

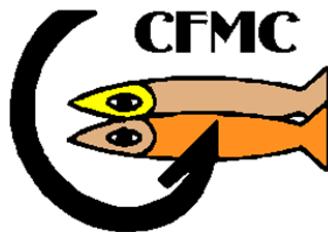
FINAL

**Five-Year Review
of
Essential Fish Habitat in the U. S. Caribbean**

VOLUME II: Tables and Figures

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Section in 2011 EFH Review		Corresponding Sections in 2004 EFH-FEIS	
1.2	Historical background: Council actions to protect habitat	2.1.5.2.2	History of Council actions to protect EFH
1.3	Changes in Administrative Environment	3.4 4.2.3 4.3.4 4.4.4 4.5	Affected-Administrative Environment Environmental consequences-effects of missing information Consequences of EFH Alternatives to the Administrative Environment Consequences of identifying HAPCs for the Administrative Environment Consequences of alternatives for preventing adverse effects of fishing on EFH- Administrative Environment
1.4	Current EFH Designations	2.3	FMP Alternatives for EFH
1.5	Current HAPC Designations	2.4	Alternatives to designate HAPC
1.6	Marine Protected Areas in the U.S. Caribbean	3.4.5	Non-fishery management laws and regulations
1.7	EFH Areas Protected from Fishing Impacts in the U.S. Caribbean	2.3 2.4 2.5	Alternatives for EFH Alternatives to deisnate HAPC Alternatives to minimize the effects of fishing
1.8	Current Measures to Minimize Fishing Impacts to EFH	2.5	Alternatives to prevent, mitigate or minimize the effects of fishing
2	Review Existing EFH Descriptions and Designations	2.3, 2.4	Review of Alternatives for EFH, HAPC and to Minimize the effects of fishing
3	Review Changes in the Biological Environment	3.2	Affected Environment- Biological Environment
3.1	Species Added or Eliminated from Fishery Management Units	3.2.11	Fishery resources under FMPs
3.2	Changes to the Status of Managed Species and Regulatory Amendments	3.2.11	Fishery resources under FMPs
3.2.1	Spiny Lobster	3.2.11.2	Spiny Lobster FMU
3.2.2	Queen Conch	3.2.11.3	Queen Conch FMU
3.3	New Information about Species or Life Stage Distribution, Abundance, Density, Productivity or Habitat Associations	3.2.11 4.3.2 4.4.2	Fishery resources under FMPs Consequences of alternatives to describe and identify EFH- Biological environment Consequences of alternatives for identifying HAPCs- Biological Environment
4	Review of New Mapping Efforts, Tools and Modeling Techniques in EFH and HAPC Identification and Description	2.1.3 2.1.3.3 2.1.4 2.1.5.2.1	Describing and identifying EFH Available information- Data, Functional Relationships, Maps of habitat distributions Designating HAPCs Mapping efforts

Table 1. (Cont.)

Section in 2011 EFH Review	Corresponding Sections in 2004 EFH-FEIS
4.2 Review of Alternative Methodologies for use in EFH Designation in the U.S. Caribbean	2.1.3.4 Developing alternatives for EFH 2.1.4.3 Developing Alternatives for HAPCs 2.1.5.3 Evaluation of fishing impacts on EFH 2.1.5.4 Developing alternatives to prevent, mitigate, or minimize adverse effects of fishing on EFH 4.2.3 Environmental consequences- Ongoing work to obtain missing information 4.2.3.6 Fish-habitat models
5 Review Changes in the Human Environment	3.3 Affected Human Environment 4.3.3 Socio-economic consequences to the human environment of EFH, HAPC, and for preventing adverse effects of fishing 4.4.3 Cumulative effects- Human Environment
6 Review Changes and New Information on Fishing Impacts that May Adversely Affect EFH	3.5.1 Threats to Habitat-Fishing Impacts 4.7.2 Conservation recommendations concerning fishing impacts
7 Review Changes and New Information on Non-Fishing Impacts that May Adversely Affect EFH	3.5.2 Threats to Habitat-Non-fishing Impacts 3.5.2.1 Maritime-related factors 3.5.2.2 Coastal development and related threa 3.5.2.3 Non-fishing impacts to EFH-Natural factorsts 4.7.3 Conservation recommendations- Non-fishing projects
8 Review HAPC Designations	2.4 Alternatives to designate HAPCs 4.4 Consequences of alternatives for identifying
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9.6 Research and Information Needs	4.7.5 Recommendations for improving habitat information
9.6.1 Research Needs	4.7.5.1 NMFS' Research and Information Needs
9.6.2. Council's Information and Research Needs	4.7.5.2 CFMC's Research and Information Needs

Table 2. Puerto Rico Marine Protected Areas. Source of information: NOAA National Protected Areas Center (<http://www.mpa.gov/>).

Map ID	Name	Government Level	Management	Year Established	Level of Protection	General Objectives	Specific Objectives
1	Isla de Mona Natural Reserve	Territorial	PR-DRNA	1972	Uniform Multiple Use	Natural Heritage and Ecosystem Conservation	Scientific research, conservation of endangered species and marine habitats including coral reefs, seagrass beds, and submerged vertical cliff walls.
2	Arrecifes de la Cordillera Natural Reserve	Territorial	PR-DRNA	1985	Uniform Multiple Use	Natural Heritage and Ecosystem Conservation	Conservation of the cordillera, which includes cays, islands and coral reefs.
3	Arrecifes de Tourmaline Natural Reserve	Territorial	PR-DRNA	1998	Zoned with No-Take Areas	Natural Heritage and Ecosystem Conservation	
6	Bosque Estatal de Guanica Natural Reserve	Territorial	PR-DRNA	1985	Uniform Multiple Use	Natural Heritage and Ecosystem Conservation	Conservation of inshore marine habitats including coral reefs, hard ground platforms, seagrass beds and fringing mangroves.
7	Red Hind SPAG West of Puerto Rico – Bajo de Cico	Federal	NMFS	1996	No-Take	Fisheries Management	Protect spawning aggregations of commercial fish stocks (Red hind, <i>Epinephelus guttatus</i>)
8	Red Hind SPAG West of Puerto Rico – Tourmaline Bank	Federal	NMFS	1993	No-Take	Fisheries Management	Protect spawning aggregations of commercial fish stocks (Red hind, <i>Epinephelus guttatus</i>)
9	Red Hind SPAG West of Puerto Rico – Abrir La Sierra Bank	Federal	NMFS	1996	No-Take	Fisheries Management	Protect spawning aggregations of commercial fish stocks (Red hind, <i>Epinephelus guttatus</i>)
11	Caño Tiburones Natural Reserve	Territorial	PR-DRNA	1998	Uniform Multiple Use	Natural Heritage and Ecosystem Conservation	Conservation of the inland estuarine, palustrine and lacustrine wetlands.
12	Hacienda La Esperanza Natural Reserve	Partnership	PR Conservation Trust	1987	Uniform Multiple Use	Natural/Cultural Heritage and Ecosystem Conservation	N/A
13	Bosque Estatal de Piñones Natural reserve	Territorial	PR-DRNA	1918	Uniform Multiple Use	Natural Heritage and Ecosystem Conservation	N/A
14	El Pantano, Bosque de Pterocarpus y Lagunas Mandry y Santa Teres Natural Reserve	Territorial	PR-DRNA	1984	No-Take	Natural Heritage and Conservation of a Focal Resource	N/A
15	Jobos Bay National Estuarine Research Reserve	Partnership	PR-DRNA	1981	Uniform Multiple Use	Natural Heritage and Ecosystem Conservation	Long-term research, education, and protection of coastal habitat: coral reefs, seagrass beds, mangroves, and other estuarine habitats.

Table 2. (Cont.). PR MPAs

Map ID	Name	Government Level	Management	Year Established	Level of Protection	General Objectives	Specific Objectives
17	Canal Luis Peña Natural Reserve	Territorial	PR-DRNA	1999	No-Take	Natural Heritage and Ecosystem Conservation	Restoration of local fish stocks and conservation of coral reefs.
18	Isla de Desecheo Marine Reserve	Territorial	PR-DRNA	2000	No-Take	Natural Heritage and Ecosystem Conservation	Conservation of healthy coral reef ecosystem.
19	Bahias Bioluminiscentes de Vieques Natural Reserve	Territorial	PR-DRNA	1989	Uniform Multiple Use	Natural Heritage and Ecosystem Conservation	N/A
20	Rio Espiritu Santo Natural Reserve	Territorial	PR-DRNA	2001	Uniform Multiple Use	Natural Heritage and Ecosystem Conservation	Conservation of natural resources, including coral reefs and mangroves and commerical fisheries in the estuary
21	Bosque Natural de Boqueron Natural Reserve	Territorial	PR-DRNA	1998	Uniform Multiple Use	Natural Heritage and Ecosystem Conservation	N/A
22	Arrecifes de Guayama Natural Reserve	Territorial	PR-DRNA	1980	Uniform Multiple Use	Natural Heritage and Ecosystem Conservation	N/A
23	Bosque Estatal de Aguirre	Territorial	PR-DRNA	1983	Uniform Multiple Use	Natural Heritage and Ecosystem Conservation	N/A
24	La Parguera Natural Reserve	Territorial	PR-DRNA	1979	Uniform Multiple Use	Natural Heritage and Ecosystem Conservation	Conservation of coastal and marine habitats including mangroves, estuaries and the 22-mile "Black Wall" of black coral gardens, black gorgonians and black durgons.
28	Pantano Cibuco Natural Reserve	Territorial	PR-DRNA	1993	Uniform Multiple Use	Natural Heritage and Ecosystem Conservation	
29	Bosque Estatal de Ceiba Natural Reserve	Territorial	PR-DRNA	1979	No-Take	Natural Heritage and Ecosystem Conservation	Conservation of mangrove and salt marsh habitats.
30	Laguna Joyuda Natural Reserve	Territorial	PR-DRNA	1980	No-Take	Natural Heritage and Ecosystem Conservation	Conservation of a saltwater lagoon.

Table 2. (Cont.). PR MPAs

Map ID	Name	Government Level	Management	Year Established	Level of Protection	General Objectives	Specific Objectives
31	Punta Guaniquilla Natural Reserve	Territorial	PR-DRNA	1976	Uniform Multiple Use	Natural Heritage and Ecosystem Conservation	N/A
32	Punta Petrona Natural Reserve	Partnership	PR-DRNA	1985	Uniform Multiple Use	Natural Heritage and Ecosystem Conservation	N/A
33	Punta Yeguas Natural Reserve	Partnership	PR-DRNA	1975	Uniform Multiple Use	Natural Heritage and Conservation of a Focal Resource	N/A
34	Tres Palmas de Rincon Marine Reserve	Partnership	PR-DRNA	2004	Uniform Multiple Use	Natural Heritage and Conservation of a Focal Resource	Conservation of the marine ecosystem, including healthy elkhorn corals.
35	Cabezas de San Juan Natural Reserve	Partnership	PR Conservation Trust	1975	Uniform Multiple Use	Natural Heritage and Ecosystem Conservation	Conservation of the marine ecosystem, including coral reefs, seagrass beds, and mangroves.
36	Caja de Muertos Natural Reserve	Territorial	PR-DRNA	1981	Zoned Multiple Use	Natural Heritage and Conservation of a Focal Resource	Initially to protect endangered sea turtles, now to protect the whole coral reef ecosystems.
37	Cueva de Indio Natural Reserve	Territorial	PR-DRNA	1992	Uniform Multiple Use	Natural/Cultural Heritage and Ecosystem Conservation	Ecological restoration and management of conflicting uses.
	San Juan Bay Estuary	Partnership	USEPA-NEP	1992	Uniform Multiple Use	Natural/Cultural Heritage and Ecosystem Conservation	Conservation of critical habitats (coral, seagrass, mangrove) and balance economic needs and resource protection through environmentally sensitive tourism.

Table 3. U.S. Virgin Islands Marine Protected Areas. Source of information: NOAA National Protected Areas Center (<http://www.mpa.gov>).

Map ID	Name	Government Level	Management	Year Established	Level of Protection	General Objectives	Specific Objectives
4	Hind Bank Marine Conservation District	Federal	NMFS	1999	No-Take	Fisheries Management, Natural Heritage and Ecosystem Conservation	Preserve and protect coral reef resources, reef fish stocks and their habitats; protect red hind spawning aggregations.
5	Virgin Islands Coral Reef National Monument	Federal	NPS	2001	Zoned Multiple Use	Natural/Cultural Heritage and Ecosystem Conservation	Preserve and protect the tropical marine ecosystem including the habitats (including mangroves, coral reefs, algal plains and seagrass beds) essential for sustaining and enhancing the coastal and submerged ecosystems in the Virgin Islands National Park, and to promote scientific research and educational opportunities.
10	Virgin Islands National Park	Federal	NPS	1962	Zoned with No-Take Areas	Natural/Cultural Heritage and Ecosystem Conservation	Protect and preserve coral reef ecosystems and seascapes and conduct research.
16	St. James Marine Reserve and Wildlife Sanctuary	Territorial	VI-DPNR	1994	Uniform Multiple Use	Natural/Cultural Heritage and Ecosystem Conservation	Protect diversity of habitats including mangroves, seagrass beds and coral reefs; contribute to commercially viable fishery resources by protecting spawning stock and nursery areas.
25	Salt River Bay National Historic Park and Ecological Preserve	Federal	NPS	1992	Uniform Multiple Use	Natural/Cultural Heritage and Ecosystem Conservation	N/A

Table 3. (Cont.) USVI MPAs.

Map ID	Name	Government Level	Management	Year Established	Level of Protection	General Objectives	Specific Objectives
26	Buck Island Reef National Monument	Federal	NPS	2001	No-Take	Natural/Cultural Heritage and Ecosystem Conservation	Preservation of the coral reef ecosystem, including the elkhorn coral barrier reef, sea fans, gorgonians, spotted eagle rays, nurse sharks and lemon sharks, and juvenile Blacktip reef sharks and Whitetip reef sharks.
27	Cas Cay-Mangrove Lagoon Marine Reserve and Wildlife Sanctuary	Territorial	VI-DPNR	1994	Uniform Multiple Use	Natural/Cultural Heritage and Ecosystem Conservation	Protect marine ecosystems, restore wildlife populations and enhance populations in neighboring areas.
38	Red Hind Spawning Aggregation Area East of St. Croix	Federal	NMFS	1993	No-Take	Fisheries Management	Protect spawning aggregations of commercial fish stocks (Red hind, <i>Epinephelus guttatus</i>)
39	Mutton Snapper Spawning Aggregation Area	Federal	NMFS	1993	No-Take	Fisheries Management	Protect spawning aggregations of commercial fish stocks (Mutton snapper, <i>Lutjanus analis</i>)
40	St. Croix East End Marine Park	Territorial	VI-DPNR	2003	Zoned with No-Take Areas	Natural/Cultural Heritage and Ecosystem Conservation	Conservation of fringing reefs, mangrove forests, seagrass beds and nesting sites for endangered sea turtles; provide environmental, economic and social benefits to residents and visitors.
41	USCG Security Zone: Hovensa Refinery, St. Croix	Federal	USCG	2005	No-Entry	National Security	National Security
42	Grammanik Bank closed area	Federal	NMFS	2005	Uniform Multiple Use	Fisheries Management	Protect spawning aggregations of commercial fish stocks (Yellowfin grouper, <i>Mycteroperca venenosa</i>)

Definitions for level of protection are found at: http://www.mpa.gov/pdf/helpful-resources/factsheets/mpa_classification_may2011.pdf

Table 4. Measures to protect EFH from impacts of fishing in the U.S. Caribbean (NOAA 2010). Source: http://sharpfin.nmfs.noaa.gov/website/EFH_mapper/docs/cfmc_datasheet.pdf



Measures to Protect EFH from Impacts of Fishing in the U.S. Caribbean

Established by the Comprehensive Amendment to the Fishery Management Plans of the U.S. Caribbean to Address Required Provisions of the Magnuson-Stevens Fishery Conservation and Management Act

Gear restrictions in the U.S. Caribbean EEZ

50 CFR § 622.6 Vessel and gear identification.

(b)(1)(ii)(A) *Caribbean EEZ.* Traps or pots used in the Caribbean spiny lobster or Caribbean reef fish fisheries that are fished individually, rather than tied together in a trap line, must have at least one buoy attached that floats on the surface. Traps or pots used in the Caribbean spiny lobster or Caribbean reef fish fisheries that are tied together in a trap line must have at least one buoy that floats at the surface attached at each end of the trap line. Each buoy must display the official number and color code assigned to the vessel by Puerto Rico or the U.S. Virgin Islands, whichever is applicable.

AND

50 CFR § 622.41 Species specific limitations.

(b) *Caribbean reef fish anchoring restriction.* The owner or operator of any fishing vessel, recreational or commercial, that fishes for or possesses Caribbean reef fish in or from the Caribbean EEZ must ensure that the vessel uses only an anchor retrieval system that recovers the anchor by its crown, thereby preventing the anchor from dragging along the bottom during recovery. For a grapnel hook, this could include an incorporated anchor rode reversal bar that runs parallel along the shank, which allows the rode to reverse and slip back toward the crown. For a fluke- or plow-type anchor, a trip line consisting of a line from the crown of the anchor to a surface buoy would be required.

Additional restrictions in specific areas of the U.S. Caribbean

Abrir La Sierra Bank

50 CFR § 622.33 Caribbean EEZ seasonal and/or area closures.

(a) *Seasonal closures.* In addition to the other restrictions specified in this paragraph (a), fishing with pots, traps, bottom longlines, gillnets or trammel nets is prohibited year-round in the closed areas specified in paragraphs (a)(1), (2), (3), and (8) of this section.

(2) *Red hind spawning aggregation areas.* From December 1 through February 28, each year, fishing is prohibited in those parts of the following areas that are in the EEZ [coordinates listed]

(ii) West of Puerto Rico — (C) Abrir La Sierra Bank.

Bajo de Sico closed area

50 CFR § 622.33 Caribbean EEZ seasonal and/or area closures.

(a) *Seasonal closures.* In addition to the other restrictions specified in this paragraph (a), fishing with pots, traps, bottom longlines, gillnets or trammel nets is prohibited year-round in the closed areas specified in paragraphs (a)(1), (2), (3), and (8) of this section.

(8) *Bajo de Sico closed area.*

(i) The Bajo de Sico closed area is bounded by rhumb lines connecting, in order the following points [coordinates listed].

(ii) From October 1 through March 31, each year, no person may fish for or possess any Caribbean reef fish, as listed in Table 2 of Appendix A to part 622, in or from those parts of the Bajo de Sico closed area that are

in the EEZ. The prohibition on possession does not apply to such Caribbean reef fish harvested and landed ashore prior to the closure.

(iii) Anchoring, by fishing vessels, is prohibited year-round in those parts of the Bajo de Sico closed area that are in the EEZ.

Grammanik Bank closed area

50 CFR § 622.33 Caribbean EEZ seasonal and/or area closures.

(a) *Seasonal closures.* In addition to the other restrictions specified in this paragraph (a), fishing with pots, traps, bottom longlines, gillnets or trammel nets is prohibited year-round in the closed areas specified in paragraphs (a)(1), (2), (3), and (8) of this section.

(3) *Grammanik Bank closed area* (i) The Grammanik Bank closed area is bounded by rhumb lines connecting, in order, the following points [coordinates listed]

Lang Bank red hind spawning aggregation area, east of St. Croix

50 CFR § 622.33 Caribbean EEZ seasonal and/or area closures.

(a) *Seasonal closures.* In addition to the other restrictions specified in this paragraph (a), fishing with pots, traps, bottom longlines, gillnets or trammel nets is prohibited year-round in the closed areas specified in paragraphs (a)(1), (2), (3), and (8) of this section.

(2) *Red hind spawning aggregation areas.* From December 1 through February 28, each year, fishing is prohibited in those parts of the following areas that are in the EEZ [coordinates listed]

(i) East of St. Croix.

Mutton snapper spawning aggregation area

50 CFR § 622.33 Caribbean EEZ seasonal and/or area closures.

(a) *Seasonal closures.* In addition to the other restrictions specified in this paragraph (a), fishing with pots, traps, bottom longlines, gillnets or trammel nets is prohibited year-round in the closed areas specified in paragraphs (a)(1), (2), (3), and (8) of this section.

(1) *Mutton snapper spawning aggregation area.* From March 1 through June 30, each year, fishing is prohibited in that part of the following area that is in the EEZ [coordinates listed].

Tourmaline Bank

50 CFR § 622.33 Caribbean EEZ seasonal and/or area closures.

(a) *Seasonal closures.* In addition to the other restrictions specified in this paragraph (a), fishing with pots, traps, bottom longlines, gillnets or trammel nets is prohibited year-round in the closed areas specified in paragraphs (a)(1), (2), (3), and (8) of this section.

(2) *Red hind spawning aggregation areas.* From December 1 through February 28, each year, fishing is prohibited in those parts of the following areas that are in the EEZ [coordinates listed]

(ii) West of Puerto Rico — (B) Tourmaline Bank

Table 5. List of species in the Spiny Lobster FMP

Scientific Names	Common Names
<i>Panulirus argus</i>	Caribbean spiny lobster
<i>Panulirus guttatus</i>	Spotted spiny lobster
<i>Panulirus laevicauda</i>	Smoothtail spiny lobster

Table 6. List of species in the Queen Conch FMP.

