto Rico, Fishery Research Laboratory, San Juan. Obtained online at: www.sefsc.noaa.gov/sedar/download/S14RD45%20PR%20stats%201979-82.pdf?id=DOCUMENT

Colón-Warren, A.E. and I. Alegría-Ortega. 1998. Shattering the illusion of development: The changing status of women and challenges for the feminist movement in Puerto Rico. Feminist Review 59: 101-117.

Connell, J.H. 1978. Diversity in tropical rain forests and coral reefs. Science 199: 1302-1310.

Corredor, J.E., J.M. Morell, J.M. Lopez, J.E. Capella and R.A. Armstrong. 2004. Cyclonic eddy entrains Orinoco River plume in eastern Caribbean. EOS 85: 197-208.

Council of Environmental Quality (CEQ). 1986. Regulations for implementing the procedural provisions of the National Environmental Policy Act. Executive Office of the President, 40 CFR Parts 1500-1508, July 1 reprint.

Council of Environmental Quality (CEQ). 1997. Considering cumulative effects under the National Environmental Policy Act. Executive Office of the President, Washington, D.C.

Cummings, N.J. and D. Matos-Caraballo. 2003. Summary information on commercial fishing operations in Puerto Rico from 1969 – 2001 and reporting rates needed to adjust commercial landings. Sustainable Fisheries Division Contribution No. SFD 2003-0022

and Caribbean Deepwater SEDAR Data Workshop Report 4 SEDAR Doc-4. Obtained online at: www.sefsc.noaa.gov/sedar/download/SEDAR4-DW-04.pdf?id=DOCUMENT

Cowen R.K., K.M.M. Lwiza, S. Sponaugle, C.B. Paris, and D.B. Olson. 2000. Connectivity of marine populations: Open or closed? Science 287:857–859.

Dammann, A.E. 1969. Study of the fisheries potential of the Virgin Islands. Spec. Report, Contribution No. 1, Virgin Islands Ecological Research Station.

Dammann, A., J. Yntema, W. Brownell, R. Brody and A. Spanidorf. 1970. Exploratory fishing for a source of non-ciguatoxic sport and food fish. Carib. Res. Inst. Special Publications No. 2. 49 pp.

Dennis, G.D., Y. Sadovy and D. Matos-Caraballo. 1996. Seasonal and annual trends in commercial fisheries landings from Puerto Rico. Proc. Gulf Carib. Fish. Inst. 44: 690-705.

Department of Health, Government of the United States Virgin Islands. 2003. Healthy Virgin Islands 2010: Improving health for all.

Dietz, J.L. 1986. Economic History of Puerto Rico: Institutional Change and Capitalist Development. Princeton University Press, Princeton, NJ.

Dietz, J.L. 2003. Puerto Rico: Negotiating Development and Change. Lynne Rienner Publishers, Inc., Boulder, CO.

Ditton, R.B. and D.J. Clark. 1994. Characteristics, attitudes, catch and release behavior, and expenditures of billfish tournament anglers in Puerto Rico. TAMU-WFSC-HD-94-01, Department of Wildlife and Fisheries Science, Texas A&M University, College Station, Texas.

Duany, J. 2000. Neither black or white: The politics of race and ethnicity among Puerto Ricans in the island and in the U.S. mainland. Revised version of a paper presented at the conference on “The Meaning of Race and Blackness in the Americas: Contemporary Perspectives”, Brown University, Providence, Rhode Island, February 10-12, 2000.

Eastern Caribbean Center. 2002. Telephone survey of boat-based marine recreational fishing in the U.S. Virgin Islands, 2000. Report submitted to the Department of Planning and Natural Resources, Division of Fish and Wildlife, U.S. Virgin Islands.

Erdman, D.S. 1976. Spawning patterns of fishes from the northeastern Caribbean. Contrib. Agric. Pesq., Dep. Agric. Commonwealth of Puerto Rico 8: 1-37.

Feigenbaum, D.A. Friedlander and M. Bushing. 1989. Determination of the feasibility of fish attracting devices for enhancing fisheries in Puerto Rico. Bull. Mar. Sci. 44: 950-959.

Fernández, N.A., J.C. Burgos, C.F. Asenjo and I. Rosa. 1971. Nutritional status of the Puerto Rican population: master sample survey. The American Journal of Clinical Nutrition 24: 952-959.

Ferreira, B.P. and M.B. Peres. 2008. *Epinephelus flavolimbatus*. In: IUCN 2009. IUCN red list of threatened species. Version 2009.2. Obtained online at: <www.iucnredlist.org>.

Figuerola Fernández, M. and W. Torres Ruiz. 1997. Madurez y estacionalidad reproductiva de cuatro especies de peces de Arrecife de importancia comercial en Puerto Rico. Informe Final Laboratorio de Investigaciones Pesqueras, Puerto Rico Departamento de Recursos Naturales y Ambientales.

Fisher, J.A. 2007. Governing human subjects research in the USA: Individualized ethics and structural inequalities. Science and Public Policy 34(2): 117-126.

Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute (FWC FWRI). 2006. Queen conch: Florida's spectacular sea snail. Sea Stats May 2006. 4 pp.

Froese, R. and D. Pauly. 2002. FishBase. Obtained online at: http://www.fishbase.org.

Garcia-Moliner, G., I. Mateo, S. Maidment-Caseau, W. J. Tobias and B. Kojis. 2000. Recreational chartered fishing activity in the U.S. Caribbean. Proc. Gulf. Carib. Fish. Inst. 53: 307-317.

García-Moliner, G., W.R. Keithly, Jr. and I.N. Oliveras. 2001. Recreational SCUBA diving activity in the U.S. Caribbean. Proc. Gulf. Carib. Fish. Inst. 52: 363-371.

García Colón, I. 2002. Hegemony, land reform, and social space in Puerto Rico: Parcelas, a land distribution program for landless workers, 1940s-1960s. Ph.D. Dissertation, University of Connecticut.

García-Quijano, C.G. 2009. Managing complexity: Ecological knowledge and success in Puerto Rican small-scale fisheries. Human Organization 68: 1-17.

García-Sais, J.R., R.L. Castro-Gomez, J. Sabater-Clavell, R. Esteves, S. Williams and M. Carlo. 2010. Mesophotic benthic habitats and associated marine communities at Abrir La Sierra, Puerto Rico. Draft Final Report NOAA Grant FNA07NMF4410117. 115 pp.

Garrison H.,V., C.S. Rogers, J. Beets and A.M. Friedlander. 2004. The habitats exploited and the species trapped in a Caribbean island trap fishery. Environmental Biology of Fishes 71: 247-260.

Gibson, C. and K. Jung. 2002. Historical census statistics on population totals by race 1790 to 1990, and by Hispanic origin, 1970 to 1990, for the United States, Regions, Divisions and States. Population Division, U.S. Census Bureau, Washington, DC.

Working Paper Series No. 56. Obtained online on July 15, 2010, at: http://www.census.gov/population/www/documentation/twps0056/twps0056.html

Glazer, R.A. and C.J. Berg, Jr. 1992. Growth and mortality of the queen conch, *Strombus gigas*, in Florida. Proc. Gulf. Carib. Fish Inst. 42: 153-157.

Goenaga, C., and R. H. Boulon. 1991. The state of Puerto Rican and U.S. Virgin Island corals: an aid to managers. Special Report of the Caribbean Fishery Management Council. 64 pp.

Gordon, S. 2002. United States Virgin Islands queen conch stock assessment. Final report to Southeast Area Monitoring and Assessment Program-Caribbean. Obtained online at: http://bcrc.bio.umass.edu/vifishandwildlife/Fisheries/FisheriesReports/2002/SEAMAP_Conch2002.pdf

Griffith, D. and M. Valdés Pizzini. 2002. Fishers at Work, Workers at Sea. A Puerto Rican Journey through Labor and Refuge. Temple University Press, Philadelphia, PA.

Griffith, D., M. Valdés Pizzini and J.C. Johnson. 1992. Injury and therapy: Proletarianization in Puerto Rico's fisheries. American Ethnologist 19: 53-74.

Griffith, D., M. Valdés Pizzini and C. García Quijano. 2007. Entangled communities: Socioeconomic profiles of fishers, their communities, and their responses to marine protective measures in Puerto Rico (Volume 1: Overview). In: J.J. Agar and B. Stoffle (Eds.), NOAA series on U.S. Caribbean fishing communities. NOAA Technical Memorandum NMFS-SEFSC-556, 524 pp.

Gutierrez Sanchez, J., M. Valdés Pizzini and B. McCay. 1986. La pesca artisanal y las asociaciones de pescadores en Puerto Rico. University of Puerto Rico Sea Grant College Report, Mayaguez, Puerto Rico.

Halstead, B.W. 1970. Results of a field survey on fish poisoning in the Virgin and Leeward islands during 7-18th January 1970. UNDP/FAO Caribbean Fisheries Development Project, Barbados.

[The] Heinz Center. 2000. Improving federal fisheries management in the Caribbean region: A summary of views presented during the Caribbean Regional Roundtable. The H. John Heinz III Center for Science, Economics, and the Environment. Obtained online at: http://www.heinzctr.org/publications/PDF/Caribbean.PDF.

Helmer, E.H. 2003. Forest conservation and land development in Puerto Rico. Landscape Ecology 19: 29-40.

Herman, D. 2009. The three roots of Manifest Destiny. National Museum of the American Indian 10(4): 22-25.

Hilborn, R. and R.M. Peterman. 1996. The development of scientific advice with incomplete information in the context of the precautionary approach. In: Precautionary approach to fisheries. Part 2: Scientific papers. FAO Fish. Tech. Pap. (350/2): 77–101.

Hinkey, M.L., N. Quinn and R. Strickland. 1994. A survey of marine recreational services in the U.S. Virgin Islands. Final Report submitted to the Eastern Caribbean Center, University of Virgin Islands, PRU-T-92-001. 47 pp.

Hollander, G.M. 2008. Raising Cane in the 'Glades: The Global Sugar Trade and the Transformation of Florida. University of Chicago Press, Chicago, IL.

Holt, M. and K.R. Uwate. 2004. Estimates of the number of licensed commercial fishers per year in the U.S. Virgin Islands,1974/75 to 2003/2004. Bureau of Fisheries, Division of Fish and Wildlife, Department of Planning and Natural Resources, U.S. Virgin Islands. Obtained online at: http://bcrc.bio.umass.edu/vifishandwildlife/Fisheries/FisheriesReports/2004/CommFisherLicenseQty1974to2003.pdf

Hubbard, D.K., J.L. Sadd and H.H. Roberts. 1981. The role of physical processes in controlling sediment transport patterns on the insular shelf of St. Croix, U.S. Virgin Islands. In: E.D. Gomez et al. (Eds.), The Reef and Man: Proceedings of the Fourth International Coral Reef Symposium, Volume 1, Manila, Phillippines, May 18-22, 1981, pp. 399-404.

Hughes, T.P. 1994. Catastrophes, phase-shifts, and large-scale degradation of a Caribbean coral reef. Science 265: 1547-1551.

Humann, P. 1994. Reef fish identification, 2nd Edition. New World Publications, Inc., Jacksonville, FL, 396 pp + index.

Impact Assessment, Inc. 2007. Community profiles and socioeconomic evaluations of marine conservation districts: St. Thomas and St. John, U.S. Virgin Islands. NOAA Series on U.S. Caribbean Fishing Communities. NOAA Technical Memorandum NMFS-SEFSC-557, 123 pp. Agar, J. J. and B. Stoffle (Eds.).

International Committee on Guidelines and Principles for Social Impact Assessment. 1994. Guidelines and Principles for Social Impact Assessment. U.S. Department of Commerce, NOAA, NMFS. Obtained online at: http://www.nmfs.noaa.gov/sfa/social_impact_guide.htm

Isern, M.R. 2007. The discourse of race as reflected in the press of St. Croix in the 1970s and 1980s. Ph.D. Dissertation, University of Puerto Rico.

Island Resources Foundation. 1977. Marine environments of the Virgin Islands. Technical Supplement No. 1. Prepared for Virgin Islands Planning Office, Coastal Zone Management Program, St. Thomas, U.S. Virgin Islands.

Island Resources Foundation. 2002. Resource description report. Prepared for Virgin Islands Department of Planning and Natural Resources Division of Coastal Zone Management. Obtained online at: http://www.irf.org/mission/planning/Resource_Desc.doc

Jennings, C.A. 1992. Survey of non-charter boat recreational fishing in the U.S. Virgin Islands. Bull.Mar. Sci. 50: 342-351.

Johnson, D.H. 2008. Power and politics in the management of U.S. fisheries: Fisheries bio-economics and fisheries science as social technologies and technologies of power. Masters Thesis, University of Manchester.

Johnson, J.C. and D. C. Griffith. 1995. Promoting sportfishing development in Puerto Rico: Travel agents' perceptions of the Caribbean. Human Organization 54(3): 295-303.

Johnston, B.R. 1987. The political ecology of development: Changing resource relations and the impacts of tourism in St. Thomas, United States Virgin Islands. Ph.D. Dissertation, University of Massachusetts.

Jompa, J. and L.J. McCook. 2002. The effects of nutrients and hervibory on competition between a hard coral (*Porites cylindrica*) and a brown alga (*Lobophora variegata*). Limnol. Oceanogr. 47: 527-534.

Kendall, M.S., M.E. Monaco, K.R. Buja, J.D. Christensen, C.R. Kruer, M. Finkbeiner and R.A. Warner. 2001. Methods used to map the benthic habitats of Puerto Rico and the U.S. Virgin Islands. Obtained online at: http://biogeo.nos.noaa.gov/projects/mapping/caribbean/startup.htm.

Kimmel, J.J. and R.S. Appeldoorn. 1992. A critical review of fisheries and fisheries management policy in Puerto Rico. Proc. Gulf Carib. Fish. Inst. 41: 349-360.

Kirkley, J.E., J.J. Agar, G. García-Moliner and J. Terry. 2008. U.S. Caribbean region assessment in national assessment of excess harvesting capacity in federally managed commercial fisheries. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-F/SPO-93, pp. 191-242.

Kjerfve, B. 1981. Tides of the Caribbean Sea. J. Geophys. Res. 86: 4243-4247.

Kojis, B. 2004. Census of the marine commercial fishers of the U.S. Virgin Islands. U.S. Virgin Islands, Department of Planning and Natural Resources (DPNR), St. Thomas.

Lapp, M. 1995. The rise and fall of Puerto Rico as a social laboratory, 1945-1965. Social Science History 19(2): 169-199.

Levy, T.A. 2007. The history of tobacco cultivation in Puerto Rico, 1899-1940. Ph.D. Dissertation, City University of New York.

LeGore, R. S., M.P. Hardin and D. Ter-Ghazaryan. 2005. Organization and operation of the marine ornamental fish and invertebrate export fishery in Puerto Rico. Rev. Biol. Trop. 53 (Suppl. 1): 145-153.

Lohr, L. 2007. Conch season closed until 2008 because of overfishing. St. Thomas Source, July 30, 2007. Obtained online at: http://stthomassource.com/content/news/local-news/2007/07/30/conch-season-closed-until-2008-because-overfishing

Lohr, L. 2009. Council seeks input on catch limits. St. Thomas Source, April 22, 2009.

Loveman, M. and J. Muniz. 2007. How Puerto Rico became white: Boundary dynamics and intercensus racial classification. American Sociological Review 72 (6): 915-939.

Macari, E.S. and L.R. Hoyos. 2005. Earthquake-induced liquefaction potential in western Puerto Rico using GIS technology. Geological Society of America Special Paper 2005, 385: 277-287.

