Photo Courtesy of B. Kojis

Regulatory Amendment 4

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

Parrotfish Minimum Size Limits

Including Environmental Assessment, Fishery Impact Statement, Regulatory Impact Review, and Regulatory Flexibility Act Analysis

February 2013

Abbreviations and Acronyms

ACL	annual catch limit
AM	accountability measure
APA	Administrative Procedures Act
BVI	British Virgin Islands
CEA	cumulative effects analysis
CEQ	Council on Environmental Quality
CFMC	Caribbean Fishery Management Council
CZMA	Coastal Zone Management Act
DPNR	Department of Planning and Natural Resources of the USVI
EA	environmental assessment
EC	ecosystem component species
EEZ	exclusive economic zone
EFH	essential fish habitat
ESA	Endangered Species Act
FEIS	final environmental impact statement
FIS	Fishery Impact Statement
FMP	fishery management plan
FMU	fishery management unit
HAPC	habitat area of particular concern
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MPA	Marine Mammal Protection Act
MSY	maximum sustainable yield
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OMB	Office of Management and Budget
OY	optimum yield
PAR	photosynthetically active radiation
PRA	Paperwork Reduction Act
PSU	practical salinity units
RFA	Regulatory Flexibility Act
RIR	Regulatory Impact Review
SEFSC	Southeast Fisheries Science Center
SEIS	supplemental environmental impact statement
SERO	Southeast Regional Office
USVI	United States Virgin Islands

DRAFT

Regulatory Amendment 4

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

---

Proposed actions: Establish commercial and recreational minimum size limits for parrotfish harvest in the U.S. Caribbean

Lead agencies: Caribbean Fishery Management Council
National Marine Fisheries Service

For Further Information Contact:

Miguel A. Rolón
Caribbean Fishery Management Council
270 Muñoz Rivera Ave., Suite 401
San Juan, Puerto Rico 00918-1903
(787) 766-5926

Phil Steele
National Marine Fisheries Service, Southeast Region
263 13th Avenue South
St. Petersburg, FL 33701
(727) 824-5305

DRAFT

What is a Regulatory Amendment?

The 2010 Caribbean Annual Catch Limit Amendment (CFMC 2011a) established framework procedures to provide for timely adjustments to the management program for the reef fish fishery management plan. Regulatory amendments are implemented in a shorter period than plan amendments because the procedural requirements are less extensive than for the full plan amendment process. The framework procedure is designed to streamline review of repetitive or pre-identified management measures to facilitate a more rapid response to identified issues.

Table of Contents

Chapter 1. Introduction 1
1.1 What Actions Are Being Proposed? 1
1.2 Who is Proposing the Action? 1
1.3 Where is the Project Located? 2
1.4 Why is the Caribbean Council Considering Action (Purpose and Need)? 2
1.5 History of Management 3
Chapter 2. Proposed Actions and Alternatives 6
2.1 Action 1: Alternatives for Parrotfish Commercial Size Limits 6
2.2 Action 2: Alternatives for Parrotfish Recreational Size Limits 8
Chapter 3. Affected Environment 11
3.1 Physical Environment 11
3.1.1 Geology 12
3.1.2 Oceanography and Climate 13
3.1.3 Major Habitat Types 14
3.2 Biological Environment 15
3.2.1 Parrotfish, Family *Scaridae* 15
3.2.2 Protected Species 21
3.3 Human Environment 24
3.3.1 Economic Description of the Fishery 25
3.3.2 Economic and Social Environments of USVI 39
3.3.3 Economic and Social Environments of Puerto Rico 95
3.3.4 Social and Cultural Environment 115
3.3.5 Environmental Justice Considerations 120
3.4 Administrative Environment 123
3.4.1 Federal Fishery Management 123
3.4.2 State Fishery Management 125
Chapter 4. Environmental Effects 127
4.1 Biological Effects 127
4.2 Economic Effects 132
4.2.1 Action 1: Commercial Minimum Size Limits 133
4.2.2 Action 2: Recreational Minimum Size Limits 136
4.3 Social Effects 138
4.3.1 Action 1: Commercial Minimum Size Limits 138
4.3.2 Action 2: Recreational Minimum Size Limits 142
4.4 Administrative Effects 144
4.5 Cumulative Effects Analysis 144
Chapter 5. Regulatory Impact Review 153
5.1 Introduction 153
5.2 Problems and objectives 153
5.3 Methodology and framework for analysis 153
5.4 Description of the fishery 153
5.5 Economic Impacts of Management Measures 154
5.5.1 Action 1 154
5.5.2 Action 2 156
5.5.3 Total economic impact 157

DRAFT

5.6 Private and public costs 158
5.7 Determination of significant action 158
Chapter 6. Regulatory Flexibility Analysis 160
6.1 Introduction 160
6.2 Statement of need for, objectives of, and legal basis for the proposed rule 160
6.3 Identification of federal rules which may duplicate, overlap or conflict with the proposed rule. 161
6.4 Description of the projected reporting, record-keeping and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for the preparation of the report or records. 161
6.5 Description and estimate of the number of small entities to which the proposed rule will apply. 161
6.6 Substantial number of small entities criterion 162
6.7 Significant economic impact criterion 162
6.8 Economic impacts of management measures 163
6.8.1 Action 1 163
6.8.2 Action 2 165
6.9 Description of significant alternatives 165
Chapter 7. List of Preparers 166
Chapter 8. List of Agencies and Persons Consulted 167
Chapter 9. References 168
Appendix A. Other Applicable Laws 179
Appendix B. Public Hearing Locations and Summaries 187

DRAFT

List of Figures

Figure 1-1. Jurisdictional boundaries of the Caribbean Fishery Management Council……..…….1
Figure 3-1. Map of the entire U.S. Caribbean.....13
Figure 3-2. Commercial parrotfish landings (pounds (lbs)) in Puerto Rico, 2000 – 2010. Source: SERO/SEFSC.....27
Figure 3-3. Total commercial (all species) and parrotfish commercial landings, 2000 - 2010. Source: SERO/SEFSC.....27
Figure 3-4. Adjusted commercial landings of parrotfish by gear, 2000 – 2010. 28
Figure 3-5. Average percent of annual reported commercial landings of parrotfish by month, 2006 – 2010.....28
Figure 3-6. Recreational landings of parrotfish in Puerto Rico, 2000 - 2007. Source: Regulatory Impact Review for the 2010 Caribbean ACL Amendment.....29
Figure 3-7. Commercial landings of parrotfish and other species in St. Croix, 2000 – 2009. Source: SERO/SEFSC.....30
Figure 3-8. Commercial landings of parrotfish in St. Croix, 2000 – 2010. Source: SERO/SEFSC.....30
Figure 3-9. Percent of commercial parrotfish landings by gear, 2001 – 2010. Source: SERO/SEFSC...31
Figure 3-10. Revenue from parrotfish landings in St. Croix, 1999 – 2010.....32
Figure 3-11. Percent of commercial fishermen by their ranking of importance of reef fish in their catch. Source: Kojis and Quinn 2012.....32
Figure 3-12. Average nominal price per pound of parrotfish in St. Croix, 1999 – 2010.....33
Figure 3-13A. Annual parrotfish landings in St. Croix and ACL, 1999 – 2007. Source: Regulatory Impact Review for the 2010 Caribbean ACL Amendment.....34
Figure 3-13B. Updated parrotfish landings in St. Croix, 2000 – 2009, St. Croix Parrotfish ACL, and previously reported 2006 and 2007 landings used in the Regulatory Impact Review for the 2010 Caribbean ACL Amendment.....34
Figure 3-14. Commercial landings of parrotfish and all other species in St. Thomas/St. John, 2000 – 2009.....35
Figure 3-15. Percent of commercial parrotfish landings in St. Thomas/St. John by gear, 2000 – 2007....36
Figure 3.16. Estimated revenue from parrotfish landings in St. Thomas/St. John, 2000 – 2007. Source: SERO/SEFSC.....36
Figure 3-17A. Annual parrotfish landings in St. Thomas/St. John and ACL, 2000 – 2007. Source: Regulatory Impact Review for the 2010 Caribbean ACL Amendment.....37
Figure 3-17B. Updated parrotfish landings in St. Thomas, 2000 – 2009, St. Thomas Parrotfish ACL, and previously reported 2006 and 2007 landings used in the Regulatory Impact Review for the 2010 Caribbean ACL Amendment.....38
Figure 3-18. Resident populations of St. Croix subdistricts, 2000 and 2010. Source: U.S. Census.....41
Figure 3-19. Resident populations of St. John subdistricts, 2000 and 2010. Source: U.S. Census. 41
Figure 3-20. Resident populations of St. Thomas subdistricts, 2000 and 2010. Source: U.S. Census....41
Figure 3-21. Percent of licensed commercial fishermen by age, 2010-11. Source: Kojis and Quinn 2012, p. 12.....43
Figure 3-22. St. Croix census tracts. Source: Census.....49
Figure 3-23. Where St. Croix Hispanic fishermen live.....53
Figure 3-24. Where St. Croix's Black commercial fishermen live.....54
Figure 3-25. Where St. Croix's White fishermen live. 54
Figure 3-26. Census tracts 9602, 9603.01 and 9603.02 (St. Thomas). Source: Census. 56

DRAFT

Figure 3-27. Census tracts (St. Thomas). Source: Census. 56
Figure 3-28. Monthly unemployment rates, January 2006 to April 2012. Source: VIDOL. 62
Figure 3-29. Unemployment rates for Blacks, Whites and other races in St. Croix. Source: KidsCount.org. 64
Figure 3-30. Unemployment rates for Blacks, Whites and other races in St. Thomas. Source: KidsCount.org. 64
Figure 3-31. Unemployment rates for Blacks, Whites and other races in St. John. Source: KidsCount.org. 65
Figure 3-32. Percents of full-time versus part-time fishermen by location of residence in St. Croix. 66
Figure 3-33. Median family income by race in St. Croix, 2001 to 2007. Source: Annie E. Casey Foundation, Kids Count. 67
Figure 3-34. Median family income by race in St. Thomas, 2001 to 2007. Source: Annie E. Casey Foundation, Kids Count 68
Figure 3-35. Median family income by race in St. John, 2001 to 2007. Source: Annie E. Casey Foundation, Kids Count. Data not available for Other in 2002 and 2005. 68
Figure 3-36. Percent of families in poverty by race in St. Croix. Source: Annie E. Casey Foundation, Kids Count. 70
Figure 3-37. Percent of families in poverty by race in St. Thomas. Source: Annie E. Casey Foundation, Kids Count. Data not available for other in 2001, 2002, and 2005. 71
Figure 3-38. Percent of families in poverty by race in St. John. Source: Annie E. Casey Foundation, Kids Count. Data not available for Whites in 2001 and 2004, and Other races in all years except 2003. 71
Figure 3-39. Percent of USVI population that lacks health insurance, 2009. Source: State Health Access Data Assistance Center 2010. 75
Figure 3-40. Commercial landings in St. Croix and St. Thomas/St. John, 1974 to 2007. 89
Figure 3-41. Per capita landings of fish and shellfish in Puerto Rico and USVI, 1980 to 2000. 90
Figure 3-42. Landings per capita from 1999 to 2007, St. Croix and St. Thomas/St. John. 90
Figure 3-43. Nominal and real GDP, 2002 to 2007. Source: Bureau of Economic Research. 91
Figure 3-44. Locations where catch is sold in St. Thomas/St. John and St. Croix. Source: Kojis and Quinn 2012). 93
Figure 3-45. Puerto Rico's coastal municipalities. Source: Griffith et al. 2007. 96
Figure 3-46. Percent of Puerto Rico's households participating in NAP. Source: FNS, USDA, 2010. 106
Figure 3-47. Unemployment rate, 1989 to 2010. Source: Puerto Rico Department of Labor and Human Resources, Labor Force Survey. 109
Figure 3-48. Number of persons employed labor force in agriculture, forestry and fishing. Source: Dept of Labor and Human Resources, Puerto Rico. 109
Figure 3-49. Total reported and adjusted commercial landings, 2000 to 2010. 112
Figure 3-50. Total commercial landings in Puerto Rico, St. Thomas/St. John and St. Croix. 113
Figure 3-51. Per capita commercial landings in Puerto Rico, St. Thomas/St. John, and St. Croix. 113

DRAFT

List of Tables

Table 3-1. Life History Summary for U.S. Caribbean parrotfish species. Source: Robins and Ray 1986 in Froese and Pauly 2002....16
Table 3-2. Standard length to fork length conversion parameters for five parrotfish species using the equation FL=SL/a. 18
Table 3-3. Total length to fork length conversion parameters for four parrotfish species using the equation FL=b*TL. 18
Table 3-4. Summary of Federal Regulations that Directly and/or Indirectly Limit Harvest of Parrotfish in the Caribbean EEZ. 26
Table 3-5. USVI population. Source: U.S. Census 1990, 2000, and 2010....40
Table 3-6. USVI population by island area, 1999 to 2010. Source: U.S. Census, 1990, 2000, a nd 2010....40
Table 3-7. Number of licensed commercial fishermen. Source: Kojis and Quinn 2012....42
Table 3-8. Percent of population by age. Source: Census 1990 and 2000. 42
Table 3-9. USVI population by race, 2000. Source: U.S. Census Bureau, Census 2000....44
Table 3-10. St. Croix, St. John and St. Thomas Populations by Race, 2000. Source: U.S. Census Bureau, Census 2000....44
Table 3-11. USVI population by place of birth. Source: Census 2000. 45
Table 3-12. Percent of licensed commercial fishermen by race/ethnicity, 2010-2011. Source: Kojis and Quinn 2012. 45
Table 3-13. Households by race of householder. Source: Census 2000. 46
Table 3-14. Households by Hispanic or Latino householders and by their race. Source: Census 2000. 47
Table 3-15. Percent of population 5 years and older by language spoken at home and ability to speak English. Source: Census 2000. 48
Table 3-16. Percent of Hispanic or Latino population by census tract in St. Croix. Source: Census 2000. 49
Table 3-17. Percent of Black population by census tract in St. Croix. Source: Census 2000....49
Table 3-18. Percent of Hispanic or Latino householders by census tract in St. Croix 2000. Census 2000. 51
Table 3-19. Percent of Black and White only householders by census tract in St. Croix. Source: Census 2000. 52
Table 3-20. St. John and St. Thomas households by race and Hispanic or Latino ethnicity. Source: Census 2000. 55
Table 3-21. Percent of residents 5 years and older who are in linguistically isolated households by language by census tract (St. Thomas). Source: Census 2000. 57
Table 3-22. Percent of population by place of birth, 2000. Source: Census 2000. 59
Table 3-23. Percent of licensed commercial fishermen by ethnic group. Source: Kojis and Quinn 2012. 60
Table 3-24. Educational attainment of USVI population, 2000. Source: U.S. Census 2000. 60
Table 3-25. Education level of USVI licensed commercial fishermen, 2010. Source: Kojis and Quinn 2012. 61
Table 3-26. U.S. Median Weekly Earnings in 2010 by Educational Attainment. Source: Census....61
Table 3-27. Difficulty finding non-fishing employment in the USVI. Source: Kojis and Quinn 2012. 62
Table 3-28. Hours devoted by commercial fishermen to fishing and fishing related activities. 65
Table 3-29. Per capita, median household and median family incomes (1999 dollars). Source: Census 2000. 67

DRAFT

Table 3-30. Number and percent of USVI families and individuals with incomes below poverty level, 1999. Source: Census 2000. 69
Table 3-31. Percent of children in families with incomes below poverty level. Source: Annie E. Casey Foundation, 2003. 69
Table 3-32. Self-sufficiency standard by household structure in USVI, 2010. Source: USVI Bureau of Economic Research 2010. 72
Table 3-33. Self-sufficiency standard by household structure in St. Thomas/St. John, 2010. Source: USVI Bureau of Economic Research 2010. 73
Table 3-34. Self-sufficiency standard by household structure in St. Croix, 2010. Source: USVI Bureau of Economic Research 2010. 74
Table 3-35. Comparison of U.S. poverty threshold and USVI costs of basic needs with employer health benefits, 2010. Source: USVI Bureau of Economic Research 2010. 75
Table 3-36. Median household income (1999 dollars) by White and Black only and Hispanic/Latino householders and census tract in St. Croix. Source: Census 2000. 76
Table 3-37. Median household income for White and Black only and Hispanic or Latino householders in St. John and St. Thomas. 77
Table 3-38. Average household size by race and Hispanic/Latino ethnicity. Source: Census 2000. 78
Table 3-39. Households with income below poverty line. Source: Census 2000. 78
Table 3-40. Households with income below poverty line in St. Croix by census tract. Source: Census 2000. 80
Table 3-41. Households with incomes below poverty level in St. Thomas by census tract. Source: Census 2000. 81
Table 3-42. Percent of household income from commercial fishing, 2010. Source: Kojis and Quinn 2012. 82
Table 3-43. Number and percent of households with public assistance income. Source: Census 2000. 82
Table 3-44. Percent of catch sold, 2010. Source: Kojis and Quinn 2012. 83
Table 3-45. Pounds kept for personal or family consumption, 2010. Source: Kojis and Quinn 2012. 84
Table 3-46. Pounds given away to friends, 2010. Source: Kojis and Quinn 2012. 84
Table 3-47. Species kept and consumed and/or given away. Source: Kojis and Quinn 2012. 85
Table 3-48. What USVI commercial fishermen fish for by island area, 2010. Source: Kojis and Quinn 2012. 86
Table 3-49. St. Croix and St. Thomas/St. John farms and farm land. Source: USDA, 2007 Census of Agriculture. 87
Table 3-50. Market value of agricultural products sold, 2002 – 2007. Source: USDA, Census of Agriculture. 88
Table 3-51. Pounds of harvested crops. Source: 2007 Census of Agriculture. 89
Table 3-52. Populations of north coast municipalities where active commercial fishermen lived in 2008. Source: U.S. Census Bureau. 97
Table 3-53. Populations of south coast municipalities where active commercial fishermen lived in 2008. Source: U.S. Census. 97
Table 3-54. Populations of west coast municipalities where active commercial fishermen lived in 2008. Source: U.S. Census. 98
Table 3-55. Populations of east coast municipalities where active commercial fishermen lived in 2008. Source: U.S. Census. 98
Table 3-56. Puerto Rico population by race, 2000 and 2010. Source: U.S. Census Bureau, Census 2000 and Census 2010. 99
Table 3-57. Puerto Rico population by gender and age, 1990, 2000 and 2010. Source: U.S. Census Bureau. 99

DRAFT

Table 3-58. Annual income (from all sources) of Puerto Rico and U.S., 2000 and 2007. Source: FNS, USDA 2010. 102
Table 3-59. Median household income in 2008 dollars. Source: 2006-2008 Puerto Rico Community Survey. (HH=Household) 102
Table 3-60. Comparison of percent of people below poverty level. Source: 2006-2008 American Community Survey, Puerto Rico Community Survey. 103
Table 3-61. Poverty rate in fishing municipalities, 1999. Source: Census 2000.....104
Table 3-62. Percent of children in families with incomes below poverty line, 1999, in municipalities where active commercial fishermen live. Source: Annie E. Casey Foundation, 2003. 105
Table 3-63. Federal funding for jointly operated social welfare programs in Puerto Rico. Source: FNS, USDA, 2010. 106
Table 3-64. Percent of households with public assistance income, 1999. Source: Census 2000.....107
Table 3-65. Percent of municipal population 16 to 19 years old comprised of high school dropouts, 2000. Source: U.S. Census Bureau, Census 2000.....108
Table 3-66. Persons 16 years and older in farming, fishing and forestry occupations, 2000. Source: U.S. Census Bureau, Census 2000.....110
Table 3-67. Puerto Rico farms, 1993 – 2007. Source: USDA, Census of Agriculture.....111
Table 3-68. Number of establishments in Fish & Seafood Merchant Wholesalers Industry with paid employees by municipality. Source: 2008 Puerto Rico County Business Patterns. 114
Table 3-69. Number of marinas with paid employees by municipality. Source: 2008 Puerto Rico County Business Patterns. 115
Table 3-70. Number of establishments in Scenic and Sightseeing Transportation, Water, Industry with paid employees. Source: 2008 Puerto Rico County Business Patterns. 115
Table 3-71. USVI commercial parrotfish landings by year in whole weight.....116
Table 3-72. St. Croix commercial parrotfish landings by year in whole weight.....117
Table 3-73. St. Thomas and St. John commercial parrotfish landings by year in whole weight. 117
Table 3-74. Puerto Rico commercial parrotfish landings by year from expanded pounds. 119
Table 3-75. Puerto Rico commercial parrotfish landings by year and coast from expanded pounds. 119
Table 3-76. Puerto Rico communities which exceeded poverty threshold for year 2010.....122
Table 3-77. USVI communities which exceeded poverty threshold for year 2000. 123
Table 4-1. Estimated percent reductions in St. Croix TIP-reported commercial parrotfish landings for various minimum size limits, derived using 2008 – 2010 St. Croix TIP data. FL = fork length; the distance from the snout of the fish to the fork in the tail. 128
Table 4-2. Estimated percent reductions in St. Thomas TIP-reported commercial parrotfish landings for various minimum size limits derived using 2008 – 2010 St. Thomas TIP data. 129
Table 4-3. Estimated percent reductions in Puerto Rico TIP-reported commercial parrotfish landings for various minimum size limits derived using 2009 – 2011 Puerto Rico TIP data.....130
Table 4-4. Percentage of TIP records by species for each island for the most recent data (St. Croix 2008-2010, St. Thomas 2008-2010, and Puerto Rico 2009-2011). Numbers in parenthesize are sample sizes.....130
Table 4-5. Total Time to Measure Parrotfish per Trip 134
Table 6-1. List of Interdisciplinary Plan Team Members. 166

DRAFT

Table of Contents for the Environmental Assessment

Purpose and Need……..2

Alternatives……....6

Affected Environment……..11

Environmental Effects……124

List of Preparers……163

List of Agencies and Persons Consulted……164

DRAFT

Chapter 1. Introduction

1.1 What Actions Are Being Proposed?

NOAA's National Marine Fisheries Service (NMFS) and the Caribbean Fishery Management Council (Caribbean Council) are proposing to establish commercial and recreational minimum size limits for parrotfish harvest in the U.S. Caribbean exclusive economic zone (EEZ) through Regulatory Amendment 4 to the Fishery Management Plan for the Reef Fish Fishery of Puerto Rico and the U.S. Virgin Islands (Reef Fish FMP). These regulations are being considered to allow juveniles to mature into reproductively active individuals and have a chance to spawn prior to harvest.

Photo Courtesy of Wikipedia

1.2 Who is Proposing the Action?

The Caribbean Council is proposing the action. The Caribbean Council develops the action and proposed regulations and submits the regulatory amendment to the Secretary of Commerce (Secretary). If the Secretary finds the regulations are consistent with the FMP, the Magnuson-Stevens Fishery Conservation and Management Act, and other applicable laws, the Secretary publishes the regulations in the *Federal Register* for public comment.

Caribbean Fishery Management Council

- Responsible for conservation and management of U.S. Caribbean fish stocks
- Consists of seven voting members
  - Four voting members appointed by the Secretary of Commerce
  - One voting member appointed by each of the Governors of Puerto Rico and the U.S. Virgin Islands
  - The Regional Administrator of National Marine Fisheries Service (NMFS) for the Southeast Region
- Manages area from 3 to 200 nautical miles (nm) off the coasts of the U.S. Virgin Islands and 9 to 200 nm off the coast of Puerto Rico
- Develops fishery management plans and recommends regulations to NMFS and the Secretary of Commerce for implementation

DRAFT

1.3 Where is the Project Located?

The parrotfish unit of the U.S. Caribbean EEZ reef fish fishery is managed under the Reef Fish FMP (CFMC 1985). The Reef Fish FMP was developed by the Caribbean Council in cooperation with NMFS. The jurisdictional boundary of the Caribbean Council is federal waters located off the U.S. Virgin Islands (USVI) in the 3-200 nautical mile (nm) U.S. EEZ, and off Puerto Rico in the 9-200 nm EEZ (**Figure 1-1**).

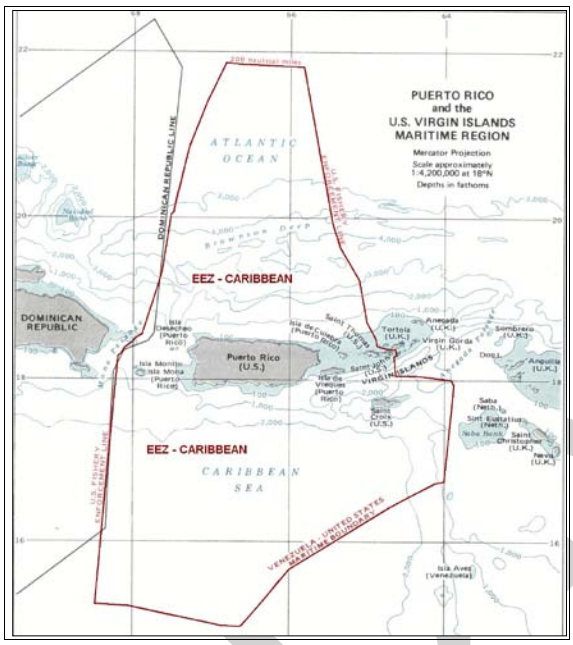

Figure 1-1. Jurisdictional boundaries of the Caribbean Fishery Management Council.

1.4 Why is the Caribbean Council Considering Action (Purpose and Need)?

The Caribbean Council is considering the proposed action to provide protection from harvest to maturing parrotfish. The parrotfish management unit in the U.S. Caribbean is composed of multiple species, and together, they represent an ecologically, culturally, and economically important group, particularly on the island of St. Croix where they support a targeted fishery. Parrotfish are omnivorous grazers that remove algae which would otherwise interfere with settlement and survival of coral recruits (Brock 1979; Mumby 2006; Burkepile and Hay 2010). The ecological role of parrotfish has become more relevant in the past 30 years due to the Caribbean-wide decline of the longspine sea urchin (*Diadema antillarum*), another essential grazer (Sandin and McNamara, 2012), in the 1980s (Mumby 2006).

Recreational bag limits of two parrotfish per person per day, with no more than six parrotfish per vessel per day, were established in the 2010 Caribbean Annual Catch Limit (ACL) Amendment (CFMC 2011a). However, no limitations on harvest size have been established. Parrotfish achieve maturity, generally as females, at various sizes that are species dependent, then change from female to terminal male as they grow larger (Robertson and Warner 1978). To maintain reproductive viability, it is important to ensure that adequate numbers of juvenile parrotfish have a chance to achieve sexual maturity and spawn at least once prior to harvest. In the absence of minimum size limits, substantial numbers of immature parrotfish may be included in the catch, thus eliminating individuals before they have a chance to

DRAFT

reproduce. This situation results in reduced gamete production and thereby compromises the reproductive viability of the population. Because egg production is generally the limiting factor in population reproductive viability (Bateman's Principle; Bateman, 1948) and egg production is more energetically expensive than sperm production (Hayward and Gillooly, 2011), it is essential to maximize egg production by protecting individual parrotfish to the greatest extent possible until they mature (generally as females) and spawn.

1.5 History of Management

The Caribbean Council's Reef Fish FMP (CFMC 1985) was implemented in September 1985. The FMP, which was supported by an environmental impact statement (EIS), defined the reef fish fishery management unit (FMU) 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 1990) 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 trap mesh size, a prohibition on harvest of Nassau grouper, and establishment of a seasonal area closure near St. Thomas, USVI. Amendment 1 also defined status determination criteria (overfished and overfishing) for shallow water reef fish.

A regulatory amendment to the Reef Fish FMP (CFMC 1991) was implemented in 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), implemented in November 1993, was supported by a supplemental EIS (SEIS). That amendment redefined the reef fish FMU 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.

An additional regulatory amendment to the Reef Fish FMP (CFMC 1996) was implemented in January 1997. That action, supported by an EA, reduced the size of the Tourmaline Bank (off the west coast of Puerto Rico) closed area that was originally implemented in 1993, and prohibited fishing in two other areas also located 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 Sustainable Fisheries Act Amendment (Caribbean SFA Amendment), in which the Caribbean Council redefined the FMUs and defined rebuilding plans for

DRAFT

overfished species (CFMC 2005). Primary management measures implemented through this amendment are as follows:

- Established new FMUs 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 EEZ.
- Established a seasonal area closure in the area known as Grammanik Bank south of St. Thomas, USVI.
- 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 Snapper Unit 1 (silk, black, blackfin and vermillion snapper) from October 1 through December 31, Grouper Unit 4 (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.
- Established MSY, OY, minimum stock size threshold, and maximum fishing mortality threshold for the FMUs.

A notice of intent to prepare a draft environmental impact statement 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 Caribbean Council developed another regulatory amendment to the Reef Fish FMP (CFMC 2010). The amendment, which was effective on December 2, 2010, extended the seasonal closure of Bajo de Sico. Primary management measures implemented through this amendment are as follows:

- Modified the length of the seasonal closure of Bajo de Sico to 6 months (October 1 through March 31).
- Prohibited fishing for or possession of Council-managed reef fish within the EEZ portion of Bajo de Sico.
- Prohibited anchoring year-round within Bajo de Sico.

DRAFT

Amendment 5 (CFMC 2011a) was implemented in January 2012 and was supported by an EIS. Primary management measures implemented through this amendment are as follows:

- Amended the stock complexes in the Reef Fish FMUs:
  - Separated the Grouper Unit 4 into Grouper Unit 4 (yellowfin, red, tiger, plus black grouper) and Grouper Unit 5 (yellowedge and misty grouper).
  - Removed creole fish from Grouper Unit 3.
  - Modified the snapper FMU by adding cardinal snapper to Snapper Unit 2 and moving wenchman to Snapper Unit 1.
- Prohibited harvest of three parrotfish species (midnight, blue, and rainbow).
- Specified ACLs and accountability measures (AMs) to prevent overfishing of these snapper, grouper, and parrotfish.
- Established Reference Points: MSY and OY.
- Established framework measures to facilitate regulatory modifications.
- Adjusted management measures as needed to constrain harvest to specified ACLs.
- Established recreational bag limits for snappers, groupers, and parrotfish.
- Subdivided the U.S. Caribbean EEZ for purposes of tracking catch and applying AMs.

Amendment 6 (CFMC 2011b) was also implemented in January 2012 and was supported by an EIS. Primary management measures implemented through this amendment are as follows:

- Revised management reference points for species not identified as undergoing overfishing within the Reef Fish FMP.
- Redefined the Aquarium Trade Species FMUs within the Reef Fish FMP and the Coral FMP.
- Established recreational bag limits for managed reef fish species not designated as undergoing overfishing.

DRAFT

Chapter 2. Proposed Actions and Alternatives

The Caribbean Council is proposing two actions for establishing parrotfish size limits. Action 1 pertains to minimum size limits for the commercial sector of the parrotfish unit of the reef fish fishery. Action 2 pertains to minimum size limits for the recreational sector of the parrotfish unit of the reef fish fishery. The alternatives for each action are outlined in the following sections.

2.1 Action 1: Alternatives for Parrotfish Commercial Size Limits

Alternative 1: No Action: Do not establish minimum size limits for the commercial sector of the parrotfish unit of the reef fish fishery.

Alternative 2 (PREFERRED): Establish minimum size limits for the commercial sector of the parrotfish unit of the reef fish fishery in St. Croix.

a. 8 inches fork length (FL) **(PREFERRED FOR REDBAND PARROTFISH)**
b. 9 inches FL **(PREFERRED FOR ALL OTHER PARROTFISH SPECIES)**
c. 10 inches FL
d. 11 inches FL
e. 12 inches FL

Alternative 3: Establish minimum size limits for the commercial sector of the parrotfish unit of the reef fish fishery in St. Thomas/St. John.

a. 8 inches FL
b. 9 inches FL
c. 10 inches FL
d. 11 inches FL
e. 12 inches FL

Alternative 4: Establish minimum size limits for the commercial sector of the parrotfish unit of the reef fish fishery in Puerto Rico.

a. 8 inches FL
b. 9 inches FL
c. 10 inches FL
d. 11 inches FL
e. 12 inches FL

Discussion: Action 1 addresses the establishment of minimum size limits for the commercial sector harvest of species included in the parrotfish unit of the reef fish fishery. **Alternative 1** would not set any commercial minimum size limits for the U.S. Caribbean exclusive economic zone (EEZ). Parrotfish harvest would remain under current regulations.

Alternatives 2 through **4** under Action 1 allow the Caribbean Council to select preferred minimum size limits on an island or island group basis. The Caribbean Council can set the same minimum size limits on each island or select different size limits based on the unique needs of each area. Note that, regardless of which alternative is chosen, harvest of midnight, blue, and rainbow parrotfish will continue to be prohibited in U.S. Caribbean EEZ waters.

Option a under **Alternatives 2** (St. Croix), **3** (St. Thomas/St. John), and **4** (Puerto Rico) would allow the Caribbean Council to set a minimum size limit of 8 in FL for each island/island group. The Council chose **Preferred Alternative 2a** as the preferred alternative for redband parrotfish in St. Croix EEZ. Because it is a relatively smaller fish, redband parrotfish would reach sexual maturity at a smaller size than the other allowable parrotfish species. **Option b** under **Alternatives 2** (St. Croix), **3** (St. Thomas/St. John), and **4** (Puerto Rico) would allow the Caribbean Council to set a minimum size limit of 9 in FL for each island/island group. The Council chose **Preferred Alternative 2b** as the preferred for all other parrotfish in the St. Croix EEZ for which harvest is allowed. **Options c**, **d**, and **e** under each alternative will establish a minimum size limit of 10 in FL, 11 in FL, or 12 in FL, respectively, for each island or island group.

Preferred Alternative 2a would establish the smallest commercial minimum size limit among the alternatives but, as designated by the Caribbean Council, only for redband parrotfish, which is the smallest of the species of managed parrotfish. **Preferred Alternative 2b** would establish the second smallest commercial minimum size limit among the size alternatives for the other managed species that are presently harvested. However, **Preferred Alternative 2b** (a minimum harvest size of nine inches) was chosen because it best captures the range of sizes at maturity for the suite of parrotfish species being considered.

A minimum size limit would reduce mortality of smaller (generally female) parrotfish, thereby enhancing spawning biomass and the supply of gametes (especially eggs), and ultimately increasing yield-per-recruit from the stock (assuming discard mortality is low). Additionally, a minimum size limit reduces the likelihood of recruitment overfishing that might otherwise lead to a stock biomass level below maximum yield. Therefore, the goal of this amendment is to set a size limit to increase the number of juveniles that can reach sexual maturity.

The larger the minimum size limit the larger the adverse impact on fishermen, who presently take individuals of all sizes, because they would no longer be able to land parrotfish of sizes less than the minimum size limit. Similarly, the larger the minimum size limit, the larger the impacts to the biological environment. Larger size limits may result in redirection of harvest to target larger fish, which produce

DRAFT

exponentially more gametes than an equivalent biomass of small fish (Bohnsack 1990). The resultant reduction in abundance of larger and older members of the spawning stock may lower recruitment by preventing parrotfish from living long enough to survive through periods when conditions are poor for offspring survival (Hawkins and Roberts 2003). This shift in fishing pressure from smaller to larger individuals may also render the larger fish susceptible to overfishing.

The level of harvest of parrotfish in St. Thomas/St. John and Puerto Rico is substantially lower than in St. Croix. Parrotfish make up only 7.2 percent of the total allowable commercial catch in St. Thomas/St. John, versus 36.4 percent of the allowable commercial harvest in St. Croix. In Puerto Rico, parrotfish harvest accounts for only 2.3 percent of the total allowable commercial harvest. Because parrotfish are not heavily targeted in St. Thomas/St. John and Puerto Rico, the Caribbean Council chose to not establish minimum size limits for parrotfish harvest in those areas**.**

2.2 Action 2: Alternatives for Parrotfish Recreational Size Limits

Alternative 1: No Action: Do not establish minimum size limits for the recreational sector of the parrotfish unit of the reef fish fishery.

Alternative 2 (PREFERRED): Establish minimum size limits for the recreational sector of the parrotfish unit of the reef fish fishery in St. Croix.

a. 8 inches FL **(PREFERRED FOR REDBAND PARROTFISH)**
b. 9 inches FL **(PREFERRED FOR ALL OTHER PARROTFISH SPECIES)**
c. 10 inches FL
d. 11 inches FL
e. 12 inches FL

Alternative 3: Establish minimum size limits for the recreational sector of the parrotfish unit of the reef fish fishery in St. Thomas/St. John.

a. 8 inches FL
b. 9 inches FL
c. 10 inches FL
d. 11 inches FL
e. 12 inches FL

AFT

Alternative 4: Establish minimum size limits for the recreational sector of the parrotfish unit of the reef fish fishery in Puerto Rico.

a. 8 inches FL
b. 9 inches FL
c. 10 inches FL
d. 11 inches FL
e. 12 inches FL

Discussion: Action 2 would establish minimum size limits for the recreational sector harvest of species included in the parrotfish unit of the reef fish fishery. **Alternative 1** would not set any recreational minimum size limits for the U.S. Caribbean EEZ. Parrotfish harvest would remain under current regulations, including an aggregate bag limit of five per fisher per day including not more than two parrotfish per fisher per day or six parrotfish per boat per day, and 15 aggregate snapper, grouper, and parrotfish per boat per day.

Alternatives 2 through **4** under Action 1 allow the Caribbean Council to select preferred minimum size limits on an island or island group basis. The Caribbean Council can set the same minimum size limits on each island or select different size limits based on the unique needs of each area.

Option a under **Alternatives 2** (St. Croix), **3** (St. Thomas/St. John), and **4** (Puerto Rico) would allow the Caribbean Council to set a minimum size limit of 8 in FL for each island/island group. The Council chose **Preferred Alternative 2a** as the preferred alternative for redband parrotfish in the St. Croix EEZ. Because it is a relatively smaller fish, redband parrotfish would reach sexual maturity at a smaller size than the other allowable parrotfish species. **Option b** under **Alternatives 2** (St. Croix), **3** (St. Thomas/St. John), and **4** (Puerto Rico) would allow the Caribbean Council to set a minimum size limit of 9 in FL for each island/island group. The Council chose **Preferred Alternative 2b** as the preferred for all other parrotfish in the St. Croix EEZ for which harvest is allowed. **Options c**, **d**, and **e** under each alternative will establish a minimum size limit of 10 in FL, 11 in FL, or 12 in FL, respectively, for each island or island group.

Preferred Alternatives 2a and **Preferred Alternative 2b** of Action 2 would establish the same minimum size limits as **Preferred Alternatives 2a** and **2b** of Action 1: eight inches for redband parrotfish and nine inches for the other six species. **Preferred Alternative 2a** would establish the smallest recreational minimum size limit among the alternatives but only for redband parrotfish, which is the smallest of the species of managed parrotfish. **Preferred Alternative 2b** would establish the second smallest recreational minimum size limit among the size alternatives for the other managed species that are presently harvested. However, **Preferred Alternative 2b** (a minimum harvest size of nine inches) was chosen because it best captures the range of sizes at maturity for the suite of parrotfish species being considered.

DRAFT

A minimum size limit would reduce mortality of smaller (generally female) parrotfish, thereby enhancing spawning biomass and the supply of gametes (especially eggs), and ultimately increasing yield-per-recruit from the stock (assuming discard mortality is low). Additionally, a minimum size limit reduces the likelihood of recruitment overfishing that might otherwise lead to a stock biomass level below maximum yield. Therefore, the goal of this amendment is to set a size limit to increase the number of juveniles that can reach sexual maturity.

Further, as discussed in Section 2.1, the larger the minimum size limit, the larger the adverse impact on fishermen and the larger the impacts to the biological environment. Larger size limits redirect harvest to target larger fish, which produce exponentially more gametes than an equivalent biomass of small fish (Bohnsack 1990). The resultant reduction in abundance of larger and older members of the spawning stock may lower recruitment by preventing parrotfish from living long enough to survive through periods when conditions are poor for offspring survival (Hawkins and Roberts 2003). This shift in fishing pressure from smaller to larger individuals may also render the larger fish susceptible to overfishing.

The level of harvest of parrotfish in St. Thomas/St. John and Puerto Rico is substantially lower than in St. Croix. Parrotfish make up only 7.2 percent of the total allowable commercial catch in St. Thomas/St. John, versus 36.4 percent of the allowable commercial harvest in St. Croix. Recreational harvest of parrotfish in the USVI is unknown but is likely to be much less in St. Thomas/St. John than in St. Croix, reflecting commercial trends and cultural preferences. In Puerto Rico, parrotfish harvest accounts for only 3.5 percent of the total allowable recreational harvest. Because parrotfish are not heavily targeted in St. Thomas/St. John and Puerto Rico, the Caribbean Council chose to not establish minimum size limits for parrotfish harvest in those areas.

DRAFT

Chapter 3. Affected Environment

This section describes the affected environment in the proposed project area. The affected environment is divided into four major components:

- **Physical environment** (Section 3.1)

  Examples include geology, climate, and habitat

- **Biological environment** (Section 3.2)

  Examples include populations of parrotfish

- **Human environment** (Section 3.3)

  Examples include fishing communities and economic descriptions of the fisheries

- **Administrative environment** (Section 3.4)

  Examples include the fishery management process and enforcement activities

DRAFT

3.1 Physical Environment

The U.S. Caribbean is located in the eastern extreme of the Caribbean archipelago, about 1,770 km (1,100 miles (mi)) east-southeast of Miami, Florida (Olcott 1999). It comprises the Commonwealth of Puerto Rico in the Greater Antilles and the Territory of the U.S. Virgin Islands (USVI) in the Lesser Antilles island chain, both of which separate the Caribbean Sea from the western central Atlantic Ocean (Figure 3-1).

The USVI are part of the Virgin Islands chain, which lies about 80 km (50 mi) east of Puerto Rico and consist of about 80 islands and cays (Olcott 1999). The USVI include the largest and most important

islands of the Virgin Islands chain: St. Croix, St. Thomas, and St. John. Together, the USVI total approximately 347 km^2 (134 mi^2) of land space area (Catanzaro *et al.* 2002). St. Croix is located about 74 km (40 nautical miles (nm)) south of St. Thomas and St. John (CFMC 2004). Covering about 207 km^2 (80 mi^2), that island is surrounded by the Caribbean Sea. The islands of St. Thomas and St. John are bordered by the Atlantic Ocean to the north and the Caribbean Sea to the south. Their respective areas are approximately 83 km^2 (32 mi^2) and 52 km^2 (20 mi^2) (Catanzaro *et al.* 2002). The island of St. Thomas is bordered to the west by Vieques and Culebra, Puerto Rico, and to the east by St. John, USVI. St. John is bordered to the east by the British Virgin Islands (BVI).

The island of Puerto Rico is almost rectangular in shape, about 177 by 56 km (110 by 35 mi), and is the smallest and the most eastern island of the Greater Antilles (CFMC 1998; Morelock et al. 2000). Its coast measures approximately 1,227 km (700 mi) and includes the adjacent inhabited islands of Vieques and Culebra. In addition, the Commonwealth of Puerto Rico includes the islands of Mona, Monito, and various other isolated islands without permanent populations. Deep ocean waters fringe Puerto Rico. The Mona Passage, which separates the island from Hispaniola to the west, is about 120 km (75 mi) wide and more than 1,000 m (3,300 ft) deep. Off the northern coast is the 8,500 m (28,000 ft) deep Puerto Rico Trench, and to the south the sea bottom descends to the 5,000 m (16,400 ft) deep Venezuelan Basin of the Caribbean Sea.

More detailed information on the physical environment can be found in Section 3.1 of the Essential Fish Habitat (EFH) Amendment Final Environmental Impact Statement (FEIS) (CFMC 2004).

3.1.1 Geology

The shelf shared by the islands of St. Thomas and St. John is about 8 mi (12.9 km) wide on the south and 20 mi (32.2 km) wide on the north (Goenaga and Boulon 1991). St. Croix, which lies on a different geological platform, is separated from the other islands by a 2.5 mi (4 km) deep trench (CFMC 2004). The St. Croix shelf is much narrower and shallower than that of the northern islands (Goenaga and Boulon 1991), extending only 2.5 mi (4 km) wide in the south, less than 0.1 mi (0.2 km) wide on the northwest, though up to several km wide in the northeast and on the Lang Bank (CFMC 2004).

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

Section 3 of the EFH Amendment FEIS (CFMC 2004) summarizes the available information on the geology of the U.S. Caribbean.

DRAFT

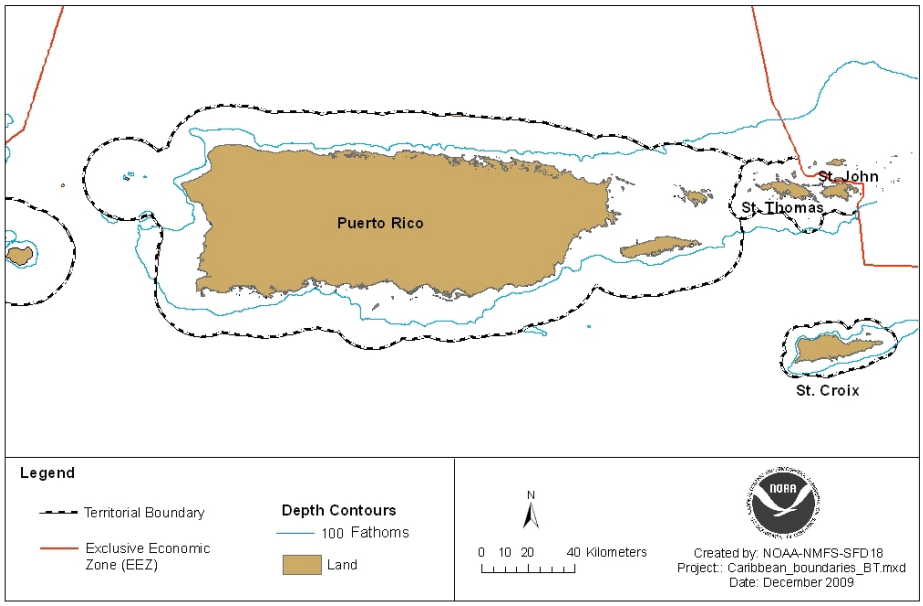

Figure 3-1. Map of the entire U.S. Caribbean

3.1.2 Oceanography and Climate

The Caribbean Current flows about 100 km (62 mi) south of the U.S. Caribbean islands at an average speed of 0.5 to 1 knots (CFMC 2004). The current is characterized by large cyclonic and anticyclonic gyres. Its strength is influenced by changes in the position of the inter-tropical convergence zone (ITCZ). The zonal shift of the ITCZ is also responsible for the seasonal change in precipitation in the Caribbean. Average annual precipitation ranges from less than 30 in (76.2 cm) to greater than 55 in (139.7 cm) in the USVI. Average annual precipitation in Puerto Rico ranges from less than 40 in (101.6 cm) on the southern coastal plain, to greater than 200 in (512 cm) in the mountains. Along the coasts, average annual precipitation ranges from about 30 in (76.2 cm) on the lee side of the island along the southwestern coast to about 75 in (190.5 cm) on the windward north coast.

Surface water salinity changes along with the seasonal change in precipitation. However, precipitation affects salinity only indirectly. The discharge from the Amazon, Orinoco, and Magdalena rivers is the main contribution to buoyancy in the Caribbean, increasing silica concentrations, decreasing salinity (Yoshioka *et al.* 1985) and increasing chlorophyll and pigments, as well as increasing the input of terrestrial materials (Kjerfve 1981).

Sea surface temperature ranges from a minimum of 25 degrees Celsius (ºC) in February-March to a maximum of about 28.5 ºC in August-September. Tidal regimes differ between the north and south coasts. The fluctuations range from a diurnal tide of about 10 cm in the south coast to a semi-diurnal

regime of between 60-100 cm along the north coast, where waves are larger (CFMC 2004). However, the astronomical tidal range is slight (20-30 cm) (Kjerfve 1981).

Additional information regarding the oceanography and climate of the U.S. Caribbean can be found in Section 5.1.2 of the Comprehensive Sustainable Fisheries Act Amendment (Caribbean SFA Amendment) (CFMC 2005).

3.1.3 Major Habitat Types

The coastal-marine environment of Puerto Rico and the USVI is characterized by a wide variety of habitat types. NOAA's National Ocean Service has mapped 21 distinct benthic nearshore habitat types using aerial photographs acquired in 1999. Those maps display 49 km^2 of unconsolidated sediment, 721 km^2 of submerged vegetation, 73 km^2 of mangroves, and 756 km^2 of coral reef and colonized hard bottom over an area of 1600 km^2 in Puerto Rico. They document 24 km^2 of unconsolidated sediment, 161 km^2 of submerged vegetation, 2 km^2 of mangroves, and 300 km^2 of coral reef and hard bottom over an area of 490 km^2 in the USVI. The EFH Amendment (CFMC 2004) provides an in-depth description of the distribution of these habitats, along with information on their ecological functions and condition.

A general description of the marine environments of the USVI is given in Island Resources Foundation (1977). St. Croix has the most extensive reefs, with many miles of bank-barrier reefs, often with algal ridges, extending in an almost unbroken line from Coakley Bay on the north coast, around the eastern tip to Great Pond Bay on the south coast. There are also numerous fringing and patch reefs. On the north coast, the eastern shelf is up to several kilometers wide and is rimmed by emergent Holocene reefs, considered to be the best developed on the island. The western portion is less than 0.2 km wide and is traversed by two small submarine canyons; in the Salt River and Cane Bay areas, the edge of the shelf drops precipitously into great depths and the reefs form a vertical wall supporting abundant growths of black coral. The south shore has a shelf up to 4 km wide (Hubbard *et al*. 1981).

Generally, the north coast of Puerto Rico is characterized by a mixture of coral and rock reefs. The east coast is characterized by a sandy bottom, which commonly contains algal and sponge communities. The southern shelf is characterized by hard or sand-algal bottoms with emergent coral reefs, seagrass beds, and shelf edge. A small seamount known as Grappler Bank lies 70 m (229.7 ft) below the surface waters about 40.3 km (25 mi) off the southeast coast of the island. An extensive seagrass bed extends 9 km (5.6 mi) off the central south coast to Caja de Muertos Island. Habitats along the southern portion of the west coast are similar to those of the south coast (CFMC 2004).

Additional information on regional habitat types can be found in Section 3.2 of the EFH FEIS (CFMC 2004) and Section 5.1.3 of the Caribbean SFA Amendment (CFMC 2005).

DRAFT

3.2 Biological Environment

3.2.1 Parrotfish, Family *Scaridae*

The Scaridae family contains 83 species in 9 genera, distributed in the Atlantic, Indian, and Pacific Oceans (Nelson 1994 in Froese and Pauly 2002). The 10 species in the Caribbean reef fish fishery management unit (FMU) belong to two genera: *Scarus* and *Sparisoma*. All these species are marketed for food, but are considered to be of minor importance to commercial fisheries in Puerto Rico and St. Thomas/St. John. With the exception of the midnight parrotfish, *Scarus coelestinus*, all are utilized in the aquarium trade.

Parrotfish are tropical shallow-water fishes that commonly occur on or adjacent to coral reef habitat but also can be found over rocky shores and substrates. They have a tendency to exhibit residential behavior for variable periods of time, but may move over distances of up to several hundred meters during feeding (Reeson 1975). These fishes are omnivorous herbivores. Most species feed on algae scraped from dead coral substrates. However, some parrotfish also graze upon coral polyps and various other invertebrate species (Yoshioka 2008; Rotjan & Lewis 2006**)**. The common practice of consuming and crushing bits of rock along with the algae to aid in the digestive process make these fishes some of the most important producers of sand on coral reefs (Nelson 1994 in Froese and Pauly 2002).

Parrotfish are diurnally active, feeding during the day and resting at night. They tend to aggregate in shallow waters near dusk, then move to deeper areas before nightfall. Mixed species aggregations may occur, or the schools may also contain representatives of other families. For example, it is common around Jamaica to find members of the Surgeonfish (Acanthuridae), Goatfish (Mullidae), Grunt (*Pomadasyidae*) and Wrasse (*Labridae*) families in association with the usually numerically dominant striped parrotfish (*Scarus iseri*) (Reeson 1975).

Sparisomatinae:
Redfin parrotfish, *Sparisoma rubripinne*
Redtail parrotfish, *Sparisoma chrysopterum*
Stoplight parrotfish, *Sparisoma viride*
Redband parrotfish, *Sparisoma aurofrenatum*

Scarinae:
Midnight parrotfish, *Scarus coelestinus*
Blue parrotfish, *Scarus coeruleus*
Rainbow parrotfish, *Scarus guacamaia*
Princess parrotfish, *Scarus taeniopterus*
Queen parrotfish, *Scarus vetula*
Striped parrotfish, *Scarus iseri*
(previously *Scarus croicensis*)

Many species undergo sex reversal, with an initial phase of both males and females, and the latter changing into a brilliantly colored male terminal phase. Terminal males dominate several females. These fishes are pelagic spawners (Nelson 1994 in Froese and Pauly 2002); some spawn in pairs; others in small groups or aggregations (Reeson 1975). Juveniles are present in the northeastern Caribbean year-round (Erdman 1976).

DRAFT

Table 3-1 outlines some of the important life history traits of the Council-managed parrotfish species, including at what size each species become mature. Additional information for the different species can be found in Sections 3.2.1.1-3.2.1.10.

Table 3-1. Life History Summary for U.S. Caribbean parrotfish species. Source: Robins and Ray 1986 in Froese and Pauly 2002

Species	Depths	Maximum Size Total Length (TL)	Estimated Mean Size at Sexual Maturity (TL)	Estimated Mean Size at Sexual Maturity (FL)*	Natural Mortality Rate
Blue parrotfish, *Scarus coeruleus*	3-25 m (10-82 ft)	120 cm (47.2 in)	62.9 cm (24.8 in)	Unknown	0.43
Rainbow parrotfish, *Scarus guacamaia*	3-25 m (10-82 ft)	120 cm (47.2 in) (male)	62.9 cm (24.8 in)	Unknown	0.43
Midnight parrotfish, *Scarus coelestinus*	5-75 m (16-246 ft)	77 cm (30.3 in) (male)	Unknown	Unknown	Unknown
Stoplight parrotfish, *Sparisoma viride*	3-49 m (9.8-160.8 ft)	64 cm (25.2 in) (male)	36.1 cm [1] (14.2 in)	Unknown[2]	0.66
Queen parrotfish, *Scarus vetula*	3-25 m (10-82 ft)	61 cm (24 in) (male)	30.6 cm (12 in)	29.6 cm (11.6 in)	1.05
Redfin parrotfish, *Sparisoma rubripinne*	15 m (49.2 ft)	47.8 cm (18.8 in) (male)	28.3 cm (11.1 in)	26.0 cm (10.2 in)	1.05
Redtail parrotfish, *Sparisoma chrysopterum*	15 m (49.2 ft)	46 cm (18.8 in) (male)	26.5 cm (10.4 in)	23.9 cm (9.4 in) [3]	Unknown
Striped parrotfish, *Scarus iseri*	3-25 m (10-82 ft)	35 cm (13.8 in) (male)	21.2 cm (8.3 in)	Unknown	0.61
Princess parrotfish, *Scarus taeniopterus*	2-25 m (6.6-82 ft)	35 cm (13.8 in) (male)	21.2 cm (8.3 in)	Unknown	0.88
Redband parrotfish, *Sparisoma aurofrenatum*	2-20 m (6.6-65.6 ft)	28 cm (11 in) (male)	17.4 cm (6.9 in)	Unknown	1.14

* Conversion factors from TL to FL is not known for all parrotfish species. The conversion factors used are from *Fishbase.org* (see Table 3-3)

** In the Caribbean, all parrotfish belonging to the Sparisomatinae sub-family initially mature as female then transition to male, whereas some belonging to the Scarinae sub-family may initially mature as males. This pattern does not occur outside the Caribbean region (Hawkins and Roberts 2003), where the pattern is always initial maturation as females then transition into males.

[1] Female stoplight parrotfish (*Sparisoma viride*) switch to male at a size between 6 in and 10 in standard length (SL) (Koltes 1993).
[2] Size at 50% maturity estimated from a survey conducted off Puerto Rico is 20.5 cm (8.1 in) FL (females) (Figuerola and Torres 1997).
[3] Estimated size at 50% maturity based on fishery independent and dependent data collected from Puerto Rican waters is 23.5 cm (9.3in) FL (females). Transitional fish ranged from 20.1 cm (7.9 in) FL to 24.8 cm (9.8 in) FL (Figuerola and Torres 1997).

DRAFT

3.2.1.1 Midnight parrotfish, *Scarus coelestinus*

The midnight parrotfish occurs in the Western Atlantic, ranging from Bermuda to Brazil, including the Caribbean Sea (Robins and Ray 1986 in Froese and Pauly 2002).

The midnight parrotfish occurs from rocky coastal reefs to seaward reefs and is often encountered in schools, feeding on algae along with surgeonfish. The midnight parrotfish has been observed to spawn in pairs. Observations in Jamaica reported the highest proportion of active and ripe fishes was confined to the period between January and May. Spawning seems to be confined to the warmer months of the year in Bermuda (Reeson 1975).

3.2.1.2 Blue parrotfish, *Scarus coeruleus*

The blue parrotfish occurs in the Western Atlantic, ranging from Maryland (USA) and Bermuda to Brazil, including the Caribbean Sea (Robins and Ray 1986 in Froese and Pauly 2002).

Adult blue parrotfish inhabit coral reefs while juveniles are found on seagrass (*Thalassia*) beds. This fish is known to form large spawning aggregations (Robins and Ray 1986 in Froese and Pauly 2002). In Jamaican waters, the highest proportion of active and ripe fishes occurs between January and May (Reeson 1975). Dietary items include benthic plants and small organisms in the sand (Robins and Ray 1986 in Froese and Pauly 2002).

3.2.1.3 Striped parrotfish, *Scarus iseri* (previously *Scarus croicensis*)

The striped parrotfish occurs in the Western Atlantic, ranging from Bermuda to northern South America (and possibly Brazil), including the Gulf of Mexico and Caribbean Sea (Böhlke and Chaplin 1993).

The striped parrotfish is found over shallow, clear waters. It is a schooling species, and generally occurs over seagrass (*Thalassia*) beds, but also is found in rocky or coral areas. An additional study conducted in Bermuda reports that males mature at 11-13 cm (4.3-5.1 in) standard length (SL) and females, at 9-10 cm (3.5-3.9 in) SL (Reeson 1975).

Supermales spawn individually with striped females, while sexually mature males in the striped phase spawn in aggregations (Böhlke and Chaplin 1993) of up to 400 individuals (Reeson 1975). One spawning aggregation site has been documented off the

Much of the literature on parrotfish length is measured in SL (tip of nose to end of vertebrae) or TL (tip of nose to the tip of the tail). Although not all information is available for every species, *Fishbase.org* provides conversion factors from SL or TL to FL (tip of nose to fork in tail) for many species. As an example, for an unsexed stoplight parrotfish, the conversion is 0.830 for the conversion equation FL=SL/0.830. Thus, a stoplight parrotfish measuring 30.0 cm (12 in) SL will measure 36.1 cm (14.2 in) FL (Fishbase.org). For a list of other species conversions and a list of conversions from TL to FL, see Tables 3.1 and 3.2, respectively.

DRAFT

southwest coast of Puerto Rico. Striped parrotfish have been observed to spawn at that site in winter months at about 20-30 m (65.6-98.4 ft) depth (Rielinger 1999). This species has been observed to spawn in the USVI in February, March, April, June, and August. Deeper reef fronts (15-20 m (49.2-65.6 ft)) appear to be the focal points for spawning groups. It has been observed to migrate daily among specific routes (Reeson 1975). It feeds on plants (Böhlke and Chaplin 1993).

Table 3-2. Standard length to fork length conversion parameters for five parrotfish species using the equation FL=SL/a.

Common Name	*Genus species*	a	Source
Queen Parrotfish	*Scarus vetula*	0.867	Fishbase on 5/14/2012
Blue Parrotfish	*Scarus coeruleus*	0.922	Fishbase on 5/14/2012
Rainbow parrotfish	*Scarus guacamaia*	0.885	Fishbase on 5/14/2012
Redfin Parrotfish	*Sparisoma rubripinne*	0.877	Fishbase on 5/14/2012
Stoplight Parrotfish (Female)	*Sparisoma viride*	0.892	Fishbase on 5/14/2012
Stoplight Parrotfish (Male)		0.892	
Stoplight Parrotfish (Unsexed)		0.830	Choat *et al*. 2003

Table 3-3. Total length to fork length conversion parameters for four parrotfish species using the equation FL=b*TL.