Scientific name	Common name
<i>Strombus gigas</i>	Queen conch
<i>Species included for data collection purposes only</i>	
<i>Charonia variegata</i>	Atlantic triton's trumpet
<i>Cassis madagascarensis</i>	Cameo helmet
<i>Astrea tuber</i>	Green star shell
<i>Strombus raninus</i>	Hawkwing conch
<i>Strombus costatus</i>	Milk conch
<i>Strombus gallus</i>	Roostertail conch
<i>Strombus pugilis</i>	West Indian fighting conch
<i>Fasciolaria tulipa</i>	True tulip

Table 7. List of species in the Reef Fish FMP.

Scientific name of species or species group	Common name
<i>Holocentrus ascensionis</i>	Squirrelfish
<i>Holocentrus rufus</i>	Longspine squirrelfish
<i>Myripristis jacobus</i>	Blackbar soldierfish
<i>Epinephelus adscensionis</i>	Rock hind
<i>Epinephelus cruentatus</i>	Graysby
<i>Epinephelus flavolimbatus</i>	Yellowedge grouper
<i>Epinephelus fulvus</i>	Coney
<i>Epinephelus guttatus</i>	Red hind
<i>Epinephelus itajara</i>	Goliath grouper
<i>Epinephelus morio</i>	Red grouper
<i>Epinephelus mystacinus</i>	Misty grouper
<i>Epinephelus striatus</i>	Nassau grouper
<i>Mycteroperca venenosa</i>	Yellowfin grouper
<i>Mycteroperca tigris</i>	Tiger grouper
<i>Paranthias furcifer</i>	Creole-fish
<i>Priacanthus arenatus</i>	Bigeye
<i>Caulolatilus cyanops</i>	Blackline tilefish
<i>Malacanthus plumieri</i>	Sand tilefish
<i>Caranx bartholomaei</i>	Yellow jack
<i>Caranx cryos</i>	Blue runner
<i>Caranx latus</i>	Horse-eye jack
<i>Caranx lugubris</i>	Black jack
<i>Caranx ruber</i>	Bar jack
<i>Seriola dumerili</i>	Greater amberjack
<i>Seriola rivoliana</i>	Almaco jack
<i>Apsilus dentatus</i>	Black snapper
<i>Etelis oculatus</i>	Queen snapper
<i>Lutjanus analis</i>	Mutton snapper
<i>Lutjanus apodus</i>	Schoolmaster
<i>Lutjanus buccanella</i>	Blackfin snapper
<i>Lutjanus griseus</i>	Gray snapper
<i>Lutjanus jocu</i>	Dog snapper
<i>Lutjanus mahogoni</i>	Mahogany snapper
<i>Lutjanus synagris</i>	Lane snapper
<i>Lutjanus vivanus</i>	Silk snapper
<i>Ocyurus chrysurus</i>	Yellowtail snapper
<i>Pristipomoides aquilonaris</i>	Wenchman
<i>Rhomboplites aurorubens</i>	Vermilion snapper
<i>Anisotremus virginicus</i>	Porkfish

Scientific name of species or species group	Common name
<i>Haemulon album</i>	Margate
<i>Haemulon aurolineatum</i>	Tomtate
<i>Haemulon flavolineatum</i>	French grunt
<i>Haemulon plumieri</i>	White grunt
<i>Haemulon sciurus</i>	Bluestriped grunt
<i>Archosargus rhomboidalis</i>	Sea bream
<i>Calamus bajonado</i>	Jolthead porgy
<i>Calamus penna</i>	Sheepshead porgy
<i>Calamus pennatula</i>	Pluma
<i>Mulloidichthys martinicus</i>	Yellow goatfish
<i>Pseudupeneus maculatus</i>	Spotted goatfish
<i>Holacanthus ciliaris</i>	Queen angelfish
<i>Pomacanthus arcuatus</i>	Gray angelfish
<i>Pomacanthus paru</i>	French angelfish
<i>Bodianus rufus</i>	Spanish hogfish
<i>Halichoeres radiatus</i>	Puddingwife
<i>Lachnolaimus maximus</i>	Hogfish
<i>Scarus coeruleus</i>	Midnight parrotfish
<i>Scarus coeruleus</i>	Blue parrotfish
<i>Scarus croicensis</i>	Striped parrotfish
<i>Scarus guacamaia</i>	Rainbow parrotfish
<i>Scarus taeniopterus</i>	Princess parrotfish
<i>Scarus vetula</i>	Queen parrotfish
<i>Sparisoma aurofrenatum</i>	Redband parrotfish
<i>Sparisoma chrysopterum</i>	Redtail parrotfish
<i>Sparisoma rubripinne</i>	Redfin parrotfish
<i>Sparisoma viride</i>	Stoplight parrotfish
<i>Acanthurus bahianus</i>	Ocean surgeonfish
<i>Acanthurus chirurgus</i>	Doctorfish
<i>Acanthurus coeruleus</i>	Blue tang
<i>Aluterus scriptus</i>	Scrawled filefish
<i>Balistes vetula</i>	Queen triggerfish
<i>Cantherhines macrocerus</i>	Whitespotted filefish
<i>Canthidermis sufflamen</i>	Ocean triggerfish
<i>Melichthys niger</i>	Black duron
<i>Xanthichthys ringens</i>	Sargassum triggerfish
<i>Lactophrys bicaudalis</i>	Spotted trunkfish
<i>Lactophrys polygonia</i>	Honeycomb cowfish
<i>Lactophrys quadricornis</i>	Scrawled cowfish
<i>Lactophrys trigonus</i>	Trunkfish
<i>Lactophrys triqueter</i>	Smooth trunkfish

Aquarium Trade Species in the Reef Fish FMP

The following species are included for data collection purposes only

Scientific name of species or species group	Common name
<i>Echidna catenata</i>	Chain moray
<i>Gymnothorax funebris</i>	Green moray
<i>Gymnothorax miliaris</i>	Goldentail moray
<i>Myrichthys oculatus</i>	Goldspotted eel
<i>Synodus intermedius</i>	Sand diver
<i>Antennarius spp.</i>	Frogfish
<i>Ogcocephalus spp.</i>	Batfish
<i>Hippocampus spp.</i>	Seahorses
<i>Syngnathus spp.</i>	Pipefishes
<i>Dactylopterus volitans</i>	Flying gurnard
<i>Hypoplectus unicolor</i>	Butter hamlet
<i>Liopropoma rubre</i>	Swissguard basslet
<i>Rypticus saponaceus</i>	Greater soapfish
<i>Serranus annularis</i>	Orangeback bass
<i>Serranus baldwini</i>	Lantern bass
<i>Serranus tabacarius</i>	Tobaccofish
<i>Serranus tigrinus</i>	Harlequin bass
<i>Serranus tortugarum</i>	Chalk bass
<i>Gramma loreto</i>	Royal gramma
<i>Priacanthus cruentatus</i>	Glasseye snapper
<i>Apogon maculatus</i>	Flamefish
<i>Astrapogon stellatus</i>	Conchfish
<i>Equetus acuminatus</i>	High-hat
<i>Equetus lanceolatus</i>	Jackknife-fish
<i>Equetus punctatus</i>	Spotted drum
<i>Chaetodipterus faber</i>	Atlantic spadefish
<i>Chaetodon aculeatus</i>	Longsnout butterflyfish
<i>Chaetodon capistratus</i>	Foureye butterflyfish
<i>Chaetodon ocellatus</i>	Spotfin butterflyfish
<i>Chaetodon striatus</i>	Banded butterflyfish
<i>Centropyge argi</i>	Cherubfish
<i>Holacanthus tricolor</i>	Rock beauty
<i>Abudefduf saxatilis</i>	Sergeant major
<i>Chromis cyaneus</i>	Blue chromis
<i>Chromos insolatus</i>	Sunshinefish
<i>Microspathodon chrysurus</i>	Yellowtail damselfish
<i>Pomacentrus fuscus</i>	Dusky damselfish
<i>Pomacentrus leucostictus</i>	Beaugregory
<i>Pomacentrus partitus</i>	Bicolor damselfish
<i>Pomacentrus planifrons</i>	Threespot damselfish

Aquarium Trade Species in the Reef Fish FMP	
<i>The following species are included for data collection purposes only</i>	
Scientific name of species or species group	Common name
<i>Amblycirrhitus pinos</i>	Redspotted hawkfish
<i>Clepticus parrai</i>	Creole wrasse
<i>Halichoeres cyancephalus</i>	Yellowcheek wrasse
<i>Halichoeres garnoti</i>	Yellowhead wrasse
<i>Halichoeres maculipinna</i>	Clown wrasse
<i>Hemipteronotus novacula</i>	Pearly razorfish
<i>Hemipteronotus splendens</i>	Green razorfish
<i>Thalassoma bifasciatum</i>	Bluehead wrasse
<i>Opistognathus aurifrons</i>	Yellowhead jawfish
<i>Opistognathus whitehursti</i>	Dusky jawfish
<i>Ophioblennius atlanticus</i>	Redlip blenny
<i>Gobiosoma oceanops</i>	Neon goby
<i>Priolepis hipoliti</i>	Rusty goby
<i>Bothus lunatus</i>	Peacock flounder
<i>Syphurus arawak</i>	Caribbean tonguefish
<i>Canthigaster rostrata</i>	Sharpnose puffer
<i>Diodon hystrix</i>	Porcupinefish

Table 8. List of species in the Corals and Reef Associated Plants and Invertebrates FMP.

Scientific name of species or species group	Common name
<i>Millepora spp.</i>	Fire corals
<i>Stylaster roseus</i>	Rose lace corals
<i>Antipathes spp.</i>	Bushy black coral
<i>Stichopathes spp.</i>	Wire coral
<i>Erythropodium caribaeorum</i>	Encrusting gorgonian
<i>Iciligorgia schrammi</i>	Deepwater sea fan
<i>Briareum asbestinum</i>	Corky sea finger
<i>Telesto spp.</i>	
<i>Carjua riisei</i>	
<i>Gorgonia mariae</i>	Wide-mesh sea fan
<i>Gorgonia ventalina</i>	Common sea fan
<i>Gorgonia flabellum</i>	Venus sea fan
<i>Pseudopterogorgia acerosa</i>	Sea plume
<i>Pseudopterogorgia americana</i>	Slimy sea plume
<i>Pseudopterogorgia bipinnata</i>	Bipinnate plume
<i>Pseudopterogorgia rigida</i>	
<i>Pseudopterogorgia albatrossae</i>	
<i>Pterogorgia anceps</i>	Angular sea whip
<i>Pterogorgia citrina</i>	Yellow sea whip
<i>Eunicea mammosa</i>	Swollen-knob
<i>Eunicea succinea</i>	Shelf-knob sea rod
<i>Eunicea laxispica</i>	
<i>Eunicea fusca</i>	Doughnut sea rod
<i>Eunicea laciniata</i>	
<i>Eunicea touneforti</i>	
<i>Eunicea clavigera</i>	
<i>Eunicea knighti</i>	
<i>Eunicea calyculata</i>	Warty sea rod
<i>Muricea atlantica</i>	
<i>Muricea muricata</i>	Spiny sea fan
<i>Muricea pinnata</i>	Long spine sea fan
<i>Muricea laxa</i>	Delicate spiny rod
<i>Muricea elongata</i>	Orange spiny rod
<i>Muriceopsis spp.</i>	
<i>Muriceopsis sulphurea</i>	
<i>Muriceopsis flava</i>	Rough sea plume
<i>Plexaura flexuosa</i>	Bent sea rod
<i>Plexaura homomalla</i>	Black sea rod
<i>Pseudoplexaura porosa</i>	Porous sea rod
<i>Pseudoplexaura flagellosa</i>	
<i>Pseudoplexaura wagenaari</i>	

Scientific name of species or species group	Common name
<i>Pseudoplexa ura crucis</i>	
<i>Plexaurella dichotoma</i>	Slit-pore sea rod
<i>Plexaurella nutans</i>	Giant slit-pore
<i>Plexaurella grandiflora</i>	
<i>Plexaurella grisea</i>	
<i>Plexaurella fusifera</i>	
<i>Ellisella spp.</i>	Sea whips
<i>Stephanocoenia michelinii</i>	Blushing star
<i>Madracis decactis</i>	Ten-ray star coral
<i>Madracis mirabilis</i>	Yellow pencil
<i>Acropora palmata</i>	Elkhorn coral
<i>Acropora cervicornis</i>	Staghorn coral
<i>Acropora prolifera</i>	Fused staghorn
<i>Agaricia agaricites</i>	Lettuce leaf coral
<i>Agaricia fragilis</i>	Fragile saucer
<i>Agaricia tenuifolia</i>	Thin leaf lettuce
<i>Agaricia lamarcki</i>	Lamarck's sheet
<i>Leptoseris cucullata</i>	Sunray lettuce
<i>Siderastrea siderea</i>	Massive starlet
<i>Siderastrea radians</i>	Lesser starlet
<i>Porites astreoides</i>	Mustard hill coral
<i>Porites porites</i>	Finger coral
<i>Porites branneri</i>	Blue crust coral
<i>Porites divaricata</i>	Small finger coral
<i>Favia fragum</i>	Golfball coral
<i>Diploria clivosa</i>	Knobby brain coral
<i>Diploria strigosa</i>	Symmetrical brain
<i>Diploria labyrinthiformis</i>	Grooved brain
<i>Manicina areolata</i>	Rose coral
<i>Manicina mayori</i>	Tortugas rose coral
<i>Colpophyllia natans</i>	Boulder coral
<i>Cladocora arbuscula</i>	Tube coral
<i>Montastrea annularis</i>	Boulder star coral
<i>Montastrea cavernosa</i>	Great star coral
<i>Solenastrea bournoni</i>	Smooth star coral
<i>Phyllangia americana</i>	Hidden cup coral
<i>Astrangia solitaria</i>	Dwarf cup coral
<i>Meandrina meandrites</i>	Maze coral
<i>Dichocoenia stokesi</i>	Elliptical star
<i>Dichocoenia stellaris</i>	Pancake star
<i>Dendrogyra cylindrus</i>	Pillar coral

Scientific name of species or species group	Common name
<i>Mussa angulosa</i>	Large flower coral
<i>Scolymia lacera</i>	Solitary disk
<i>Scolymia cubensis</i>	Artichoke coral
<i>Isophyllia sinuosa</i>	Sinuous cactus
<i>Isophyllastrea rigida</i>	Rough star coral
<i>Mycetophyllum lamarckiana</i>	Fungus coral
<i>Mycetophyllum aliciae</i>	Thin fungus coral
<i>Mycetophyllum danae</i>	Fat fungus coral
<i>Mycetophyllum ferox</i>	Grooved fungus
<i>Eusmilia fastigiata</i>	Flower coral
<i>Tubastrea aurea</i>	Cup coral
<i>Oculina diffusa</i>	Ivory bush coral
<i>Thalassia testudinum</i>	Turtle grass
<i>Syringodium filiforme</i>	Manatee grass
<i>Halophilia spp.</i>	Sea vines
<i>Halodule wrightii</i>	Shoal grass
<i>Ruppia maritima</i>	Widgeon grass

Aquarium Trade Species in the Coral FMP

The following species are included for data collection purposes only

Scientific name of species or species group	Common name
<i>Niphates digitalis</i>	Pink vase sponge
<i>Niphates erecta</i>	Lavender rope sponge
<i>Aphimedon compressa</i>	Erect rope sponge
<i>Spinosa pollicifera</i>	
<i>Spinosa vaginalis</i>	
<i>Geodia neptuni</i>	Potato sponge
<i>Chondrilla nucula</i>	Chicken liver sponge
<i>Cynachirella alloclada</i>	
<i>Tethya crypta</i>	
<i>Myriaster spp.</i>	
<i>Haliclona spp.</i>	Finger sponge
<i>Condylactis gigantea</i>	Giant pink-tipped anemone
<i>Bartholomea annulata</i>	Corkscrew anemone
<i>Hereractis lucida</i>	Knobby anemone
<i>Aiptasia tagetes</i>	Pale anemone
<i>Lebrunia spp.</i>	Staghorn anemone
<i>Stichodactyla helianthus</i>	Sun anemone
<i>Zoanthus spp.</i>	Sea mat
<i>Ricordia florida</i>	Florida false coral
<i>Discosoma spp. (formally Rhodactis)</i>	False coral
<i>Cyphoma gibbosum</i>	Flamingo tongue
<i>Oliva reticularis</i>	Netted olive
<i>Tridachia crispata</i>	Lettuce sea slug
<i>Lima spp.</i>	Fileclams
<i>Lima scabra</i>	Rough fileclam
<i>Spondylus americanus</i>	Atlantic thorny oyster
<i>Octopus spp. (except the Common Octopus, O. vulgaris)</i>	Octopus
<i>Sabellastarte magnifica</i>	Magnificent duster
<i>Sabellastarte spp.</i>	Tube worms
<i>Spirobranchus giganteus</i>	Christmas tree worm
<i>Stenopus hispidus</i>	Banded shrimp
<i>Stenopus scutellatus</i>	Golden shrimp
<i>Lysmata spp.</i>	Peppermint shrimp
<i>Thor amboinensis</i>	Anemone shrimp
<i>Periclimenes spp.</i>	Cleaner shrimp
<i>Alpheus armatus</i>	Snapping shrimp
<i>Paguristes spp.</i>	Hermit crabs
<i>Paguristes cadenati</i>	Red reef hermit

Aquarium Trade Species in the Coral FMP
The following species are included for data collection purposes only

Scientific name of species or species group	Common name
<i>Mithrax spp.</i>	Clinging crabs
<i>Mithrax sculptus</i>	Green clinging
<i>Mithrax cinctimanus</i>	Banded clinging
<i>Stenorhynchus seticornis</i>	Yellowline arrow
<i>Percnon gibbesi</i>	Nimble spray crab
<i>Lysiosquilla spp.</i>	
<i>Gonodactylus spp.</i>	
<i>Oreaster reticulatus</i>	Cushion sea star
<i>Linckia guildingii</i>	Common comet star
<i>Ophidiaster guildingii</i>	Comet star
<i>Astropecten spp.</i>	Sand stars
<i>Ophiocoma spp.</i>	Brittlestars
<i>Ophioderma spp.</i>	Brittlestars
<i>Ophioderma rubicundum</i>	Ruby brittlestar
<i>Astrophyton muricatum</i>	Giant basket star
<i>Davidaster spp.</i>	Crinoids
<i>Nemaster spp.</i>	Crinoids
<i>Analcidometra armata</i>	Swimming crinoid
<i>Diadema antillarum</i>	Long-spined urchin
<i>Echinometra spp.</i>	Purple urchin
<i>Lytechinus spp.</i>	Pin cushion urchin
<i>Eucidaris tribuloides</i>	Pencil urchin
<i>Tripneustes ventricosus</i>	Sea egg
<i>Holothuria spp.</i>	Sea cucumbers

Table 9. Current and proposed FMUs for various species of Caribbean reef fish and for Queen Conch F (FR 2005, NOAA and CFMC 2010).

Complex	Current	Proposed
Snapper Unit 1	Silk Black Blackfin Vermilion	Silk Black Blackfin Vermilion Wenchman (<i>Pristipomoides aquilonaris</i>)
Snapper Unit 2	Queen Wenchman	Queen Cardinal (<i>Pristipomoides macrophthalmus</i>)
Snapper Unit 3	Gray Lane Mutton Dog Schoolmaster Mahogany	No changes
Snapper Unit 4	Yellowtail	No change
Grouper Unit 1	Nassau	No change
Grouper Unit 2	Goliath	No change
Grouper Unit 3	Red hind Coney Rock hind Graysby Creole-fish	Remove creole-fish and move it to a monitoring only category.
Grouper Unit 4	Yellowfin Red Tiger Yellowedge Misty	Yellowfin Red Tiger Black
Grouper Unit 5		Yellowedge Misty
Parrotfish	Blue Midnight Princess Queen Rainbow Redfin Redtail Stoplight Redband Striped	Princess Queen Redfin Redtail Stoplight Redband Striped
Parrotfish Unit 2		Blue Midnight Rainbow
Queen Conch	Queen conch Milk conch West Indian Fighting Conch Roostertail Conch	Queen conch

Complex	Current	Proposed
	Hawkwing Conch True Tulip Atlantic Triton's Trumpet Cameo Helmet Green Star Shell	

Table 10. Status of US Caribbean species that have been assessed.

SPECIES	STATUS	REFERENCE
Nassau grouper	Undergoing overfishing	CFMC and NOAA 2009
Caribbean spiny lobster	Unknown, data insufficient	SEFSC 2005
Caribbean yellowtail snapper	Unknown; data insufficient	SEFSC 2005
Yellowfin grouper	Undergoing overfishing/ Stock not rebuilt but stock assessment results were inconclusive.	SEFSC 2007a
Mutton snapper	Not overfished and not undergoing overfishing Insufficient information for stock assessment analysis	CFMC 2005 in SEFSC 2007b SEFSC 2007b
Queen conch	Overfished and undergoing overfishing	SEFSC 2007c, NOAA and CFMC 2010

Table 11. Reef fishes showing ontogenetic migration from shallow water tropical habitats to reefs (R): inshore seagrass (Sg), mangrove (Mg), algal plains (Al), rubble (Rb), patch reefs (Pr), rocky shorelines (Rs), mangrove channels (Ch). Original source: Appeldoorn, cited in EFH-FEIS (CFMC 2004), updated by Kojis (pers. comm.) and Mateo (pers comm).