Magnuson-Stevens Fishery Conservation and Management Act. 1990. H.R. 2061 Fishery Conservation Amendments of 1990. Obtained at: http://el.erdc.usace.army.mil/emrrp/emris/emrishelp5/magnuson_fishery_conservation_and_management_act_legal_matters_(1990).htm

Magnuson-Stevens Fishery Conservation and Management Act. 2007. +

Mateo, I. 1999. Annual report recreational fishery assessment project F-8-9 Job 7: Angler telephone household survey. Division of Fish and Wildlife, DPNR, Government of the U.S. Virgin Islands. 6 pp.

Mateo, I., R.S. Appeldoorn and W. Rolke. 1998. Spatial variation in stock abundance of queen conch, *Strombus gigas*, (Gastropoda: Strombidae) in the west and east coast of Puerto Rico. Proc. Gulf Carib. Fish. Inst. 50: 32-47.

Mateo, I., R. Gomez and K.R. Uwate. 2000. Activity and harvest patterns in the U.S. Virgin Islands recreational fisheries. Recreational Fisheries Assessment Project. F-8. USVI Division of Fish and Wildlife. St. Thomas.

Matos-Caraballo, D. 1996. Puerto Rico fishery census, 1995-1996. Department of Natural and Environmental Resources, Final Report to the National Marine Fisheries Service, NOAA. 21 pp.

Matos-Caraballo, D. 2001. Overview of Puerto Rico's small-scale fisheries statistics, 1998-2001. Proc. Gulf Carib. Fish. Inst. 52: 197-203.

Matos-Caraballo, D. 2004. Job 3. Comprehensive census of the marine fishery of Puerto Rico, 2002. Department of Natural and Environmental Resources, Final Report to the National Marine Fisheries Service, NOAA.

Matos-Carraballo. D. 2005. Final report: Bycatch study of Puerto Rico's marine commercial fisheries. SEDAR 14-RD05. Obtained online at: www.sefsc.noaa.gov/sedar/download/S14RD05%20PR%20Comm%20bycatch.pdf?id=DOCUMENT

Matos-Caraballo, D. 2007. Puerto Rico/NMFS Cooperative Fisheries Statistics Program April 2004-March 2007. NA04NMF4340063.

Matos-Caraballo, D. 2009. Comprehensive census of the marine fishery of Puerto Rico, 2008. Department of Natural and Environmental Resources Final Report to National Marine Fisheries Service, NOAA. 27 pp.

Matos-Caraballo, D. and J. Agar, Census of Active Fishermen in Puerto Rico (2008). *Marine Fisheries Review*. (In press).

Matos-Carraballo, D., M. Cartagena-Haddock and N. Peña-Alvarado. 2002. Comprehensive census of the marine commercial fishery of Puerto Rico 2002. Obtained online at: http://www.drna.gobierno.pr/oficinas/arn/recursosvivientes/negociado-de-pesca-y-vida-silvestre/laboratorio-de-investigaciones-pesqueras-1/publicaciones/Comprehensive%20census%20marine%20comm%20fish%20PR%202002-001.pdf

McCaffrey, K.T. 1999. Culture, power and struggle: Anti-military protest in Vieques, Puerto Rico. Ph.D. Dissertation, City University of New York.

McFadden, D. 2008. Venomous lionfish prowls fragile Caribbean waters. The Clarksdale Press Register, April 14, 2008.

Messineo, J. 2004. Compilation and summary of commercial catch report forms in the U.S. Virgin Islands, 1974/1975 to 2004/2005. Bureau of Fisheries, Division of Fish and Wildlife, Department of Planning and Natural Resources, U.S.Virgin Islands.

Miller, M.W., M.E. Hay, S.L. Miller, D. Malone, E.E. Sotka and A.M. Szmant. 1999. Effects of nutrient versus herbivores on reef algae: A new method for manipulating nutrients on coral reefs. Limnol. Oceanogr. 44: 1847-1861.

Morelock, J.N., J. Capella, J.R. Garcia and M. Barreto. 2001. Puerto Rico-seas at the millenium. Carribbean Journal of Science. Obtained online at: http://rmocfis.uprm.edu/~morelock/pdfdoc/morlok2.pdf

Mowbray, L.S. 1950. The commercial game industries of Bermuda. Proc. Gulf Carib. Fish. Inst., 2nd Ann. Sess., Nov. 1949. Univ. Miami Mar. Lab.: 27-30.

MRAG Americas. 2006. A pilot program to assess methods of collecting bycatch, discard, and biological data in the commercial fisheries of the US Caribbean. Final Report, Southeast Regional Office, National Marine Fisheries Service, Cooperative Research Program, Grant No. NA04NMF4540214. 47 pp. + Appendix.

Muller-Karger, F.E., C.R. McClain, T.R. Fisher, W.E. Esaias and R. Varela. 1989. Pigment distribution in the Caribbean Sea: Observations from space. Prog. Oceanogr. 23: 23-64.

Mumby, P.J. 2006. The impact of exploiting grazers (Scaridae) on the dynamics of Caribbean coral reefs. Ecol. Appl. 16: 747-769.

Mumby, P.J., C.P. Dahlgren, A.R. Harborne, C.V. Kappel, F. Micheli, D.R. Brumbaugh, K.E. Holmes, J.M. Mendes, K. Broad, J.N. Sanchirico, K. Buch, S. Box, R.W. Stoffle and A.B. Gill. 2006. Fishing, trophic cascades, and the process of grazing on coral reefs. Science 311: 98-101.

Mumby, P.J., A. Hastings and H.J. Edwards. 2007. Thresholds and the resilience of Caribbean reef corals. Nature 450: 98-101.

National Marine Fisheries Service (NMFS). 2002. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments-2002. NOAA Technical Memorandum NMFS-NE-169. 319 pp.

National Marine Fisheries Service (NMFS). 2006. Draft recovery plan for the fin whale (*Balaenoptera physalus*). National Marine Fisheries Service, Silver Spring, MD.

National Marine Fisheries Service (NMFS). 2008. 2007 status of U.S. Fisheries. Obtained online at: http://www.nmfs.noaa.gov/sfa/domes_fish/StatusoFisheries/2007/2007StatusofUSFisheries_Report_to_Congress.pdf

National Marine Fisheries Service (NMFS), Highly Migratory Species (HMS). 2009. Final scoping summary for Amendment 4 to the consolidated Atlantic highly migratory species fishery management plan. Obtained online at: www.nmfs.noaa.gov/sfa/hms/Amendment_4_Caribbean/01-15-09_A4_Scoping_Summary_Final.pdf

National Marine Fisheries Service (NMFS), Highly Migratory Species (HMS). 2010. Final Amendment 3 to the Consilidated Atlantic Highly Migratory Species Fishery Management Plan. Obtained online at: http://www.nmfs.noaa.gov/sfa/hms/FMP/AM3_FEIS/Total_A3_FEIS.pdf

National Marine Fisheries Service (NMFS), Office of Sience and Technology. Recreational Fishery Statistics Effort Time Series Query. Obtained online at:http://www.st.nmfs.noaa.gov/st1/recreational/queries/effort/effort_time_series.html

National Ocean Service (NOS). February 2009. Coral reef habitat assessment for U.S. marine protected areas: U.S. Virgin Islands. Obtained online at: http://coris.noaa.gov/activities/habitat_assessment/pdfs/usvi.pdf

Nelson, J.S. 1984. Fishes of the World, 2nd Edition. John Wiley and Sons, Inc. New York. 523 pp.

Nelson, J.S. 1994. Fishes of the World, 3rd Edition. John Wiley and Sons, Inc. New York. 600 pp.

NOAA Satellite & Information Service. 1999. Georges pummels Caribbean, Florida Keys and U.S. Gulf Coast. Storm review (April 12, 1999 update). Obtained online at: http://lwf.ncdc.noaa.gov/oa/reports/georges/georges.html

Office of Technology Assessment (OTA). 1987. Integrated renewable resource management for U.S. insular areas: Summary. Washington, D.C. Congress of the United States, Office of Technology Assessment.

Ojeda-Serrano, E. R. Appeldoorn and I. Ruiz-Valentin. 2007. Reef fish spawning aggregations of the Puerto Rico shelf. Caribbean Coral Reef Institute. Obtained online at: http://ccri.uprm.edu/researcher/Ojeda/Ojeda_Final_Report_CCRI_SPAG's.pdf

Olcott, P. G. 1999. Puerto Rico and the U.S. Virgin Islands. In: Ground Water Atlas of the United States, Alaska, Hawaii, Puerto Rico and the U. S. Virgin Islands. USGS Rep. HA 730-N. Obtained online at: http://www.fiu.edu/orgs/caribgeol/

Olsen, D.A., D.W. Nellis and R.S. Wood. 1984. Ciguatera in the eastern Caribbean. Mar. Fish. Rev. 46: 13-18.

Osborn, M.F. and A.B. Lowther. 2001. Re-initiation of the Marine Recreational Fishery Statistics Survey in the U.S. Caribbean in 2000. Proc. Gulf Carib. Fish. Inst. 53: 286-317.

Paine, R. T. 1969. The Pisaster–Tegula interaction: prey patches, predator food preference, and intertidal community structure. Ecology 50: 950–961.

Pérez, R. 2000. Fragments of memory: The State and small-scale fisheries modernization in southern Puerto Rico. Ph.D. Dissertation, University of Connecticut.

Pérez, R. 2005. The State and small-scale fisheries in Puerto Rico. University of Florida Press, Gainesville, FL.

Picó, R. 1974. The Geography of Puerto Rico. Aldine Publishing Company, Chicago, IL.

Picó, F. 2006. History of Puerto Rico: A Panorama of Its People. Markus Wiener Publishers, Princeton, N.J.

Puerto Rico Department of Natural and Environmental Resource. Fisheries Research Laboratory. 200-2004 Shallow-water Reef Fish Monitoring SEAMAP-Caribbean Fisheries Independent Monitoring. Obtained online at: (http://www.drna.gobierno.pr/oficinas/arn/recursosvivientes/negociado-de-pesca-y-vida-silvestre/laboratorio-de-investigaciones-pesqueras-1/publicaciones).

Puerto Rico Coastal Zone Management Program. 2007. Southern and Caribbean regional meeting, Lafayette, LA, November 5-8, 2007. Obtained online at: http://coastalmanagement.noaa.gov/news/archivedmtgdocs/2007SCRMarchives/PR_state_updatef.pdf

Puerto Rico Department of Natural and Environmental Resources (PRDNER). 2004. Job 3, Comprehensive census of the marine fishery of Puerto Rico, 2002. Final Report to National Marine Fisheries Service. Obtained online at: http://www.sefsc.noaa.gov/sedar/download/S14RD29%20PR%20Census.pdf?id=DOCUMENT

Puerto Rico Department of Natural and Environmental Resources (PRDNER). 2008a. Eventos de varamientos y mortandad desde 1999 hasta 2007, prepared by Milagros Justiniano, Mayagüez, Puerto Rico, 29 pp.

Puerto Rico Department of Natural and Environmental Resources (PRDNER). 2008b. Puerto Rico Marine Recreational Fisheries Statistics Program. Grant F-42.6 annual report for the period of January 1, 2006 to December 31, 2006.

Puerto Rico Industrial Development Company (PRIDCO). 2009. Biotechnology industry overview. Obtained online at: http://www.pridco.com/english/industry_groups/biotechnology/5.30ind_grps_bio_over.html

Quint, H.H. 1958. American socialists and the Spanish-American War. American Quarterly 10(2): 131-141.

Rakitin, A. & D.L. Kramer. 1996. The effect of a marine reserve on the distribution of coral reef fishes in Barbados. Mar. Ecol. Prog. Ser. 131: 97-113.

Randall, J.E. 1963. Additional recoveries of tagged reef fishes from the Virgin Islands. Proc. Gulf Carib. Fish. Inst. 15: 155-157.

Randall, J.E. 1964. Contributions to the biology of the queen conch *Strombus gigas*. Bull. Mar. Sci. Gulf. Carib. 14: 246-295.

Randall, J.E. 1967. Food habits of reef fishes of the West Indies. Stud. Trop. Oceanogr. 5: 1-847.

Randall, J.E. 1990. Scaridae. In: J.C. Quero, J.C. Hureau, C. Karrer, A. Post and L. Saldanha (Eds.), Check-list of the Fishes of the Eastern Tropical Atlantic (CLOFETA), Volume 2. JNICT, Lisbon, SEI, Paris, and UNESCO, Paris. Pp. 883-887.

Renken, R.A., W.C. Ward, I.P. Gill, F. Gómez-Gómez, J. Rodríguez-Martínez, and others. 2004. Geology and hydrogeology of the Caribbean islands aquifer system of the Commonwealth of Puerto Rico and the U.S. Virgin Islands. U.S. Geological Survey. Obtained online at: http://pubs.usgs.gov/pp/pp1414/pdf/PLATE2.pdf

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

Rielinger, D.M. 1999. Spawning aggregations in the Gulf of Mexico, South Atlantic and Caribbean: A source document for fisheries management. NEED COMPLETE REF

Rivera, J.A. 1999. Queen conch CPUE assessment in PR and USVIs: Preliminary report. Obtained online at: http://www.sefsc.noaa.gov/sedar/download/S14RD33%20QC%20CPUE%20Assessmt%2099.pdf?id=DOCUMENT

Rodríguez, C.E. 1989. Puerto Ricans Born in the U.S.A. Unwin Hyman, Boston MA.

Rodríguez-Ferrer, G., Y. Rodríguez-Ferrer and C. Lilyestrom. 2005. An overview of recreational fishing tournaments in Puerto Rico. Proc. Gulf. Carib. Fish. Inst. 56: 611-620.

Rodríguez-Pérez, R. 2005. Economic restructuring and the making of a mass of deracinated workers: A community in Mayagüez, Puerto Rico. Ph.D. Dissertation, SUNY Binghampton.

Rosario, A. 1993. Shallow-water reef fish monitoring, Caribbean/NMFS Cooperative SEAMAP Program. Annual Report April 1, 1992-March 31, 1993. Fisheries Research Laboratory, Puerto Rico Department of Natural Resources. 73 pp.

Rosario, A. 1995. Queen conch stratification survey. SEAMAP-C Report to CFMC.

Rothenberger, P., J. Blondeau, C. Cox, S. Curtis, W.S. Fisher, V. Garrison, Z. Hillis-Starr, C.F.G. Jeffrey, E. Kadison, I. Lundgren, W.J. Miller, E. Muller, R. Nemeth, S. Paterson, C. Rogers, T. Smith, A. Spitzack, M. Taylor, W. Toller, J. Wright, D. Wusinich-Mendez and J. Waddell. 2008. The state of coral reef ecosystems of the U.S. Virgin Islands. In: J. Waddell and A.M. Clarke (Eds.), The state of coral reef ecosystems of the United States

and Pacific Associated States, 2008. NOAA Technical Memorandum NOS NCCOS 73. NOAA/NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team. Silver Spring, MD.

Ruiz-Marrero, C. June 23, 2009. Puerto Rico: Biotech Island. Counterpunch.org.

Ruiz-Marrero, C. July 13, 2004. Puerto Rico's biotech harvest. Alternet.org. Obtained online at: www.grain.org/research/contamination.cfm?id=141#

Sadovy, Y. 1991. A preliminary assessment of the export trade in marine aquarium organisms in Puerto Rico. Report submitted to the Caribbean Fishery Management Council, Fisheries Research Laboratory, Mayagüez, Puerto Rico. 43 pp.

Sandt, V.J. and A.W. Stoner. 1993. Ontogenetic shift in habitat by early juvenile conch *Strombus gigas*: patterns and potential mechanism. Fish. Bull. 91: 516-525.