Common Name	*Genus species*	b	Source
Queen Parrotfish	*Scarus vetula*	0.967	Fishbase on 5/14/2012
Redfin Parrotfish	*Sparisoma rubripinne*	0.920	Fishbase on 5/14/2012
Redtail Parrotfish	*Sparisoma chrysopterum*	0.901	Molina (2005)
Stoplight Parrotfish	*Sparisoma viride*	0.903	Fishbase on 5/14/2012

3.2.1.4 Rainbow parrotfish, *Scarus guacamaia*

The rainbow parrotfish occurs in the Western Atlantic, ranging from Bermuda to Argentina, including the Caribbean Sea (Robins and Ray 1986 in Froese and Pauly 2002).

Juvenile rainbow parrotfish are commonly encountered in mangrove areas. It inhabits a home cave at night and when threatened. The maximum weight is 20 kg (44 lbs) (Robins and Ray 1986 in Froese and Pauly 2002). In Jamaican waters, the highest proportion of active and ripe fishes appear to be confined to the period between January and May (Reeson 1975). In the northeastern Caribbean, individuals in spawning condition have been observed in June and July (Erdman 1976). This fish feeds primarily on benthic algae (Robins and Ray 1986 in Froese and Pauly 2002).

DRAFT

3.2.1.5 Princess parrotfish, *Scarus taeniopterus*

The princess parrotfish occurs in the Western Atlantic, ranging from Bermuda to Brazil, and throughout the Caribbean Sea (Robins and Ray 1986 in Froese and Pauly 2002).

Adult princess parrotfish are found on coral or rock bottoms. Juveniles often occur in association with seagrass (*Thalassia*). This species appears to spawn throughout the year in Jamaican waters, with the highest proportion of ripe fishes occurring in December and January (Reeson 1975). It feeds on plants in large aggregations, and sleeps in a mucus cocoon (Robins and Ray 1986 in Froese and Pauly 2002).

3.2.1.6 Queen parrotfish, *Scarus vetula*

The queen parrotfish occurs in the Western Central Atlantic, ranging from Bermuda to northern South America, and throughout the Caribbean Sea (Robins and Ray 1986 in Froese and Pauly 2002).

The queen parrotfish inhabits coral reefs and adjacent habitats. It is often observed in groups of one supermale with several young adults, most of which are believed to be females. Age at first maturity is estimated as 1.1 years with an approximate life span of 4.8 years (Froese and Pauly 2002). In the northeastern Caribbean, individuals in spawning condition have been observed in January, February, May, June, and August (Erdman 1976). Spawning pairs have been observed in August and January off the USVI and Puerto Rico, respectively (Reeson 1975). The queen parrotfish feeds on algae and sleeps in a mucus cocoon (Robins and Ray 1986 in Froese and Pauly 2002).

3.2.1.7 Redband parrotfish, *Sparisoma aurofrenatum*

The redband parrotfish occurs in the Western Atlantic, ranging from Bermuda to Brazil, and throughout the Caribbean Sea (Robins and Ray 1986 in Froese and Pauly 2002).

The redband parrotfish inhabits coral reefs. Juveniles are usually found in adjacent seagrass beds. It is often observed resting on the sea bottom, either solitary or in small groups. This species is moderately resilient, with a minimum population doubling time of 1.4 - 4.4 years. Reeson (1975) reports that spawning has been observed to occur off the USVI in the months of March, April, June, and August. Erdman (1976) reports that individuals also have been observed in spawning condition in the northeastern Caribbean in February and December. Ripe fishes have been caught in both the nearshore and offshore environment. Pair spawning has been observed (Reeson 1975). It feeds on plants (Robins and Ray 1986 in Froese and Pauly 2002).

3.2.1.8 Redtail parrotfish, *Sparisoma chrysopterum*

The redtail parrotfish occurs in the southwest Atlantic, ranging from southern Florida (USA) to Brazil, and throughout the Caribbean Sea (Robins and Ray 1986 in Froese and Pauly 2002).

DRAFT

The redtail parrotfish occurs in coral reefs and adjacent habitats. Juveniles most commonly inhabit seagrass beds. Age at first maturity is estimated in Froese and Pauly (2002) as 0.9 years with an approximate life span of 3.6 years. Estimated size at 50 percent maturity based on fishery independent and dependent data collected from Puerto Rican waters is 23.5 cm (9.3 in) FL (females). Transitional fish ranged from 20.1 cm (7.9 in) FL to 24.8 cm (9.8 in) FL (Figuerola and Torres 1997). Spawning period is protracted. According to Figuerola and Torres (1997), no peaks are apparent in the U.S. Caribbean, but spawning activity appears to decrease during the summer (May through August). Data from a Jamaican study indicate that the highest proportion of active and ripe fishes occurs between January and May (Reeson 1975). The redtail parrotfish feeds on benthic algae and seagrasses (Robins and Ray 1986 in Froese and Pauly 2002).

3.2.1.9 Redfin parrotfish, *Sparisoma rubripinne*

The redfin parrotfish occurs in both the Eastern and Western Atlantic. In the Western Atlantic, this species ranges from Massachusetts (USA) to Brazil, and throughout the Caribbean Sea. It is apparently absent in the Gulf of Mexico (Randall 1990 in Froese and Pauly 2002).

The redfin parrotfish inhabits coral reefs and seagrass beds. Age at first maturity is estimated as 1.2 years with an approximate life span of 4.9 years (Froese and Pauly 2002). Spawning usually occurs in small groups (Randall 1990 in Froese and Pauly 2002), but also in pairs. Deeper reef fronts (15-20 m (49.2-65.6 ft)) appear to be the focal points for spawning groups. Data collected in a Jamaican study indicate that the highest proportion of active and ripe fishes occurs between January and May. Ripe males and females have been collected in all months of the year off the USVI (Reeson 1975). The redfin parrotfish feeds on benthic algae and seagrasses (Randall 1990 in Froese and Pauly 2002).

3.2.1.10 Stoplight parrotfish, *Sparisoma viride*

The stoplight parrotfish occurs in the Western Atlantic, ranging from southern Florida (USA) to Brazil, and throughout the Caribbean Sea (Cervigón *et al.* 1992 in Froese and Pauly 2002).

The stoplight parrotfish inhabits clear water coral reefs. Juveniles may be found in seagrass beds and other heavily vegetated bottoms. This species is strictly diurnal, and spends the night resting on the sea bottom. It occurs singly or in small groups. Size at 50 percent maturity estimated from a survey conducted off Puerto Rico is 20.5 cm (8.1 in) FL (females) (Figuerola and Torres 1997). A Bermuda study reports that males mature at 16-20 cm (6.3-7.9 in) SL and females at 16.3 cm (6.4 in) SL (Reeson 1975).

Spawning period is protracted. According to Figuerola and Torres (1997), no peaks are apparent in the U.S. Caribbean, but spawning activity appears to decrease during the summer (May through August). Pair spawning has been observed in May off the USVI (Reeson 1975). This fish feeds primarily on soft algae, but also has been observed to graze on live corals, such as *Montastrea annularis*. It produces a

DRAFT

significant amount of sediment through bioerosion using its strong beak-like jaws and constantly regrowing teeth (Cervigón *et al.* 1992 in Froese and Pauly 2002).

3.2.2 Protected Species

There are 32 different species of marine mammals that may occur in the Caribbean region. All 32 species are protected under the MMPA and six are also listed as endangered under the ESA (i.e., sperm, sei, fin, blue, humpback, and North Atlantic right whales). There are no known interactions between the Caribbean reef fish fishery and marine mammals. Other species protected under the ESA occurring in the Caribbean include species of sea turtle (green, hawksbill, leatherback, and loggerhead), and two *Acropora* coral species (elkhorn [*Acropora palmata*] and staghorn [*A. cervicornis*]). A discussion of these species is below. Several volumes exist that cover more thoroughly the biology and ecology of sea turtles (i.e., Lutz and Musick (eds.) 1997, Lutz et al. (eds.) 2002) and *Acropora* corals (e.g., *Acropora* Biological Review Team 2005). Critical habitat has been designated for green, hawksbill, and leatherback sea turtles in the Caribbean region; however, 99% or more of these areas are contained within state waters.

3.2.2.1 Green sea turtle, *Chelonia mydas*

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

3.2.2.2 Hawksbill sea turtle, *Eretmochelys imbricata*

The hawksbill sea turtles pelagic stage lasts from the time they leave the nesting beach as hatchlings until they are approximately 22-25 cm in straight carapace length (Meylan 1988, Meylan and Donnelly 1999). The pelagic stage is followed by residency in developmental habitats (foraging areas where juveniles reside and grow) in coastal waters. Little is known about the diet of pelagic stage hawksbills. Adult foraging typically occurs over coral reefs, although other hard-bottom communities and mangrove-fringed areas are occupied occasionally. Hawksbills show fidelity to their foraging areas over several years (van Dam and Diéz 1998). The hawksbill's diet is highly specialized and consists primarily of sponges (Meylan 1988). Gravid females have been noted ingesting coralline substrate (Meylan 1984) and

DRAFT

calcerous algae (Anderes Alvarez and Uchida 1994), which are believed to be possible sources of calcium to aid in eggshell production. The maximum diving depths of these animals are not known, but the maximum length of dives is estimated at 73.5 minutes. More routinely dives last about 56 minutes (Hughes 1974).

3.2.2.3 Leatherback sea turtle, *Dermochelys coriacea*

Leatherback sea turtles are the most pelagic of all ESA-listed sea turtles and spend most of their time in the open ocean. Although they will enter coastal waters and are seen over the continental shelf on a seasonal basis to feed in areas where jellyfish are concentrated. Leatherbacks feed primarily on cnidarians (medusae, siphonophores) and tunicates. Unlike other sea turtles, leatherbacks' diets do not shift during their life cycles. Because leatherbacks' ability to capture and eat jellyfish is not constrained by size or age, they continue to feed on these species regardless of life stage (Bjorndal 1997). Leatherbacks are the deepest diving of all sea turtles. It is estimated that these species can dive in excess of 1000 m (Eckert et al. 1989) but more frequently dive to depths of 50 m to 84 m (Eckert et al. 1986). Dive times range from a maximum of 37 minutes to more routines dives of 4 to 14.5 minutes (Standora et al. 1984, Eckert et al. 1986, Eckert et al. 1989, Keinath and Musick 1993). Leatherbacks may spend 74% to 91% of their time submerged (Standora et al. 1984).

3.2.2.4 Loggerhead sea turtle, *Caretta caretta*

Loggerhead sea turtles are less common in the Caribbean region than other sea turtles. Loggerhead hatchlings forage in the open ocean and are often associated with Sargassum rafts (Hughes 1974, Carr 1987, Walker 1994, Bolten and Balazs 1995). The pelagic stage of these sea turtles are known to eat a wide range of things including salps, jellyfish, amphipods, crabs, syngnathid fish, squid, and pelagic snails (Brongersma 1972). Stranding records indicate that when pelagic immature loggerheads reach 40-60 cm straight-line carapace length they begin to live in coastal inshore and nearshore waters of the continental shelf throughout the U.S. Atlantic (Witzell 2002). Here they forage over hard- and soft-bottom habitats (Carr 1986). Benthic foraging loggerheads eat a variety of invertebrates with crabs and mollusks being an important prey source (Burke et al. 1993). Estimates of the maximum diving depths of loggerheads range from 211 m to 233 m (692-764ft.) (Thayer et al. 1984, Limpus and Nichols 1988). The lengths of loggerhead dives are frequently between 17 and 30 minutes (Thayer et al. 1984, Limpus and Nichols 1988, Limpus and Nichols 1994, Lanyan et al. 1989) and they may spend anywhere from 80 to 94% of their time submerged (Limpus and Nichols 1994, Lanyan et al. 1989).

3.2.2.5 Elkhorn coral (*Acropora palmata)* and staghorn coral (*A. cervicornis*)

Elkhorn and staghorn corals are two of the major reef-building corals in the wider Caribbean. In the Gulf of Mexico, South Atlantic, and Caribbean they are found most commonly in the Florida Keys and U.S. Virgin Islands, though colonies exist in Puerto Rico and Flower Gardens National Marine Sanctuary in the Gulf of Mexico. The depth range for these species ranges from <1 m to 60 m. The optimal depth range for

DRAFT

elkhorn is considered to be 1 to 5 m depth (Goreau and Wells 1967), while staghorn corals are found slightly deeper, 5 to 15 m (Goreau and Goreau 1973).

All Atlantic *Acropora* species (including elkhorn and staghorn coral) are considered to be environmentally sensitive, requiring relatively clear, well-circulated water (Jaap et al. 1989). Optimal water temperatures for elkhorn and staghorn coral range from 25° to 29°C (Ghiold and Smith 1990, Williams and Bunkley-Williams 1990). Both species are almost entirely dependent upon sunlight for nourishment, contrasting the massive, boulder-shaped species in the region (Porter 1976, Lewis 1977) that are more dependent on zooplankton. Thus, Atlantic *Acropora* species are much more susceptible to increases in water turbidity than some other coral species.

Fertilization and development of elkhorn and staghorn corals is exclusively external. Embryonic development culminates with the dev7elopment of planktonic larvae called planulae (Bak et al. 1977, Sammarco 1980, Rylaarsdam 1983). Unlike most other coral larvae, elkhorn and staghorn planulae appear to prefer to settle on upper, exposed surfaces, rather than in dark or cryptic ones (Szmant and Miller 2006), at least in a laboratory setting. Studies of elkhorn and staghorn corals indicated that larger colonies of both species[4] had higher fertility rates than smaller colonies (Soong and Lang 1992).

Critical habitat was designated by NMFS for elkhorn and staghorn corals on December 26, 2008. The primary constituent element (PCE) of critical habitat for elkhorn and staghorn corals is substrate of suitable quality and availability, in water depths from the mean high water line to 30 m, to support successful larval settlement, recruitment, and reattachment of fragments. Substrate of suitable quality and availability means consolidated hardbottom or dead coral skeletons free from fleshy macroalgae and sediment cover.

While algae, including crustose coralline algae (CCA), and fleshy and turf macroalgae, are a natural component of healthy reef ecosystems, the recent increase in the dominance of fleshy macroalgae as major space-occupiers on many Caribbean coral reefs impedes the recruitment of new corals. This "phase shift" (sensu Jompa and McCook 2002) in benthic community structure (from the dominance of stony corals to that of fleshy algae) on Caribbean coral reefs is generally attributed to the greater persistence of fleshy macroalgae under reduced grazing regimes due to human overexploitation of herbivorous fishes (Hughes 1994) and the regional mass mortality of the herbivorous long-spined sea urchin (Diadema antillarum) in 1983-84 (Carpenter 1990). Although herbivorous fish and particularly parrotfish are able to substantially compensate for the loss of grazing coverage provided by D. antillarum (Carpenter 1990), chronic harvest of these herbivores has reduced that capacity for compensation. Reduced abundance of herbivores and particularly parrotfish on Caribbean coral reefs can, in part, be attributed to the use of fish traps as large-bodied parrotfish are susceptible to fish traps (Rakitin and Kramer 1996). As a result, fleshy macroalgae are better able to colonize coral skeletons and other available substrate, preempting space available for coral recruitment. Further, increased nutrients from land-based sources contribute to

[4] As measured by surface area of the live colony

DRAFT

the phase shift by increasing the growth rate of macroalgae (Waritan and Fong 2008, Sjöö and Mörk 2008, Smith 2008). Increased nutrient loads can also alter the species of macroalgae growing on the reef and simultaneously decrease the efficiency of grazers. Thus, it is a combination of increased nutrients under reduced grazing regimes that reduces the availability of appropriate substrate for acroporid recruitment (Jompa and McCook 2002).

The persistence of fleshy macroalgae under reduced grazing regimes has impacts on CCA growth, which may reduce settlement of coral larvae as CCA is thought to provide chemical cues for settlement. Most CCA are susceptible to fouling by fleshy algae, particularly when herbivores are absent (Steneck 1986). As Mumby et al. (2007) demonstrated via a modeling analysis, an unexploited community of parrotfish can maintain approximately 40 percent of the reef in a permanently grazed state but overfishing reduces this capacity to about 5 percent. Most grazing thresholds lie near the upper level observed for parrotfish in nature, suggesting that reefs are highly sensitive to parrotfish exploitation (Mumby et al. 2007). Patterns observed in St. Croix waters also indicate a strong positive correlation between CCA abundance and herbivory (Steneck 1997). A study in which Miller et al. (1999) used cages to exclude large herbivores from the study site resulted in increased cover of both turf algae and macroalgae, and decreased CCA coverage. In experimental microcosm studies, Brock (1979) found that, at low densities of parrotfish (<0.6 parrotfish or <9 g wet weight/m2) and in the absence of other grazers, the benthic community structure proceeded to macroalgal dominance; at intermediate levels of parrotfish grazing intensity (0.6 to 1.5 parrotfish or 9 to 17 g wet weight/ m2) a diverse community developed.

High grazing activity in exposed situations appears to favor CCA and thus coral recruitment. This suggests parrotfish may serve as a keystone species (Paine 1969) and that fishing effects on parrotfish grazing may profoundly influence coral dynamics (Mumby et al. 2007). Therefore, active management of parrotfish is both highly desirable and a feasible conservation goal (Mumby et al. 2007). In 2005 and 2006, gill and trammel nets were banned from the U.S. Caribbean EEZ and from the territorial waters of the USVI. The primary reason for the ban was the unprecedented use of these nets by SCUBA divers to herd parrotfish into the nets, a practice that resulted in large numbers of parrotfish being harvested (CFMC 2005).

DRAFT

3.3 Human Environment

3.3.1 Economic Description of the Fishery

Introduction

The fisheries of Puerto Rico and the USVI provide food, livelihoods and income to Puerto Ricans and U.S. Virgin Islanders. The two states' 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 their seafood processors are small-scale producers. Fishing vessel permits are not required to commercially harvest any Council-managed species in federal waters of the U.S. Caribbean.

Parrotfish are part of the Caribbean Reef Fish FMU, which also includes the following species: Snappers, sea basses and groupers, grunts, goatfishes, porgies, squirrelfishes, tilefishes, jacks, surgeonfishes, triggerfishes, filefishes, boxfishes, wrasses, angelfishes, and aquarium trade species. The actions under consideration within this regulatory amendment concern only parrotfish species.

The Caribbean Parrotfish Unit is composed of 10 species, 6 of the genus *Scarus* and 4 of the genus *Sparisoma*: blue (*Scarus coeruleus*), midnight (*Sc. coelestinus*), princess (*Sc. taeniopterus*), queen (*Sc. vetula*), rainbow (*Sc. guacamaia*), striped (*Sc. iseri*), redband (*Sparisoma aurofrenatum*), redtail (*Sp. chrysopterum*), stoplight (*Sp. viride*) and redfin (*Sp. rubripinne*) parrotfishes. There is no indicator species for this unit. A number of regulations affect parrotfish landings and are summarized in the table below. The most recent regulatory changes include setting parrotfish annual catch limits (ACLs), establishing recreational bag limits, and prohibiting fishing for midnight, blue, and rainbow parrotfish in the EEZ.

DRAFT

Table 3-4. Summary of Federal Regulations that Directly and/or Indirectly Limit Harvest of Parrotfish in the Caribbean EEZ.

Permanent Area Closure:
Fishing for any species is prohibited year-round in the Hind Bank Marine Conservation District.
Seasonal Area Closures:
From February 1 through April 30, each year, fishing for or possession of any species of fish, except highly migratory species, in or from the Grammanik Bank closed area, is prohibited
From March 1 through June 30, each year, fishing is prohibited in the Mutton Snapper Spawning Aggregation Area
From October 1 through March 31, each year, fishing for and possession of Caribbean reef fish in or from Bajo de Sico is prohibited
From December 1 through February 28, each year, fishing is prohibited in the Red Hind Spawning Aggregation Areas (east of St. Croix, Tourmaline Bank, and Abrir La Sierra Bank)
Gear Prohibitions and Restrictions:
Fishing with pots, traps, bottom longlines, gillnets or trammel nets is prohibited year-round in the Red Hind Spawning Aggregation Areas, Bajo de Sico, Grammanik Bank, and Mutton Snapper Spawning Aggregation Area
An explosive (except an explosive in a powerhead) may not be used
A powerhead may not be used to harvest Caribbean reef fish
A poison, drug, or other chemical may not be used to fish for Caribbean reef fish
A gillnet or trammel net may not be used to fish for Caribbean reef fish
A fish trap must have an escape mechanism as defined in the Code of Federal Regulations (50 CFR Part 622)
Landing Restrictions:
Fishing for midnight, blue and rainbow parrotfish is prohibited year-round
Puerto Rico: The Commercial ACL for parrotfish is 52,737 pounds and Recreational ACL is 15,263 pounds.
St. Croix ACL is 240,000 pounds and St. Thomas/St. John ACL is 42,500 pounds.
Recreational Bag Limit of aggregate harvest of not more than five fish per fisher per day including not more than two parrotfish per fisher per day or six parrotfish per boat per day; and 15 aggregate snapper, grouper, and parrotfish per boat per day

Puerto Rico

Parrotfish have been abundant on the reefs of Puerto Rico and in some areas they are a preferred food fish (CFMC February 1985). The original fishery management plan (FMP) for the complex did not include redfin parrotfish, which was added in 1993. Parrotfish are taken by commercial, recreational and subsistence fishermen.

Not all of the above parrotfish have a category in the (commercial) trip-ticket form specific to the species. The trip-ticket form has a category for each of the following 5 species: blue, midnight, rainbow, redtail and stoplight. Three of the other 5 species (princess, queen, striped) are reported in the generic category, Parrotfishes. It is assumed here that redband and redfin parrotfish (*Sparisoma aurofrenatum* and *Sparisoma rubripinne*) are also placed within this category when landed.

From 2000 to 2010, reported commercial landings of parrotfish ranged from under 20,000 to approximately 107,000 pounds and adjusted landings of parrotfish ranged from approximately 51,000 to approximately 146,000 pounds (Figure 3-2). In 2011, less than 14,000 pounds were reported to be landed. Annual commercial landings of parrotfish represented from 1.8 percent to 3.6 percent of total commercial landings from 2000 to 2010 (Figure 3-3). Since 2006, annual parrotfish landings represented

DRAFT

no more than 2.6 percent of total landings and averaged 2.2 percent of total landings. Note that the commercial ACL is substantially greater than adjusted landings after 2005.

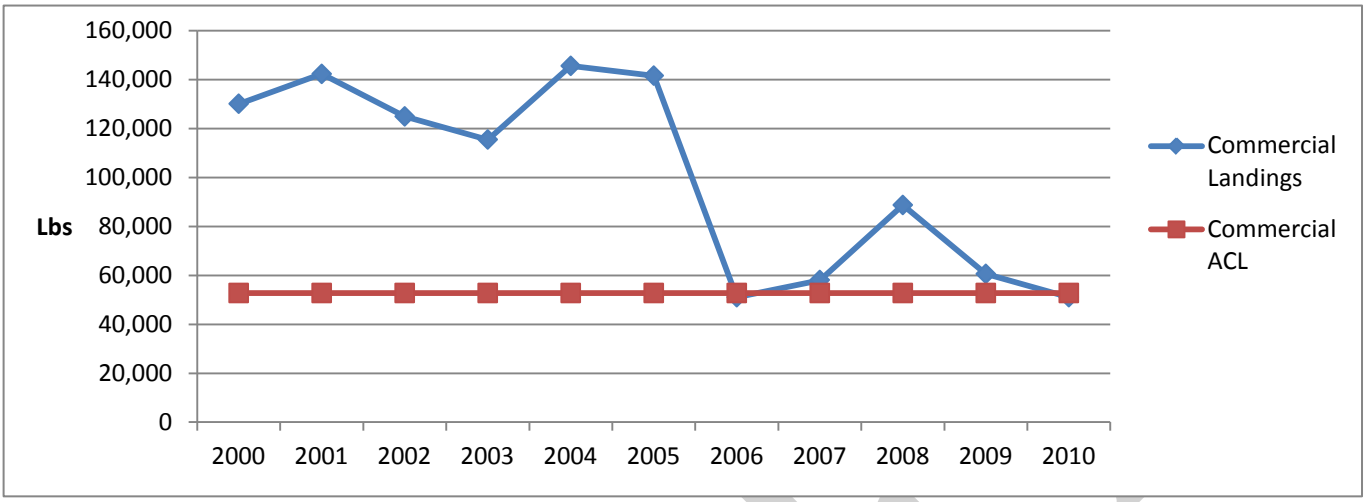

Figure 3-2. Commercial parrotfish landings (pounds (lbs)) in Puerto Rico, 2000 – 2010. Source: SERO/SEFSC.

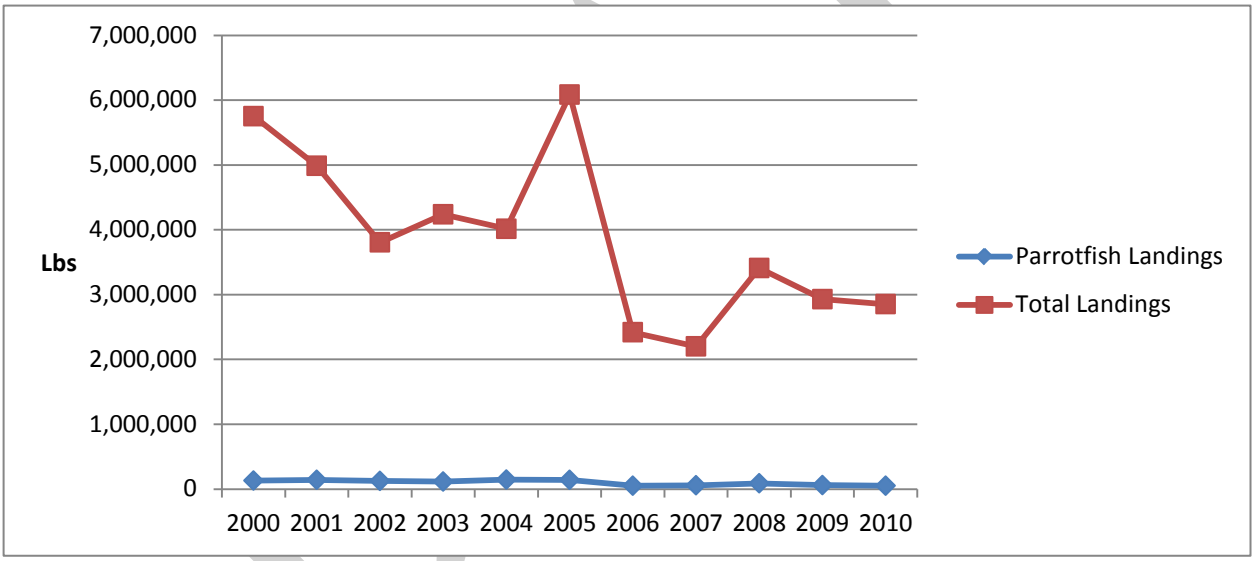

Figure 3-3. Total commercial (all species) and parrotfish commercial landings, 2000 - 2010. Source: SERO/SEFSC.

Commercial fishermen of Puerto Rico harvest parrotfish with multiple gears and methods: traps, line, nets, and diving. From 2000 to 2005, approximately 47 percent of adjusted commercial landings (in pounds) were obtained using nets, followed by traps with 31 percent, and diving with approximately 17 percent. After 2005, the shares of the commercial adjusted catch in Puerto Rico by diving increased, while those by traps and nets declined (Figure 3-4). The average of annual adjusted landings taken by nets from 2000 to 2005 was 62,226 pounds, but from 2006 to 2010 the average was 17,523 pounds, an approximate 72 percent drop.

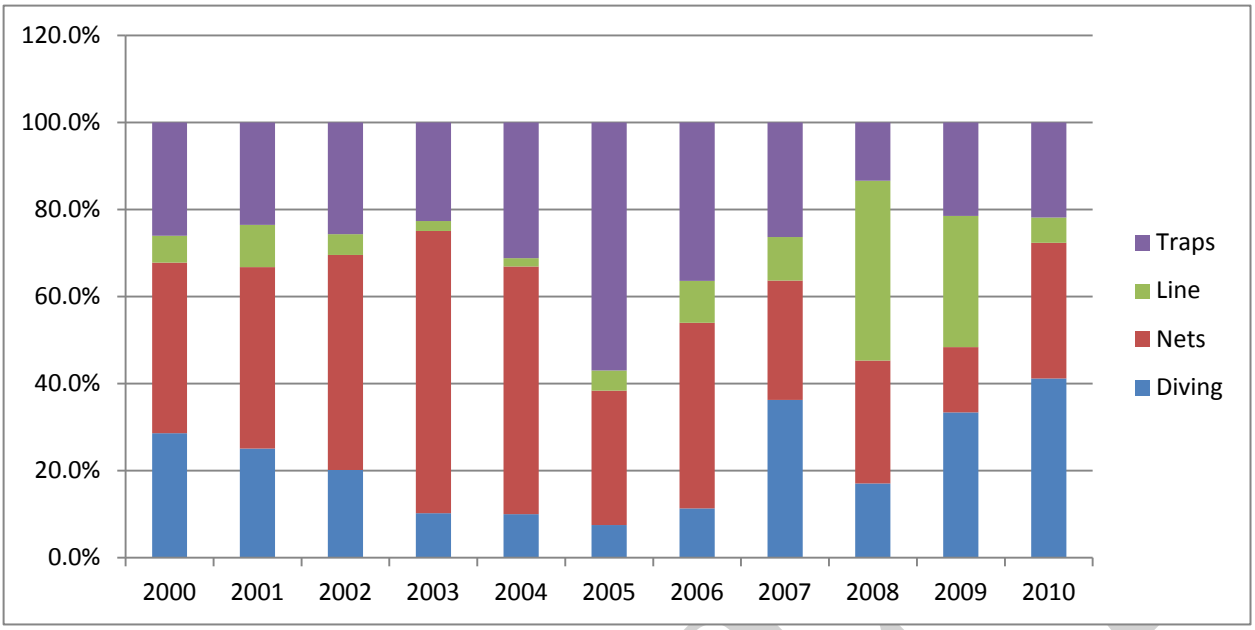

Figure 3-4. Adjusted commercial landings of parrotfish by gear, 2000 – 2010.

Monthly landings of fish, excluding shellfish, tend to show the highest monthly landings in March and April (Figure 3-5), which corresponds to the Christian religious season of Lent. During Lent, demand for seafood tends to increase significantly in Puerto Rico, which motivates increased fishing activity (Griffith *et al*. 2007, vol. 1).

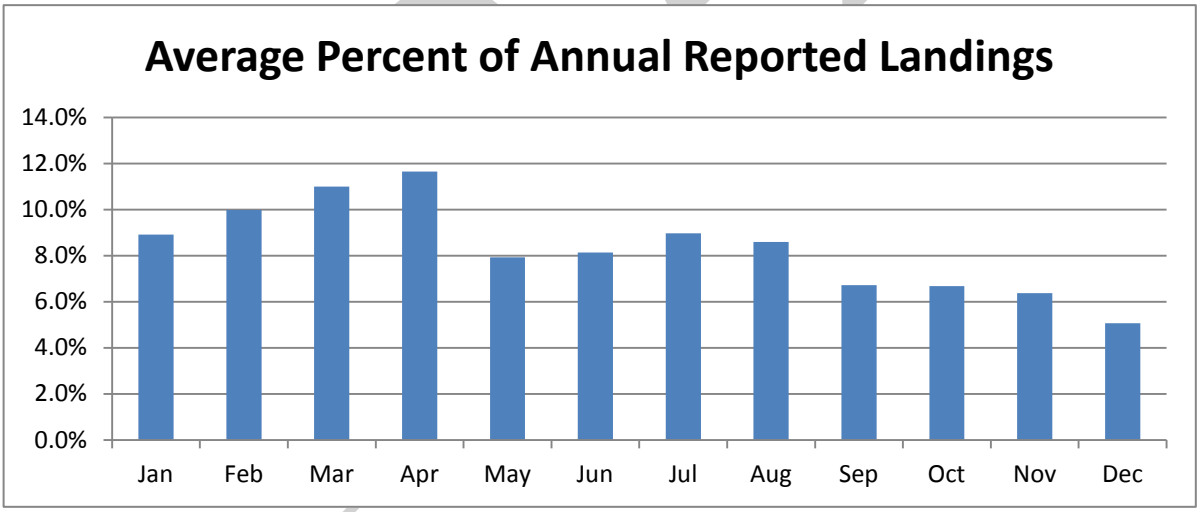

Figure 3-5. Average percent of annual reported commercial landings of parrotfish by month, 2006 – 2010.

Like commercial landings, recreational landings of parrotfish also dropped substantially after the mid-2000s (Figure 3-6). These substantial declines may be explained by federal/territorial area closures and gear restrictions/prohibitions that were imposed after 2004. Note that also like the commercial sector, the recreational parrotfish ACL is substantially greater than recreational landings after 2003.

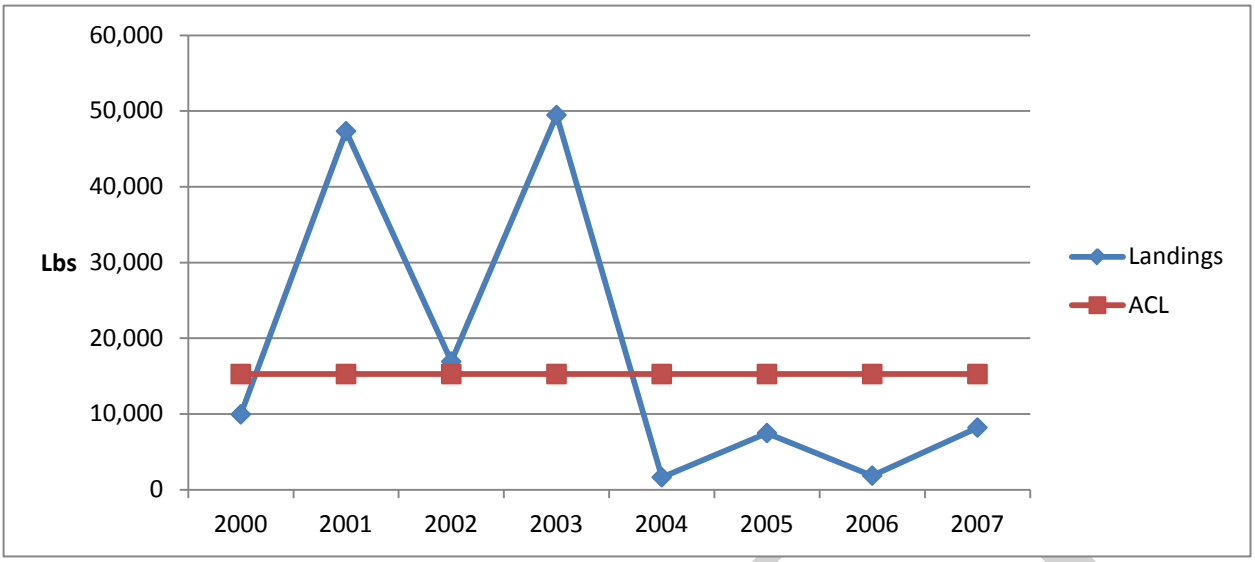

Figure 3-6. Recreational landings of parrotfish in Puerto Rico, 2000 - 2007. Source: Regulatory Impact Review for the 2010 Caribbean ACL Amendment.

Public comment during a scoping meeting for the 2010 Caribbean ACL Amendment indicates parrotfish are harvested exclusively or almost exclusively in territorial waters, and to date, there have been no comments to indicate otherwise. This suggests any regulatory actions that affect fishing in federal waters have little to no impact on commercial and recreational landings of parrotfish in Puerto Rico.

St. Croix

Parrotfish is a traditional and popular food source in St. Croix. Its landings represent from 19 percent to 34 percent of all annual commercial landings from 2000 to 2010 (Figure 3-7). Parrotfish landings range from 162,623 to 433,345 pounds during that time (Figure 3-8).

DRAFT

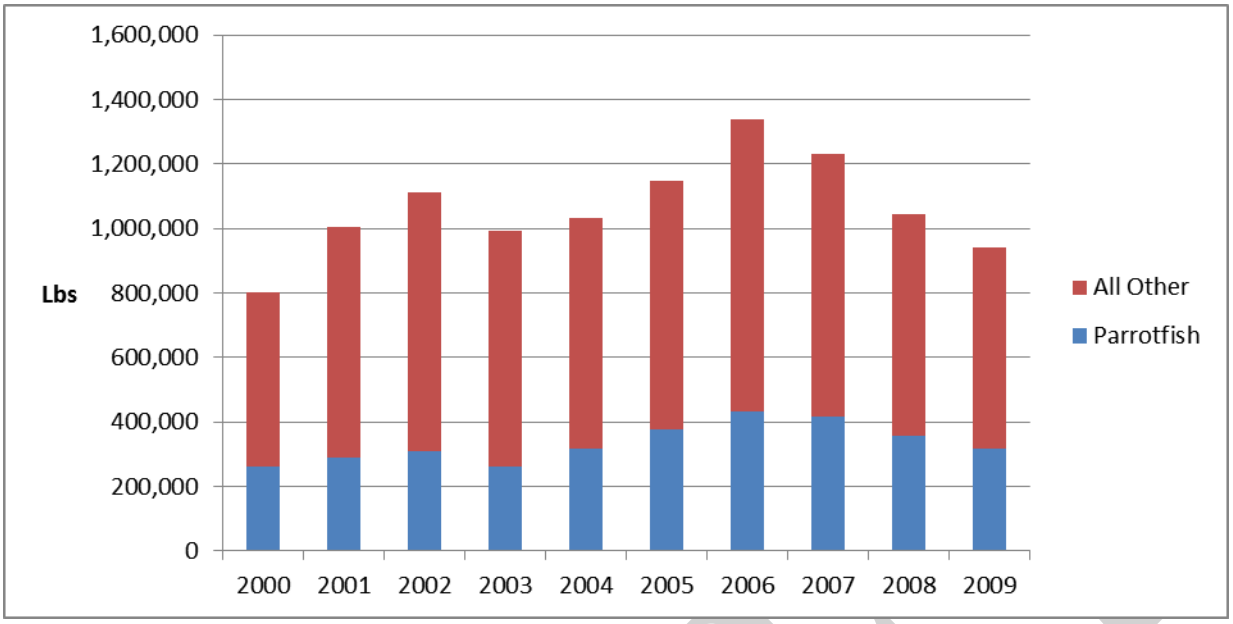

Figure 3-7. Commercial landings of parrotfish and other species in St. Croix, 2000 – 2009. Source: SERO/SEFSC.

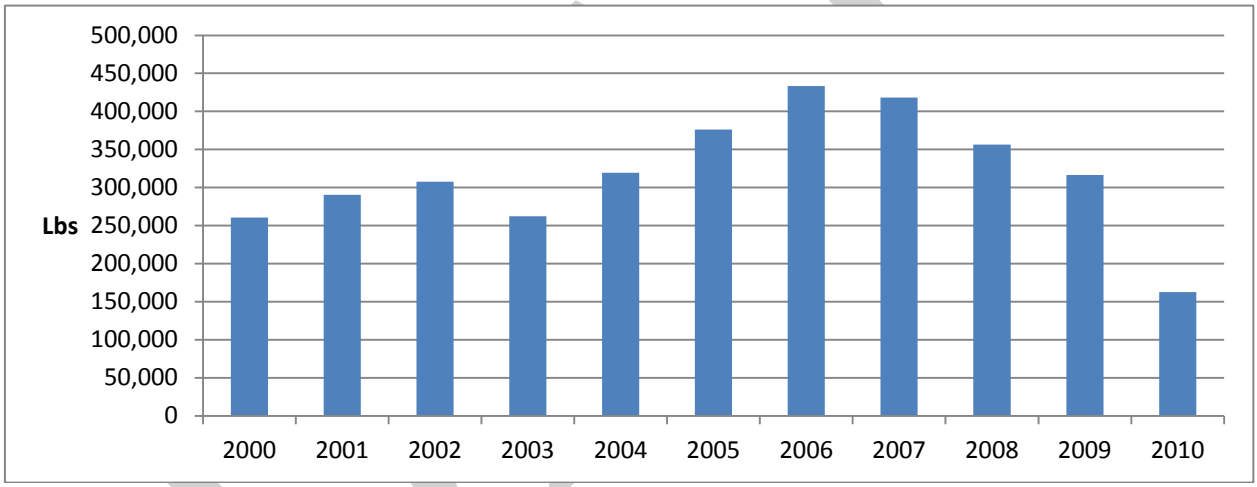

Figure 3-8. Commercial landings of parrotfish in St. Croix, 2000 – 2010. Source: SERO/SEFSC.

Diving (SCUBA and free diving) is, and has been, an increasingly common method of harvesting parrotfish. Since 2003, more than half of the parrotfish that were annually landed were harvested by divers. The trend is increasing, with diving (with or without additionally reported gear) accounting for approximately 64 percent of annual parrotfish landings in 2007, 78 percent of parrotfish landings in 2008, over 90 percent in 2009 and 2010.

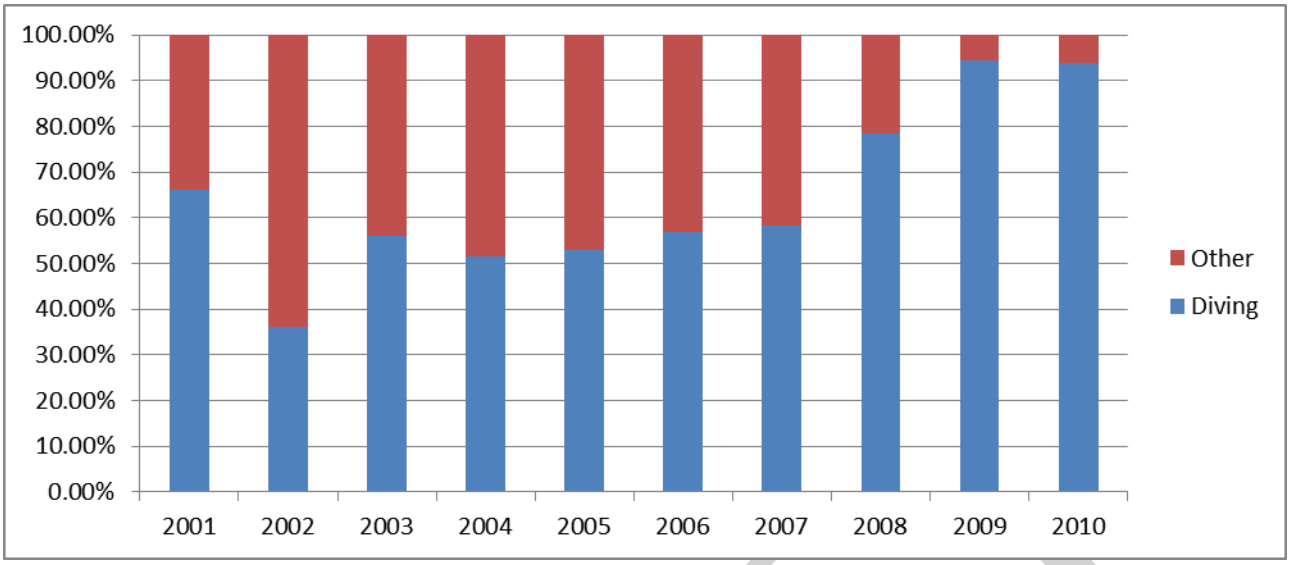

Figure 3-9. Percent of commercial parrotfish landings by gear, 2001 – 2010. Source: SERO/SEFSC.

In the past, gillnet was also a popular method of harvesting parrotfish. From 2000 to 2006, the use of gill nets accounted for approximately 24 percent to 35 percent of annual landings of these species. However, since 2005, the use of trammel nets and gillnets has been prohibited in the EEZ, and since July 2006, the USVI Department of Planning and Natural Resources has prohibited the use of trammel and gill nets in territorial waters, although the territorial ban was not enforced until 2008. In 2007, gillnets accounted for less than 8 percent of parrotfish landings. In 2008 and 2009, gillnets accounted for less than 1 percent of parrotfish landings. While use of gillnets decreased, the share of parrotfish landings by line fishing increased from less than 0.5 percent in 2006 to 4.6 percent in 2007, but then fell to less than 2.5 percent in 2008 and 2009.

Trammel nets, used alone or in combination with other gear, accounted for almost none of the landings from 2000 to 2002, but began to be increasingly used after 2003. Despite the federal ban in 2005 and territorial ban in 2006, the share of parrotfish landings accounted for by trammel nets rose to almost 16 percent in 2007. Trammel net landings represented one tenth of a percent of parrotfish landings in 2008 and zero percent in 2009.

Total annual revenue from parrotfish landings in St. Croix ranged from approximately $0.80 million to $1.49 million, peaking in 2006 (Figure 3-10). During the 2009-2010 fishing season, there were 214 licensed commercial fishermen in St. Croix (Kojis and Quinn 2012). If that number represented the number fishing in 2009 and 2010, the average annual revenue from parrotfish landings per licensed commercial fisherman would have been $5,321 and $3,192, respectively. However, not all licensed fishermen are active each year, nor do they all target parrotfish or other reef fish. For example, 81 percent of St. Croix's licensed commercial fishermen were actively fishing in the 2010-2011 fishing season and approximately 80 percent reported that they targeted reef fish, but not equally (Kojis and Quinn 2012). Reef fish species are the most important species for approximately 72 percent of St. Croix's commercial fishermen, but rank third or less for almost 14 percent of them (Figure 3-11).

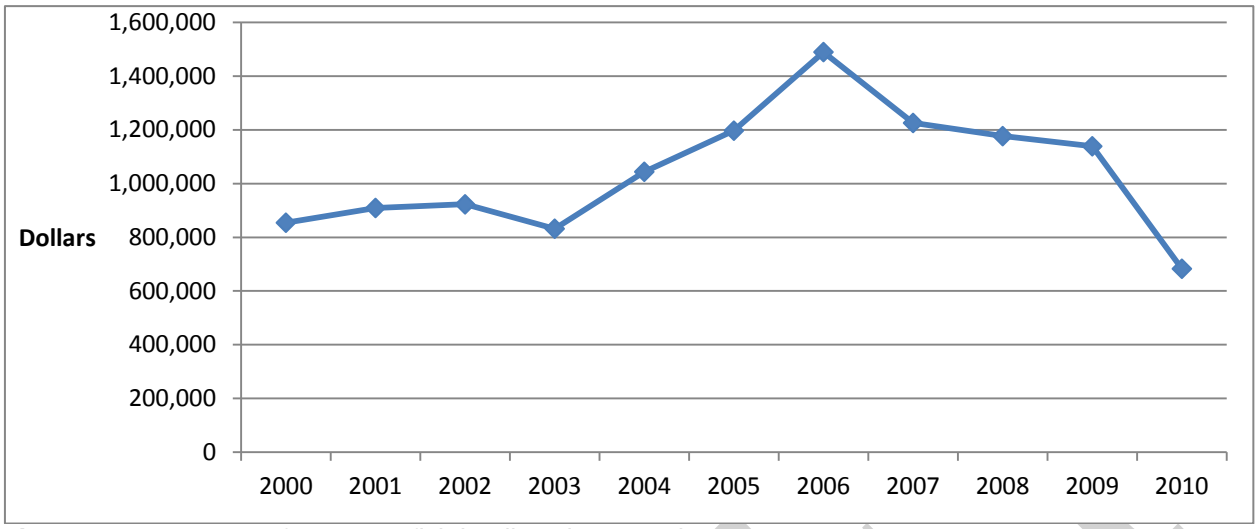

Figure 3-10. Revenue from parrotfish landings in St. Croix, 1999 – 2010.

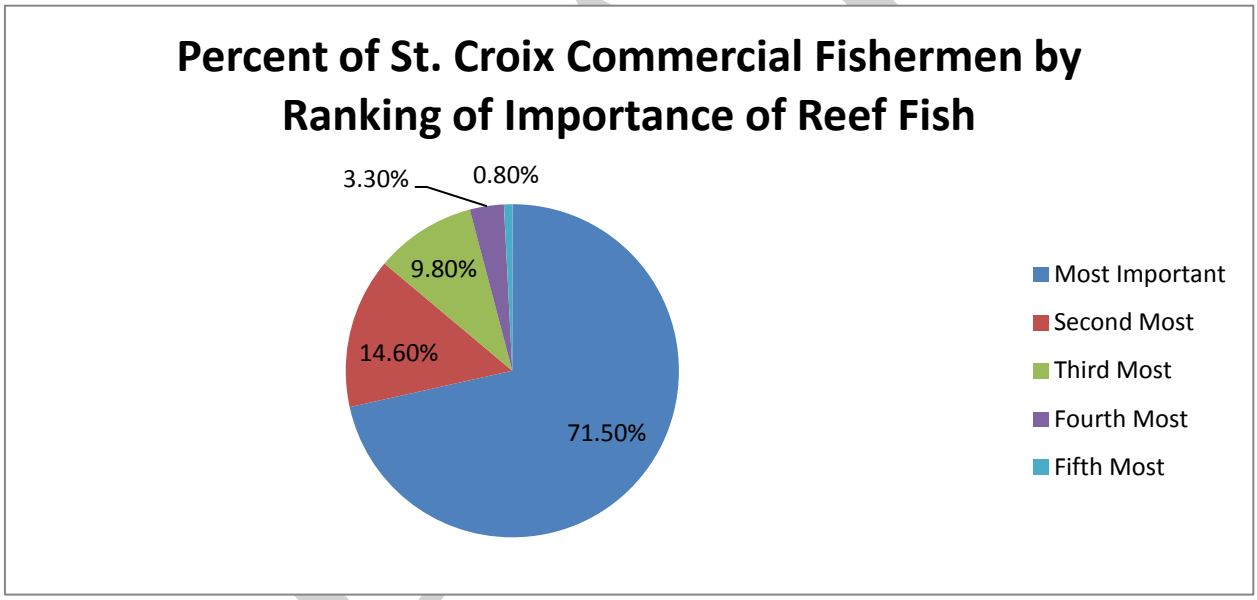

Figure 3-11. Percent of commercial fishermen by their ranking of importance of reef fish in their catch. Source: Kojis and Quinn 2012.

The average ex-vessel (nominal) price of a pound of parrotfish was $3.30 from 2000 to 2010. During that time, the ex-vessel price demonstrated generally increasing trend (Figure 3-12). In St. Croix, fishermen often sell directly to the customer, so the distinction between ex-vessel price and retail price is blurred.

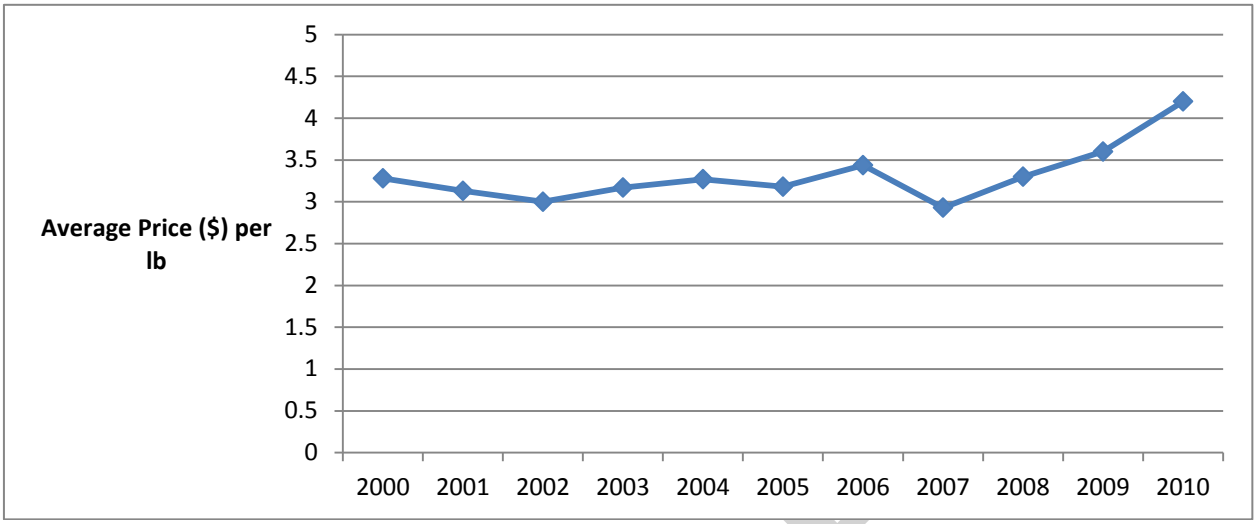

Figure 3-12. Average nominal price per pound of parrotfish in St. Croix, 1999 – 2010.

The Regulatory Impact Review (RIR) for the 2010 Caribbean ACL Amendment used the average of 2006 and 2007 annual landings as baseline landings to estimate the overage of landings and adverse economic impacts caused by the St. Croix parrotfish ACL. It was estimated that St. Croix's commercial fishermen would collectively lose up to 121,247 pounds (approximately 34 percent) of parrotfish landings at a value of $606,235 annually (Figure 3-13A). That dollar estimate assumed an average price of $5 per pound, which is an overestimate as evidenced in Figure 3-10. If parrotfish landings continue to represent a third of all commercial landings (pounds) in St. Croix as they did in 2006 and 2007, the 34 percent reduction in parrotfish landings caused by implementation of the Parrotfish ACL would reduce all commercial landings (pounds) by approximately 11 percent.

DRAFT

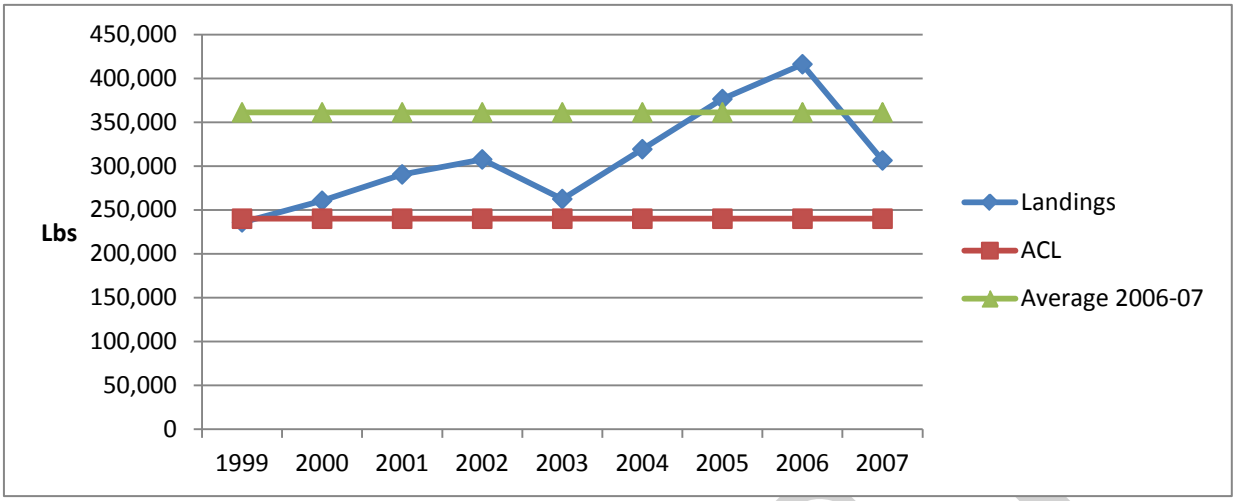

Figure 3-13A. Annual parrotfish landings in St. Croix and ACL, 1999 – 2007. Source: Regulatory Impact Review for the 2010 Caribbean ACL Amendment.

Recent updates of St. Croix's parrotfish landings show higher landings in 2006 and 2007 and the same for the previous years (Figure 3-13B). The revised figures increase 2006 landings by approximately 4 percent and 2007 landings by approximately 37 percent. If the revised landings were used for baseline parrotfish landings in the estimate of the impacts of the parrotfish ACL, the annual loss to St. Croix's commercial fishermen would be up to 185,835 pounds of parrotfish with a value of $0.93 million.

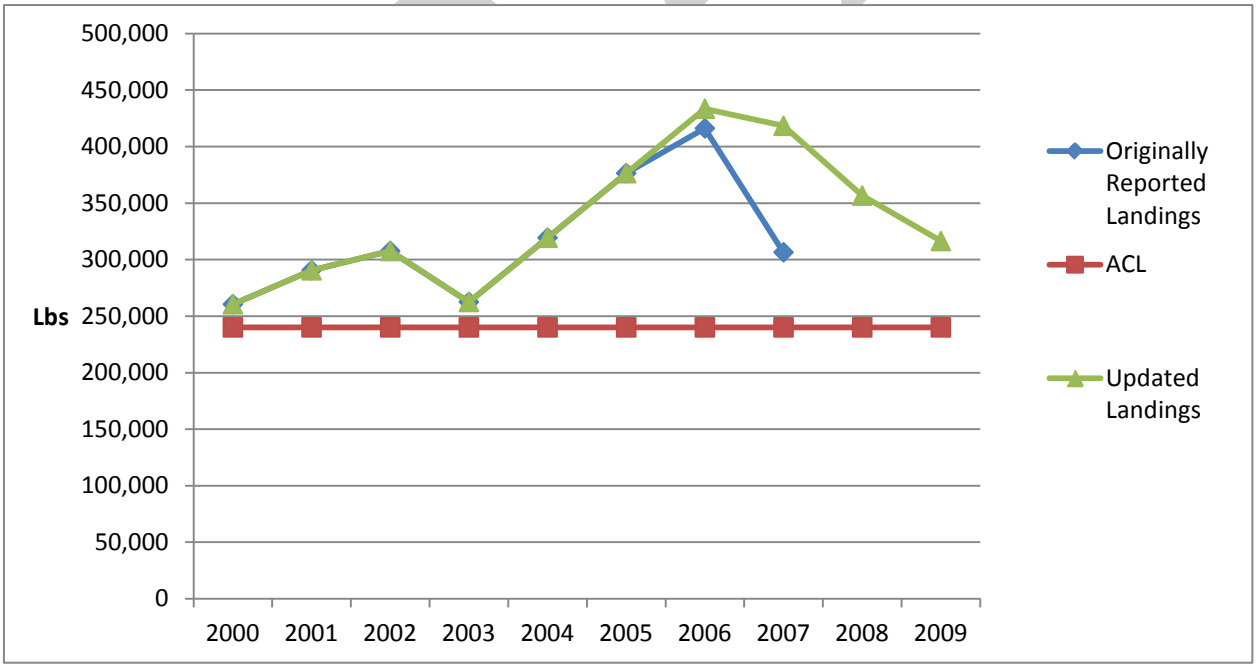

Figure 3-13B. Updated parrotfish landings in St. Croix, 2000 – 2009, St. Croix Parrotfish ACL, and previously reported 2006 and 2007 landings used in the Regulatory Impact Review for the 2010 Caribbean ACL Amendment.

It is reasonable to expect that enforcement of the St. Croix parrotfish ACL would substantially decrease the market supply of parrotfish and cause its price to significantly increase. Given the recent shutdown of the HOVENSA refinery and its associated adverse economic impacts, such as increases in fuel prices and decreases in household incomes and employment in St. Croix, the total adverse economic impact of the ACL on individuals and households could be significantly greater than initially estimated, should market demand for parrotfish increase in response to it being a local comfort food.

Recreational landings data are not available for the USVI. Consequently, recreational landings of parrotfish in St. Croix are unknown.

St. Thomas/St. John Landings

Parrotfish do not have the same economic or cultural significance in St. Thomas/St. John as they do in St. Croix. While parrotfish landings represented over a quarter to over a third of all commercial landings in St. Croix, they represented less than a tenth of all commercial landings in St. Thomas/St. John from 2000 to 2009 (Figure 3-14).