Species	Common Name	Settlement/ Juvenile Habitat	Adult Habitat	Juvenile Habitat Dependency	References
<i>Acanthurus bahianus</i>	Surgeonfish	Al,Rb,Pr	R		8,13,14,15,16
<i>Acanthurus chirurgus</i>	Doctorfish	Al,Rb,Pr,Mg/Sg	R	Opportunistic Mg/Sg	1,6,8,9,10,13,14,15,16
<i>Chaetodon capistratus</i>	Four-eye butterflyfish	Al,Rb,Pr,Mg	R	Not Mg	1,9,10,13,14,15,16
<i>Epinephelus striatus</i>	Nassau grouper	sh Algae	R		3
<i>Gerres cinereus</i>	Yellowfin mojarra	Mg	Mg/Ch/R	Possible Mg	9,13
<i>Haemulon flavolineatum</i>	French grunt	Al,Rb,Pr,Sg/Mg/R	R	Opportunistic Sg/Mg	1,5,6,7,8,9,10,11,13,14,15,16
<i>Haemulon parra</i>	Sailors choice	Mg	R	Opportunistic	5,10
<i>Haemulon plumieri</i>	White grunt	Al,Rb,Pr,Sg(Mg)	R	Opportunistic	4,5,6,9,11,13,14,15,16
<i>Haemulon sciurus</i>	Bluestriped grunt	Sg to Mg	R	Sg/Mg	5,6,7,9,10,11,13
<i>Haemulon aurolineatum</i>	Tomtate	R			18
<i>Lutjanus analis</i>	Mutton snapper	Mg/Sg	R	Possible Sg/Mg	5,9,11,13,14,15,16
<i>Lutjanus apodus</i>	Schoolmaster	Mg/Sg	R	Mg/Sg	1,2,5,6,8,9,10,11,13,14,15,16,17
<i>Lutjanus griseus</i>	Gray snapper	Mg/Ch	R	Possible Mg/Sg	1,5,8,9,10,11,13,14,15,16
<i>Lutjanus jocu</i>	Dog snapper	Mg	R	Possible Mg/Sg	5,11
<i>Lutjanus mahogoni</i>	Mahogany snapper	Al,Rb,Pr,Mg, Rs	R		5,9,10,11,13,14,15,16
<i>Lutjanus synagris</i>	Lane snapper	Sg, Rs	R	Estuarine Opportunistic	5,14
<i>Ocyurus chrysurus</i>	Yellowtail snapper	Al,Rb,Pr,Mg,Sg,Ch	R	Mg/Sg	5,6,8,9,10,11,12,13,14,15,16
<i>Scarus coeruleus</i>	Blue parrotfish	Sg/Ch, Rs	R	Possible Sg	9,14,15,16
<i>Scarus guacamaia</i>	Rainbow parrotfish	Mg, Rs	R	Possible Mg	9,10,13,
<i>Scarus croicensis</i>	Striped parrotfish	Al,Rb,Pr,Sg/Ch, Rs	R		8,9,10,13,14,15,16
<i>Scarus taeniopterus</i>	Princess parrotfish	Al,Rb,Pr,Mg/Sg, Rs	R		8,14,15,16
<i>Sparisoma rubripinne/</i> <i>chrysopterum</i>	Yellowtail/redtail parrotfish	Pr,Mg/Ch, Rs	Ch/R	Not Mg/Sg	6,9,10,13,16
<i>Sparisoma viride</i>	Stoplight parrotfish	Pr, Rb, Mg, Rs	R		13,14,15,16
<i>Sphyraena barracuda</i>	Great barracuda	Mg	R	Possible Mg	1,6,9,10,13,

Table 11. (Cont.)

Literature Sources:	
1	Dennis (1992)
2	Rooker (1995)
3	Egginton (1995)
4	Appeldoorn <i>et al.</i> (1997)
5	Lindeman (1997a)
6	Murphy (2001)
7	Recksiek <i>et al.</i> (2001)
8	Cocheret <i>et al.</i> (2002)
9	Nagelkerken <i>et al.</i> (2002)
10	Nagelkerken and van der Velde (2002)
11	Appeldoorn <i>et al.</i> (2003)
12	Christensen <i>et al.</i> (2003)
13	Nagelkerken and van der Velde (2003)
14	Mateo and Tobias (2001)
15	Mateo and Tobias (2004)
16	Adams and Ebersole (2001)
17	Mateo <i>et al</i> (2010)

Table 12. NCCOS-Biogeography projects in the U.S. Caribbean. Source:
http://ccma.nos.noaa.gov/about/biogeography/proj_region.aspx

CARIBBEAN	
<u>Benthic Habitat Mapping off Southwest Puerto Rico</u>	New, FY11
<u>Survey and Impact Assessment of Derelict Fish Traps (DFTs) in St. Thomas and St. John, U.S. Virgin Islands</u>	Ongoing
<u>National Fish Habitat Action Plan (NFHAP) Coastal Assessment: Developing a Spatial Framework and Indicator Dataset</u>	Ongoing
<u>Benthic Habitat Mapping for National Park Service, St. Croix</u>	Ongoing
<u>GAP Analysis of Geospatial National Park Service Data</u>	Ongoing
<u>Caribbean Coral Reef Ecosystem Monitoring Project</u>	Ongoing
<u>Baseline Assessment of Guanica Bay, Puerto Rico in Support of Watershed Restoration</u>	Ongoing
<u>National Inventory of Deep Coral Distribution and Development of GIS</u>	Ongoing
<u>Seafloor Characterization of the U.S. Caribbean</u>	Ongoing
<u>Comprehensive U.S. Caribbean Coral Reef Ecosystem Monitoring Project</u>	Ongoing
<u>Conservation Effects Assessment Project (CEAP):- Jobos Bay, Puerto Rico - Special Emphasis Watershed Partnership</u>	Ongoing

<u>Acoustic Tracking of Fish Movements in Coral Reef Ecosystems</u>	Ongoing
<u>Ecological Characterization of the Marine Resources of Vieques, Puerto Rico</u>	Completed, 2010
<u>Biogeographic Characterization of Essential Fish Habitats Affected by Human Activities in the Coastal Zone of Puerto Rico</u>	Completed, 2010
<u>Benthic Habitat Mapping of St. John, USVI National Park and Virgin Islands Reef National Monument</u>	Completed, 2009
<u>National Coral Reef Ecosystem Monitoring Program - Coral Reef Ecosystem Monitoring Grants</u>	Completed, 2009
<u>Summit to Sea Characterization of Coastal Watersheds</u>	Completed, 2008
<u>Coral Reef Ecosystem Studies (CRES) - U.S. Caribbean Component</u>	Completed, 2008
<u>U.S. Caribbean Coral Bleaching Assessment</u>	Completed, 2008
<u>Development of Reef Fish Monitoring Protocols to Support National Park Service Inventory and Monitoring Program</u>	Completed, 2006
<u>Ecological Characterization of the Salt River Bay National Historical Park and Ecological Preserve</u>	Completed, 2005
<u>Benthic Habitat Mapping in Puerto Rico and the U.S. Virgin Islands</u>	Completed, 2002

Table 13. Summary of concerns about natural and anthropogenic pressures on coral reef ecosystems in the US Caribbean based on priorities of reef managers (Source: (Updated) Table 3.18 in EFH-FEIS, CFMC and NOAA 2004).

	Puerto Rico	U.S. Virgin Islands
Global warming and bleaching	H	H
Diseases	H	H
Tropical storms	L	H
Coastal development and runoff	H	H
Coastal pollution	H	H
Tourism and recreation	M	M
Trade in coral and live reef species	H	L
Ships, boats, and groundings	M	H
Marine debris	M	L
Alien species	L	L
Other physical impacts	H	L
Offshore oil and gas exploration	L	L

H= High concern; M= Medium concern; L= Little to no concern
Based on Turgeon et al. (2002)

FIGURES

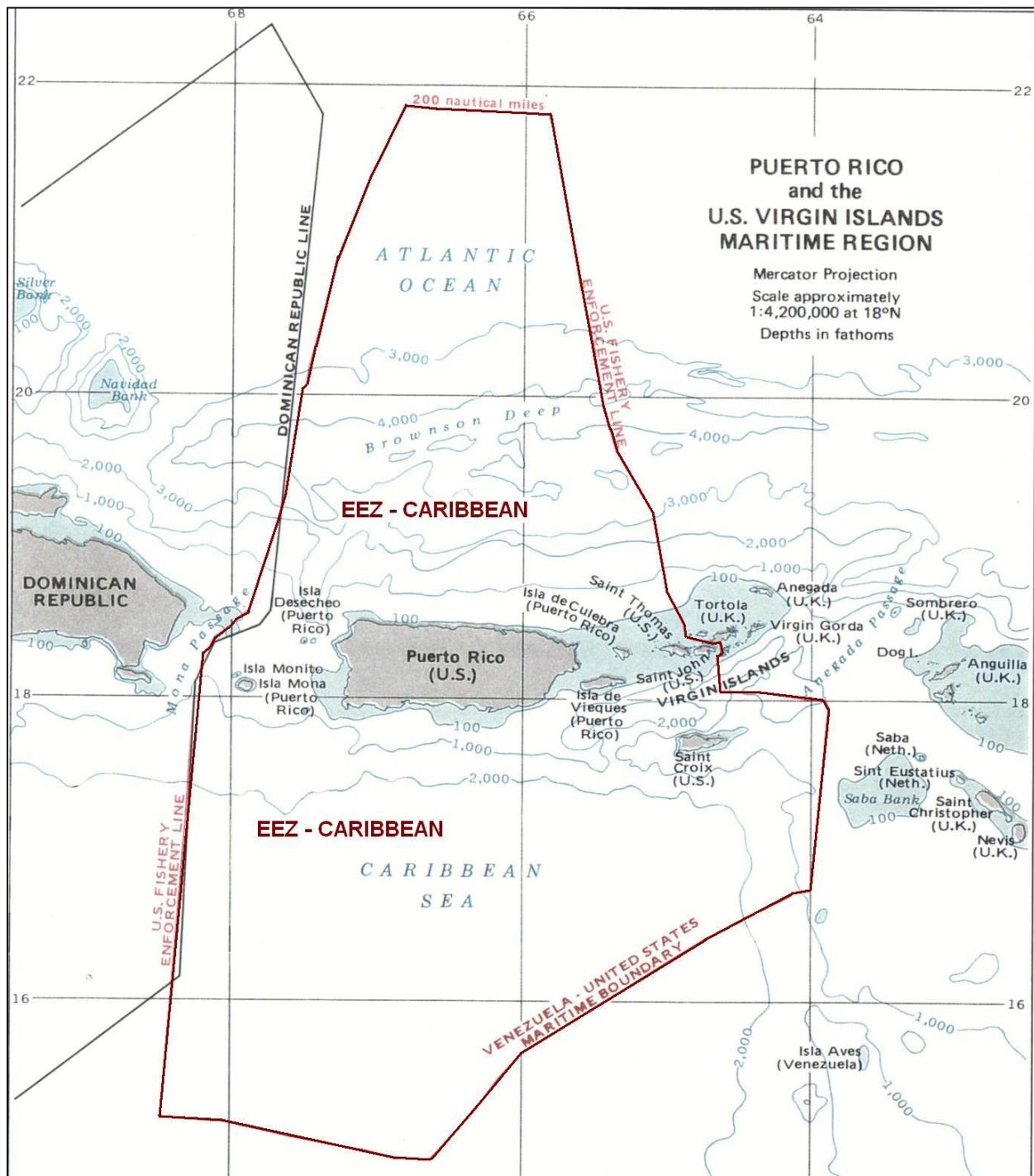


Figure 1. U.S. Caribbean Exclusive Economic Zone (EEZ). Source: NOAA, U.S. DOC (<http://www.caribbeanfmc.com/images/EEZ%20CARIBBEAN.JPG>)

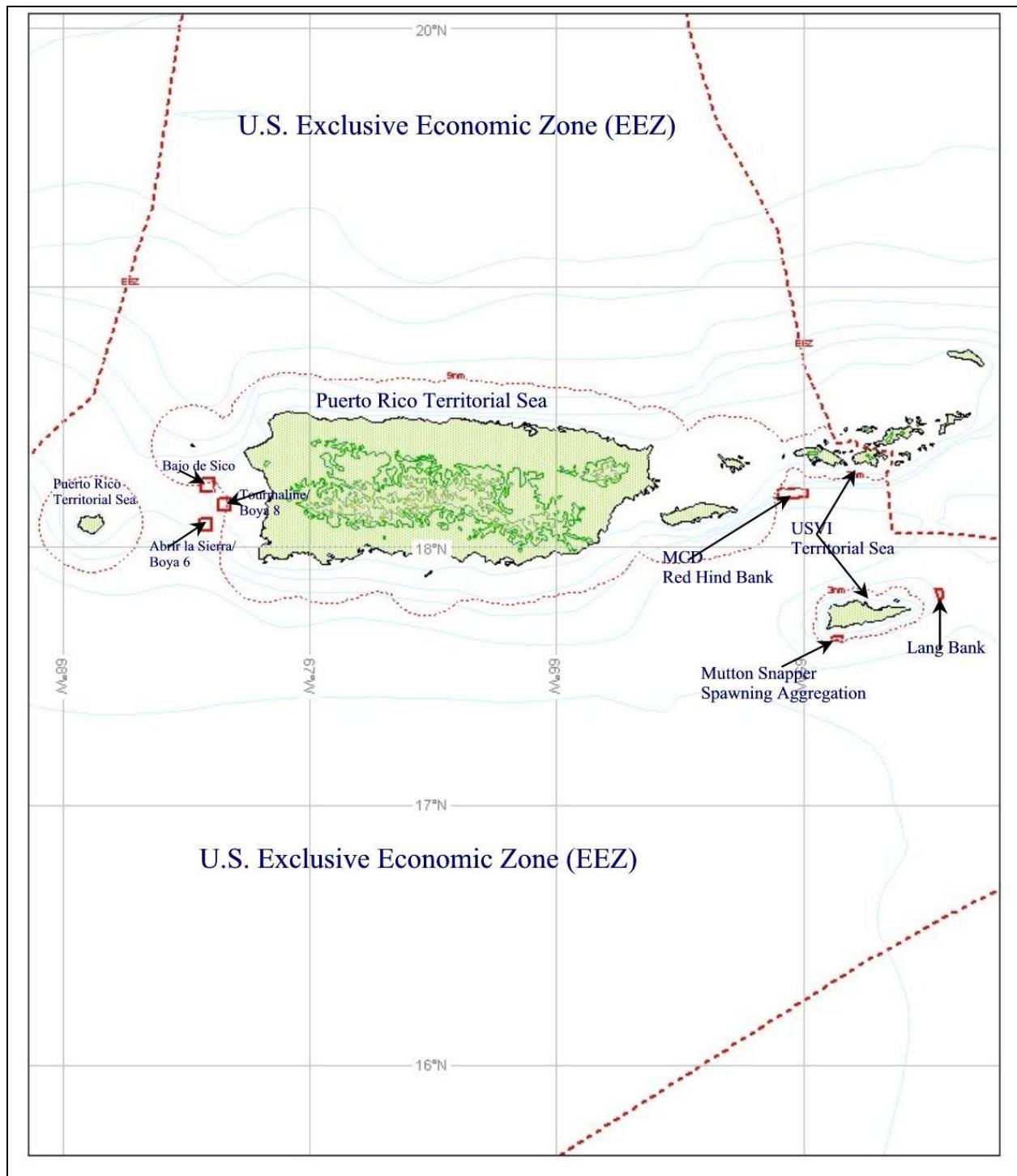


Figure 2. U.S. Caribbean EEZ and Territorial Seas of Puerto Rico and the U.S. Virgin Islands.
Source: Frederick Kyle, NMFS, Office of Law Enforcement (<http://www.caribbeanfmc.com/eez.htm>)



Figure 3. Spawning aggregation areas in the USVI; missing Grammanik Bank, St. Thomas.
Source: (<http://www.caribbeanfmc.com/images/USVI%20eez%20y%20territorial.jpg>)

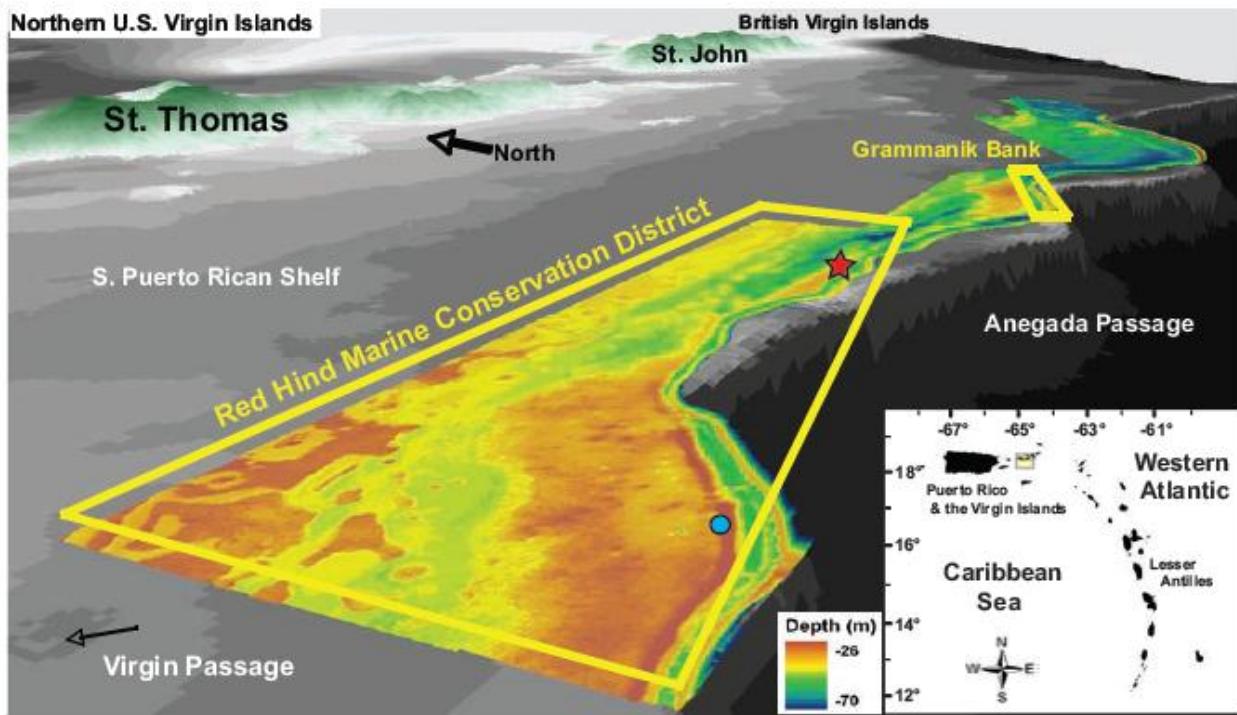


Figure 4. Side view of the southern Puerto Rican Shelf, U.S. Virgin Islands, looking east, northeast. The outer shelf contains two mesophotic coral ecosystem MPAs, the Grammanik Bank and the Hind Bank Marine Conservation District (MCD). Sources: MCD data from (Rivera et al. 2006) and NOAA CCMA (http://ccma.nos.noaa.gov/products/biogeography/usvi_nps/overview.html); Map from: (http://www.uvi.edu/sites/uvi/Documents/Research%20and%20Public%20Service/CMES/uvi_cmephotic_description.pdf)

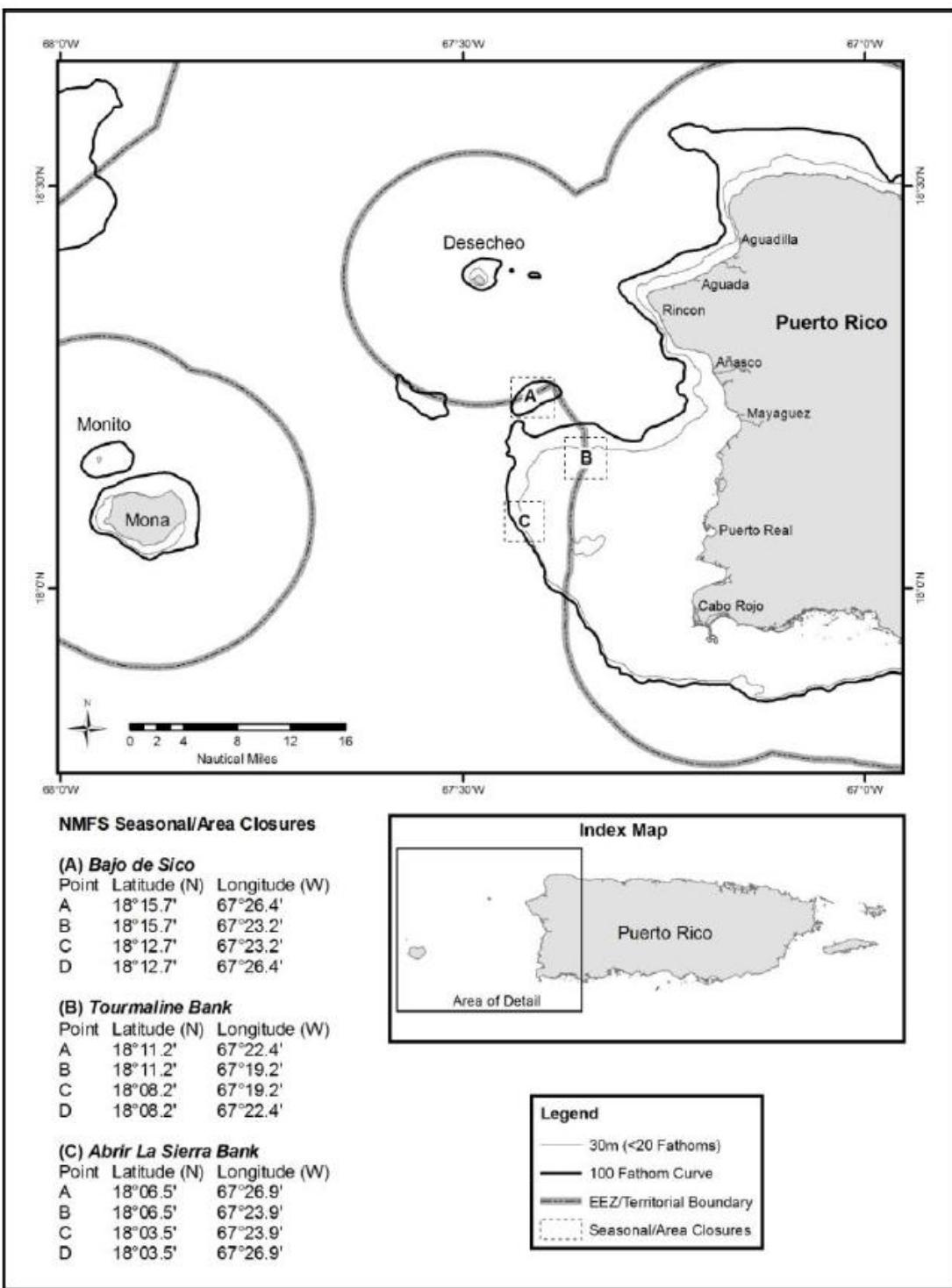


Figure 5. Bajo de Sico in relation to Puerto Rico and other seasonally closed areas (Source: Bajo de Sico FAQs, CFMC, 2010).