Schneider, F. 2004. The size of the shadow economies of 145 countries all over the world: First results over the period 1999 to 2003. Forschungsinstitut zur Zukunft der Arbeit Institute for the Study of Labor, Discussion Paper Series, IZA DP No. 1431.

Sefton, N. and S.K. Webster. 1986. Field Guide to Caribbean Reef Invertebrates. Sea Challenges, California. 116 pp.

Sen, A. 1993. Hunger and public action. In: A. Sen adn J. Drèze (Eds.), The Amartya Sen and Jean Drèze Omnibus 1999. Oxford University Press, New Dehli.

Sen, A. 1989. Food and freedom. World Development 17(6): 769-781.

Sen, A. 1981. Poverty and famines, an essay on entitlement and deprivation. Oxford University Press, Oxford, UK.

Sjöö, G.L. and E. Mörk. 2008. Anthropogenic influence on macroalgal nutrient dynamics-implications for potential bottom-up effects on secondary production in the western Indian Ocean. Presentation at the 8th International Coral Reef Symposium, July 2008.

Smith, C.L. 1959. Hermaphroditism in some serranid fishes from Bermuda. Pap. Mich. Acad. Sci., Arts. Lett. 44: 111-118.

Smith, J.E. 2008. Nutrients and herbivores: What do we know about their relative importance on coral reefs? Presentation at the 8th International Coral Reef Symposium, July 2008.

South Atlantic Fishery Management Council (SAFMC). 1999. Stock assessment and fishery evaluation report fo rthe snapper grouper fishery of the South Atlantic. NEED COMPLETE REFERENCE

SEDAR 08A. 2005. Caribbean Spiny Lobster & Yellowtail Snapper. Obtained online at: http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=08%20A

SEDAR 14. 2007. Caribbean Yellowfin Grouper, Mutton Snapper, Queen Conch. Obtained online at: http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=14

SEDAR 2009. Caribbean fisheries data evaluation: SEDAR procedures workshop 3. San Juan, Puerto Rico, January 26-29, 2010. 183 pp. + References. Available online at: http://www.sefsc.noaa.gov/sedar/download/CaribData_Final.pdf?id=DOCUMENT

St. Thomas Fishermen's Association (STFA). 2008. Study of by-catch from fishing operations. Final report, Marine Fisheries Initiative (MARFIN), NOAA Award Number NA06NMF4330052.

Steneck, R.S. 1986. The ecology of coralline algal crusts: Convergent patterns and adaptive strategies. Ann. Rev. Ecol. Syst. 7: 273-303.

Steneck, R.S. 1997. Crustose corallines, other algal functional groups, herbivores and sediments: Complex interactions along reef productivity gradients. Proc. 8th Int. Coral Reef Sym. 1: 695-700.

Stoffle, B., J.R. Waters, S. Abbott-Jamieson, S. Kelley, D. Grasso, J. Freibaum, S. Koestner, N. O'Meara, S. Davis, M. Stekedee and J. Agar. 2009. Can an island be a fishing community: An examination of St. Croix and its fisheries. NOAA Technical Memorandum NMFS-SEFSC-593, 57pp.

Stoner, A.W. 1997. The status of queen conch, *Strombus gigas:* Research in the Caribbean. Mar. Fish. Rev. 59:14-22.

Stoner, A.W. and J.M. Waite. 1990. Distribution and behavior of queen conch *Strombus gigas* relative to seagrass standing crop. Fish. Bull. US 88: 573-585.

Stoner, A.W. and M. Ray-Culp. 2000. Evidence for Allee effect in an over-harvested marine gastropod: density-dependent and egg production. Mar. Ecol. Prog. Ser. 202: 297-302.

Struble, M.B. and L.L. Aomari. 2003. Position of the American Dietetic Association: Addressing world hunger, malnutrition, and food insecurity. Journal of American Dietetic Association 103(8): 1046-57.

Suárez-Caabro, J.R. 1975. Puerto Rico's fishery statistics 1968-1969. Puerto Rico Department of Agriculture, Cabo Rojo, Puerto Rico.

Swartz, S.L., J. Stamates, C. Burks and A.A. Mignucci-Giannoni. 2001. Acoustic and visual survey of cetaceans in the waters of Puerto Rico and the Virgin Islands: February-March 2001. NOAA Technical Memorandum NMFS-SEFSC-463, 62 pp.

Swearer, S.E., J.E. Caselle, D.W. Lea and R.R. Warner. 1999. Larval retention and recruitment in an island population of a coral-reef fish. Letters to Nature. Nature, Vol 402, 16 December 1999. www.nature.com

Taylor, J.B. 2000. Caribbean drug trafficking and the western hemisphere. Colegio Interamericano de Defense, Washington DC. Obtained online at: http://library.jid.org/en/mono39/taylor.htm

Terry, J., J. Walden and J. Kirkley. 2008. National assessment of excess harvesting capacity in federally managed commercial fisheries. NOAA Technical Memorandum NMFS-F/SPO-93, 368 pp.

Tobias, W. and K. Dupigny. 2009. Survey of the U.S. Virgin Islands recreational fishing boats that target billfish and other pelagic species. Final report (Grant No. Billfish-2005-16) submitted to the GSMFC. 73 pp. + Appendices.

Toller, W., C. O'Sullivan and R. Gomez. 2005. Survey of fishing tournaments in the U.S. Virgin Islands, October 1, 2000 to September 30, 2005. Obtained online at: http://bcrc.bio.umass/edu/vifishandwildlife/Fisheries/FisheriesReport/2005/F8TournamentSurvey.pdf

Toller, W. and W. Tobias. 2005. Management implications for restrictions on the use of gill and trammel nets in St. Croix, U.S. Virgin Islands. Proceedings of the 58th Gulf and Caribbean Fisheries Institute, 518 pp. Obtained online at: http://www.vifishandwildlife.com/Fisheries/Fisheries Reports/2004/

Toro Tulla, H.J. 2007. Economic development and labor market inequality in Puerto Rico. Ph.D. Dissertation, University of California, Berkeley, CA.

Trumble, R.J., D. Olsen and N. Cummings. 2006. A pilot program to assess methods of collecting bycatch, discard, and biological data in the commercial fisheries of St. Thomas, U.S. Caribbean. Cooperative research report, Grant #NA05NMF4540042, 63 pp. + Appendices.

U.S. Bureau of Economic Research. 2010. U.S. Virgin Islands Economic Review March 2010.

U.S. Census Bureau. 2000. Census 2000. Obtained online at http://www.census.gov/main/www/cen2000.html

U.S. Department of Commerce, Bureau of Fisheries. 1933. Report of the United States Commissioner of Fisheries for the fiscal year 1923 with appendices. U.S. Government Printing Office, Washington DC.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 2007. Magnuson-Stevens Fishery Conservation and Management Act. Second Printing. Obtained online at: http://www.nmfs.noaa.gov/msa2005/docs/MSA_amended_msa%20_20070112_FINAL.pdf

U.S. Environmental Protection Agency (EPA). 2000. Guidance for assessing chemical contaminant data for use in fish advisories. Volume 2 Risk assessment and fish consumption limits. Third Edition. Obtained online at: http://www.epa.gov/waterscience/fish/advice/volume2/v2cover.pdf

U.S. Government Accountability Office (GAO). 2006. Puerto Rico. Fiscal relation with the federal government and economic trends during the phaseout of the possessions tax credit. Washington, DC. Obtained online at: http://www.gao.gov/new.items/d06541.pdf

University of the Virgin Islands Center for Marine and Environmental Studies. 2008. Waves of Change: A Resource for Environmental Issues in the United States Virgin Islands. Obtained online at http://epscor.uvi.edu/docs/uvi_vimas_waves_of_change.pdf.

Valdés-Pizzini, M. A. Acosta, D.C. Griffith and M. Ruiz_Perez. 1992. Assessment of the socioeconomic impact of fishery management options upon gill net and trammel net fishermen in Puerto Rico: An interdisciplinary approach (Anthropology and Fisheries Biology) for the evaluation of management alternatives. Final Report for NOAA/NMFS (Saltonstall Kennedy Program) Grant Number NA17FL0100-01.

Valdés-Pizzini, M., J. J. Agar, K. Kitner, C. García-Quijano, M. Tust and F. Forrestal. 2010. Cruzan fisheries: A rapid assessment of the historical, social, cultural and economic processes that shaped coastal communities' dependence and engagement in fishing in the island of St. Croix, U.S. Virgin Islands. NOAA Series on U.S. Caribbean Fishing Communities. NOAA Technical Memorandum NMFS-SEFSC-597, 144 pp.

Valle-Esquivel, M. 2002. U.S. Caribbean queen conch (*Strombus gigas*) data update with emphasis on the commercial landings statistics. Sustainable Fisheries Division Contribution SFD-01/02-169.

Valle-Esquivel, M. 2003. Aspects of the population dynamics, stock assessment, and fishery management strategies of the queen conch, *Strombus gigas*, in the Caribbean. Ph.D. Dissertation, University of Miami.

Victora, C.G., L. Adair, C. Fall, P.C. Hallal, R. Martorell, L. Richter and H. Singh Sachdev. 2008. Maternal and child undernutrition: Consequences for adult health and human capital. The Lancet 371: 340–357.

Virgin Islands Daily News. April 8, 2009. St. Croix conch season to close early, DPNR says. Obtained online at: www.virginislandsdailynews.com/index.pl/article?id=17634780

Volety, A.K., M. Savarese, S.G. Tolley, W.S. Arnold, P. Sime, P. Goodman, R.H. Chamberlain and P.H. Doering. 2009. Eastern oysters (*Crassostrea virginica*) as an indicator for restoration of Everglades ecosystems. Ecol. Indic. 9 Suppl. 1: 120-136.

Waritan, M. and P. Fong. 2008. Environmental stress changes the relative importance of top-down (herbivorous fishes) and bottom-up (nutrients) forces regulating community structure and resilience of coral reefs. Presentation at the 8th International Coral Reef Symposium, July 2008.

Weiler, D. and J.A. Suárez-Caabro. 1986. Overview of Puerto Rico's small-scale fisheries statistics. CODREMAR Technical Report, Number 1, Volume 1. Obtained online at: http://www.sefsc.noaa.gov/sedar/download/S14RD41%20PR%20small%20Scale%201972-78.pdf?id=DOCUMENT

Wilkinson, C. and D. Souter. 2008. Status of Caribbean coral reefs after bleaching and hurricanes in 2005. Global Coral Reef Monitoring Network, and Reef and Rainforest Research Center, Townsville, Australia, 152 pp.

World Food Programme. 2009. World hunger series: Hunger and markets. Earthscan, Sterling, VA.

World Resources Institute. 2006. Earth trends: The environmental information portal, agriculture and food, country profile for Puerto Rico. Obtained online at: http://earthtrends.wri.org/text/agriculture-food/country-profile-148.html

10. APPENDICES

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APPENDIX 8 – Other Things to Consider

APPENDIX 1 - Alternatives Considered by the Council and NOAA Fisheries but Eliminated

This section describes alternatives to the proposed actions that the Caribbean Fishery Management Council (Council) and NOAA Fisheries considered in developing this document, but decided not to pursue. The description of each alternative is followed by a summary statement of why it was eliminated from more detailed summary. This section will be completed after the Council meeting June 28-29, 2011. At this meeting, the Council will decide what actions and alternatives they will consider and should go out for public comments.

APPENDIX 2 – Species in the Reef Fish, Queen Conch, Spiny Lobster and Coral and Reef Associated Plants and Invertebrates FMU

Haemulidae--Grunts
White grunt, *Haemulon plumieri*
Margate, *Haemulon album*
Tomtate, *Haemulon aurolineatum*
Bluestriped grunt, *Haemulon sciurus*
French grunt, *Haemulon flavolineatum*
Porkfish, *Anisotremus virginicus*
Mullidae--Goatfishes
Spotted goatfish, *Pseudupeneus maculatus*
Yellow goatfish, *Mulloidichthys martinicus*
Sparidae--Porgies
Jolthead porgy, *Calamus bajonado*
Sea bream, *Archosargus rhomboidalis*
Sheepshead porgy, *Calamus penna*
Pluma, *Calamus pennatula*
Holocentridae--Squirrelfishes
Blackbar soldierfish, *Myripristis jacobus*
Bigeye, *Priacanthus arenatus*
Longspine squirrelfish, *Holocentrus rufus*
Squirrelfish, *Holocentrus adscensionis*
Malacanthidae--Tilefishes
Blackline tilefish, *Caulolatilus cyanops*
Sand tilefish, *Malacanthus plumieri*
Carangidae--Jacks
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*
Acanthuridae--Surgeonfishes
Blue tang, *Acanthurus coeruleus*
Ocean surgeonfish, *Acanthurus bahianus*
Doctorfish, *Acanthurus chirurgus*
Balistidae–-Triggerfishes
Ocean triggerfish, *Canthidermis sufflamen*
Queen triggerfish, *Balistes vetula*
Sargassum triggerfish, *Xanthichthys rigens*
Monacanthidae–-Filefishes
Scrawled filefish, *Aluterus scriptus*
Whitespotted filefish, *Cantherhines macrocerus*
Black durgon, *Melichthys niger*

Ostraciidae--Boxfishes
Honeycomb cowfish, *Lactophrys polygonia*
Scrawled cowfish, *Lactophrys quadricornis*
Trunkfish, *Lactophrys trigonus*
Spotted trunkfish, *Lactophrys bicaudalis*
Smooth trunkfish, *Lactophrys triqueter*
Labridae--Wrasses
Hogfish, *Lachnolaimus maximus*
Puddingwife, *Halichoeres radiatus*
Spanish hogfish, *Bodianus rufus*
Pomacanthidae--Angelfishes
Queen angelfish, *Holacanthus ciliaris*
Gray angelfish, *Pomacanthus arcuatus*
French angelfish, *Pomacanthus paru*
Aquarium Trade-data collection only
Frogfish, *Antennarius* spp.
Flamefish, *Apogon maculatus*
Conchfish, *Astrapogen stellatus*
Redlip blenny, *Ophioblennius atlanticus*
Peacock flounder, *Bothus lunatus*
Longsnout butterflyfish, *Chaetodon aculeatus*
Foureye butterflyfish, *Chaetodon capistratus*
Spotfin butterflyfish, *Chaetodon ocellatus*
Banded butterflyfish, *Chaetodon striatus*
Redspotted hawkfish, *Amblycirrhitus pinos*
Flying gurnard, *Dactylopterus volitans*
Atlantic spadefish, *Chaetodipterus faber*
Neon goby, *Gobiosoma oceanops*
Rusty goby, *Priolepis hipoliti*
Royal gramma, *Gramma loreto*
Creole wrasse, *Clepticus parrae*
Yellowcheek wrasse, *Halichoeres cyanocephalus*
Yellowhead wrasse, *Halichoeres garnoti*
Clown wrasse, *Halichoeres maculipinna*
Pearly razorfish, *Hemipteronotus novacula*
Green razorfish, *Hemipteronotus splendens*
Bluehead wrasse, *Thalassoma bifasciatum*
Chain moray, *Echidna catenata*
Green moray, *Gymnothorax funebris*
Goldentail moray, *Gymnothorax miliaris*
Trumpetfish, *Aulostomus maculatus*
Cardinal soldierfish, *Plectrypops retrospinus*
Batfish, *Ogcocephalus* spp.
Goldspotted eel, *Myrichthys ocellatus*
Yellowhead jawfish, *Opistognathus aurifrons*
Dusky jawfish, *Opistognathus whitehursti*