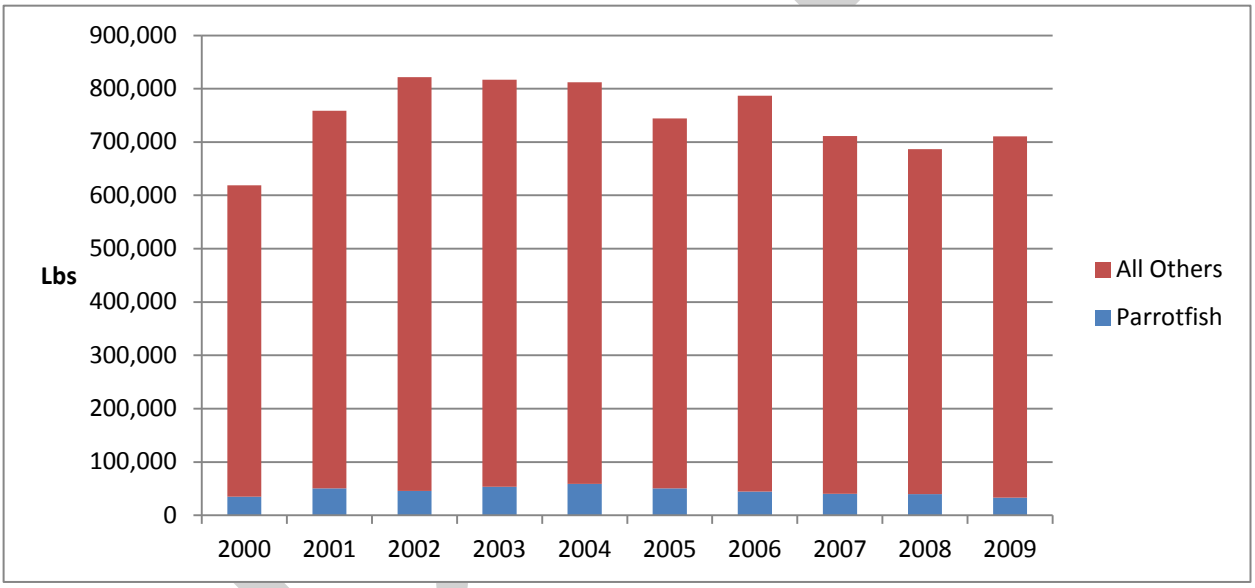

Figure 3-14. Commercial landings of parrotfish and all other species in St. Thomas/St. John, 2000 – 2009.

The large majority of parrotfish harvested in St. Thomas/St. John are caught in traps. From 2000 to 2007, an average of approximately 95 percent of the district's annual parrotfish landings was attributable to traps used alone or in combination with line fishing and diving (Figure 3-15). In 2008 and 2009, traps accounted for 98 percent and 94 percent of all landings, respectively. Diving, alone or in combination with other gears, accounted for approximately 4 percent of the St. Thomas/St. John's annual landings of parrotfish, which differs significantly from diving's substantial contribution to annual parrotfish landings in St. Croix.

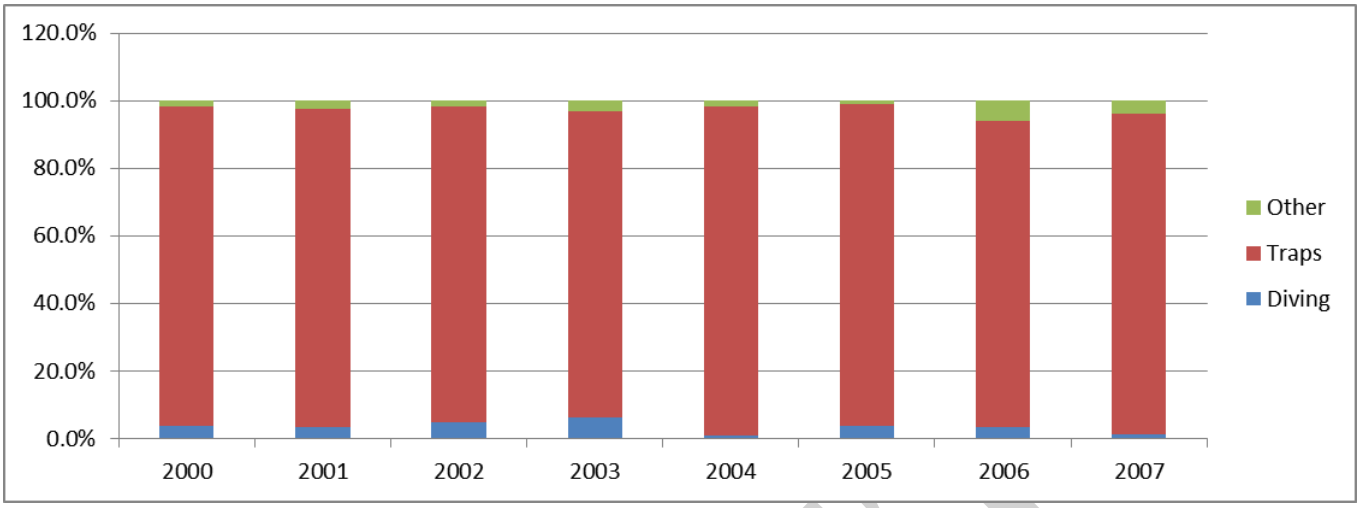

Figure 3-15. Percent of commercial parrotfish landings in St. Thomas/St. John by gear, 2000 – 2007.

The estimated average nominal price per pound of parrotfish ranged from $3.13 to $4.20 in St. Thomas/St. John from 2000 to 2007. Ex-vessel revenues from landings of parrotfish are estimated to have ranged from $119,046 to $202,840 in St. Thomas/St. John (Figure 3-16). During these same years, ex-vessel revenues of parrotfish in St. Croix are estimated to have ranged from $0.85 million to $1.49 million.

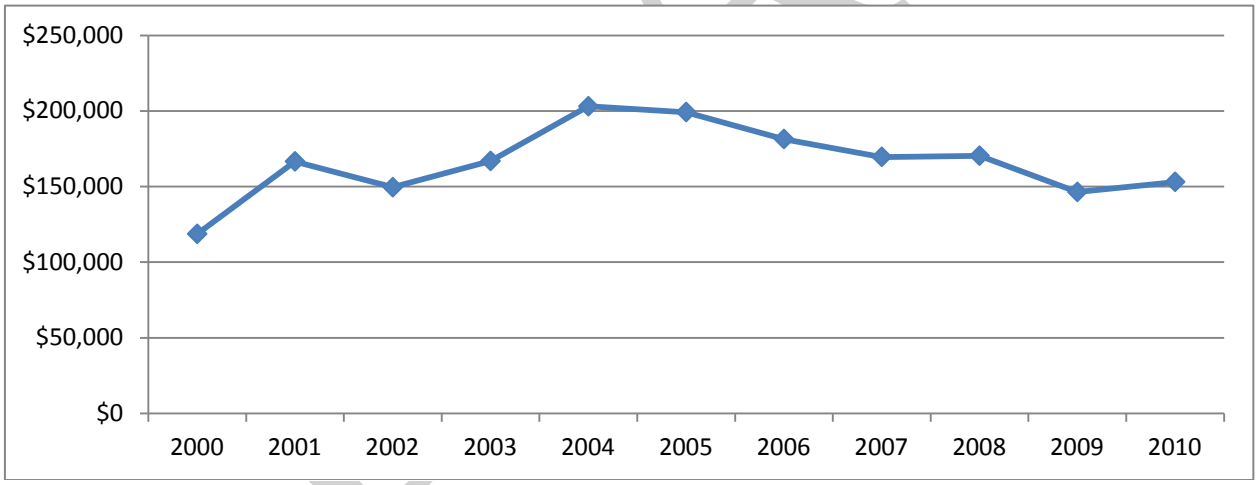

Figure 3.16. Estimated revenue from parrotfish landings in St. Thomas/St. John, 2000 – 2007. Source: SERO/SEFSC

The RIR for the 2010 Caribbean ACL Amendment used the average of 2006 and 2007 annual landings as baseline landings to estimate the overage of landings and adverse economic impacts caused by the St. Thomas/St. John parrotfish ACL. It was estimated St. Thomas/St. John's commercial fishermen would collectively lose up to 1,006 pounds (approximately 2.4 percent) of parrotfish landings at a value of $1,510 annually (Figure 3-17A). That dollar estimate assumed an average price of $5 per pound, which is an overestimate.

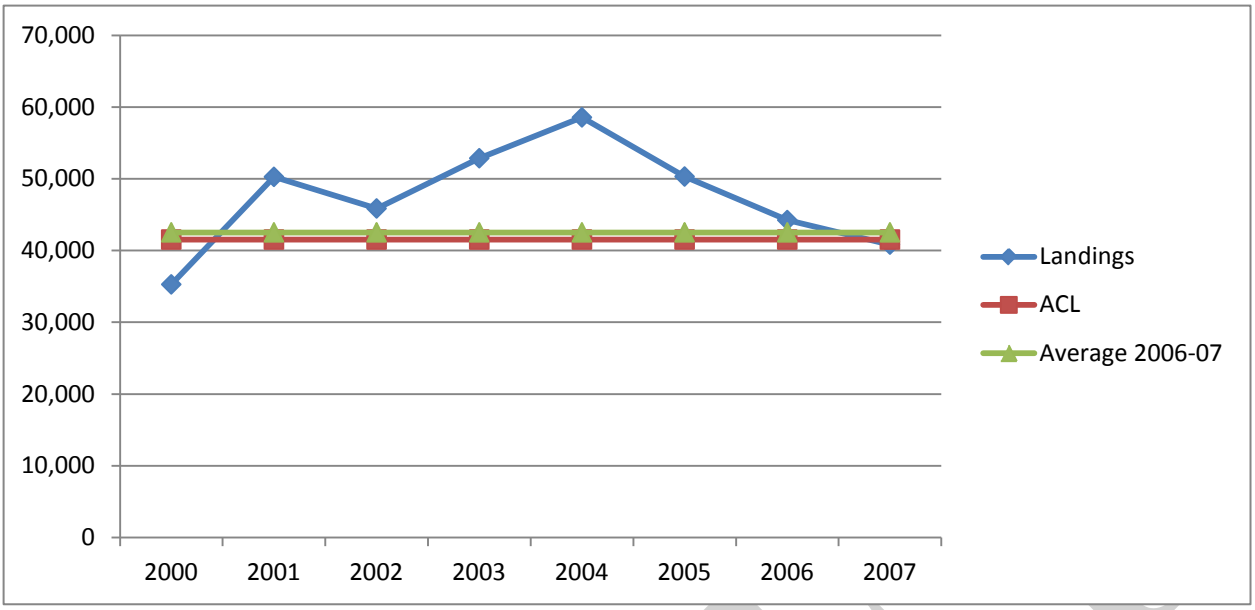

Figure 3-17A. Annual parrotfish landings in St. Thomas/St. John and ACL, 2000 – 2007. Source: Regulatory Impact Review for the 2010 Caribbean ACL Amendment.

Recent updates of the St. Thomas/St. John parrotfish landings show no change in landings in 2006, slightly lower landings in 2007, and little to no change in previous years. If the revised 2006 and 2007 landings were used for baseline parrotfish landings in the estimate of the impacts of the parrotfish ACL (Figure 3-17B), the annual loss to St. Thomas/St. John commercial fishermen would be up to 785 pounds of parrotfish with a value of $3,926 if the average price is $5 per pound or $3,140 if $4 per pound. However, if annual baseline landings were less than the ACL – as suggested by 2008 and 2009 landings, there would be no annual loss to St. Thomas/St. John fishermen because of the ACL.

DRAFT

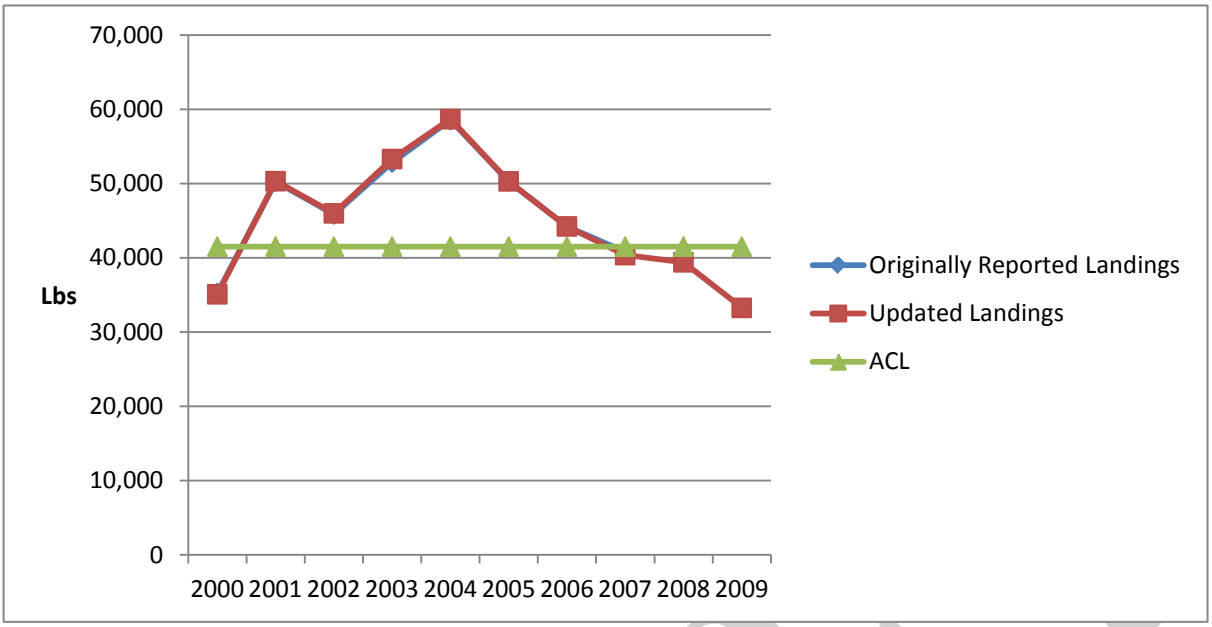

Figure 3-17B. Updated parrotfish landings in St. Thomas, 2000 – 2009, St. Thomas Parrotfish ACL, and previously reported 2006 and 2007 landings used in the Regulatory Impact Review for the 2010 Caribbean ACL Amendment.

As of March 2011, there were 120 licensed commercial fishermen in St. Thomas/St. John. The average annual loss of parrotfish landings to a fisherman because of the ACL, assuming the baseline of annual landings is the average of 2006 and 2007 landings, would be up to 7 pounds with a value of $35 if the average price were $5 per pound or $32 if $4 per pound. The average annual loss would be zero per fisherman if 2008 and 2009 landings represent the baseline. However, not all of these licensed fishermen were active and St. Thomas/St. John commercial fishermen do not equally target parrotfish and other reef fish.

Approximately 85 percent of St. Thomas/St. John commercial fishermen target reef fish and among those that do, 78 percent report reef fish as their primary target (Kojis and Quinn 2012). Another 21 percent of fishermen report reef fish as their second most targeted fish.

Recreational landings of parrotfish in St. Thomas/St. John are unknown.

DRAFT

3.3.2 Economic and Social Environments of USVI

Like the countries of the Caribbean Regional Fisheries Mechanism (CRFM), the USVI's commercial fisheries sector is an important contributor to income, employment, food and nutritional security, and social and economic stability. Fisheries shape the culture of the USVI people, and make an important contribution to attainment of food and nutrition security. Fish is a prime source of animal protein for the CRFM and USVI populations. During the three-year period from 2003 to 2005, USVI per capita consumption of fish and shellfish averaged 29.6 pounds as compared to 1.8 pounds in Puerto Rico, 94.9 pounds in Antigua, 53.4 pounds in the U.S., and 22.3 pounds in the Dominican Republic (*Fisheries Statistics of the United States 2008*). During the same 3-year period, average per capita commercial landings were approximately 16.6 pounds, which represented up to 56 percent of consumed fish and shellfish. More recent data indicates per capita consumption of seafood has declined in both Puerto Rico and the USVI (SEFSC, personal communication, December 2012).

The fisheries sector in the USVI is a safety net in that it provides employment and livelihood opportunities for some of the most socio-economically disadvantaged in St. Croix and St. Thomas/St. John, including the least formally educated, racial and ethnic minorities, and the poor, who have limited occupational mobility and limited access to capital. Moreover, as a safety net, commercial fishing provides food for personal and family consumption, and approximately 5 percent of USVI commercial fishermen engage in subsistence fishing (Kojis and Quinn 2012).

Fish is an important source of easily digested high quality protein containing essential amino acids, particularly lysine, which is not easily obtainable elsewhere in such high concentrations. Nutritionists have known for decades that seafood is a low-fat source of top-quality protein, and that the health benefits of eating seafood make it one of the best choices for growing children, active adults, and the elderly. Recent studies show that eating seafood can decrease your risk of heart attack, stroke, obesity, and hypertension. Fish have health benefits in protection against cardiovascular disease, assist in brain and nervous system development, in fetal and infant development and seems to offer some protection against diabetes, chronic infections, and certain types of cancer. In January 2011, the U.S. Department of Agriculture (USDA) updated their Dietary Guidelines, recommending that consumers eat at least two servings of seafood each week and that women who are pregnant or breastfeed eat 8 to 12 ounces of seafood per week (NOAA Fish Watch: http://www.nmfs.noaa.gov/fishwatch/seafood_and_health.htm).

Hunger has been a serious problem in the USVI. According to Governor deJongh's November 2011 Proclamation to Proclaim Hunger and Homelessness Week in the USVI, the Virgin Islands Interagency Council on Homeless and the Virgin Islands Continuum of Care in Homelessness recognize that homelessness and hunger are serious problems facing many individuals and families in the USVI.

DRAFT

USVI Resident and Fishermen Populations in Context

The population of the USVI grew during the decade from 1990 to 2000 then fell from 2000 to 2010 (Table 3-5). The recent decline in population is not unique. Puerto Rico's population also declined, as did the populations of the U.S. Commonwealth of the Northern Mariana Islands and American Samoa.

Table 3-5. USVI population. Source: U.S. Census 1990, 2000, and 2010.

Year	Residents	Change	Change
1990	101,809		
2000	108,612	6,803	6.68%
2010	106,504	-2,108	-1.94%

The decline of the USVI population is not spread evenly across the island areas. While the populations of St. Croix and St. John decreased, that of St. Thomas grew. During the decade from 2000 to 2010, St. Croix lost 2,633 residents and St. John lost 27 residents, while St. Thomas gained 453 residents (Table 3-6). In 2000, St. Thomas/St. John had 2,144 more residents than St. Croix, but by 2010, St. Thomas/St. John had more than 5,203 residents than St. Croix.

Table 3-6. USVI population by island area, 1999 to 2010. Source: U.S. Census, 1990, 2000, and 2010.

Year	St. Croix	St. John	St. Thomas	USVI	% STX	% STJ	% STT
1990	50,139	3,504	48,166	101,809	49.25%	3.44%	47.31%
2000	53,234	4,197	51,181	108,612	49.01%	3.86%	47.12%
2010	50,601	4,170	51,634	106,405	47.56%	3.92%	48.53%

Not all areas of St. Croix lost residents. There were population gains in the East End subdistrict and in the town of Frederiksted, although the Frederiksted subdistrict lost almost 18 percent of its population from 2000 to 2010 (Figure 3-18). In St. Thomas/St. John, there were gains in the number of residents in the East End, Northside, Water Island, West End, and Central subdistricts (Figures 3-19 and 3-20).

DRAFT

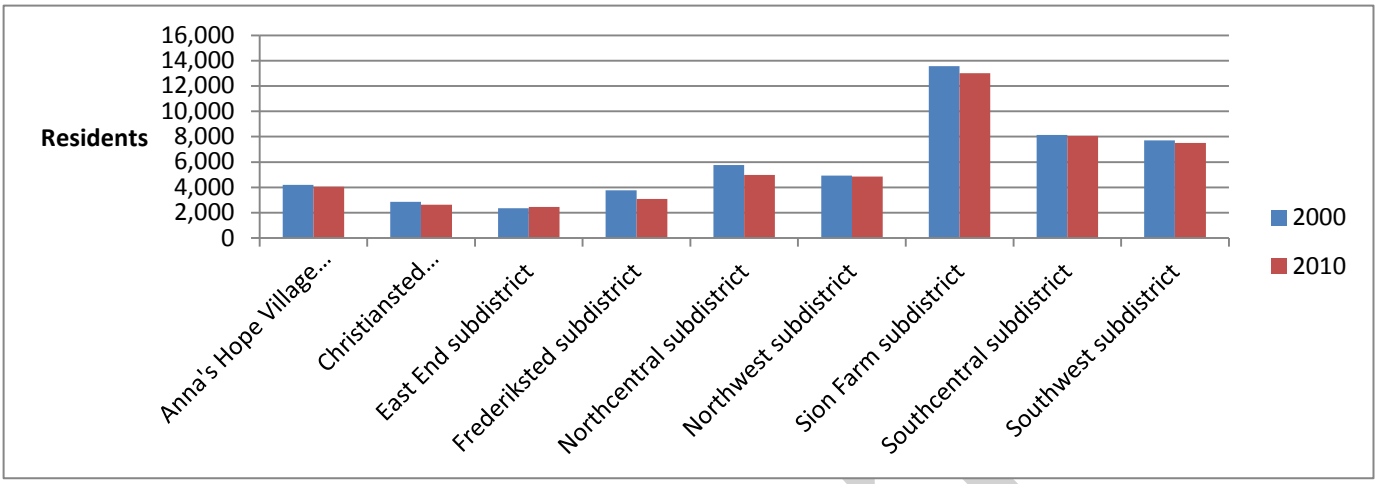

Figure 3-18. Resident populations of St. Croix subdistricts, 2000 and 2010. Source: U.S. Census.

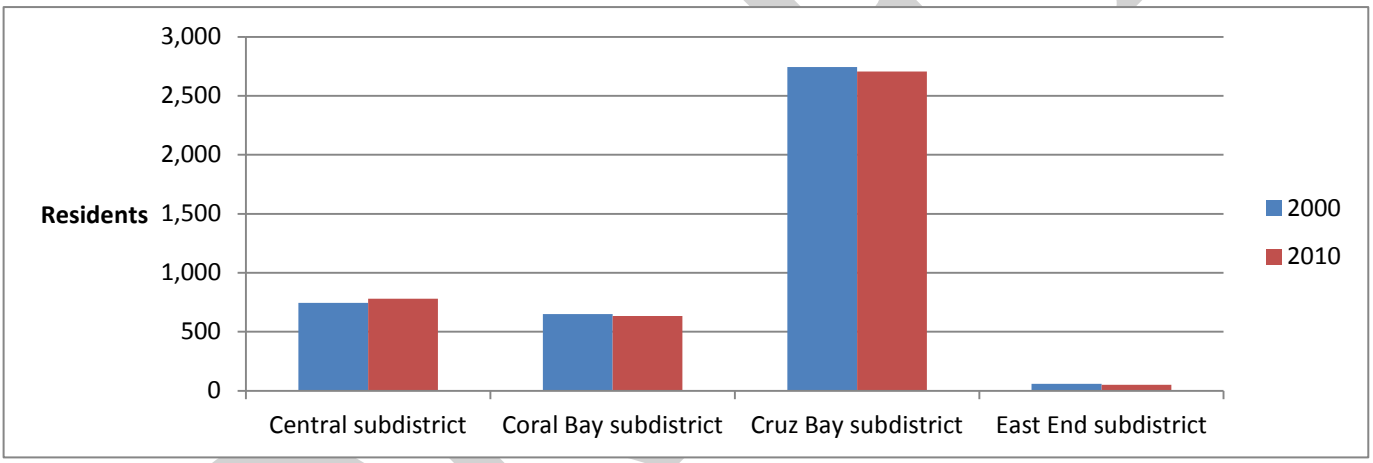

Figure 3-19. Resident populations of St. John subdistricts, 2000 and 2010. Source: U.S. Census.

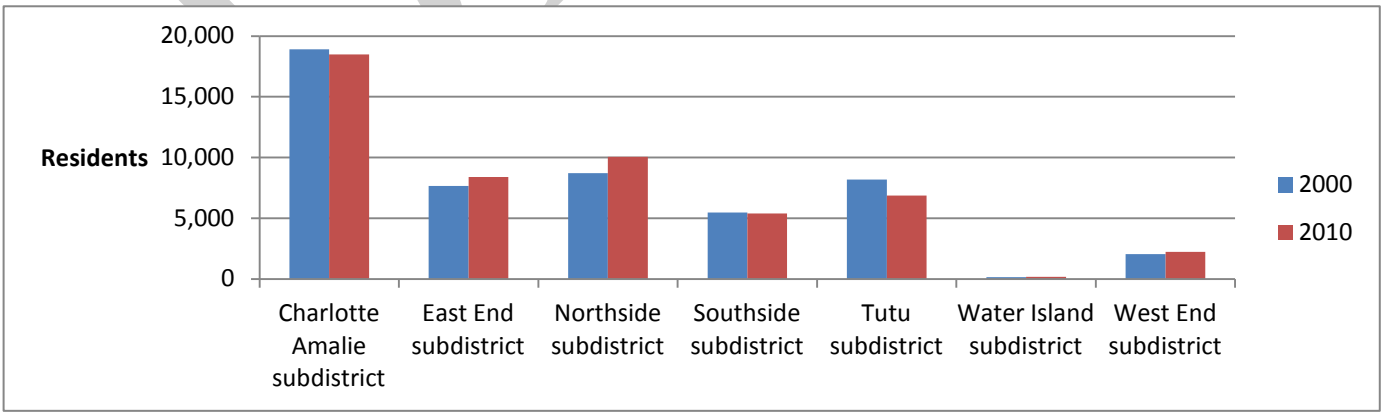

Figure 3-20. Resident populations of St. Thomas subdistricts, 2000 and 2010. Source: U.S. Census.

The number of licensed commercial fishermen in the USVI has also declined. According to Kojis and Quinn (2012), there were 401 licensed commercial fishermen on the Department of Fish and Wildlife (DFW) registration list for the 2009-2010 year and as of March 15, 2011, there were 297, which is a 26 percent decline (Table 3-7). The number of licensed commercial fishermen in St. Croix declined by approximately 17 percent and in St. Thomas/St. John by approximately 39 percent.

Table 3-7. Number of licensed commercial fishermen. Source: Kojis and Quinn 2012.

Area	Licensed Commercial Fishermen	
	2009-10	March 2011
St. Croix	214	177
St. Thomas/St. John	187	120
USVI	401	297

The age distribution of the USVI changed from 1990 to 2000 as the average resident got older (Table 3-8). The median age in 2000 was 5.1 years older than in 1990. The median age of residents increased across all islands. In 2000, 52.2 percent of the USVI population was female and 47.8 percent male.

Table 3-8. Percent of population by age. Source: Census 1990 and 2000.

Years of age	Percent of Population							
	USVI		St. Croix		St. Thomas		St. John	
	1990	2000	1990	2000	1990	2000	1990	2000
Under 5	9.1%	7.9%	9.4%	8.4%	8.7%	7.4%	8.1%	7.0%
Under 18	34.8%	31.6%	37.3%	34.1%	32.7%	29.5%	27.6%	24.9%
18 to 24	10.6%	8.0%	10.3%	7.9%	11.0%	8.2%	8.7%	7.0%
25 to 44	29.2%	27.1%	27.4%	25.2%	30.3%	28.7%	39.3%	32.0%
45 to 64	19.1%	24.9%	19.0%	24.3%	19.3%	25.2%	18.3%	29.0%
65 and over	6.4%	8.4%	6.0%	8.4%	6.7%	8.4%	6.1%	7.2%
80 and over	1.0%	1.5%	0.9%	1.4%	1.1%	1.6%	0.7%	1.3%
	Years of Age							
Median	28.2	33.4	26.8	31.9	29.1	34.4	32.4	36.7

The average USVI commercial fisherman has also aged. In 2004, the average St. Croix commercial fisherman was 51.4 years old and in 2010-2011 was 54 years old. Similarly, the average St. Thomas/St. John commercial fisherman was 48.6 years old in 2004 and 52 years old in 2010-2011. In 2010-2011, the ranges of age of commercial fishermen were from 17 to 78 years in St. Thomas/St. John and from 18 to 80 years old in St. Croix (Figure 3-21). In St. Croix, the highest percent of fishermen were 61 to 70 years old, while the highest percent of fishermen in St. Thomas/St. John were from 51 to 60 years old. Less than 10 percent of fishermen were 30 years old or younger.

DRAFT

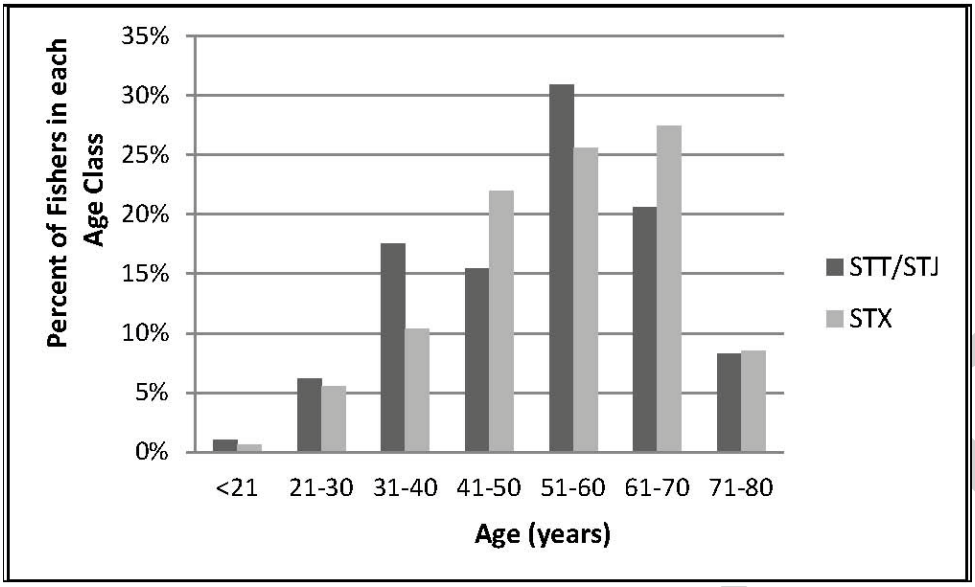

Figure 3-21. Percent of licensed commercial fishermen by age, 2010-11. Source: Kojis and Quinn 2012, p. 12.

The 2010-2011 census of USVI fishermen did not include a question regarding the gender of a fisherman. However, based on names and local knowledge of the community, Kojis and Quinn (2012) estimate one woman in St. Croix and two women in St. Thomas/St. John had commercial fishing licenses (Kojis and Quinn 2012). These three women represented 1 percent of all licensed commercial fishermen in the USVI. This is not to suggest that women's time spent in fishing and fishing related activities is similarly 1 percent. Although men tend to engage in the harvesting and marketing of seafood (and have a commercial license to do so), women tend to play supportive roles such as transporting gear and fish, cleaning fish, completing paperwork, and so forth (Impact Assessment Inc 2007). The 2010-2011 census did not include a question concerning if others, such as spouses or children, are regularly involved in fishing related activities and how much time they devote to these activities on a weekly basis. Instead, the census asked how much time the licensed commercial fisher spent on fishing and fishing related activities.

A large majority of the USVI's population is non-White. In 2000, 76.2 percent of the population was Black or African American, 13.1 percent was White, 7.2 percent was another race, and 3.5 was multiracial (Table 3-9). Fourteen percent of the population was Hispanic or Latino. Although Blacks and African Americans are a majority racial population in the USVI, they comprise a minority population in the U.S. Caribbean and U.S. as a whole. Similarly, although Hispanic or Latinos are a minority ethnic population in the USVI and U.S., they represent a majority population in the U.S. Caribbean. Approximately 56 percent of Hispanics/Latinos in the USVI originate from Puerto Rico.

DRAFT

Table 3-9. USVI population by race, 2000. Source: U.S. Census Bureau, Census 2000.

Race	Number	Percent
One race	104,820	96.5
White	14,218	13.1
Black or African American	82,750	76.2
Other races	7,852	7.2
Two or more races	3,792	3.5
Ethnicity	**Number**	**Percent**
Hispanic or Latino	15,196	14.0
Mexican	308	0.3
Puerto Rican	8,558	7.9
Cuban	141	0.1
Other Hispanic or Latino	6,189	5.7
Not Hispanic or Latino	93,416	86.0

Blacks/African Americans represent significantly different proportions of the populations across the USVI. In 2000, approximately 81 percent of the population of St. Thomas was Black or African American, followed by 73 percent of the population of St. Croix and 38 percent of the population of St. John (Table 3-10). The percent of the population that is Hispanic or Latino also varies substantially, with 21.2 percent of St. Croix's population, 7.3 percent of St. Thomas's population, and 4.9 percent of St. John's population being Hispanic/Latino. The Hispanic/Latino population is spread across St. Croix; however, concentrations of Hispanic, mostly Puerto Rican, communities are noticeable in the towns of Christiansted and Frederiksted. In 2000, Hispanics/Latinos represented almost 27 percent of the residents of Christiansted and 26.4 percent of the residents of Frederiksted. For example, Christiansted includes the neighborhood of Barrio Machuchal, where the flag of Puerto Rico can be seen on rooftops and Spanish is heard on every corner (Villaneuva Feliciano 2009).

Table 3-10. St. Croix, St. John and St. Thomas Populations by Race, 2000. Source: U.S. Census Bureau, Census 2000.

Race	St. Croix		St. John		St. Thomas	
	Number	Percent	Number	Percent	Number	Percent
Total Population	**53,234**		**4,197**		**51,181**	
One race	50,901	95.6%	4,115	98.0%	49,804	97.3%
White	6,175	11.6%	1,587	37.8%	6,456	12.6%
Black or African American	39,045	73.3%	2,419	57.6%	41,286	80.7%
Other races	1,420	2.7%	109	2.6%	2,062	4.0%
Two or more races	2,333	4.4%	82	2.0%	1,377	2.7%
Hispanic or Latino (of any race)	11,277	21.2%	207	4.9%	3,712	7.3%

A significant percent of the USVI population is composed of residents who were born in a foreign country. Approximately 31 percent of St. Croix residents and 37 percent of St. Thomas/St. John residents were born in a foreign country (Table 3-11). Approximately 6 percent of St. Croix residents were born in Puerto Rico or other U.S. islands, while only 2 percent of those in St. Thomas and St. John were so born.

DRAFT

Table 3-11. USVI population by place of birth. Source: Census 2000.

Population by Place of Birth	STX	% STT	STT/STJ	% STT/STJ
Total:	53,234		55,378	
Born in the U.S. Virgin Islands:	26,492	49.8%	25,508	46.1%
St. Croix	24,647	46.3%	1,135	2.0%
St. John	404	0.8%	509	0.9%
St. Thomas	1,441	2.7%	23,864	43.1%
Born in the United States	7,240	13.6%	8,472	15.3%
Born in Puerto Rico or other U.S. Island Area	3,224	6.1%	1,112	2.0%
Born in a foreign country:	16,278	30.6%	20,286	36.6%
Antigua and Barbuda	2,742	5.2%	2,090	3.8%
British Virgin Islands	154	0.3%	2,573	4.6%
Dominica	1,862	3.5%	3,047	5.5%
Dominican Republic	1,338	2.5%	1,856	3.4%
St. Kitts and Nevis	2,659	5.0%	4,395	7.9%
Other foreign country	7,523	14.1%	6,325	11.4%

While Hispanics/Latinos made up approximately 21 percent of St. Croix's population in 2000, they represented 52 percent of St. Croix's licensed commercial fishermen in 2010-2011. According to Kojis and Quinn (2012), many of St. Croix's commercial fishermen, who self-identify as Hispanic, are from Puerto Rico or Dominican Republic. Blacks represent smaller percents of licensed commercial fishermen in the two island areas than Blacks/African Americans in the populations as a whole. While Whites represented approximately 38 percent of the population of St. Thomas and 13 percent of St. Thomas in 2000, Whites represented approximately 57 percent of St. Thomas/St. John licensed commercial fishermen in 2010-2011 (Table 3-12). Approximately 70 percent of St. Thomas/St. John licensed commercial fishermen self-identified as being of French descent.

Table 3-12. Percent of licensed commercial fishermen by race/ethnicity, 2010-2011. Source: Kojis and Quinn 2012.

Race	Licensed commercial fishermen		
	STT/STJ	STX	USVI
Black	39.8%	65.2%	51.6%
Mixed	1.9%	16.9%	8.9%
White	57.3%	15.7%	38.0%
Other	1.0%	2.2%	1.6%
Total	100.0%	100.0%	100.1%
Ethnicity			
Hispanic or Latino	3.6%	52.0%	34.6%

DRAFT

The majority of households in St. Croix and St. Thomas are occupied by Black/African American only householders, while approximately 48 percent of St. John households are occupied by Black/African American only householders and similarly by White only householders (Table 3-13). The percent of households occupied by Hispanic/Latino households similarly varies (Table 3-14). While almost 20 of every 100 households in St. Croix is occupied by a Hispanic/Latino householder, less than 4 of every 100 households in St. John and less than 8 of every 100 households in St. Thomas is occupied by a Hispanic/Latino householder.

Table 3-13. Households by race of householder. Source: Census 2000.

Households	St. Croix	St. John	St. Thomas	% St. Croix	% St. John	% St. Thomas
Total	19,455	1,735	19,458	100.0%	100.0%	100.0%
1 Race	18,679	1,699	18,936	96.0%	97.9%	97.3%
Black	13,821	840	14,908	71.0%	48.4%	76.6%
White	2,894	825	3,254	14.9%	47.6%	16.7%
American Indian & Alaska Native	78	2	46	0.4%	0.1%	0.2%
Asian	168	9	261	0.9%	0.5%	1.3%
Other	1,718	23	467	8.8%	1.3%	2.4%
2 or More Races	776	36	522	4.0%	2.1%	2.7%
Black and White	37	2	51	0.2%	0.1%	0.3%
Black and Non-White	401	15	213	2.1%	0.9%	1.1%
White and Non-Black	153	11	160	0.8%	0.6%	0.8%
Other combination	185	8	98	1.0%	0.5%	0.5%

DRAFT

Table 3-14. Households by Hispanic or Latino householders and by their race. Source: Census 2000.

Households	St. Croix	St. John	St. Thomas	% St. Croix	% St. John	% St. Thomas
Total	19,455	1,735	19,458	100.0%	100.0%	100.0%
Total Non-Hispanic or Latino	15,609	1,671	18,027	80.2%	96.3%	92.6%
Total Hispanic or Latino	3,846	64	1,431	19.8%	3.7%	7.4%
1 Race	3,507	56	1,319	91.2%	87.5%	92.2%
Black or African American Only	1,329	29	728	34.6%	45.3%	50.9%
White Only	548	7	185	2.8%	0.4%	1.0%
American Indian & Alaska Native	37	0	5	1.0%	0.0%	0.3%
Other	1,593	20	401	41.4%	31.3%	28.0%
2 or More Races	339	8	112	8.8%	12.5%	7.8%

The population of the USVI has been divided by race, color, ethnicity, and class, and race and ethnicity have been conflated as evidenced in *Hispanos Unidos et al. versus Government of the United States Virgin Islands*. The conflation of race and ethnicity may partially explain why, prior to 2010, the census of USVI commercial fishermen identified Hispanic as a racial category in the results of that census. Nonetheless, the actual 2010-2011 census question pertaining to racial identity did not include racial categories for fishermen to choose from and simply asked fishermen to self-identify their "Race," not race(s). Many fishermen continued to self-identify their race as Hispanic, and many of these fishermen were from Puerto Rico and the Dominican Republic whose people are predominantly multiracial (Kojis and Quinn 2012). Kojis and Quinn's (2012) report summarizes the collective responses about race into four categories: Black, Mixed, White, and Other.

The U.S. Census in 2000 asked respondents to identify what language is spoken in their homes and their ability to speak English. A large majority of each USVI island's populations speak English only; however, Spanish, French, French Creole, and other Indo-European languages are also spoken (Table 3-15). Almost one-third of St. Croix's population spoke a language other than English in 2000, almost 25 percent of the population aged 5 years and older spoke Spanish, and almost 6 percent spoke French and French Creole in their homes. Approximately 28 percent of the population aged 5 years and older of St. John and approximately 19 percent of the population in St. Thomas spoke a language other than English in their homes. When conducting the 2010-2011 census of USVI commercial fishermen, it was observed that fewer St. Croix than St. Thomas/St. John fishermen were able to understand the survey questions in English (Kojis and Quinn 2012). An unspecified number of the interviews of fishermen in St. Croix were conducted in Spanish or Spanish and English.

DRAFT

Table 3-15. Percent of population 5 years and older by language spoken at home and ability to speak English. Source: Census 2000.

LANGUAGE SPOKEN AT HOME AND ABILITY TO SPEAK ENGLISH	St. Croix		St. John		St. Thomas	
	Number	Percent	Number	Percent	Number	Percent
Population 5 years and over	48,772	100	3,926	100	47,383	100
English only	33,212	68.10%	2,811	71.60%	38,343	80.92%
Language other than English	15,560	31.90%	1,115	28.40%	9,040	19.08%
Speak English less than "very well"	5,207	10.68%	319	8.13%	3,236	6.83%
Spanish	11,823	24.24%	854	21.75%	4,659	9.83%
Speak English less than "very well"	4,246	8.71%	246	6.27%	2,019	4.26%
French (and French Creole)	2,902	5.95%	122	3.11%	3,338	7.04%
Speak English less than "very well"	667	1.37%	23	0.59%	933	1.97%
Other Indo-European language	347	0.71%	63	1.60%	641	1.35%
Speak English less than "very well"	85	0.17%	17	0.43%	125	0.26%
Asian and Pacific Island languages	100	0.21%	30	0.76%	149	0.31%
Speak English less than "very well"	40	0.08%	12	0.31%	39	0.08%

The native Black Crucian community is also divided by race, color, and class (Isern 2007). The Black Crucian middle-income class is mostly comprised of individuals with at least a high school diploma and in skilled occupations, such as nurses, social workers, managers, and salespeople. Lower-income class Black Crucians often are darker in color, have less than a high school diploma and lowest paying jobs, and tend to be more dependent on public assistance and public housing (Isern 2007). Residence patterns tend to follow racial/ethnic segregation lines throughout St. Croix, with Black/West Indians living on the west-side of the island, Hispanics living throughout the central area, and Whites living on the east-side of the island (Stoffle *et al*. 2009).

There are 15 census tracts in St. Croix (Figure 3-22). In 2000, census tract 9709 had the fewest percent of Hispanic residents (Table 3-16) and the highest percent of residents who are Blacks of one race (Table 3-17). The percents of householders who are Hispanic or Latino or Black are similar (Tables 3-18 and 3-19). The top four census tracts by percent of Hispanic or Latino population and householders are tracts 9714, 9703, 9702 and 9708. Tracts 9714 and 9708 are located in the interior central portion of the island, while tracts 9702 and 9703 are located on the northeast coast.

DRAFT

Figure 3-22. St. Croix census tracts. Source: Census.

Table 3-16. Percent of Hispanic or Latino population by census tract in St. Croix. Source: Census 2000.

Census Tract	Total population	Total Hispanic or Latino	Total Not Hispanic or Latino	% Hispanic
9714	6,019	1,750	4,269	29.1%
9703	4,409	1,173	3,236	26.6%
9702	2,829	743	2,086	26.3%
9708	2,926	734	2,192	25.1%
9705	5,106	1,240	3,866	24.3%
9713	3,069	725	2,344	23.6%
9710	1,599	373	1,226	23.3%
9712	4,633	1,039	3,594	22.4%
9715	2,106	419	1,687	19.9%
9711	3,765	749	3,016	19.9%
9707	2,834	549	2,285	19.4%
9716	4,228	788	3,440	18.6%
9706	4,050	489	3,561	12.1%
9701	2,341	267	2,074	11.4%
9709	3,320	239	3,081	7.2%

Table 3-17. Percent of Black population by census tract in St. Croix. Source: Census 2000.

Census Tract	Total popula-tion	Total Black, one race	% Black, one race	Total Black, 2 or more races	% Black, 2 or more races
9709	3,320	3,013	90.8%	30	0.9%
9711	3,765	3,176	84.4%	84	2.2%
9713	3,069	2,436	79.4%	70	2.3%
9708	2,926	2,303	78.7%	78	2.7%
9703	4,409	3,420	77.6%	136	3.1%
9712	4,633	3,568	77.0%	116	2.5%
9702	2,829	2,133	75.4%	48	1.7%
9706	4,050	2,987	73.8%	121	3.0%
9714	6,019	4,407	73.2%	182	3.0%
9707	2,834	2,072	73.1%	54	1.9%
9705	5,106	3,568	69.9%	204	4.0%
9716	4,228	2,875	68.0%	146	3.5%
9710	1,599	1,018	63.7%	78	4.9%
9715	2,106	1,244	59.1%	57	2.7%
9701	2,341	825	35.2%	53	2.3%

DRAFT

Table 3-18. Percent of Hispanic or Latino householders by census tract in St. Croix 2000. Census 2000.

Census Tract	Total house-holders	Total Hispanic or Latino house-holders	Total Not Hispanic or Latino house-holders	% Hispanic or Latino
9714	1,844	514	1,330	27.9%
9702	1,204	334	870	27.7%
9708	993	246	747	24.8%
9703	1,575	380	1,195	24.1%
9713	971	220	751	22.7%
9712	1,707	382	1,325	22.4%
9705	2,025	447	1,578	22.1%
9715	779	154	625	19.8%
9710	624	123	501	19.7%
9711	1,312	252	1,060	19.2%
9707	1,052	189	863	18.0%
9716	1,619	270	1,349	16.7%
9706	1,488	157	1,331	10.6%
9701	1,073	93	980	8.7%
9709	1,189	85	1,104	7.1%

DRAFT

Table 3-19. Percent of Black and White only householders by census tract in St. Croix. Source: Census 2000.

Census Tract	Total house-holders	Total Black, 1 race, house-holders	% Black, 1 race	Total White only house-holders	% White only	Total Black, 2 or more races house-holders	% Black, 2 or more races
9701	1,073	335	31.2%	667	62.2%	15	1.4%
9702	1,204	869	72.2%	144	12.0%	16	1.3%
9703	1,575	1,170	74.3%	192	12.2%	37	2.3%
9705	2,025	1,356	67.0%	328	16.2%	69	3.4%
9706	1,488	1,081	72.6%	261	17.5%	28	1.9%
9707	1,052	736	70.0%	189	18.0%	14	1.3%
9708	993	768	77.3%	57	5.7%	24	2.4%
9709	1,189	1,063	89.4%	75	6.3%	11	0.9%
9710	624	381	61.1%	161	25.8%	27	4.3%
9711	1,312	1,090	83.1%	83	6.3%	26	2.0%
9712	1,707	1,320	77.3%	118	6.9%	34	2.0%
9713	971	785	80.8%	56	5.8%	19	2.0%
9714	1,844	1,352	73.3%	75	4.1%	56	3.0%
9715	779	464	59.6%	168	21.6%	14	1.8%
9716	1,619	1,051	64.9%	320	19.8%	48	3.0%

Dot density maps of licensed commercial fishermen by ethnicity in St. Croix shows Hispanic fishermen live primarily in the central area of the island and southwest, although between 9 and 12 fishermen are located in Christiansted and Richmond (Figure 3-23). Black fishermen reside in the central area and on the west coast, with the largest densities in and around Frederiksted, La Grange, Christiansted, and Richmond (Figure 3-24). Few of the Hispanic or Black commercial fishermen live in the East End. Most White fishermen reside on the east coast of the island in and around Teague Bay and Catherine's Hope; however, a few are in the central area and on the west coast (Figure 3-25).

DRAFT

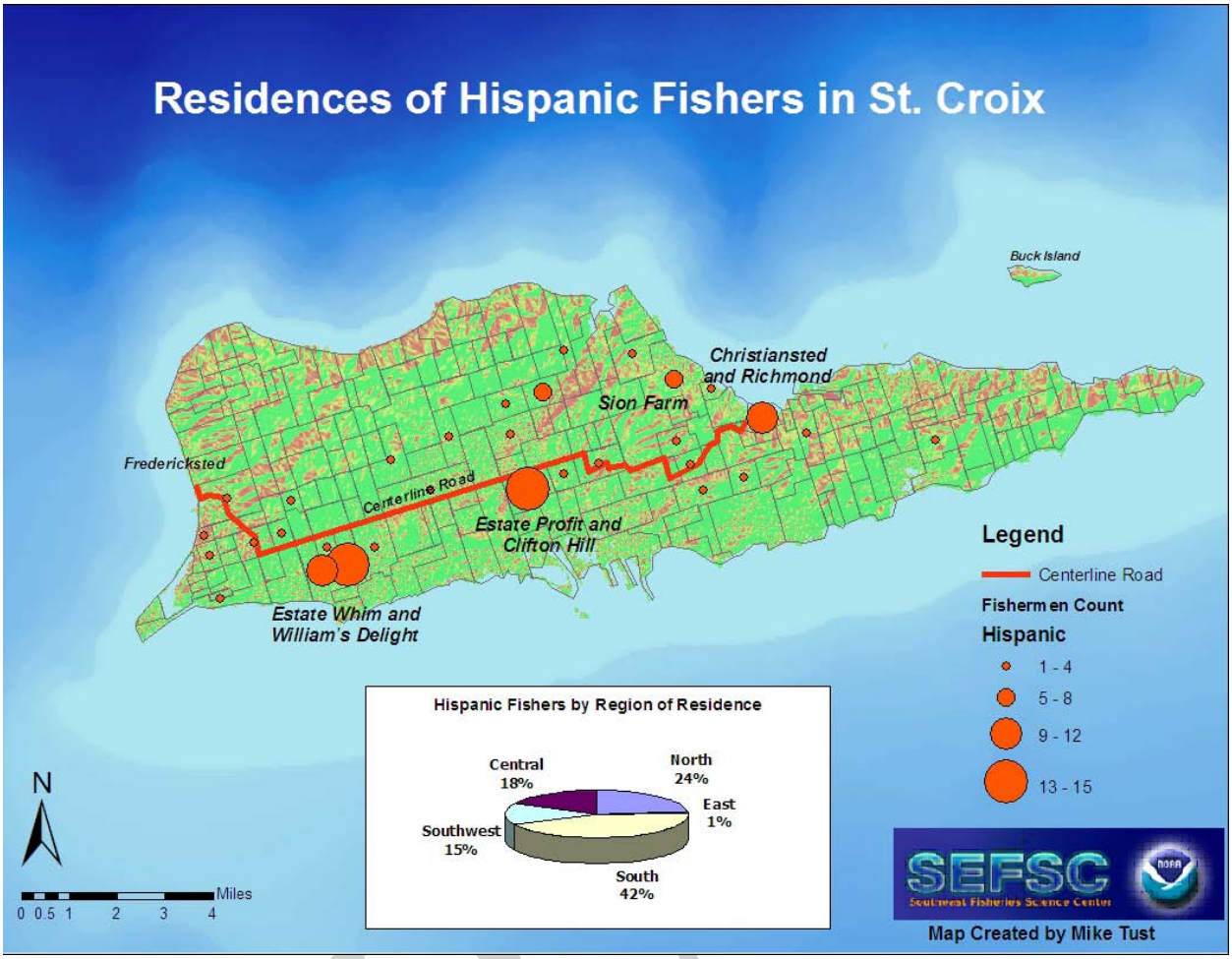

Figure 3-23. Where St. Croix Hispanic fishermen live.

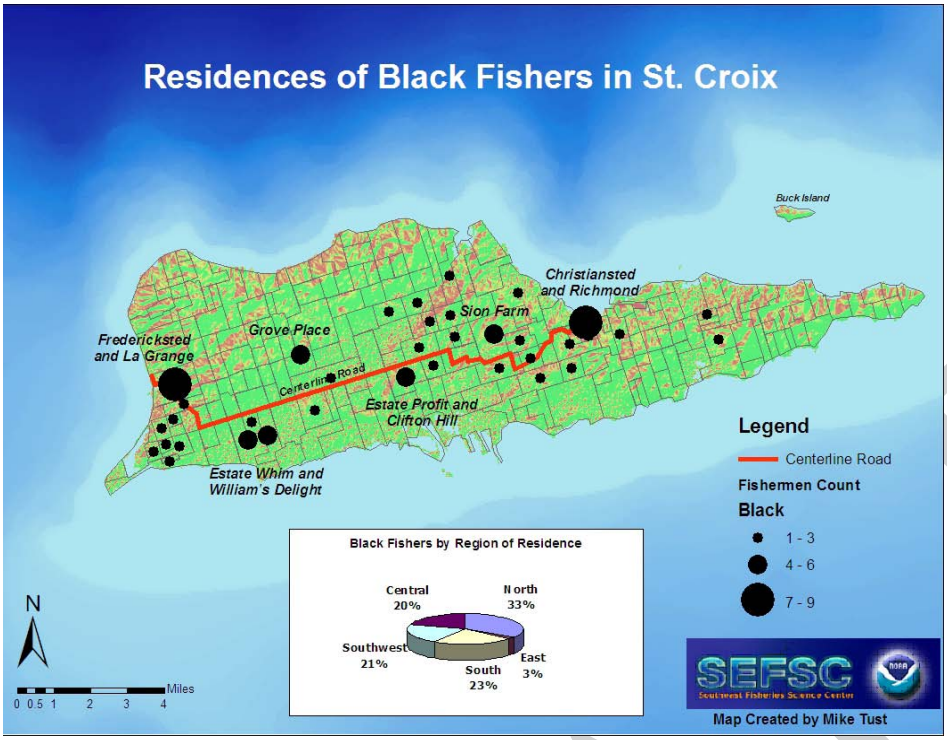

Figure 3-24. Where St. Croix's Black commercial fishermen live.

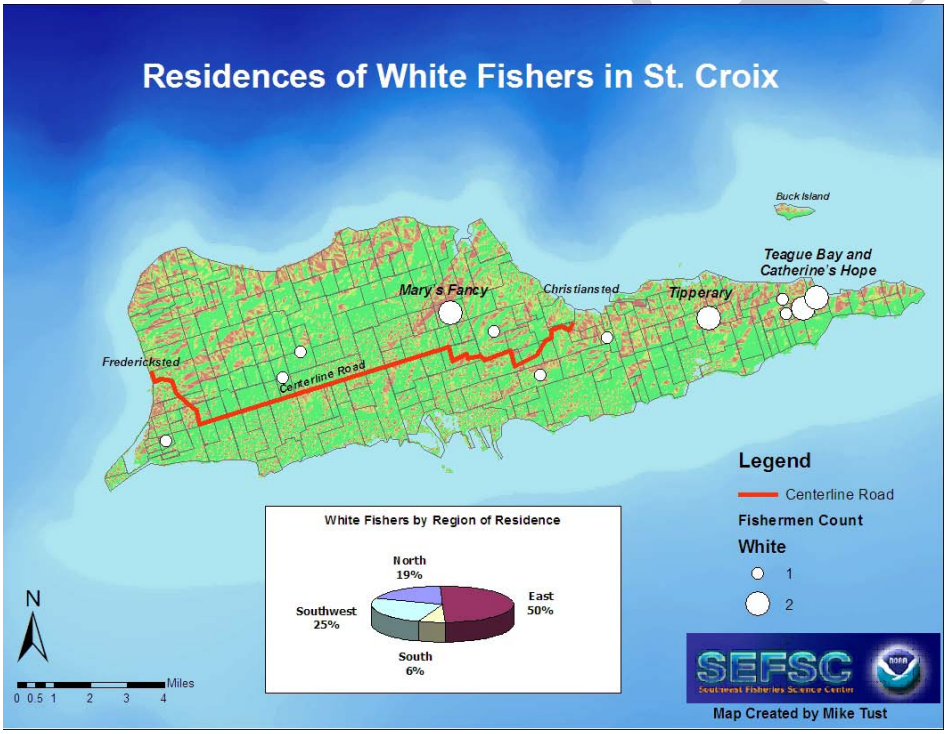

Figure 3-25. Where St. Croix's White fishermen live.

In 2000, census tracts 9602, 9603.01 and 9603.02 in St. Thomas had the smallest percents of White householders and 9603.01 and 9603.02 had the smallest percent of Hispanic/Latino householders (Table 3-20). These three census tracts are located in the vicinity of Anna's Retreat (Figure 3-26). Census tract 9605 (West End) had the lowest percent of Black householders and highest percent of White householders. Census tracts 9608, 9609, and 9610 had the largest percents of Hispanic householders, and they include Charlotte Amalie and surrounding area (Figure 3-27).

Table 3-20. St. John and St. Thomas households by race and Hispanic or Latino ethnicity. Source: Census 2000.

Census Tract	Total house-holders	Total Black, 1 race, house-holders	% Black, 1 race	Total White, one race house-holders	% White, one race	Total Black, 2 or more races house-holders	% Black, 2 or more races	Hispanic or Latino Householder	% Hispanic or Latino
St. John	1,735	840	48.4%	825	47.6%	17	1.0%	64	3.7%
St. Thomas									
9601	1,602	1,294	80.8%	233	14.5%	22	1.4%	87	5.4%
9602	919	874	95.1%	14	1.5%	11	1.2%	55	6.0%
9603.01	1,022	977	95.6%	13	1.3%	8	0.8%	37	3.6%
9603.02	702	687	97.9%	5	0.7%	4	0.6%	17	2.4%
9604	1,693	911	53.8%	649	38.3%	28	1.7%	98	5.8%
9605	1,882	909	48.3%	836	44.4%	32	1.7%	80	4.3%
9606	1,039	633	60.9%	289	27.8%	25	2.4%	66	6.4%
9608	1,029	827	80.4%	122	11.9%	17	1.7%	139	13.5%
9609	938	809	86.2%	56	6.0%	8	0.9%	149	15.9%
9610	2,319	1,972	85.0%	166	7.2%	34	1.5%	277	11.9%
9612	1,461	1,279	87.5%	102	7.0%	19	1.3%	113	7.7%
9613.01	599	533	89.0%	31	5.2%	6	1.0%	44	7.3%
9613.02	1,653	1,446	87.5%	100	6.0%	18	1.1%	98	5.9%
9614	1,245	875	70.3%	259	20.8%	13	1.0%	82	6.6%
9615	1,355	882	65.1%	379	28.0%	19	1.4%	89	6.6%

DRAFT

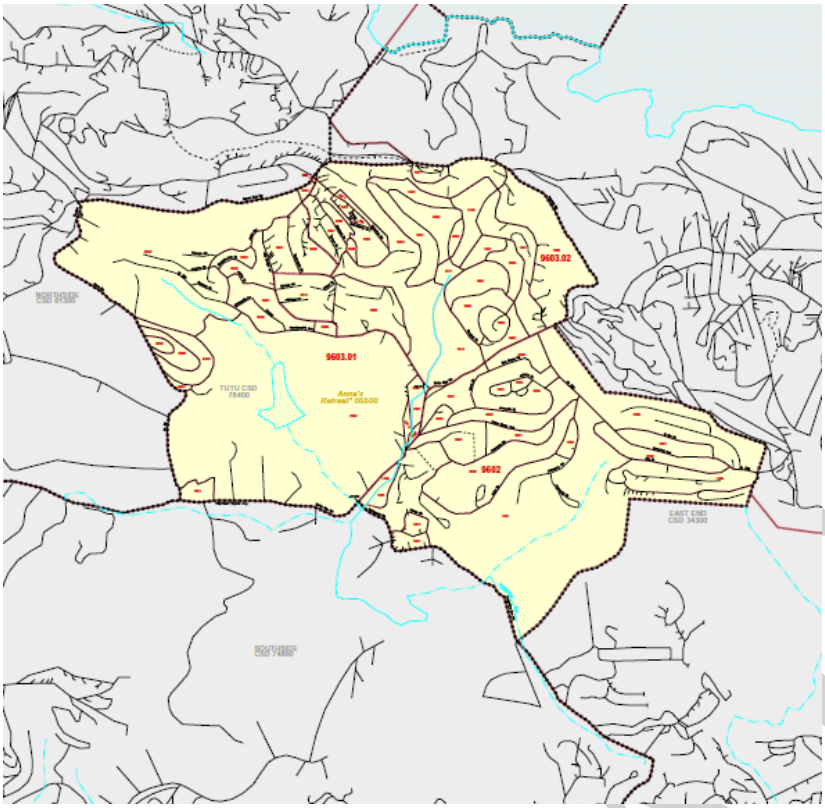

Figure 3-26. Census tracts 9602, 9603.01 and 9603.02 (St. Thomas). Source: Census.