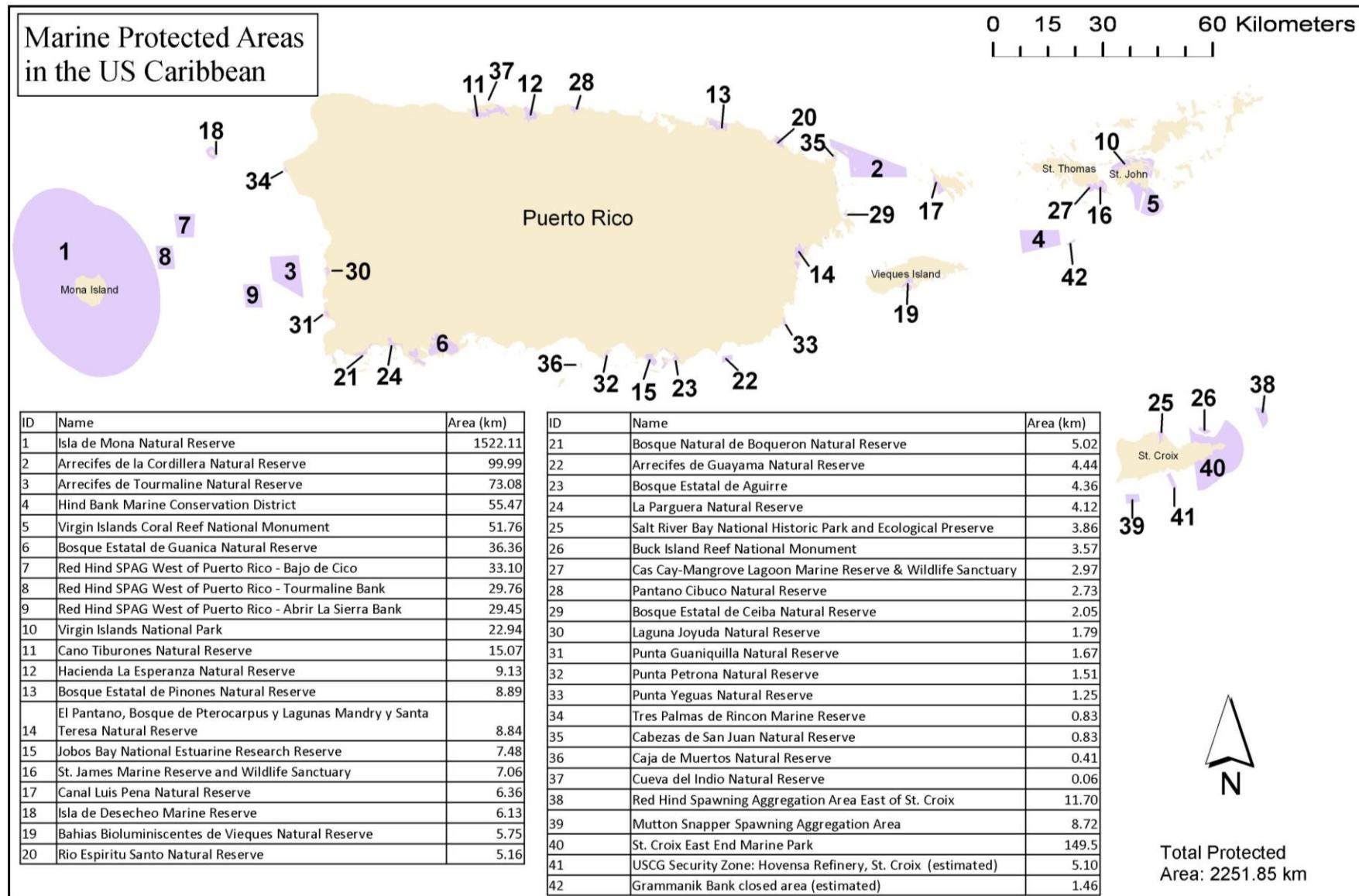


Figure 6. Territorial, state, federal (USFWS, USCG) and EEZ Marine Protected Areas in the U.S. Caribbean. (Source: CFMC and NOAA 2010). Note: Buck Island Reef (26) was expanded, this figure only shows the original monument. Sandy Point Leatherback reserve has an offshore component to protect leatherback turtles (B.Kojis, pers. comm.).

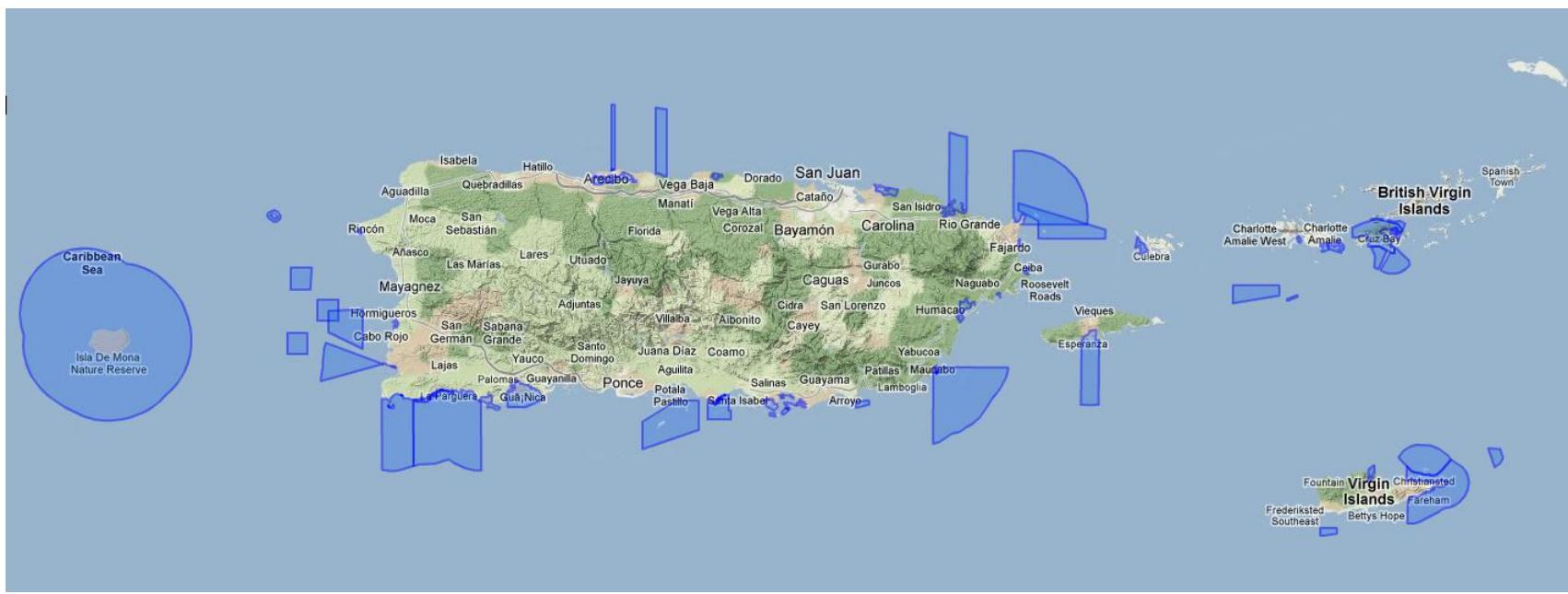


Figure 7. MPAs of the U.S. Caribbean, map created with MPA Viewer (Source: <http://www.mpa.gov/dataanalysis/mpainventory/mpaviewer/>).

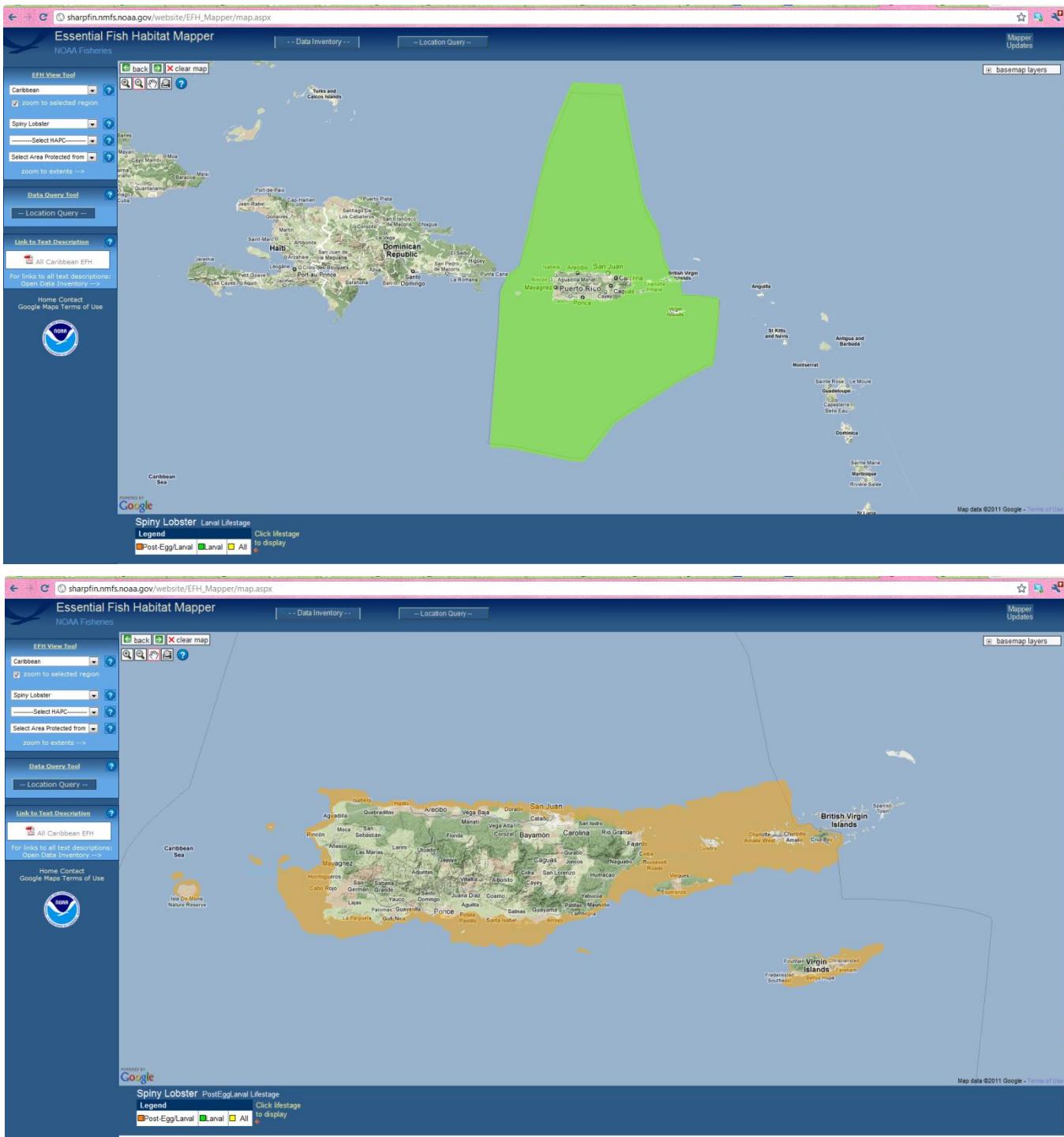


Figure 8. EFH designation for Spiny Lobster larval (upper panel) and postlarval stages (bottom panel). Maps created with NMFS-EFH Mapper online tool (http://sharpfin.nmfs.noaa.gov/website/EFH_Mapper/map.aspx).

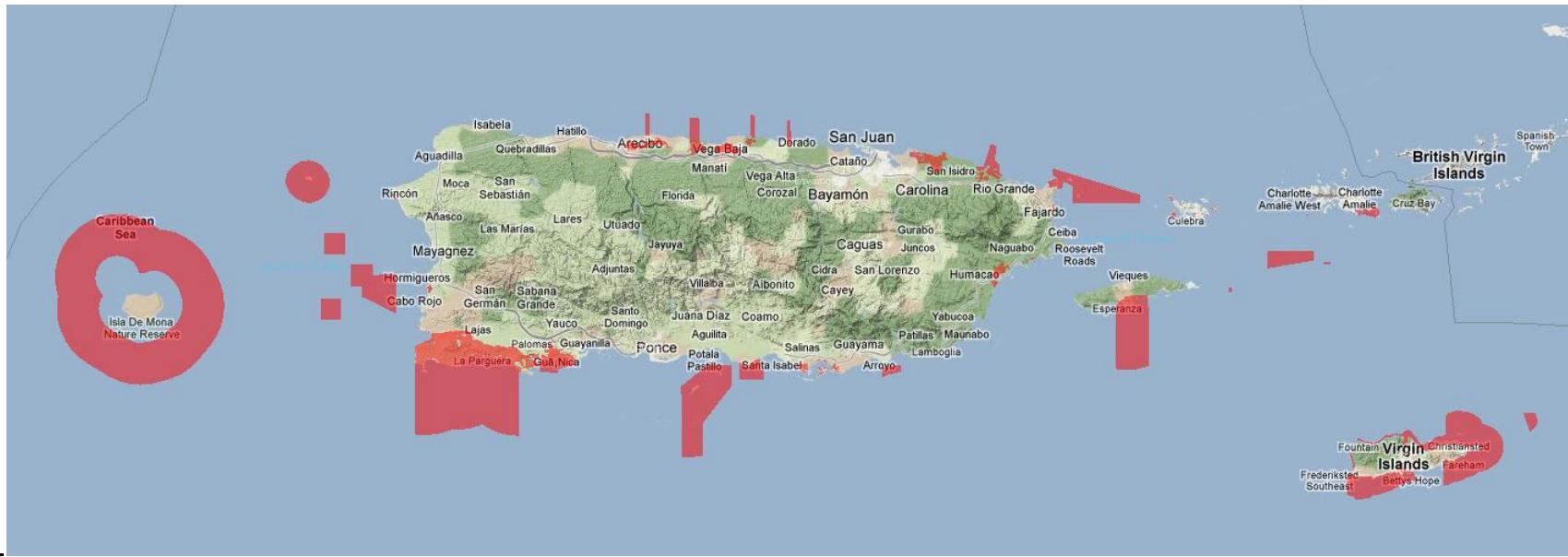


Figure 9. U.S. Habitat Areas of Particular Concern (HAPC) in the U.S. Caribbean. Source: NOAA-EFH Mapper
http://sharpfin.nmfs.noaa.gov/website/EFH_Mapper/map.aspx

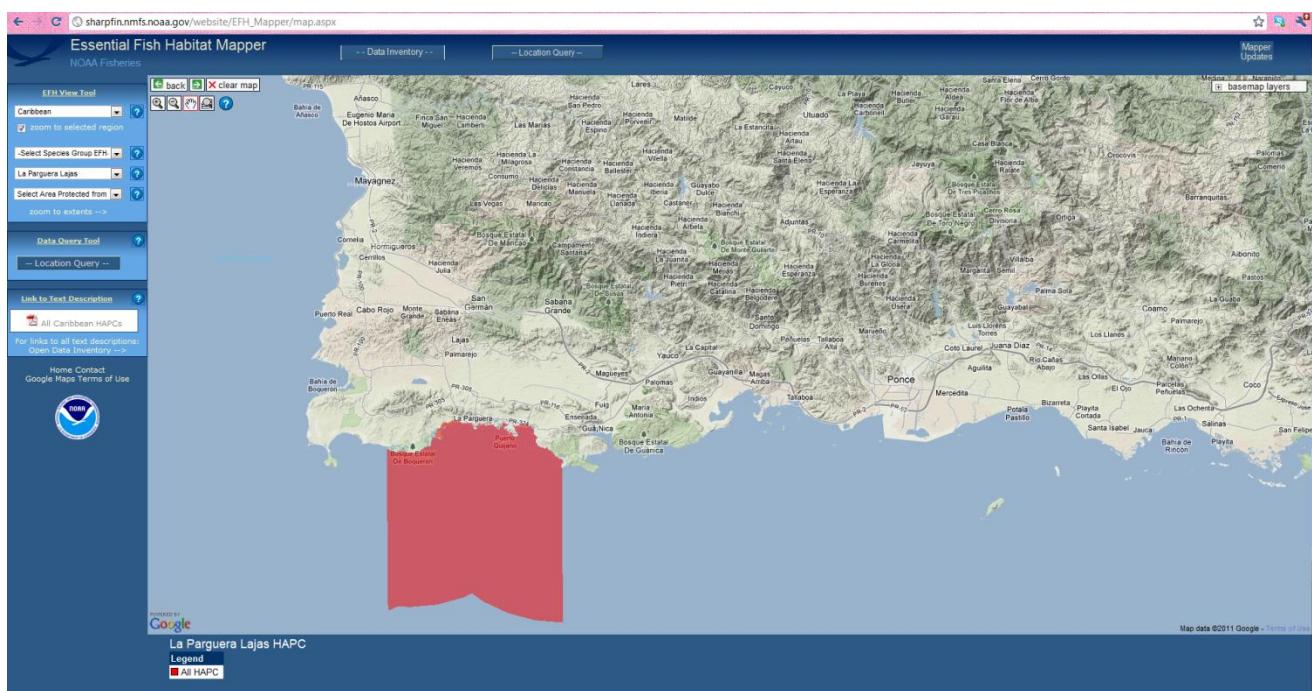
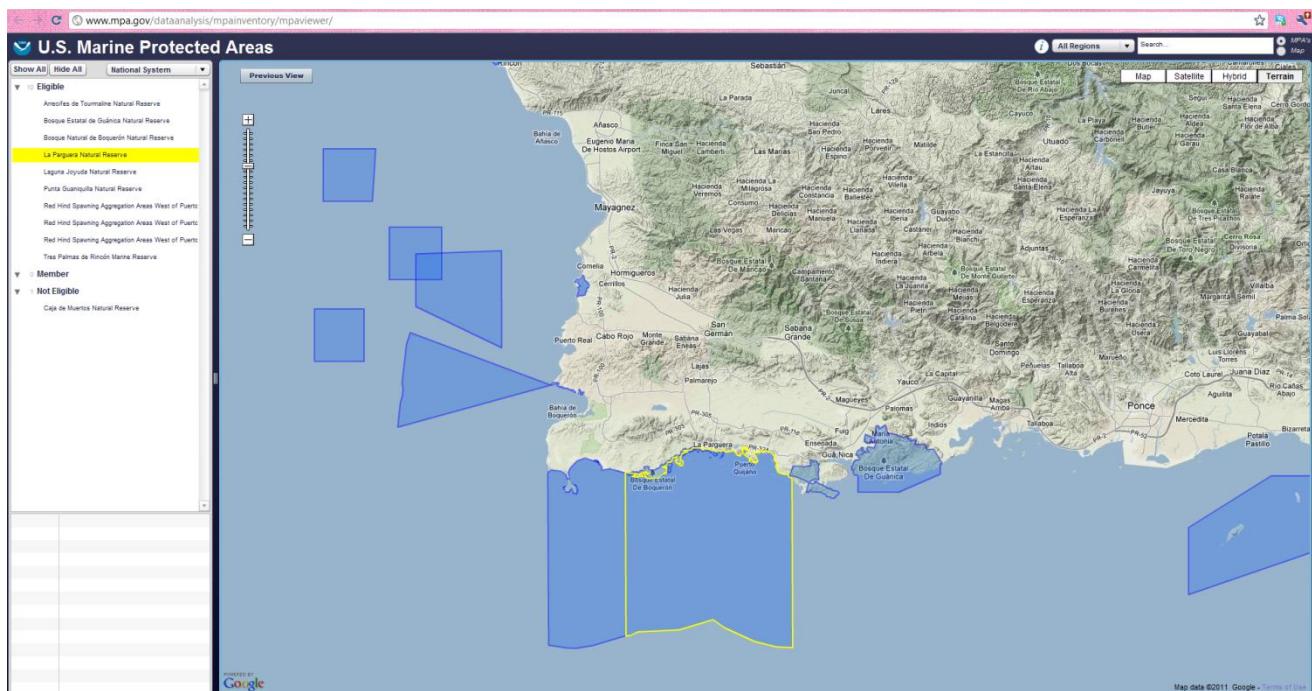


Figure 10. La Parguera Natural Reserve (created with MPA Viewer, upper panel) and La Parguera Lajas HAPC (created with EFH Mapper, bottom panel). (Sources: <http://www.mpa.gov/dataanalysis/mpainventory/mpaviewer/> and http://sharpfin.nmfs.noaa.gov/website/EFH_Mapper/map.aspx).