Cherubfish, *Centropyge argi*
Rock beauty, *Holacanthus tricolor*
Sargeant major, *Abudefduf saxatilis*
Blue chromis, *Chromis cyanea*
Sunshinefish, *Chromis insolata*
Yellowtail damselfish, *Microspathodon chrysurus*
Dusky damselfish, *Pomacentrus fuscus*
Beaugregory, *Pomacentrus leucostictus*
Bicolor damselfish, *Pomacentrus partitus*
Threespot damselfish, *Pomacentrus planifrons*
Glasseye snapper, *Priacanthus cruentatus*
High-hat, *Equetus acuminatus*
Jackknife-fish, *Equetus lanceolatus*
Spotted drum, *Equetus punctatus*
Scorpaenidae-scorpionfishes
Butter hamlet, *Hypoplectrus unicolor*
Swissguard basslet, *Liopropoma rubre*
Great soapfish, *Rypticus saponaceus*
Orangeback bass, *Serranus annularis*
Lantern bass, *Serranus baldwini*
Tobaccofish, *Serranus tabacarius*
Harlequin bass, *Serranus tigrinus*
Chalk bass, *Serranus tortugarum*
Caribbean tonguefish, *Symphurus arawak*
Seahorses, *Hippocampus* spp.
Pipefishes, *Syngnathus* spp.
Sand diver, *Synodus intermedius*
Sharpnose puffer, *Canthigaster rostrata*
Porcupinefish, *Diodon hystrix*
Strombidae-Conchs
Queen conch, *Strombus gigas*
Milk conch, *Strombus costatus*
West Indian Fighting Conch, *S. pugilis*
Roostertail Conch, *S. gallus*
Hawkwing Conch, *S. raninus*
Fasciolariidaea-Tulips
True Tulip, *Fasciolaria tulipa*
Cymatiidae-Trumpets
Atlantic Triton's Trumpet *Charonia variegata*
Carridae-Helmets
Cameo Helmet, *Cassis madagascarensis*
Trochidae-Shells
Green Start Shell, *Astrea tuber*

APPENDIX 3 – Scoping Hearings Summaries

CARIBBEAN FISHERY MANAGEMENT COUNCIL
268 MUÑOZ RIVERA AVE. SUITE 1108
SAN JUAN, P. R. 00918-1920

ACLs 2011 SCOPING MEETING
DOUBLE TREE HILTON HOTEL
February 7, 2011

The Council's Chairman, Mr. Eugenio Piñeiro called the meeting to order at 7:25 pm. Graciela García-Moliner gave a brief explanation of the purpose of the meeting, the information on species under consideration for the ACL 2011, and the different alternatives being considered in the Scoping Document to amend the various FMPs.

A total of 15 people attended the scoping meeting, all but 4 were commercial fishers and 2 fishing associations were represented at the meeting. Appendix A includes the attendance sheets from the scoping meeting. Also present were Iris Oliveras (CFMC staff member), and Miguel Lugo and Dr. Bill Arnold, from the NOAA Fisheries Southeast Regional Office.

Action 1: Consensus on using the years with highest landings to establish any type of limits.

Action 1(c): Consensus on separate geographic areas for ACLs.

Action 2: In general the discussion on ornamental fish was on (1) keeping track of the landings, (2) separate the ornamental fishery and manage it separately, (3) there should be limits since these fish are part of the ecosystem, and part of the reefs. Many of these species are cleaners of fish and reef and should be managed with specific quotas.

Atendee 1:

> There are no landings data on lionfish. Although lionfish is not being considered in this amendment, it impacts the commercial, recreational and ornamental fisheries. Lionfish is part of the ornamental fishery, imported as an ornamental fish.

The invasion of lionfish is impacting the commercial, recreational and ornamental fisheries. This fish is edible and its meat is as good as that of groupers, snappers, and grunts. Allow for this fishery to be an option during the seasonal closures of other species.

Do not set harvest limits on ornamental species, especially within the state waters [there are specific limits in state waters].

Do not set harvest limits on lionfish, especially within the state waters since they are found are in greater quantities than 45-50 individual per area and as many can be harvested in 45 minutes. Allow for harvest of lionfish in closed areas, including the federal seasonally closed areas since the lionfish have been reported to be found in them already. In state waters allow for especial license to fish lionfish in closed areas.

Lionfish are eating the juveniles of many commercially and recreationally important species. Therefore need to update the FMPs to include this 24/7 predator. In 5 years the decrease in landings will be due to the predation on juvenile fish (groupers, parrotfish, etc.) but there are no landings data on lionfish.

Action 3(a): Consensus on separate limits for the commercial and recreational sectors. If limits are exceeded by the recreational sector, close the fishery to the recreational fishers only.

Action 3 (b): Most of the comments received at the meeting were related to **Action 3**: Recreational fishery management and these are listed below:

Attendee 2:

He is concerned about the recreational fishing data because they are not required to submit landings data as are the commercial fishers. The data for the recreational fishers is lacking and what there is not easily corroborated. This is detrimental to the commercial fishers.

Recreational fishers should have a license to fish in both the state and federal waters.

There should be fines for the recreational fishers if they do not submit landings data.

Attendee 3, Villa Pesquera de Cataño:

Supports Action 3(b) Option 6: not to punish the recreational fishers too much. They do not make a living through fishing, should be able to harvest some fish. Recreational fishers should not sell the catch.

Support for the recreational fishing license.

Attendee 1:

Recreational fishers should be subjected to a fine and/or suspension of the license if no landings data are submitted.

Attendee 4:

Commercial fishers can lose their license and are subjected to fines if they do not submit landings data. Recreational fishers do not report landings data and harvest considerable amounts of fish.

The following options were offered under Action 3(b):

Less restrictive:

Option X: Specify a 5-fish per species bag limit per person (would not apply to a fisherman who has a valid commercial fishing license issued by Puerto Rico or the USVI).

Option XX: Specify a 2-fish per species bag limit per person (would not apply to a fisherman who has a valid commercial fishing license issued by Puerto Rico or the USVI).
More restrictive:

Option XXX: Specify a 5-organisms bag limit per person (would not apply to a fisherman who has a valid commercial fishing license issued by Puerto Rico or the USVI) to a maximum of 15 organisms total.

Action 4(a), Option 2, Sub-option A: Consider only one year of landings.

Action 4(b): So that the limits are not exceeded, educate the public on the other species that are not undergoing overfishingand are edible. The public does not consume some species due to misinformation or because these are unknown to them. There are species that are tasty and nutritious. This includes the lionfish.

CARIBBEAN FISHERY MANAGEMENT COUNCIL
268 MUÑOZ RIVERA AVE. SUITE 1108
SAN JUAN, P. R. 00918-1920

ACLs 2011 SCOPING MEETING
Holiday Inn Hotel
Mayagüez, PR

February 9, 2011

The meeting was called to order at 7:30 pm by the Council's Chairman, Mr. Eugenio Piñeiro. Graciela García-Moliner gave a brief explanation of the purpose of the meeting, the information on species under consideration for the ACL 2011, and the different alternatives being considered in the Scoping Document to amend the various FMPs.

A total of 22 people attended the scoping meeting, all but 4 were commercial fishers (including ornamental harvesters) and 4 fishing associations were represented at the meeting. A written statement by the Union de Pescadores de Rincon is included under Appendix A. Appendix B includes the attendance sheets from the scoping meeting. Also present were Iris Oliveras (CFMC staff member), and Miguel Lugo and Dr. Bill Arnold, from the NOAA Fisheries Southeast Regional Office.

The following comments were made and are summarized under each alternative:

Action 1. Management Reference Points

Action 1a: Establish a year sequence for determining average annual landings that can be applied to each island group for both the commercial and recreational sectors.

Consensus was reached on further looking into using the years 1999-2005 and 1999-2009.

Attendee 1: Commented on the 2005 peak on landings (Figure 3 of the Options Paper) as being due to the storm activity; he explained that in years when there are more storms there is more fishing. The last two years there have been little storm activity and the landings are lower. He suggested looking at storm activity over the years and the impact on landings.

Attendee 2: He suggested that decreases in landings are due to the underreporting by many fishers. He suggested looking into the real fishers' landings this year (January to December) and use this year for any

determination. Additionally he commented on the impact of closures ("vedas") as another factor in the decrease of landings.

Option 2: Establish a year sequence for determining average annual landings for each species or species group within Puerto Rico.

Sub-option A: Establish a start year for the year sequence.

Sub-sub-option iii: Use 1999 as the start date for determining average annual landings for each species or species group within Puerto Rico.

Attendee 3– I am in favor of 1999 as the starting year. He stated that 1998 should not be used because that was the year of Hurricane George and there was little fishing effort due to the damage caused by the storm.

Attendee 4 – I agree with Attendee 3, use 1999, that the years before 1999 were years of many storms and hurricane and people could not go out fishing. . He addressed the issue of including those years when there was a good market for their product (1999-2000) and not the very recent years when because of the economy, not overfishing, the landings have decreased.

Sub-sub-option iv: Use 2000 as the start date for determining average annual landings for each species or species group within Puerto Rico.

Attendee 5 – Use the data from the last 10 years; [2000-2010]. The data collection efforts of the last ten years has improved, although it is still not perfect but it is better than 15- 20 years ago, more exact for species.

Sub-option B: Establish an end year for the year sequence.

Sub-sub-option i: Use 2005 as the end date for determining average annual landings for each species or species group within Puerto Rico.

Attendee 3 – Sub-sub-option i, 2005. Among the reasons given for the selection of 2005 as the end year of the sequence were: (1) the most stable period of fishing was 1999-2005; (2) the 2005 storm Jean that was early in the season and although was far from the Island it impacted fishing and this and the conditions of 2005 were very favorable for fishing (peak landings); (3) there have been changes to the collection of data and it might appear that the landings are decreasing; (4) from 2006-2010 the fishing effort has decreased because of increased winds, increased swells and surge, all due to climate change which they hope will not be the norm; and (5) even

during the months of bonanza (later part of the year) and for example, in 2010, between September and December they were only able to fish only 1 week each month. He is especially concerned about the data for lobster.

Attendee 4 – Sub-sub-option i. Use data until 2005. There is no trust on the data being collected by the PR DNER because there are many fishing for the same resource, for example lobster. Recreational fishers are harvesting lobster and selling it; and selling as do commercial fishers to the restaurants. He knows because he has a fish house ("pescadería") and many people come, people I know fish on the weekends, and try to sell me fish at much lower price than do the commercial fishers. This is damaging the market. Need to think about conservation but the (recreational fishers) are fishing as commercial and there is a need for recreational landings data; he needs the data so that he can analyze it. He is not in agreement with the data on lobster; he thinks it is much more that is being harvested.

Action 1b. Establish MSY proxy.

Attendee 6: commented on the need to look at other data such as fish lengths, reproductive success, etc. as criteria for determining the status of the stock. These are factors that need to be assessed since landings can be decreasing due to other variables and the stock might not be overfished. He wanted to make clear that the only data being used were the landings data.

Option 1: No action. Retain current management reference points or proxies for species/species groups.

Attendee 3 – Not necessary to take any action. Species being considered are not undergoing overfishingand are being fished under the limit.

Attendee 4 – I would like to choose no action at this time. Don't feel the resource is overfished, no need right now to look at a reduction. I want everything at 100% (no reduction).

Action 1c. Allocation of ACLs among island groups.

Option 2: Divide and manage ACLs by island group (i.e., Puerto Rico, STT/STJ, STX) based on the preferred management reference point time series determined in Action 1(a).

Attendee 3 – Keep an equidistant geographic distribution, as it was established for the 2010 ACLs.

Attendee 4 – I want Puerto Rico to keep its own ACLs and St. Thomas and St. Croix to keep their own. If they are overfishing they need to take care of their area and we need to take care of ours since we are not overfishing.

Attendee 6: We should also talk about the large quantity of "imports" that are impacting us (commercial fishers) and being sold to restaurants and big business which affect the quota that is being imposed on us. Also, if fish is coming in from St. Thomas, is it being counted as landings from Puerto Rico? This could be a way of keeping the landings below the quota.

Action 2: Management of Aquarium Trade Species

Option 1: No action. Do not re-evaluate and revise management of aquarium trade species.

Attendee 3– There is no need for the federal government to deal with this, 99% of all fishing is done in state waters.

Attendee 7 – No action. There is nobody fishing in federal waters.

Option 2: Consolidate all aquarium trade species listed in the FMP for Corals and Reef Associated Plants and Invertebrates of Puerto Rico and the U.S. Virgin Islands and Reef Fish FMP of Puerto Rico and the U.S. Virgin Islands into a single FMP.

Sub-option C: Move all of the aquarium trade species listed in both the FMP for Corals and Reef Associated Plants and Invertebrates of Puerto Rico and the U.S. Virgin Islands, and in the Reef Fish FMP of Puerto Rico and the U.S. Virgin Islands, into a separate FMP specific to aquarium trade species.

Attendee 8: There should be a separate management plan.

Attendee 9: What kind of research is needed to understand and manage the fishery? This is the type of information that Sea Grant needs.

Option 4: Transfer management authority, for all aquarium trade species listed in either the FMP for Corals and Reef Associated Plants and Invertebrates of Puerto Rico and the U.S. Virgin Islands or the Reef Fish FMP of Puerto Rico and the U.S. Virgin Islands, to the jurisdiction of the appropriate commonwealth or territory as defined by Action 3(c) of 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.

Attendee 6 – No action. There is nobody fishing in federal waters.

Attendee 7 – Move the ornamental fishery to the federal government. (* See Appendix C for verbatim transcription.)

Action 3. Recreational fishery management.

Action 3a. Separation of recreational and commercial sectors.

Option 2: Specify separate commercial and recreational ACLs based on the preferred management reference point time series.

Attendee 5 – Separate commercial and recreational ACLs. Most of the data are from the commercial fishers. Need to get data from the recreational fishers. The recreational fishers compete with the commercial fishers. Of ten divers, 4 might have commercial licenses and permits and the others don't; they are providing data.

Attendee 3: Separate commercial and recreational sectors.

NOTE: Consensus on separating the commercial and recreational sectors and establishing a bag limit for the recreational sector.

Action 3b. Recreational Bag Limits

Option 2: Specify a 5-fish aggregate bag limit per person (would not apply to a fisherman who has a valid commercial fishing license issued by Puerto Rico or the USVI).

Attendee 3– In favor of Option 2. The recreational fishery is the fastest growing sector and should have a bag limit.

Option 4: Establish a 0-fish aggregate bag limit per person (would not apply to a fisherman who has a valid commercial fishing license issued by Puerto Rico or the USVI) for species in the surgeonfish FMU.

Attendee 9 – It should be 1 fishing day per year, or 2, as it is in Florida, especially for lobster fishing.

Option 6: Establish an aggregate bag limit of: Five per fisher including not more than two surgeonfish per fisher or six surgeonfish per boat, and 15 aggregate fish per boat on a fishing day (would not apply to a fisherman who has a valid commercial fishing license issued by Puerto Rico or the USVI).

Attendee 4 – In favor of Option 6. Recreational fishers try to sell him fish even when the law says that recreational fishers cannot sell their catch. The recreational fishers have the right to fish. It is illegal to fish over the limit and to sell the fish. There are tournaments, for example the wahoo tournaments that bring in 30 to 50 wahoo and these come into the market. Favors an aggregated bag limit to control the recreational fishing activity. Would prefer Option 4 (0 fish) because of the sale of

fish by the recreational fishers including dorados and deep water snappers. Limit the fishing gears for recreational fishing, for example for reels in the EEZ. Increase funding for enforcement.