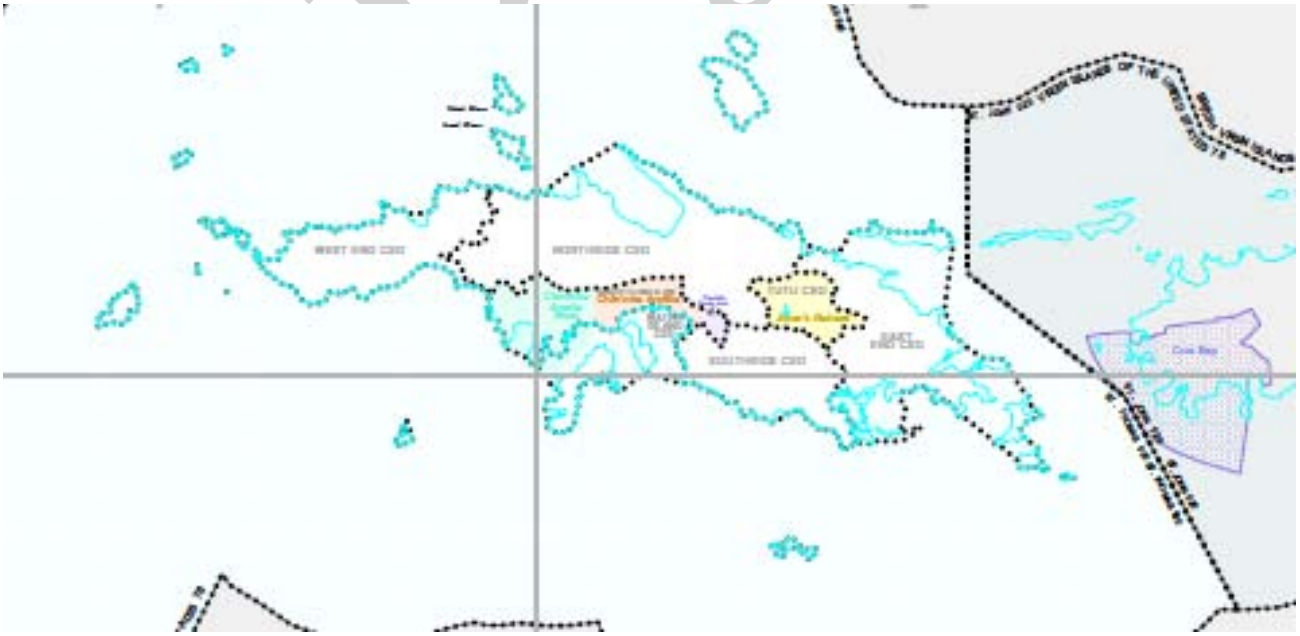

Figure 3-27. Census tracts (St. Thomas). Source: Census.

The largest percents of St. Thomas residents 5 years and older who live in linguistically isolated households who speak French or French Creole are found in census tracts 9601 and 9615, which are in the East End (Table 3-21). However, according to Impact Assessment Inc (2007), commercial fishermen with French ancestry tend to live in Northside (Impact Assessment Inc 2007).

Table 3-21. Percent of residents 5 years and older who are in linguistically isolated households by language by census tract (St. Thomas). Source: Census 2000.

Census tract	Spanish or Spanish Creole	French or French Creole	Other Indo-European	Asian or Pacific Island	Other languages
9601	2.1%	3.1%	0.0%	0.0%	0.0%
9602	1.9%	0.9%	0.0%	0.0%	0.0%
9603.01	0.9%	0.2%	0.0%	0.0%	0.0%
9603.02	0.7%	0.4%	0.0%	0.0%	0.0%
9604	1.3%	0.5%	0.5%	0.1%	0.0%
9605	0.7%	0.5%	0.1%	0.0%	0.0%
9606	1.2%	0.3%	0.5%	0.0%	0.3%
9608	5.8%	0.3%	0.1%	0.0%	0.8%
9609	6.8%	0.9%	0.0%	0.2%	0.1%
9610	5.9%	1.1%	0.1%	0.0%	0.0%
9612	4.1%	1.0%	0.1%	0.0%	0.1%
9613.01	1.8%	0.5%	0.1%	0.0%	0.3%
9613.02	2.3%	1.4%	0.0%	0.0%	0.1%
9614	1.6%	1.1%	0.2%	0.0%	0.0%
9615	3.3%	2.4%	0.0%	0.2%	0.0%
Total	40.2%	14.5%	1.7%	0.5%	1.8%

Immigrants to the USVI from the West Indian Islands, such as St. Lucia, Martinique and Guadeloupe, have distinctive English or French dialects or languages that have been used to separate them from the rest of the population. They are and have been over represented in lowest paying jobs, such as fishing as evidenced in a College of the Virgin Islands study in the late 1970s found that West Indians held 89 percent of all jobs in agriculture/fisheries in St. Croix (Isern 2007).

In 2000, approximately 16 percent of St. Croix residents and 25 percent of St. Thomas/St. John residents were immigrants of the non-U.S. West Indian islands of Antigua and Barbuda, British Virgin Islands, Dominica, Dominican Republic, and St. Kitts and Nevis (Table 3-22). In 2010, approximately 20 percent of St. Croix commercial fishermen and approximately 22 percent of St. Thomas/St. John commercial fishermen self-identified as West Indian according to Kojis and Quinn (2012). Another 1.2 percent of St. Thomas/St. John commercial fishermen identified themselves as French West Indian.

DRAFT

DRAFT

Table 3-22. Percent of population by place of birth, 2000. Source: Census 2000.

Population by Place of Birth	STX	%	STT/STJ	%
Total:	53,234		55,378	
Born in the U.S. Virgin Islands:	26,492	49.8%	25,508	46.1%
St. Croix	24,647	46.3%	1,135	2.0%
St. John	404	0.8%	509	0.9%
St. Thomas	1,441	2.7%	23,864	43.1%
Born in the United States	7,240	13.6%	8,472	15.3%
Born in Puerto Rico or other U.S. Island Area	3,224	6.1%	1,112	2.0%
Born in a foreign country:	16,278	30.6%	20,286	36.6%
Antigua and Barbuda	2,742	5.2%	2,090	3.8%
British Virgin Islands	154	0.3%	2,573	4.6%
Dominica	1,862	3.5%	3,047	5.5%
Dominican Republic	1,338	2.5%	1,856	3.4%
St. Kitts and Nevis	2,659	5.0%	4,395	7.9%
Other foreign country	7,523	14.1%	6,325	11.4%
Born at sea	0	0.0%	0	0.0%
West Indies immigrants	8755	16.4%	13,961	25.2%

Most persons currently engaged in commercial and subsistence-oriented fishing on St. Thomas and St. John are persons of French descent who arrived from Saint-Barthelemy over the past centuries, or are descendants of slaves who also arrived long ago from West Africa, other islands in the Caribbean, or from the continental U.S. (Impact Assessment Inc 2007). The French, like the West Indians, are also an ethnic minority in the USVI, and have also experienced economic and other social segregation. For example, they are overrepresented in fishing (Table 3-23). According to Kojis and Quinn (2012), approximately 70 percent of St. Thomas/St.John's licensed commercial fishermen self-identified themselves as being of French descent.

Hispanics are overrepresented in commercial fishing in St. Croix. In 2000, Hispanics represented approximately 21 percent of St. Croix's population, whereas they represented 52 percent of interviewed commercial fishermen in 2010 (Kojis and Quinn 2012). The overrepresentation of Hispanics and West Indians in St. Croix and persons of French descent in St. Thomas/St. John in commercial fishing result in federal and territorial commercial fishing regulations that have a disproportionate impact on these ethnic minorities. This adds to the adverse impacts of territorial laws/policies and private discrimination faced by Hispanics in St. Croix and other ethnic groups in St. Thomas/St. John.

DRAFT

Table 3-23. Percent of licensed commercial fishermen by ethnic group. Source: Kojis and Quinn 2012.

Ethnic Group	Licensed commercial fishermen		
	STT/STJ	STX	USVI
African American	0.0%	0.7%	0.4%
British descent	1.2%	6.1%	4.3%
Continental	1.2%	2.0%	1.7%
Crucian	1.2%	14.2%	9.5%
European (non French)	0.0%	3.4%	2.2%
French descent	69.9%	0.0%	25.1%
French West Indian	1.2%	0.0%	0.4%
Hispanic	3.6%	52.0%	34.6%
West Indian	21.7%	20.3%	20.8%
Virgin Islands	0.0%	0.0%	0.4%
Other	0.0%	0.7%	0.4%
Total	100.0%	100.0%	100.0%

Commercial fishermen tend to have less educational attainment than the general population. Approximately 39 percent of USVI's population in 2000 did not have a high school diploma (or GED), while 53 percent of USVI fishermen similarly lack a high school diploma in 2010 (Tables 3-24 and 3-25). A larger percent of St. Croix fishermen lack a high school diploma. Approximately 62 percent of St. Croix commercial fishermen do not have a high school diploma, while approximately 40 percent of St. Thomas/St. John fishermen have similar educational attainment. Approximately 59 percent of Hispanic males who are 25 years old or older in St. Croix do not have a high school diploma (Census 2000).

Table 3-24. Educational attainment of USVI population, 2000. Source: U.S. Census 2000.

Educational Attainment	Number	Percent
Population 25 years and over	65,603	100.0
Less than 9th grade	12,133	18.5
9th to 12th grade, no diploma	13,743	20.9
High school graduate (includes GED)	17,044	26.0
Some college, no degree	9,425	14.4
Associate degree	2,269	3.5
Bachelor's degree	6,841	10.4
Graduate or professional degree	4,148	6.3
High school graduate or higher		60.6
Bachelor's degree or higher		16.8

DRAFT

Table 3-25. Education level of USVI licensed commercial fishermen, 2010. Source: Kojis and Quinn 2012.

Education Level	Licensed commercial fishermen		
	STT/STJ	STX	USVI
None	2.0%	1.3%	1.6%
Elementary School	8.8%	16.8%	13.6%
Junior High School	11.8%	24.5%	19.5%
Some High School	17.6%	18.7%	18.3%
High School	52.9%	27.7%	37.7%
Some College	2.9%	7.7%	5.8%
College	3.9%	3.3%	3.5%
Total	100.0%	100.0%	100.0%

The level of educational employment is strongly correlated with wages: the higher the level of attainment, the higher median earnings. In 2010, median weekly income for individuals in the U.S. with less than a high school diploma was $444 (Table 3-26). It is equally expected that USVI fishermen who are overrepresented by individuals with less than a high school diploma and who earn wage income, are similarly overrepresented among those in the USVI population with the lowest median weekly earnings.

Table 3-26. U.S. Median Weekly Earnings in 2010 by Educational Attainment. Source: Census.

Educational Attainment	Unemployment Rate	Median Weekly Earnings in 2010
Doctoral degree	1.9%	$1,550
Professional degree	2.4%	$1,610
Master's degree	4.0%	$1,272
Bachelor's degree	5.4%	$1,038
Associate degree	7.0%	$767
Some college, no degree	9.2%	$712
High school graduate	10.3%	$626
Less than high school diploma	14.9%	$444
All workers	8.2%	$782

DRAFT

The 2010 census of commercial fishermen asked the question, "How easy is it to find employment outside fishing?" Approximately 58 percent of the fishermen in St. Croix said it was hard to very hard to find other employment, while approximately 10 percent of the fishermen in St. Thomas/St. John so agreed (Table 3-27). According to Kojis and Quinn (2012), those who responded "Don't know" or "Not applicable" were often retired or had been wage laborers for at least a few years. The 2010 census also included a question, "What other employment do you engage in?" A discussion of the answers to that question, however, is not found in the Kojis and Quinn (2012) report.

Table 3-27. Difficulty finding non-fishing employment in the USVI. Source: Kojis and Quinn 2012.

Difficulty finding non-fishing employment	Percent of Responding Fishermen		
	STX	STT/STJ	USVI
Very hard	24.2%	3.7%	17.0%
Hard	34.0%	6.1%	24.3%
Easy	9.8%	12.2%	10.6%
Very easy	3.9%	6.1%	4.7%
Don't know	21.6%	31.7%	25.1%
Not applicable	6.5%	40.2%	18.3%

The substantial differences in commercial fishermen's perceptions regarding the difficulty of finding non-fishing employment are not unexpected because of the significant difference in the unemployment rate in St. Croix versus that in St. Thomas/St. John. The unemployment rate tends to be substantially higher in St. Croix (Figure 3-28). In March 2012, for example, the unemployment rate was 7.9 percent in St. Thomas/St. John and 10.1 percent in St. Croix. In April, one month later, the unemployment rates were 8.0 percent in St. Thomas/St. John and 10.8 percent in St. Croix (Virgin Islands Department of Labor (VIDOL)).

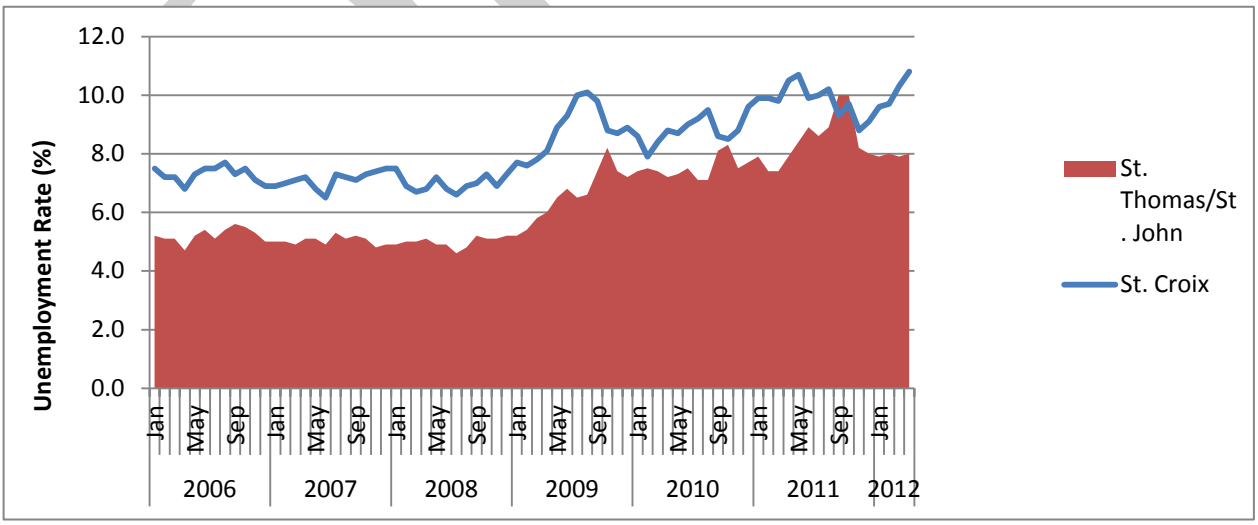

Figure 3-28. Monthly unemployment rates, January 2006 to April 2012. Source: VIDOL.

The USVI's largest taxpayer and employer and main supplier of energy, HOVENSA, ceased its refinery operations in St. Croix in February 2012. The closure of the refinery resulted in over 2,000 job losses: 1,158 HOVENSA employees plus those who were employed by 17 of the company's contractors lost their jobs (Caribbean 360, May 21, 2012). According to Assistant Secretary of Interior, Anthony M. Babausta (May 17, 2012), the unemployment rate is expected to rise to 21 percent in St. Croix. In response to the substantial job losses, USVI Delegate Christensen sought an Economic Disaster Declaration in March. In May, three months after the refinery closed, the U.S. Department of Labor announced that a $7.84 million National Emergency Grant had been made to the USVI's Department of Labor to assist the displaced workers affected by the shutdown by providing employment-related services. In a statement, U.S. Labor Secretary Hilda Solis said, "The HOVENSA refinery's closure was a significant blow to many workers, as well as the community at large." The end of HOVENSA-subsidized fuel is expected to push electricity costs from 43 cents to 50 cents per kilowatt hour. Also, HOVENSA practice of making payments for private school tuition for its employees is ending, which is expected to cause financial stress for both private and public schools when children of employees transfer to public schools. The closure of the refinery is anticipated to result in a loss of USVI government revenue of $92 million, or 14 percent, in 2012 (Babauta, May 17, 2012). According to Delegate Christensen, the USVI government has estimated a total impact of over $500 million in direct and other economic losses (Caribbean Journal, March 29, 2012); however, the source of that estimate could not be found in an online search of USVI government documents.

Prior to the closing of the refinery, the USVI government undertook austerity measures that included 500 employees losing their jobs, an 8 percent cut in government salaries for employees earning more than $25,000, and increasing the gross receipts tax from 4 percent to 5 percent. The 14 percent cut in government revenues due to the HOVENSA shutdown will necessitate additional scaling back of USVI programs and personnel.

Unemployment rates also tend to differ by race with Blacks and other non-Whites experiencing higher unemployment rates than Whites in St. Croix and St. Thomas (Figures 3-29 to 3-31). Approximately 65 percent of St. Croix commercial fishermen are Black, 16 percent are White and 19 percent are other. Almost 40 percent of St. Thomas/St. John commercial fishermen are Black, approximately 57 percent are White and almost 3 percent are other. The unemployment rate for Hispanics also tends to be higher than for non-Hispanics.

DRAFT

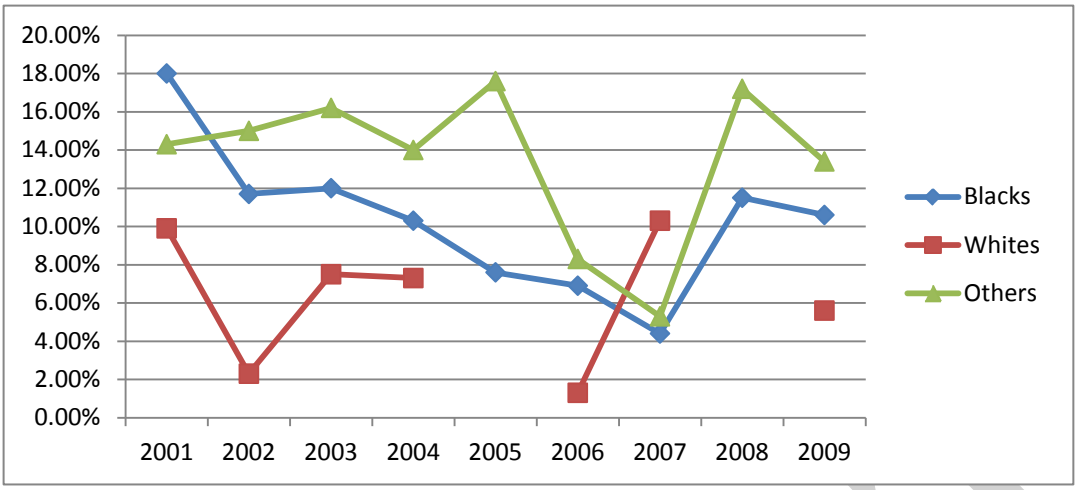

Figure 3-29. Unemployment rates for Blacks, Whites and other races in St. Croix. Source: KidsCount.org.

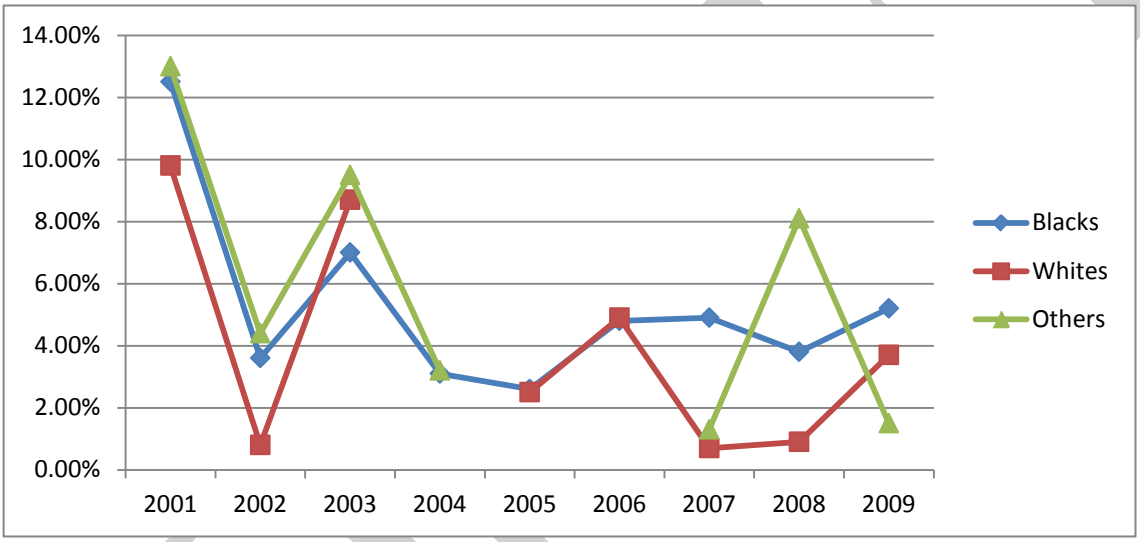

Figure 3-30. Unemployment rates for Blacks, Whites and other races in St. Thomas. Source: KidsCount.org.

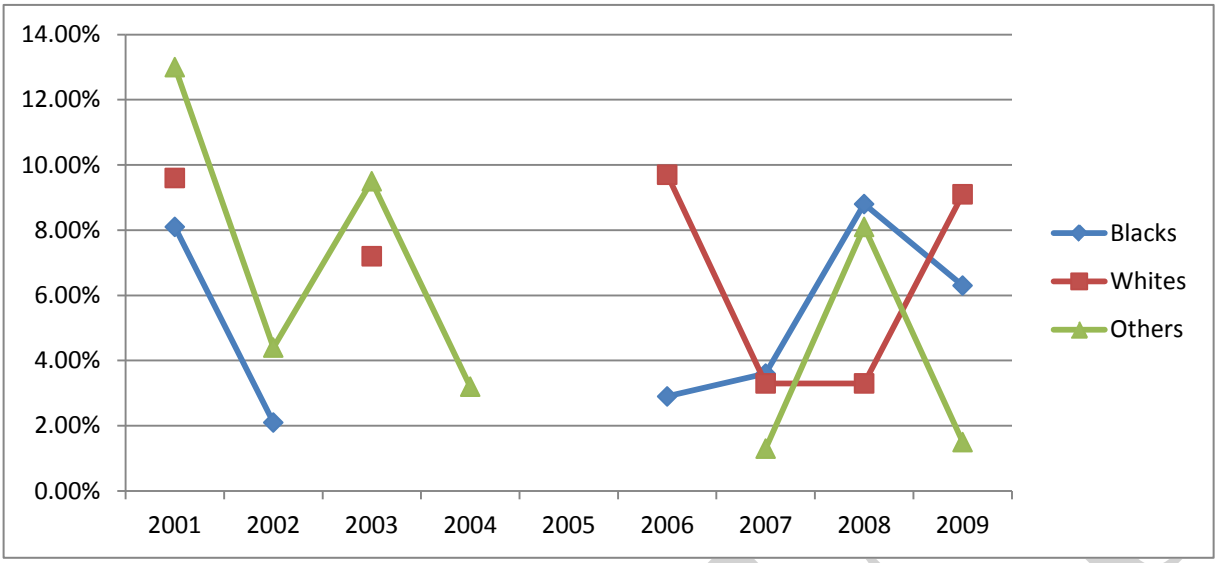

Figure 3-31. Unemployment rates for Blacks, Whites and other races in St. John. Source: KidsCount.org.

The 2010 census asked each fisherman how many hours per week they spend on all fishing activities: more than 36 hours, 15 to 36 hours, or less than 15 hours. Approximately 41 percent of St. Croix fishermen and 30 percent of St. Thomas/St. John fishermen are engaged in fishing related activities more than 36 hours per week (Table 3-28). This does not include the time devoted to fishing related activities by supporting spouses or other members of the family. Approximately 7 percent of St. Croix and 12 percent of St. Thomas/St. John licensed commercial fishermen were not fishing.

Table 3-28. Hours devoted by commercial fishermen to fishing and fishing related activities. Source: Kojis and Quinn 2012.

Hours per week	Percent Fishermen		
	St. Croix	St. Thomas/ St. John	USVI
More than 36	40.6%	30.2%	36.7%
15 to 36	24.5%	27.1%	25.5%
Less than 15	27.7%	30.2%	28.7%
None	7.1%	12.4%	9.2%

The 2010 census also asked how many hours per week are spent performing the following activities: 1) fixing their boat, 2) repairing fishing gear, 3) preparing for fishing (fueling boat, filling tanks, driving to dock/boat ramp), and 4) selling fish. Two other questions asked how many fishing trips do they make per week and how many hours is their average trip. Each week, a St. Croix fisherman made an average of 3.4 trips, each lasting 6.5 hours, for a total of 22.1 hours fishing per week. The average St. Croix commercial fisherman also devoted 9.2 hours selling fish, 5.1 hours fixing their boat, and 2.9 hours fixing gear each week (total 17.2 hours per week). Together, but excluding time preparing for fishing because those

results are lacking from Kojis and Quinn's 2012 report, the average St. Croix commercial fisherman devoted 39.3 hours to fishing and fishing related activities each week. If just 1 hour per week were spent on preparing for fishing, the average St. Croix fishermen would have devoted more than 40 hours per week to fishing and fishing related activities. This suggests that commercial fishing is, for the average Crucian commercial fisherman, equivalent to a full-time job. Similarly, each week, the average St. Thomas/St. John commercial fisherman made 2.6 trips, each 7.4 hours long, for a total of 19.24 hours of fishing per week. The average St. Thomas/St. John commercial fisherman also devoted 6.2 hours selling fish, 3 hours repairing their boat, and 2 hours fixing gear each week (total 11.2 hours). Together, but again excluding time preparing for fishing because those results are also lacking from the above report, the average St. Thomas/St. John commercial fisherman devoted 30.44 hours per week to fishing and fishing related activities.

Commercial fishermen who reside in the East End and Northwest region of St. Croix tend to be part time fishermen (Figure 3-32). The few fishermen who reside in the East End tend to be White. Those who live in the Southcentral region are most likely to fish full time, and they tend to be Hispanic and Black. Kojis and Quinn (2012) do not provide differences in average hours devoted to fishing and fishing related activities by race or ethnicity.

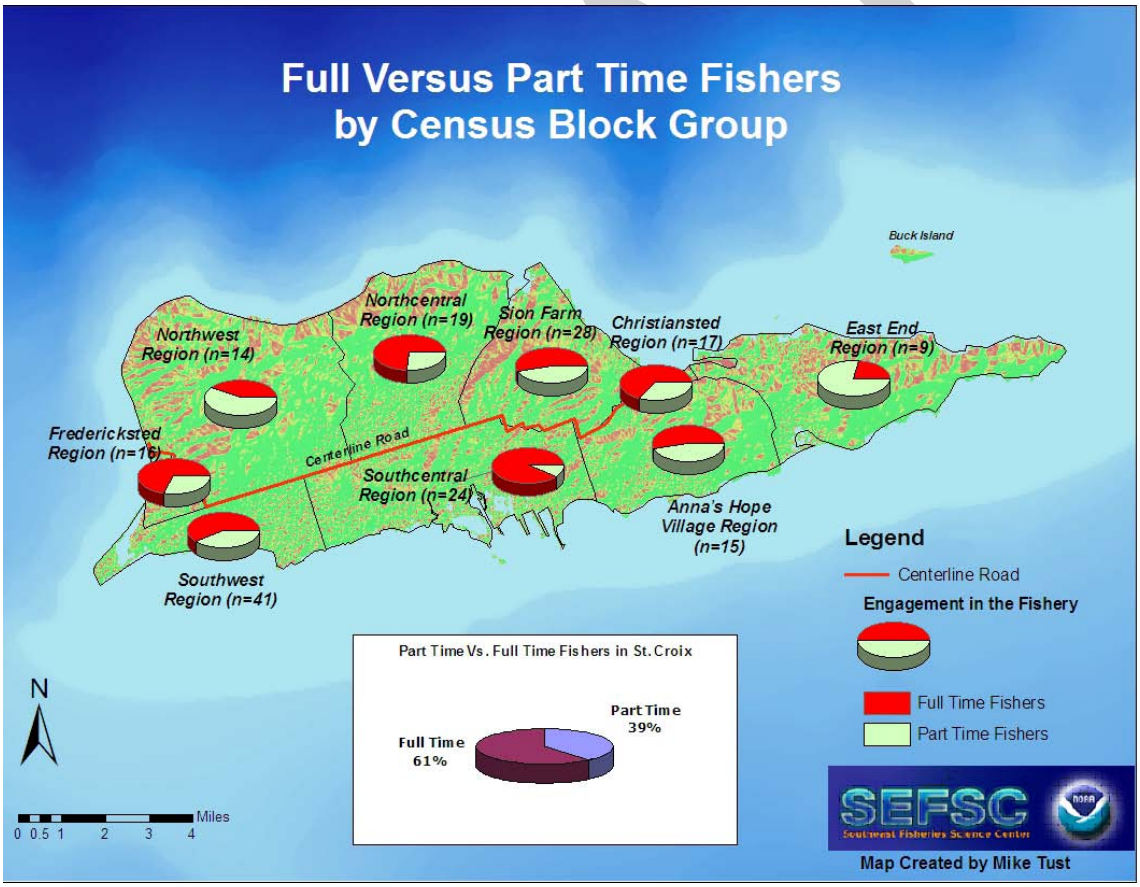

Figure 3-32. Percents of full-time versus part-time fishermen by location of residence in St. Croix.

Per capita, median household, and median family incomes vary significantly across the USVI, with St. Croix having the lowest and St. John the highest (Table 3-37).

Table 3-29. Per capita, median household and median family incomes (1999 dollars). Source: Census 2000.

Island	1999 Income		
	Per capita	Median Household	Median Family
St. Croix	$11,868	$21,401	$24,235
St. John	$18,012	$32,482	$39,567
St. Thomas	$14,061	$26,893	$31,724

Median family income varies substantially by race in the USVI. In St. Croix, the median family income for Whites exceeded the median family income of Blacks and other non-Whites from 2001 to 2007 (Figure 3-33). The same racial income differences among Black and White families are found in St. Thomas (Figure 3-34). In St. John, White families typically have higher median incomes as well (Figure 3-35). In the USVI, poor families are more often black.

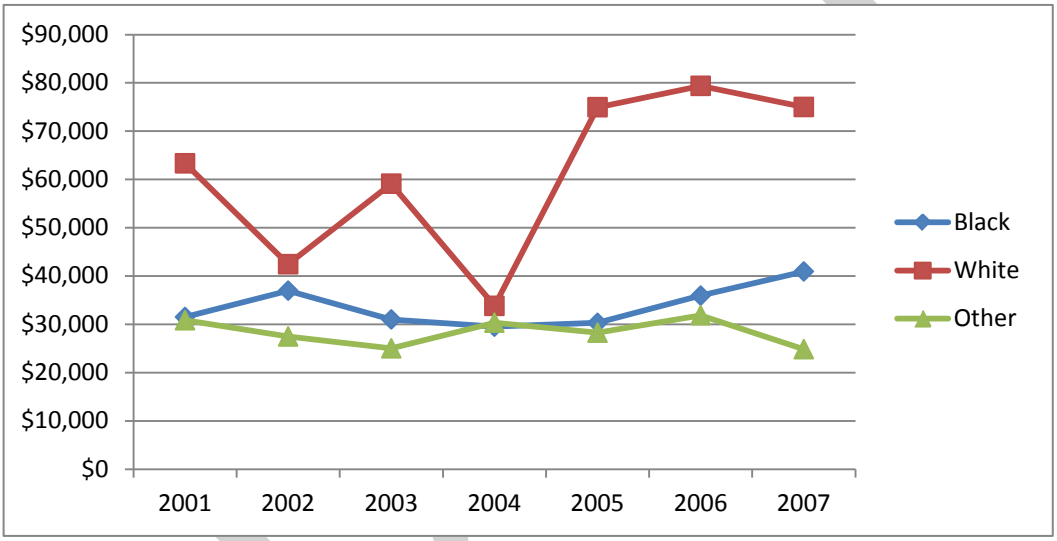

Figure 3-33. Median family income by race in St. Croix, 2001 to 2007. Source: Annie E. Casey Foundation, Kids Count.

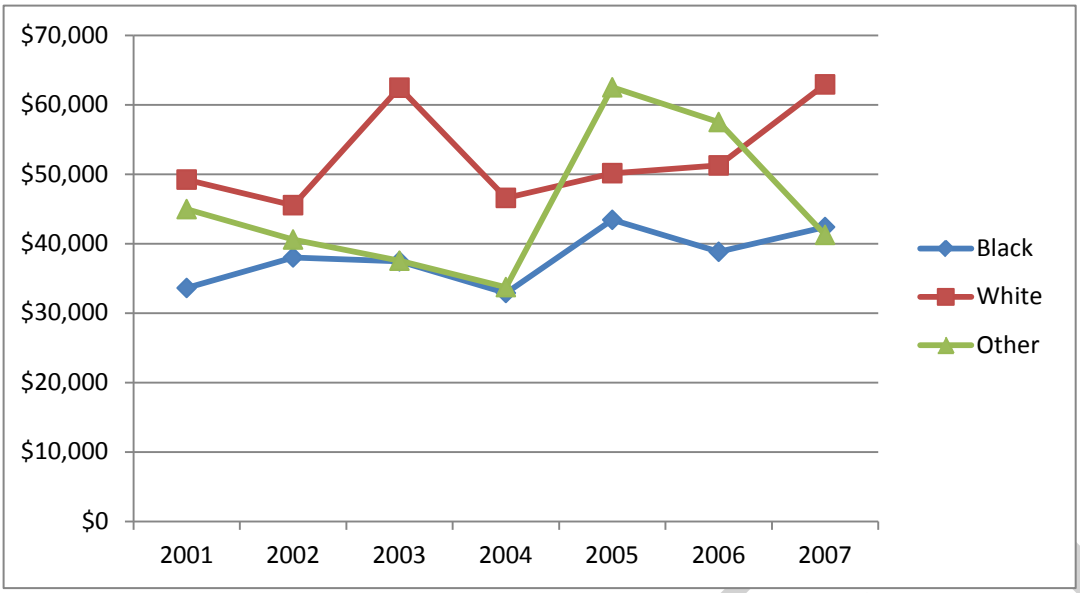

Figure 3-34. Median family income by race in St. Thomas, 2001 to 2007. Source: Annie E. Casey Foundation, Kids Count.

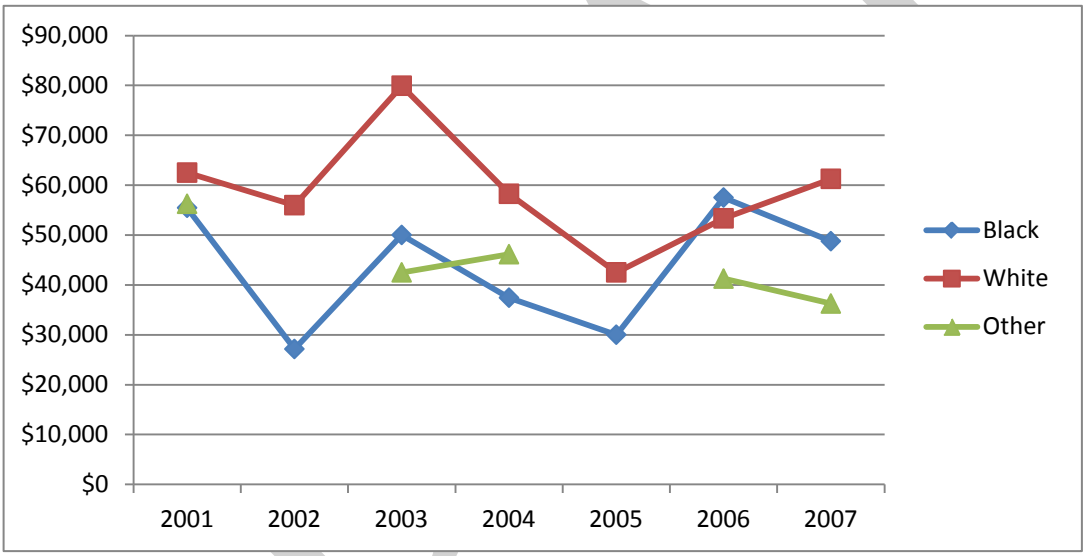

Figure 3-35. Median family income by race in St. John, 2001 to 2007. Source: Annie E. Casey Foundation, Kids Count. Data not available for Other in 2002 and 2005.

Substantial numbers of families in the USVI have incomes below the poverty level. In 1999, 28.7 percent of all families lived in poverty. Families with no husband present and with related children were more at risk to live in poverty. Over fifty percent of families with no husband present and with related children under 5 years lived in poverty (Table 3-30). An undernourished pregnant woman generally passes the condition on to her child as low birth weight, which has an impact on the child's future health and well-being. Damage done by malnutrition before a child reaches two years old is irreversible, which substantially decreases the likelihood that the person can escape the hunger-poverty trap. It is reasonable

to suggest that USVI families that live in poverty, especially those with related children under 5 years old, may be more dependent on fish either caught by themselves or given to them from commercial and/or recreational fishermen to meet basic nutritional needs.

Table 3-30. Number and percent of USVI families and individuals with incomes below poverty level, 1999. Source: Census 2000.

Population	Number below Poverty Level	Percent below Poverty Level
Families	7,635	28.7
Families with related children under 18 years	5,862	35.3
Families with related children under 5 years	2,637	41.0
Families, no husband present	4,521	44.6
Families with related children under 18 years	3,863	49.2
Families with related children under 5 years	1,795	56.7
Individuals	34,931	32.5

Higher percentages of families in St. Croix live in poverty than families in St. Thomas and St. John. In 1999, 38.7 percent of St. Croix's population and 34.8 percent of its families lived in poverty, while 27.2 percent of St. Thomas's population and 23.2 percent of its families and 18.5 percent of St. John's population and 14.8 percent of its families lived in poverty. St. Croix had the highest percentage of children in families with incomes below the poverty line from 2000 to 2007 (Table 3-31). In 2008, approximately 25 percent of USVI residents and 23 percent of families lived in poverty. Almost a quarter of families with children under 18 years old lived in poverty, and the 34 percent of families headed by females with no husband present live in poverty. Approximately 45 percent of single, female-head households with children under 5 years old live in poverty (Virgin Islands Bureau of Economic Research 2010).

Table 3-31. Percent of children in families with incomes below poverty level. Source: Annie E. Casey Foundation, 2003.

Year	Percent	
	St. Croix	St. Thomas/St. John
2000	49.0	34.0
2001	45.0	31.0
2002	32.0	29.0
2003	39.0	25.0
2004	37.0	35.0
2005	46.0	25.0
2006	32.8	25.9
2007	38.9	28.8

The percent of families in poverty in the USVI differs by race. In St. Croix, larger percentages of Black and other Non-White families lived in poverty from 2001 to 2007. An annual average of 25.6 percent of Black families lived in poverty, as opposed to 11.2 percent of White families and 30.7 percent for other race families (Figure 3-36). Similarly, a larger percentage of Black families lived in poverty in St.

DRAFT

Thomas than their White counterparts. An annual average of 19.1 percent of Black families in St. Thomas lived in poverty from 2001 to 2007 as opposed to 13 percent of White families (Figure 3-37). The percent of non-Black or non-White families living in poverty averaged 13.7 percent. In St. John, the percents of Black and White families living in poverty are very similar (Figure 3-38). The annual poverty levels set by the U.S. Census Bureau do not reflect local and regional variations in the cost of living. In comparative studies conducted during the late 1980s by the Departments of Commerce and Labor, it was estimated that the cost of living in the USVI was significantly higher than that of the U.S. mainland, particularly in the following areas: food higher by 47 percent; housing higher by 65 percent; utilities higher by 36 percent; transportation higher by 11 percent; health services higher by 47 percent (1997 Department of Human Services Community Assessment). The USVI Department of Labor's Consumer Price Index indicates that the cost of living in the territory is an average of at least 35 percent higher cumulatively. Consequently, the actual poverty rates in the USVI island areas, with the USVI's higher cost of living, are higher than reported here and in the Census Bureau's community and population surveys.

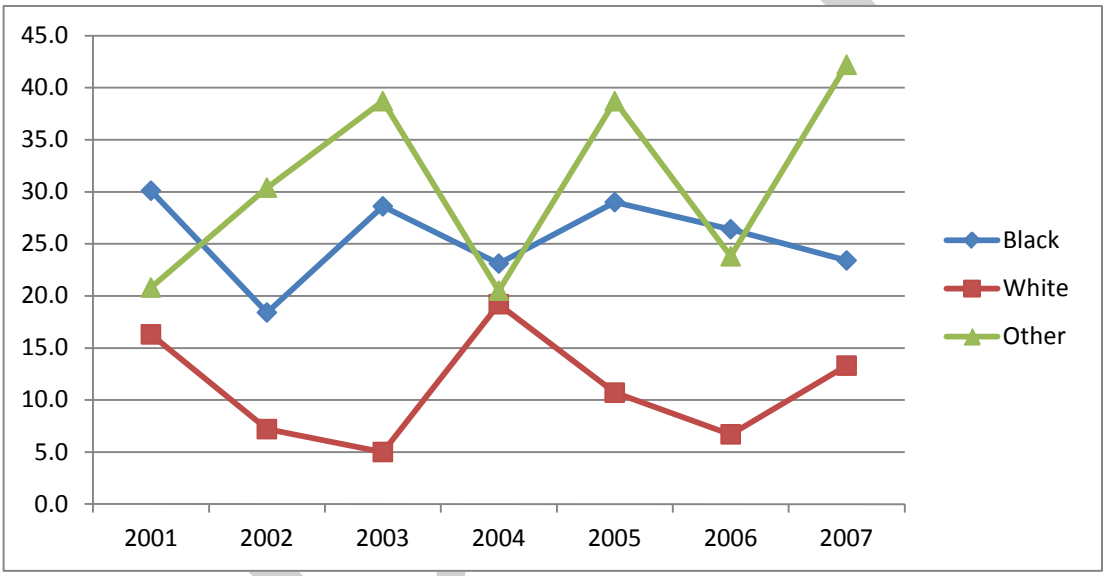

Figure 3-36. Percent of families in poverty by race in St. Croix. Source: Annie E. Casey Foundation, Kids Count.

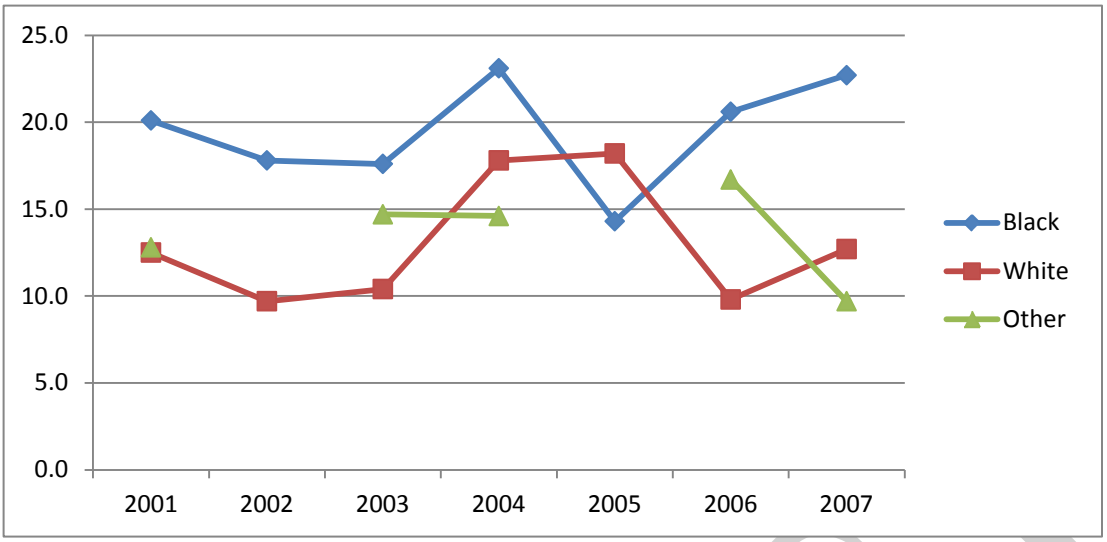

Figure 3-37. Percent of families in poverty by race in St. Thomas. Source: Annie E. Casey Foundation, Kids Count. Data not available for other in 2001, 2002, and 2005.

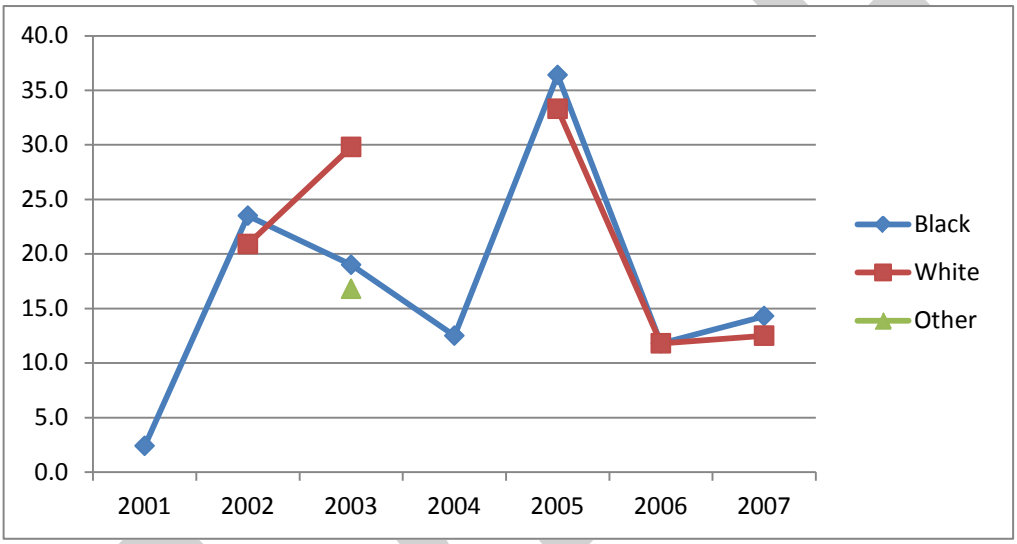

Figure 3-38. Percent of families in poverty by race in St. John. Source: Annie E. Casey Foundation, Kids Count. Data not available for Whites in 2001 and 2004, and Other races in all years except 2003.

In response to continuing high poverty rates, the USVI Legislature passed Act 7027, which required the USVI Bureau of Economic Research to develop an economic self-sufficiency standard. The standard defines how much money is needed by a family or household to provide for basic needs of housing, food, child care, health care, transportation, clothing, miscellaneous household and personal expenses, and taxes without public or private subsidies (USVI Bureau of Economic Research 2010). The cost of medical care, for example, is higher in the USVI where such services are limited. There are only two hospitals, one in St. Thomas and the other in St. Croix. Also, the USVI produces very little locally grown food, and therefore must import nearly all of the food for households and restaurants, which significantly adds to the cost. Studies show that the USVI has a 15 percent to 30 percent higher food cost when compared to the

rest of the U.S., and for some items, the cost is 50 percent higher (USVI Bureau of Economic Research 2010). An adult in the USVI requires an income of $20,806 with employer health benefits and $23,829 without employer health benefits annually to meet basic needs (Table 3-32). Two adults with 2 children require $59,799 with employer health benefits and $68,430 without employer health benefits. Median USVI household income was estimated to be $35,711 in 2008.

Table 3-32. Self-sufficiency standard by household structure in USVI, 2010. Source: USVI Bureau of Economic Research 2010.

USVI					
Basic Needs Budget with Employer Health Benefits					
Costs	**1 Adult**	**1 Adult 1 Child**	**2 Adults**	**2 Adults 1 Child**	**2 Adults 2 Children**
Monthly Basic Needs	$1,638	$2,667	$2,469	$3,878	$4,613
Annual Basic Needs	$19,656	$32,004	$29,628	$46,536	$55,356
Taxes	$1,150	$1,856	$2,059	$3,308	$4,443
Total Annual	$20,806	$33,860	$31,687	$49,844	$59,799
Basic Needs Budget without Employer Health Benefits					
Costs	**1 Adult**	**1 Adult 1 Child**	**2 Adults**	**2 Adults 1 Child**	**2 Adults 2 Children**
Monthly Basic Needs	$1,876	$3,129	$2,931	$4,544	$5,279
Annual Basic Needs	$22,512	$37,551	$35,175	$54,526	$63,346
Taxes	$1,317	$2,178	$2,444	$3,876	$5,084
Total Annual	$23,829	$39,729	$37,619	$58,402	$68,430

The living wage (self-sufficiency standard) is higher in St. Thomas/St. John than in St. Croix because the cost of living is higher in the former (Tables 3-33 and 3-34). An adult in St. Thomas/St. John without employer health benefits needs a pre-tax income of $25,029, while the same adult requires a pre-tax income $21,429 in St. Croix. Gasoline prices have tended to be higher in St. Thomas/St. John than in St. Croix; however, the price differences may have become less since the shutdown of the HOVENSA refinery.

DRAFT

Table 3-33. Self-sufficiency standard by household structure in St. Thomas/St. John, 2010. Source: USVI Bureau of Economic Research 2010.

St. Thomas and St. John					
Basic Needs Budget with Employer Health Benefits					
Costs	**1 Adult**	**1 Adult 1 Child**	**2 Adults**	**2 Adults 1 Child**	**2 Adults 2 Children**
Monthly Basic Needs	$1,738	$2,894	$2,669	$4,305	$5,135
Annual Basic Needs	$20,856	$34,728	$32,028	$51,660	$61,620
Taxes	$1,150	$1,856	$2,059	$3,308	$4,443
Total Annual	$22,006	$36,584	$34,087	$54,968	$66,063
Basic Needs Budget without Employer Health Benefits					
Costs	**1 Adult**	**1 Adult 1 Child**	**2 Adults**	**2 Adults 1 Child**	**2 Adults 2 Children**
Monthly Basic Needs	$1,976	$3,356	$3,131	$4,971	$5,801
Annual Basic Needs	$23,712	$40,275	$37,575	$59,650	$69,610
Taxes	$1,317	$2,178	$2,444	$3,876	$5,084
Total Annual	$25,029	$42,453	$40,019	$63,526	$74,694

DRAFT

Table 3-34. Self-sufficiency standard by household structure in St. Croix, 2010. Source: USVI Bureau of Economic Research 2010.

St. Croix					
Basic Needs Budget with Employer Health Benefits					
Costs	**1 Adult**	**1 Adult 1 Child**	**2 Adults**	**2 Adults 1 Child**	**2 Adults 2 Children**
Monthly Basic Needs	$1,438	$2,393	$2,369	$3,504	$4,183
Annual Basic Needs	$17,256	$28,716	$28,428	$42,048	$50,196
Taxes	$1,150	$1,856	$2,059	$3,308	$4,443
Total Annual	$18,406	$30,572	$30,487	$45,356	$54,639
Basic Needs Budget without Employer Health Benefits					
Costs	**1 Adult**	**1 Adult 1 Child**	**2 Adults**	**2 Adults 1 Child**	**2 Adults 2 Children**
Monthly Basic Needs	$1,676	$2,855	$2,831	$4,170	$4,849
Annual Basic Needs	$20,112	$34,263	$33,975	$50,038	$58,186
Taxes	$1,317	$2,178	$2,444	$3,876	$5,084
Total Annual	$21,429	$36,441	$36,419	$53,914	$63,270

According to the 2009 USVI Health Insurance Survey, the percent of the population without health insurance rose from 2003 to 2009, with 21.4 percent of the population in 2003 and 28.7 percent in 2009 (about 33,000 residents) not having health insurance (State Health Access Data Assistance Center 2010). The percent of the populations in St. Croix and St. John without health insurance rose during that time, while there was a slight improvement in St. Thomas. There are also substantial differences by race and ethnicity. Approximately 20 percent of Blacks and 28 percent of Whites were uninsured, while 37 percent of Hispanics were uninsured (Figure 3-39). Recall that approximately 52 percent of USVI commercial fishermen are Black and 35 percent are Hispanic. The percents are higher in St. Croix, where 52 percent of commercial fishermen are Hispanic and 65 percent are Black.

DRAFT

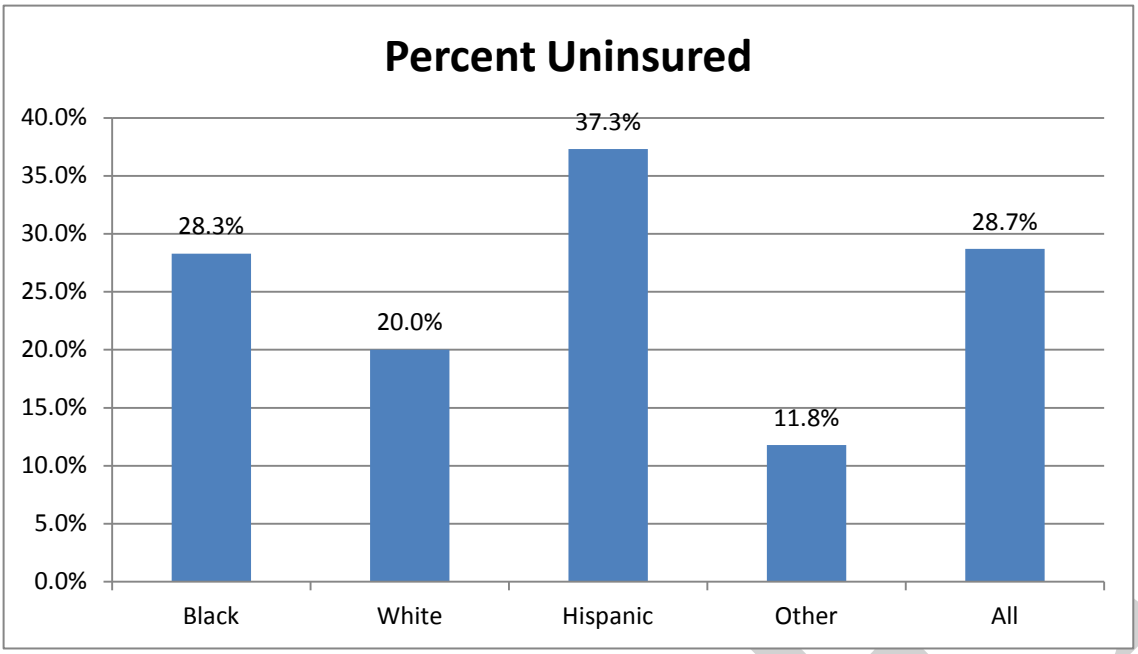

Figure 3-39. Percent of USVI population that lacks health insurance, 2009. Source: State Health Access Data Assistance Center 2010.

The U.S. poverty threshold does not account for differences in the cost of living. A family of four (two adults and two children) requires an annual income 274 percent of the U.S. poverty threshold of $21,832 (Table 3-35). The USVI relies heavily on tourism, with enterprises that require a large service staff that are paid relatively low wages. This reliance on tourism limits employment options and complicates earning income sufficient to meet basic needs. In 2009, approximately 14 percent of the USVI workforce was employed in the Leisure and Hospitality sector. A living hourly wage in the USVI (self-sufficiency wage) would be $10 for a single adult, $16.28 for an adult with one child, $15.23 for each adult in a 2 adult household, $23.96 for each adult in a two adult and one child household, and $28.75 for a 2 adult and 2 children household.

Table 3-35. Comparison of U.S. poverty threshold and USVI costs of basic needs with employer health benefits, 2010. Source: USVI Bureau of Economic Research 2010.

Family Unit	U.S. Poverty Threshold	USVI Basic Needs Budget with Employer Health Benefits	USVI Basic Needs Budget as % of U.S. Poverty Threshold
Single Person	$11,161	$20,806	186.4%
Adult and Child	$14,787	$33,860	229.0%
2 Adults	$14,366	$31,687	220.6%
2 Adults & 1 Child	$17,285	$49,844	288.4%
2 Adults & 2 Children	$21,832	$59,799	273.9%

The estimate of median household income in the USVI in 2008 was $35,711. According to the USVI Bureau of Economic Research, approximately 11 percent of all USVI households live on less than $10,000 annually.

Median household income varies significantly by race and ethnicity in St. Croix. In Black households, the median household income was $19,730 and in Hispanic households, it was $16,595 in 1999. The median household income for a White household was $41,508.

Median household income also varies significantly across census tracts of St. Croix and St. Thomas/St. John. In 2000, it varied from $12,308 to $38,988 in St. Croix (Table 3-36) and from $19,877 to $41,078 in St. Thomas.

Table 3-36. Median household income (1999 dollars) by White and Black only and Hispanic/Latino householders and census tract in St. Croix. Source: Census 2000.

Census Tract	Median Household Income							
	All	Black	White	Hispanic or Latino	Rank All	Rank Black	Rank White	Rank Hispanic or Latino
9701	$38,988	$33,750	$45,125	$41,250	1	1	3	1
9702	$13,548	$12,819	$23,125	$10,417	12	13	11	14
9703	$12,308	$11,366	$30,577	$10,658	15	14	9	13
9705	$29,551	$28,720	$35,313	$25,804	6	4	7	4
9706	$36,133	$32,297	$49,821	$34,821	2	2	2	2
9707	$27,083	$25,804	$34,250	$21,719	7	6	8	5
9708	$14,653	$14,797	$20,938	$11,364	11	11	12	12
9709	$12,480	$11,206	$40,625	$14,107	14	15	4	11
9710	$30,673	$27,232	$39,375	$19,821	5	5	5	7
9711	$12,930	$13,091	$18,438	$7,794	13	12	13	15
9712	$21,231	$21,806	$25,833	$16,023	8	8	10	8
9713	$15,977	$15,824	$16,250	$14,231	10	10	14	10
9714	$17,639	$18,627	$14,792	$15,449	9	9	15	9
9715	$30,703	$22,941	$76,000	$21,250	4	7	1	6
9716	$32,407	$31,424	$37,031	$29,643	3	3	6	3

In St. Croix, tract 9701, which had the second lowest percentage of Hispanic or Latino residents and householders and lowest percentage of Black residents, had the highest median household income, and tract 9709, which had the lowest percentage of Hispanic or Latino residents and householders but highest percentage of Black residents and householders, had the second lowest median household income. Census tract 9701 had the highest percent of White householders and highest median household income; however, census tract 9715 had the highest median household income among White householders. Census tracts 9702 and 9703 are within the bottom four tracts by median household income (Table 3-36). Tract 9708 is fifth from the bottom, while tract 9714 is seventh. Approximately 52 percent of St. Croix

DRAFT

commercial fishermen are Hispanic, although only 21.2 percent of St. Croix residents were Hispanic in 2000. According to Valdés-Pizzini *et al*. (2010), the percent of income derived from fishing is much less for Whites (40 percent) and Blacks (56 percent) than for Hispanics (68 percent); however, Valdés-Pizzini *et al*. do not state if that is household, family, or personal income.

In St. Thomas, tract 9605 had the highest median household income, the highest percent of White householders, and highest median household income among Black householders. This tract includes the West End where few commercial fishermen reside (Table 3-37). The tracts with the lowest median household incomes (9610, 9612, 9613.01 and 9613.02) are in the Charlotte Amalie area and have the highest percents of residents 5 years and older who live in Spanish or Spanish Creole speaking households.

Table 3-37. Median household income for White and Black only and Hispanic or Latino householders in St. John and St. Thomas.

Census Tract	Median Household Income						
	Black	**White Only**	**Hispanic or Latino**	**Rank Black Only**	**Rank White Only**	**Rank Hispanic or Latino**	**All**
St. John	$30,735	$35,550	$24,500	4	8	5	$32,482
St. Thomas							
9601	$26,875	$37,344	$21,094	7	7	10	$28,239
9602	$28,712	NA	$22,813	5	NA	6	$28,493
9603.01	$26,709	NA	$21,250	9	NA	8	$26,667
9603.02	$27,731	NA	$16,250	6	NA	16	$27,759
9604	$35,938	$46,719	$31,250	3	2	3	$40,330
9605	$44,511	$38,438	$35,833	1	6	2	$41,078
9606	$36,169	$39,125	$36,250	2	5	1	$36,960
9608	$24,223	$26,000	$20,875	10	10	11	$24,137
9609	$21,014	$16,667	$17,250	13	13	14	$20,875
9610	$19,321	$25,833	$20,074	16	11	12	$19,877
9612	$19,464	$30,833	$16,964	15	9	15	$20,269
9613.01	$19,962	$21,250	$21,250	14	12	8	$20,296
9613.02	$21,076	$40,714	$20,000	12	4	13	$22,289
9614	$22,173	$48,438	$25,000	11	1	4	$26,899
9615	$26,859	$41,103	$22,813	8	3	6	$29,528

The average size of a household varies across the USVI, ranging from 2.71 persons in St. Croix to 2.39 persons in St. John (Table 3-38). There is significant variation across race and ethnicity. The average Hispanic or Latino household in St. Croix is larger than Black or White only households, but the same as

DRAFT

households with a householder of another race. In St. Thomas, the average White only household has the smallest number of members and if White and non-Hispanic or Latino, the number is smaller still. In 2010, Hispanics represented approximately 52 percent and Blacks represented approximately 65 percent of St. Croix's commercial fishermen. This suggests the average size of a St. Croix commercial fishermen's household is larger than the average St. Croix household. Approximately 57 percent of St. Thomas/St. John commercial fishermen are White and 40 percent are Black. White only households have the smallest average number of members. This suggests that a typical St. Croix commercial fisherman's household has almost 3 members, while the typical St. Thomas/St. John commercial fisherman's household has approximately 2 members. This further suggests that an equal reduction in landings in St. Croix and St. Thomas/St. John would have a greater impact on fishermen's households of St. Croix because the typical household in St. Croix has more members.