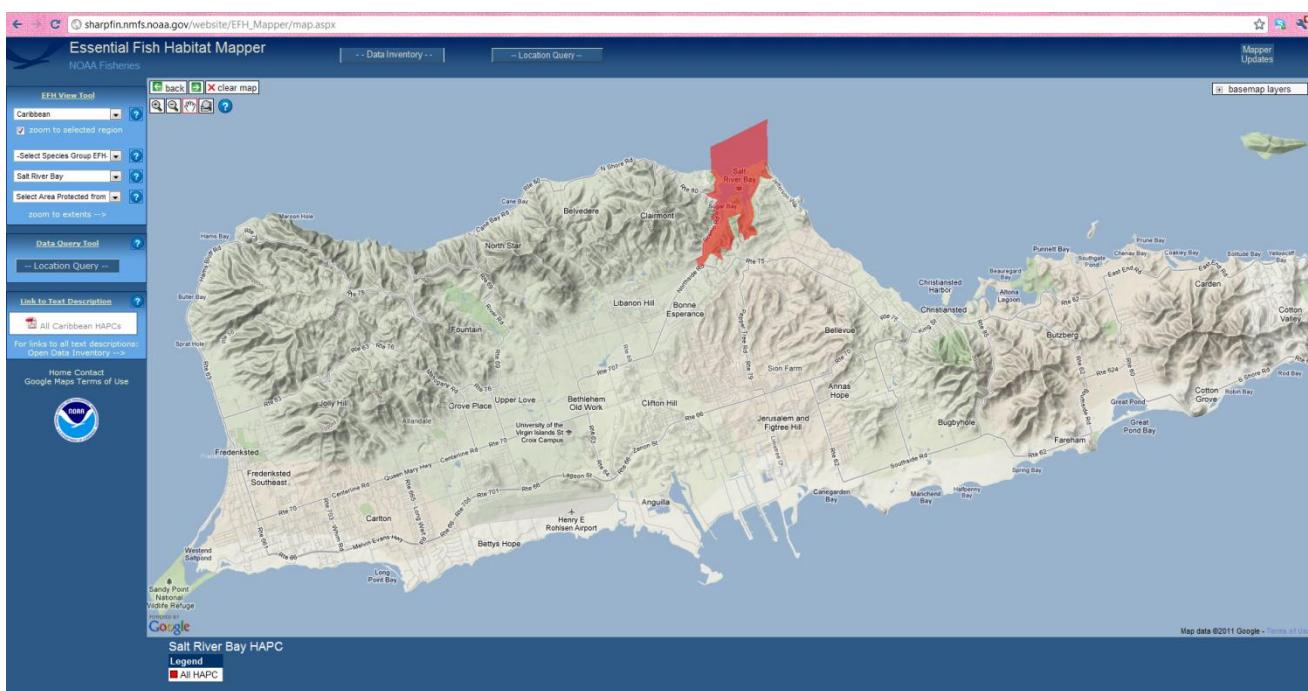
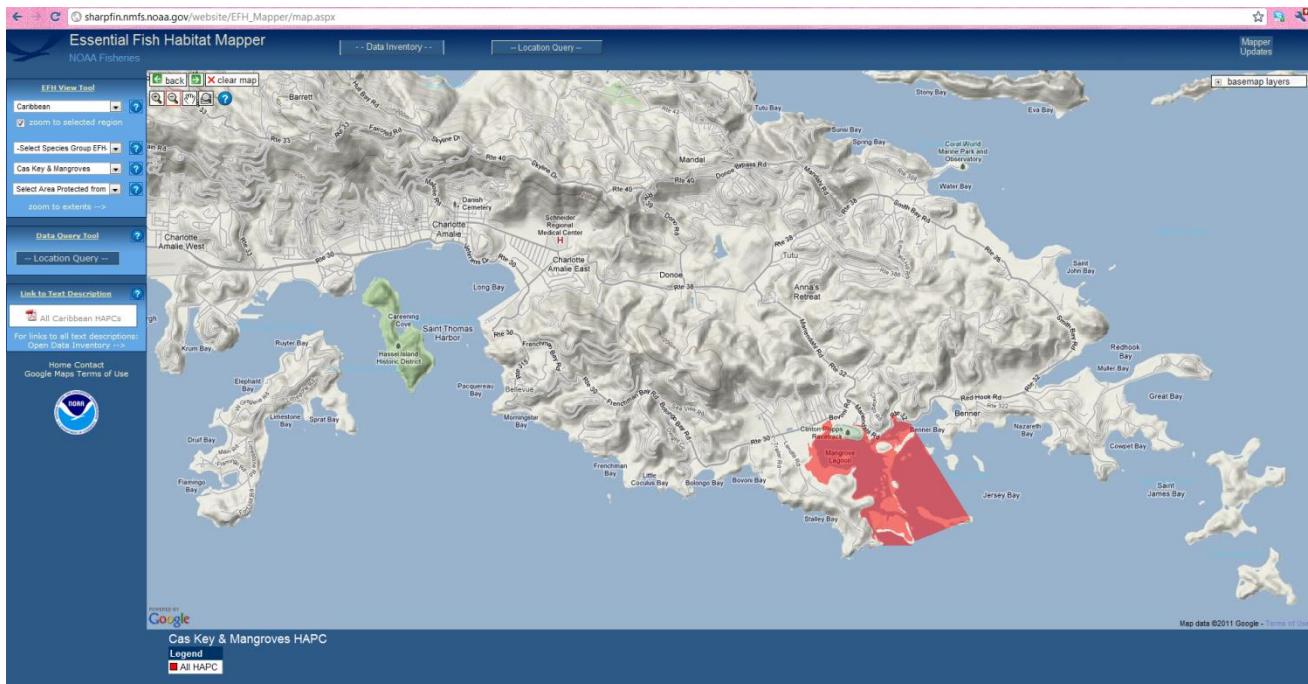
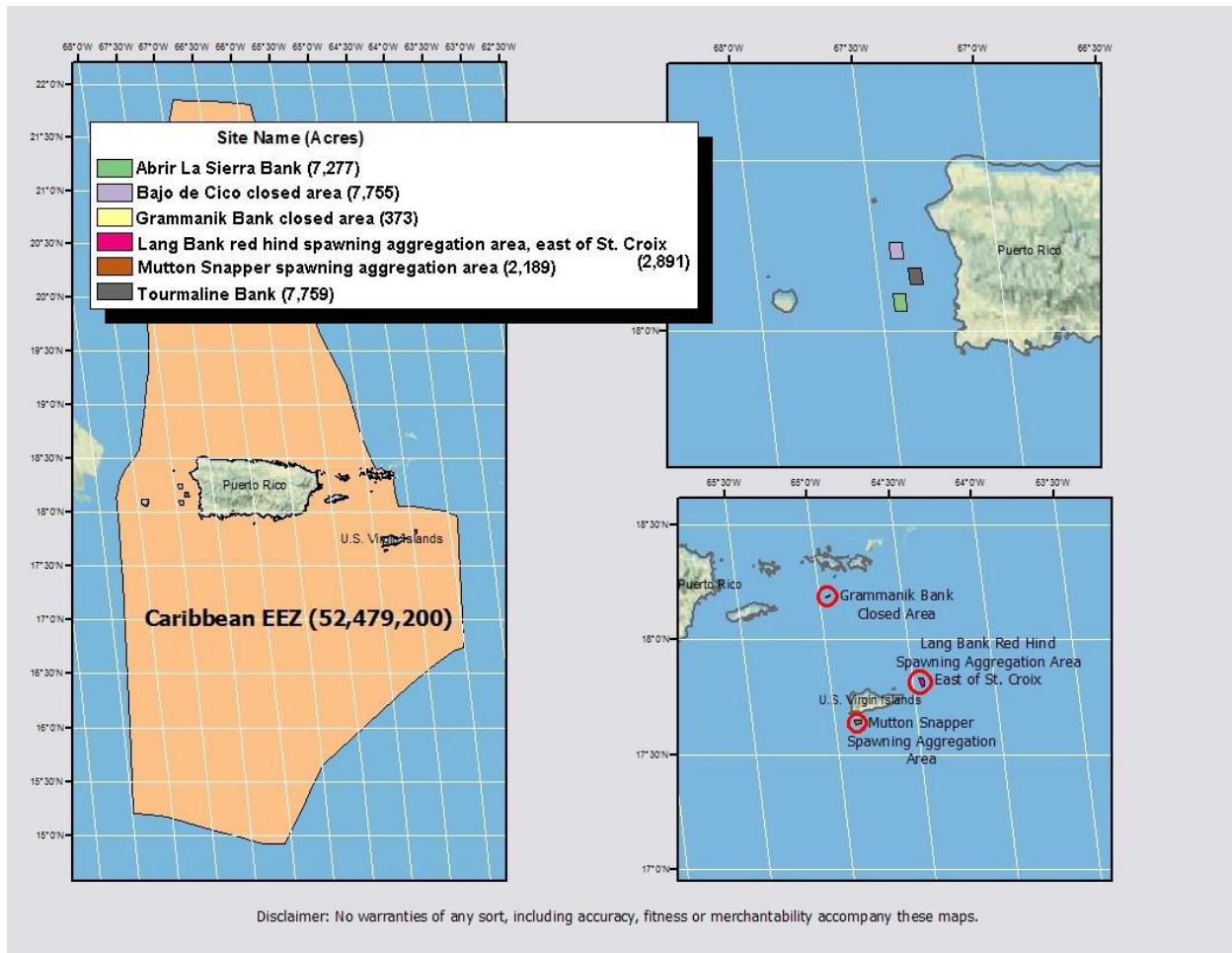


Figure 11. Cas Cay and Mangrove Lagoon (SE St. Thomas) and Salt River Bay (St. Croix). Source: EFH Mapper (http://sharpfin.nmfs.noaa.gov/website/EFH_Mapper/map.aspx).



Site Name	GIS Area (Acres)	50 CFR	Regs published
1 Caribbean EEZ gear restrictions	52,479,200	CFR 622.6 (b)(1)(ii)(A); 622.41 (b)	10/28/2005
2 Abrir La Sierra Bank	7,277	CFR 622.33 (a)(2)(ii)(C)	10/28/2005
3 Bajo de Sico closed area	4,559	CFR 622.33 (a)(8)	11/02/2010
4 Grammanik Bank closed area	373	CFR 622.33 (a)(3)	10/28/2005
5 Lang Bank Red hind spawning aggregation area, east of St. Croix	2,891	CFR 622.33 (a)(2)(i)	10/28/2005
6 Mutton snapper spawning aggregation area	2,189	CFR 622.33 (a)(1)	10/28/2005
7 Tourmaline Bank	7,759	CFR 622.33 (a)(2)(ii)(B)	10/28/2005

Missing from Figure and Table is the MCD (Hind Bank) a no take zone with an area of 13, 560 acres (CFR 622.33(b)).

Figure 12. EFH areas protected from fishing impacts in the U.S. Caribbean (NOAA 2010). Source: http://sharpfin.nmfs.noaa.gov/website/EFH_mapper/docs/cfmc_datasheet.pdf

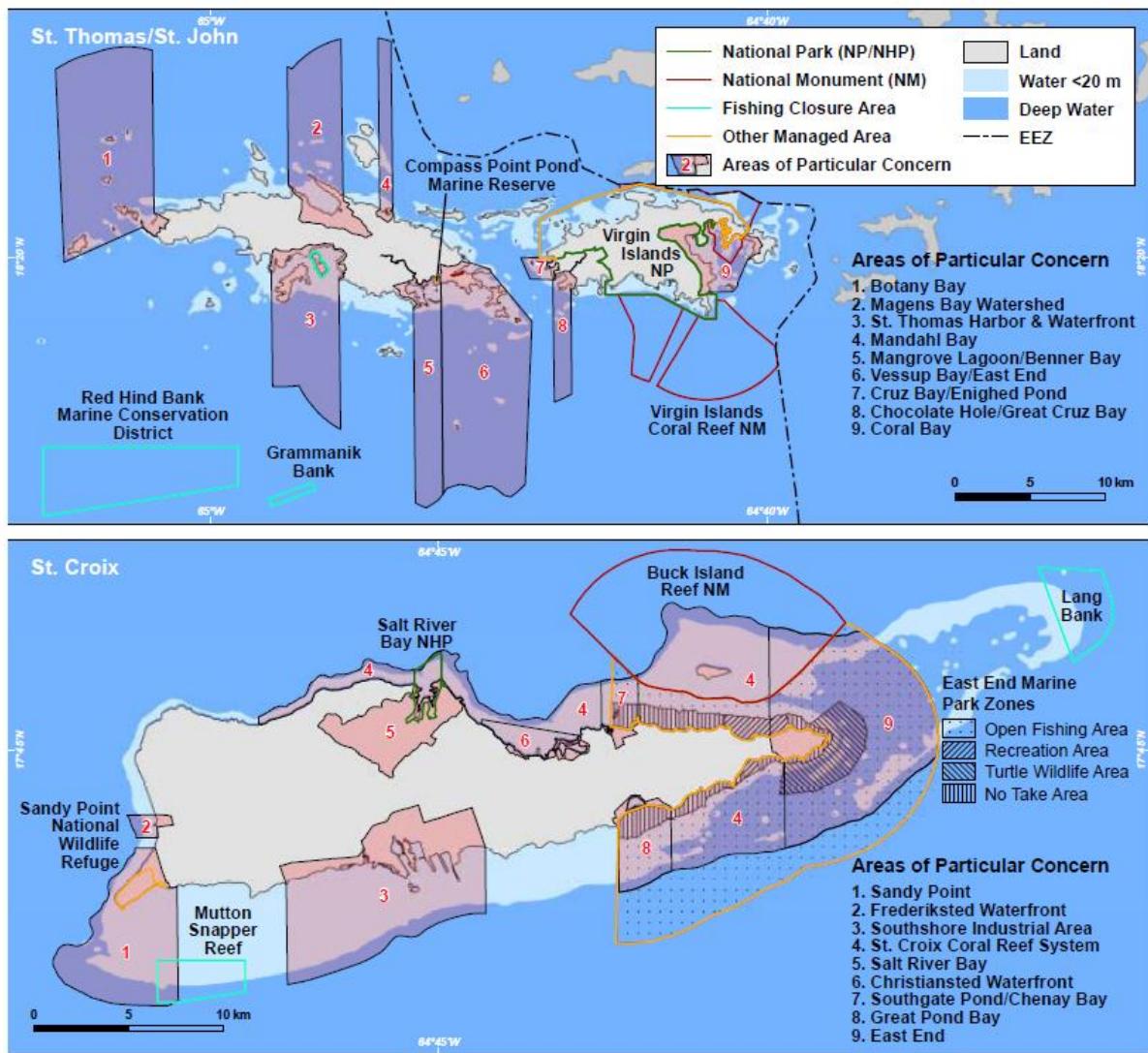


Figure 13. Map of USVI with managed areas (Source: Rothenberg *et al.* 2008). Note: the Mangrove Lagoon, Cas Cay, St. James, Marine Reserves on the east end of St. Thomas are not shown in the map (see Figure 11)..

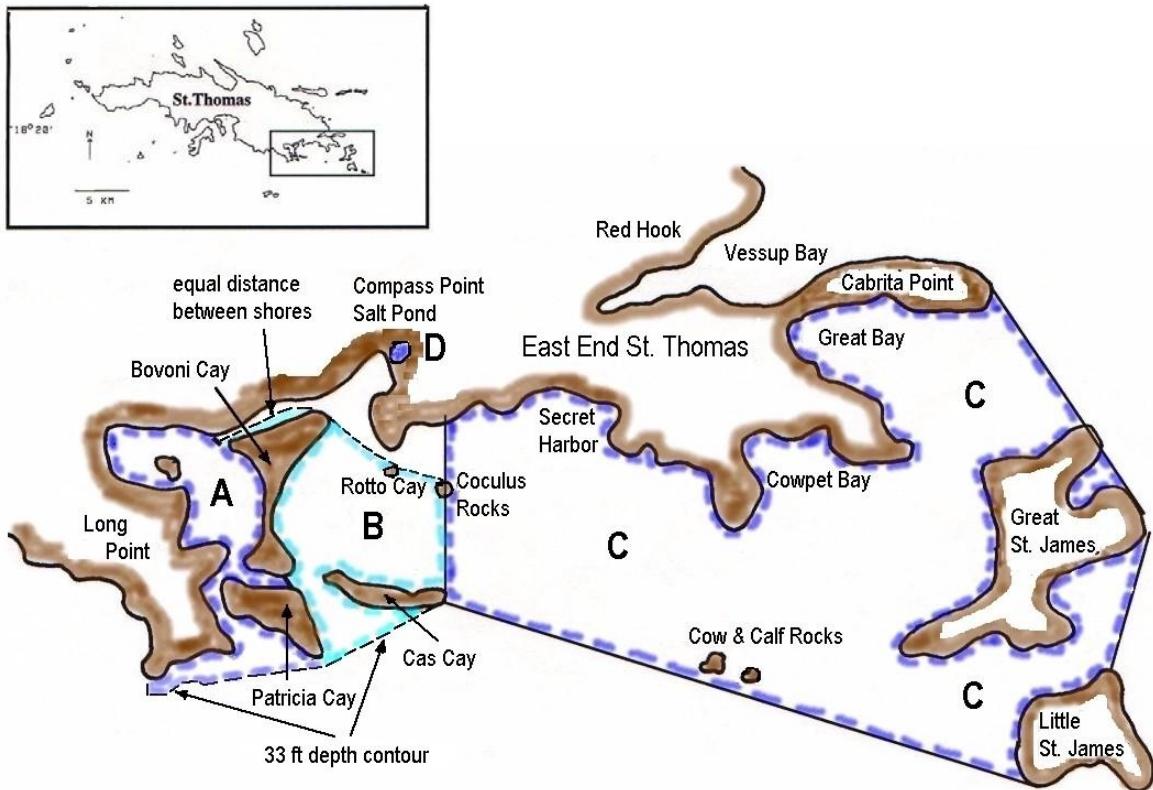


Figure 14. Managed areas in the Southeast end of St. Thomas: Cas Cay/Mangrove Lagoon, St. James and Compass Point Marine Reserves and Wildlife Sanctuaries. Source: (<http://fw.dprn.gov.vi/education/Brochures/MarineReserves2.pdf>)

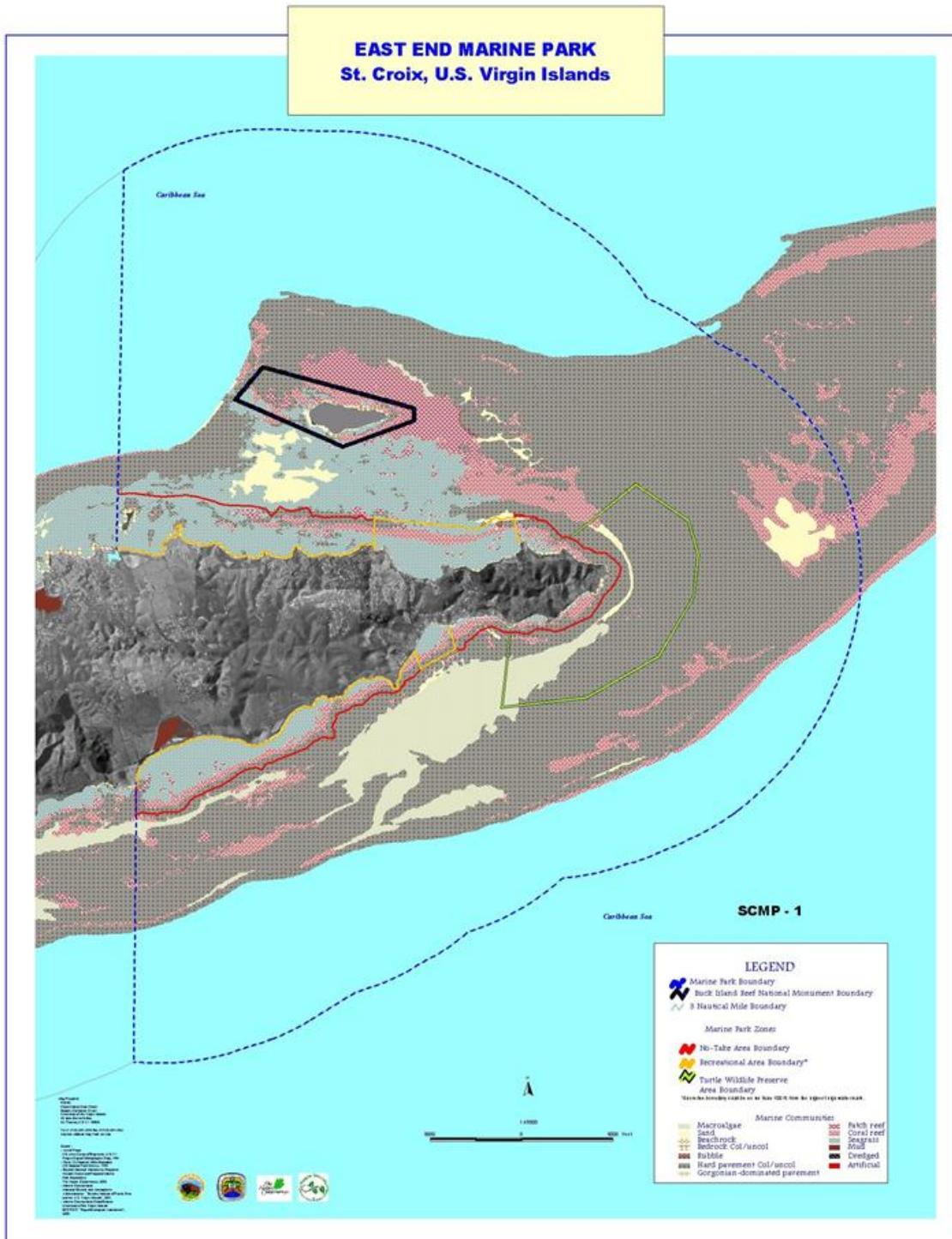


Figure 15. East End Marine Park, St. Croix USVI. Management Plan Area: Map of park zoning and gross benthic categories included in the St. Croix East End Marine Park Management Plan. Source: NOAA/NOS (2001) (http://www.stxeastendmarinepark.org/includes/map_3.htm)