Attendee 3- Option 4 would be ideal until an effective management plan is in place, but to be fair, agrees with Option 6. There is a need for an effective enforcement, until such time there should be restrictions on the recreational catch. It is well known that the recreational catch, of species that are under management, end up in the market and de-stabilize the market for the commercial fishers and impact all other activities related to commercial fishing. As an example, on December 25 2010, with the PR DNER fishing regulations, the market for dorado was flooded by the fish sold by recreational fishers. The new regulations allow for many more fish to be landed and in less than a month the restaurants were saturated, and were buying fish from the recreational fishers at a much lower price. This is also the case for the deep water snappers. Need to limit the gear that the recreational fishers can use. The recreational fishers should not be allowed to use electric reels in the EEZ. If the local authorities cannot deal with these issues, let the federal government do the job. If there is no funding, regulations are worthless.

Attendee 10: Recreational fishers should have a license and permits as commercial fishers. Free divers can use spear gun.

Action 4: Accountability Measures.

Action 4a: Triggering Accountability Measures.

Attendee 3: The species discussed in this amendment are not undergoing overfishingand there should be an increase in the amount of fish that can be harvested [from these groups] once the ACLs set last year are reached. If quotas are not met, allow for an increase in the limit the next year.

Option 1: No Action. Do not trigger AMs.

Attendee 3: The Association recommends No Action.

Option 2: Trigger AMs if the ACL is exceeded based upon:

Attendee 11 – Agrees that accountability measures be set.

Note: Nothing was said addressing the sub-option alternatives.

Action 4b: Apply Accountability Measures.

Option 1: No Action. Do not apply AMs.

Attendee 3: The Association recommends No Action.

Consensus: Not Option 3, no pay back.

Action 5: Framework Measures.

Action 5a: **Establish Framework Measures for the Spiny Lobster FMP.**

Option 1: No Action. Do not amend the framework measures for the Spiny Lobster FMP.

Attendee 3: The Association recommends Option 1.

Action 5b: **Establish Framework Measures for the Corals and Reef Associated Plants and Invertebrates FMP.**

Option 1: No Action. Do not amend the framework measures for the Corals and Reef Associated Plants and Invertebrates FMP.

Attendee 3: The Association recommends Option 1.

The following is a summary of additional comments made by those present but that did not address the issues of the scoping meeting:

Attendee 3: The USCG has intervened with fishers, both commercial and recreational, at Bajo de Sico after the changes to the regulations. The state agents have also intervened with fishers without the right to do so. There was a lack of communication among the enforcement agents with regard to the changes in the regulations.

Attendee 5: Asked about the changes to the seasonally closed areas of Abrir La Sierra and Tourmaline. Also if there were going to be any changes to the red hind seasonal closure because there has been an increase in the numbers of red hind.

Attendee 6: Suggested a federal permit for fishing in the EEZ.

Wilfredo Velez: 47 year commercially fishing and helped with the seasonally closed areas but these areas should be open now with the increase in red hinds in the area. There are other fish that the commercial fishers can harvest from these areas.

Additional comments included: (1) the need for identification of the groupers because there have been interventions with commercial fishers and misidentification of the groupers by the enforcement agents which result in the loss of the catch and (2) requests for books with the regulations that are in place, the same books that are given to the enforcement agents should be given to the fishers.

The meeting was adjourned at 9:20 pm.

Attendee 3 for the Record Testimony:
Muy buenas noches tengan todos.
Mi nombre es Nelson Crespo *I* presidente de la Union de Pescadores Comerciales de Rincon. Nuestras recomendaciones al Documento de Opciones para la Enmienda a los Limites de Captura para el Caribe Americano son las siguientes:
Qpciones de Manejo Accion 1: Puntos de Referencia de Manejo
l(a): Establecer una secuencia de años Recomendamos la Opcion 2 que consiste en establecer una secuencia de años para determinar el promedio anual de capturas para cada especie o grupo de especies en P.R. Sub-opcion A El comienzo de la serie de años deberia ser la Sub-sub-opcion iii que consiste en usar los datos del ano 1999 como el comienzo de la serie para determinar el promedio anual de captura para cada especie o grupo de especies en P.R. Quisiera hacer notar que en el ano 1998 P.R. fue azotado por el Huracan Georges y no se pudo pescar por la devastacion sufrida en el Pais por tal razon no hubo esfuerzo pesquero y utilizar este año seria detrimental para la pesca en P.R. y el Caribe. Sub-opcion B El final de la serie de años debera ser la Sub-sub-opcion i que sugiere usar los datos hasta el año 2005 como el final de la serie para determinar el promedio anual de captura para cada especie o grupo de especies en P.R. Tambien quiero resaltar que aunque P.R. fue azotado por la Tormenta Jean a la cual solo le falto una milla para clasificarla como Huracan esta ocurrio temprano y no fue un sistema que nos afecto adversamente en la pesca. Por lo tanto estos son los años comenzando en el 1999 y finalizando con el 2005. Es bien importante dejar claro que en el 2006 la forma de recogido de data se cambio y no fue del agrado de los
pescadores. Esto llevo a una merma en los reportes de pesca. Tambien hay que resaltar que en los pasados años desde el 2006 al 2010 hemos sufrido una reduccion en el esfuerzo pesquero debido a un cambio c1imatico que esperamos que sea temporal que durante los meses de bonanza pesquera no se ha podido pescar por los fuertes vientos y grandes marejadas. Como ejemplo de esto durante los meses de septiembre a octubre de 2010 solamente se pudo pescar una semana por mes. O sea en tres meses se pesco solamente tres semanas.
En cuanto a la Opdon 3 y Opcion 4 ,debemos tener deferencia con nuestros hermanos pescadores de Sto Thomas, Sto John y Sta. Cruz y dejar que ellos se expresen en cuanto a este asunto ya que solamente le compete a ellos. Pues de la misma forma a nosotros no nos gustaria que opinaran en
nuestros asuntos. Accion 1 (b): Establecer proxy de Rendimiento Maximo
Sostenible No debe tomarse accion ya que estas especies no estan sobrepescadas.
Accion 1 (c): Cuota / Manejo Geografico Hay que mantener una distribucion geografica equidistante con las Islas segun las medidas aprobadas en los ACL's del 2010.
Accion 2: Manejo de las especies de peces e invertebrados de interes ornamental. Sugerimos la Opcion 4 ya que en P.R. el 99% por no decir el 100% de esta actividad se realiza en aguas estatales y ya el Gobierno tiene un plan de manejo para la misma.

Accion 3: Manejo de la Pesca Recreacional

Accion 3(a): Separacion de los sectores de Pesca Comercial y
Recreacional Favorecemos la Opcion 2 la Pesca Recreacional es la de mayor crecimiento y debe tener un Bag limito Nosotros los Pescadores Comerciales somos los mismos y nuestra situacion es estable y no podemos permitir que en un futuro nuestro modo de vida se afecte por el crecimiento descontrolado de otro sector.
Accion 3 (b): limites de captura a la Pesca Recreativa Aqui lo ideal seria la Qpcion 4.
Hasta que no se cree un plan de vigilancia efectivo. Como es posible que se permita capturar recreacionalmente especies que estan en un plan de manejo. Es de conocimiento pleno que estas terminan en el mercado
vendidas ilegalmente y desestabilizan la economia no tan solo del Pescador Comercial sino de toda las las partes envueltas en la industria pesquera. y para muestra con un boton basta. Ejemplo de esto es que el pasado 25 de diciembre con las nuevas enmiendas puestas en vigor en el Reglamento de Pesca en P.R. con relacion a la captura del dorado en un solo mes se saturo el mercado por capturas provenientes de la Pesca Recreativa creando un colapso al punto que los restaurantes no querian nuestros productos ya que estaban pagando el mismo muy por debajo de lo que se nos paga a nosotros en las pescaderias. Y quiero dejar saber que lo mismo esta ocurriendo con los Pargos de Profundidad. Hay que limitar las artes de pesca a los recreacionales y no permitir el uso de reeles electricos en aguas estatales y federales. Si las autoridades estatales no tienen los recursos deberian permitir que las autoridades federales hagan el trabajo. Una leyes tan buena como su implementacion. Si no se asignan recursos no sirve de nada. Pero para ser justos de establecer un buen plan de manejo la apcion 6 seria aceptable.
Accion 4: Medidas de Responsabilidad En cuanto a esto no tenemos inconveniente con las especies manejadas en los ACL's de 2010. Pero segun se cierra una pesqueria al llegar al limite, con las especies que no estan sobrepescadas se deberia recompensar al pescador si no alcanza la cuota y se le deberia permitir coger mas el proximo ano. Accion 4(a): Activacion de las medidas de responsabilidad Recomendamos la Qpcion 1. 7 Accion 4(b): Aplicando medidad de responsabilidad
Recomendamos la Opcion 1 .
Accion 5: Medidas de Marco de TrabaÍQ Accion 5(a): Establecer Medidas de Trabajo para el FMP de langosta. Recomendamos la Qpcion 1 .
Accion 5(b) Establecer medidas de marco de trabajo para el FMP de Corales y Especies Asociadas a los Arrecifes de Coral Recomendamos la Opcion 1 .

Muchas gracias a todos pero no quisiera terminar sin dejar para conocimiento publico lo

frustrante y decepcionante que es la situacion del Bajo de Cico en aguas federales,

donde pescadores tanto Recreacionales como Comerciales hemos sido sacados

ilegalmente del area por parte de la Guardia Costera. Tambien hemos sido intervenidos

por las autoridades estatales sin estas tener juridiccion. Es increible la falta de comunicacion entre las autoridades de ley y orden en donde alegan que nunca recibieron la nota aclaratoria mas sin embargo la gran mayoria de los pescadores la tenian. Buenas noches a todos y muchas gracias por su atencion.

APPENDIX 4 - Other Applicable Laws

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) provides the authority for U.S. fishery management. 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 within which those fisheries are conducted. Major laws affecting federal fishery management decision making are summarized below.

Administrative Procedures Act

All federal rulemaking is governed under the provisions of the Administrative Procedure Act (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, NOAA Fisheries 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

The Coastal Zone Management Act (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, NOAA Fisheries 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. The Council and NOAA Fisheries determined that this action is consistent to the maximum extent practicable with the enforcement policies of the approved coastal management programs of Puerto Rico and the U.S. Virgin Islands (USVI).

Data Quality Act

The Data Quality Act (DQA) (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 MSA. To be consistent with the Act, FMPs and amendments must be based on the best information available, properly reference all supporting materials and data, and should 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 must also undergo quality control prior to being used by the agency.

Endangered Species Act

The Endangered Species Act (ESA) of 1973 (16 U.S.C. Section 1531 et seq.) requires that federal agencies use their authorities to conserve endangered and threatened species, and that they ensure actions they authorize, fund, or carry out are not likely to harm the continued existence of those species or the habitat designated to be critical to their survival and recovery. The ESA requires NOAA Fisheries, when proposing a fishery action that "may affect" critical habitat or endangered or threatened species, to consult with the appropriate administrative agency (itself for most marine species, the U.S. Fish and Wildlife Service for all remaining species) to determine the potential impacts of the proposed action. Consultations are concluded informally when proposed actions "may affect but are not likely to adversely affect" endangered or threatened 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" endangered or threatened species or designated critical habitat. If jeopardy or adverse modification is found, the consulting agency is required to suggest reasonable and prudent alternatives.

As provided in 50 CFR 402.16, reinitiating of formal consultation is required when discretionary involvement or control over the action has been retained (or is authorized by law) and: (1) the amount or extent of the incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not previously considered; or (4) if a new species is listed or critical habitat designated that may be affected by the identified action. The Protected Resources Division of NOAA Fisheries Southeast Region is conducting a Biological Opinion to determine effects of the proposed actions on listed species.

National Marine Sanctuaries Act

Under the National Marine Sanctuaries Act (NMSA) (also known as Title III of the Marine Protection, Research and Sanctuaries Act of 1972), as amended, the Secretary of Commerce is authorized to designate National Marine Sanctuaries to protect distinctive natural and cultural resources whose protection and beneficial use requires comprehensive planning and management. The National Marine Sanctuaries are administered by NOAA's National Ocean Service. NMSA provides authority for comprehensive and coordinated conservation and management of these marine areas. The National Marine Sanctuary System currently comprises 13 sanctuaries around the country, including sites in American Samoa and Hawaii. These sites include significant coral reef and kelp forest habitats, and breeding and feeding grounds of whales, sea lions, sharks, and sea turtles. A complete listing of the current sanctuaries and information about their location, size, characteristics, and affected fisheries can be found at:
http://sanctuaries.noaa.gov/

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act protects the quality of the aquatic environment needed for fish and wildlife resources. The Act requires consultation with the Fish and Wildlife Service (FWS) and the fish and wildlife agencies of States where the "waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted . . . or otherwise controlled or modified" by any agency (except TVA) under a federal permit or license. NOAA Fisheries was brought into the process later, as these responsibilities were carried over, during the reorganization process that created NOAA. Consultation is to be undertaken for the purpose of "preventing loss of and damage to wildlife resources", and to ensure that the environmental value of a body of water or wetland is taken into account in the decision-making process during permit application reviews. Consultation is most often (but not exclusively) initiated when water resource agencies send the FWS or NOAA Fisheries a public notice of a Section 404 permit. FWS or NOAA Fisheries may file comments on the permit stating concerns about the negative impact the activity will have on the environment, and suggest measures to reduce the impact.

Executive Orders

E.O. 12114: Environmental Effects Abroad of Major Federal Actions

The purpose of this Executive Order is to enable responsible officials of federal agencies having ultimate responsibility for authorizing and approving actions encompassed by this Order to be informed of pertinent environmental considerations and to take such considerations into account, with other pertinent considerations of national policy, in making decisions regarding such actions. While based on independent authority, this Order furthers the purpose of the National Environmental Policy Act (NEPA) and the Marine Protection Research and Sanctuaries Act and the Deepwater Port Act consistent with the foreign policy and national security policy of the United States, and represents

the United States government's exclusive and complete determination of the procedural and other actions to be taken by federal agencies to further the purpose of the NEPA, with respect to the environment outside the United States, its territories and possessions.

Agencies in their procedures shall establish procedures by which their officers having ultimate responsibility for authority and approving actions in one of the following categories encompassed by this Order, take into consideration in making decisions concerning such actions, a document described in Section 2-4(a):

(1) major federal actions significantly affecting the environment of the global commons outside the jurisdiction of any nation (e.g., the oceans or Antarctica);
(2) major federal actions significantly affecting the environment of a foreign nation not participating with the United States and not otherwise involved in the action;
(3) major federal actions significantly affecting the environment of a foreign nation, which provide to that nation:
    (a) a product, or physical project producing a principal product or an emission or effluent, which is prohibited or strictly regulated by federal law in the United States because its toxic effects on the environment create a serious public health risk; or
    (b) a physical project, which in the United States is prohibited or strictly regulated by federal law to protect the environment against radioactive substances.
(4) major federal actions outside the United States, its territories and possessions that significantly affect natural or ecological resources of global importance designated for protection under this subsection by the President, or, in the case of such a resource protected by international agreement binding on the United States, by the Secretary of State. Recommendations to the President under this subsection shall be accompanied by the views of the Council on Environmental Quality and the Secretary of State.

E.O. 12866: Regulatory Planning and Review

Executive Order 12866: Regulatory Planning and Review, 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, NOAA Fisheries prepares a Regulatory Impact Review (RIR) for all fishery regulatory actions that either implement a new FMP 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 (RFA). A regulation is significant if it is likely to result in an annual effect on the economy of at least $100,000,000 or has other major economic effects.

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.

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).