Table 3-38. Average household size by race and Hispanic/Latino ethnicity. Source: Census 2000.

Household Size	St. Croix	St. John	St. Thomas
Average	2.71	2.39	2.60
Black only householder	2.76	2.86	2.72
White only householder	2.19	1.91	2.03
Other race only householder	2.94	2.53	2.62
Hispanic or Latino householder	2.94	2.84	2.56
White, non-Hispanic/Latino householder	2.06	1.91	2.01

Approximately 36 percent of all households in St. Croix, 27 percent in St. Thomas, and approximately 18 percent in St. John had incomes below the poverty line in 1999 (Table 3-39). Of those households with income below the poverty line, 65 percent of those in St. Croix are family households and approximately 47 percent of those in St. John and 55 percent of those in St. Thomas are family households.

Table 3-39. Households with income below poverty line. Source: Census 2000.

Households	St. Croix	St. John	St. Thomas	% St. Croix	% St. John	% St. Thomas
Total	19,455	1,735	19,458	100.0%	100.0%	100.0%
Total below poverty line	7,082	318	5,245	36.4%	18.3%	27.0%
Family below poverty line	4,611	150	2,874	23.7%	8.6%	14.8%
Non-family below poverty line	2,471	168	2,371	12.7%	9.7%	12.2%

DRAFT

DRAFT

The poverty rate of households varies across St. Croix's census tracts, ranging from 21 percent of households to almost 52 percent in 1999. Approximately one of every two households in census tracts 9703, 9708, 9709, and 9711 in St. Croix has an income below poverty level (Table 3-40). These tracts include the areas north of Christiansted Harbor, North Central, and Frederiksted. The East End has the smallest percent of households with incomes below poverty level.

Table 3-40. Households with income below poverty line in St. Croix by census tract. Source: Census 2000.

Census Tract	Households			
	Total	Income below poverty	Income at or above poverty	% Income below povety
9701	1,073	225	848	21.0%
9702	1,204	551	653	45.8%
9703	1,575	813	762	51.6%
9705	2,025	516	1,509	25.5%
9706	1,488	307	1,181	20.6%
9707	1,052	296	756	28.1%
9708	993	478	515	48.1%
9709	1,189	630	559	53.0%
9710	624	176	448	28.2%
9711	1,312	662	650	50.5%
9712	1,707	625	1,082	36.6%
9713	971	448	523	46.1%
9714	1,844	801	1,043	43.4%
9715	779	205	574	26.3%
9716	1,619	349	1,270	21.6%

The poverty rate of households varies across census tracts in St. Thomas, ranging from approximately 16 percent to approximately 34 percent of households in 1999 (Table 3-41). The highest household poverty rates were in tracts 9613.02 and 9613.01, which include the area of Anna's Retreat. The lowest poverty rate was in tract 9605, which is the West End.

DRAFT

Table 3-41. Households with incomes below poverty level in St. Thomas by census tract. Source: Census 2000.

Census Tract	Households			
	Total	Income below poverty	Income at or above poverty	% Income below poverty
9601	1,602	436	1,166	27.2%
9602	919	242	677	26.3%
9603.01	1,022	284	738	27.8%
9603.02	702	190	512	27.1%
9604	1,693	292	1,401	17.2%
9605	1,882	292	1,590	15.5%
9606	1,039	188	851	18.1%
9608	1,029	295	734	28.7%
9609	938	297	641	31.7%
9610	2,319	751	1,568	32.4%
9612	1,461	482	979	33.0%
9613.01	599	201	398	33.6%
9613.02	1,653	565	1,088	34.2%
9614	1,245	373	872	30.0%
9615	1,355	357	998	26.3%

In 2003, approximately 24 percent of USVI residents did not have health insurance. The percent was larger among Hispanics, of which 32 percent lacked health insurance. Forty-four percent of the uninsured were Hispanic and approximately 40 percent were self-employed. Approximately 53 percent of residents with incomes under the poverty threshold lacked health insurance (State Health Access Data Assistance Center 2003). The census of fishermen does not include a question concerning if the fisherman has health insurance or not. If any fishermen have health insurance that is paid for by ex-vessel revenues as self-employed individuals, a regulation that results in a reduction in their revenues and personal and household incomes could result in the loss of health insurance as fishermen's incomes decline.

In 2010, USVI commercial fishermen were asked what percent of their household, not personal, income comes from fishing. In 2010, approximately 41 percent of St. Croix fishermen and 43 percent of those in St. Thomas/St. John reported that all of their household income derived from fishing, and approximately one of every two fishermen reported at least half of their household income came from fishing (Table 3-42). Household income includes income from various sources, such as wages and public assistance income. Hence, at least 41 percent of St. Croix fishermen and 43 percent of St. Thomas/St. John fishermen's households did not receive public assistance income and did not have a member engaged in wage labor. The USVI census of commercial fishermen does not ask how many persons are in a fisherman's household or if others in the household contribute to household income. If there are other members in a fisherman's household, all or some of those members may engage primarily or entirely in

DRAFT

wage labor and contribute to a fisherman's household income. It is reasonable to expect that fishing income represents a larger percent of household income in households where the fisherman and householder is in an ethnic or racial group with historically higher unemployment rates and lower median household income. Kojis and Quinn (2012) also do not discuss any differences in percents of household income from fishing by race or ethnicity, if any.

Table 3-42. Percent of household income from commercial fishing, 2010. Source: Kojis and Quinn 2012.

Percent of income	STT/STJ	STX	USVI
100%	43.2%	40.5%	41.5%
Greater than 75%	1.2%	9.5%	6.6%
Greater than 50% to 75%	6.2%	4.1%	4.8%
25% to 50%	8.6%	14.2%	12.2%
Less than 25%	28.4%	15.5%	20.1%
0%	12.3%	16.2%	14.8%

The percent of USVI households living in poverty is substantially larger than the percent that receive public assistance income. Less than 9 percent of St. Croix households received public assistance income (Table 3-43) while that same year approximately 36 percent of households had incomes below poverty level. Similarly, approximately 2 percent of St. John households and 8 percent of St. Thomas households had public assistance income and 18 percent of St. John and 27 percent of St. Thomas households had incomes less than poverty level. To participate in the Food Stamp Program, a household's net monthly income must be 100 percent or less than the federal poverty level. Net household income is equal to gross household income less approved deductions, such as child care and shelter.

Table 3-43. Number and percent of households with public assistance income. Source: Census 2000.

Island/ County	Households		
	Total	With public assistance income	% with public assistance income
St. Croix	19,455	1,684	8.7%
St. John	1,735	31	1.8%
St. Thomas	19,458	817	4.2%

Licensed commercial fishermen are not the only ones who may derive personal income from commercial fishing. Typically, a licensed commercial fisherman has other people fishing with him or her. The USVI census of fishermen asks how many people commercially fish with the licensed fisherman. Hence, more individuals and households may obtain part or all of their incomes from fishing than the numbers of licensed commercial fishermen and their respective households. In 2010, approximately 86 percent of St.

DRAFT

Croix and 88 percent of St. Thomas/St. John commercial fishermen reported that they fished with helpers who were not licensed commercial fishermen. Only 13 percent of St. Croix and approximately 16 percent of St. Thomas/St. John fishermen fished alone, and approximately 37 percent of St. Croix and 24 percent of St. Thomas/St. John commercial fishermen fished with other commercial fishermen. According to Kojis and Quinn (2012), commercial fishermen in both St. Croix and St. Thomas/St. John usually fish with one helper; however, when using nets, St. Croix fishermen may use from 6 to 13 helpers. Also, St. Croix fishermen who dive usually do so with at least one helper who serves as the boat captain. The USVI census of commercial fishermen does not include a question that asks if the helper(s) or other commercial fisherman who fishes with them is a member of the fisherman's household or not. It also does not include a question concerning how the helpers or others fishing with them are reimbursed for their efforts.

Dependence on fishing cannot be gauged strictly by the percent of personal or household income derived from fishing because the personal and social value of a catch extends far beyond its market value. Fishermen may also keep a significant portion of their catch for their own personal, family's, household's, and community's consumption, thereby withholding it from capitalist commodity production. The census of USVI fishermen asks what percent of their catch is sold. In 2010, approximately 21 percent of USVI fishermen said they sell all of their catch, although there are substantial differences across island areas. While approximately 46 percent of St. Thomas/St. John fishermen said all of their catch is sold, only about 7 percent of those in St. Croix sell all of their catch. Approximately 68 percent of St. Croix fishermen sell from 75 percent to 99 percent of their catch (Table 3-44).

Table 3-44. Percent of catch sold, 2010. Source: Kojis and Quinn 2012.

Percent of Catch Sold	Percent of Responding Fishermen		
	STX	STT/STJ	USVI
0	10.0%	12.3%	10.9%
1 to under 25	2.1	2.5%	2.3%
25 to under 75	12.9	6.2%	10.4%
75 to less than 100	67.9	33.3%	55.2%
100	7.1	45.7%	21.3%

In 2010, USVI commercial fishermen were also asked how many pounds of fish and/or conch/lobster/whelk per week are kept for personal or family consumption or given to friends. Approximately 24 percent of St. Thomas/St. John fishermen and 41 percent of St. Croix fishermen reported that they kept 15 or more pounds per week for their personal or family's consumption (Table 3-45). A partial explanation of why a larger percent of St. Croix fishermen retain a portion of their catch for personal or household consumption may be grounded in economic factors such as larger average households, lower median household income, and higher unemployment rates in St. Croix, especially for non-Whites, that decrease personal and household access to commodity food (and food security) as well as differing social norms, such as food sharing and other gift giving.

DRAFT

Table 3-45. Pounds kept for personal or family consumption, 2010. Source: Kojis and Quinn 2012.

Pounds kept per week for personal or family consumption	Percent of Responding Fishermen		
	STX	STT/STJ	USVI
0	4.8%	2.8%	4.1%
1 to under 5	10.5	8.3%	9.7%
5 to less than 15	43.5	65.3%	51.5%
15 to under 25	22.6	19.4%	21.4%
25 or more	18.5	4.2%	13.3%

Approximately 35 percent of St. Croix fishermen give 15 or more pounds each week to friends while approximately 22 percent of St. Thomas/St. John fishermen give away such quantities (Table 3-46). According to Kojis and Quinn (2012), St. Croix commercial fishermen often reported that they consumed and/or gave away fish that they could not sell. That is not to suggest that all fish consumed for personal or family consumption and/or given away are originally intended to be sold. Less than 2 percent of fishermen in St. Croix and less than 4 percent in St. Thomas/St. John reported that they kept and consumed and/or gave away fish they could not sell.

Table 3-46. Pounds given away to friends, 2010. Source: Kojis and Quinn 2012.

Pounds per week given to friends	Percent of Responding Fishermen		
	STX	STT/STJ	USVI
0	9.0%	10.0%	9.3%
1 to under 5	7.7%	37.5%	17.8%
5 to less than 15	47.4%	30.0%	41.5%
15 to under 25	17.9%	15.0%	16.9%
25 or more	17.9%	7.5%	14.4%

In St. Croix, the most frequently kept and consumed and/or given away commercial species are "potfish," which are reef fish, such as parrotfish, doctorfish, trunkfish, and triggerfish. They are called potfish because "they all go in the pot" and are sold as a part of an aggregate sale, not segregated from one another (Stoffle *et al.* 2009). Approximately one-third of commercial fishermen in St. Croix reported that they keep and consume and/or give away potfish (Table 3-47). In St. Croix, potfish are primarily consumed by locals and served in restaurants that cater to locals rather than tourists. Parrotfish is a much desired potfish. It is not uncommon for locals to turn away a seven pound mutton snapper and buy seven pounds of squirrel fish, blue or red parrotfish, angelfish, or grunts. The seven pounds of potfish feed a larger number of people and are said to be the preferred species of local consumers (Stoffle *et al.* 2009). Parrotfish are culturally important to Crucians (Valdés-Pizzini *et al.* 2010), and their importance along with other potfish likely increases substantially during times of economic hardship, which increases with rising unemployment, rising consumer prices, and falling household incomes. In St. Thomas/St. John, almost 66 percent of fishermen reported that they keep and consume and/or give away snapper, especially yellowtail snapper, and almost 48 percent keep and consume and/or give away potfish.

DRAFT

Table 3-47. Species kept and consumed and/or given away. Source: Kojis and Quinn 2012.

St. Thomas/St. John			St. Croix	
Species kept and consumed and/or given away	**Percent of Responding Fishermen**		**Species kept and consumed and/or given away**	**Percent of Responding Fishermen**
Snapper	65.6%		**Potfish**	32.7%
Potfish	47.5%		**All**	27.9%
Grouper	39.3%		**Snapper**	17.3%
Jacks	21.3%		**Conch**	14.4%
Lobster	9.8%		**Dolphinfish**	14.4%
Kingfish	4.9%		**Lobster**	9.6%
Tuna	3.3%		**Wahoo**	8.7%
Deepwater snapper	3.3%		**Tuna**	8.7%
Variable	3.3%		**Deepwater snapper**	6.7%
Fish not sold	3.3%		**Pelagics**	4.8%
All	1.6%		**Kingfish**	1.9%
Conch	1.6%		**Barracuda**	1.9%
Dolphinfish	1.6%		**Jacks**	1.9%
Bottomfish	1.6%		**Fish not sold**	1.9%
Flatfish	1.6%		**Octopus**	1.0%
Wahoo	0.0%		**Big eye scad**	1.0%
Pelagics			**Gar**	1.0%
Octopus			**Variable**	1.0%
Barracuda			**Grouper**	0.0%
Big eye scad			**Bottomfish**	
Gar			**Flatfish**	

The collective value of potfish is also evidenced by fishermen's responses to the question of what they commercially fish for. Approximately 80 percent of St. Croix's commercial fishermen and 85 percent of St. Thomas/St. John's commercial fishermen fished for reef fish (Table 3-48). Spiny lobster is the second most targeted species in St. Croix, and coastal pelagic species rank second in St. Thomas/St. John. According to Valdés-Pizzini *et al*. (2010), Whites tend to focus more on pelagic and deep-water species using hook and line and they spend a great deal of time fishing offshore. Approximately 57 percent of St. Thomas/St. John commercial fishermen and almost 16 percent of fishermen in St. Croix are White. Hispanics target reef fish, conch, and lobster through diving and spear fishing, and Blacks prefer coastal pelagic and reef fish species. Approximately 52 percent of St. Croix but less than 4 percent of St. Thomas/St. John commercial fishermen are Hispanic.

Table 3-48. What USVI commercial fishermen fish for by island area, 2010. Source: Kojis and Quinn 2012.

St. Croix			St. Thomas/St. John	
Species fished for	**Percent of Responding Fishermen**		**Species fished for**	**Percent of Responding Fishermen**
Reef fish	79.9%		**Reef fish**	84.5%
Spiny lobster	57.8%		**Coastal pelagic**	50.5%
Deep pelagic	48.1%		**Spiny lobster**	29.7%
Queen conch	42.2%		**Deep pelagic**	9.9%
Deepwater snapper	37.7%		**Whelk**	9.9%
Coastal pelagic	31.2%		**Queen conch**	8.8%
Whelk	13.0%		**Deepwater snapper**	7.7%
Bait fish	6.5%		**Bait fish**	3.3%

Just like in the U.S. as a whole, food insecurity is, and has been, a concern in the USVI. Food insecurity can have wide-ranging detrimental consequences on the physical and mental health of adults, including more vulnerable populations such as pregnant women and seniors. Lack of access to a nutritious and adequate food supply has implications not only for the development of physical and mental disease, but also behaviors and social skills (Hunger in America, Feeding America). Food and nutrition assistance programs of the USDA increase food security by providing low-income households access to food, a healthful diet, and nutrition education. The number of persons in the USVI who participated in the USDA Supplemental Nutrition Assistance Program (NAP; formerly called the Food Stamp Program) rose from 22,324 in February 2011 to 24,281 in February 2012, an 8.8 percent increase, as compared to the U.S. as whole which saw a 4.8 percent increase during that time. The food stamps have been replaced with an electronic benefit transfer, or EBT card, which limits recipients to buy food from grocery stores and other retailers where they can swipe the card. This may prevent them from buying fish directly from commercial fishermen at a lower cost.

Nationally, rates of food insecurity have been substantially higher than the national average for households with incomes near or below the federal poverty line, households with children headed by single women or single men, and Black and Hispanic households. As stated earlier, median family incomes vary substantially by race in the USVI. In St. Croix, the median family income for Whites exceeds the median family income of Blacks/African Americans and other Non-Whites, and the same racial income differences among Black/African American and White families are found in St. Thomas and St. John where Blacks/African Americans and Hispanics/Latinos have a lower median household income than Whites. In St. Croix, larger percents of Black/African American and other Non-White families live in poverty. For example, an annual average of 25.6 percent of Black/African American families lived in poverty, as opposed to 11.2 percent of White families from 2001 to 2007. Similarly, a larger percentage of Black/African American families lived in poverty in St. Thomas than their White

DRAFT

counterparts. Recall that approximately 65 percent of St. Croix commercial fishermen are Black and 52 percent are Hispanic, while approximately 40 percent of St. Thomas/St. John commercial fishermen are Black and almost 4 percent are Hispanic.

The number of farms in the USVI increased from 191 in 2002 to 219 in 2007; however, the number of acres declined significantly from 9,168 to 5,881 (USDA; 2007 Census of Agriculture). Similarly, the number of farms increased and acres in farms decreased in both St. Croix and St. Thomas/St. John (Table 3-49). The average size per farm decreased from 62.6 acres to 34.8 acres in St. Croix and from 8.8 to 5.2 acres in St. Thomas/St. John.

Table 3-49. St. Croix and St. Thomas/St. John farms and farm land. Source: USDA, 2007 Census of Agriculture.

Farms		USVI		St. Croix		St. Thomas/St. John	
		2002	2007	2002	2007	2002	2007
Farms	**Number**	191	219	139	160	52	59
Land in Farms	**Acres**	9,168	5,881	8,708	5,574	460	307
Average Size per Farm	**Acres**	48.0	26.9	62.6	34.8	8.8	5.2
Cropland	**Farms**	132	147	94	106	38	41
	Acres	911	493	845	399	66	94
Harvested	**Farms**	129	145	91	105	38	40
	Acres	602	304	558	246	44	58
Other	**Farms**	55	40	39	27	16	13
	Acres	309	188	287	152	22	36
Pasture or Grazing Land	**Farms**	109	103	86	79	23	24
	Acres	7,482	5,209	7,110	5,048	372	161
Woodland	**Farms**	13	19	9	11	4	8
	Acres	541	95	531	71	10	24
Other Land	**Farms**	109	82	84	54	25	28
	Acres	234	83	221	55	12	28

USVI farmers produce field and forage crops, such as cassava, dry beans, dry corn, sorghum, sugarcane, sweet potatoes, taniers, yams, and hay. They also produce vegetable crops, such as cabbage, carrots, celery, eggplant, green beans, okra, peppers, spinach, squash, and tomatoes. Fruits and nuts, such as avocadoes, bananas, coconuts, mangoes, papayas, and breadfruits, are also grown. The market value of these sold crops grew from 2002 to 2007 (Table 3-50). During the same period, the market value of most sold livestock increased; however, the market value of cattle and calves sold by Cruzan ranchers dropped substantially. During this 5-year period, there was a substantial decline in the number of cattle and calves and ranches from 2,223 to 776 animals. The primary reason for this fall is the rising price of land, which has motivated ranchers to sell their land. The Buccaneer, a resort in St. Croix for example, is located on a former cattle ranch. Another reason is decreased demand for local beef since the 1990s, especially after Hurricane Hugo. In 2006, the owners of Castle Nugent Farms, where Senepol cattle were developed, gave ownership of their herd to the University of the Virgin Islands. Presently, the National Park Service has proposed Castle Nugent Farms be incorporated into the National Park System as a historical site. The proposed Castle Nugent Farms site would extend off the land into territorial waters up to the three nm

DRAFT

limit. The new park is expected to have beneficial impacts to fish habitat and nursery in addition to other beneficial impacts.

Table 3-50. Market value of agricultural products sold, 2002 – 2007. Source: USDA, Census of Agriculture.

Farms		USVI		St. Croix		St. Thomas	
		2002	2007	2002	2007	2002	2007
Field and Forage Crops	Farms	28	37	19	23	9	14
	Dollars	45,877	49,104	23,955	35,044	21,922	14,060
Vegetables	Farms	77	93	51	64	26	29
	Dollars	340,048	366,195	219,425	311,305	120,623	54,890
Fruits and Nuts	Farms	87	117	64	80	23	37
	Dollars	130,784	216,877	101,629	137,188	29,155	79,698
Horticultural Specialities	Farms	32	21	24	16	8	5
	Dollars	799,090	946,636	721,363	858,636	77,727	90,000
Cattle and Calves	Farms	44	23	38	17	6	6
	Dollars	548,336	165,150	541,136	150,150	7,200	15,000
Hogs and Pigs	Farms	25	26	20	17	5	9
	Dollars	92,857	107,200	54,607	66,250	38,250	40,950
Other Livestock and Livestock Products	Farms	59	85	42	59	17	26
	Dollars	133,775	190,190	102,675	133,095	31,100	57,095
Poultry	Farms	10	7	6	4	4	3
	Dollars	(D)	4,620	(D)	1,550	(D)	3,070
Chicken Eggs	Farms	4	3	2	1	2	2
	Dollars	(D)	(D)	(D)	(D)	(D)	(D)
Milk	Farms	3	—	3	—	—	—
	Dollars	(D)	—	(D)	—	—	—
Fish and Aquaculture Products	Farms	1	1	1	1	—	—
	Dollars	(D)	(D)	(D)	(D)	—	—

(D): Undisclosed.

Livestock producers in the USVI face similar problems affecting production and profitability, regardless of the species raised. Parasitism, market competition, management techniques, and nutrition and fertility are the major causes of these problems (2012 University of the Virgin Islands Extension Plan of Work). In the cattle industry, and to a lesser extent goat and sheep industries, the brown cattle tick carries several diseases that can cause illness and death in a herd. In more recent years, a second tick has adversely affected cattle ranchers in the USVI. The swine industry is plagued by internal parasites often caused by hogs being raised as free-range or natural penned with a dirt floor.

The second major problem facing USVI livestock producers is market competition. Most of the meat and eggs sold and consumed are imported at a low cost that is difficult for local producers to match or be competitive with. The third and fourth problems of inferior management techniques and nutrition and fertility are related to USVI livestock producers being part time or casual ranchers with less finances and land. Locals are unwilling and/or unable to purchase locally produced meat and eggs if they cost more than imported meat and eggs, especially in communities that are characterized by low median household

DRAFT

income, high unemployment, and poverty. However, they can fish for and/or receive as a gift local fresh fish or purchase locally caught fish at prices they can afford.

Pounds harvested of field and forage crops, vegetables and fruits, nuts and horticultural specialties rose from 2002 to 2007 (Table 3-51) in both St. Croix and St. Thomas/St. John. The largest increase in the harvest of field and forestry crops was due to sugarcane, which increased 249 percent in St. Croix. Pounds harvested per capita increased in both St. Croix and St. Thomas/St. John.

Table 3-51. Pounds of harvested crops. Source: 2007 Census of Agriculture.

Farms	Pounds Harvested					
	USVI		St. Croix		St. Thomas/St. John	
	2002	2007	2002	2007	2002	2007
Field and Forage Crops	49,055	65,949	27,680	47,964	10,265	15,150
Vegetable Crops	351,638	421,070	272,795	351,855	79,463	68,595
Fruits, Nuts and Horticulture Specialities	171,793	369,394	122,880	265,391	41,649	104,012
Total	572,486	856,413	423,355	665,210	131,377	187,757
Total Pounds Harvested per Capita	5.20	7.46	3.85	5.80	1.19	1.64

Commercial landings of finfish and shellfish increased steadily and substantially from 1974 to 2000 (Figure 3-40). There was also a dramatic increase in pounds of commercial landings of fish and shellfish per capita since 1980 in the USVI (Figure 3-41). Pounds per capita increased from 1.21 in 1980 to 9.09 in 1990 then to 13.15 in 2000.

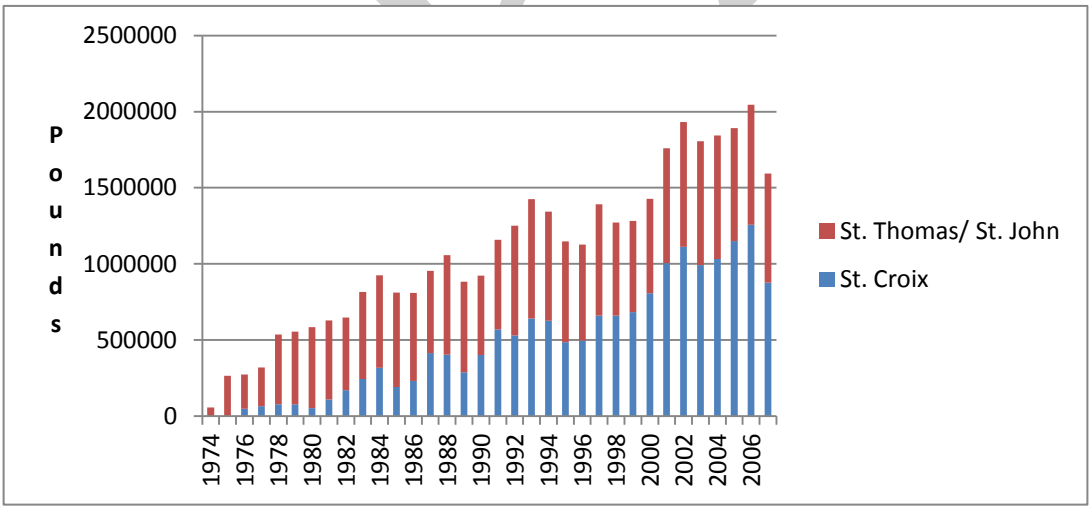

Figure 3-40. Commercial landings in St. Croix and St. Thomas/St. John, 1974 to 2007.

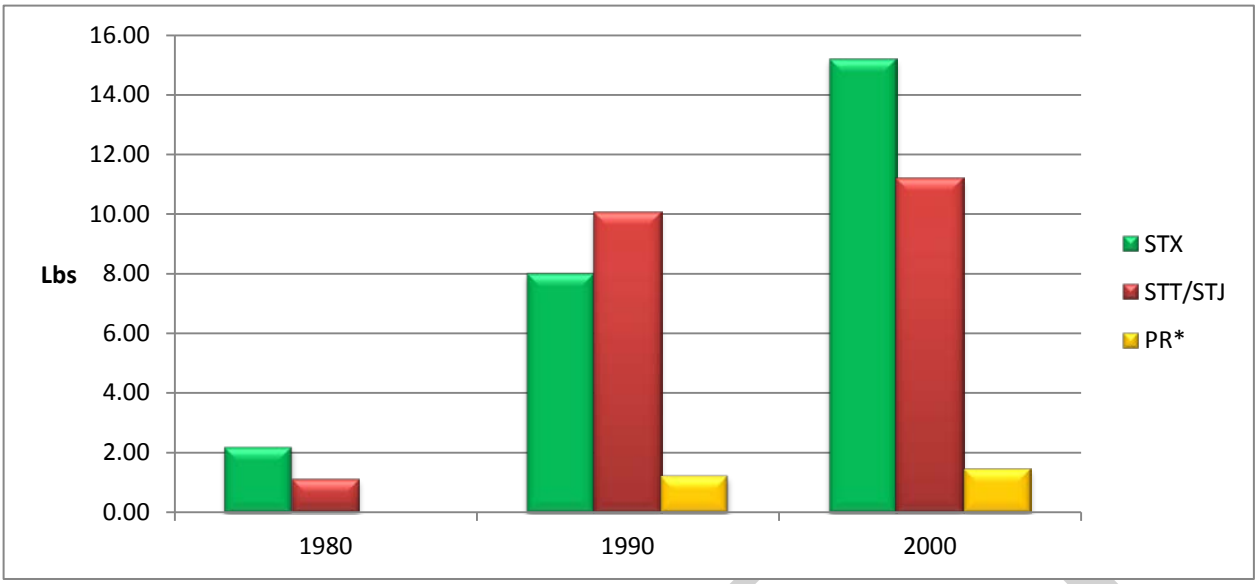

Figure 3-41. Per capita landings of fish and shellfish in Puerto Rico and USVI, 1980 to 2000.

Changes in landings per capita have not been equal across the two USVI island areas (Figure 3-42). Although both St. Croix and St. Thomas/St. John experienced increases in per capita landings from 1999 to 2002 and a decrease in 2003, St. Croix's per capita landings increased from 2004 to 2006, St. Thomas/St. John's per capita landings declined from 2004 to 2005. Both areas experienced decreases in per capita landings in 2007, although St. Croix had a substantially larger decrease.

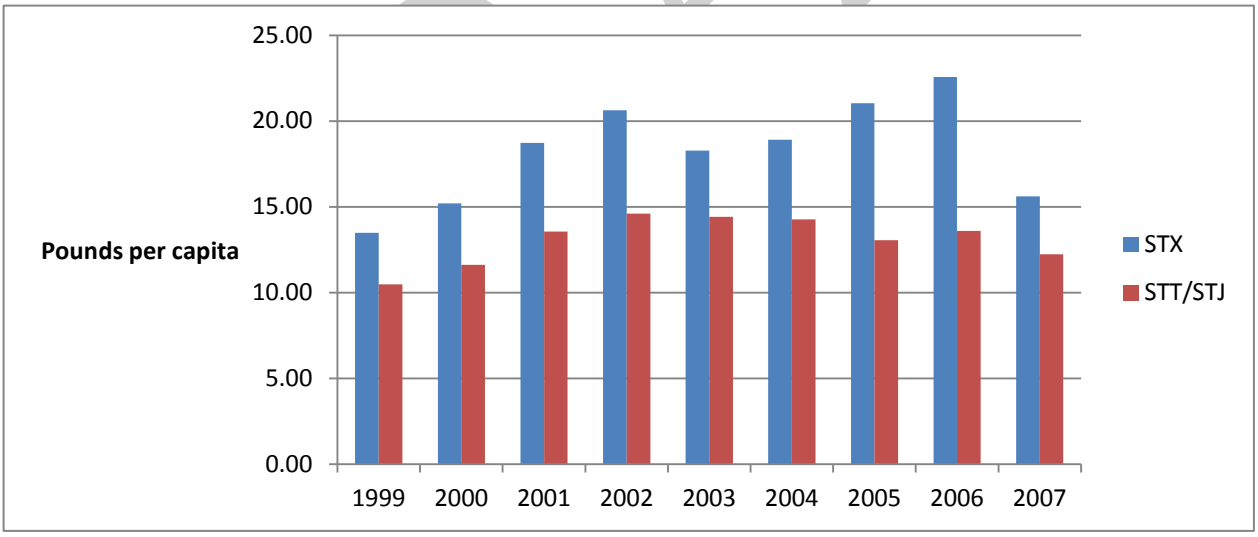

Figure 3-42. Landings per capita from 1999 to 2007, St. Croix and St. Thomas/St. John.

The annual per capita consumption of commodity fish and shellfish for human food is 29.6 pounds and much higher than that of Puerto Rico. The USVI's per capita production of landings represents 40 to 61 percent of its per capita consumption of fish and shellfish, which is evidence of USVI residents' dependence on fishing. From 1999 to 2006, there was a general increase in the contribution of USVI's

per capita landings to its per capita consumption, rising from approximately 40 percent in 1999 to 61 percent in 2006. In 2007, however, that contribution fell to approximately 47 percent.

The per capita consumption of commodity seafood does not include consumption of fish and shellfish that are caught by recreational and subsistence fishers. Landings of recreational and subsistence fishermen in the USVI are unknown. Hence, the above figure under-represents actual per capita consumption of finfish and shellfish. Recreational and subsistence fishing increase availability, access to, and consumption of fish and shellfish, and such availability, access and consumption is of substantial cultural significance in the USVI.

The agricultural sector contributes to no more than one percent of USVI's gross domestic product (GDP), and the USVI relies heavily on imported food from the U.S. mainland. This relative insignificance of agriculture is reflected in the USVI and U.S. Bureau of Economic Research annual reports, which exclude the agricultural sector. Approximately 80 percent of GDP comes from services, predominantly tourism, and 19 percent from manufacturing.

USVI's nominal and real GDP increased from 2002 to 2007 (Figure 3-43). Per capita real GDP also grew from $36,319 to $40,124 during the 5-year period. However, contraction of major economic indicators in the latter part of 2008 and 2009 indicate the territory had been in a recession, and the recent shutdown of the HOVENSA refinery, the largest private employer and taxpayer, is estimated to have an adverse impact of $500 million.

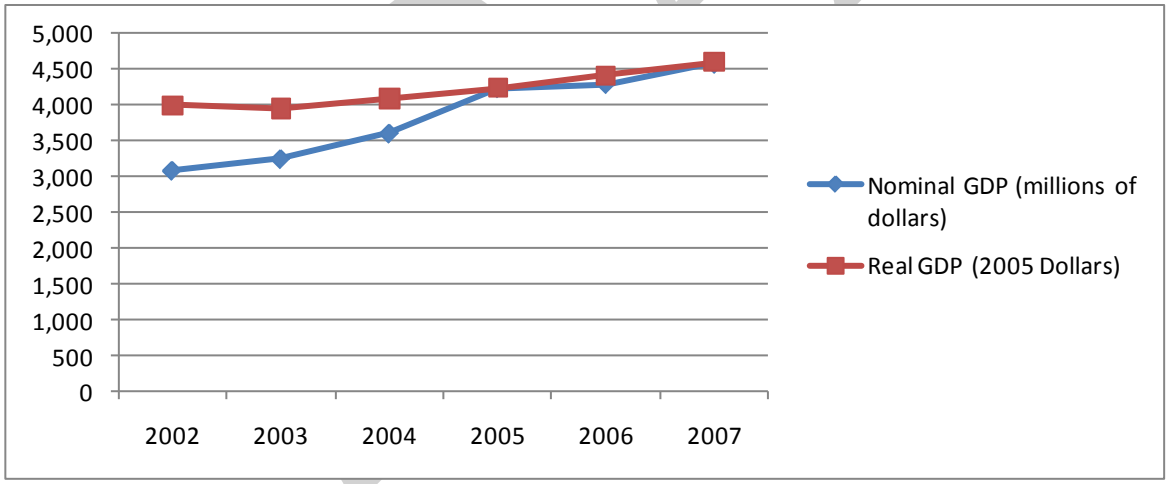

Figure 3-43. Nominal and real GDP, 2002 to 2007. Source: Bureau of Economic Research.

Fishing businesses are not employers in the USVI, although licensed commercial fishermen fish with others who may not be licensed fishermen. In 2003, about 79 percent said they fish with helpers and about 17 percent with other commercial fishermen. In 2010, approximately 86 percent of fishermen who responded to the crew question said they fished with helpers and 32 percent said they fished with other commercial fishermen. In 2010, the size of the crew, not counting the licensed fisherman who responded to the question, ranged from zero to 4 and averaged approximately one person in St. Croix, while the

number of crew members ranged from zero to 3 in St. Thomas/St. John and averaged about one as well. The functions of helpers are varied. In St. Croix, the largest percent of helpers are captains, followed by fishing (excluding diving). Other functions include diving, pulling traps, cleaning fish, etc. In St. Thomas/St. John, the largest percent of helpers are fishermen, followed by functions of preparing gear and the boat, being a first mate/deckhand, and pulling traps. In St. Croix, helpers perform functions that those in St. Thomas/St. John do not do. For example, helpers in St. Croix bait lines, clean fish, fix gear, sell fish, and do everything.

There has been a moratorium on commercial fishing licenses in the USVI since 2003. As of March 2011, there were 177 licensed commercial fishermen in St. Croix and 120 in St. Thomas/St. John. However, there were 214 fishermen in St. Croix and 187 in St. Thomas/St. John on the 2010-2011 DFW registration list (Kojis and Quinn 2012).

USVI licensed commercial fishermen devoted fewer hours to fishing activities in 2010 than in 2004. In 2004, approximately 67 percent of USVI fishermen were involved in fishing activities more than 36 hours per week. Sixty-one percent of St. Croix's commercial fishermen were full-time, 31.5 percent were part-time (36 hours or less per week), and the remaining 7.5 percent were opportunists. Approximately 77 percent of St. Thomas/St. John's commercial fishermen were full-time, 19 percent fish part-time, 3 percent were opportunists and one percent were charter fishing operations (Kojis 2004). In 2010, approximately 37 percent of USVI commercial fishermen were involved in fishing activities more than 36 hours per week. Approximately 41 percent of St. Croix's commercial fishermen were full time, 25 percent were part-time (15 to 36 hours per week), and the others spent less than 15 hours per week in fishing activities. Approximately 30 percent of St. Thomas/St. John commercial fishermen were full time, 27 percent were part time, and 30 percent spent less than 15 per week performing fishing activities. In 2010, approximately 7 percent of St. Croix and 12 percent of St. Thomas/St. John licensed commercial fishermen reported they were not fishing.

In 2009, there was one fish and seafood merchant wholesaler located in St. Thomas with zero to 19 employees in the USVI, according to 2009 County Business Patterns. According to the 2007 Economic Census, St. Croix had up to four fish markets with 15 employees, up to six diving equipment stores with 20 employees, 27 limited-services eating places with 363 employees, 37 establishments with 349 employees in Full-service Restaurants Industry, and one establishment in the Charter Boat Industry. Also, according to the same census, in St. Thomas/St. John, there were: up to 15 fish markets with 98 employees, up to12 charter and party fishing operations with 20 to 99 employees, up to seven dive shops with 20 to 99 employees, 37 limited-services eating places with 288 employees, and 76 establishments with 1,307 employees in Full-service Restaurants industry.

Commercial fishermen distribute their catches in multiple ways, but the dominant method in St. Thomas/St. John is selling the catch to government markets, while the dominant method in St. Croix is to sell catch to local residents in private sales (Figure 3-44). Less than 4 percent of St. Thomas/St. John and less than 12 percent of St. Croix fishermen sell their catches to buyers. In the past, there were two

DRAFT

government markets with facilities for cleaning fish with running water in St. Croix: Albert Edwards Fish Market in Frederiksted and Villa La Reine Fish Market; however, the Villa La Reine Fish Market has been closed for several years (Kojis and Quinn 2012). The Villa La Reine Market had waste disposal problems and there continues to be insufficient funding to add a sewer line and otherwise keep up with required maintenance and oversight. Despite that government market being closed, St. Croix fishermen continued to sell their catch adjacent to the Villa La Reine Fish Market by constructing private stands. In St. Croix, tourists tend to buy seafood at higher price restaurants, while locals get their fish at the government markets, direct from the fishermen and restaurants favored by the locals (Stoffle *et al*. 2009). That suggests the bulk of the catch is purchased and consumed by St. Croix's residents. There are only two government fish markets in St. Thomas/St. John with facilities for cleaning and selling fish and both are in St. Thomas: Gustave Quetel Fish House in Frenchtown and Lionel Roberts Stadium Fish House northeast of Charlotte Amalie. Gustave Quetel Fish House is the primary fish market on the island. The government-owned building in which the market is located has locking storage spaces available for lease to fishermen for storing gear. Some operators own freezers for storing seafood in the building. The large fish-cleaning area is a busy place in the mornings. The market is busiest on Friday and Saturday mornings when trade can begin as early as 4:00 am. Fishermen can often be observed socializing near the market (Stoffle *et al*. 2009).

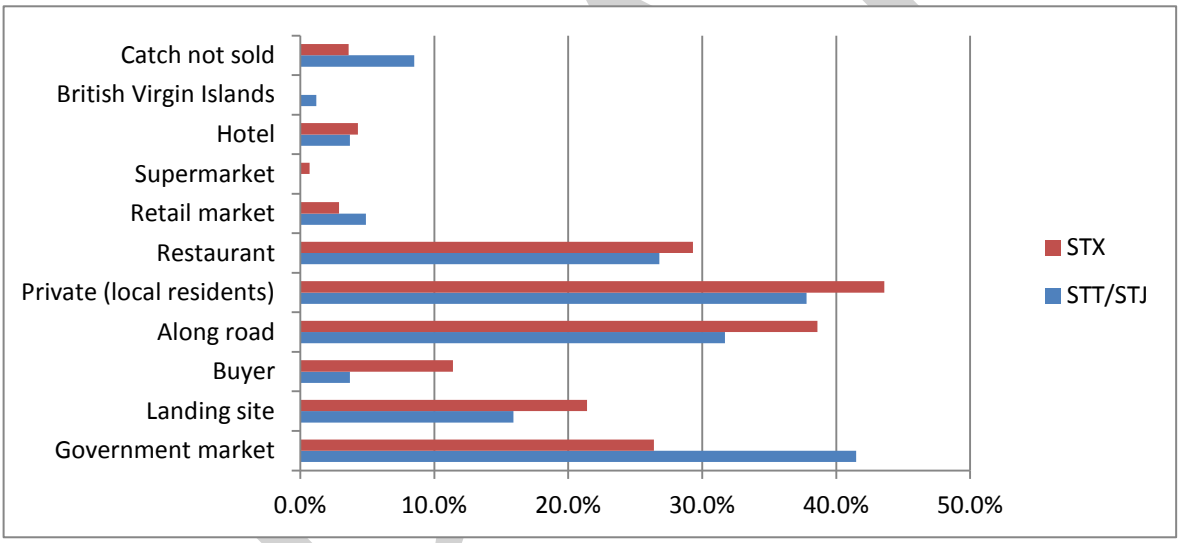

Figure 3-44. Locations where catch is sold in St. Thomas/St. John and St. Croix. Source: Kojis and Quinn 2012).

In 2007, there were up to 8 marinas in St. Croix with 73 employees and up to 29 marinas in St. Thomas/St. John with 441 employees (2007 Economic Census).

Additional information about St. Croix and St. Thomas/St. John fishing-related infrastructure and fishing communities can be found in Stoffle *et al*. (2009), Impact Assessment (2007), and Valdés-Pizzini *et al*. (2010) and is incorporated by reference.

One economic sector that rebounded in 2010 but then fell in 2011 is the tourist (visitor) sector. Hotel occupancy rates fell and while the total visitor arrivals for the first two quarters of Fiscal Year (FY) 2010

increased 12.2 percent from the previous year, they fell in FY2011. While hotel revenues grew in 2010, they fell in 2011 (USVI Bureau of Economic Research). However, cruise ship calls increased over that time.

Despite the improvement, there continued to be job losses in construction, trade, financial services, and tourist accommodation services. Construction permit value also declined from 2010 to 2011. However, there were signs of increasing construction activity and jobs primarily from private residential construction, government public works projects and the Diageo and Cruzan Rum distillery and wastewater treatment plant construction; however, they are dwarfed by the HOVENSA shutdown and its total impact. Another threat to the USVI economy has been the government's tendency to run budget deficits. In FY2011, for example, the deficit was approximately $170 million. According to the Virgin Islands Daily News (January 30, 2012), before the HOVENSA announcement was made, the USVI government laid off 500 employees because of an estimated $67.5 million budget deficit in FY2012.

Currently, 3 beach resort developments have been proposed in St. Croix and are in the permitting process: Seven Hills Beach Resort and Casino, Amalago Bay Resort and Casino, and Great Pond Bay Resort and Casino. The Seven Hills resort will cover over 618 acres on the southeast shore in the areas of Estate Mt. Retreat, Estate Little Profit, Estate Cotton Grove, and Estate Mt. Fancy (C&R Development Company, just west of the Diva Carina Bay Resort (www.crdevco.com)). It would include 4 hotels, condos and single family homes, conference and sports center, water park, 18-hole golf course, and casino.

Manufacturing has been the second largest sector of the USVI economy, and its primary industries are refined petroleum products, rum, and jewelry. The watch industry is in a state of collapse, and its survival is doubtful. There is only one company remaining and its output has been declining. On January 18, 2012, HOVENSA LLC announced it was shutting down the refinery (http://www.hovensa.com), resulting in the loss of over 2,000 jobs by mid-February 2012. Since the shutdown, the complex has operated as an oil storage terminal and retained approximately 100 workers. HOVENSA was one of the ten largest refineries in the world with a crude oil distillation capacity of 495,000 barrels per day. Approximately 95 percent of its output was exported to the U.S. mainland (U.S. Bureau of Economic Research 2010). Much of the USVI's export performance was dependent on HOVENSA, and the value of HOVENSA's exports peaked in FY2008 at $14,967 billion and then dropped to $9,353 billion in FY2009. The value of its exports for the first six months of FY2010 was $5,452 billion, suggesting improvement over the previous year. In 2011, HOVENSA was fined over $5 million for air pollution infractions and was required to implement $700 million worth of pollution control measures and a $4.875 million environmental project fund to benefit the Virgin Islands environment. The joint owners of HOVENSA claim the shutdown was primarily due to the downturn in the global petroleum market, although the looming $700 million in required capital improvements were likely also a factor.

DRAFT

St. Croix is the site of the fourth largest premium spirits company in the world: Cruzan VIRIL Ltd, which manufactures Cruzan and Old St. Croix brand rum as well as shipments for other labels. The rum tends to be exported in bulk to the U.S. mainland; however, it is also sold to local and regional bottlers for sale under a variety of private labels and regional brand names. Recently Cruzan VIRIL signed a 30-year public-private partnership agreement with the USVI government that includes an expansion of the rum-making facility and the construction of a wastewater plant to deal with historical effluent disposal concerns. Expansion of the facility will increase production capacity by approximately 50 percent (U.S. Bureau of Economic Research 2010). The deal is expected to provide the territorial government with a long-term revenue stream. In the first quarter of FY2010, the USVI government received $30.5 million in rum excise tax revenues. Also, for each proof gallon of rum produced in the USVI and exported to the U.S. mainland, the federal government collects $13.50 in excise taxes, from which $13.25 is returned to the USVI.

Rum exports increased in the second quarter of FY2010 by 23.9 percent to 2,654 proof gallons, compared to 2,143 proof gallons in the second quarter of the previous fiscal year. Rum exports during the first six months of FY2010 improved 20.7 percent over the previous year.

Additional information about the current state of manufacturing and other economic sectors can be found in the U.S. Bureau of Economic Research's report, USVI Economic Review March 2010, and is incorporated by reference.

3.3.3 Economic and Social Environments of Puerto Rico

PR Resident and Fishermen Populations in Context

The population of Puerto Rico grew from approximately 3.5 million persons in 1990 to approximately 3.8 million persons in 2000. The population fell to approximately 3.7 million persons in 2010.

Puerto Rico has one of the highest population densities in the world. As of 2008, there were 1,151 persons per square miles (44 per square kilometer), up from 1,109 persons per square mile in 2000. According to www.siteatlas.com, Puerto Rico ranks 27th in the world in population density (http://www.sitesatlas.com/Thematic-Maps/Population-density.html). According to the CIA – The World Factbook (2009), 98 percent of the population lives in urban areas, and the urbanization rate is 0.8 percent.

Puerto Rico is divided into 78 municipalities (Figure 3-45). Forty-four of these municipalities are along the coast (18 on the north coast from Isabela to Luquillo, eight on the east coast from Fajardo to Maunabo and including Vieques and Culebra, 12 on the south coast from Lajas to Patillas, and six on the west coast from Cabo Rojo to Aguadilla). In 2008, 868 active commercial fishermen lived in 39 of these coastal municipalities.

DRAFT

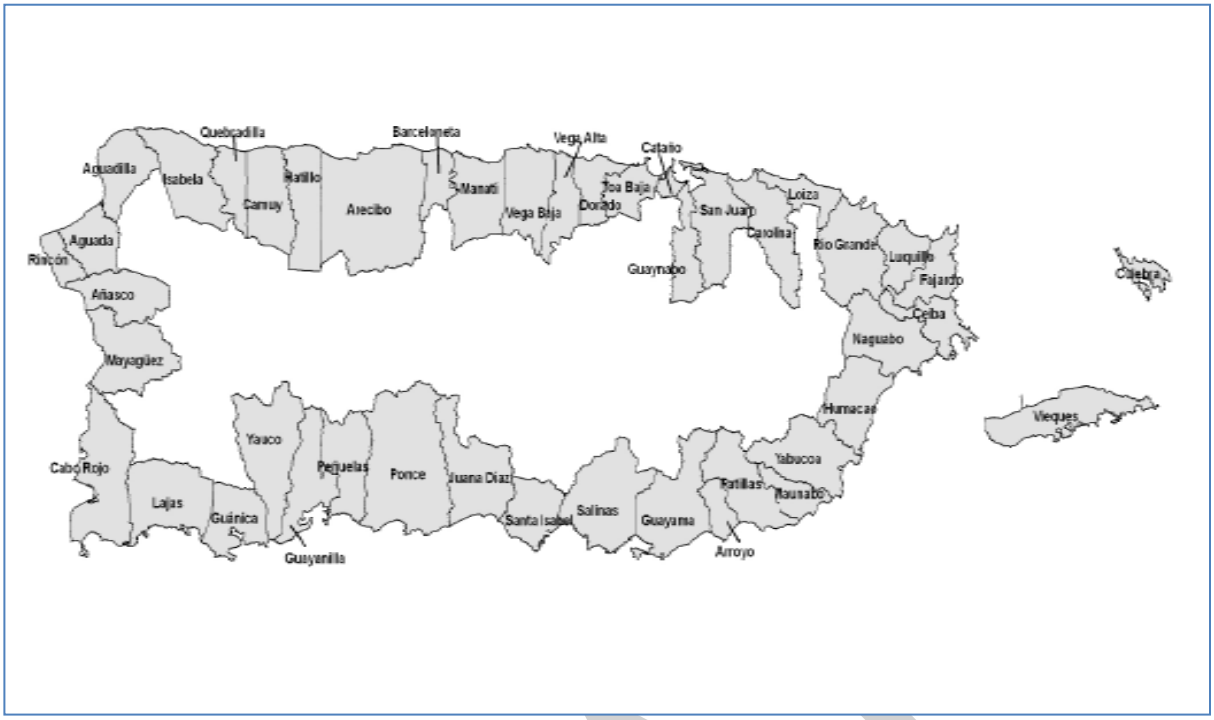

Figure 3-45. Puerto Rico's coastal municipalities. Source: Griffith et al. 2007.

The north coast is the most populated coast, with San Juan Municipio leading with an estimated population of over 400,000 persons in 2008. It is also the municipality with the highest population density (Table 3-52). Approximately 18 percent of the active commercial fishermen interviewed in 2008 lived in north coast municipalities. None of these commercial fishermen lived in Quebradillas, Manatí, Toa Baja, or Guaynabo, although there was a marina in Guaynabo in 2008. The populations of 12 of the 14 north coast municipalities where commercial fishermen lived increased from 2000 to 2008.

DRAFT

Table 3-52. Populations of north coast municipalities where active commercial fishermen lived in 2008. Source: U.S. Census Bureau.

Municipality	1990 Population	2000 Population	2008 Est. Population	2008 Population Density (mi.^{2})
Arecibo	93,385	100,131	102,645	808.2
Barceloneta	20,947	22,322	23,106	962.8
Camuy	28,917	35,244	39,851	847.9
Carolina	177,806	186,076	187,438	4,074.7
Cataño	34,587	30,071	26,074	5,214.8
Dorado	30,759	34,017	36,630	1,592.6
Hatillo	32,703	38,925	43,658	1,039.5
Isabela	39,147	44,444	48,134	859.5
Loiza	29,307	32,537	33,778	1,407.4
Luquillo	18,100	19,817	20,561	790.8
Rio Grande	45,648	52,362	56,695	929.4
San Juan	437,745	434,374	422,665	8,992.9
Vega Alta	34,559	37,910	39,723	1,418.7
Vega Baja	55,997	61,929	64,879	1,380.4
Total	1,079,607	1,130,159	1,145,837	1,900.2

Approximately 27 percent of active commercial fishermen interviewed in 2008 lived in 11 of the 12 south coast municipalities. Ponce is the largest of these municipalities, both by population and area. In 2008, it had an estimated population of 179,353 persons and population density of 1,546 persons per square mile (Table 3-53). The populations of Patillas and Ponce declined from 1990 to 2008.

Table 3-53. Populations of south coast municipalities where active commercial fishermen lived in 2008. Source: U.S. Census.

Municipality	1990 Population	2000 Population	2008 Est. Population	2008 Population Density (mi.^{2})
Arroyo	18,910	19,917	18,954	1,263.6
Guánica	19,984	21,888	22,824	634.0
Guayama	41,588	44,301	45,298	686.3
Guayanilla	21,581	23,072	23,686	564.0
Juana Diaz	45,198	50,531	53,223	872.5
Lajas	23,271	26,261	28,027	459.5
Patillas	19,633	20,152	19,941	424.3
Peñuelas	22,515	26,719	29,575	657.2
Ponce	187,749	186,475	179,353	1,546.1
Salinas	28,335	31,113	32,241	467.3
Santa Isabel	19,318	21,665	22,925	674.3
Total	448,082	472,094	476,047	804.1

Approximately 37 percent of active commercial fishermen in 2008 lived in all six west coast municipalities. The largest of these municipalities is Mayagüez, both in area and population (Table 3-54); however, its population has declined with its demise as Puerto Rico's manufacturing center.

DRAFT

Table 3-54. Populations of west coast municipalities where active commercial fishermen lived in 2008. Source: U.S. Census.

Municipality	1990 Population	2000 Population	2008 Est. Population	2008 Population Density (mi.^{2})
Aguada	35,911	42,042	46,036	1,534.5
Aguadilla	59,335	64,685	67,491	1,874.8
Añasco	25,234	28,348	30,300	757.5
Cabo Rojo	38,521	46,911	53,849	758.4
Mayagüez	100,371	98,434	92,996	1,223.6
Rincón	12,213	14,767	16,615	1,186.8
Total	271,585	295,187	307,287	1,150.9

Approximately 18 percent of active commercial fishermen lived in all of the eight east coast municipalities in 2008. The east coast is the least populated coast, and Culebra is the least populated municipality with less than 2,200 persons in 2008 (Table 3-55). Vieques and Culebra have the smallest population densities: 178 persons per square mile and 194 persons per square mile, respectively.

Table 3-55. Populations of east coast municipalities where active commercial fishermen lived in 2008. Source: U.S. Census.

Municipality	1990 Population	2000 Population	2008 Est. Population	2008 Population Density (mi.^{2})
Ceiba	17,145	18,004	17,802	659.3
Culebra	1,542	1,868	2,138	194.4
Fajardo	36,882	40,712	42,270	1,363.5
Humacao	55,203	59,035	60,809	1,351.3
Maunabo	12,347	12,741	12,668	603.2
Naguabo	22,620	23,753	24,342	459.3
Vieques	8,602	9,106	9,252	177.9
Yabucoa	36,483	39,246	40,559	737.4
Total	190,824	204,465	209,840	711.3

Census data of the racial composition of Puerto Rico's population has been and continues to be questioned for its reliability (Loveman and Muniz 2007; Duany 2000). Since the early twentieth century, according to Census data, Puerto Rico has become increasingly White. In 1910, 65 percent of Puerto Rico's population was White. By 1920, according to the Census, 74 percent of the population was White, and in 2000, approximately 80 percent of Puerto Rico's population identified themselves as White.

In 2000, less than half a percent of the population was American Indian or Alaska Native. However, a recent island-wide DNA survey found that 61 percent of all Puerto Ricans have Amerindian (Taíno) mitochondrial DNA, 27 percent have African and 12 percent Caucasian mitochondrial DNA (Kearns 2003). The genetic survey supports Puerto Ricans' belief that they are multiracial and have not, and do not, fit into Census racial categories. This genetic survey motivated some Puerto Ricans to identify themselves as Taíno in the 2010 Census (mytwocensus.com, May 12, 2010). Results of the 2010 Census indicates a 48.8 percent increase in those who identified as American Indian or Alaska Native alone.

DRAFT

The racial composition of the population changed from 2000 to 2010, with significant increases in those identifying as Black or African American alone or American Indian or Alaska Native alone (Table 3-56). The questionable usefulness of racial classifications may explain why the census of Puerto Rico's commercial fishermen does not include questions regarding race. The first inclusion of Hispanic occurred in the 1940 Census that separated Whites into those with Spanish mother tongue versus those with another mother tongue. Approximately 99 percent of Puerto Rico's population in 2000 and 2010 was classified as Hispanic or Latino (of any race).

Table 3-56. Puerto Rico population by race, 2000 and 2010. Source: U.S. Census Bureau, Census 2000 and Census 2010.

Race	2000	2010
White alone	80.5%	75.8%
Black or African American alone	8.0%	12.4%
American Indian or Alaska Native alone	0.4%	0.5%
Asian alone	0.2%	0.2%
Some other race alone	6.8%	7.8%
Two or more races	4.2%	3.3%

The distribution of Puerto Rico's population by gender and age has also changed. The median age has increased and ratio of males to females continues to decline (Table 3-57).

Table 3-57. Puerto Rico population by gender and age, 1990, 2000 and 2010. Source: U.S. Census Bureau.

Subject	1990		2000		2010	
	Number	Percent	Number	Percent	Number	Percent
Total population	**3,522,037**	**100**	**3,808,610**	**100**	**3,725,789**	**100**
SEX AND AGE						
Male	1,705,642	48.43	1,833,577	48.10	1,785,171	47.91
Female	1,816,395	51.57	1,975,033	51.90	1,940,618	52.09
Under 15 years	957,919	27.20	906,368	23.80		
Under 18 years					903,295	24.24
15 to 64 years	2,049,082	58.18	2,477,105	65.04		
18 to 64					2,280,496	61.21
65 years and over	515,036	14.62	425,137	11.16	541,998	14.55
Median age (years)	28.5		32.1		36.9	

DRAFT

DRAFT

The proportion of Puerto Rico's population under 18 years old declined from 50 percent in 1960 to 29 percent in 2000. The decline in the population under 18 years old has two primary causes. First, there has been a decline in fertility rates. In 1950, the fertility rate was 5.2 births per woman, and 20 years later it was 3.2 births per woman, and then in 2000, it was 1.9 births per woman. In 2006, the fertility rate was 1.75 births per woman, as opposed to 2.1 births per woman in the U.S. as a whole and 1.88 births per woman in the USVI. Reasons for the declining fertility rate are increasing rates of female sterilization in the 1950s and 1960s and continued sterilization (Fisher 2007). According to a 2003 Annie E. Casey Foundation Report, 46 percent of married women at that time had been sterilized, which was the highest rate of sterilization of any country for which the Foundation had data. Additionally, in the 1950s, U.S. pharmaceutical researchers established a base of operations in Puerto Rico to conduct large-scale clinical trials on oral contraceptives, the results of which led to permanent infertility among a substantial proportion of test subjects (Fisher 2007). Second, many young Puerto Ricans migrated and continue to migrate to the U.S. mainland, especially when economic opportunities are significantly greater off the island.

There has been considerable movement of Puerto Ricans between the U.S. mainland and the island since 1945-1946 when a large number of Puerto Ricans left for the mainland in search of jobs and higher wages (Ayala and Bernabe 2007: 179). Almost one million Puerto Ricans left the island for the agricultural fields and urban areas of the north between 1940 and 1970, which translated to one migrant for every two persons added to Puerto Rico's island population (Marzán *et al*. 2008). Net outmigration from the island during the 1970s substantially decreased, when almost as many returned to the island as migrated to the mainland. Middle-aged workers and pre-World War II and early post-World War II generations as well as persons who had been laid off because of industrial restructuring returned to resettle on the island. Net outmigration almost doubled during the 1980s as economic conditions on the mainland improved and were better than on the island. More persons left the island and fewer returned during the 1980s and 1990s than in the 1970s; however, substantially fewer migrated to New York City and other areas of the northeast. Increasing numbers were going to Florida and Midwest and Western states. In 2007, there were 4,120,205 Puerto Ricans living in the States, while Puerto Rico's population for that year was 3,942,375 (U.S. Census Bureau; 2007 American and Puerto Rico Community Surveys).