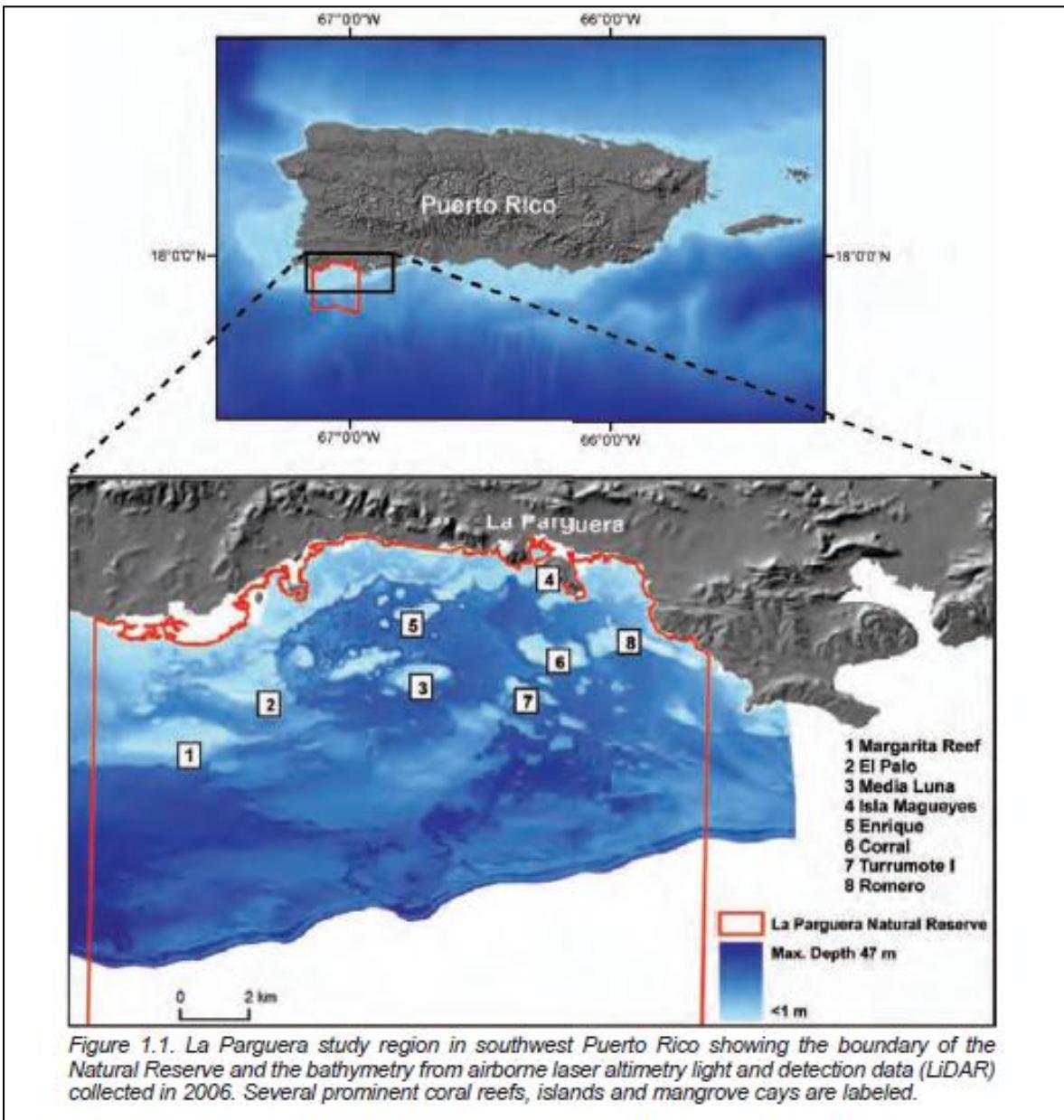


Figure 16. La Parguera study region. Source: Pittman et al. (2010).

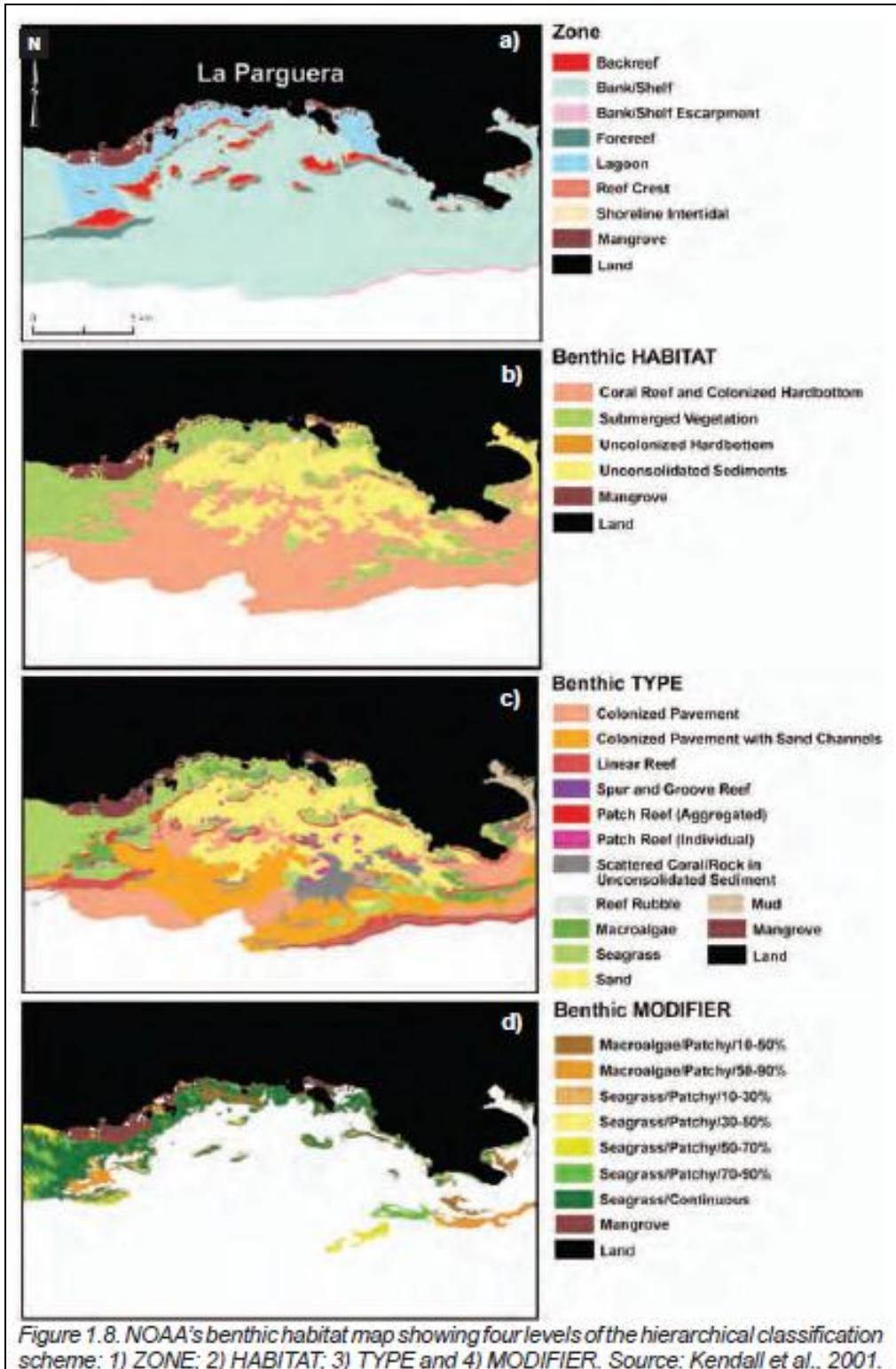


Figure 17. NOAA's benthic habitat map of La Parguera. Source: Kendall et al. (2001) in Pittman et al. (2010).

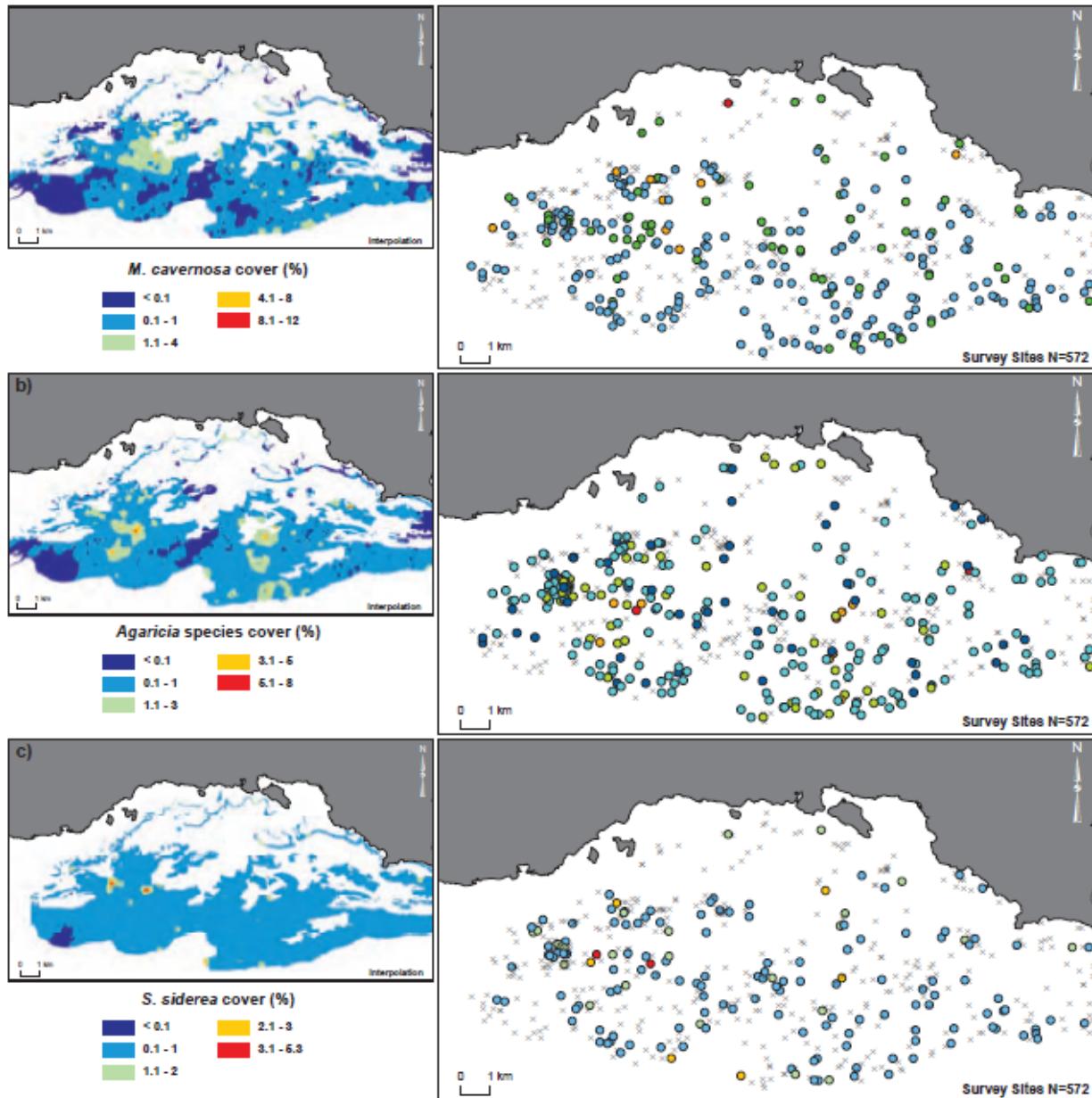


Figure 2.15. Maps of the interpolated (left map) and spatial (right map) distributions for live percent cover for coral species: (a) Montastraea cavernosa, (b) Agaricia species and (c) Siderastrea siderea.

Figure 18. Interpolated and spatial distributions for live percent cover for coral species in La Parguera, Source: Pittman et al. (2010).

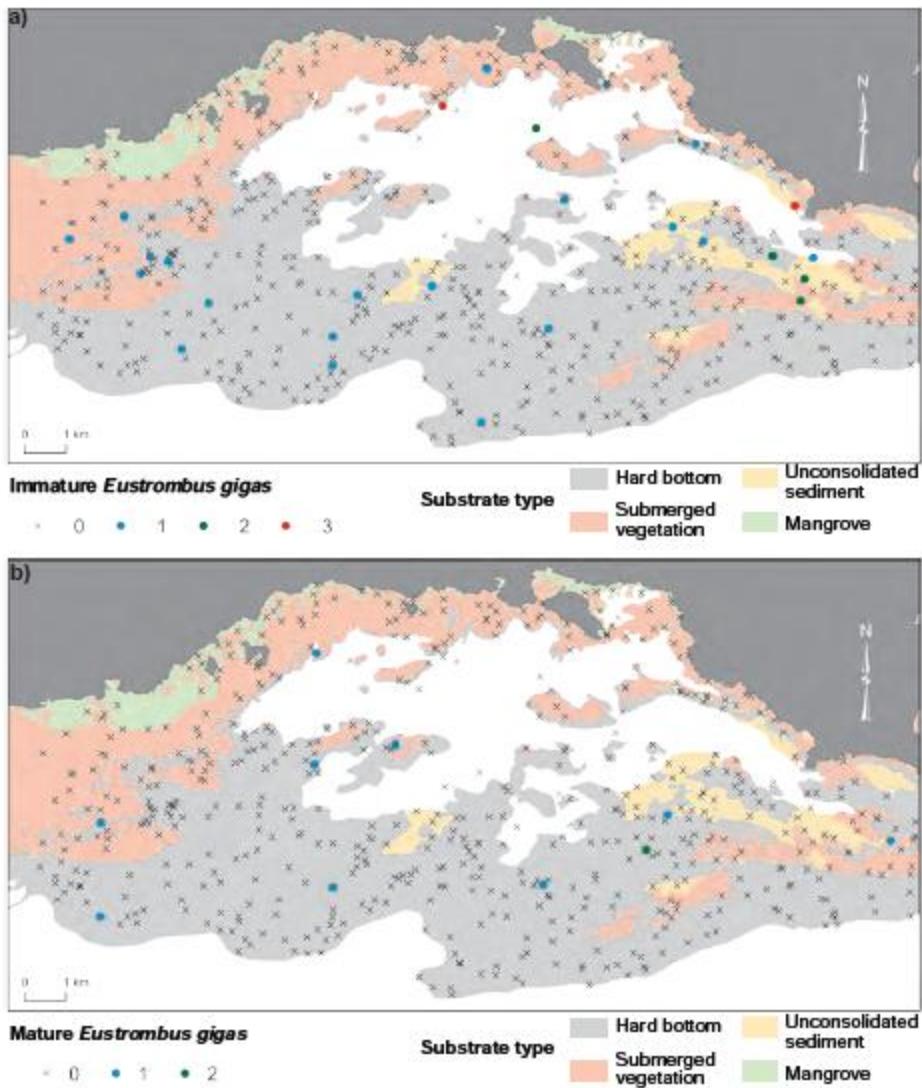


Figure 2.26. Distribution maps of a) immature and b) mature queen conch (*Eustrombus gigas*) in the southwest Puerto Rico study area.

Figure 19. Distribution of queen conch (*Strombus gigas*) in Southwest Puerto Rico. Source: Pittman et al. (2010).

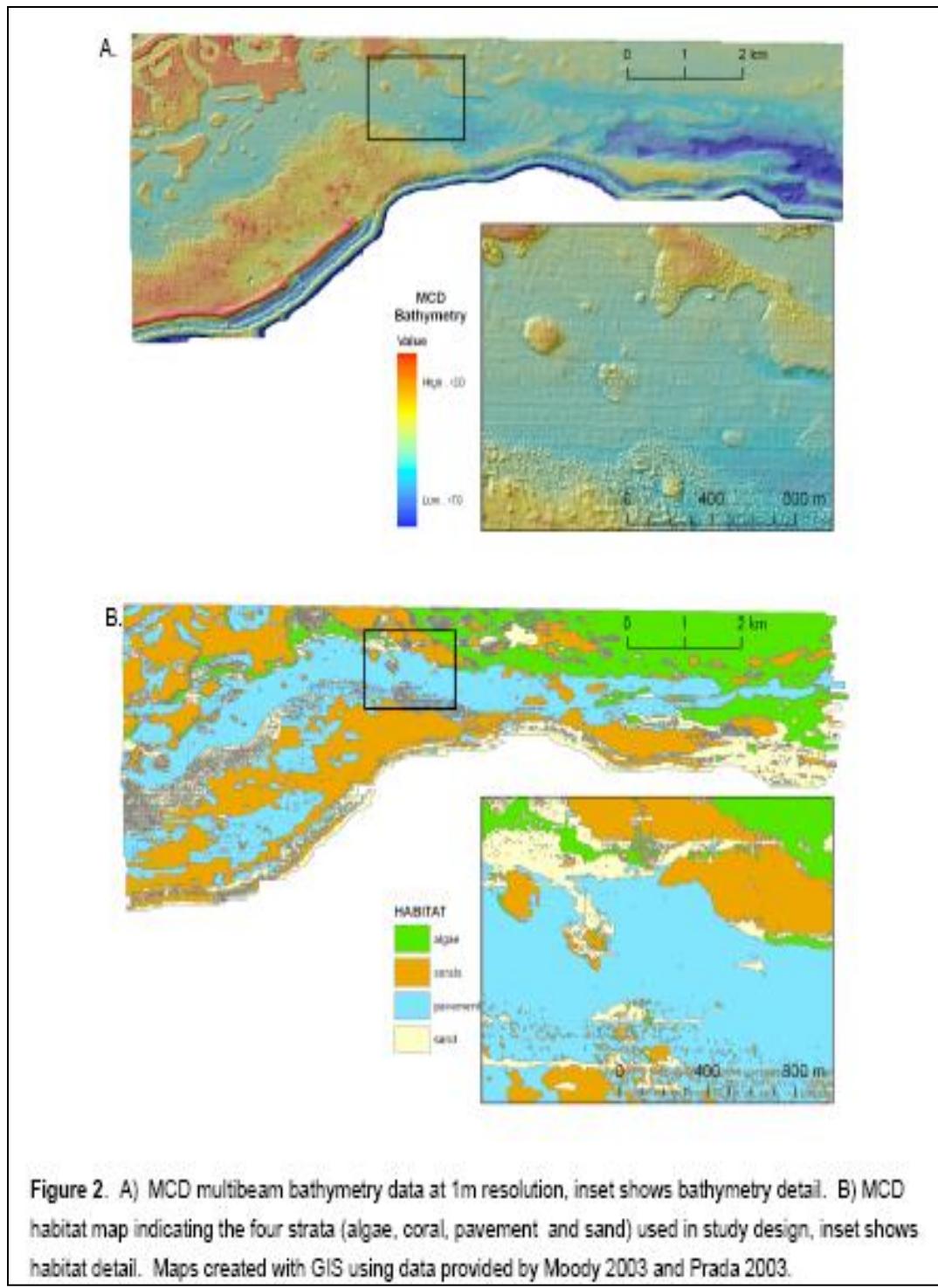


Figure 2. A) MCD multibeam bathymetry data at 1m resolution, inset shows bathymetry detail. B) MCD habitat map indicating the four strata (algae, coral, pavement, and sand) used in study design, inset shows habitat detail. Maps created with GIS using data provided by Moody 2003 and Prada 2003.

Figure 20. MCD habitat map. Source: Nemeth et al. (2008).