E.O. 13112: Invasive Species

The Executive Order requires agencies to use authorities 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. 13132: Federalism

The Executive Order on federalism requires agencies in formulating and implementing policies that have federalism implications, 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 that are 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 amendment given the overlapping authorities of NOAA Fisheries, 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 state, tribes and local entities.

E.O. 13158: Marine Protected Areas

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.

E.O. 12898: Environmental Justice

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. Federal agency responsibilities under this Executive Order include conducting their programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons from participation in, denying persons the benefit of, or subjecting persons to discrimination under, such, programs policies, and activities, because of their race, color, or national origin. Furthermore, each federal agency responsibility set forth under this Executive Order shall apply equally to Native American programs.

Specifically, federal agencies shall, to the maximum extent practicable; conduct human health and environmental research and analysis; collect human health and environmental data; collect, maintain and analyze information on the consumption patterns of those who principally rely on fish and/or wildlife for subsistence; allow for public participation and access to information relating to the incorporation of environmental justice principals in federal agency programs or policies; and share information and eliminate unnecessary duplication of efforts through the use of existing data systems and cooperative agreements among federal agencies and with State, local, and tribal governments.

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 NOAA Fisheries) 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. According to the List of Fisheries for 2010 published by the National Marine Fisheries Service, the Reef Fish (all gear), spiny lobster, and Caribbean conch fisheries are considered Category III (74 FR 58859).

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 NOAA Fisheries to obtain approval from the Office of Management and Budget before requesting most types of fishery information from the public. This action contains no new collections of information.

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 (SBA). 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, NOAA Fisheries, in implementing regulations, must make an assessment of how those regulations will affect small businesses.

Magnuson-Stevens 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 Council and NOAA

Fisheries have determined there are no adverse effects to EFH in this amendment as discussed in the Environmental Consequences section (Section 6.0).

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 Impact Statement to satisfy the NEPA requirements. The statement of need can be found in Section 2, Alternatives are found in Section 4, the environmental impacts are found in Section 6, and a list of agencies/people consulted is found in Section 12.

Regulatory Flexibility Act

The purpose of the 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 (IRFA or Final Regulatory Flexibility Analysis) 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 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. The IRFA for this action can be found in Section 8.0.

APPENDIX 5 - Research Needs

An overarching consideration with regard to the following research needs is that they be well-designed and include statistically valid sample sizes and distribution and that they be conducted with a commitment to long-term data collection as appropriate (SEDAR 2009).

☐ Conduct age, growth, and reproduction studies for important fish groups in the U.S. Caribbean (those species or groups overfished or undergoing overfishing).
☐ Assess the temporal and spatial stability of spawning aggregations.
☐ Elucidate source-sink dynamics and larval transport pathways, including stability of those pathways, for reef fish and conch species metapopulations in the U.S. Caribbean.
☐ Determine fishery-independent CPUEs for principal gears in the U.S. Caribbean.
☐ Determine the adult standing crop of conch species in Lang Bank USVI and compare to overall populations of the rest of STX.
☐ Develop techniques for aging conch species .
☐ Determine the biological and economic effects of various escape vents on fish and lobster traps.
☐ Determine the effects of harvesting herbivorous fishes and invertebrates (queen conch) on the settlement of coral propagules.
☐ Quantify the size distribution and abundance of fishes in MPAs and compare to similar habitats outside of MPAs.
☐ Compare four treatments for macroalgal vs. coral cover, including:
1. unfished/no point source pollution;
2. fished/no point source pollution;
3. unfished/point source pollution; and,
4. fished/point source pollution.

☐ Continue the trap studies by Sheridan et al. from NOAA Fisheries' SEFSC.
☐ Conduct reef fish surveys (focused on targeted species) that can be used for density and abundance estimates.
☐ Conduct benthic habitat surveys that can be used for abundance and density estimates of benthic species (corals, algae, and sponges), rugosity, and temporal variation (i.e., long term studies).
☐ Conduct hydrographic studies to aid in determining larval flow/marine reserve areas.
☐ Obtain effort analysis for both the commercial and recreational fisheries.
☐ Effect comparative studies between reserve areas (that we think are actually enforced) and fished areas, focusing on assemblage density and for both fish and benthic communities.
☐ Evaluate and verify expansion factors used to estimate total catch from trip intercepts.
☐ Develop and implement effective sampling programs for recreational and commercial fisheries.
☐ Collate, computerize, and evaluate the quality of early biological and biostatistical data collected from U.S. Caribbean waters.

APPENDIX 6 – 2011 Proposed Alternatives for Year Sequences, MSY, OFL, ALC

APPENDIX 7 – History of Federal Fisheries Management in the Caribbean

History of Federal Fisheries Management

The Caribbean Fisheries Management Council (Council) manages 179 fish stocks under four Fishery Management Plans (FMPs):

- Fishery Management Plan for the Reef Fish Fishery of Puerto Rico and the U.S. Virgin Islands
- Fishery Management Plan for the Corals and Reef Associated Invertebrates of Puerto Rico and the U.S. Virgin Islands
- Fishery Management Plan for the Spiny Lobster Fishery of Puerto Rico and the U.S. Virgin Islands
- Fishery Management Plan for the Queen Conch Resources of Puerto Rico and the U.S. Virgin Islands

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

The Council's Reef Fish FMP (CFMC 1985; 50 FR 34850) was implemented in September 1985. The FMP, which was supported by an environmental impact statement (EIS), defined the reef fish fishery management unit to include shallow water species only, defined various fishing parameters, described objectives for the shallow water reef fish fishery, and established management measures to achieve those objectives.

Amendment 1 to the Reef fish FMP (CFMC 1990a; 55 FR 46214) was implemented in December 1990. That amendment was supported by an environmental assessment (EA) with a finding of no significant impact (FONSI). Primary management measures included an increase in mesh size, a prohibition on harvest of Nassau grouper, and establishment of a seasonal closure near St. Thomas, USVI. Amendment 1 also defined overfished and overfishing for shallow water reef fish.

A regulatory amendment to the Reef Fish FMP (CFMC 1991; 56 FR 48755) was implemented October 1991. The primary management measures contained in this amendment, which was supported by an EA with a FONSI, included a modification to the mesh size increase implemented through Amendment 1 and a change in the specifications for degradable panels for fish traps.

Amendment 2 to the Reef Fish FMP (CFMC 1993; 58 FR 53145), implemented in November 1993, was supported by a supplemental EIS (SEIS). That amendment redefined the reef fish fishery management unit to include the major species of deep water reef fish and marine aquarium finfish. Primary management measures implemented through this amendment included gear restrictions, prohibition of harvesting goliath grouper and other aquarium trade species, and creation of various seasonally closed areas. Amendment 2 also applied existing definitions of maximum sustainable yield (MSY) and

optimum yield (OY) to all reef fish within the revised FMU, with the exception of marine aquarium finfish. The MSY and OY of marine aquarium finfish remained undefined.

A technical amendment to the Reef Fish FMP (59 FR 11560), implemented in April 1994, clarified the minimum mesh size allowed for fish traps.

An additional regulatory amendment to the Reef Fish FMP (CFMC 1996; 61 FR 64485) was implemented in January 1997. That action, supported by an EA, reduced the size of the Tourmaline Bank closed area that was originally implemented in 1993, and prohibited fishing in two areas off the west coast of Puerto Rico (Abrir La Sierra Bank and Bajo de Sico).

Amendment 3 to the Reef Fish FMP was implemented in 2005 with the approval of the Comprehensive SFA Amendment, in which the Council redefined the fishery management units and defined rebuilding plans for overfished species (CFMC 2005). Primary management measures implemented through this amendment are as follows:

- Established new Fishery Management Units (FMU) for reef fish;
- Required that fish traps have an 8 inch by 8 inch panel (with mesh not smaller than the mesh of the trap) on one side of the trap (excluding top, bottom and the side of the door) attached with untreated jute twine (diameter less than 1/8 inch);
- Required that individual traps or pots have at least one buoy attached that floats on the surface;
- Required that traps or pots tied together in a trap line have at least one buoy that floats at the surface at each end of the trap line;
- Prohibited the use of gillnets and trammel nets in the exclusive economic zone (EEZ);
- Established a seasonal area closure in the area known as Grammanik Bank south of St. Thomas;
- Prohibited the use of bottom tending gear (traps, pots, gillnets, trammel nets, bottom longlines) in the seasonally closed areas including Grammanik Bank;
- Required an anchor retrieval system for anyone fishing or possessing Caribbean reef fish species;
- Prohibited the filleting of fish at sea;
- Established seasonal closures (no fishing or possession), every year during the specified months, for SU1 (silk, black, blackfin and vermillion snapper) from October 1 through December 31, GU4 (tiger, yellowfin, yellowedge, red and black) from February 1 through April 30, red hind from December 1 through the last day of February, and lane and mutton snapper from April 1 through June 30, and;
- Established MSY, OY, minimum stock size threshold (MSST), and maximum fishing mortality threshold (MFMT) for the FMUs.

A notice of intent to prepare a draft environmental impact statement (DEIS) for Amendment 4 to the Reef Fish FMP was published in the *Federal Register* on October 9, 2007 (72 FR 57307). The proposed alternatives would consider measures to implement

escape vents in the trap fishery sector. However, Amendment 4 was postponed until a pilot study could be conducted on the effective size of escape vents.

The Council developed another regulatory amendment to the Reef Fish FMP (CFMC 2010; 50 CFR Part 622). The amendment, which was effective December 2, 2010, extended the seasonal closure of Bajo de Sico. Bajo de Sico has been identified as an important spawning site, especially for red hind and possibly other resident groupers including Nassau and yellowfin, as well as an important foraging site for these and other Caribbean reef fish. The Bajo de Sico closed area has been described as a well developed and diverse coral and sponge habitat that provides essential fish habitat (EFH) for Caribbean reef fish. The purpose of the regulatory amendment is to protect red hind spawning aggregations and large snapper and grouper from directed fishing mortality. Primary management measures implemented through this amendment are as follows:

- Modify the length of the seasonal closure to 6 months (October 1 through March 31);
- Prohibit fishing for or possession of Council-managed reef fish; and
- Prohibit anchoring year-round within Bajo de Sico.

Compatible reef fish regulations exist in the U.S. Caribbean for Nassau and goliath grouper; fishing and possession of these species has been prohibited from the shore to the EEZ since 2004 for goliath grouper and since 2006 for Nassau grouper.

Seasonal closures established in the EEZ since 2005 have been also established for some of the same species groups in the territorial and state waters. Fishing for and possession of Grouper Unit 4 (yellowfin, yellowedge, red, tiger) as well as black grouper is prohibited in the territorial waters of the USVI and in the EEZ from February 1st to April 30th each year, in Puerto Rico only one species from this group (yellowfin) is regulated during this period; Snapper Unit 3 from April 1st to June 30th in the EEZ and for two species within this group (lane and mutton) in the USVI, but only for one species within this group (mutton) from April 1st to May 31st in Puerto Rico; one species from Grouper Unit 3 (red hind) from December 1st to last day of February in the EEZ and Puerto Rico but not in the USVI; Snapper Unit 1 from October 1st to December 31st in the EEZ and USVI and only 2 species within this group (silk and blackfin) are regulated during these months in Puerto Rico.

Size regulations for yellowtail snapper have been implemented in the EEZ and Puerto Rico but not in the USVI.

Gear restrictions (e.g., mesh size in traps) also provide additional protection to the reef fish resources in the U.S. Caribbean. The mesh size for traps in the U.S. Caribbean is 2" (5.1 cm) rectangular and 1.5" (3.8 cm) hexagonal mesh; the same requirements apply for escape panels, and tying materials have been specified across the jurisdictions. Trammel and gillnets are prohibited in the EEZ and in the USVI; Puerto Rico has regulated the mesh size and length of the nets.

The Council is working on Amendment 5 to the Reef Fish FMP, which would require the following changes:

- It amended the stock complexes in the Reef Fish Fishery Management Units. It separated the Grouper Unit 4 into Grouper Unit 4 (yellowfin, red, tiger, plus black grouper) and Grouper Unit 5 (yellowedge and misty grouper). In addition, it moved creole fish from Grouper Unit 3 into the "data collection category only: unit. And lastly it modified the snapper FMU by adding cardinal snapper to Snapper Unit 2 and moving wenchman to Snapper Unit 1;
- Specified annual catch limits (ACLs) and accountability measures (AMs) to prevent overfishing of these species/species groups;
- Established Reference Points: Maximum Sustainable Yield (MSY); and Optimum Yield (OY)
- Status Determination Criteria: Minimum Stock Size Threshold (MSST); and Maximum Fishing Mortality Threshold (MFMT)
- Established framework measures to facilitate regulatory modifications; and
- Adjusted management measures as needed to constrain harvest to specified annual catch limits.

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

The Council's Spiny Lobster FMP (CFMC 1981; 49 FR 50049) was implemented in January 1985, and was supported by an EIS. The FMP defined the Caribbean spiny lobster fishery management unit to include *Panulirus argus* (Caribbean spiny lobster), described objectives for the spiny lobster fishery, and established management measures to achieve those objectives. Primary management measures included:

- The definition of MSY as 830,000 lbs per year;
- The definition of OY as "all the non-[egg-bearing] spiny lobsters in the management area having a carapace length of 3.5 inches or greater that can be harvested on an annual basis," which was estimated to range from 582,000 to 830,000 lbs per year;
- A prohibition on the retention of egg-bearing (berried) lobsters (berried female lobsters may be kept in pots or traps until the eggs are shed), and on all lobsters with a carapace length of less than 3.5 inches;
- A requirement to land lobster whole;
- A requirement to include a self-destruct panel and/or self-destruct door fastenings on traps and pots;
- A requirement to identify and mark traps, pots, buoys, and boats; and
- A prohibition on the use of poisons, drugs, or other chemicals, and on the use of spears, hooks, explosives, or similar devices to take spiny lobsters.

The plan further acknowledges that "conclusive data regarding genetics between various geographic areas…not available…establishment of an international coalition will

eventually be necessary to effectively manage this migratory species throughout its range" (pg. 5). The plan addresses only the species *P. argus* where it is limited to the geological platforms of Puerto Rico and the Virgin Islands essentially inside the 100-fathom isobath. It continues "these shelf areas include not only the Commonwealth of Puerto Rico and the territory of the Virgin Islands, but also the entire chain of the British Virgin Islands. The lobster population recognizes none of these political entities nor the limits of territorial seas" (pg. 6).

The stock unit is defined as:

> "The question of whether or not biologically distinct stocks of *P. argus* may be identified is not resolved. For purposes of this plan three biological assessment areas (distinguished by their user groups and geography) were assumed; (1) Puerto Rico, (2) St. Thomas and St. John, and (3) St. Croix. A single optimum yield is established. There is nominally one species and the source(s) of recruitment are not verified" (Section 4.2)".

The original FMP analyzed several different potential minimum sizes, ranging from 2.75 to greater than 3.5 inches CL. As in the Gulf of Mexico and S. Atlantic FMP, the smaller minimum sizes were eliminated because they would not protect the spawning stock. The larger sizes were deemed to cost the fishery too much economically and socially, therefore, the 3.5 inch CL was chosen (see below for rationale for differences in minimum size between the 2 FMPs).

Amendment 1 to the Spiny Lobster FMP (CFMC 1990b; 56 FR 19098), implemented in May 1991, added to the FMP definitions of overfished and overfishing, and outlined framework actions that could be taken should overfishing occur. The amendment defined "overfished" as a biomass level below 20% of the spawning potential ratio (SPR). It defined "overfishing" as a harvest rate that is not consistent with a program implemented to rebuild the stock to the 20% SPR. That amendment was supported by an EA and a FONSI.