The median annual income in Puerto Rico is substantially less than the median annual income in the U.S., which explains, in part, the movement from the island to the U.S. mainland. In 2000, the median annual income in Puerto Rico was $9,200 as compared to $21,300 in the U.S. (Table 3-58). The percent of individuals in Puerto Rico with annual incomes less than $10,000 fell from 74.5 percent in 2000 to 62.1 percent in 2007.

DRAFT

Table 3-58. Annual income (from all sources) of Puerto Rico and U.S., 2000 and 2007. Source: FNS, USDA 2010.

Annual Income (from all sources)	Percent of Population			
	Puerto Rico		United States	
	2000	2007	2000	2007
Less than $5,000	61.9	44.6	39.4	21.3
$5,000 to $9,999	12.6	17.5	9.2	10.2
$10,000 to $14,999	9.6	12.0	7.9	9.1
$15,000 to $19,999	5.2	7.2	6.7	7.5
$20,000 to $24,999	3.9	5.2	6.4	7.3
$25,000 to $29,999	1.7	3.5	5.3	6
$30,000 and over	5.2	10.0	25.1	38.6
Median Annual Income	$9,200	$10,200	$21,300	$25,000

Median household income in Puerto Rico in 2008 was $18,610, which was below every median household income for the 50 states and District of Columbia (2006-2008 American Community Survey and Puerto Rico Community Survey). The median household income for the 39 coastal municipalities where active commercial fishermen lived in 2008 ranged from $11,212 to $27,467 in 2008 (Table 3-59). The average median household income per coast was highest along the north coast and lowest along the west coast. Note that the municipalities of Arroyo, Ceiba, Culebra, Maunabo, Vieques, and Rincón were not included in the 2006-2008 Community Survey and their median household incomes are identified as NA (not applicable) in the below table.

Table 3-59. Median household income in 2008 dollars. Source: 2006-2008 Puerto Rico Community Survey. (HH=Household)

North Coast		South Coast		East Coast		West Coast	
Municipality	**Median HH Income**	**Municipality**	**Median HH Income**	**Municipality**	**Median HH Income**	**Municipality**	**Median HH Income**
Arecibo	16,515	**Arroyo**	NA	**Ceiba**	NA	**Aguada**	13,715
Barceloneta	15,303	**Guánica**	12,561	**Culebra**	NA	**Aguadilla**	13,946
Camuy	13,311	**Guayama**	16,859	**Fajardo**	18,879	**Añasco**	15,311
Carolina	27,467	**Guayanilla**	14,845	**Humacao**	18,215	**Cabo Rojo**	15,432
Cataño	17,661	**Juana Diaz**	16,631	**Maunabo**	NA	**Mayagüez**	14,095
Dorado	22,976	**Lajas**	15,302	**Naguabo**	14,729	**Rincón**	NA
Hatillo	15,148	**Patillas**	13,396	**Vieques**	NA	***Average***	14,500
Isabela	11,212	**Peñuelas**	14,379	**Yabucoa**	13,632		
Loiza	20,220	**Ponce**	16,658	***Average***	16,364		
Luquillo	19,997	**Salinas**	13,335				
Rio Grande	20,257	**Santa Isabel**	11,934				
San Juan	23,916	***Average***	14,590				
Vega Alta	16,996						
Vega Baja	16,981						
Average	18,426						

DRAFT

Poverty is the lack of basic human needs, such as clean water, nutrition, clothing, shelter, health care, and education because of the inability to afford them. High poverty rates have been persistent in Puerto Rico. From 2006 to 2008, 45.3 percent of the population was below the poverty level (Puerto Rico Community Survey). To place that in comparison to the 50 States and the District of Columbia, Mississippi's 21.0 percent poverty rate was the highest among the States, followed by Louisiana (18.5 percent), New Mexico (17.9 percent), District of Columbia (17.8 percent), and Arkansas (17.6 percent). The top five states with the lowest poverty rates were New Hampshire, Maryland, Connecticut, New Jersey, and Hawaii (Table 3-60). From 2006 to 2008, 13.2 percent of people in the U.S. as a whole lived in poverty. The annual poverty levels set by the U.S. Census Bureau do not reflect local and regional variations. Consequently, the actual poverty rate in Puerto Rico, with its higher cost of living, is higher than reported in the Census Bureau's community and population surveys.

Table 3-60. Comparison of percent of people below poverty level. Source: 2006-2008 American Community Survey, Puerto Rico Community Survey.

Area	Percent	Area	Percent	Area	Percent
Puerto Rico	45.3	New York	13.8	Nebraska	11.1
Mississippi	21.0	Oregon	13.4	Nevada	10.8
Louisiana	18.5	Missouri	13.3	Wisconsin	10.7
New Mexico	17.9	Ohio	13.2	Vermont	10.5
District of Columbia	17.8	South Dakota	13.2	Delaware	10.4
Arkansas	17.6	California	12.9	Massachusetts	10.0
Kentucky	17.2	Indiana	12.7	Utah	10.0
West Virginia	17.2	Florida	12.6	Virginia	9.9
Alabama	16.3	Maine	12.6	Minnesota	9.7
Texas	16.3	Idaho	12.4	Alaska	9.5
Oklahoma	16.2	Illinois	12.1	Wyoming	8.9
Tennessee	15.7	North Dakota	12.1	Hawaii	8.8
South Carolina	15.5	Colorado	11.9	New Jersey	8.7
North Carolina	14.6	Pennsylvania	11.9	Connecticut	8.5
Georgia	14.5	Kansas	11.7	Maryland	8.0
Arizona	14.3	Rhode Island	11.6	New Hampshire	7.6
Montana	14.3	Washington	11.6		
Michigan	14.0	Iowa	11.2	United States	13.2

The average poverty rates of municipalities where active commercial fishermen live and those were they did not live have been very similar. The average poverty rate of the 39 municipalities where active commercial lived in 2008 was 52.3 percent as compared with an average poverty rate of 53.5 percent for all other municipalities in 1999. Among the 39 municipalities where active commercial fishermen lived, Culebra had the lowest poverty rate (36.99 percent) and Vieques had the highest with 64.58 percent of its population living below the poverty level (Table 3-61). The highest average poverty rate was on the south coast; however, all were approximately 50 percent or higher.

DRAFT

In 1989, 67 percent of Puerto Rico's children less than 18 years old lived in families with incomes below the poverty line. That decreased in 1999 to 58 percent of Puerto Rican children. For comparison, 16 percent of children less than 18 years old lived in families with incomes below the poverty line in the U.S. in 1999. During the 3-year period from 2006-2008, an estimated 56.1 percent of children under 18 years old lived below the poverty level in Puerto Rico (U.S. Census Bureau; Puerto Rico Community Survey). Also, an estimated 262,175 (21.6 percent) of the 1,213,446 persons that comprised the employed civilian labor force 16 years and older lived in poverty. During the same time period, 66.2 percent of the unemployed civilian labor force 16 years and over in Puerto Rico lived in poverty. Employment reduces the risk of living in poverty; however, it does not eliminate poverty.

Table 3-61. Poverty rate in fishing municipalities, 1999. Source: Census 2000.

North Coast		South Coast		East Coast		West Coast	
Municipality	**Poverty Rate**	**Municipality**	**Poverty Rate**	**Municipality**	**Poverty Rate**	**Municipality**	**Poverty Rate**
Arecibo	50.86%	**Arroyo**	55.10%	**Ceiba**	38.58%	**Aguada**	59.27%
Barceloneta	55.98%	**Guánica**	63.66%	**Culebra**	36.99%	**Aguadilla**	55.04%
Camuy	51.88%	**Guayama**	52.83%	**Fajardo**	42.14%	**Añasco**	51.59%
Carolina	33.71%	**Guayanilla**	57.01%	**Humacao**	47.23%	**Cabo Rojo**	47.12%
Cataño	50.05%	**Juana Diaz**	56.70%	**Maunabo**	59.09%	**Mayagüez**	52.21%
Dorado	41.36%	**Lajas**	56.52%	**Naguabo**	55.97%	**Rincón**	56.34%
Hatillo	55.78%	**Patillas**	54.63%	**Vieques**	64.58%	***Average***	53.59%
Isabela	55.45%	**Peñuelas**	59.75%	**Yabucoa**	54.47%		
Loiza	59.72%	**Ponce**	52.27%	***Average***	49.88%		
Luquillo	51.66%	**Salinas**	58.25%				
Rio Grande	46.64%	**Santa Isabel**	57.36%				
San Juan	40.78%	***Average***	56.73%				
Vega Alta	51.34%						
Vega Baja	50.62%						
Average	49.70%						

Vieques had the highest percent of children below the poverty line in 1999, with 81 percent of children in families with incomes below the poverty line, and Guánica was second with 75 percent (Table 3-62). Ceiba had the smallest, with 43 percent of children living below the poverty line. The average child poverty rate was highest on the south coast and lowest on the north coast. In 2008, 36 percent of children lived in extreme poverty and 50 percent of families with related children lived in poverty (Annie E. Casey Foundation; Kids Count Data Center). The median family (with child) income in 2008 was $18,700. Extreme poverty is defined as having a family income that is equal to or less than 50 percent of the poverty level of income.

DRAFT

Substantial numbers of households received, and continue to receive, public assistance income. In 1999, 20 percent of Puerto Rico's households had public assistance income. USDA's Nutrition Assistance Block Grants Program provides food assistance to low income families in Puerto Rico, in lieu of food stamps. The Puerto Rico government's NAP establishes eligibility and benefit levels. In FY2005, Puerto Rico's program received $1.495 billion from the USDA program. In FY2008, federal funding for the NAP totaled $2.04 billion. Approximately 79 percent of the total went to the NAP Block Grant, followed by the Special Supplemental Nutrition Program for Women, Infants and Children, which received approximately $2.18 million, approximately 10.7 percent of the total.

Table 3-62. Percent of children in families with incomes below poverty line, 1999, in municipalities where active commercial fishermen live. Source: Annie E. Casey Foundation, 2003.

North Coast		South Coast		East Coast		West Coast	
Municipality	**Percent children**	**Municipality**	**Percent children**	**Municipality**	**Percent children**	**Municipality**	**Percent children**
Arecibo	59	**Arroyo**	66	**Ceiba**	43	**Aguada**	68
Barceloneta	64	**Guánica**	75	**Culebra**	NA	**Aguadilla**	65
Camuy	59	**Guayama**	62	**Fajardo**	53	**Añasco**	59
Carolina	45	**Guayanilla**	64	**Humacao**	57	**Cabo Rojo**	56
Cataño	59	**Juana Diaz**	64	**Maunabo**	70	**Mayagüez**	62
Dorado	49	**Lajas**	68	**Naguabo**	64	**Rincón**	65
Hatillo	64	**Patillas**	60	**Vieques**	81	***Average***	63
Isabela	63	**Peñuelas**	70	**Yabucoa**	63		
Loiza	68	**Ponce**	65	***Average***	62		
Luquillo	63	**Salinas**	68				
Rio Grande	54	**Santa Isabel**	66				
San Juan	56	***Average***	66				
Vega Alta	63						
Vega Baja	59						
Average	59						

In March 2009, Puerto Rico provided nutrition assistance benefits to 1.18 million (30 percent) of the territory's 3.95 million individuals in 1.35 million family units. Almost 19 percent of NAP participants were 60 years old or older and approximately 10 percent were disabled. Approximately 77 percent had a high-school degree or less (State Plan of Operations 2009). Fifty-seven percent of the NAP participants were females and approximately 36 percent were children between the ages of 0 and 18 (State Plan of Operations 2009). The percent of households participating in the NAP has varied from 33.7 to 36.8 percent from 2005 to 2008 (Figure 3-46). In FY2009, NAP participants received an average of $115 per month per person (Food and Nutrition Service (FNS); USDA, 2010). NAP covers 62 percent of the individuals in Puerto Rico under 100 percent of the federal poverty guideline, leaving 38 percent of individuals uncovered (FNS; USDA, 2010).

DRAFT

Table 3-63. Federal funding for jointly operated social welfare programs in Puerto Rico. Source: FNS, USDA, 2010.

Program Name	Federal Funding FY 2008 (in thousands)	Total Participants FY 2008
Nutrition Assistance		
NAP Block Grant	$1,622,521	1,180,000
Special Supplemental Nutrition Program for Women, Infants and Children	$217,692	199,077
National School Lunch Program	$135,890	370,336
Child and Adult Care Food Program	$24,123	23,523
School Breakfast Program	$31,339	134,729
Summer Food Service Program	$11,029	28,930
Seniors Farmers Market Nutrition Program	$1,000	62,500
Social Insurance		
Unemployment Insurance Program	$334,865	N/A
Public Assistance Programs		
Temporary Assistance for Needy Families	$22,874	31,678
Child Support Enforcement	$50,249	237,233
Health Care for Low-Income Persons and Families		
Medicaid (amount is capped)	$260,400	888,370
State Children's Health Insurance Program	$62,221	100,000
Maternal and Child Health Block Grant (Title V)	$16,276	168,972
Social and Support Services		
Social Services Block Grant	$8,793	10,883
Childcare and Development Block Grant	$26,656	9,100

DRAFT

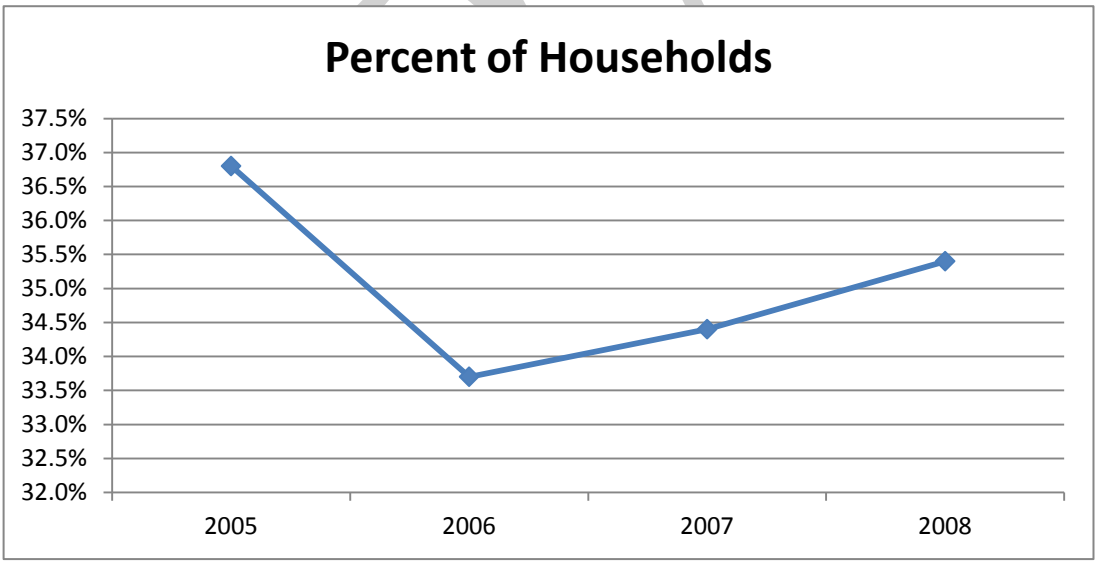

Figure 3-46. Percent of Puerto Rico's households participating in NAP. Source: FNS, USDA, 2010.

Of all households in the 39 municipalities, 19.8 percent of the households received public assistance, as compared to 20.5 percent of households in all other municipalities. Culebra had the smallest percent of households receiving such income, while Arroyo had the largest among the municipalities where active commercial fishermen lived in 2008 (Table 3-64). The south coast had the highest average percent of households receiving public assistance, and the north coast had the lowest.

Table 3-64. Percent of households with public assistance income, 1999. Source: Census 2000.

North Coast		South Coast		East Coast		West Coast	
Municipality	**Percent of Households**	**Municipality**	**Percent of Households**	**Municipality**	**Percent of Households**	**Municipality**	**Percent of Households**
Arecibo	22.25%	**Arroyo**	29.38%	**Ceiba**	17.01%	**Aguada**	21.03%
Barceloneta	25.95%	**Guánica**	27.52%	**Culebra**	6.53%	**Aguadilla**	25.68%
Camuy	19.60%	**Guayama**	24.13%	**Fajardo**	15.44%	**Añasco**	21.94%
Carolina	11.63%	**Guayanilla**	24.54%	**Humacao**	20.30%	**Cabo Rojo**	19.68%
Cataño	20.99%	**Juana Diaz**	25.59%	**Maunabo**	25.21%	**Mayagüez**	19.86%
Dorado	16.18%	**Lajas**	24.40%	**Naguabo**	20.49%	**Rincón**	22.08%
Hatillo	24.72%	**Patillas**	24.69%	**Vieques**	25.47%	***Average***	21.71%
Isabela	22.11%	**Peñuelas**	25.68%	**Yabucoa**	28.45%		
Loiza	22.56%	**Ponce**	24.22%	***Average***	19.86%		
Luquillo	19.77%	**Salinas**	30.12%				
Rio Grande	18.11%	**Santa Isabel**	23.40%				
San Juan	14.69%	***Average***	25.79%				
Vega Alta	24.56%						
Vega Baja	21.32%						
Average	20.32%						

Access to potable water has also been an issue in Puerto Rico. In 1995, the Puerto Rico Aqueduct and Sewer Authority (PRASA) signed a contract with the French conglomerate Vivendi, now called Veolia. PRASA had serious problems with its infrastructure, and it was argued that outsourcing would lead to investment in water services for the island's residents. In August 1999, the Puerto Rican Office of the Comptroller produced a report severely critiquing of Vivendi's services, noting deficiencies in the maintenance, repair, administration and operation of aqueducts and sewers. According to that report, there were higher incidents of skin allergies, gastroenteritis, and muscle spasms after privatization. Despite the higher water bills, Vivendi put PRASA's operational deficit at $241.1 million, and the Government Development Bank had to contribute emergency funding on multiple occasions. Even the World Trade Organization states that poor communities in Puerto Rico went without water while U.S. military bases and resorts enjoyed unlimited supplies as a result of the privatization of water (http://www.gatt.org/trastat_e.html).

Puerto Rico ranks last in percent of people who have completed high school among the 50 states, District of Columbia, and Puerto Rico. Approximately 66 percent of Puerto Rico's population 25 years and older from 2006-2008 completed high school, including equivalency (2006-2008 American Community Survey and Puerto Rico Community Survey). Mississippi ranks next to last with approximately 79 percent of its people 25 years and older having completed high school. In the U.S. as a whole, approximately 85 percent of people 25 years and older have completed high school.

DRAFT

The percent of high school dropouts in the 39 municipalities ranged from 7 percent to 22 percent in 2000 (Table 3-65). The highest was in Aguadilla on the west coast where 22 percent of the population 16 to 19 years old had dropped out of high school.

Table 3-65. Percent of municipal population 16 to 19 years old comprised of high school dropouts, 2000. Source: U.S. Census Bureau, Census 2000.

North Coast		South Coast		East Coast		West Coast	
Municipality	**Percent dropouts**	**Municipality**	**Percent dropouts**	**Municipality**	**Percent dropouts**	**Municipality**	**Percent dropouts**
Arecibo	10	**Arroyo**	8	**Ceiba**	11	**Aguada**	13
Barceloneta	17	**Guánica**	20	**Culebra**	NA	**Aguadilla**	22
Camuy	15	**Guayama**	13	**Fajardo**	15	**Añasco**	17
Carolina	10	**Guayanilla**	15	**Humacao**	16	**Cabo Rojo**	14
Cataño	19	**Juana Diaz**	14	**Maunabo**	19	**Mayagüez**	12
Dorado	13	**Lajas**	7	**Naguabo**	19	**Rincón**	12
Hatillo	13	**Patillas**	11	**Vieques**	20		
Isabela	17	**Peñuelas**	13	**Yabucoa**	16		
Loiza	16	**Ponce**	14				
Luquillo	21	**Salinas**	20				
Rio Grande	15	**Santa Isabel**	15				
San Juan	13						
Vega Alta	18						
Vega Baja	17						

There has been an increasing demand for workers with at least a high school diploma in Puerto Rico. The increase has motivated fewer Puerto Ricans to drop out. In 1990, 22 percent of Puerto Ricans 16 to 19 years old were high school dropouts, while in 2000, that figure was 14 percent.

Across all age groups, Puerto Rico has a greater percentage of disabled individuals than the U.S. (26.4 percent versus 15.6 percent, respectively). From 2000 to 2007, Puerto Rico witnessed a decline in the disabled population of young and middle-aged adults, while experiencing a corresponding increase in the percentage of disabled children and elderly individuals.

The average annual unemployment rate in Puerto Rico is typically significantly higher than for the U.S. as a whole, and has not been under 10 percent since 1989 (Figure 3-47). In 2010 and 2011, average annual unemployment was 16.1 percent and 15.7 percent, respectively, in Puerto Rico and 9.6 percent and 8.9 percent, respectively, in the U.S. as a whole. In April 2012, the unemployment rate in the territory was 14.8 percent.

DRAFT

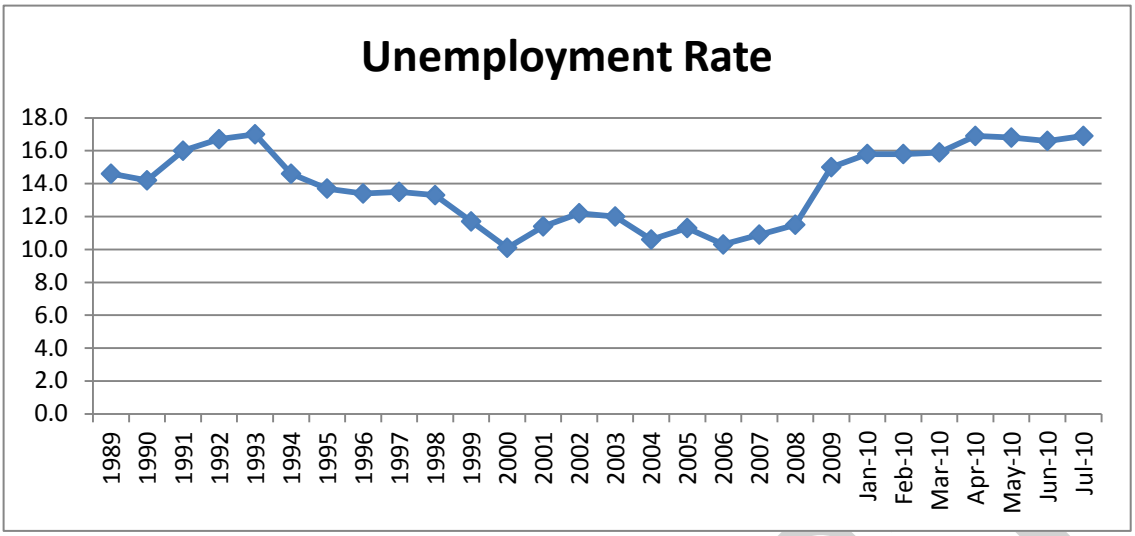

Figure 3-47. Unemployment rate, 1989 to 2010. Source: Puerto Rico Department of Labor and Human Resources, Labor Force Survey.

The percent of the employed labor force in agriculture, fishing and forestry has consistently declined in Puerto Rico since the 1970s. In 1970, it was almost 10 percent and by 2006 it was less than 1.5 percent. In 1990, approximately 35,000 persons were employed in agriculture, fishing, and forestry, and in 2009, that number fell to approximately 17,000 (Figure 3-48).

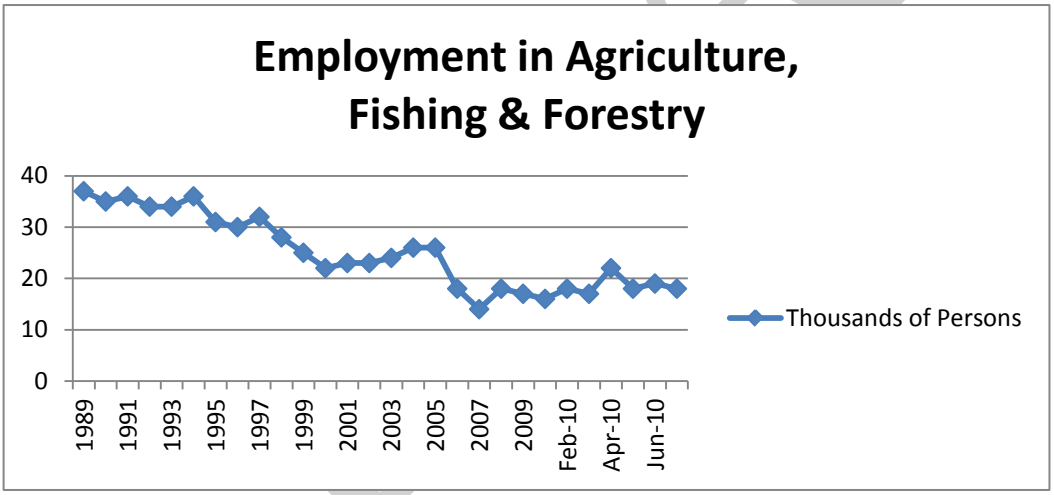

Figure 3-48. Number of persons employed labor force in agriculture, forestry and fishing. Source: Dept of Labor and Human Resources, Puerto Rico.

The percent of persons 16 years and older in farming, fishing, and forestry occupations varied from 0.31 to 7.76 in the 39 municipalities in 2000 (Table 3-66). The average percent was highest on the north coast and lowest on the east coast. Santa Isabel had the largest percent of its employed civilian population in farming, fishing and forestry occupations in with 7.76 percent. No one was in that occupational group in Culebra, although active commercial fishermen lived there in 2008. An occupation describes the kind of

work that one does on the job. Because Puerto Rico's commercial fishermen tend to have wage-paying jobs, they may identify their occupation as what they do on their wage-paying jobs.

Table 3-66. Persons 16 years and older in farming, fishing and forestry occupations, 2000. Source: U.S. Census Bureau, Census 2000.

Municipality	Percent Emp. Civ. Pop.	Municipality	Percent Emp. Civ. Pop.	Municipality	Percent Emp. Civ. Pop.	Municipality	Percent Emp. Civ. Pop.
Arecibo	2.09%	**Arroyo**	1.16%	**Ceiba**	0.41%	**Aguada**	1.50%
Barceloneta	1.52%	**Guánica**	2.89%	**Culebra**	0.00%	**Aguadilla**	1.03%
Camuy	4.51%	**Guayama**	1.01%	**Fajardo**	0.59%	**Añasco**	1.89%
Carolina	0.31%	**Guayanilla**	2.81%	**Humacao**	0.77%	**Cabo Rojo**	2.92%
Cataño	1.01%	**Juana Diaz**	5.18%	**Maunabo**	3.63%	**Mayagüez**	1.01%
Dorado	1.28%	**Lajas**	3.94%	**Naguabo**	1.44%	**Rincón**	1.33%
Hatillo	6.34%	**Patillas**	1.80%	**Vieques**	1.69%	***Average***	1.61%
Isabela	2.36%	**Peñuelas**	1.58%	**Yabucoa**	2.18%		
Loiza	0.70%	**Ponce**	0.83%	***Average***	1.34%		
Luquillo	0.64%	**Salinas**	3.77%				
Rio Grande	0.74%	**Santa Isabel**	7.76%				
San Juan	0.27%	***Average***	2.97%				
Vega Alta	1.13%						
Vega Baja	0.86%						
Average	1.70%						

The decline in employment in agriculture, fishing, and forestry has been mirrored by a decline in the number of farms. The number of farms steadily declined from 1993 to 2007 (USDA, Census of Agriculture). From 1993 to 2007, there was a 42 percent decline in the number of farms and a 46 percent decline in cuerdas with harvested cropland (Table 3-67). The average size of a farm peaked in 1998 at 43.4 cuerdas, and as of 2007, it was 35.4 cuerdas. A cuerda is approximately 0.9712 acres. Total sales of agricultural products rose from approximately $557 million in 1993 to $593 million in 1998, then fell to $582 million in 2002 and $516 million in 2007. The market value of production dropped 11 percent from approximately $581.5 million in 2002 to $515.7 million in 2007. The average market value of production per farm fell from $32,932 in 2002 to $32,752 in 2007. The top five crops by cuerdas in 2007 were coffee, grasses or other similar crops, plantains, vegetables, and oranges. Among the crops that experienced significantly higher sales in 2007 as compared to 1993 were plantains, bananas, fruits, coconuts, vegetables, and melons.

The production of cereals per hectare declined significantly after the mid 1980s; however, the rate of production of roots and tubers increased significantly in the mid 1990s. Total production of roots and tubers declined from 2002 to 2007, from a hundredweight of 213,204 to 180,751, while hundredweight per cuerda increased from 45.97 to 59.50 as the number of farms and cuerdas continued to declined.

DRAFT

Table 3-67. Puerto Rico farms, 1993 – 2007. Source: USDA, Census of Agriculture.

All Farms		1993	1998	2002	2007
Farms	number	22,350	19,951	17,659	15,745
Land in farms	cuerdas	826,893	865,478	690,687	557,530
	average size	37.0	43.4	39.1	35.4
Total cropland	farms	NA	19,030	16,912	14,074
	cuerdas	460,818	533,081	453,433	392,728
Harvested cropland	farms	18,251	16,341	15,284	10,595
	cuerdas	215,093	195,877	199,225	116,198

NA: Data not available.

Puerto Rico imports approximately 80 percent of all of its food and 90 percent of its imports are brought in at the Port of San Juan. These figures are of concern to food security specialists.

In August 2009, Puerto Rico Governor Luis Fortuño signed the "Law for the Promotion and Development of Agricultural Biotechnological Businesses in Puerto Rico." The law pre-empts any local authorities from attempting to regulate agricultural biotechnology. As of that date, there were 11 biotech companies in Puerto Rico. According to Ruiz-Marrero (2004), most genetically engineered corn and soybean seed that is planted in the U.S. comes from Puerto Rico. Puerto Rico offers biotechnology companies benefits such as: no federal income tax; a low corporate income tax rate from two to seven percent, which can be lower than two percent in some cases; and fast-tracking of government and other permits (PRIDCO 2009). As of January 2005, there were 3,483 field tests of genetically modified (GM) crops on the island. Most GM crops are planted in the southern plains between Juana Diaz and Guayama, and they are concentrated in the area between the towns of Santa Isabel and Salinas (Ruiz-Marrero 2009). GM crops are also found in the northern town of Isabela. There is concern that the recent law may encourage biotech companies to use more fertile lands, which could further decrease domestic food production and increase the island's dependence on imported foods. On June 9, 2011, the Environmental Protection Agency approved a label change that allows Monsanto's genetically engineered organism, MON 87701 Soybean, to be grown in the Commonwealth of Puerto Rico and two other states. The label permits up to 100 acres per municipio in Puerto Rico (www.aphis.usda.gov/brs/aphisdocs/90_08201p_fea.pdf).

Tilapia, shrimp, and other aquaculture products are produced in Puerto Rico. Total sales rose substantially from 1992 to 2002, and then declined substantially after peaking in 2002. Tilapia and shrimp sales fell dramatically after 2002. Puerto Rico was the site of an offshore aquaculture operation that grew cobia; however, it relocated to Belize.

Per capita (commodity) food production has declined in Puerto Rico since 1960, while total food production has declined since 1990. The decline in the production of metric tons of cereals has been the most dramatic, falling 84 percent from 1979-1981 to 1999-2001 (World Resources Institute 2006). The total and per capita losses of (commodity) food production suggest growing dependence on imported

DRAFT

food, which increases Puerto Rico's risk of food insecurity. Historical and continuing subsistence farming and fishing may reduce that risk by increasing availability and access of food.

Total commercial landings (all species) from 2000 to 2010 suggest a declining linear trend (Figure 3-49), despite the substantial increase in adjusted landings in 2005.

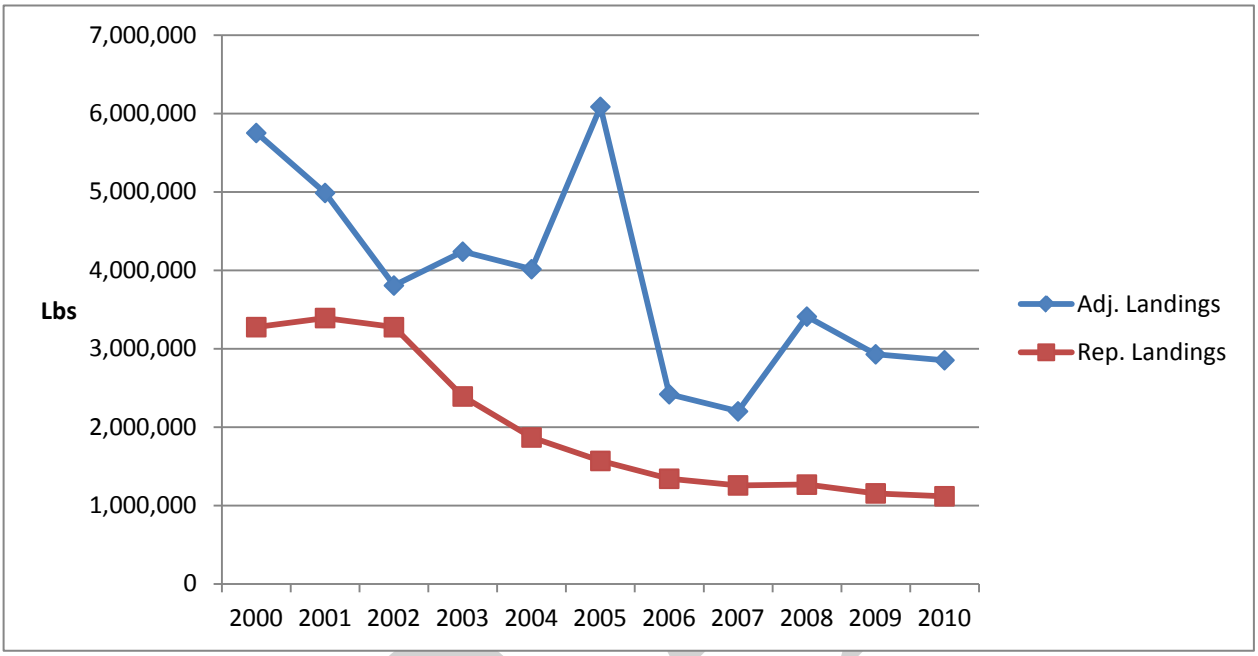

Figure 3-49. Total reported and adjusted commercial landings, 2000 to 2010.

Puerto Rico's commercial landings increased from over 4 million pounds in 1990 to over 5 million pounds in 2000, but fell to less than 3 million pounds in 2010. St. Croix's and St. Thomas/St. John's commercial landings are dwarfed in comparison; however, Puerto Rico's per capita commercial landings are dwarfed by per capita commercial landings in Thomas/St. John and St. Croix (Figures 3-50 and 3-51). Per capita commercial landings in Puerto Rico remained under 2 pounds per person from 1990 to 2000. In 2000, approximately 3.5 million fish were caught by recreational fishermen in Puerto Rico, yielding a per capita recreational harvest of 1.1 fish.

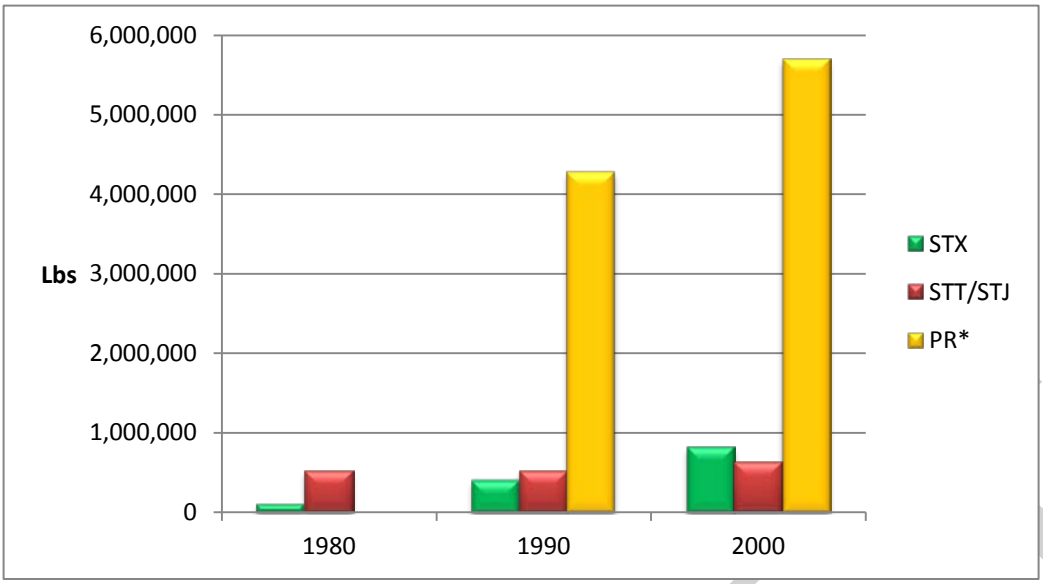

Figure 3-50. Total commercial landings in Puerto Rico, St. Thomas/St. John and St. Croix.
*Data is unavailable for Puerto Rico in 1980.

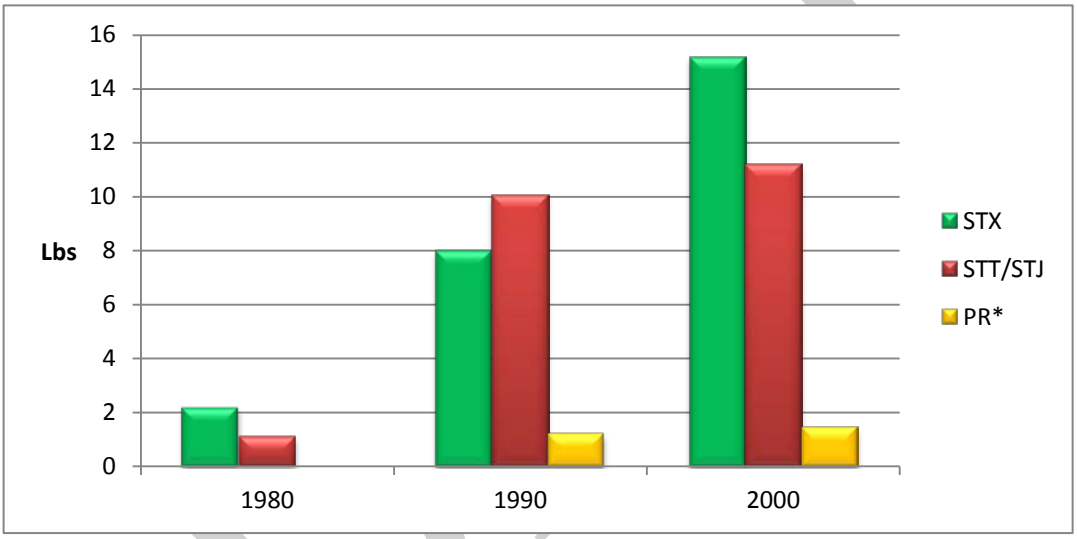

Figure 3-51. Per capita commercial landings in Puerto Rico, St. Thomas/St. John, and St. Croix.
* Data not available for Puerto Rico in 1980.

The annual per capita consumption of commodity fish and shellfish for human food is low in Puerto Rico. During the three-year period from 2003 to 2005, it averaged to be 1.8 pounds (NMFS Fisheries Statistics of the United States 2008). That contrasts sharply with average annual per capita consumption of 53.4 pounds in the U.S. and 29.6 pounds in the USVI. However, these figures do not include consumption of fish and shellfish that are caught by recreational and subsistence fishers. In 2008, for example, approximately 1.911 million pounds of finfish were harvested by recreational fishers and 0.941 million pounds were reported by commercial fishermen in Puerto Rico. The above figures suggest the focus on per capita consumption of commoditized fish under-represents actual per capita consumption of finfish. Subsistence and recreational fishing increases availability, access to, and consumption of finfish and

shellfish, and such availability, access, and consumption may be of substantial historical significance in Puerto Rico, especially to those living in poverty and extreme poverty.

Fishing businesses are not employers in Puerto Rico. In 2000, only one establishment in the Fishing, Hunting, and Trapping Industry had one to four paid employees (Puerto Rico County Business Patterns 2000). More recently in 2004 and 2008, there were no such establishments. Such a conclusion is consistent with artisanal fisheries. Artisanal fishermen are self-employed who may either fish alone or with the assistance of another fisherman. Self-employed individuals and businesses that do not pay federal taxes are not included in the County Business Patterns survey, and many of Puerto Rico's commercial fishermen do not pay federal taxes. In 2008, there were 868 active commercial fishermen in Puerto Rico, and 638 of these fishermen were captains and the remaining 230 were helpers.

One of the primary institutions of Puerto Rico's fishing industry infrastructure is the fishing association, more commonly known as the villa pesquera. Griffith *et al*. (2007) describe the many villa pesqueras and fishing-related infrastructure and their descriptions are incorporated by reference.

As of 2008, there was only one employer in the Seafood Product Preparation and Packaging Industry (NAICS 31171) and that was a tuna cannery in Mayaguez that employed 250 to 499 persons. Also that year, there were 7 establishments in the Fish and Seafood Merchant Wholesalers Industry with paid employees (NAICS 424460). These establishments had a combined 101 employees and an annual payroll of approximately $2.7 million. All but one of the establishments was located in a coastal municipality where active commercial fishermen lived (Table 3-68). There were five establishments in the Fish and Seafood Markets Industry in 2008 with paid employees. Combined they had no more than 25 paid employees.

Table 3-68. Number of establishments in Fish & Seafood Merchant Wholesalers Industry with paid employees by municipality. Source: 2008 Puerto Rico County Business Patterns.

Municipality	Number of Establishments in Fish and Seafood Merchant Wholesalers (NAICS 424460)				
	1 to 4 employees	5 to 9 employees	10 to 19 employees	20 to 49 employees	Total
Barceloneta		1			1
Florida*	1				1
Humacao	1				1
San Juan		1	1	1	3
Toa Baja				1	1
Total	2	2	1	2	7

* Not a coastal municipality where one or more active commercial fishermen lived in 2008.

In 2008, there were 18 marinas with a combined annual payroll of $4.46 million. These marinas were located in eight municipalities (Table 3-69). Fajardo had the most with seven, followed by San Juan with four and Cabo Rojo with two. The others had one. In 2008, there were nine establishments in the Scenic and Sightseeing Water Transportation Industry (NAICS 487201) that had 100 to 249 employees (Table 3-70). This industry category includes charter boat fishing operations.

DRAFT

Table 3-69. Number of marinas with paid employees by municipality. Source: 2008 Puerto Rico County Business Patterns.

Municipality	Number of Marinas				
	1 to 4 employees	5 to 9 employees	10 to 19 employees	20 to 49 employees	Total
Arecibo	1	1			1
Cabo Rojo	1	1			2
Fajardo	2	2	2	1	7
Guaynabo	1				1
Humacao	1	1			1
Lajas	1				1
Ponce	1			1	1
San Juan	1	1	2		4
Total	9	6	4	2	18

Table 3-70. Number of establishments in Scenic and Sightseeing Transportation, Water, Industry with paid employees. Source: 2008 Puerto Rico County Business Patterns.

Muncipality	Number of Establishments in Scenic and Sightseeing Transportation, Water (NAICS 487210)					
	1 to 4 employees	5 to 9 employees	10 to 19 employees	20 to 49 employees	100 to 249 employees	Total
Fajardo	1	0	0	2	0	3
Guaynabo	1	0	0	0	0	1
Mayaguez	0	0	0	0	1	1
Ponce	0	1	0	0	0	1
San Juan	2	0	0	0	0	2
Utuado*	1	0	0	0	0	1
Total	5	1	0	2	1	9

Over 40 percent of Puerto Rico's domestic income from the mid-1980s to 2006 was derived from manufacturing. Pharmaceuticals accounted for about 40 percent of total value added in manufacturing in 1987 and that share rose to over 70 percent by 2002 (GAO 2006). However, since the 1990s, there has been an increased shift towards a service economy.

3.3.4 Social and Cultural Environment

Parrotfish are harvested commercially, recreationally, and are also consumed for subsistence in the U.S. Caribbean. This description of the social and cultural environment provides a narrative of the reliance on these types of fishing. The majority of the data is not available at the community level; however in order to meet the requirements of National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) which requires the consideration of the importance of fishery resources on human communities when making changes in regulations, data has been examined at the closest level to that of the community as possible.

Additional information on the social and cultural environment of the parrotfish fishery in Puerto Rico and the USVI and descriptions of communities involved in fishing in the U.S. Caribbean are contained in previous amendments (CMFC 2011a; CFMC2011b) and incorporated herein by reference. Detailed descriptions of fishing communities and fishermen in the U.S. Caribbean are included in: Griffith and

DRAFT

Valdes Pizzini 2002, Impact Assessment 2007, and Stoffle *et al*. 2009, Kojis and Quinn 2012, Matos-Caraballo and Agar 2011, and Tonioloi and Agar 2011 and are also incorporated herein by reference.

Commercial harvest of parrotfish in the USVI: In the U.S. Caribbean, the majority of reported commercial parrotfish landings occur in the USVI. Parrotfish are caught in federal waters in the USVI; however it is not known how much of the total catch is harvested in federal waters. The reported parrotfish landings in the USVI over the last ten years have ranged from a high of 477,582 pounds in the year 2006 to a low of 196,633 pounds in the year 2010 (Table 3-71).

Table 3-71. USVI commercial parrotfish landings by year in whole weight. Source: U.S. Caribbean Landings Dataset, summarized by LAPP/DM Branch of SERO.

Year	Pounds Landed
2000	295,577
2001	340,827
2002	353,589
2003	315,788
2004	377,929
2005	426,694
2006	477,582
2007	458,702
2008	396,110
2009	349,628
2010	196,633

Within the USVI, fishermen in St. Croix harvest the largest amount of parrotfish commercially. Reported landings of parrotfish in St. Croix over the last ten years have ranged from a high of 433,345 pounds in the year 2006 to a low of 162,623 pounds in the year 2010 (Table 3-72). As detailed in Section 3.3.1, parrotfish are an important commercial species group in St. Croix making up 26 percent to 34 percent of all annual commercial landings from 2000 to 2009.

DRAFT

Table 3-72. St. Croix commercial parrotfish landings by year in whole weight. Source: U.S. Caribbean Landings Dataset, summarized by LAPP/DM Branch of SERO.

Year	Pounds Landed
2000	260,474
2001	290,499
2002	307,591
2003	262,473
2004	319,250
2005	376,389
2006	433,345
2007	418,325
2008	356,497
2009	316,359
2010	162,623

The combined commercial landings of parrotfish to St. Thomas and St. John over the last ten years have ranged from a high of 58,679 reported pounds in the year 2004 to a low of 33,269 reported pounds in the year 2009 (Table 3-73). As detailed in Section 3.3.1, parrotfish comprised 4.7 percent to 7.2 percent of all annual commercial landings in St. Thomas and St. John from 2000 to 2009.

Table 3-73. St. Thomas and St. John commercial parrotfish landings by year in whole weight. Source: U.S. Caribbean Landings Dataset, summarized by LAPP/DM Branch of SERO.

Year	Pounds Landed
2000	35,103
2001	50,328
2002	45,998
2003	53,315
2004	58,679
2005	50,305
2006	44,237
2007	40,377
2008	39,613
2009	33,269
2010	34,010

DRAFT

The number of fishermen engaged in commercial fishing for parrotfish in the USVI is not known. The number of total commercial fishermen harvesting any species of fish in the USVI included 401 licensed commercial fishermen (as listed on the 2009-2010 Division of Fish and Wildlife commercial fisher registration list) with 187 in St. Thomas/St. John and 214 in St. Croix; however more recent records indicate that there were a total of 297 licensed commercial fishermen as of March 2011 with 120 in St. Thomas/St. John and 177 in St. Croix (Kojis and Quinn 2012). As described in Section 3.3.2, in a recent census of USVI commercial fishermen, 79.9 percent of fishermen interviewed in St. Croix revealed that they target reef fish (of which parrotfish was a sub-category) as opposed to 84.5 percent of fishermen in St. Thomas and St. John (Kojis and Quinn 2012).

USVI fishermen catch parrotfish in federal waters; however it is not known what proportion of the total commercial landings are caught in federal waters.

Parrotfish are a popular food in the USVI. In a recent census of commercial fishermen, a large number of fishermen (32.7 percent of those interviewed) in St. Croix mentioned that they either consume potfish/reef fish or give these fish away to friends (Kojis and Quinn 2012). Within this category, parrotfish was one of the most frequently mentioned categories of fish consumed by fishers or given away to friends (Kojis and Quinn 2012). Overall in the USVI, a large number of fishermen (38.2 percent of those interviewed) mentioned that they consumed, or gave away to friends, fish within the category of potfish or reef fish. The most frequently mentioned sub-category of potfish or reef fish was parrotfish for all of the USVI (Kojis and Quinn 2012). In addition to being consumed by those fishermen that catch parrotfish, parrotfish are also available for sale at local markets.

<u>Commercial harvest of parrotfish in Puerto Rico:</u> Puerto Rico is second following the combined USVI landings for parrotfish in terms of the amount of fish landed commercially per year; however public comment for a recent amendment suggests that Puerto Rican fishermen do not catch parrotfish in federal waters (CMFC 2011a). In the last ten years the commercial landings of parrotfish in Puerto Rico have ranged from a high of 145,568 pounds in the year 2004 to a low of 51,015 pounds in the year 2006 (Table 3-74).

DRAFT

Table 3-74. Puerto Rico commercial parrotfish landings by year from expanded pounds. Source: U.S. Caribbean Landings Dataset, summarized by LAPP/DM Branch of SERO.

Year	Pounds Landed
2000	130,092
2001	142,285
2002	124,912
2003	115,470
2004	145,568
2005	141,577
2006	51,015
2007	58,056
2008	88,708
2009	60,560
2010	51,027

Within Puerto Rico from 2000 to 2010 (Table 3-75), the greatest amount of parrotfish were landed on the south coast (53 percent) followed by the east coast (20 percent) and west coast (17 percent). However, for the year 2010 this trend differed and the greatest amount of parrotfish were landed on the south coast (45 percent) followed by the north coast (34 percent) and east coast (14 percent).

Table 3-75. Puerto Rico commercial parrotfish landings by year and coast from expanded pounds. Source: U.S. Caribbean Landings Dataset, summarized by LAPP/DM Branch of SERO.

	Coast			
Year	East	North	South	West
2000	34494	5865	72615	17118
2001	38421	11847	68477	23540
2002	26293	5499	57557	35563
2003	9197	5903	60617	39753
2004	8594	3525	113776	19673
2005	49841	1165	75940	14631
2006	9417	2446	29992	9160
2007	18119	2661	28577	8699
2008	8445	43551	27349	9363
2009	8128	11701	31402	9329
2010	7319	17298	23116	3294
Total	218268	111461	589418	190123

DRAFT

The landings of parrotfish were distributed throughout all coastal municipalities in Puerto Rico; however the municipalities with the highest landings in the year 2008 were Cabo Rojo, Guánica, and Guayama (Tonioli and Agar 2011). Municipalities with the next highest landings included Guayama, Penuelas, Vega Alta, Lajas, and Salinas (Tonioli and Agar 2011).

The total number of commercial fishermen in Puerto Rico who target parrotfish is not known. The most recent census of commercial fishermen in Puerto Rico determined that there were an estimated 868 active commercial fishermen and of these 77.3 percent targeted reef fish (Matos-Caraballo and Agar 2011). However, public comment received during a recent amendment regarding parrotfish suggested that fishermen in Puerto Rico do not catch parrotfish in the EEZ commercially, recreationally, or for subsistence (CMFC 2011a) and therefore it is possible that the bulk of the Puerto Rico parrotfish landings described above were not harvested in federal waters.

Recreational harvest:
As of March 9, 2010, there were 594 U.S. Caribbean recreational (including subsistence) fishermen registered with the National Angler Registry: 12 in the USVI and 582 in Puerto Rico. The number of fishermen who target parrotfish recreationally is not known; however recreational fishermen in the U.S. Caribbean who fish in the EEZ tend to target pelagic species rather than parrotfish. According to the Puerto Rico Marine Recreational Fisheries Statistics Survey (MRFSS) survey data, 14 parrotfish were harvested recreationally in the year 2009, 20 in the year 2010, and 24 in the year 2011. Recreational parrotfish landings in Puerto Rico over time are detailed in Section 3.3.1 and have decreased significantly since the mid-2000s with a high of approximately 50,000 pounds harvested recreationally in 2003. However, as mentioned above, according to public comment parrotfish are not caught in Puerto Rico's EEZ and the majority of these fish caught recreationally were likely harvested in commonwealth waters. No information is available on recreational parrotfish catch in the USVI.

Subsistence harvest: The subsistence catch is often linked to the commercial catch with some commercial fishermen retaining part of their catch for their own consumption, their family's consumption, or to distribute to friends. The importance of parrotfish, in particular, as a retained species for subsistence was evident in a recent survey conducted with commercial fishermen in the USVI where potfish and reef fish were noted as one of the top categories of fish that were either consumed by fishermen or given away to friends (Kojis and Quinn 2012).

3.3.5 Environmental Justice Considerations

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

DRAFT

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

Low-income populations: Low-income populations in the U.S. Caribbean make up a much greater percentage of the general population than in the continental U.S. The percentage of people below poverty included 45.2 percent of the population in Puerto Rico for 2010, significantly higher than that of the continental U.S. which included 15.3 percent of the population below poverty (U.S. Census Bureau, 2010 Census). Information for 2010 was not available for the USVI. In 2000, the poverty rate for the USVI was 32.5 percent, also significantly higher than the rate for the continental U.S. which was 11.3 percent for the same year (U.S. Census Bureau, 2000 Census). These overall higher poverty rates indicate that the U.S. Caribbean includes more individuals that are likely to be more vulnerable and experience higher levels of effects when changes in fisheries management are conducted.

Additional detailed descriptions of poverty status in the U.S. Caribbean by various cross-sections of the population are included in Section 3.3.2 such as: population below poverty rate by households, poverty by household size, and families in poverty. A detailed discussion of income for various cross-sections of the population is also included in Section 3.3.2 such as: median family income by area, income by race, and income by ethnicity.

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

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

As mentioned above, the poverty rate for Puerto Rico for 2010 was 45.2 percent. This value translates into an EJ poverty threshold of approximately 54.2 percent. The communities below exceeded this poverty threshold and are the most likely to be vulnerable to EJ concerns (Table 3-76). The coastal communities with parrotfish landings in 2008 (as shown in Tonioli and Agar 2011) are highlighted in gray and are likely the municipalities at the greatest risk because they have both a high percentage of the population below the poverty level and have shown to be reliant on parrotfish because they have

DRAFT

documented commercial landings (however, as mentioned in Section 3.3.4, these landings were likely not harvested in federal waters).

Table 3-76. Puerto Rico communities which exceeded poverty threshold for year 2010. Source: U.S. Census Bureau 2010

Community	Percent of Population Below Poverty Level
Adjuntas	57.2
Aguada	56.5
Barranquitas	54.7
Ciales	59.3
Coamo	55.8
Comerío	58.4
Corozal	58.4
Guánica	58.2
Guayanilla	56.5
Isabela	57.1
Lajas	55.7
Lares	58.1
Las Marías	58.2
Maricao	65.7
Maunabo	55.6
Moca	57
Morovis	62
Naranjito	55.3
Orocovis	62.6
Patillas	57
Peñuelas	57.7
Quebradillas	60.6
Salinas	58.5
San Sebastián	58.5
Utuado	57.6
Villalba	57.1
Yauco	56.8

DRAFT

As mentioned above, the poverty rate for USVI in 2000 was 32.5 percent. This value translates into an EJ poverty threshold of approximately 39 percent. The communities below exceeded this poverty threshold and are likely the most vulnerable to EJ concerns (Table 3-77).

Table 3-77. USVI communities which exceeded poverty threshold for year 2000. Source: U.S. Census Bureau 2000

Community	Percent of Population Below Poverty Level
Christiansted	50.4
Frederiksted	53.9
Frederiksted Southeast	57.2
Grove Place	57.8

The greater commonwealth of Puerto Rico and territory of the USVI and the majority of the communities expected to be affected by this proposed amendment have minority or economic profiles that include higher rates than that of the continental U.S. Environmental Justice issues could arise as a result of this proposed amendment, particularly in regard to poverty. Food insecurity (a detailed discussion of food insecurity is included in Section 3.3.2) is a large issue in the U.S. Caribbean and these vulnerable low-income populations could be impacted to a greater extent because of their dependence on the fish they receive through fishing efforts and utilize as food to supplement their income. If their ability to retain fish is decreased, it is entirely possible that their ability to feed themselves and their families could be impacted.

The general participatory process used in the development of fishery management measures (e.g. public hearings and open Caribbean Council meetings) is expected to provide opportunity for meaningful involvement by potentially affected individuals to participate in the development of this amendment and have their concerns factored into the decision process. In addition, the proposed actions section (Chapter 2) of this amendment will be translated into Spanish to provide local populations with access to the information and the ability to participate in the development of this amendment.

3.4 Administrative Environment

3.4.1 Federal Fishery Management

Federal fishery management is conducted under the authority of the Magnuson-Stevens Act (16 U.S.C. 1801 et seq.), originally enacted in 1976 as the Fishery Conservation and Management Act. The Magnuson-Stevens Act claims sovereign rights and exclusive fishery management authority over most

DRAFT

fishery resources within the U.S. EEZ, an area extending from the seaward boundary of each coastal state to 200 nm 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 Magnuson-Stevens Act and with other applicable laws. In most cases, the Secretary has delegated this authority to NOAA's National Marine Fisheries Service (NMFS).

The Caribbean Council is responsible for fishery resources in federal waters of the U.S. Caribbean. These waters extend to 200 nm 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 (8,462 km^2). The fishable habitat within the EEZ is 355 nm^2 (1,218 km^2) or 14.39 percent of the U.S. Caribbean total, with 116 nm^2 (398 km^2) (4.7 percent) occurring off Puerto Rico and 240 nm^2 (823 km^2) (9.7 percent), occurring off the USVI. The vast majority of the fishable habitat in federal waters off Puerto Rico is located off the west coast. The vast majority of the fishable habitat in federal waters off the USVI is located off the north coast of St. Thomas. 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 Caribbean Council-managed species, except for fishing for deep water snappers, which occurs primarily in the EEZ (at depths greater than 100 fathoms).

The Caribbean Council consists of seven voting members: four public members appointed by the Secretary, one each from the fishery agencies of Puerto Rico and the USVI, and one from NMFS. 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 U.S. Coast Guard, and various territorial authorities. To better coordinate enforcement activities, federal and territory enforcement agencies have developed cooperative agreements to enforce the Magnuson-Stevens Act. However, enforcement in the Caribbean region is severely underfunded. Because personnel and equipment are limited, enforcement depends largely on voluntary compliance (The Heinz Center 2000).

DRAFT

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 FMP for Atlantic Tunas, Swordfish, and Sharks (HMS FMP, http://www.nmfs.noaa.gov/sfa/hms/).

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

3.4.2 Commonwealth and 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 U.S. 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 nm from shore. Those fisheries are managed by Puerto Rico's Department of Natural and Environmental Resources. Section 19 of Article VI of the Constitution of Puerto Rico provides the foundation for the fishery rules and regulations. Puerto Rico's Law 278 of 1998 establishes public policy regarding fisheries.

The USVI has jurisdiction over fisheries in waters extending three nm 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 USVI Department of Planning and Natural Resources is the USVI's fishery management agency.

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

Both Puerto Rico and the USVI require commercial fishing licenses, permits for some species, and reporting. Puerto Rico 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.

DRAFT

Puerto Rico also requires a license for all recreational fishermen 13 years and older (excluding fishermen on charter or head boats); however this requirement has not been enforced yet. Additional recreational permits are required for the harvest of spiny lobster, queen conch, common land crab, billfish (HMS), freshwater shrimp, and sirajo goby.

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 state or federal waters can be found in the 2010 Caribbean ACL Amendment (CFMC 2011a).