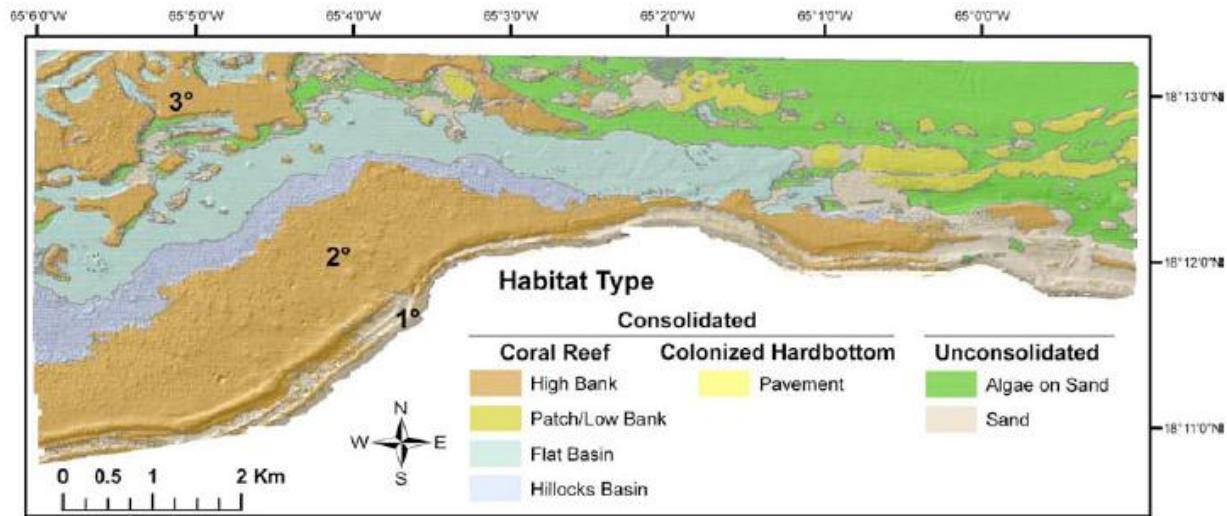


Figure 21. Habitat designations of the Hind Bank MCD, St.Thomas, USVI. Locations of primary, secondary, and tertiary high coral banks are indicated. Source: CMES, UVI 2009 (http://www.uvi.edu/sites/uvi/Documents/Research%20and%20Public%20Service/CMES/uvi_cmes_meso_photic_description.pdf).

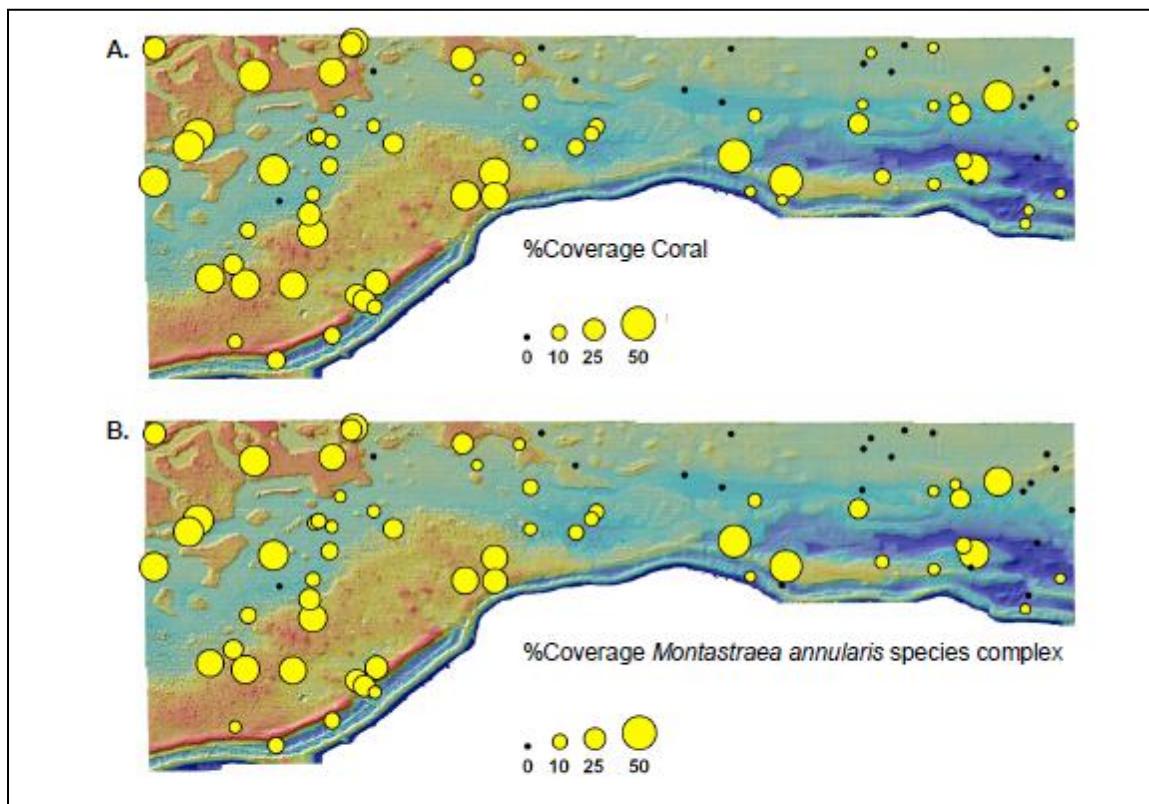
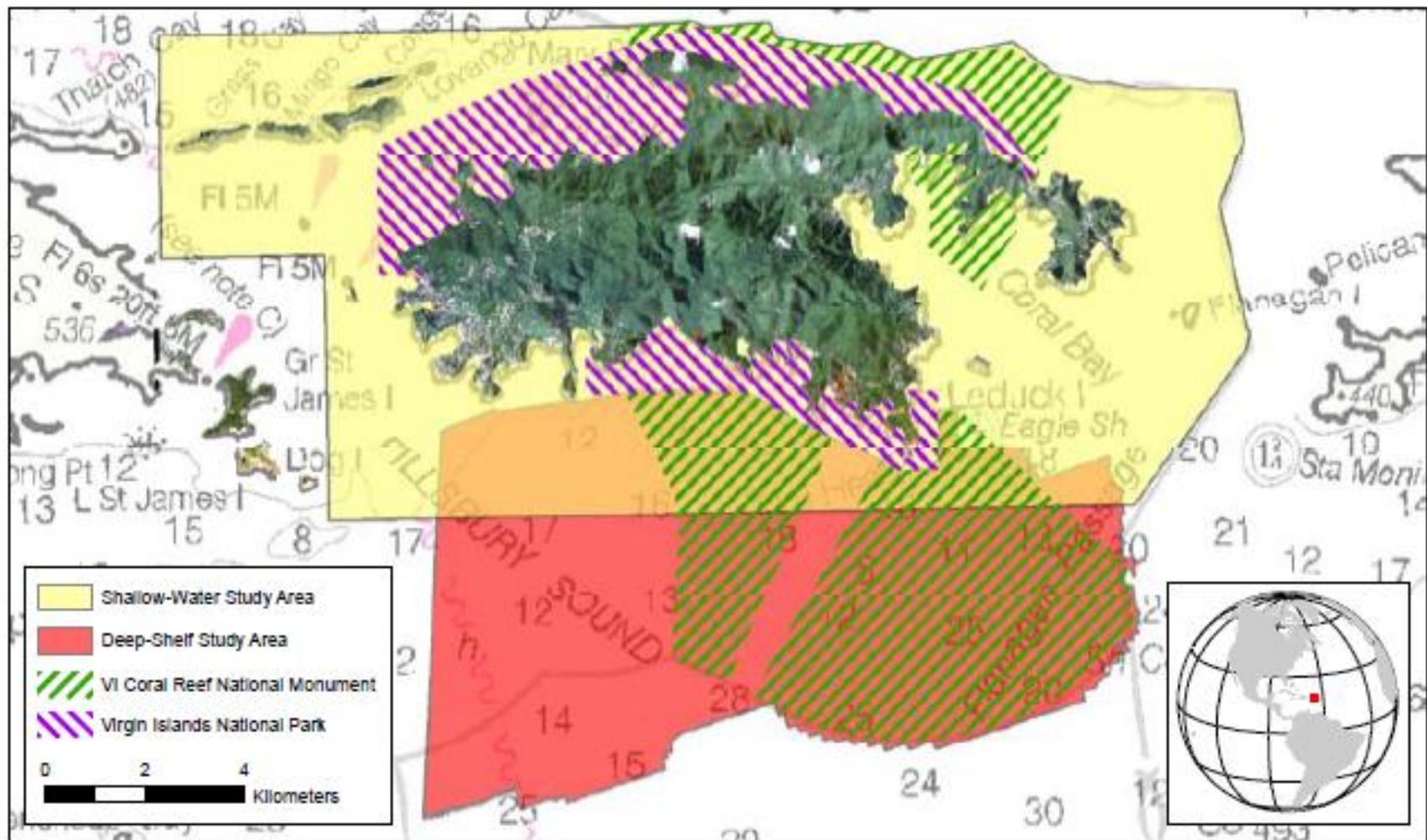


Figure 22. Percent coverage of corals in the MCD. Source: Nemeth et al. (2008).



Overview of St. John, U.S. Virgin Islands with U.S. National Park Service management boundaries and mapping effort extents.

Figure 23. Map of St. John, USVI. Source: Zitello et al. (2009).



Figure 24. Map of St. John, U.S. Virgin Islands. Source: St. John BIOMapper (<http://ccma.nos.noaa.gov/explorer/biomapper/biomapper.html?id=StJohn>).

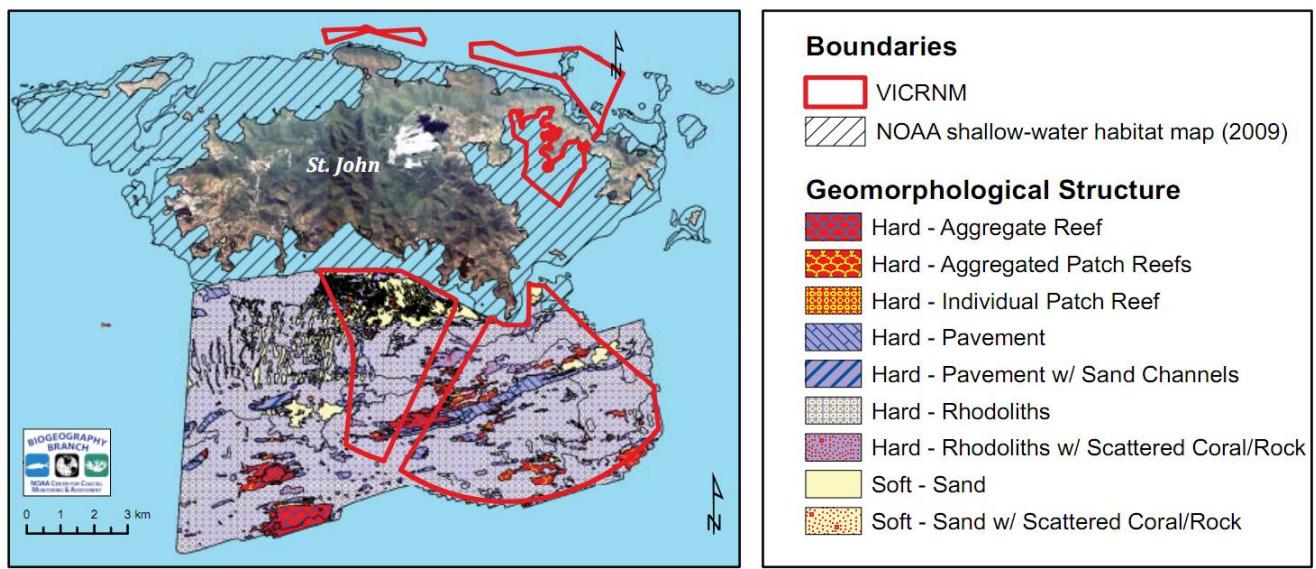


Figure 25. Detailed Geomorphological structure of the moderate-depth area south of St. John (USVI).
Source: Costa et al. (2009). The red polygons show the boundaries of the VICRNM.

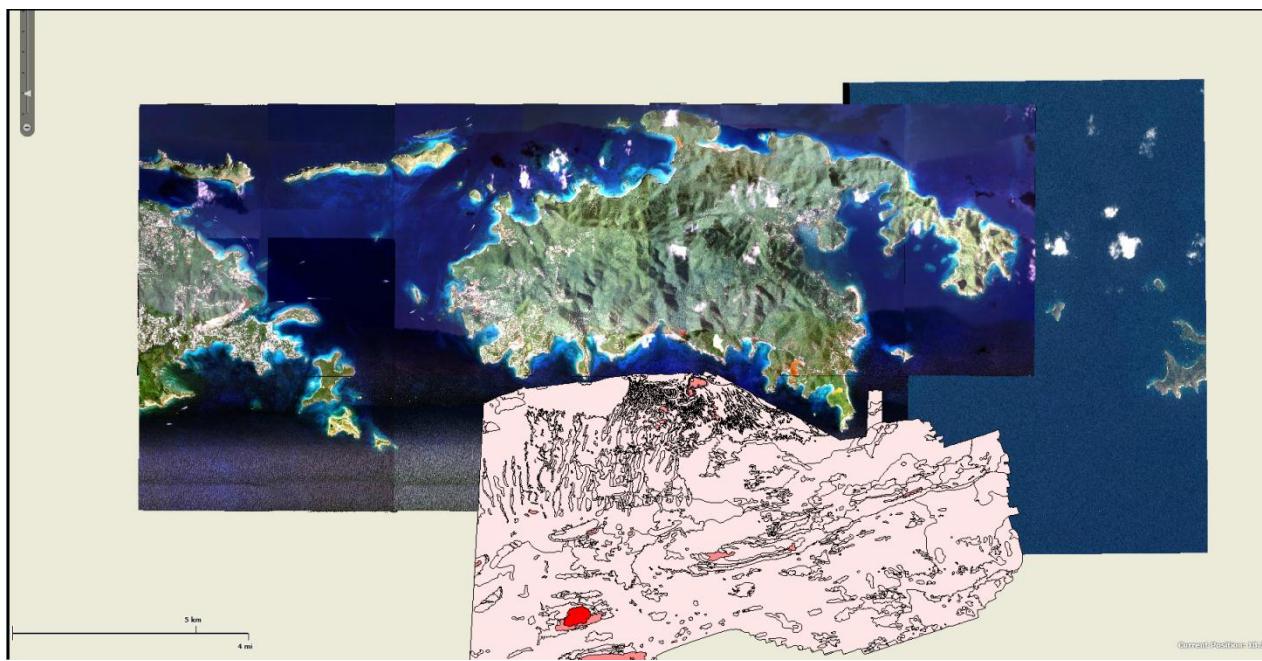
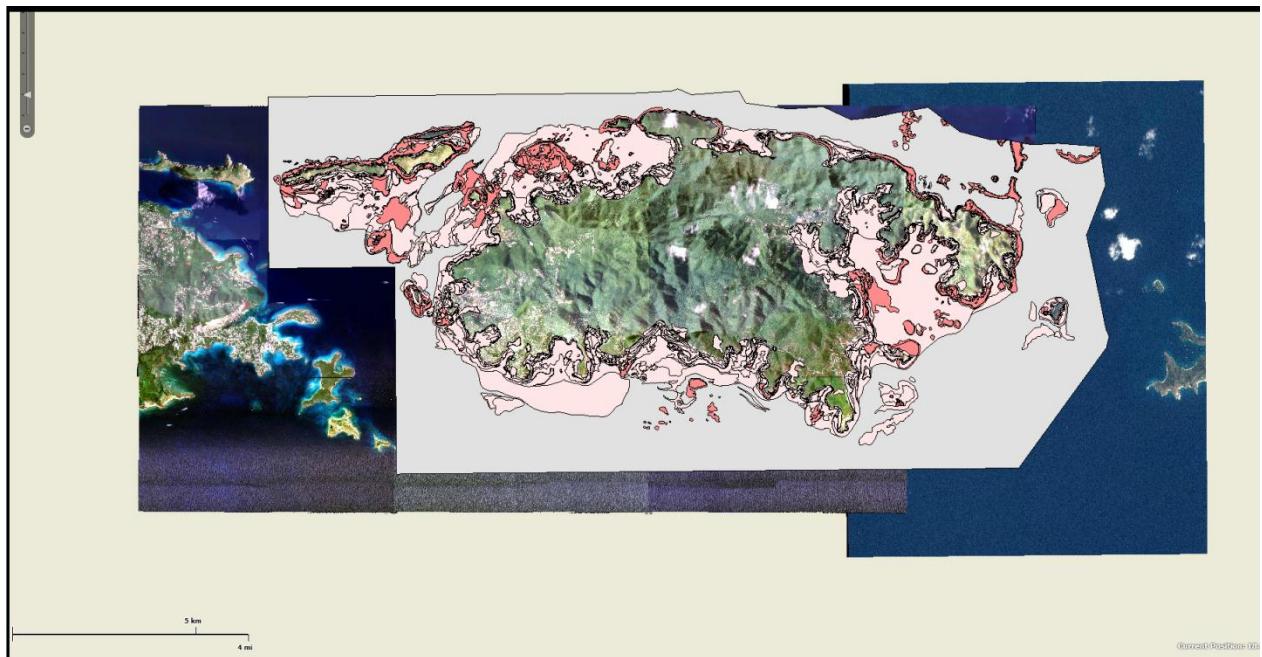


Figure 26. Coral cover: shallow (upper panel), moderate depth (bottom panel). Source: St. John BIOMapper (<http://ccma.nos.noaa.gov/explorer/biomapper/biomapper.html?id=StJohn>).

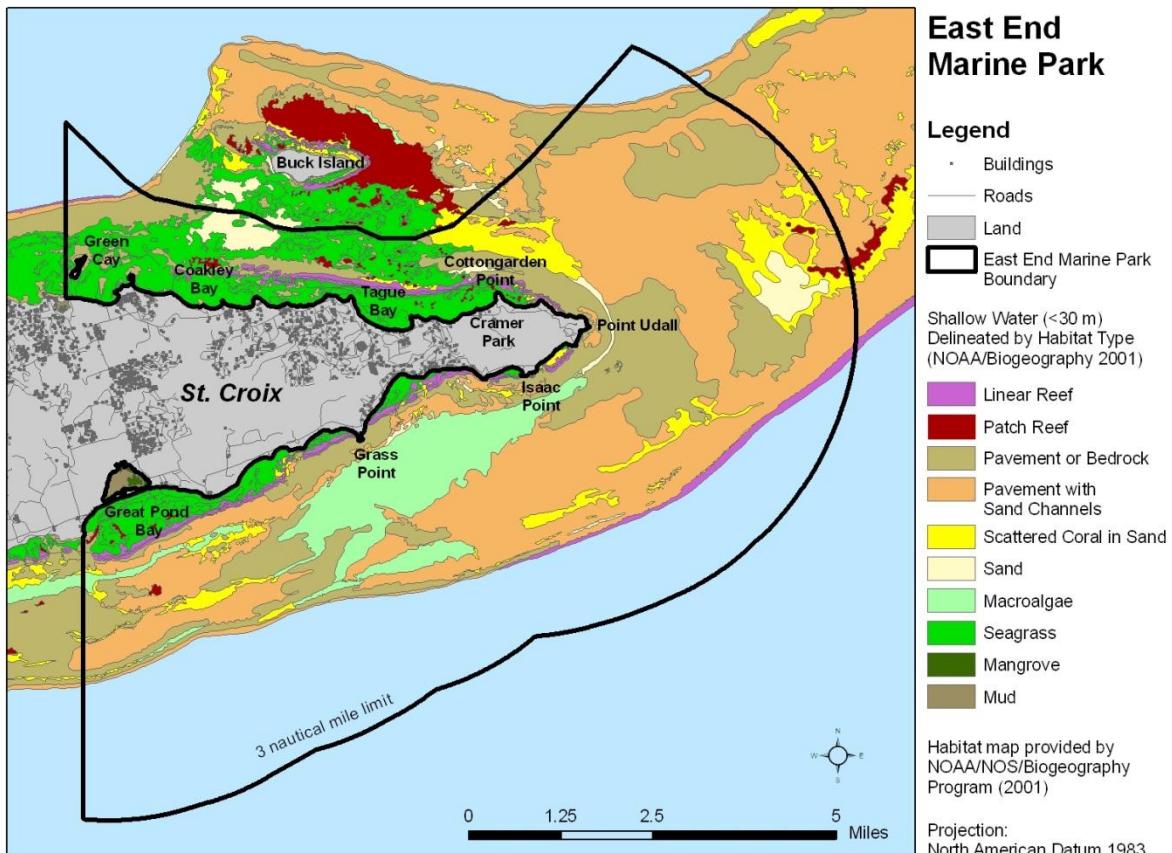


Figure 27. Habitats of the STX East End Marine Park. included are names for each of the major bays within the park. Source: NOAA/NOS (2001) (http://www.stxeastendmarinepark.org/includes/map_1.htm)