Amendment 2 to the Spiny Lobster FMP (CFMC 2005; 70 FR 62073), implemented in 2005 was part of the Comprehensive Amendment to the FMPs of the U.S. Caribbean to Address Required Provisions of the Magnuson-Stevens Fishery Conservation and Management Act. This comprehensive amendment included a final supplemental environmental impact statement (FSEIS), which examined the impacts of amending the FMPs of the Council to comply with several provisions of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) related to establishing biological reference points and stock status determination criteria, preventing overfishing and rebuilding overfished fisheries, and assessing and minimizing to the extent practicable bycatch.

A notice of intent to prepare a DEIS for Amendment 3 to the Spiny Lobster FMP was published in the *Federal Register* on October 9, 2007 (72 FR 57307). The proposed alternatives would consider measures to implement escape vents in the trap fishery sector.

However, Amendment 3 was postponed until a pilot study could be conducted on the effective size of escape vents.

Amendment 4 to the Spiny Lobster FMP (CFMC 2008; 74 FR 1148), was implemented in February of 2009 to restrict spiny lobster imports into the U.S. to minimum conservation standards to achieve and increase in spawning stock biomass and increase long term yield of the fishery. The amendment prohibited any person from importing spiny lobster less than 5 ounces tail weight. If imported into Puerto Rico or the USVI, prohibit importing spiny lobster less than 6.0 ounces tail weight.

As with the South Atlantic and Gulf of Mexico FMP, since the 1980's the Caribbean FMP has been amended consistent with new requirements of the Magnuson-Stevens Act, but those amendments have not affected the above definitions or the minimum size regulations of the spiny lobster fishery.

Fishery Management Plan for the Queen Conch Resources of Puerto Rico and the U.S. Virgin Islands

The Council's Queen Conch FMP (CFMC 1996a; 61 FR 65481) was implemented in January 1997, and was supported by an EIS.

The FMP defined the queen conch fishery management unit (Table 2), described objectives for the queen conch fishery, and established management measures to achieve those objectives. Primary management measures included:

- The definition of the MSY of queen conch as 738,000 lbs per year;
- The definition of the OY of queen conch as "all queen conch commercially and recreationally harvested from the EEZ landed consistent with management measure set forth in this FMP under a goal of allowing 20% of the spawning stock biomass to remain intact;"
- A prohibition on the possession of queen conch that measure less than 9 inches total length or that have a shell lip thickness of less than 3/8 inches;
- A requirement that all conch species in the fishery management unit be landed in the shell;
- A prohibition on the sale of undersized queen conch and queen conch shells;
- A recreational bag limit of three queen conch per day, not to exceed 12 per boat;
- A commercial catch limit of 150 queen conch per day;
- An annual spawning season closure that extends from July 1 through September 30; and
- A prohibition on the use of hookah gear to harvest queen conch.

In 2005, the Comprehensive SFA Amendment provided a rebuilding plan for queen conch as Amendment 1 to the Queen Conch FMP. To implement the rebuilding plan, the Council prohibited commercial and recreational harvest and possession of queen conch in federal waters of the U.S. Caribbean, with the exception of Lang Bank near St. Croix. More specifically, the amendment:

- Established a new Fishery Management Unit for the queen conch by removing the Caribbean helmet, *Cassis tuberosa*; Caribbean vase, *Vasum muricatum*; flame helmet, *Cassis flammea*; and whelk (West Indian top shell), *Cittarium pica*,;
- Nine species remained in the FMU (Table 4.4.1)
- Prohibits the harvest and possession of queen conch from the EEZ, west of 64°34'W East of this coordinate, fishing and possession are prohibited between July and September;
- Where fishing is allowed in the EEZ, conch must be maintained intact and all other regulations of bag limits, gear restrictions, and minimum size apply;
- Prohibits all fishing on Grammanik Bank, south of St. Thomas, from February 1 through April 30 of each year, and;
- Specified an MSY proxy, OY, MSST, and MFMT for the FMUs.

The Council developed another regulatory amendment to the Queen Conch FMP to establish a quota and seasonal closures that are compatible with the USVI (CFMC 2011; 76 FR 23907). The final rule published in the *Federal Register* on April 29, 2011 and is effective May 31, 2011. Under previous regulations, fishing for and possession of queen conch was prohibited in the Caribbean EEZ, with the exception of an area known as Lang Bank east of St. Croix, which was open to harvest of queen conch from October 1 through June 30. Prior to the new regulation, when the territorial waters of St. Croix reach their 50,000 pound quota for queen conch, Lang Bank would remain open to queen conch harvest through the end of the fishing season. With the implementation of the new rule, when the territorial waters of St. Croix reach their 50,000 pound quota for queen conch, it will trigger the closure of Lang Bank to queen conch until the start of the next fishing season. Additionally, the Lang Bank seasonal closure is being changed from the previous closure of July 1 through September 30, to the new closure of June 1 through October 31, each year.

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

The Council's Coral FMP (CFMC 1994; 60 FR 58221) was implemented in December 1995. The FMP, which was supported by an EIS, defined the coral fishery management unit (Table 4 of the 2005 SFA), described objectives for Caribbean coral resources, and established management measures to achieve those objectives. Primary management measures included:

- A prohibition on the take or possession of gorgonians, stony corals, and any species in the fishery management unit if attached or existing upon live rock;
- A prohibition on the sale or possession of any prohibited coral unless fully documented as to point of origin;
- A prohibition on the use of chemicals, plants, or plant-derived toxins, and explosives to take species in the coral fishery management unit; and
- A requirement that dip nets, slurp guns, hands, and other non-habitat destructive

gear types be used to harvest allowable corals.

The FMP also required that harvesters of allowable corals obtain a permit from the local or federal government.

Amendment 1 to the Coral FMP (CFMC 1999; 64 FR 60132) was implemented in December 1999. Supported by SEIS, that amendment established a closed area in the U.S. EEZ southwest of St. Thomas, USVI. That area is known as the Hind Bank Marine Conservation District (MCD). Fishing for any species, and anchoring by all fishing vessels, is prohibited in the Hind Bank MCD year round.

The Caribbean SFA Amendment mandated the collection of "data collection only" on aquarium trade species under the Reef Fish and Coral FMPs, and removes these species from the purview of federal regulations. Consequently, existing regulations defining a marine aquarium fish as "a Caribbean reef fish that 36 is smaller than 5.5 inches (14.0 cm) TL" and restricting the harvest of a marine aquarium fish to hand-held dip nets or hand-held slurp guns (50 CFR 622.41§(b) were eliminated. The regulation prohibiting the harvest and possession of butterflyfish and seahorses from federal waters of the U.S. Caribbean (50 CFR §622.32(b)(1)(ii)) also was eliminated. Furthermore, inclusion in a data collection only category results in no specification of MSY, OY, or other stock status determination criteria for these species due to no real need for federal conservation and management of these species. Therefore, they are excluded from discussion in those sections.

Generic FMP amendments

The Council submitted the Generic Essential Fish Habitat Amendment to the Spiny Lobster, Queen Conch, Reef Fish, and Coral FMPs (Generic EFH Amendment with an EA) to NOAA Fisheries in 1998 to comply with the EFH provisions of the Magnuson-Stevens Act (CFMC 1998). NOAA Fisheries partially disapproved that amendment on March 29, 1999, finding that it did not evaluate all managed species or all fishing gears with the potential to damage fish habitat (64 FR 14884). The document was subsequently challenged by a coalition of environmental groups and fishing associations on the grounds that it did not comply with the requirements of the Magnuson-Stevens Act and NEPA (American Oceans Campaign et al. v. Daley et al., Civ. No. 99-982 [D.D.C.]). The federal court opinion upheld the plaintiffs' claim that the Generic EFH Amendment with an EA was in violation of NEPA, but determined that the amendment was in accordance with the Magnuson-Stevens Act. The Council completed the final EIS (FEIS) for the Generic EFH Amendment to comply with the September 14, 2000 court order (CFMC 2004). The Generic EFH Amendment was implemented by the Comprehensive SFA Amendment of 2005.

APPENDIX 8 – Other Things to Consider

Unavoidable Adverse Effects

Constraining the harvest of reef fish, spiny lobster, conch resources, and coral and reef associated plants and invertebrates in the U.S. Caribbean, as mandated by the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act, is expected to have some negative short-term effects on the social and economic environment, and will create some burdens with respect to the administrative environment. These effects are discussed in detail throughout Section 6 of the document. No alternatives are being considered that would avoid these negative effects because they are a necessary cost associated with setting annual catch limits (ACLs) for the affected fisheries. The range of alternatives has varying degrees of economic costs and administrative burdens. Some alternatives have relatively small short-term economic costs and/or administrative burdens, but would also provide smaller and more delayed long-term benefits. Other alternatives have greater short-term costs, but provide larger long-term benefits. Therefore, it is difficult to mitigate these measures and managers must balance the costs and benefits when choosing management alternatives for the reef fish, spiny lobster, conch resources, and coral and reef associated plants and invertebrates fisheries.

Relationship Between Short-Term Uses and Long-Term Productivity

The process of protecting reef fish, spiny lobster, conch resources, and coral and reef associated plants and invertebrates species through the specification of management targets, thresholds, and accountability measures (AMs), and regulations that implement those AMs, could adversely affect the economic and social environments related to the uses of the resources in the short-run. However, the process is also expected to provide larger benefits to those environments in the long-run than would be expected with the no action alternative. It is anticipated that more stable and sustainable catches of reef fish, spiny lobster, conch resources, and coral and reef associated plants and invertebrates will be realized as an outcome of the provisions of this amendment, assuming that alternatives other than the "no-action" alternatives are chosen.

Mitigation, Monitoring, and Enforcement Measures

As mentioned under the unavoidable adverse effects heading above, the process of establishing ACLs and AMs for the reef fish, spiny lobster, conch resources, and coral and reef associated plants and invertebrates fisheries of the U.S. Caribbean could have some negative short-term effects on the social and economic environment, and will create additional burdens for the administrative environment. This is particularly true when establishing ACLs that may fall below the average annual catch of some species that has been previously realized. No alternatives are being considered that would completely avoid these negative effects because they are a necessary cost associated with establishing ACLs and AMs in the U.S. Caribbean. It is therefore difficult to mitigate these measures

and managers must balance the costs and benefits when choosing management alternatives for these fisheries.

Harvest of reef fish, spiny lobster, conch resources, and coral and reef associated plants and invertebrates in the U.S. Caribbean has been monitored for many decades, but as discussed in Section 3.3 of this document the history of that monitoring has been replete with problems. Instead, initiatives are underway to substantially improve both commercial and recreational fisheries data collection programs. For commercial harvest data, the , NOAA Fisheries' Southeast Fisheries Science Center (SEFSC) is leading an effort to enhance the data collection program for both Puerto Rico and the USVI. When implemented, the U.S. Caribbean Commercial Data Improvement Program will provide for improved and more comprehensive data reporting forms, species-specific landings data, more timely reporting, data that are referenced by location, depth and gear, better validation of catch and effort, detailed biological information, and enhanced enforcement. For recreational harvest data, NOAA Fisheries is advancing and evolving the Marine Recreational Fisheries Statistic Survey data collection program to the MRIP program, and this evolution should result in more targeted and detailed data on recreational catch. Additionally, it is anticipated that the MRIP will be expanded in the U.S. Caribbean to include the USVI. These advancements in fisheries data collection programs will provide the data required to populate advance fisheries assessment models, thereby allowing for more precise and responsive guidance for the management of these fisheries.

Enforcing reef fish, spiny lobster, conch resources, and coral and plants and associated invertebrates harvest regulations is time- and labor-intensive. Cooperation between NOAA Fisheries Law Enforcement, the U.S. Coast Guard, local enforcement agencies, and other entities such as the Department of Defense is essential, and that cooperation continues to grow via Joint Enforcement Agreements and other instruments. These agreements are typically reconsidered and renewed on a frequent (e.g., annual) basis, which allows for adaptation to changing regulations and conditions.

Irreversible and Irretrievable Commitments of Resources

There are irreversible or irretrievable commitments of agency resources proposed herein. Resources will be needed to monitor the actions taken through this amendment in addition to implementing accountability measures if needed. The actions to impose minimum conservation standards are readily changeable by the Council or NOAA Fisheries in the future.

Comparison of Alternatives to Magnuson-Stevens Act National Standards

National Standard 1

This national standard states conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery. The intent of this amendment is to bring the reef fish, coral and associated plants, spiny lobster, and queen conch fisheries into compliance with the 2007 revisions to the Magnuson-Stevens Fishery Conservation and Management Act. Included are alternatives

to consider measures to revise management reference points and status determination criteria, implement ACLs and AMs to prevent overfishing in both the commercial and recreational sectors, revise management of aquarium trade species, establish recreational fishing bag limits, establish exclusive economic zone (EEZ) sub-boundaries for purposes of applying AMs, adjust management measures as needed to constrain harvest to specified ACLs.

National Standard 2

This national standard requires conservation and management measures be based on the best scientific information available. The rationale in developing the amendment is based on numerous peer-reviewed scientific studies from the U.S., the U.S. Caribbean and other similar tropical reef fisheries. These resources were analyzed and discussed in Sections 4 and 6, and provide the basis for the decision and selection of preferred alternatives.

National Standard 3

This national standard requires to the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination. In this action, ACLs and reference points are discussed and determined for specific species group in order to protect the stock as a whole.

National Standard 4

This national standard requires conservation and management measures not discriminate between residents of different states. This amendment will apply to the entire U.S. Caribbean and in no way restrict domestic harvest privileges among fishers.

National Standard 5

This national standard requires conservation and management measures shall, where, practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose. This amendment will establish EEZ sub-boundaries for purposes of applying AMs, thus allow fishing to occur in other areas of the U.S. Caribbean if one area reaches the ACL and is subsequently closed to fishing.

National Standard 6

This national standard requires conservation and management measures take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches. This amendment will establish framework measures that will allow modification to reference points, ACLs, AMs, and other management measures when deemed necessary and appropriate.

National Standard 7

This national standard requires conservation and management measures, where practicable, minimize costs and avoid unnecessary duplication. Currently there are no duplicative efforts for establishing ACLs, AMs, and other reference points for species contained within the amendment. Economic analysis was conducted to establish costs associated with the amendment and are discussed in the appropriate sections.

National Standard 8

This national standard requires management and conservation measures take into account the importance of fishery resources to fishing communities by utilizing economic and social data in order to provide for the sustained participation of such communities and to the extent practicable, minimize adverse economic impacts on such communities. Social and economic analyses were performed for this document and are discussed in the appropriate sections. The intent of this amendment is to revise management reference points and status determination criteria, implement ACLs and AMs to prevent overfishing in both the commercial and recreational sectors, and establish recreational fishing bag limits, thereby creating a sustainable fishery resource for these communities to continue utilizing.

National Standard 9

This national standard requires management and conservation measures minimize bycatch, to the extent practicable, and to the extent, bycatch cannot be avoided, minimize mortality. A bycatch practicability analysis was conducted and is included in the appropriate section. In summary, the proposal of closing a fishery when an ACL is met could help to reduce bycatch. It is likely that some management measures such as reduced or new quotas, bag limits, and increased size limits could increase the number of discards. However, this depends on if fishermen shift effort to other species, seasons, or fisheries and if effort decreases in response to more restrictive management measures as well as changes in community structure and age/size structures that could result from ending overfishing. Potential increases in dead discards are taken into consideration in bag and size limits, setting commercial quotas, and determining the effectiveness of a seasonal closure. Furthermore, overall fishing effort could decrease in the commercial and recreational sectors in response to more restrictive management measures, thereby reducing the potential for bycatch. In addition, if new information arises in respect to bycatch, adjustments to ACLs and AMs may be made through the framework measures to address necessary actions.