DRAFT

Chapter 4. Environmental Effects

Chapter 4 describes the effects to the biological, economic, social, and administrative environment from the alternatives in Chapter 2.

4.1 Biological Effects

NOAA's National Marine Fisheries Service (NMFS) conducted size limit analyses in a report titled, "Analyses of Commercial Parrotfish Landings in the U.S. Caribbean" (SERO-LAPP-2012-02). Two different datasets were used to estimate landings reductions associated with a variety of management schemes: 1) the National Marine Fisheries Service Southeast Fisheries Science Center's (SEFSC) Trip Interview Program (TIP) and 2) the commercial landings data for the U.S. Caribbean, which consists of the USVI Department of Planning and Natural Resources commercial catch record (USVI CCR) and Puerto Rico's Department of Natural and Environmental Resources (PRDNR) sales receipts. TIP data were collected by port samplers that interviewed commercial fishermen and measured their catch. TIP data provided information on the length and numbers of parrotfish species landed, gear used, information on the fishing trip (e.g., date sampled, location sampled), and information on fishing effort (e.g. soak time, number of lines, number of traps). In some intercept cases, the port sampler may only sample a subset of the catch, thus providing a sub-sample of the total catch. USVI CCR and PRDNR trip data provided fishermen reported catch for each trip, and included landings (in pounds whole weight) by general family name (parrotfish) with information on the fishing trip (i.e., date landed or sold, location fished, and capture gear). The reductions were calculated in terms of parrotfish weight (lbs) with respect to gear. Then the reductions were weighted by the percentage of landings for each gear type.

Under **Action 1** and **Action 2**, **Alternative 1** is the no action alternative and, therefore, would not result in any change to the management of parrotfish included in the reef fish fishery management plan (FMP), and therefore, would not have any direct or indirect effect on the biology of the parrotfish populations. The 2010 Caribbean Annual Catch Limit (ACL) Amendment prohibited the harvest of the three largest parrotfish species (midnight, blue, and rainbow), thus those species would still be fully protected, regardless of whether minimum size limits are established. Note that midnight, blue, and rainbow parrotfish are rarely caught by commercial fishers. Historically they have been sought by recreational divers in the U.S. Caribbean, but a harvest prohibition recently has been implemented through the 2010 Caribbean ACL Amendment (CFMC 2011a). The impacts of harvest size limit restrictions on these three species are therefore not considered further.

Analysis of size limits for St. Croix was based on the most recent available three years of TIP data (2008 to 2010) obtained from the commercial fishery. These three years of data represent the majority (59 percent) of the records and a substantial component (35 percent) of the samples of parrotfish TIP data collected during the 2000-2010 TIP sampling program history in the U.S. Caribbean. Moreover, these data provide the best available representation of current harvesting practices. Reductions anticipated for

DRAFT

the range of minimum size limit options for St. Croix are presented in Table 4-1. As an example, if fishing practices otherwise remained the same and a minimum size limit of 9 inches fork length (FL) was implemented (**Alternative 2b**), it is anticipated that 5.8 percent of the parrotfish that otherwise would have been harvested, would remain alive and would have the opportunity to continue to grow and potentially reach sexual maturity. Since landings are not separated into species-specific information, it cannot be further estimated to what degree the landings will be impacted by separate minimum size limits for redband parrotfish (8 inches FL) and all other allowable parrotfish species (9 inches FL). **Alternative 2a** would have the least amount of impact on the level of harvest and would therefore provide the least benefit in the form of additional spawning potential. In contrast, **Alternative 2e,** which implements the largest minimum sizes limit, would likely provide the greatest benefit in the form of additional spawning potential. The same considerations and impacts described above for the St. Croix commercial sector would also hold true for the St. Croix recreational sector.

Table 4-1. Estimated percent reductions in St. Croix TIP-reported commercial parrotfish landings for various minimum size limits, derived using 2008 – 2010 St. Croix TIP data. FL = fork length; the distance from the snout of the fish to the fork in the tail. Table from SERO-LAPP-2012-02.

Alternative	Minimum Size Limit (inches FL)	Estimated percent reduction
2a	8	0.4
2b	9	5.8
2c	10	18.1
2d	11	43.1
2e	12	73.8

Size limit analyses for St. Thomas/St. John were based on the most recent available three years of TIP data (2008 to 2010) obtained from the commercial fishery. These three years of data represent the majority (61 percent of the records and 68 percent of the samples) of parrotfish TIP data collected during the 2000-2010 TIP sampling program history in the U.S. Caribbean and best represent current harvesting practices. Reductions anticipated for the range of minimum size limit options for St. Thomas are presented in Table 4-2. As an example, if fishing practices otherwise remained the same and a minimum size limit of 10 inches was implemented (**Alternative 3c**), it is anticipated that 12.8 percent of parrotfish that otherwise would have been harvested, would continue to grow and potentially reach sexual maturity. **Alternative 3a** would have the least amount of impact on the level of harvest and would therefore provide the least benefit in the form of additional spawning potential. In contrast, **Alternative 3e,** which implements the largest minimum sizes limit, would likely provide the greatest benefit in the form of additional spawning potential. The same considerations and impacts described above for the St. Thomas/St. John commercial sector would also hold true for the St. Thomas/St. John recreational sector.

Alternative 3 was not chosen by the Council, therefore this action will not establish minimum size limits for parrotfish harvest in St. Thomas/St. John. As such, sexually immature parrotfish in St. Thomas/St. John are not expected to be further protected in order to reach sexual maturity. However, parrotfish are

DRAFT

not a heavily targeted species in St. Thomas/St. John waters. Parrotfish make up only 7 percent of the total ACL for St. Thomas/St. John, a percentage based on the percentage contribution of parrotfish harvest to the total commercial St. Thomas/St. John harvest during 2000-2005. This percentage contrasts with the 36 percent contribution of parrotfish harvest to the total ACL in St. Croix.

Table 4-2. Estimated percent reductions in St. Thomas TIP-reported commercial parrotfish landings for various minimum size limits derived using 2008 – 2010 St. Thomas TIP data. Table from SERO-LAPP-2012-02.

Alternative	Minimum Size Limit (inches FL)	Estimated percent reduction
3a	8	0.1
3b	9	1.6
3c	10	12.8
3d	11	44.7
3e	12	79.0

Size limit analyses for Puerto Rico were based on the most recent available three years of TIP data (2009 to 2011) obtained from the commercial fishery. These three years of data represent a substantial component (41 percent of the records and 42 percent of the samples) of parrotfish TIP data collected during the 2000-2011 TIP sampling program history in the U.S. Caribbean. Reductions anticipated for the range of minimum size limit options for Puerto Rico are presented in Table 4-3. As an example, if fishing practices otherwise remained the same and a minimum size limit of 10 inches was implemented (**Alternative 4c**), it is anticipated that 22.3 percent of the parrotfish that otherwise have been harvested, would remain alive in order to continue to grow and reach sexual maturity. **Alternative 4a** would have the least amount of impact on the level of harvest and would therefore provide the least benefit in the form of additional spawning potential. In contrast, **Alternative 4e,** which implements the largest minimum sizes limit, would likely provide the greatest benefit in the form of additional spawning potential.. The same considerations and impacts described above for the Puerto Rico commercial sector would also hold true for the Puerto Rico recreational sector.

The Council chose not to establish minimum size limits for harvest of parrotfish in Puerto Rico EEZ at this time. Similar to St. Thomas/St. John, parrotfish are not heavily targeted in Puerto Rico. Parrotfish harvest accounts for 2.3 percent of the total allowable commercial harvest and 3.5 percent of the total allowable recreational harvest from EEZ waters off Puerto Rico. This percentage contrasts with the 36 percent contribution of parrotfish harvest to the total ACL in St. Croix.

DRAFT

Table 4-3. Estimated percent reductions in Puerto Rico TIP-reported commercial parrotfish landings for various minimum size limits derived using 2009 – 2011 Puerto Rico TIP data. Table from SERO-LAPP-2012-02.

Alternative	Minimum Size Limit (inches FL)	Estimated percent reduction
4a	8	0.9
4b	9	6.5
4c	10	22.3
4d	11	45.1
4e	12	71.2

It is important to note that the reductions anticipated to result from the proposed size limits would not reduce the total amount of parrotfish that is harvested from the Caribbean EEZ. The total parrotfish harvest allowed is managed by an annual catch limit, which will not be affected by these proposed minimum size limits. Instead, parrotfish who do not meet the minimum size limits, and would have been harvested under previous regulations, would now have the opportunity to reach sexual maturity. Those individuals would still remain in the fishery and simply be available for harvest at a later date after they had a chance to spawn at least one time.

The most common parrotfish species in the most recent available TIP data for all three areas (St. Croix 2008-2010, St. Thomas 2008-2010, Puerto Rico 2009-2011) were redtail and stoplight, with the remaining species constituting 15 percent or less of the catch (Table 4-4).

Table 4-4. Percentage of TIP records by species for each island for the most recent data (St. Croix 2008-2010, St. Thomas 2008-2010, and Puerto Rico 2009-2011). Numbers in parenthesize are sample sizes. Table from SERO-LAPP 2012.

	Princess	Queen	Redband	Redfin	Redtail	Stoplight	Striped
St. Croix	1.4 (87)	0.2 (13)	7.9 (463)	5.6 (329)	49.4 (2,907)	35.5 (2,090)	0.0 (0)
St. Thomas	0.7 (7)	0.2 (2)	0.8 (8)	3.6 (38)	45.8 (485)	48.9 (518)	0.1 (1)
Puerto Rico	3.0 (225)	1.3 (100)	3.7 (281)	3.6 (275)	47.6 (3,605)	40.7 (3,079)	0.02 (2)
All Three Islands	2.2 (319)	0.8 (115)	5.2 (752)	4.4 (642)	48.2 (6,997)	39.2 (5,687)	0.02 (3)

Size limit restrictions have the potential to impact each parrotfish species in a different way. Relative impacts depend primarily on the size distribution and population abundance of each parrotfish species. Parrotfish are protogynous hermaphrodites, generally, but not always, maturing as females and switching sex later in life. In the Caribbean, all parrotfish belonging to the Sparisomatinae sub-family initially mature as females, whereas some belonging to the Scarinae sub-family may initially mature as males. This pattern does not occur outside the Caribbean region (Hawkins and Roberts 2003), where the pattern is always initial maturation as females.

Parrotfish mature at a range of lengths varying spatially and across species. A literature review provided a range of lengths at maturity for U.S. Caribbean parrotfish of 6 to 11 inches FL (Robertson and Warner

DRAFT

1978; Koltes 1993). The size at which U.S. Caribbean parrotfish switch sex (generally, but not always, from female to male) is also species specific. For instance, female stoplight parrotfish (*Sparisoma viride*) switch to male at a size between 6 inches and 10 inches standard length (SL) (Koltes 1993). Unfortunately, for most species of parrotfish occurring in the U.S. Caribbean, information on the size at which members of the population change sex, is unavailable.

Regardless, a minimum size limit would reduce mortality of smaller (generally female) parrotfish, thereby enhancing spawning biomass and the supply of gametes (especially eggs), and ultimately increasing yield-per-recruit from the stock (assuming discard mortality is low). Additionally, a minimum size limit reduces the likelihood of recruitment overfishing that might otherwise lead to a stock biomass level below maximum yield. Therefore, the goal of this amendment is to set a size limit to increase the number of juveniles that can reach sexual maturity.

There also may be negative biological consequences with regard to establishing a minimum size limit for parrotfish harvest in the U.S. Caribbean. Fishers may redirect harvest to target larger fish, which produce exponentially more gametes than an equivalent biomass of small fish (Bohnsack 1990). The resultant reduction in abundance of larger and older members of the spawning stock may lower recruitment by preventing parrotfish from living long enough to survive through periods when conditions are poor for offspring survival (Hawkins and Roberts 2003). For example, the maximum age of Caribbean stoplight parrotfish (*Sparisoma viride*) ranges from 7 to 9 years and further analysis of mortality rates suggest the life span does not exceed 12 years (Choat *et al*. 2003). This shift in fishing pressure from smaller females (males) to larger males (females) may then render the males (females) susceptible to overfishing. Parrotfish must reach a genetically determined size threshold before they can switch sex (Warner 1988; Clua and Legendre 2008). Chronic removal of the male (female) parrotfish will dramatically decrease sperm (egg) availability and act as a limiting factor during mating (Clua and Legendre 2008). In particular, male parrotfish maintain harems, so spawning by the entire harem will be interrupted when a male is harvested. Such an outcome has been reported for another common Caribbean reef fish, the hogfish *Lachnolaimus maximus* (McBride and Johnson 2007). Hawkins and Roberts (2003) examined parrotfish populations in Jamaica and the Dominican Republic and discovered fishing pressure eliminated stoplight and queen parrotfish males to the point where the populations were dependent on recruitment from distant sources. Finally, a minimum size limit may alter the ecological balance of the various U.S. Caribbean parrotfish species since each parrotfish species will be impacted differently. This could be counterproductive to ecosystem health.

Alternative 1 would not change the existing level of risk to ESA-listed sea turtles because no change in management would occur and no change in the current operation of the fishery is anticipated. Therefore, the potential risk to ESA-listed sea turtle from fishers targeting parrotfish remains the same. Likewise, this alternative is likely to have no biological benefit for ESA-listed coral species. Parrotfish are omnivorous grazers that remove algae which can interfere with settlement and survival of coral recruits (Brock 1979; Mumby 2006; Burkepile and Hay 2010). Under the no action alternative, the current level

DRAFT

of parrotfish harvest is anticipated to continue and their ability to mediate algal growth leading will be unchanged.

The biological benefits for **Preferred Alternative 2a and 2b** are likely to be minimal for ESA-listed sea turtles and corals. These alternatives are anticipated to reduce landings by 0.4% and 5.7%, respectively. Assuming these landing reductions result in a commensurate reduction in effort, we anticipate little noticeable change in the likelihood of interactions between parrotfish fishery and ESA-listed sea turtles. Additionally, we anticipate these reductions would have few biological benefits for ESA-listed corals because the relatively small reduction in parrotfish harvest is anticipated to lead to relatively small increases in the algae mediating abilities of those non-harvested fish.

All things being equal, **Alternative 2e** would likely have the greatest biological benefit to ESA-listed corals because it would reduce parrotfish harvest by the greatest amount. These reductions would likely cause the greatest increase in the number of parrotfish available to graze algae. Relative to **Alternative 2e**, **Alternative 2d** is likely to fewer biological benefits to ESA-listed corals because harvest under **Alternative 2d** is likely to be greater than under **Alternative 2e**. For the same reason, **Alternative 2c** is anticipated to have fewer biological benefits than **Alternative 2d**.

The biological benefits of **Alternatives 2c-e** on ESA-listed sea turtles are unclear. If these alternatives reduce overall fishing effort, they may reduce the likelihood of interactions between fishers and sea turtles. However, if these alternatives simply lead to shifts in effort, with no actual reductions, there may be fewer biological benefits for sea turtles. Assuming there is some reduction in effort, **Alternative 2c** would be anticipated to have the fewest biological benefits because it would reduce harvest be the smallest amount, likely leading to the smallest effort reductions. **Alterative 2e** is anticipated to have the greatest biological benefits because it would reduce harvest by the largest amount, likely leading to the largest effort reductions.

The same rationale and potential biological benefits noted above are likely to be the same for each alternative proposed for the recreational fishery.

4.2 Economic Effects

This amendment to the Reef Fish FMP includes two actions, both of which could affect fishing for parrotfish in federal waters by establishing minimum size limits. **Action 1** would establish commercial minimum size limits, and **Action 2** would establish recreational minimum size limits.

The parrotfish complex is composed of 10 managed species. Harvest of the three largest of these species (rainbow, blue, and midnight) in federal waters has been prohibited since January 2012. Consequently, the minimum size limits would affect fishing for the following seven species: princess, queen, striped, redband, redtail, stoplight, and redfin parrotfish.

DRAFT

4.2.1 Action 1: Commercial Minimum Size Limits

Alternative 1 of **Action 1** is the status quo alternative. Hence, it would not establish commercial minimum size limits in federal waters and St. Croix, St. Thomas/St. John and Puerto Rico fishermen could continue to harvest all sizes of the above seven species of parrotfish in the EEZ. **Alternative 1,** would have no economic impact beyond the status quo.

Preferred Alternative 2 and **(non-preferred) Alternatives 3** and **4** would establish commercial minimum size limits for parrotfish in the EEZ off St. Croix, St. Thomas/St. John and Puerto Rico, respectively. Because neither **Alternative 3** nor **4** are preferred, there would be no adverse (or beneficial) economic impacts on commercial fishermen and their families and communities in St. Thomas/St. John and Puerto Rico beyond the status quo.

Preferred Alternative 2a would establish the smallest commercial minimum size limit among the alternatives but, as designated by the Caribbean Council, only for redband parrotfish, which is the smallest of the species of managed parrotfish. **Preferred Alternative 2b** would establish the second smallest commercial minimum size limit among the size alternatives for the other managed species that are presently harvested in federal waters. The larger the minimum size limit, the larger the adverse economic impact because fishermen, who presently take individuals of all sizes, would no longer be able to land parrotfish of sizes less than the minimum size limit. **Alternative 2e** would establish the largest size limit and have the largest adverse economic impact, followed in turn by **Alternative 2d** with the second largest adverse economic impact, then **Alternative 2c**, **Preferred Alternative 2b** and **Preferred Alternative 2a**. Hence, **Preferred Alternative 2a** would have the smallest and **Preferred Alternative 2b** would have the second smallest adverse economic impact among the various alternatives. Similarly, **Alternatives 3e and 4e** would have the largest adverse economic impacts on St. Thomas/St. John and Puerto Rico parrotfish fishermen who harvest parrotfish in the EEZ, respectively, followed in turn by **Alternatives 3d** and **4d**, **Alternatives 3c** and **4c**, **Alternatives 3b** and **4b**, and **Alternatives 3a** and **4a**.

Preferred Alternative 2, **Alternative 3** and **Alternative 4** would require fishermen who harvest parrotfish in the EEZ to obtain and use a measuring tool to determine if a parrotfish is of legal size or not (unless visibly it is obviously larger or smaller than the size limit) and discard those fish that are undersized. **Preferred Alternative 2, Alternative 3 and Alternative 4** would increase fishing time in the EEZ per pound landed by adding time to measure parrotfish and reducing landings by the number of discarded parrotfish. Fishermen may further increase fishing time to mitigate for losses of undersized fish. **Alternative 1**, the status quo, would have no effect on fishing time or parrotfish landings. Because neither **Alternative 3 or 4** is preferred, there would be no changes in the amount of time fishing and/or sizes of parrotfish landed in St. Thomas/St. John and Puerto Rico.

Public comment during a scoping meeting for the 2010 Caribbean ACL Amendment indicates parrotfish are harvested by Puerto Rico's commercial fishermen exclusively or almost exclusively in territorial

DRAFT

waters, and to date, there have been no comments to indicate otherwise. This suggests **Alternative 4** would have little to no impact on commercial fishing of parrotfish in Puerto Rico.

Preferred Alternative 2 (Preferred Alternatives 2a and **2b)** would require St. Croix's commercial fishermen to purchase or create a measuring tool, use that tool unless the parrotfish is obviously larger or smaller than its minimum size limit, and discard any fish that are undersized. It is possible that the same tool would be used to assess if a redband parrotfish is less than 8 inches FL (**Preferred Alternative 2a**) or if another species of parrotfish is less than 9 inches FL (**Preferred Alternative 2b**). It is expected that the average cost of purchasing a measuring tool would be between $5 and $10 and average cost of making one would be less. It is assumed that each licensed commercial fishermen and helper would have his or her own measuring tool. On average, St. Croix commercial fishermen typically fish with one helper or another commercial fisherman, but two commercial fishermen who fish with nets have had crews ranging from six to 13 (Kojis and Quinn 2012). This analysis assumes **Alternatives 2, 3** and **4** would require each licensed commercial fisherman who harvest parrotfish in federal waters to acquire one or two measuring tools at a total cost between $5 and $20.

In 2010, St. Croix commercial fishermen reported that the length of their trips varied from 1.5 hours to 6.5 hours. It is also expected that the average amount of time to measure a parrotfish would begin at five seconds and decline to four seconds as fishermen become more experienced (Kahn et al. 2004); however, Table 4-5 includes 10 seconds for comparison purposes. Measurement of 75 parrotfish would take 5 minutes to 12.5 minutes, which represents from 5.6 percent to 13.5 percent of a 1.5-hour trip and from 1.3 percent to 3.2 percent of a 6.5-hour trip (Table 4.5).

Table 4-5. Total Time to Measure Parrotfish per Trip

Number Parrotfish Caught	Total Time to Measure Parrotfish per Trip in the EEZ (Alternatives 2, 3 and 4)								
	4 seconds per fish			5 seconds per fish			10 seconds per fish		
	Seconds	Minutes	Hours	Seconds	Minutes	Hours	Seconds	Minutes	Hours
25	100	1.67	0.03	125	2.08	0.03	250	4.17	0.07
50	200	3.33	0.06	250	4.17	0.07	500	8.33	0.14
75	300	5.00	0.08	375	6.25	0.10	750	12.50	0.21
100	400	6.67	0.11	500	8.33	0.14	1,000	16.67	0.28
125	500	8.33	0.14	625	10.42	0.17	1,250	20.83	0.35
150	600	10.00	0.17	750	12.50	0.21	1,500	25.00	0.42

Preferred Alternative 2 and **Alternatives 3** and **4** would likely result in commercial fishermen having to discard a percent of their traditional EEZ catches and landings. If they cannot, or do not, mitigate for these losses, it is estimated that **Preferred Alternatives 2a** and **2b** would result in an annual loss of commercial parrotfish landings in St. Croix between 960 pounds and 13,920 pounds. If the average ex-vessel price is $5 per pound, although that is an overestimate, the annual revenue losses would be between $4,800 and $69,600. St. Croix's commercial parrotfish fishermen would incur higher losses of annual

DRAFT

revenue from **Alternatives 2c, 2d** and **2e**. Losses of annual parrotfish landings and revenue caused by **Preferred Alternative 2** and **Alternatives 3** and **4** would not be distributed equally across commercial fishermen. The distribution of losses would likely reflect differences in the methods used to commercially harvest parrotfish. As discussed in the Regulatory Impact Review (Chapter 5), St. Croix divers can, and have, used their physical advantage of visually sizing up fish before making the effort of taking them in order to land a larger percent of larger parrotfish. Non-diving commercial fishermen tend to land a larger percent of smaller parrotfish, and pot-and-trap fishermen have landed the greatest percent of smaller parrotfish. Consequently, a commercial fisherman who does not dive is expected to incur a higher percent loss of annual parrotfish landings and associated revenues than one who dives, and a pot-and-trap fisherman the highest percent loss.

If fishermen can and do mitigate for losses of landings due to **Preferred Alternatives 2a** and **2b** and **Alternatives 3** and **4**, they would have to increase fishing time to catch enough legally sized parrotfish or other species to offset pounds discarded in undersized fish. It is expected that the ability of commercial fishermen, and their helpers to increase their time on or in the water and associated costs of that time varies significantly, depending on their financial status and personal and family responsibilities, including whether or not they are engaged in full-time or part-time wage labor. Fishermen and their helpers who cannot increase their fishing time would lose portions of their parrotfish catches equal to the portions that are undersized. Because a pot-and-trap fisherman is expected to catch the largest percent of undersized fish, a pot-and-trap fisherman who cannot increase time on the water would experience the largest percent loss of parrotfish landings and any pot-and-trap fisherman who can increase time, would require the largest percent increase in total fishing time. In other words, **Preferred Alternative 2** and **Alternatives 3 and 4** would disproportionately impact pot-and-trap fishermen who harvest parrotfish in the EEZ because they tend to catch a larger percent of smaller fish. A commercial fisherman who dives to take parrotfish is expected to incur the smallest percent increase in total fishing time in order to mitigate for the percent loss of catch represented by undersized fish. It is unknown if the average disproportionate adverse impact on a pot-and-trap fisherman or other non-diving fisherman who land parrotfish caused by **Preferred Alternative 2**, could also represent a disproportionate adverse impact on St. Croix's commercial fishermen of a specific race, ethnicity, age, geographic area, or business size.

Pots and traps do not account for the majority of parrotfish landings. Diving (SCUBA and free diving) is, and has been, an increasingly common method of harvesting parrotfish. Since 2003, more than half of the parrotfish that were annually landed in St. Croix were harvested by divers; and in 2007, diving accounted for approximately 64 percent of annual parrotfish landings. Diving (with or without additionally reported gear) accounted for 78 percent of parrotfish landings in 2008 and 94 percent of the landings in 2009. Commercial fishermen who dive take parrotfish by hand and/or use spear or nets. Many use a modified net, although the USVI government is working to ban their use. It is expected that most use spear. A sample of St. Croix parrotfish landings from 2007 to 2010 suggests the percent landed by fishermen using spear more than doubled during that time and that almost two-thirds of landings are by fishermen using spear. This suggests pot-and-trap fishermen and other non-divers represent a relatively small percent of commercial parrotfish fishermen, although 37.5 percent of licensed commercial fishermen in 2010

DRAFT

reported using pots and traps and 55.9 percent said they dive. Collectively, the total adverse impact of **Preferred Alternative 2** and **Alternatives 3** and **4** on all commercial fishermen who dive to take parrotfish could be larger than the total adverse economic impact on all commercial fishermen who do not dive to take parrotfish especially in St. Croix.

Preferred Alternative 2 (Preferred Alternatives 2a and **2b)** could generate long-run net economic benefits to St. Croix's commercial fishermen, their households, and communities in the form of economic benefits that derive from exploitation of an improved parrotfish stock with a larger proportion of larger and older fish and ecological benefits of healthier coral reefs; however, these long-run benefits could be at the expense of non-diving fishermen who more quickly exit the commercial fishery. **Alternative 1** would not change long-run benefits because it would not affect the size distribution and spawning of the stock. **Alternative 3** would change the size distribution of landings, which could generate long-run net benefits to St. Thomas/St. John commercial fishermen. **Alternative 4** would have little to no long-run net economic benefits because Puerto Rico commercial fishermen harvest little to no parrotfish in federal waters.

4.2.2 Action 2: Recreational Minimum Size Limits

Alternative 1 of **Action 2** is the status quo alternative and would have no additional economic impact. **Preferred Alternative 2** and (non-preferred) **Alternatives 3** and **4** would establish recreational size limits for parrotfish in the EEZ off St. Croix, St. Thomas/St. John and Puerto Rico, respectively. Because neither **Alternative 3** nor **4** are preferred, the status quo would continue in the St. Thomas/St. John and Puerto Rico EEZ. Hence, there would be no adverse (or beneficial) economic impacts on recreational fishermen who harvest parrotfish, their families and communities in St. Thomas/St. John and Puerto Rico beyond the status quo.

Preferred Alternative 2, **Alternative 3** and **Alternative 4** would require fishermen to obtain and use a measuring tool to determine if a parrotfish is of legal size or not (unless visibly it is obviously larger or smaller than the size limit) and discard those fish that are undersized. **Preferred Alternative 2 and (non-preferred) Alternatives 3 and 4** would increase fishing time per pound landed by adding time to measure parrotfish and reducing landings by the number of discarded parrotfish, absent any attempts to mitigate for losses of parrotfish landings. **Alternative 1**, the status quo, would have no effect on fishing time or parrotfish landings. Because neither **Alternative 3 or 4** is preferred, there would be no changes in the amount of fishing time and/or sizes of parrotfish landed in St. Thomas/St. John and Puerto Rico.

Preferred Alternatives 2a and **Preferred Alternative 2b** of Action 2 would establish the same minimum size limits as **Preferred Alternatives 2a** and **2b** of Action 1: eight inches for redband parrotfish and nine inches for the other six species. Recreational landings data are not available for the USVI. Consequently, recreational landings of parrotfish in St. Croix and estimate of percent losses of these landings cannot be generated. **Preferred Alternative 2a** would have the smallest and **Preferred Alternative 2b** would have the second smallest adverse economic impact, followed in turn by **Alternative 2c**, **Alternative 2d** and

DRAFT

Alternative 2e. Similarly, among the subalternatives of **Alternative 3**, **Alternative 3e** would have the largest adverse economic impact, followed by **Alternatives 3d, 3c, 3b**, and **3a.** Also, among the subalternatives of **Alternative 4, Alternative 4e** would have the largest adverse economic impact on Puerto Rico's commercial fishermen, followed by **Alternatives 4d, 4c, 4b and 4a** if they harvest parrotfish in federal waters.

Public comment during a scoping meeting for the 2010 Caribbean ACL Amendment indicates parrotfish are harvested by Puerto Rico's recreational fishermen exclusively or almost exclusively in territorial waters, and to date, there have been no comments to indicate otherwise. This suggests **Alternative 4** would have little to no impact on recreational fishing of parrotfish in Puerto Rico.

Fishermen may or may not use the same tool to measure redband and other species of parrotfish. The average cost of a measuring tool would likely be between $5 and $10, and the average amount of time to measure a fish would range from four to five seconds and would decrease as recreational fishermen gain more experience measuring fish. There is presently a bag limit of no more than two parrotfish per day per fisherman and no more than six parrotfish per vessel. If the average recreational fisherman has to catch four parrotfish for every two that are of legal size, the total time to measure the four fish would be less than a half a minute, which is expected to be relatively insignificant. Even if the average amount of time to measure a fish was 10 seconds, the total time would be no more than two minute per vessel. **Preferred Alternative 2** (**Preferred Alternatives 2a** and **2b**) and **Alternatives 3 and 4** would increase fishing time by no more than two minutes per trip per vessel and no more than half a minutes per angler per day.

Recreational fishermen use both for-hire and private/rental boats to fish in federal waters; however, for-hire boats in the U.S. Caribbean tend to target pelagic species and other sport fish, not parrotfish. Hence, **Preferred Alternatives 2a** and **2b** are not expected to affect recreational fishing aboard for-hire vessels. **Preferred Alternative 2** is expected to have the same economic impact on charter fishing operations as **Alternatives 1, 3 and 4**, which is none beyond the status quo.

USVI recreational fishermen are prohibited from using pots and traps, so the effects of **Preferred Alternative 2** and **Alternative 3** on pot-and-trap fishermen would not apply to recreational fishermen. It is expected that most to all of St. Croix's recreational fishermen and the majority of St. Thomas/St. John recreational fishermen dive when harvesting parrotfish, which of the various methods used to catch parrotfish, is the easiest to filter out individuals by size. Nonetheless, recreational fishermen may require additional dive time and associated costs to filter out undersized fish and maintain their current levels of landings. However, their ability to mitigate for potential losses of landings and associated benefits may be limited by existing regulations, rising fuel costs, declining incomes, and personal and family responsibilities, such as a wage employment, care giving, and provision of other daily household services that limit their abilities to increase dive time and associated costs in order to maintain their present levels of landings of parrotfish.

DRAFT

Preferred Alternative 2 (Preferred Alternatives 2a and **2b)** could generate long-run net economic benefits to St. Croix's recreational fishermen, their households and communities in the form of economic benefits that derive from exploitation of an improved parrotfish stock with a larger proportion of larger and older fish and ecological benefits of healthier coral reefs; however, these benefits could be at the expense of non-diving fishermen who more quickly exit the recreational fishery. **Alternative 1** would have no change on long-run economic benefits because it would not change the size distribution and spawning of the stock. **Alternative 3** could generate long-run net economic benefits to St. Thomas/St. John recreational fishermen, but **Alternative 4** would likely generate little to no long-run net benefits because Puerto Rico recreational fishermen catch little to no parrotfish in the EEZ.

4.3 Social Effects

Effects from fishery management changes on the social environment are difficult to analyze due to complex human-environment interactions and a lack of quantitative data about that interaction. Generally, social effects can be categorized according to changes in: human behavior (what people do), social relationships (how people interact with one another), and human-environment interactions (how people interact with other components of their environment, including enforcement agents and fishery managers). It is generally accepted that a positive correlation exists between economic effects and social effects. Thus, in Section 4.2, alternatives predicting positive or negative economic effects are expected to have correlating positive or negative social effects.

4.3.1 Action 1: Commercial Minimum Size Limits

Alternative 1 of **Action 1** would not establish parrotfish commercial size limits and would likely negatively impact fishermen in the long-term by reducing the proportion of parrotfish that reach sexual maturity and reproduce. This could negatively impact the stock and possibly cause negative social impacts in the long-term if the stocks decline and further restrictions are put into effect in order to allow the stock to rebound and/or fishermen are not allowed to fish. However, evidence from public comments from a recent amendment suggests that parrotfish are not harvested in all federal waters off Puerto Rico and the USVI (evidence suggests parrotfish are not harvested in the Puerto Rican EEZ), therefore minimum size limits might not be socially beneficial in the long-term for all areas universally. Also, under **Alternative 1,** fishing would be allowed to continue at status quo and this would be socially beneficial to commercial fishermen in the short-term because they would be allowed to continue harvesting without any required change.

<u>St. Croix commercial minimum size limit:</u>
Alternatives 2a (Preferred for redband parrotfish**), 2b** (Preferred for all other allowable parrotfish species), **2c**, **2d**, and **2e** would all establish minimum size limits of various sizes for commercial parrotfish in St. Croix and thus, could reduce the available catch for commercial fishermen by increasing percentages (the larger the minimum size, the larger the estimated loss in catch) if fishing practices

DRAFT

remain the same as those that occurred from 2008 to 2010 (the years of data used to produce the estimation of reduction in landings by minimum size). However, fishing practices may have changed since an ACL was established for St. Croix in 2012.

As shown in Table 4-1, with a minimum size limit of 8 inches FL as in **Preferred Alternative 2a** there would be an estimated 0.4 percent reduction in catch, with a minimum size limit of 9 inches FL as in **Preferred Alternative 2b** there would be an estimated 5.8 percent reduction in catch, with a minimum size limit of 10 inches FL as in **Alternative 2c** there would be an estimated 18.1 percent reduction in catch, with a minimum size limit of 11 inches FL as in **Alternative 2d** there would be an estimated 43.1 percent reduction in catch and with a minimum size limit of 12 inches FL as in **Alternative 2e** there would be an estimated 73.8 percent reduction in catch if fishing practices remain the same as those that occurred from 2008 to 2010. This would be expected to negatively impact fishermen that depend on this resource for their livelihood in the short-term because their catch would be reduced. This could negatively impact the ability of fishermen to make a full-time living from fishing and could displace some fishermen or crew. It is expected that, if fishing practices remain the same, the resulting negative social effects would increase along with a larger increase in minimum size limit because of an increase in loss of percentage and total pounds accompanying a larger minimum size limit.

A larger minimum size limit and larger loss in catch could impact those that depend on their catch for subsistence to provide food for themselves and their families and these impacts would likely also be more severe, the larger the minimum size limit established (because the loss in catch would be significantly larger, the larger the size limit) if fishing practices remain the same as those that occurred from 2008 to 2010.

A larger minimum size limit could also increase the effort (including time and fuels costs) necessary to catch a larger sized fish which could negatively impact fishermen and their crew. This increase in effort required would likely be more of an issue for those fishermen that who are not able to see the fish they are targeting such as pot and trap fishermen. As explained in Section 5.5.1, fishermen who dive tend to catch larger fish; whereas pot and trap fishermen tend to catch a larger amount of smaller fish (34 percent of redband caught by pot and trap fishermen were less than eight inches FL and 29 percent of other parrotfish caught by pot and trap fishermen were less than nine inches FL). Thus, pot and trap fishermen would likely be negatively impacted to a much greater degree by instituting a minimum size limit of any size. Also, as explained in Section 4.2, pot and trap fishermen who target redband parrotfish would likely be more severely impacted (than dive fishermen) by **Preferred Alternative 2a** because redband parrotfish are smaller in size in general. Pot and trap fishermen that target other parrotfish would likely be more severely impacted (than dive fishermen) by the other alternatives including **Preferred Alternative 2b**, and **Alternatives 2c**, **2d**, and **2e**. These impacts would also likely be more severe because the larger the minimum size limit established, the more likelihood they would catch smaller fish, have to release those fish, and try again to catch the appropriate sized fish. Also, as mentioned in Section 5.5.1, it is likely that these pot and trap fishermen currently keep smaller sized fish to use as subsistence for themselves, their families, and their friends. It is thus possible that the establishment of any of the

DRAFT

minimum size limits in any of the sub-alternatives could negatively impact these fishermen's efforts to provide food for their families and friends.

Conversely, dive fishermen (including spear fishermen) would likely be less impacted by instituting a minimum size limit because they are able to visibly assess the size the fish they are targeting. As mentioned in Section 5.5.1, a large percentage of fishermen that target parrotfish utilize diving as their method of catch (64 percent of total parrotfish landings in 2007, 78 percent in 2008, and 94 percent in 2009). Dive fishermen also tend to target larger, plate-sized fish. As explained in Section 5.5.1, in a sample of landings from 2007 to 2010, less than 3 percent of redband parrotfish landed by divers using spears were less than eight inches FL and 8 percent landed by divers using their hands were less than eight inches FL. During the same sample years, about 4 percent of other parrotfish landed by divers were less than nine inches FL. Thus, Preferred **Alternative 2a** would likely negatively impact dive fishermen to a lesser extent (than pot-and-trap fishermen). **Preferred Alternative 2b**, and **Alternatives 2c**, **2d**, and **2e** would also likely negatively impact dive fishermen to a lesser extent (than pot fishermen). However, all of the sub-alternatives could increase the amount of effort (time) required by dive fishermen to find an appropriate sized fish.

In addition, as discussed in Section 4.2.1, the sub-alternatives would require that fishermen purchase or create a measuring tool to determine the size of parrotfish (unless the fish is obviously bigger or smaller than the size limit) and discard undersized fish. As explained in Section 4.2.1, this need for a measuring tool could impact fishermen and crewmembers monetarily (it is estimated that this measuring tool could cost between $5 and $10 to purchase and would be necessary for each fisherman and crewmember).

All of these sub-alternatives would likely prove to be beneficial to fishermen overall in the long-term and it is expected that these benefits would be greater, the larger the established minimum size (because the larger the minimum size, the more likely greater biological benefits will result for the stock because more parrotfish will have been allowed to reach sexual maturity). However if fishing is severely curtailed by a large loss in catch from the establishment of a large minimum size (as could happen if fishing practices remain the same as those during the years 2008 to 2010) or a large increase in the amount of effort necessary to catch fish occurs (as is possible for pot and trap fishermen), it is expected that the negative impacts to fishermen could become severe in the long-run. This could cause extreme impacts where fishermen might have to decide to switch to other fisheries (and put more pressure on those fisheries), stop fishing and change careers if available (it has been established that across nearly all cultures fishermen enjoy what they do and a loss in their job of choice might result in a loss of happiness which might result in other additional negative social impacts), or continue fishing at a reduced rate with a loss in income and likely loss of some subsistence foods.

Since St. Croix lands the greatest amount of commercial parrotfish and since parrotfish have been shown to be important to locals for consumption, it is likely that the impacts of establishing a minimum size limit would be the most severe to St. Croix commercial fishermen, their households, and communities (than their counterparts in St. Thomas/St. John and Puerto Rico if a minimum size limit were established in

DRAFT

those areas) if fishing practices remain the same. Conversely, if a minimum size limit is not established it is possible that there would be severe negative impacts to the stock and resulting negative impacts to the people that depend on the stock. Likely, the best option, socially, for this action would be to mitigate the positive and negative impacts through the selection of a minimum size limit that would be effective at serving the biological needs of the fish stock (and the resulting social positive effects from a strong fish stock) while resulting in the least amount of loss in catch. Therefore, if a commercial minimum size limit is set for parrotfish off St. Croix and fishing practices remain the same, it is likely that both the greatest social benefits would occur and the fewest negative social impacts would occur for St. Croix fishermen and their communities under **Preferred Alternative 2a**. **Preferred Alternative 2b** would likely be the next best option after **Preferred Alternative 2a**.

St. Thomas/St. John commercial minimum size limit: As shown in Table 4-2, with a minimum size limit of 8 inches FL as in **Alternative 3a** there would be an estimated 0.1 percent reduction in catch, with a minimum size limit of 9 inches FL as in **Alternative 3b** there would be an estimated 1.6 percent reduction in catch, with a minimum size limit of 10 inches FL as in **Alternative 3c** there would be an estimated 12.8 percent reduction in catch, with a minimum size limit of 11 inches FL as in **Alternative 3d** there would be an estimated 44.74 percent reduction in catch and with a minimum size limit of 12 inches FL as in **Alternative 3e** there would be an estimated 79 percent reduction in catch if fishing practices remain the same as those that occurred from 2008 to 2010 (the years of data used to produce the estimation of reduction in landings by minimum size). However, fishing practices may have changed since an ACL was established for St. Thomas/St. John in 2012.

If fishing practices remain the same as those that occurred from 2008 to 2010, the social impacts of **Alternative 3a, Alternative 3b, Alternative 3c, Alternative 3d,** and **Alternative 3e** closely follow those described above for **Preferred Alternative 2a, Preferred Alternative 2b**, and **Alternatives 2c** through **2e**. These social impacts include the estimated reduction in catch and possible displacement of some fishermen if fishing practices remain the same, the necessity of obtaining a measuring tool, and the likely disparate and adverse impacts to pot and trap fishermen. However, fewer landings of parrotfish are delivered to St. Thomas and St. John and therefore, the negative social impacts on St. Thomas/St. John commercial fishermen, households, and communities would likely be less severe (than if a minimum size limit were established in St. Croix). As in the St. Croix options, if a commercial minimum size limit is set for parrotfish off of St. Thomas and St. John and fishing practices remain the same as those during 2008 to 2010, it is likely that both the greatest social benefits would occur and the fewest negative social impacts would occur for St. Thomas and St. John fishermen and their communities under **Alternative 3a**. **Alternative 3b** would likely be the next best option after **Alternative 3a**.

Puerto Rico commercial minimum size limit: If fishing practices remain the same as those that occurred from 2009 to 2011, the social impacts of **Alternatives 4a,** through **4e** closely follow those described above for **Preferred Alternative 2a, Preferred Alternative 2b, Alternatives 2c, 2d,** and **Alternative 2e** unless it is shown that parrotfish are not harvested from federal waters in Puerto Rico. These social impacts include the estimated reduction in catch and possible displacement of some fishermen if fishing

DRAFT

practices remain the same, the necessity of obtaining a measuring tool, and the likely disparate and adverse impacts to pot and trap fishermen. However, public comment from a recent amendment suggested that few parrotfish are harvested in the federal waters of Puerto Rico and if this is true, then **Alternative 1** would likely be the most socially beneficial option because it would allow the very small amount of harvesting to occur in federal waters (if such harvesting does occur) without a size limit. Creating a minimum size limit for a miniscule amount of harvest would likely have no resulting long-term social benefits.

Even if a portion of the landed parrotfish catch is harvested from federal waters, a much smaller amount of parrotfish is commercially harvested from commonwealth (than in the St. Croix) and the negative social impacts are likely to be less severe (than those that would occur if a commercial minimum size limit is created in the St. Croix). As shown in Table 4-3, with a minimum size limit of 8 inches as in **Alternative 4a** there would be an estimated 0.9 percent reduction in catch, with a minimum size limit of 9 inches FL as in **Alternative 4b** there would be an estimated 6.5 percent reduction in catch, with a minimum size limit of 10 inches FL as in **Alternative 4c** there would be an estimated 22.3 percent reduction in catch, with a minimum size limit of 11 inches FL as in **Alternative 4d** there would be an estimated 45.1 percent reduction in catch and with a minimum size limit of 12 inches FL as in **Alternative 4e** there would be an estimated 71.2 percent reduction in catch if fishing practices remain the same as those that occurred from 2009 to 2011. If a large catch in federal waters can be shown, a commercial minimum size limit is set for parrotfish off of Puerto Rico, and fishing practices remain the same, it is likely that both the greatest social benefits would occur and the fewest negative social impacts would occur for Puerto Rican fishermen and their communities under **Alternative 4a**. **Alternative 4b**would likely be the next best option after **Alternative 4a**. However, fishing practices may have changed since an ACL was established for Puerto Rico in 2012.

4.3.2 Action 2: Recreational Minimum Size Limits

Alternative 1 of **Action 2** would not establish parrotfish recreational size limits and would likely negatively impact fishermen in the long-term by reducing the proportion of parrotfish that reach sexual maturity and reproduce. This could negatively impact the stock and possibly cause negative social impacts in the long-term if the stocks decline and further restrictions are put into effect in order to allow the stock to rebound and/or fishermen are not allowed to fish. However, as mentioned above, evidence from public comments from a recent amendment suggests that parrotfish are not harvested in federal waters off Puerto Rico and the USVI (evidence suggests parrotfish are not harvested in the Puerto Rican EEZ), therefore minimum size limits might not be socially beneficial in the long-term for all areas universally. Also, under **Alternative 1,** fishing would be allowed to continue at status quo and this would likely be socially beneficial to recreational fishermen in the short-term because they would be allowed to continue harvesting without any required change. However, little data is available on recreational fishing for parrotfish and it is possible that few parrotfish are harvested recreationally and that **Alternative 1** would have limited discernible negative or positive social impacts.

DRAFT

St. Croix recreational minimum size limit: The reductions in catch, if any, that result from establishment of a recreational minimum size limit are not known; however it is reasonable to extrapolate the trend seen in the commercial losses to what might occur if a recreational minimum size limit is imposed and assume that the larger the size limit (size limit is set at 8 inches for **Preferred Alternative 2a** [preferred for redband parrotfish] 9 inches FL for **Preferred Alternative 2b [**preferred for all other parrotfish species], 10 inches FL for **Alternative 2c**, 11 inches FL for **Alternative 2d**, and 12 inches FL for **Alternative 2e**), the greater the short-term negative social impacts might be from a larger loss in catch assuming that fishing practices remain the same as those during the years of 2008 to 2010. However, it is possible that recreational fishermen might be targeting a fish of a certain size already and thus, would not be as negatively impacted. If fishing practices remain the same and recreational fishermen lose catch at a similar rate to that of commercial fishermen, it would be reasonable to assume that it is likely that both the greatest social benefits would occur and the fewest negative social impacts would occur for St. Croix recreational fishermen under **Preferred Alternative 2a**. **Preferred Alternative 2b** would likely be the next best option after **Alternative 2a**.

St. Thomas/St. John recreational minimum size limit: The reductions in catch, if any, that result from establishment of a recreational minimum size limit are not known; however it is reasonable to extrapolate the trend seen in the commercial losses to what might occur if a recreational minimum size limit is imposed and assume that the larger the size limit [size limit is set at 8 inches FL for **Alternative 3a**, 9 inches FL for **Alternative 3b**, 10 inches FL for **Alternative 3c**, 11 inches FL for **Alternative 3d**, and 12 inches FL for **Alternative 3e**], the greater the short-term negative social impacts might be from a larger loss in catch assuming that fishing practices remain the same as those during the years of 2008 to 2010. However, it is possible that recreational fishermen might be targeting a fish of a certain size already and thus would not be as negatively impacted. If fishing practices remain the same and recreational fishermen lose catch at a similar rate to that of commercial fishermen it would be reasonable to assume that it is likely that both the greatest social benefits would occur and the fewest negative social impacts would occur for St. Thomas/St. John recreational fishermen under **Alternative 3a**. **Alternative 3b** would likely be the next best option after **Alternative 3a**.

Puerto Rico recreational minimum size limit: If there is some recreational catch of parrotfish in federal waters in Puerto Rico (as previously discussed it has been stated in public comment during a previous amendment that parrotfish are not harvested in federal waters in Puerto Rico), the reductions in catch, if any, that result from establishment of a recreational minimum size limit are not known; however it is reasonable to extrapolate the trend seen in the commercial losses to what might occur if a recreational minimum size limit is imposed and assume that the larger the size limit [size limit is set at 8 inches FL for **Alternative 3a**, 9 inches FL for **Alternative 4b**, 10 inches FL for **Alternative 4c**, 11 inches FL for **Alternative 4d**, and 12 inches FL for **Alternative 4e**], the greater the short-term negative social impacts might be from a larger loss in catch assuming that fishing practices remain the same as those during the years of 2009 to 2011. However, it is possible that recreational fishermen might be targeting a fish of a certain size already and thus would not be as negatively impacted. If fishing practices remain the same and recreational fishermen lose catch at a similar rate to that of commercial fishermen it would be

DRAFT

reasonable to assume that it is likely that both the greatest social benefits would occur and the fewest negative social impacts would occur for Puerto Rican recreational fishermen under **Alternative 4a**. **Alternative 4b**would likely be the next best option after **Alternative 4a**. However, since there is likely no or very little recreational catch of parrotfish in federal waters in Puerto Rico, **Alternative 1** would likely be the most socially beneficial and least detrimental option because it would allow the very small amount of harvesting to occur in federal waters (if such harvesting does occur) without a size limit. Creating a minimum size limit for a miniscule amount of harvest would likely have no resulting long-term social benefit.

4.4 Administrative Effects

Alternatives 2 through **4** in **Action 1** or **Action 2** would result in a direct effect to the administrative environment, because enforcement agents would have one more regulation to enforce. NMFS would continue to monitor both recreational and commercial landings to determine if landings are meeting or exceeding specified ACLs. NOAA's Office for Law Enforcement, in cooperation with the U.S. Coast Guard and territorial/commonwealth agencies, would continue to monitor regulatory compliance as best as possible with existing regulations.

4.5 Cumulative Effects Analysis

As directed by the National Environmental Policy Act (NEPA), federal agencies are mandated to assess not only the direct and indirect impacts, but the cumulative impacts of proposed actions as well. The Council on Environmental Quality (CEQ) regulations define a cumulative impact as "the impact on the environment which 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" (40 C.F.R. 1508.7). Cumulative effects can either be additive or synergistic. A synergistic effect occurs when the combined effects are greater than the sum of the individual effects.

This section uses an approach for assessing cumulative effects based upon guidance offered by the CEQ publication —Considering Cumulative Effects (1997). The report outlines 11 items for consideration in drafting a CEA for a proposed action.

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.

DRAFT

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.

This CEA for the biophysical environment will follow a modified version of the 11 steps. Cumulative effects for the socio-economic environment will be analyzed separately.

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 4.1 through 4.4. Establishing minimum size limits for parrotfish in the St. Croix EEZ 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 3.0 and 4.0. These include:

1. Managed resources (reef fish);
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.

DRAFT

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. These waters extend in Puerto Rico from 9 nautical miles (nm) to 200 nm and from 3 nm to 200 nm off USVI waters. Managed resources, non-target species, habitat, and protected species present in federal waters of the U.S. Caribbean are also within this geographic scope. The immediate areas affecting humans would include fishing communities of Puerto Rico and the USVI. A detailed description of the geographic range for the parrotfish species primarily affected by this proposed amendment can be found in section 3.2.1

3. Establish the timeframe for the analysis.

The timeframe for this analysis starts when the FMPs for each of the species under consideration was created (Reef Fish FMP in 1985). The species in this amendment have been federally managed since 1985. The timeframe should be initiated when data collection began for each of the species. For species in this amendment, data through 2010 for the USVI and 2011 for Puerto Rico was used.

4. Identify the other actions affecting the resources, ecosystems, and human communities of concern.

There have been a number of past actions (e.g. 2005 Caribbean SFA Amendment, 2010 and 2011 Annual Catch Limit Amendments) taken by the Council that may have positively or negatively affected the resources, ecosystems, and human communities of concern. In addition, there are foreseeable future actions, such as the USVI Trap Reduction Program, that could affect the resources, ecosystems, and human communities of concern. These actions, including the proposed amendment, are intended to work together to promote the sustainability of the U.S. Caribbean fisheries resources.

For a detailed description of past actions and those currently in the process of implementation, see the 2010 Caribbean Annual Catch Limit Amendment (CFMC 2011a) and those described in Chapter 1.5 of this EA.

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 addresses 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,

DRAFT

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 Caribbean Council and NMFS evaluate the status of wild stocks relative to various pre-defined benchmarks and implement necessary management measures to maintain sustainable resources. 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 sectors 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. 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

DRAFT

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.

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 Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires federal FMPs to prevent overfishing and achieve OY on a continuing basis. This proposed regulatory amendment is intended to improve federal managers' ability to prevent overfishing and achieve long-term optimal yield through the establishment of minimum size limits for the parrotfish fishery in St. Croix. Stresses affecting these resources include directed fishing mortality, habitat loss and degradation, increasing demand for food, 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 regularly assessed, as they are considered undergoing overfishing. The Magnuson-Stevens Act requires NMFS 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 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.

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 2011). The baseline status of Council managed species is also described in Chapter 3.0.

The status and health of EFH has been extensively described (CFMC 1998, 2004) with a review completed in 2011. The recent review incorporated impacts from climate change, lionfish invasion and lobster diseases. The Caribbean Council, the NMFS, 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.

Chapter 3.3 describes baseline economic and social conditions for fishing communities in Puerto Rico and the USVI. The Generic Essential Fish Habitat (EFH) Amendment (CFMC 1998), FEIS (CFMC 2004), Griffith et al. (2007), Stoffle et al. (2009), and the 2011 Caribbean Annual Catch Limit (CFMC 2011b) provide more extensive characterization of fishing-dependent communities.

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 fisheries and measures proposed in this regulatory amendment to address these potential effects are described in Chapters 3 and 4. Actions

DRAFT

considered in this regulatory amendment should not have adverse effects on public health but could have effects on safety at sea since these measures, if implemented, could trigger and increase in fishing effort. With the establishment of a minimum size limits, it could take longer for the fisherman to catch the allowable harvest. Fishing may still occur, just limited to the extent allowed by the minimum size limits adopted. Unique characteristics of the geographic area are highlighted in Chapter 3. Effects of fishing activities on the physical environment are described in detail in Chapter 4 of this amendment.

Past actions affecting the reef fish are summarized in the 2010 Caribbean Annual Catch Limit Amendment (CFMC 2011a) and described in Chapter 1.5 of this EA. To the extent that minimum size limits assist in rebuilding overfished stocks, they should have positive long-term benefits to both the biological and socioeconomic environments.

9. Determine the magnitude and significance of cumulative effects.

Past actions affecting the Reef Fish FMPs are summarized in are summarized in the 2010 Caribbean Annual Catch Limit Amendment (CFMC 2011a) and described in Chapter 1.5 of this EA. The actions proposed in this amendment consider measures to establish minimum size limits for parrotfish and minimize to the extent practicable negative socioeconomic impacts. In combination with the 2005 Caribbean SFA Amendment, the 2010 and 2011 Caribbean ACL Amendments, this action will impose more restrictions on the catch of parrotfish resulting in negative social and economic impacts over the short-term. To the extent that minimum size limits can prevent overfishing and assist in rebuilding overfished stocks, they should have positive long-term benefits to both the biological and socio-economic environments. In combination with past and present actions, this action could affect the quantity and composition of harvest of species addressed in this document, through the minimum size limits.

This action will not have any effect on allowable fishing gear. Nor will this action affect current area and seasonal closures. The cumulative social and economic effects of past, present, and future amendments may be described as limiting fishing opportunities in the short-term. However, this regulatory amendment is expected to improve prospects for sustained participation in the parrotfish segment of the reef fish fishery over time.

10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.

The process of protecting reef fish through the specification minimum size limits 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 allowing parrotfish juveniles to mature into reproductively active individuals, and to have a chance to spawn prior to harvest. The range of alternatives has varying degrees of economic and social costs and administrative burdens, starting at zero.

DRAFT

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 NMFS 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 U.S. Virgin Islands Department of Planning and Natural Resources in the USVI. Recreational data is collected through MRFSS, which has not been implemented to date in the USVI.

4.6 Council Conclusions

At its April 2012 meeting, the Council discussed alternatives presented in an options paper to modify management of parrotfish. These options included a no action option as well as minimum and maximum sizes limits, escape vents, and trip limits. The Council also considered the recommendations of the AP and SSC in the discussion of the parrotfish. These measures were proposed based on the ecological relevance of these herbivores and potential impacts on the coral reefs and protected coral species.

The Council decided to move forward with parrotfish size and trip limits but to withhold action on escape vents for traps until the outcomes of a trap vent study being conducted in the USVI were finalized. After further discussion, the Council decided to take only the size limit management measures to public hearings, with alternatives including minimum sizes of 9, 10, 11, and 12 inches FL for parrotfish only. The Council chose not to consider establishing maximum size limits for parrotfish. At the April 2012 Council meeting, the Council unanimously approved the alternatives discussed (size limits for parrotfish for both the commercial and recreational harvest for all islands) to be taken to Public Hearings before the August 2012 Council meeting. They did not, however, identify preferred alternatives. The Council's decision to establish size limits for parrotfish was based on recommendations from the industry and scientific staff that minimum size limits would allow fish to reach reproductive size and spawn at least once prior to entering the fishery, thereby contributing to improvements in the health of the stock.

A Public Hearing Draft of Regulatory Amendment 4 to the Reef Fish FMP for Parrotfish Minimum Size Limits was prepared and public hearings were conducted in both Puerto Rico and the USVI during July 2012. The Council's AP discussed the results of the public hearings and recommended to the Council to establish, for both the commercial and recreational sectors, a minimum size of 8 in FL for the redband parrotfish and 9 in FL for all other allowable parrotfish. The Council reviewed the alternatives, the comments received at the public hearings, and the AP's recommendations and concluded that: (1) since parrotfish species are ecologically and culturally important, there was a need to establish minimum sizes; and (2) there were significant differences among Puerto Rico, St. Croix, and St. Thomas/St. John in the prosecution of the parrotfish fishery. In particular, parrotfish are specifically targeted for harvest in St. Croix whereas they are essentially bycatch in St. Thomas/St. John and Puerto Rico. Because parrotfish

DRAFT

are not heavily targeted in St. Thomas/St. John and Puerto Rico, the Council chose to not establish minimum size limits for parrotfish harvest in those areas. The Council selected a smaller 8 in FL minimum size for redband parrotfish because it is a relatively smaller fish and reaches sexual maturity at a smaller size than the other allowable parrotfish species.

The proposed codified text was presented at the Council's December 2012 meeting in St. Thomas, USVI, and final action was taken at that meeting to submit Regulatory Amendment 4 to the Reef Fish FMP to the Secretary for implementation.

DRAFT

Chapter 5. Regulatory Impact Review

5.1 Introduction

The National Marine Fisheries Service (NMFS) requires a Regulatory Impact Review (RIR) for all regulatory actions that are of public interest. The RIR does three things: (1) it provides a comprehensive review of the level and incidence of impacts associated with a regulatory action; (2) it provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives which could be used to solve the problem; and (3) it ensures that the regulatory agency systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost effective way.

The RIR also serves as the basis for determining whether any proposed regulations are a "significant regulatory action" under certain criteria provided in Executive Order 12866 (E.O. 12866) and whether the approved regulations will have a "significant economic impact on a substantial number of small business entities" in compliance with the Regulatory Flexibility Act of 1980 (RFA).

5.2 Problems and objectives

The purpose and need, issues, problems, and objectives of the emergency action are presented in Section 1.2 and are incorporated herein by reference.

5.3 Methodology and framework for analysis

This RIR assesses management measures from the standpoint of determining the resulting changes in costs and benefits to society. To the extent practicable, the net effects of the emergency measures for an existing fishery should be stated in terms of producer and consumer surplus, changes in profits, and employment in the direct and support industries. Where figures are available, they are incorporated into the analysis of the economic impacts of the different actions and alternatives.

5.4 Description of the fishery

A description of the fishery is contained in Chapter 3 and incorporated here by reference.

DRAFT

5.5 Economic Impacts of Management Measures

5.5.1 Action 1

Preferred Alternative 2 would set minimum size limits for parrotfish species commercially harvested in federal waters off of St. Croix, USVI. **Preferred Alternative 2a** would establish a commercial minimum size limit of eight inches FL for redband parrotfish, and **Preferred Alternative 2b** would establish a commercial minimum size limit of nine inches FL for the six other parrotfish species (princess, queen, redfin, redtail, stoplight, and striped). These actions would not establish minimum size standards in federal waters off Puerto Rico or St. Thomas/St. John, USVI. Presently, parrotfish of any size can be legally harvested anywhere in the EEZ.

Fishermen can use various commercial and homemade tools to measure the length of a finfish: from tape measures and adhesive rulers to markings on the barrel of a spear gun. At the minimum, it is likely that **Preferred Alternatives 2a** and **2b** would require St. Croix's commercial fishermen to purchase or create a measuring tool, use that tool to determine whether or not a parrotfish is of legal size (unless visibly it is obviously greater than its minimum size limit), and discard any fish that are undersized. It is expected that the average cost of purchasing a measuring tool would be between $5 and $10 and average cost of making one would be less. It is also expected that the average amount of time to measure a parrotfish would begin at five seconds and decline to four seconds as fishermen become more experienced.