National Standard 10

This national standard requires management and conservation measures promote, to the extent practicable, the safety of human life at sea. The amendment has no effect on safety at sea.

APPENDIX 9– Alternative U.S. Caribbean Management Reference Points or Proxies.

These values are calculated based on the alternative time series described in Action 1(a) and 2(a) for species not considered to be undergoing overfishing in the Reef Fish, Spiny Losbter, Queen Conch and Corals and Reef and Associated Plants and Invertebrates FMP.

Table 9.1 - Alternative 1. No action. Retain current management reference points or proxies for species/species groups as defined in the Caribbean SFA Amendment.

FMU	MSY	OFL	(OY/ABC)
Grunts	195,000	Undefined	183,000
Goatfishes	24,000	Undefined	23,000
Squirrelfish	27,000	Undefined	25,000
Porgies	45,000	Undefined	42,000
Jacks	310,000	Undefined	291,000
Surgeonfish	36,000	Undefined	34,000
Triggerfish	196,000	Undefined	184,000
Boxfish	113,000	Undefined	106,000
Wrasses	67,000	Undefined	63,000
Angelfish	8,000	Undefined	8,000
Tilefish	3,000	Undefined	3,000
Lobster	547,000	Undefined	513,000
Conch/Other	0	Undefined	0
Aquarium trade	0	Undefined	Unknown

Table 9.2 - Alternative 2. Redefine management reference points or proxies based on the longest time series of relaiable catch data.

Caribbean Wide

	MSY		OFL		ABC/Alt. 2 (e)				
FMU	Alt. 2 (a)	Alt. 2 (b)	Alt. 2 (c)	Alt. 2 (d)	Alt. 2 (i)	Alt. 2 (j)	Alt. 2 (k)	Alt. 2 (l)	Alt. 2 (m)
Angelfish	11,854	22,295			22,295	18,951	16,721	11,148	0
Aquarium Trade	13,176	37,631			37,631	31,987	28,223	18,816	0
Boxfish	143,703	235,024			235,024	199,770	176,268	117,512	0
Goatfish	26,249	52,588			52,588	44,700	39,441	26,294	0
Grunts	277,217	444,596			444,596	377,906	333,447	222,298	0
Jacks	259,310	498,649			498,649	423,851	373,986	249,324	0
Spiny Lobster	608,582	935,164			935,164	794,889	701,373	467,582	0
Porgies	65,308	114,521			114,521	97,343	85,891	57,260	0
Squirrelfish	28,324	55,446			55,446	47,129	41,584	27,723	0
Surgeonfish	84,469	109,269			109,269	92,879	81,952	54,634	0
Tilefish	1,595	6,346			6,346	5,394	4,760	3,173	0
Triggerfish	218,069	356,258			356,258	302,819	267,193	178,129	0
Wrasses	74,394	134,259			134,259	114,120	100,694	67,130	0
Conch	0	0			0	0	0	0	0

	ABC/Alt. 2 (f)					ABC/Alt. 2 (g)				
FMU	Alt. 2 (i)	Alt. 2 (j)	Alt. 2 (k)	Alt. 2 (l)	Alt. 2 (m)	Alt. 2 (i)	Alt. 2 (j)	Alt. 2 (k)	Alt. 2 (l)	Alt. 2 (m)
Angelfish	16,759	14,245	12,569	8,380	0	11,854	10,076	8,891	5,927	0
Aquarium Trade	25,403	21,593	19,053	12,702	0	13,176	11,199	9,882	6,588	0
Boxfish	189,576	161,139	142,182	94,788	0	143,703	122,148	107,777	71,852	0
Goatfish	39,409	33,497	29,556	19,704	0	26,249	22,311	19,686	13,124	0
Grunts	362,104	307,788	271,578	181,052	0	277,217	235,635	207,913	138,609	0
Jacks	378,417	321,654	283,813	189,208	0	259,310	220,413	194,482	129,655	0
Spiny Lobster	779,195	662,316	584,397	389,598	0	608,582	517,295	456,437	304,291	0
Porgies	90,293	76,749	67,719	45,146	0	65,308	55,512	48,981	32,654	0
Squirrelfish	41,897	35,612	31,423	20,948	0	28,324	24,076	21,243	14,162	0
Surgeonfish	98,003	83,303	73,502	49,002	0	84,469	71,799	63,352	42,234	0
Tilefish	3,971	3,375	2,978	1,985	0	1,595	1,355	1,196	797	0
Triggerfish	287,620	244,477	215,715	143,810	0	218,069	185,359	163,552	109,035	0
Wrasses	104,327	88,678	78,246	52,164	0	74,394	63,235	55,795	37,197	0
Conch	0	0	0	0	0	0	0	0	0	0

Table 9.3 - Alternative 3. Redefine management reference points or proxies based on the longest time series of pre- Caribbean SFA Amendment catch data that is considered consistently reliable across all islands.

Caribbean Wide

	MSY		OFL		ABC/Alt. 2 (e)				
FMU	Alt. 2 (a)	Alt. 2 (b)	Alt. 2 (c)	Alt. 2 (d)	Alt. 2 (i)	Alt. 2 (j)	Alt. 2 (k)	Alt. 2 (l)	Alt. 2 (m)
Angelfish	12,521	24,549	12,521	24,549	24,549	20,866	18,412	12,274	0
Aquarium Trade	18,086	45,484	18,086	45,484	45,484	38,662	34,113	22,742	0
Boxfish	176,117	277,219	176,117	277,219	277,219	235,636	207,914	138,609	0
Goatfish	35,958	62,399	35,958	62,399	62,399	53,039	46,799	31,199	0
Grunts	298,531	430,496	298,531	430,496	430,496	365,922	322,872	215,248	0
Jacks	326,612	551,845	326,612	551,845	551,845	469,068	413,884	275,923	0
Spiny Lobster	686,118	1,066,235	686,118	1,066,235	1,066,235	906,300	799,676	533,118	0
Porgies	84,949	134,852	84,949	134,852	134,852	114,624	101,139	67,426	0
Squirrelfish	33,574	55,016	33,574	55,016	55,016	46,763	41,262	27,508	0
Surgeonfish	84,645	112,517	84,645	112,517	112,517	95,639	84,388	56,258	0
Tilefish	2,632	8,400	2,632	8,400	8,400	7,140	6,300	4,200	0
Triggerfish	244,235	384,648	244,235	384,648	384,648	326,951	288,486	192,324	0
Wrasses	54,149	156,000	54,149	156,000	156,000	132,600	117,000	78,000	0
Conch	0	0	0	0	0	0	0	0	0

	ABC/Alt. 2 (f)					ABC/Alt. 2 (g)				
FMU	Alt. 2 (i)	Alt. 2 (j)	Alt. 2 (k)	Alt. 2 (l)	Alt. 2 (m)	Alt. 2 (i)	Alt. 2 (j)	Alt. 2 (k)	Alt. 2 (l)	Alt. 2 (m)
Angelfish	18,535	15,755	13,901	9,267	0	12,521	10,643	9,391	6,260	0
Aquarium Trade	31,785	27,017	23,839	15,893	0	18,086	15,373	13,564	9,043	0
Boxfish	226,668	192,668	170,001	113,334	0	176,117	149,699	132,087	88,058	0
Goatfish	49,178	41,801	36,884	24,589	0	35,958	30,564	26,968	17,979	0
Grunts	364,514	309,837	273,385	182,257	0	298,531	253,752	223,899	149,266	0
Jacks	439,229	373,344	329,422	219,614	0	326,612	277,621	244,959	163,306	0
Spiny Lobster	876,176	744,750	657,132	438,088	0	686,118	583,200	514,588	343,059	0
Porgies	109,900	93,415	82,425	54,950	0	84,949	72,207	63,712	42,474	0
Squirrelfish	44,295	37,651	33,221	22,147	0	33,574	28,538	25,181	16,787	0
Surgeonfish	98,581	83,794	73,936	49,291	0	84,645	71,948	63,484	42,323	0
Tilefish	5,516	4,688	4,137	2,758	0	2,632	2,237	1,974	1,316	0
Triggerfish	314,441	267,275	235,831	157,221	0	244,235	207,599	183,176	122,117	0
Wrasses	126,183	107,255	94,637	63,091	0	54,149	46,027	40,612	27,075	0
Conch	0	0	0	0	0	0	0	0	0	0

Table 9.3 - Alternative 4. Redefine management reference points or proxies based on the longest time series of recent reliable catch data.

Caribbean Wide

	MSY		OFL		ABC/Alt. 2 (e)				
FMU	Alt. 2 (a)	Alt. 2 (b)	Alt. 2 (c)	Alt. 2 (d)	Alt. 2 (i)	Alt. 2 (j)	Alt. 2 (k)	Alt. 2 (l)	Alt. 2 (m)
Angelfish	11,873	22,416	11,873	22,416	22,416	19,054	16,812	11,208	0
Aquarium Trade	12,506	38,473	12,506	38,473	38,473	32,702	28,855	19,237	0
Boxfish	147,144	263,038	147,144	263,038	263,038	223,582	197,278	131,519	0
Goatfish	27,055	60,055	27,055	60,055	60,055	51,047	45,041	30,027	0
Grunts	250,288	435,013	250,288	435,013	435,013	369,761	326,259	217,506	0
Jacks	275,193	520,493	275,193	520,493	520,493	442,419	390,370	260,247	0
Spiny Lobster	641,046	1,029,057	641,046	1,029,057	1,029,057	874,698	771,793	514,529	0
Porgies	73,115	127,071	73,115	127,071	127,071	108,011	95,303	63,536	0
Squirrelfish	29,778	57,950	29,778	57,950	57,950	49,257	43,462	28,975	0
Surgeonfish	84,429	109,016	84,429	109,016	109,016	92,664	81,762	54,508	0
Tilefish	1,625	6,737	1,625	6,737	6,737	5,726	5,053	3,368	0
Triggerfish	217,020	363,310	217,020	363,310	363,310	308,813	272,482	181,655	0
Wrasses	84,155	147,732	84,155	147,732	147,732	125,572	110,799	73,866	0
Conch	0	0	0	0	0	0	0	0	0

	ABC/Alt. 2 (f)					ABC/Alt. 2 (g)				
FMU	Alt. 2 (i)	Alt. 2 (j)	Alt. 2 (k)	Alt. 2 (l)	Alt. 2 (m)	Alt. 2 (i)	Alt. 2 (j)	Alt. 2 (k)	Alt. 2 (l)	Alt. 2 (m)
Angelfish	16,829	14,305	12,622	8,414	0	11,873	10,092	8,905	5,936	0
Aquarium Trade	25,489	21,666	19,117	12,745	0	12,506	10,630	9,379	6,253	0
Boxfish	205,303	174,507	153,977	102,651	0	147,144	125,072	110,358	73,572	0
Goatfish	43,545	37,014	32,659	21,773	0	27,055	22,997	20,291	13,528	0
Grunts	343,848	292,271	257,886	171,924	0	250,288	212,745	187,716	125,144	0
Jacks	397,281	337,689	297,961	198,640	0	275,193	233,914	206,395	137,596	0
Spiny Lobster	842,374	716,018	631,780	421,187	0	641,046	544,889	480,784	320,523	0
Porgies	100,471	85,401	75,353	50,236	0	73,115	62,148	54,837	36,558	0
Squirrelfish	43,876	37,295	32,907	21,938	0	29,778	25,312	22,334	14,889	0
Surgeonfish	97,857	83,178	73,392	48,928	0	84,429	71,764	63,321	42,214	0
Tilefish	4,181	3,554	3,136	2,090	0	1,625	1,381	1,219	813	0
Triggerfish	290,622	247,028	217,966	145,311	0	217,020	184,467	162,765	108,510	0
Wrasses	115,945	98,553	86,959	57,972	0	84,155	71,532	63,117	42,078	0
Conch	0	0	0	0	0	0	0	0	0	0

Table 9.5 - Alternative 5. Redefine management reference points or proxies based on the most recent five years of available catch data.

Caribbean Wide

	MSY		OFL		ABC/Alt. 2 (e)				
FMU	Alt. 2 (a)	Alt. 2 (b)	Alt. 2 (c)	Alt. 2 (d)	Alt. 2 (i)	Alt. 2 (j)	Alt. 2 (k)	Alt. 2 (l)	Alt. 2 (m)
Angelfish	11,678	16,550	11,678	16,550	16,550	14,068	12,413	8,275	0
Aquarium Trade	3,341	10,410	3,341	10,410	10,410	8,848	7,807	5,205	0
Boxfish	126,728	264,709	126,728	264,709	264,709	225,002	198,532	132,354	0
Goatfish	19,861	59,652	19,861	59,652	59,652	50,705	44,739	29,826	0
Grunts	213,877	433,226	213,877	433,226	433,226	368,242	324,920	216,613	0
Jacks	204,037	361,256	204,037	361,256	361,256	307,068	270,942	180,628	0
Spiny Lobster	657,930	1,148,764	657,930	1,148,764	1,148,764	976,450	861,573	574,382	0
Porgies	65,549	127,499	65,549	127,499	127,499	108,374	95,624	63,749	0
Squirrelfish	26,285	62,022	26,285	62,022	62,022	52,718	46,516	31,011	0
Surgeonfish	87,120	104,520	87,120	104,520	104,520	88,842	78,390	52,260	0
Tilefish	602	3,006	602	3,006	3,006	2,555	2,254	1,503	0
Triggerfish	190,517	330,990	190,517	330,990	330,990	281,341	248,242	165,495	0
Wrasses	76,876	158,441	76,876	158,441	158,441	134,675	118,831	79,221	0
Conch	0	0	0	0	0	0	0	0	0

	ABC/Alt. 2 (f)					ABC/Alt. 2 (g)				
FMU	Alt. 2 (i)	Alt. 2 (j)	Alt. 2 (k)	Alt. 2 (l)	Alt. 2 (m)	Alt. 2 (i)	Alt. 2 (j)	Alt. 2 (k)	Alt. 2 (l)	Alt. 2 (m)
Angelfish	14,114	11,997	10,586	7,057	0	11,678	9,926	8,759	5,839	0
Aquarium Trade	6,876	5,844	5,157	3,438	0	3,341	2,840	2,506	1,671	0
Boxfish	195,719	166,361	146,789	97,859	0	126,728	107,719	95,046	63,364	0
Goatfish	39,757	33,793	29,817	19,878	0	19,861	16,882	14,896	9,930	0
Grunts	323,552	275,019	242,664	161,776	0	213,877	181,796	160,408	106,939	0
Jacks	282,647	240,250	211,985	141,323	0	204,037	173,431	153,028	102,018	0
Spiny Lobster	903,347	767,845	677,510	451,674	0	657,930	559,240	493,447	328,965	0
Porgies	96,524	82,045	72,393	48,262	0	65,549	55,717	49,162	32,775	0
Squirrelfish	44,153	37,530	33,115	22,077	0	26,285	22,342	19,714	13,143	0
Surgeonfish	95,820	81,447	71,865	47,910	0	87,120	74,052	65,340	43,560	0
Tilefish	1,804	1,533	1,353	902	0	602	511	451	301	0
Triggerfish	260,754	221,640	195,565	130,377	0	190,517	161,940	142,888	95,259	0
Wrasses	117,659	100,010	88,244	58,829	0	76,876	65,345	57,657	38,438	0
Conch	0	0	0	0	0	0	0	0	0	0

APPENDIX 10– Alternatives Considered by the Council but Eliminated.

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