Preferred Alternatives 2a and **2b** of Action 1 would apply to licensed commercial fishermen who harvest parrotfish in federal waters off St. Croix. As of March 2011, there were 177 licensed commercial fishermen in St. Croix (Kojis and Quinn 2012). Approximately 80 percent of commercial fishermen who reported they were fishing also reported that they target reef fish, and parrotfish is a reef fish. From these figures, it is estimated that **Preferred Alternatives 2a** and **2b** would affect up to 80 percent (142) of St. Croix's 177 commercial fishermen and their helpers.

In theory, when a firm's level of output is set, it acts to minimize the cost of producing that level of output. It can be postulated that similarly, St. Croix's commercial fishermen have, since the parrotfish ACL was established, targeted and landed larger individuals of parrotfish in order to minimize the number and length of trips and associated costs of producing 240,000 pounds of parrotfish. If such a scenario is valid, commercial fishermen have foregone catching and landing smaller parrotfish, such as redband, and are presently catching and landing larger species, especially stoplight and queen parrotfish, and larger individuals within a species that exceed the proposed minimum size standards, and rarely, if at all, would require a measurement. **Preferred Alternatives 2a** and **2b** would have little to no adverse economic impact beyond the $5 to $10 cost of acquiring the measuring tool because most to all of the parrotfish would not necessitate a measurement and there would be no losses of landings due to discards of undersized fish. That conclusion does not necessarily require that any, to all, fishermen land more pounds of parrotfish per trip, just that they target and land larger individuals than before. The total pounds may be the same, but the number of fish that make up those pounds and the average length of a trip are less.

DRAFT

Such a conclusion, however, presumes the value of a pound of parrotfish is the same regardless of species or size of the individual harvested.

The above scenario presumes equal ability to catch and land larger parrotfish, however, that is not the reality of St. Croix's commercial fishermen. Those who dive can more easily catch and land larger parrotfish than those who use pots and traps or other non-diving methods because divers can visibly scan and size-up individual fish before making the effort of spearing or otherwise catching one. This physical advantage is likely an economic advantage as well. A sample of landings from 2007 to 2010 provides evidence of divers' advantage. Less than three percent of the redband parrotfish landed by divers using spears were less than eight inches FL as compared to approximately eight percent landed by divers using their hands and approximately 34 percent of those landed by fishermen using pots and traps. In 2009 and 2010, none of the redband parrotfish in the sample that were landed by divers were less than eight inches FL. Similarly, approximately four percent of the other species landed by divers from 2007 to 2010 were less than nine inches FL as compared to the approximately 29 percent of landings by fishermen who used pots and traps that were less than nine inches FL.

The advantage that divers have over non-divers may also explain why diving (SCUBA and free diving) is, and has been, an increasingly common method of harvesting parrotfish. Since 2003, more than half of the parrotfish that were annually landed were harvested by divers; and in 2007, diving accounted for approximately 64 percent of annual parrotfish landings. Diving (with or without additionally reported gear) accounted for 78 percent of parrotfish landings in 2008 and 94 percent of the landings in 2009. The Parrotfish ACL may have further increased that percent.

A second scenario of the economic impacts of **Preferred Alternatives 2a** and **2b** assumes commercial fishermen have not responded to the parrotfish ACL by foregoing traditionally caught and landed smaller parrotfish. Hence, based on an analysis of St. Croix's commercial parrotfish landings by weight, it is estimated that a minimum size limit of eight inches FL for all parrotfish would reduce annual parrotfish landings by 0.4 percent if the minimum size limit was accompanied by a compatible USVI minimum size standard. That estimate of 0.4 percent is based on all commercial parrotfish landings, from the smallest of the seven species (redband) to the largest (stoplight). Hence, the 0.4 percent loss underestimates the adverse impact that **Preferred Alternative 2a** would have on redband parrotfish landings in St. Croix. It is also estimated that a minimum size limit of nine inches FL for all parrotfish caught in federal or USVI waters would reduce annual parrotfish landings by 5.8 percent. Because this second estimate includes redband parrotfish, which is the smallest of the seven species, the 5.8 percent loss likely overestimates the adverse impact that an eight-inch minimum size standard would have on the other six species of parrotfish. From these estimates of percent losses, it is concluded that **Preferred Alternatives 2a** and **2b** would result in an annual loss of parrotfish landings between 960 pounds and 13,920 pounds, assuming St. Croix's parrotfish fishermen do not relocate into USVI or other federal waters or otherwise do not act to mitigate for any losses of parrotfish landings. If the average ex-vessel price is $5 per pound, the annual revenue losses would be between $4,800 and $69,600. Added to these losses of landings would be the additional time required (four to five seconds per fish) to measure caught parrotfish that would increase trip time and costs. These losses of landings and revenue would not be distributed equally. Because pot-

DRAFT

and-trap fishermen have landed the greatest percent of smaller parrotfish, they would experience the greatest percent losses of annual landings and associated revenues.

A third and final scenario expects fishermen would act to mitigate for losses of landings caused by **Preferred Alternatives 2a** and **2b** by increasing fishing time to catch enough legally sized parrotfish or other fish to offset pounds discarded in undersized fish. It is expected that the ability of commercial fishermen and their helpers to increase their time on or in the water and associated costs of that time varies significantly, depending on their personal and family responsibilities, including whether or not they are engaged in full-time or part-time wage labor. Fishermen and their helpers who cannot increase their fishing time would lose portions of their parrotfish catches equal to the portions that are undersized. Because pot-and-trap fishermen are expected to catch the largest percent of undersized fish, any pot-and-trap fishermen who cannot increase their time on the water would experience the largest percent losses of parrotfish landings and those who can increase their time, would require the largest percent increase in total fishing time. It is unknown if such a disproportionate adverse impact on pot-and-trap fishermen or other non-divers could also represent a disproportionate adverse impact on St. Croix's commercial fishermen of a specific race, ethnicity, age, geographic area, or business size.

Additional fishing time to make up for pounds lost to discards would result in higher fuel and bait costs and other associated time-related trip costs, including personal risk, and these impacts would vary across fishermen, especially by methods of fishing. In this third and most likely scenario, **Preferred Alternatives 2a** and **2b** would have a disparate adverse economic impact on St. Croix's pot-and-trap and other non-diving fishermen because they would require more time to filter out undersized individuals and land those of legal size than their diving counterparts, especially if the USVI implements compatible size standards. In consequence, **Preferred Alternatives 2a** and **2b** may further squeeze pot-and-trap and other non-diving commercial fishermen out of the parrotfish fishery.

Preferred Alternatives 2a and **2b** could generate long-run net economic benefits to commercial fishermen, their families and communities in the forms of reduced fishing costs and/or higher ex-vessel prices that derive, in part, from an improved stock with a larger proportion of larger and older fish and healthier coral reefs; however, these benefits could be at the expense of non-diving fishermen who more quickly exit the fishery.

5.5.2 Action 2

Preferred Alternative 2 would establish recreational size limits for parrotfish in the St. Croix EEZ. **Preferred Alternative 2a** and **Preferred Alternative 2b** would establish the same minimum size limits for recreational harvest as **Preferred Alternatives 2a** and **2b of Action 1** would for commercial harvest: eight inches for redband parrotfish and nine inches for the other six species.

At the minimum, it is likely that **Preferred Alternatives 2a** and **2b** would require St. Croix's recreational fishermen, who fish in the EEZ, to purchase or create a measuring tool, use that tool to determine whether

DRAFT

or not a parrotfish is of legal size (unless visibly it is obviously greater than its minimum size limit), and discard any that are undersized. The average cost of a measuring tool would likely be between $5 and $10, and the average amount of time to measure a fish would range from four to five seconds.

Recreational landings data are not available for the USVI. Consequently, an estimate of potential losses of parrotfish landings caused by **Preferred Alternatives 2a** and **2b** cannot be generated.

Recreational fishermen use both for-hire and private/rental boats to fish in federal waters. There are three for-hire operations in St. Croix; however, for-hire boats in the U.S. Caribbean tend to target pelagic species and other sport fish, not parrotfish. Hence, **Preferred Alternatives 2a** and **2b** are not expected to affect recreational fishing aboard for-hire vessels from St. Croix. USVI individual recreational fishermen who use private/rental boats are required to register with the National Saltwater Anglers Registry to fish in federal waters. As of September 24, 2012, there were 33 USVI residents in the National Registry; however, it is unknown at this time how many of these individuals reside in St. Croix. As a consequence of **Preferred Alternatives 2a** and **2b**, up to 33 recreational fishermen would be required to purchase or create and use an instrument to measure parrotfish and discard those that are undersized. To mitigate for potential losses of landings, these recreational fishermen would have to increase current fishing times and associated costs, especially if the USVI implements compatible regulations.

St. Croix recreational fishermen are prohibited from using pots and traps, so the disproportionate effects of a minimum size limit on pot-and-trap fishermen would not apply to them. It is expected that most to all of St. Croix's recreational fishermen dive when catching parrotfish, which of the various methods used to catch parrotfish, is the easiest to filter out individuals by size.

Recreational fishermen's ability to increase fishing time and associated costs may be limited by fuel costs, personal and household incomes, and personal and family responsibilities, such as wage employment, care giving, and provision of other daily household services. It is anticipated that in the long run, **Preferred Alternatives 2a** and **2b** could generate a net economic benefit to recreational fishermen, their families and communities in the forms of reduced fishing time and associated costs to harvest parrotfish for their personal and household's consumption and larger economic benefits that derive from improved coral reefs.

5.5.3 Total economic impact

Preferred Alternatives 2a and 2b of Actions 1 and 2 would require commercial and recreational fishermen who harvest parrotfish in the EEZ off St. Croix to purchase or create and use an instrument to measure parrotfish by FL and discard those species that measure less than their proposed minimum size limits. The average cost of a measuring tool is expected to be from $5 to $10 and the average length of time to measure a parrotfish is expected to be from four to five seconds.

DRAFT

If the recently imposed Parrotfish ACL has resulted in fishermen not catching or landing smaller parrotfish such that current landings are of fish equal to or greater in size than the minimum size limits, **Preferred Alternatives 2a and 2b of Actions 1 and 2** would have a total adverse economic impact from $5 to $10 per commercial fisherman, which would be the average cost of purchasing or creating a measuring instrument.

If the ACL has had no such effect and fishermen do not act to mitigate for losses of landings due to discards, **Preferred Alternatives 2a** and **2b** would collectively result in an annual loss of parrotfish landings between 960 pounds and 13,920 pounds and $4,800 and $69,660, assuming an average ex-vessel price of $5 per pound. Also, there would be an increase in trip time and associated costs due solely to the time incurred measuring parrotfish.

If fishermen increase fishing time to offset pounds lost by discards, they would experience higher fuel and bait costs and other associated time-related trip costs, including greater personal risk, and these adverse economic impacts would vary across fishermen, especially by methods of fishing. **Preferred Alternatives 2a** and **2b** would favor fishermen who dive and disfavor those who use pots, traps, hand lines, and other non-diving gear because divers can visibly scan and size-up individual fish before making the effort of spearing or otherwise catching one.

Preferred Alternatives 2a and **2b** could generate long-run net economic benefits to St. Croix's fishermen, their households and communities in the form of economic benefits that derive from exploitation of an improved parrotfish stock with a larger proportion of larger and older fish and ecological benefits of healthier coral reefs; however, these benefits could be at the expense of non-diving fishermen who more quickly exit the commercial and recreational fisheries.

5.6 Private and public costs

The preparation, implementation, enforcement, and monitoring of this, or any Federal action, involves the expenditure of public and private resources, which can be expressed as costs associated with the regulations. Costs associated with this emergency action include, but are not limited to, Council costs of document preparation, meeting, and other costs; NMFS administration costs of document preparation, meetings and review, and annual law enforcement costs. A preliminary estimate is up to $100,000 before annual law enforcement costs.

5.7 Determination of significant action

Pursuant to E.O. 12866, a regulation is considered a "significant regulatory action" if it is expected to result in: (1) an annual effect of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities; (2) create a serious inconsistency or otherwise

DRAFT

interfere with an action taken or planned by another agency; (3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights or obligations of recipients thereof; or (4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this executive order.

This action is not expected to have an adverse effect of $100 million or more, create a serious inconsistency or otherwise interfere with an action taken by another agency, materially alter the budgetary impact of programs or rights or obligations of recipients, or raise novel legal or policy issues.

DRAFT

Chapter 6. Regulatory Flexibility Analysis

6.1 Introduction

The purpose of the Regulatory Flexibility Act (RFA) is to establish a principle of regulatory issuance that agencies shall endeavor, consistent with the objectives of the rule and applicable statutes, to fit regulatory and informational requirements to the scale of businesses, organizations, and governmental jurisdictions subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure that such proposals are given serious consideration. The RFA does not contain any decision criteria; instead, the purpose of the RFA is to inform the agency, as well as the public, of the expected economic impacts of the alternatives contained in the fishery management plan (FMP) or amendment (including framework management measures and other regulatory actions) and to ensure that the agency considers alternatives that minimize the expected impacts while meeting the goals and objectives of the FMP and applicable statutes.

With certain exceptions, the RFA requires agencies to conduct a regulatory flexibility analysis for each proposed rule. The regulatory flexibility analysis is designed to assess the impacts various regulatory alternatives would have on small entities, including small businesses, and to determine ways to minimize those impacts. In addition to analyses conducted for the Regulatory Impact Review (RIR), the initial regulatory flexibility analysis (IRFA) provides: (1) a description of the reasons why action by the agency is being considered; (2) a succinct statement of the objectives of, and legal basis for the proposed rule; (3) an identification, to the extent practicable, of all relevant Federal rules which may duplicate, overlap, or conflict with the proposed rule; (4) a description and, where feasible, an estimate of the number of small entities to which the proposed rule will apply; (5) a description of the projected reporting, record-keeping, and other compliance requirements of the final rule, including an estimate of the classes of small entities which will be subject to the requirements of the report or record; and (6) a description of significant alternatives to the proposed rule which accomplish the stated objectives of applicable statues and which minimize any significant economic impact of the proposed rule on small entities.

6.2 Statement of need for, objectives of, and legal basis for the proposed rule

The purpose and need, issues, problems, and objectives of the emergency action are presented in Section 1.2 and are incorporated herein by reference.

DRAFT

6.3 Identification of federal rules which may duplicate, overlap or conflict with the proposed rule.

No federal rules have been identified that duplicate, overlap or conflict with the proposed rule.

6.4 Description of the projected reporting, record-keeping and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for the preparation of the report or records.

The preferred actions would impose minimum size standards on parrotfish harvested in federal waters off St. Croix, USVI. **Preferred Alternative 2a** of **Action 1** would prohibit commercial harvest of redband parrotfish that are less than eight inches FL in the St. Croix EEZ, and **Preferred Alternative 2b** of **Action 1** would prohibit commercial harvest of six other species of parrotfish (princess, queen, redfin, redtail, stoplight, and striped) that are less than nine inches FL in the St. Croix EEZ. **Preferred Alternatives 2a** and **2b** of **Action 2** would impose the same minimum size standards in the recreational parrotfish fishery. None of the preferred alternatives would impose additional reporting or record-keeping requirements; however, fishermen would be required to purchase or create an instrument/gauge that can measure a parrotfish's fork length (FL) and use that instrument to determine if a parrotfish meets or exceeds the minimum size limit. If a parrotfish is less than its respective minimum size limit, it would have to be returned to the water. It is expected that the average cost of acquiring a measuring tool would range from $5 to $10. It is also expected that the average amount of time to measure a parrotfish would be approximately four to five seconds.

6.5 Description and estimate of the number of small entities to which the proposed rule will apply.

This proposed rule applies to licensed commercial fishermen and for-hire operations that harvest parrotfish in federal waters off St. Croix. As of March 2011, there were 177 licensed commercial fishermen in St. Croix (Kojis and Quinn 2012). Approximately 80 percent of commercial fishermen who stated they were fishing also reported that they target reef fish, and parrotfish is a reef fish. From these figures, it is estimated that **Preferred Alternatives 2a** and **2b** would affect up to 80 percent (142) of St. Croix's 177 licensed commercial fishermen and their helpers.

St. Croix's commercial fishermen who harvest parrotfish operate in the Finfish Fishing Industry (NAICS 114111). According to SBA Size Standards, a business in the Finfish Fishing Industry is a small business

DRAFT

if its annual receipts are less than $4 million. This analysis assumes each one of St. Croix's licensed commercial fishermen affected by this proposed rule represents a small business.

St. Croix's small businesses in the fishing industry can be stratified by the average number of hours commercial fishermen engage in fishing activities each week. Of those who were fishing at the time of the Census of the Marine Commercial Fishers of the U.S. Virgin Islands 2011, approximately 44 percent stated that they engaged in fishing related activities more than 36 hours a week, 27 percent said they were engaged in such activities from 15 to 36 hours a week, and 29 percent less than 15 hours per week (Kojis and Quinn 2012).

St. Croix small businesses in the fishing industry are also largely minority owned and managed businesses as demonstrated by the race and ethnicity of commercial fishermen. Approximately 65 percent of commercial fishermen are Black and another 17 percent of mixed race. Approximately 52 percent are Hispanic, 20 percent West Indian, and 14 percent Crucian.

St. Croix's for-hire fishing operations are within the Charter Fishing Industry (NAICS 487210). Up to three for-hire operations are expected to be affected by this proposed rule. Small businesses in the Charter Fishing Industry have annual receipts less than $7 million, and it is assumed here that all three of St. Croix's for-hire operations are small businesses.

6.6 Substantial number of small entities criterion

The proposed rule would apply to up to 80 percent of St. Croix's small businesses in the Finfish Fishing Industry and 100 percent of its small businesses in the Charter Fishing Industry.

6.7 Significant economic impact criterion

The outcome of "significant economic impact" can be ascertained by examining two issues: disproportionality and profitability.

Disproportionality: Does the proposed rule place a substantial number of small entities at a significant competitive disadvantage to large entities?

Profitability: Does the proposed rule significantly reduce profit for a substantial number of small entities?

As described in the next section and RIR (Chapter 5), commercial fishermen who dive for parrotfish have a physical advantage in catching and landing larger fish because they can visibly see and size up a fish before making an effort to catch it. Consequently, they land a substantially smaller percent of smaller fish, which is an economic advantage for them. This advantage likely explains why diving (SCUBA and free diving) is, and has been, an increasingly common method of harvesting parrotfish. Since 2003, more

DRAFT

than half of the parrotfish that were annually landed were harvested by divers; and in 2007, diving accounted for approximately 64 percent of annual parrotfish landings. Diving (with or without additionally reported gear) accounted for 78 percent of parrotfish landings in 2008 and 94 percent of the landings in 2009 and over 90 percent in 2010. The parrotfish annual catch limit (ACL) may have further increased that percent and additionally squeezed out pot-and-trap and non-diving fishermen. It is unknown how many of St. Croix's commercial fishermen who harvest parrotfish in the EEZ use pots-and-traps or otherwise do not dive. According to the latest census of USVI commercial fishermen (Kojis and Quinn 2012), 37.5% of St. Croix commercial fishermen reported that they use pots and traps. As a segment of the small businesses affected by the rule, they represent a substantial number.

Parrotfish landings in St. Croix represented, on average, approximately a third of all annual landings (pounds) from 2000 to 2010, which demonstrates the significance of parrotfish to St. Croix's commercial fishermen. Its contribution to annual revenue, however, tends to be less because parrotfish is a lower priced fish. Nonetheless, parrotfish landings represent significant economic benefits, and commercial divers take over 90% of these annual economic benefits (pounds and dollars). Given the increasing dominance of divers in commercial parrotfish fishing, it is unknown how many of St. Croix's pot-and-trap and other non-diving fishermen continue to harvest parrotfish from the EEZ.

Preferred Alternatives 2a and **2b** would likely have a significantly larger adverse economic impact on pot-and-trap and other non-diving fishermen because larger percents of their historical catches are composed of smaller parrotfish. **Preferred Alternatives 2a** and **2b** may further squeeze pot-and-trap and other non-diving commercial fishermen out of the parrotfish fishery.

6.8 Economic impacts of management measures

6.8.1 Action 1

Preferred Alternatives 2a and **2b** would require commercial fishermen (including their helpers) to measure parrotfish and discard those that are under their respective minimum size limit. It has been theorized that, as a result of the recently imposed St. Croix parrotfish ACL of 240,000 pounds, commercial fishermen have foregone catching and landing smaller parrotfish so as to minimize cost of producing 240,000 pounds. In this scenario, commercial fishermen are presently catching and landing larger ones that are visibly greater than the minimum size limit and rarely, if at all, are catching any that would require a measurement if the minimum size limits are imposed. If true, **Preferred Alternatives 2a** and **2b** would have little to no adverse economic impact beyond the $5 to $10 cost of acquiring a measuring tool and an additional 4 to 5 seconds to measure a rare small fish.

The above scenario, however, ignores differences across commercial fishermen in their abilities to catch and land larger parrotfish. Those who dive can more easily target and land larger parrotfish than those who use pots and traps or other non-diving methods because divers can visibly scan and size-up

DRAFT

individual fish before making the effort of spearing or otherwise catching one. This physical advantage is also an economic advantage. An analysis of a sample of parrotfish landings from 2007 to 2010 shows less than three percent of the redband parrotfish landed by divers using spears were less than eight inches FL as compared to approximately eight percent landed by divers using their hands and approximately 34 percent of those landed by fishermen using pots and traps. In 2009 and 2010 none of the redband parrotfish in the sample that were landed by divers were less than eight inches FL. Similarly, approximately four percent of the other species landed by divers from 2007 to 2010 were less than nine inches FL as compared to the approximately 29 percent of landings by fishermen who used pots and traps that were less than nine inches FL.

A second scenario assumes commercial fishermen have not changed their catches because of the parrotfish ACL and cannot mitigate for losses of landings due to discarded undersized fish. If true, **Preferred Alternatives 2a** and **2b** would result in an estimated annual loss of parrotfish landings between 960 pounds and 13,920 pounds, assuming St. Croix's parrotfish fishermen do not relocate into USVI or other federal waters or otherwise do not act to mitigate for any losses of parrotfish landings. If the average ex-vessel price is $5 per pound, the annual revenue losses to all parrotfish fishermen would be between $4,800 and $69,600. Added to these losses of landings would be the additional time required (four to five seconds per fish) to measure each and every one of the parrotfish that are caught, which would increase trip time and costs. These combined losses of landings and revenue and added time would not be distributed equally. Because pot-and-trap fishermen have landed the greatest percent of smaller parrotfish, they would experience the greatest percent losses of annual landings and associated revenues and greatest increase in fishing time. See Section 5.5.1 for greater explanation of this scenario and its adverse impacts.

A third and final scenario expects fishermen would act to mitigate for losses of landings caused by **Preferred Alternatives 2a** and **2b** by increasing fishing time to catch enough legally sized parrotfish or other species to offset pounds discarded in undersized fish. It is expected that the ability of commercial fishermen and their helpers to increase their time on or in the water and associated costs of that time varies significantly, depending on their personal and family responsibilities, including whether or not they are engaged in full-time or part-time wage labor. Fishermen and their helpers who cannot increase their fishing time would lose portions of their parrotfish catches equal to the portions that are undersized. Because pot-and-trap fishermen are expected to catch the largest percent of undersized fish, any pot-and-trap fishermen who cannot increase their time on the water would experience the largest percent losses of parrotfish landings and those who can increase their time, would require the largest percent increase in total fishing time.

Additional fishing time to make up for pounds lost to discards because of **Preferred Alternatives 2a** and **2b** would result in higher fuel and bait costs and other associated time-related trip costs, including personal risk, and these impacts would vary across fishermen, especially by methods of fishing. The greatest adverse economic impact would be on fishermen who catch parrotfish with pots and traps. It is unknown if such a disproportionate adverse impact on pot-and-trap fishermen or other non-divers could

DRAFT

also represent a disproportionate adverse impact on St. Croix's commercial fishermen of a specific race, ethnicity, age, geographic area, or business size.

6.8.2 Action 2

For-hire boats in the U.S. Caribbean tend to target pelagic species and other sport fish, not parrotfish. Hence, **Preferred Alternatives 2a** and **2b** are not expected to affect any of the three charter fishing operations in St. Croix.

6.9 Description of significant alternatives

Among the considered alternatives were establishing minimum size limits for parrotfish in the areas of the EEZ off Puerto Rico and St. Thomas/St. John, USVI (Alternatives 3 and 4). Public comment suggests **Alternative 4** would have little to no adverse economic impact on Puerto Rico commercial fishermen because they target parrotfish in territorial, not federal, waters. The addition of **Alternative 3** would have increased the number of small businesses affected and the size and geographic area of the adverse economic impact.

Also, considered but rejected were Alternatives 2c through 2e, which would have established larger minimum size limits for parrotfish in the St. Croix EEZ and caused larger losses of landings and associated revenues for small businesses in St. Croix.

Alternative 1 would have kept the status quo. Although Preferred Alternative 2 has a larger adverse economic impact in the short run, it is expected to yield a larger net economic benefit in the long run.

DRAFT

Chapter 7. List of Preparers

Table 6-1. List of Interdisciplinary Plan Team Members.

Name	Agency	Title
Juan Agar	SEFSC	Economist
Bill Arnold	NMFS/SF	Caribbean Branch Chief/Fishery Biologist
Michael Bailey	NMFS	Fishery Biologist
Meagan Bryan	SEFSC	Research Fish Biologist
David Dale	NMFS/HC	EFH Specialist
Anne Marie Eich	NMFS/SF	Technical Writer Editor
Graciela Garcia-Moliner	CFMC	Fishery Biologist
Andy Herndon	NMFS/PR	Fishery Biologist (Protected Resources)
Denise Johnson	NMFS/SF	Economist
David Keys	NMFS	Regional NEPA Coordinator
Michael Larkin	NMFS/SF	Fishery Biologist
Mara Levy	NOAA/GC	Attorney
Maria Lopez	NMFS/SF	Fishery Biologist
Miguel Lugo	NMFS/SF	Fishery Biologist
Christina Package	NMFS/SF	Anthropologist
Scott Sandorf	NMFS/SF	Technical Writer Editor
Noah Silverman	NMFS/SF	NEPA Specialist
Britni Tokotch	NMFS/SF	IPT Lead/Fishery Biologist

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

DRAFT

Chapter 8. List of Agencies and Persons Consulted

Responsible Agencies

Caribbean Fishery Management Council
268 Muñoz Rivera Ave., Suite 1108
San Juan, Puerto Rico 00918-1920
(787) 766-5926 (Telephone)
(787) 766-6239 (Fax)
http://www.caribbeanfmc.com/

NMFS, Southeast Region
263 13th Avenue South
St. Petersburg, Florida 33701
(727) 824-5301 (Telephone)
(727) 824-5320 (Fax)
http://sero.nmfs.noaa.gov/

List of Agencies, Organizations, and Persons Consulted

Department of Commerce Office of General Counsel
National Marine Fisheries Service Office of General Counsel
National Marine Fisheries Service Office of General Counsel Southeast Region
National Marine Fisheries Service Southeast Regional Office
National Marine Fisheries Service Southeast Fisheries Science Center
National Marine Fisheries Service Silver Spring Office
National Marine Fisheries Service Office of Law Enforcement
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 U.S. 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)

DRAFT

Chapter 9. References

Acropora Biological Review Team. 2005. Atlantic *Acropora* Status Review Document. Report to National Marine Fisheries Service, Southeast Regional Office. March 3. 152 p + App.

Anderes Alavrez, B.A., and I., Uchida. 1994. Study of the Hawksbill turtle (*Eretmochelys imbricata)* stomach content in Cuban waters. *In*: Study of the Hawksbill turtle in Cuba (I), Ministry of Fishing Industry, Cuba.

Babausta, A.M. May 17, 2012. Statement of Anthony M. Babausta Assistant Secretary of the Interior for Insular Areas before The House Subcommittee on Fisheries, Wildlife, Oceans, and Insular Affairs regarding H.R. 3706, a bill to create the Office of Chief Financial Officer of the Government of the Virgin Islands. www.doi.gov.

Bak, R.P.M., J.J.W.M. Brouns, and F.M.L. Hayes. 1977. Regeneration and aspects of spatial competition in the scleractinian corals *Agaricia agaricites* and *Montastrea annularis*. Proceedings of the 3rd International Coral Reef Symposium, Miami, pp 143-148.

Bateman, A.J. 1948. Intra-sexual selection in *Drosophila*. Heredity 2: 349-368.

Bjorndal, K.A. 1980. Nutrition and grazing behavior of the green sea turtle, *Chelonia mydas*. *Marine Biology*. 56:147.

Bjorndal, K.A. (ed.). 1995. Biology and Conservation of Sea Turtles, revised edition. Smithsonian Institute Press, Washington, D.C., 579.

Bjorndal, K.A. 1997. Foraging ecology and nutrition of sea turtles. *In*: Lutz, P.L. and J.A. Musick (eds.), The Biology of Sea Turtles. CRC Press, Boca Raton, Florida.

Böhlke, J.E. and C.C.G. Chaplin. 1993. Fishes of the Bahamas and adjacent tropical waters. 2nd edition. University of Texas Press, Austin.

Bohnsack, J.A. 1990. The potential of marine fishery reserves for reef fish management in the U.S. southern Atlantic. NOAA tech. Memo NMFS-SEFSC-261, Miami.

Bolten, A.B. and G.H., Balazs. 1995. Biology of the early pelagic stage – the "lost year." In: *In*: Bjorndal, K.A. (ed.), Biology and Conservation of Sea Turtles, Revised edition. Smithsonian Institute Press, Washington, D.C., 579.

Brock, R.E. 1979. An experimental study on the effects of grazing by parrotfishes and role of refuges in benthic community structure. Mar. Biol. 51: 381-388.

Brongersma, L.D. 1972. European Atlantic Turtles. Zool. Verhand. Leiden, 121:318

Burke, V.J., E.A. Standora, and S.J. Morreale. 1993. Diet of juvenile Kemp's ridley and loggerhead sea turtles from Long Island, New York. Copeia, 1993, 1176.

DRAFT

Burkepile, D.E. and M.E. Hay. Impact of herbivore identity on algal successions and coral growth on aCaribbean Reef. Plos ONE. 5(1): e8963. Doi:10:1371/journal.pone.0008963.

Byles, R.A. 1988. Behavior and Ecology of Sea Turtles from Chesapeake Bay, Virginia. Ph.D. dissertation, College of William and Mary, Williamsburg, VA.

Caribbean 360. May 21, 2012. www.caribbean360.com.

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. February.

Caribbean Fishery Management Council (CFMC). 1990. 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). 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). 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). 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). 2004. Final Environmental Impact Statement for the Generic Essential Fish Habitat Amendment to the Fishery Management Plans of the U.S. Caribbean. March.

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.

DRAFT

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). 2011a. Amendment 2 to the fishery management plan for queen conch resources of Puerto Rico and the U.S. Virgin Islands and amendment 5 to the fishery management plan for reef fish fishery of Puerto Rico and the U.S. Virgin Islands. Caribbean Fishery Management Council, San Juan, Puerto Rico. 647 pp. including appendices

Caribbean Fishery Management Council (CFMC). 2011b. 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, and amendment 3 to the fishery management plan for corals and reef associated plants and invertebrates of Puerto Rico and the U.S. Virgin Islands. Caribbean Fishery Management Council, San Juan, Puerto Rico. 407 pp. including appendices

Caribbean Journal. May 29, 2012. www.caribbeanjournal.com

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.

Carr, A. 1986. Rips, FADS, and little loggerheads. BioScience, 36:92.

Carr, A. 1987. New perspectives on the pelagic stage of sea turtle development. Conservation Biology, 1:103.

Catanzaro, D., Rogers, C, Hillis-Starr, Z., Nemeth, R., and M. Taylor. 2002. Status of Coral Reefs in the U.S. Virgin Islands. pages 131-142. In: The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2002. National Oceanic and Atmospheric Administration/National Ocean Service/National Centers for Coastal Ocean Science, Silver Spring, MD. 265 pp.

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 marinas y de aquas salobres de la costa septentrional de Sur América. Rome, Italy: FAO. Preparado con el financiamento de la Comisión de Comunida Europeas y de NORAD.

Choat, J.H., Robertson, D.R., Ackerman, J.L., and Posada. 2003. An age-based demographic analysis of the Caribbean stoplight parrotfish *Sparisoma viride*. Marine Ecology Progress Series. 246: 265-277

Clua, E. and P. Legendre. 2008. Shifting dominance among Scarid species on reefs representing a gradient of fishing pressure. Aquatic Living Resources. 21:339-348.

DRAFT

Council of Environmental Quality (CEQ). 1997. Considering cumulative effects under the National Environmental Policy Act. Executive Office of the President, Washington, D.C.

deJongh, John P. November 7, 2011. A Proclamation by the Governor of the United States Virgin Islands to Proclaim Hunger and Homelessness Week in the United States Virgin Islands. Obtained online on January 30, 2012, at http://www.governordejongh.com/news/proclamations/2011/pdf/hunger-and-homelessness-week.pdf

Eckert, S.A., D.W., Nellis, K.L., Eckert and G.L., Kooyman. 1986. Diving patterns of two leatherback sea turtles (*Dermochelys coriacea*) during internesting intervals at Sandy Point, St. Croix, U.S. Virgin Islands. *Herpetologica*, 42:381.

Eckert, S.A., K.L., Eckert, P., Ponganis, and G.L., Kooyman. 1989. Diving patterns of two leatherback sea turtles (*Dermochelys coriacea*). *Canadian Journal of Zoology*, 67:2834.

Erdman, D.S. 1976. Spawning patterns of fishes from the northeastern Caribbean. Agriculture and Fisheries Contributions VIII (2). July.

Figuerola Fernández, M. and W. Torres Ruiz (Figuerola and Torres). 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. Noviembre.

Fisher, J.A. 2007. Governing human subjects research in the USA: individualized ethics and structural inequalities. Science and Public Policy 34(2): 117-126.

Frick, J. 1976. Orientation and behaviour of hatchling green turtles (*Chelonia mydas*) in the sea. *Animal Behavior*, 24:849.

Froese, R. and D. Pauly (eds.). 2001-2002. FishBase. World Wide Web electronic publication. Available online at: http://www.fishbase.org

Ghiold, J. and S.H. Smith. 1990. Bleaching and recovery of deep-water, reef-dwelling invertebrates in the Cayman Islands, BWI. Caribbean Journal of Science, 26:52-61.

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.

Griffith, D. and M. Valdes Pizzini. 2002. Fishers at Work, Workers at Sea: A Puerto Rican Journey through Labor and Refuge. Temple University Press: Philadelphia, PA. 265p.

Goreau, T.F. and N.I. Goreau. 1973. Coral Reef Project-Papers in Memory of Dr. Thomas F. Goreau. Bulletin of Marine Science, 23:399-464,

Goreau, T.F. and J.W. Wells. 1967. The shallow-water Scleractinia of Jamaica: revised list of species and their vertical range. Bulletin of Marine Science, 17:442-453.

DRAFT

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.

Hawkins, J.P. and C.M. Roberts. 2003. Effects on sex-changing Caribbean parrotfish. Biological conservation. 115: 213-226.

Hayward, A. and J.F. Gillooly. 2011. The cost of sex: Quantifying energetic investment in gamete production by males and females. PLoS ONE 6(1): e16557, doi:10.1371/journal.pone.0016557.

Hispanos Unidos, Nellie Rivera, Robert Hoffman, Joseph San Martin, Mary Simpson, Michael A. Monagle, Terrance L. Conklin, Bonnie L. Blair, Plantiffs, v. Government of the United States Virgin Islands; the Legislature of the United States Virgin Islands, the Boards of Elections of the St. Croix and St. Thomas/St. John districts; in their official capacities only, the Senators of the 25th Legislature of the Virgin Islands: Norman Jn. Baptiste, Lorraine L. Berry, Douglas E. Canton, Jr., Roosevelt St. C. David, Adlah Donastorg, Carlton Dowe, Emmett Hansen, II, Louis P. Hill, David S. Jones, Almondo Liburd, Shawn-Michael Malone, Luther F. Renee, Usie Richards, Ronald E. Russell, and Celestino A. White, Sr.; Defendants (Hispanos Unidos et al. versus Government of the United States Virgin Islands). Obtained online on January 18, 2011, at http://swdb.berkeley.edu/News_Info/News_Info/Court_Cases/first_ammend_complaint.pdf.

Hughes, G.R. 1974. The sea-turtles of south-east Africa. II. The biology of the Tongaland loggerhead turtle *Caretta caretta* L. with comments on the leatherback turtle *Dermochelys coriacea* L. and green turtle *Chelonia mydas* L. in the study region. Oceanographic Research Institute (Durban) Investigative Report. No. 36.

Hughes, T.P. 1994. Catastrophes, phase-shifts, and large-scale degradation of a Caribbean coral reef. Science 265: 1547-1551.

The H. John Heinz III Center for Science, Economics, and the Environment (The Heinz Center). 2000. Improving Federal Fisheries Management in the Caribbean Region: A Summary of Views Presented During the Caribbean Regional Roundtable. August.

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. Pages 399-404 In: Gomez,E.D. *et al*. (eds.), The Reef and Man: Proceedings of the Fourth International Coral Reef Symposium, Volume1, Manila (Philippines), 18-22 May 1981.

Impact Assessment Inc. 2007. Community Profiles and Socioeconomic Evaluation of Marine Conservation Districts: St. Thomas and St. John, U.S. Virgin Islands. NOAA Technical Memorandum NMFS-SEFSC-557. 123p.

IPCC, 2007. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

DRAFT

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.

Jaap, W.C., W.G. Lyons, P. Dustan, and J.C. Halas. 1989. Stony coral (Scleractinia and Milleporina) community structure at Bird Key Reef, Ft. Jefferson National Monument, Dry Tortugas, Florida. Florida Marine Research Publication, 46:31.

Jompa, J. and L.J. McCook. 2002. The effects of nutrients and herbivory on competition between a hard coral (Porites cylindrica) and a brown alga (Lobophora variegata). Limnol. Oceanogr. 47: 527-534.

Kahn, R.G; D.E. Pearson, and E.J. Dick. 2004. Comparison of Standard Length, Fork Length and Total Length for Measuring West Coast Marine Fishes. Marine Fisheries Review 66(1): 31-33.

Keinath, J.A., and J.A., Musick. 1993. Movements and diving behavior of a leatherback sea turtle, *Dermochelys coriacea*. *Copeia*, 1993:1010.

Kjerfve, B. 1981. Tides in the Caribbean Sea. J. of Geophysical Research, 86:5, 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.

Kojis, B.L. and N.J. Quinn. March 27, 2012. Census of the Marine Commercial Fishers of the U.S. Virgin Islands 2011. USVI Dept. of Planning and Natural Resources, Division of Fish and Wildlife.

Koltes, K.H. 1993. Aspects of the reproductive biology and social structure of the stoplight parrotfish Sparisoma viride, at Grand Turk, Turks and Caicos Islands, B.W.I. Bulletin of Marine Science. 52(2):792-805.

Lanyon, J.M., C.J. Limpus, and H., Marsh. 1989. Dugongs and turtles: grazers in the seagrass system. *In:* Larkum, A.W.D, A.J., McComb and S.A., Shepard (eds.) Biology of Seagrasses. Elsevier, Amsterdam, 610.

Leon, Y.M. and C.E. Diez. 2000. Ecology and population biology of hawksbill turtles at a Caribbean feeding ground. Pp.32-33 *In*: Proceedings of the 18th International Sea Turtle Symposium, Abreau-Grobois, F.A., Briseno-Duenas, R., and Sarti, L., Compilers. NOAA Technical Memorandum NMFS-SEFSC-436.

Lewis, J.B. 1977. Suspension feeding in Atlantic reef corals and the importance of suspended particulate matter as a food source. Proceedings of the 3rd International Coral Reef Symposium, 1:405-408.

Limpus, C.J. and N., Nichols. 1988. The southern oscillation regulates the annual numbers of green turtles (*Chelonia mydas*) breeding around northern Australia. *Australian Journal of Wildlife Research*, 15:157.

Limpus, C.J. and N., Nichols. 1994. Progress report on the study of the interaction of El Niño Southern Oscillation on annual *Chelonia mydas* numbers at the southern Great Barrier Reef rookeries. *In:* Proceedings of the Australian Marine Turtle Conservation Workshop, Queensland Australia.

DRAFT

Lutz, P.L., and J.A., Musick (eds.). 1997. The Biology of Sea Turtles. CRC Press, Boca Raton, Florida.

Lutz, P.L., J.A., Musick, and J. Wyneken. 2002. The Biology of Sea Turtles, Volume II. CRC Press, Boca Raton, Florida.

Matos-Caraballo, D. and J.J. Agar. 2011. Census of Active Commercial Fishermen in Puerto Rico: 2008. Marine Fisheries Review. 73 (1). p. 13-27.

Mayor, P., B. Phillips, and Z. Hillis-Starr. 1998. Results of stomach content analysis on the juvenile hawksbill turtles of Buck Island Reef National Monument , U.S.V.I. pp.230-232 *in* Proceedings of the 17th Annual Sea Turtle Symposium, S. Epperly and J. Braun, Compilers. NOAA Tech. Memo. NMFS-SEFSC-415

McBride, R.S. and M.R. Johnson. 2007. Sexual development and reproductive seasonality of hogfih (Labridae:Lachnolaimus maximus), an hermaphroditic reef fish. Journal of Fish Biology. 71:1270-1292.

McCaffrey, K.T. 1999. Culture, power and struggle: Anti-military protest in Vieques, Puerto Rico. Ph.D. Dissertation, City University of New York.

Meylan, A. 1984. Feeding Ecology of the Hawksbill turtle (*Eretmochelys imbricata)*: Spongivory as a Feeding Niche in the Coral Reef Community. Disseration, University of Florida, Gainesville, FL.

Meylan, A. 1988. Spongivory in hawksbill turtles: a diet of glass. *Science* 239:393-395.

Meylan, A.B., and M. Donnelly. 1999. Status justification for listing the hawksbill turtle (*Eretmochelys imbricata)* as critically endangered on the 1996 IUCN Red List of Threatened Animals. Chelonian Conservation and Biology 3(2): 200-204.

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., Capella, J., García-Saiz, J.R., and M. Barreto. 2000. Puerto Rico – Seas at the Millenium. Available online at: http://geology.uprm.edu/Morelock/pdfdoc/morlok2.pdf (June 2012)

Mortimer, J.A. 1981. The feeding ecology of the West Caribbean green turtle (*Chelonia mydas*) in Nicaragua. *Biotropica*, 13:49.

Mortimer, J.A. 1982. Feeding ecology of sea turtles. *In*: Bjorndal, K.A. (ed.), Biology and Conservation of Sea Turtles. Smithsonian Institute Press, Washington, D.C.

Mumby, P.J. 2006. The impact of exploited grazers (Scaridae) on the dynamics of Caribbean Coral Reefs. Ecological Applications. 16(2):747-769.

Mumby, P.J., A. Hastings and H.J. Edwards. 2007. Thresholds and the resilience of Caribbean reef corals. Nature 450: 98-101.

DRAFT

Nelson, J.S. 1994. Fishes of the world. 3rd ed.. John Wiley & Sons, Inc. New York. 600 p.

NMFS. 2011. Endangered Species Act— Section 7 consultion on the continued authorization of reef fish fishing managed under the reef fish fishery management plan of Puerto Rico and the U.S. Virgin Islands. Biological Opinion. October 4. 223 p. plus appendices.

Office of Technology Assessment (OTA). 1987. Integrated Renewable Resource Management for U.S. Insular Areas: Summary. Washington, DC: Congress of the United States, Office of Technology Assessment.

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.

Paine, R. T. 1969. The Pisaster–Tegula interaction: prey patches, predator food preference, and intertidal community structure. Ecology 50: 950–961.

Paredes, R.P. 1969. Introduccion al Estudio Biologico de *Chelonia mydas agassizi* en el Perfil de Pisco, Masters thesis, Universidad Nacional Federico Villareal, Lima, Peru.

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.

Porter, J.W. 1976. Autotrophy, heterotrophy, and resource partitioning in Caribbean reef corals. American Naturalist, 110:731-742.

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. An analysis of the fish populations of artificial and natural reefs in the virgin islands. Caribbean Journal of Science 3(1):31-47.

Reeson, P.H. 1975. The Biology, Ecology and Bionomics of the Parrotfishes, Scaridae. Chapter 13 in Caribbean Coral Reef Fishery Resources (J.L. Munro, ed.). 1983. ICLARM Studies and Reviews 7. Manila, Philippines: International Center for Living Aquatic Resources Management. June.

Rielinger, D.M. 1999. Spawning Aggregations in the Gulf of Mexico, South Atlantic and Caribbean: A Source Document for Fisheries Management. February.

Robertson, D.R., and R.R. Warner. 1978. Sexual patterns in the Labroid fishes of the Western Caribbean. II The parrot fishes (Scaridae). Smithsonian Contribution Zoology. 255: 1-26.

Robins, C.R. and G.C. Ray. 1986. A field guide to Atlantic coast fishes of North America. Boston, MA: Houghton Mifflin Company.

DRAFT

Rotjan, R.D. & Lewis, S.M. 2006, Parrotfish abundance and selective corallivory on a Belizean coral reef. Journal of Experimental Marine Biology and Ecology 335 (2006) 292–301.

Ruiz-Mazzero, C. June 23, 2009. Puerto Rico: Biotech Island. Counterpunch. www.counterpunch.org.

Ruiz-Mazzero, C. July 13, 2004. Puerto Rico's Biotech Harvest. AlterNet. www.alternet.org.

Rylaarsdam, K.W. 1983. Life histories and abundance patterns of colonial corals on Jamaican reefs. Mar Ecol Prog Ser, 13:249-260.

Sandin, S.A. and D.E. McNamara. 2012. Spatial dynamics of benthic competition on coral reefs. Oecologia 168: 1079-1090.

Sammarco, P.W. 1980. *Diadema* and its relationship to coral spat mortality: grazing, competition, and biological disturbance. Journal of Experimental Marine Biology and Ecology, 45:245-272.

SERO-LAPP. 2012. Analyses of Commercial Parrotfish Landings in the U.S. Caribbean. NMFS Southeast Regional Office, St. Petersburg, FL. 25 pp.

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, 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.

Soma, M. 1985. Radio biotelemetry system applied to migratory study of turtle. Journal of the Faculty of Marine Science and Technology, Tokai University, Japan, 21:47.

Soong, K. and J.C. Lang. 1992. Reproductive integration in coral reefs. Biol Bull, 183:418-431.

Standora, E.A., J.R., Spotila, J.A., Keinath, and C.R. Shoop. 1984. Body temperatures, diving cycles, and movements of a subadult leatherback turtle, *Dermochelys coriacea*. *Herpetologica*, 40:169.

Solis, Hilda. May 2012. In Caribbean Journal, May 16, 2012. www.caribbeanjournal.com Warner, R.R. 1988. Sex change in fishes: hypothesis, evidence, and objections. Environmental Biology of Fishes. 22:81-90.

State Health Access Data Assistance Center. January 2010. Results from the 2009 Virgin Islands Health Care Insurance Survey. Report to Bureau of Economic Research, USVI. Obtained online on Jan. 22, 2012.

State Health Access Data Assistance Center. April 24, 2003. 2003 Virgin Islands Health Care Insurance and Access Survey: Select Results. Report to Bureau of Economic Research, USVI. Obtained online on Jan. 9, 2012 (http://www.shadac.org/files/VI_2003_HH_Report+Instr.pdf).

Steneck, R.S. 1986. The ecology of coralline algal crusts: Convergent patterns and adaptive strategies. Ann. Rev. Ecol. Syst. 7: 273-303.

DRAFT

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. 57p.

Szmant, A.M. and M.W. Miller. 2006. Settlement preferences and post-settlement mortality of laboratory cultured and settled larvae of the Caribbean hermatypic corals *Montastraea faveolata* and *Acropora palmata* in the Florida Keys, USA. Proceedings of the 10th International Coral Reef Symposium.

Thayer, G.W., K.A., Bjorndal, J.C., Ogden, S.L., Williams, and J.C., Zieman. 1984. Role of large herbivores in seagrass communities. *Estuaries*, 7:351.

Tonioli, F.C. and J.J. Agar. 2011. Synopsis of Puerto Rican Commercial Fisheries. NOAA Technical Memorandum NMFS-SEFSC-622. 69 p.

U.S. Census Bureau. Census 2000 and 2010.

U.S. Department of Commerce, NOAA, NMFS. July 2009. Fisheries of the United States 2008.

U.S. Virgin Islands Bureau of Economic Research. 2010. The Self-Sufficiency Standard for the U.S. Virgin Islands 2010. Obtained online on January 18, 2012 at http://www.usviber.org/Self-Sufficiency%20Standard.pdf

Van Dam, R. and C. Diéz. 1997. Predation by hawksbill turtles on sponges at Mona Island, Puerto Rico. pp. 1421-1426, Proc. 8th International Coral Reef Symposium, v. 2.

Van Dam, R. and C. Diéz. 1998. Home range of immature hawksbill turtles (*Eretmochelys imbricata*) at two Caribbean islands. *Journal of Experimental Marine Biology and Ecology*, 220(1):15-24.

Villaneuva Feliciano, O.O. 2009. A contrastive analysis of English influences in the lexicon of Puerto Rico Spanish in Puerto Rico and St. Croix. Doctoral Dissertation. English, University of Puerto Rico.

Walker, T.A. 1994. Post-hatchling dispersal of sea turtles. p. 79. *In*: Proceedings of the Australian Marine Turtle Conservation Workshop, Queensland Australia.

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.

Williams, E.H. and L. Bunkley-Williams. 1990. The world-wide coral reef bleaching cycle and related sources of coral mortality. Atoll Research Bulletin, 335:1-71.

Witzell, W.N. 2002. Immature Atlantic loggerhead turtles (*Caretta caretta*): suggested changes to the life history model. *Herpetological Review* 33(4):266-269.

DRAFT

Yoshioka, P.M. 2008. Fish mesograzers as gatekeepers of the species composition of coral reefs. Proceedings of the 11th International Coral Reef Symposium, Ft. Lauderdale, Florida, 7-11 July 2008 Session number 10.

DRAFT

Appendix A. Other Applicable Laws

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

1.1 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, the National Marine Fisheries Service (NMFS) is required to publish notification of proposed rules in the *Federal Register* and to solicit, consider and respond to public comment on those rules before they are finalized. The APA also establishes a 30-day wait period from the time a final rule is published until it takes effect.

1.2 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, NMFS is required to provide the relevant state agency with a determination that the proposed action is consistent with the enforceable policies of the approved program to the maximum extent practicable at least 90 days before taking final action. The Caribbean Council and NMFS 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 USVI.

1.3 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

DRAFT

the quality, objectivity, utility, and integrity of information disseminated by federal agencies." Such guidelines have been issued, directing all federal agencies to create and issue agency-specific standards to: 1) Ensure information quality and develop a pre-dissemination review process; 2) establish administrative mechanisms allowing affected persons to seek and obtain correction of information; and 3) report periodically to OMB on the number and nature of complaints received.

Scientific information and data are key components of fishery management plans (FMPs) and amendments and the use of best available information is the second national standard under the Magnuson-Stevens Act. To be consistent with the Act, FMPs and amendments must be based on the best information available. They should also properly reference all supporting materials and data, and be reviewed by technically competent individuals. With respect to original data generated for FMPs and amendments, it is important to ensure that the data are collected according to documented procedures or in a manner that reflects standard practices accepted by the relevant scientific and technical communities. Data will also undergo quality control prior to being used by the agency and a pre-dissemination review. Pursuant to Section 515 of Public Law 106-554 IQA, this information product has undergone a pre-dissemination review by the National Marine Fisheries Service Southeast Regional Office, Sustainable Fisheries Division, completed on January 22, 2013.

1.4 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, reinitiation 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.

DRAFT

Effects of the Reef Fish fishery were last analyzed in an October 4, 2011, biological opinion (opinion). The 2011 opinion determined that the continued authorization of the reef fish fishery, including parrotfish harvest, was not likely to adversely affect listed marine mammals, loggerhead sea turtles, or sea turtle critical habitat. The 2011 opinion also concluded the continued authorization of the fishery would adversely affect, but not jeopardize the continued existence of, green, hawksbill, and leatherback sea turtles, and elkhorn and staghorn coral ("*Acropora*"), and would not destroy or adversely modify *Acropora* critical habitat. An incidental take statement (ITS) for sea turtles and *Acropora* corals was issued. NMFS is considering listing an additional 66 species of coral (7 species in the Caribbean) under the ESA, as well as uplisting elkhorn and staghorn coral from threatened to endangered. In a memorandum dated January 7, 2013, NMFS determined a conference was not required to address the potential listing of the 7 species of coral in the Caribbean and reinitiation of consultation was not required to address the potential uplisting of elkhorn and staghorn coral. The proposed rule is not anticipated to change that determination. I have determined that fishing activities pursuant to this rule will not affect endangered and/or threatened species or critical habitat in any manner not considered in prior consultations on this fishery. A memo dated January 16, 2013, supports this finding.

1.5 Marine Mammal Protection Act (MMPA)

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

In 1994, Congress amended the MMPA, to govern the taking of marine mammals incidental to commercial fishing operations. The MMPA requires a commercial fishery to be placed in one of three categories, based on the relative frequency of incidental serious injuries and mortalities of marine mammals. Category I designates fisheries with frequent serious injuries and mortalities incidental to commercial fishing; Category II designates fisheries with occasional serious injuries and mortalities; Category III designates fisheries with a remote likelihood or no known serious injuries or mortalities. To legally fish in a Category I and/or II fishery, a fisherman must obtain a marine mammal authorization certificate by registering with the Marine Mammal Authorization Program (50 CFR 229.4) and accommodate an observer if requested (50 CFR 229.7(c)) and they must comply with any applicable take reduction plans. According to the List of Fisheries for 2012 published by NMFS, the reef fish fishery is considered Category III (76 FR 73912).

1.6 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

DRAFT

adhere to appropriate rules governing the confidentiality of such information. The PRA requires NMFS to obtain approval from the Office of Management and Budget before requesting most types of fishery information from the public. This action contains no new collections of information.

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

The Magnuson-Stevens Act includes EFH requirements, and as such, each existing, and any new FMPs must describe and identify EFH for the fishery, minimize to the extent practicable adverse effects on that EFH caused by fishing, and identify other actions to encourage the conservation and enhancement of that EFH. The Council and NMFS have determined there are no adverse effects to EFH in this amendment.

1.8 National Environmental Policy Act

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

1.9 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, NMFS, in implementing regulations, must assess how those regulations will affect small businesses. The regulatory flexibility analysis presented in Chapter 6 of this document shows that the proposed action is in compliance with the SBA.

1.10 Regulatory Flexibility Act

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

DRAFT

adopt regulations that impose the least burden on small entities, or mandate exemptions for small entities. Rather, it requires agencies to examine public policy issues using an analytical process that identifies, among other things, barriers to small business competitiveness and seeks a level playing field for small entities, not an unfair advantage.

After an agency determines that the RFA applies, it must decide whether to conduct a full regulatory flexibility analysis (Initial Regulatory Flexibility Analysis (IRFA) and Final Regulatory Flexibility Analysis) 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 Regulatory Flexibility Act Analysis for this action can be found in Chapter 6.

1.11 Executive Orders

1.11.1 E.O. 12630: Takings

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

1.11.2 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 fishery management plan or significantly amend an existing plan. RIRs provide a comprehensive analysis of the costs and benefits to society associated with proposed regulatory actions, the problems and policy objectives prompting the regulatory proposals, and the major alternatives that could be used to solve the problems. The reviews also serve as the basis for the agency's determinations as to whether proposed

DRAFT

regulations are a "significant regulatory action" under the criteria provided in E.O. 12866 and whether proposed regulations will have a significant economic impact on a substantial number of small entities in compliance with the Regulatory Flexibility Act Analysis.

A regulation is significant if it: a) has an annual effect on the economy of $100 million or more or adversely affects in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments and communities; b) creates a serious inconsistency or otherwise interferes with an action taken or planned by another agency; c) materially alters the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or d) raises novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this Executive Order. NMFS has preliminarily determined that this action will not meet the economic significance threshold of any criteria. The RIR for this action can be found in Chapter 5.

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

This Executive Order mandates that each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions. See Section 3.3.5 for Environmental Justice considerations as they relate to this action.

1.11.4 E.O. 12962: Recreational Fisheries

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

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

DRAFT

1.11.5 E.O. 13089: Coral Reef Protection

The Executive Order on Coral Reef Protection (June 11, 1998) requires federal agencies whose actions may affect U.S. coral reef ecosystems to identify those actions, utilize their programs and authorities to protect and enhance the conditions of such ecosystems; and, to the extent permitted by law, ensure that actions they authorize, fund or carry out not degrade the condition of that ecosystem. By definition, a U.S. coral reef ecosystem means those species, habitats, and other national resources associated with coral reefs in all maritime areas and zones subject to the jurisdiction or control of the United States (e.g., federal, state, territorial, or commonwealth waters).

The action proposed in this amendment has further implications to coral reefs. Regulations are already in place to limit or reduce impact to coral reef habitat in the U.S. Caribbean EEZ. In addition, NMFS approved and implemented the 2010 Comprehensive Annual Catch Limit (ACL) Amendment, which establish ACLs and accountability measures for parrotfish. The 2010 Caribbean ACL Amendment also prohibited the harvest of the three largest parrotfish species (midnight, blue, and rainbow). These actions will prevent overfishing of parrotfish species, which play important roles on coral reef ecosystems of the U.S. Caribbean.

1.11.6 E.O. 13132: Federalism

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

No Federalism issues have been identified relative to the action proposed in this amendment. Therefore, consultation with state officials under Executive Order 13132 is not necessary.

1.11.7 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

DRAFT

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.

1.11.8 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. This action will not affect any marine protected areas because this action applies only to federal waters and there are no marine protected areas listed in the U.S. Caribbean EEZ.

DRAFT

Appendix B. Public Hearing Locations and Summaries

Public Hearings for this Amendment were held at the following locations:

PUERTO RICO

July 23, 2012 – San Juan, Puerto Rico
Doubletree by Hilton, San Juan, PR
San Juan, 105 De Diego Avenue,
San Juan, Puerto Rico 00914.

The meeting was opened at 7:10 p.m. There were no participants present at this meeting. Council staff Graciela García-Moliner and Iris Oliveras attended. Council Vice-Chair Marcos Hanke closed the public hearing at 8:00 pm.

July 24, 2012 – Naguabo, Puerto Rico
Asociación de Pescadores, Villa Pesquera Playa Húcar,
66.7 Km Highway 3 Naguabo, Puerto Rico 00718.

The meeting was opened at 7:24 p.m. There were 24 participants present at this meeting. Council staff Graciela García-Moliner and Iris Oliveras attended. Council Vice-Chair Marcos Hanke closed the public hearing at 8:00 p.m.

A brief presentation of the alternatives under consideration was presented to the participants. No comment were made regarding this action.

July 25, 2012 – Mayaguez, Puerto Rico
Holiday Inn, Mayagüez, Puerto Rico
2701 Highway #2, Mayaguez,
Puerto Rico 00680.

The meeting was opened at 7:10 p.m. There were no participants present at this meeting. Council staff Graciela García-Moliner and Iris Oliveras were in attendance. Council Vice-Chair Marcos Hanke closed the public hearing at 7:40 p.m.

July 26, 2012 – Ponce, Puerto Rico
Ponce Holiday Inn,
3315 Ponce by Pass, Ponce,
Puerto Rico 00731.

DRAFT

The meeting was opened at 7:10 p.m. There were no participants present at this meeting. Council staff Graciela García-Moliner and Iris Oliveras were in attendance. Council Vice-Chair Marcos Hanke closed the public hearing at 7:40 p.m.

U.S. VIRGIN ISLANDS

July 24, 2012, Windward Passage Hotel,
Veterans Drive, Charlotte Amalie,
St. Thomas, U.S. Virgin Islands 00804.

July 25, 2012, The Buccaneer Hotel,
5007 Estate Shoys, Christiansted,
St. Croix, U.S. Virgin Islands 00820

DRAFT