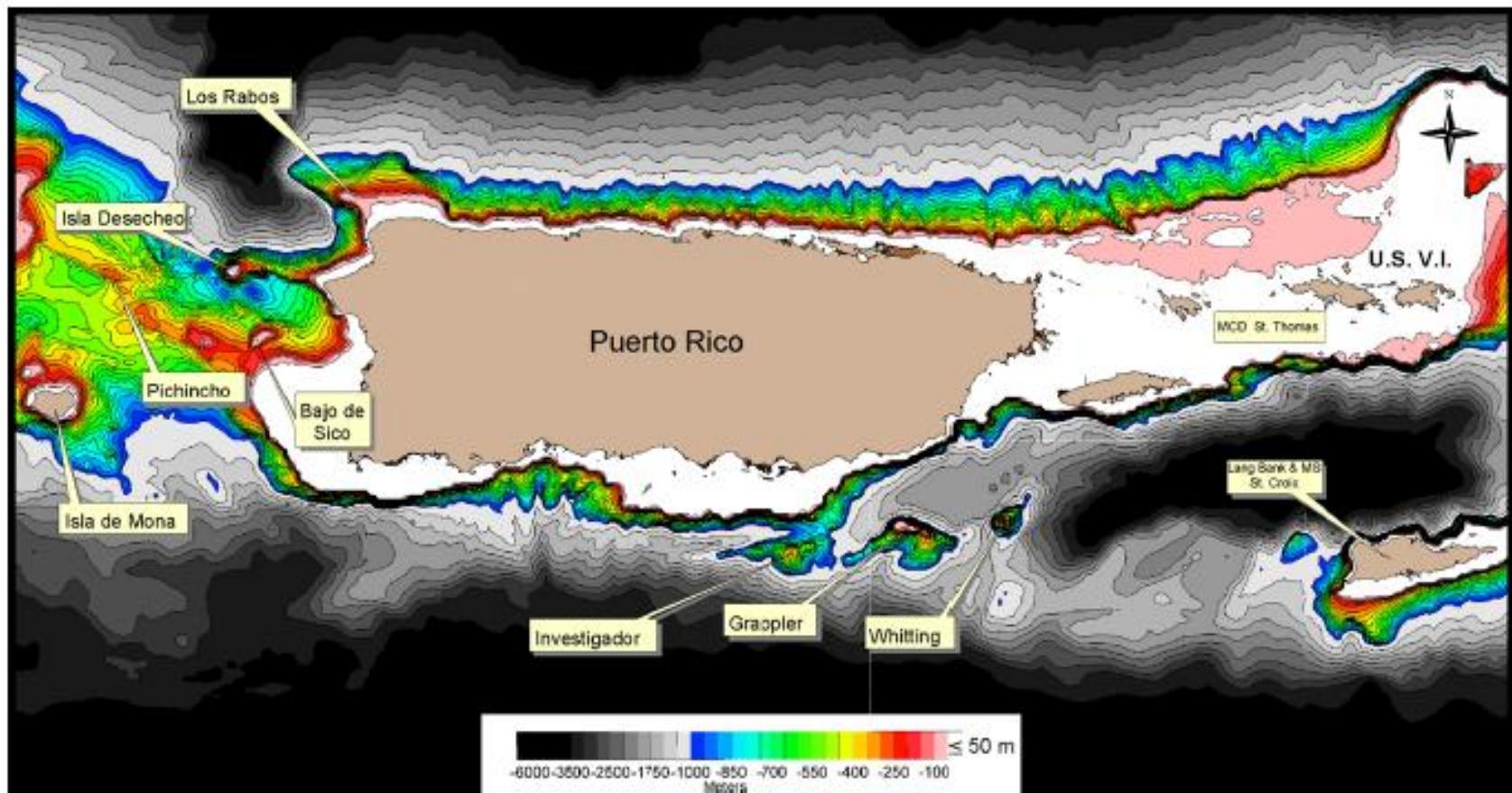


Figure 28.Bathymetric map of PR and the USVI showing the geographical distribution of deep reefs. Source: García-Sais et al. (2005).

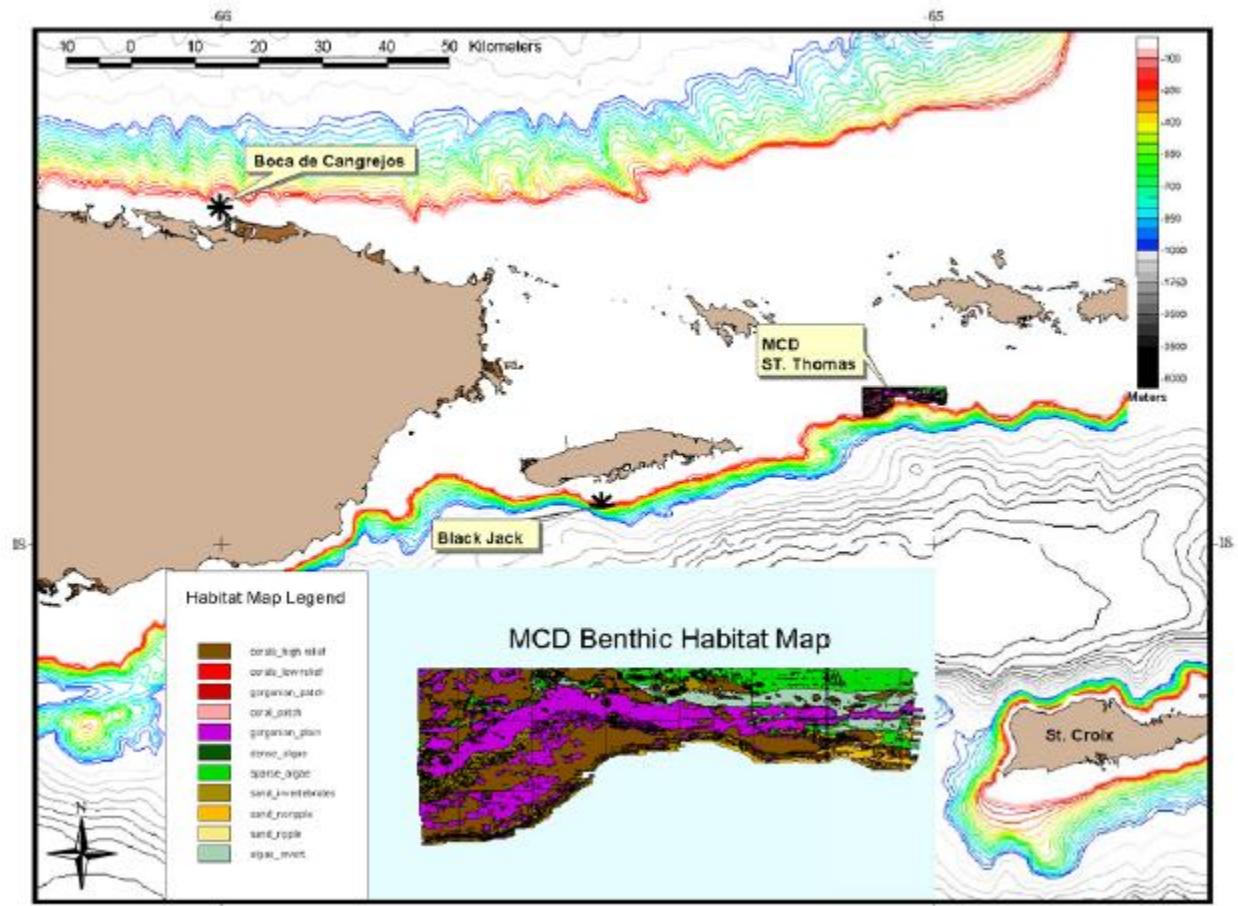


Figure 29. Location map of deep hematypic reefs in the U.S. Caribbean reported by García-Sais et al. (2005).

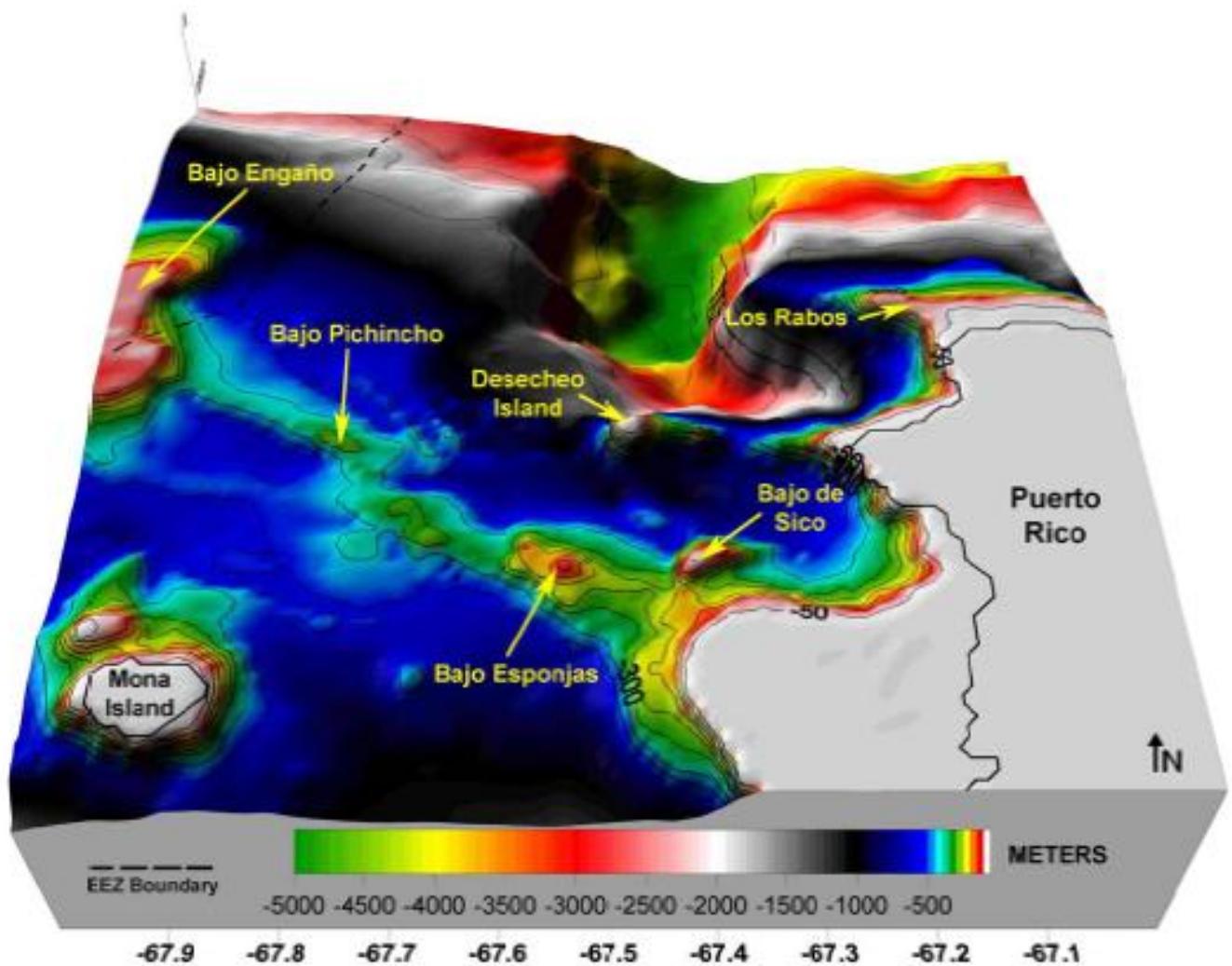


Figure 30. Three dimensional representation of the west coast of Puerto Rico. Source: García-Sais et al. (2005).

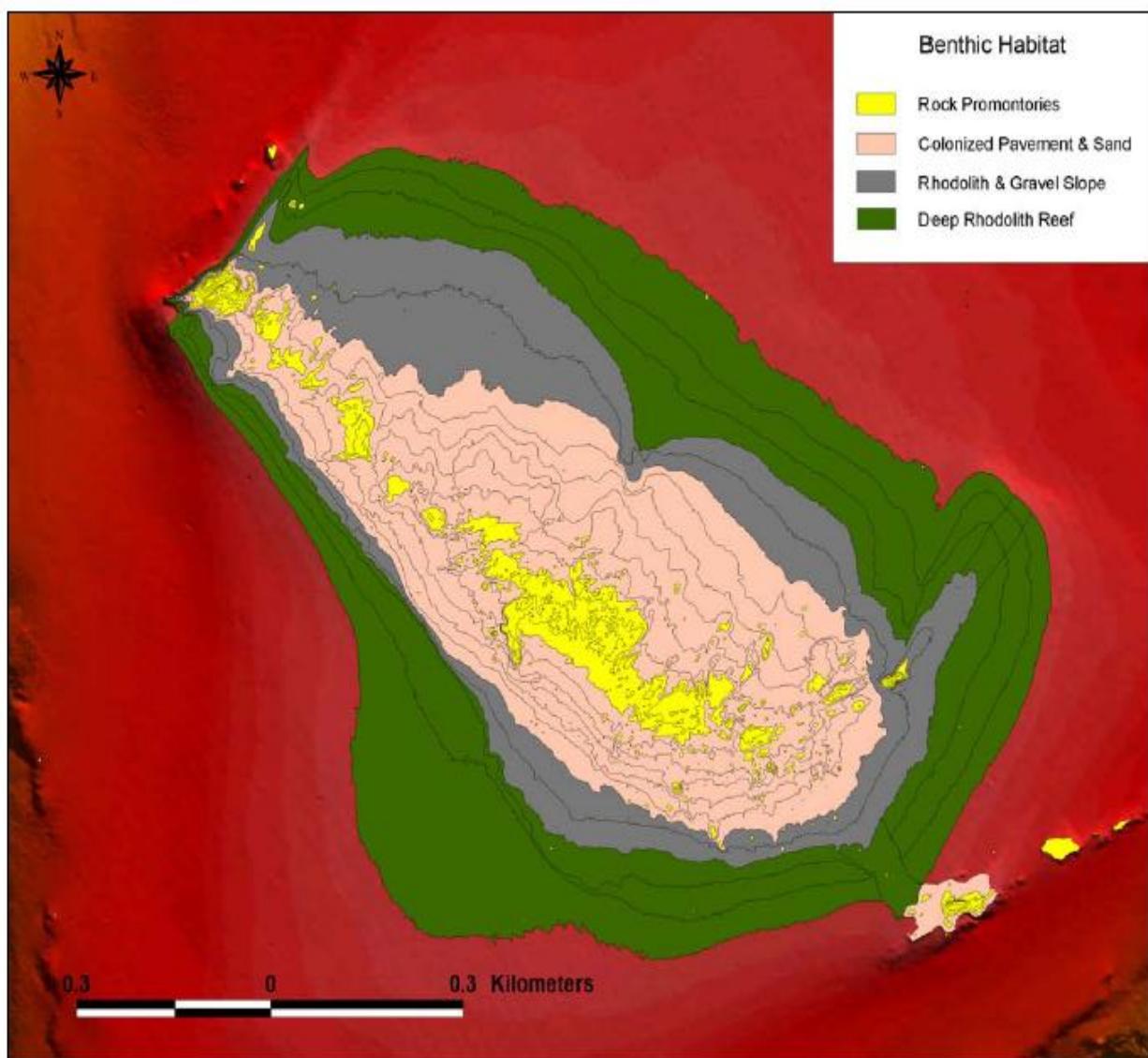


Figure 31. Benthic habitat map of Bajo de Sico up to a maximum depth of 50 m. Source: García-Sais et al. (2007).

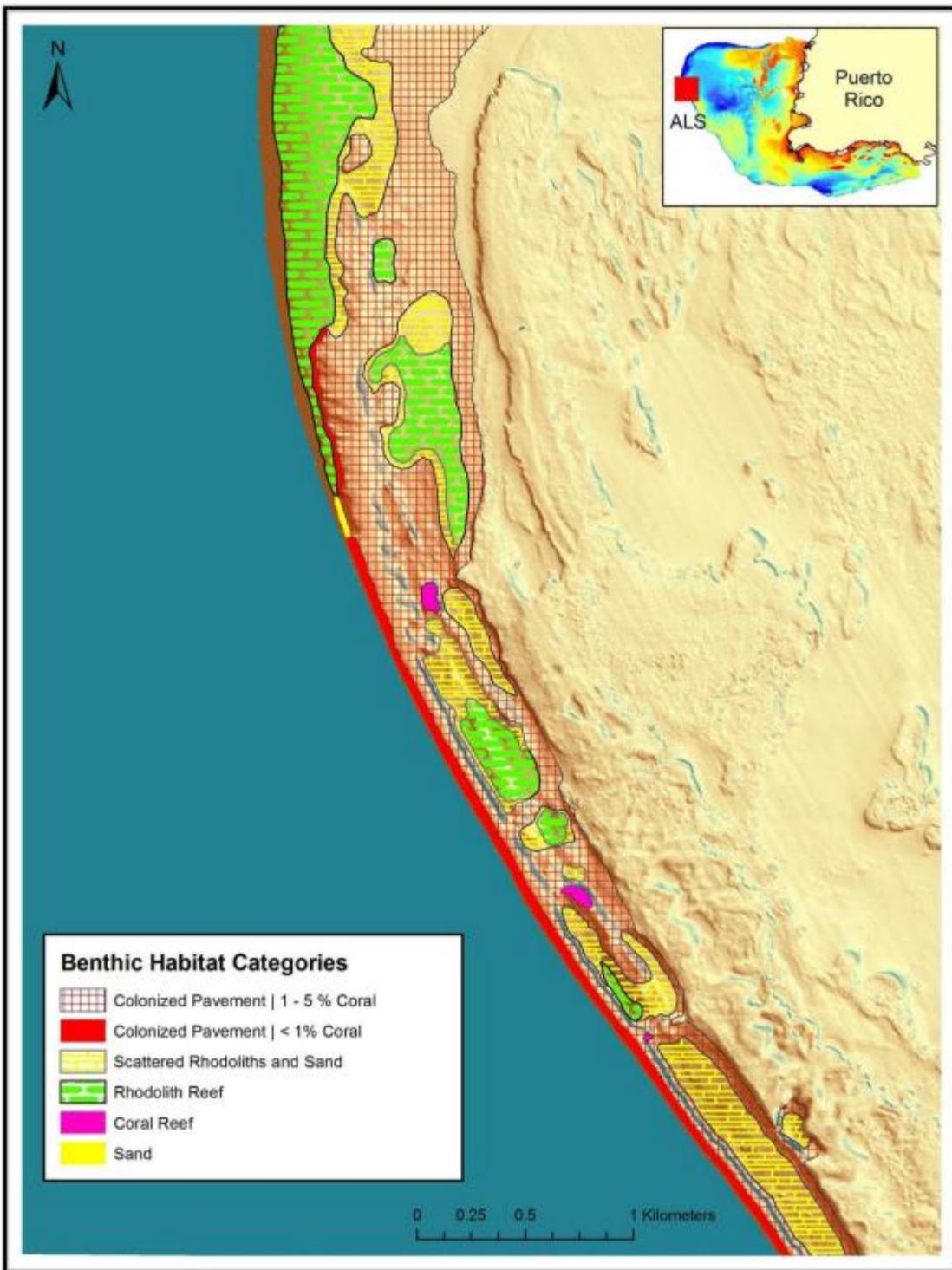


Figure 32. Benthic habitat map of Abrir La Sierra between depths of 30-50 meters. Source: García-Sais et al. (2010b).

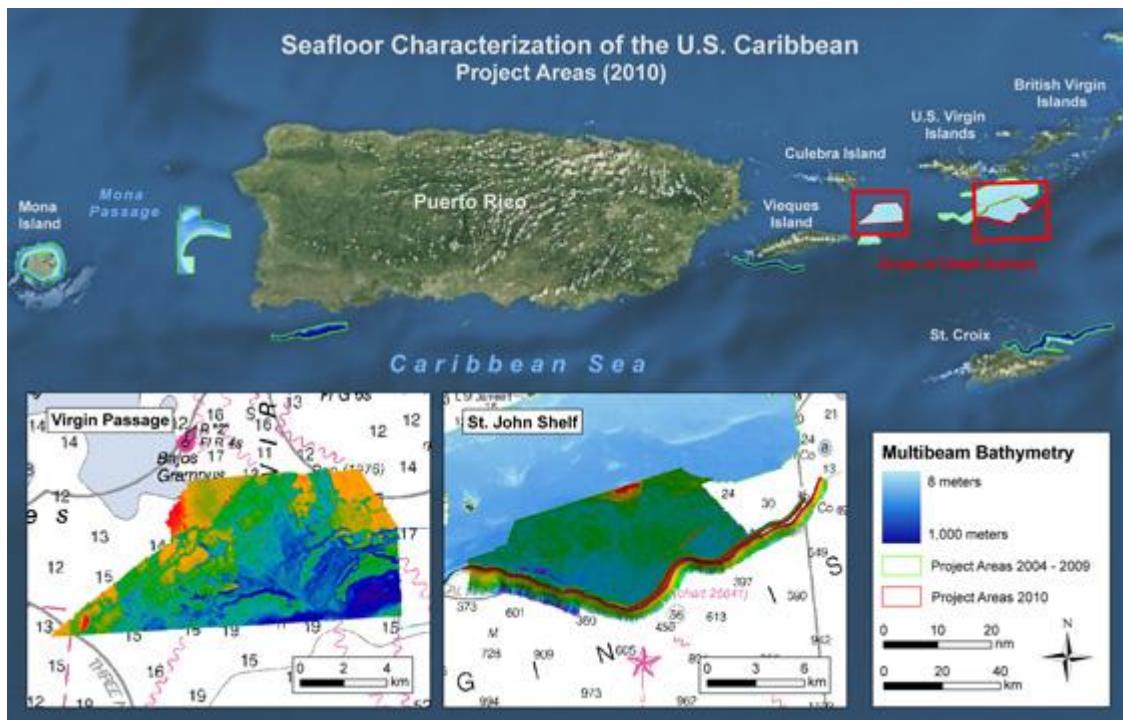


Figure 33. Project areas (2010) of the NOAA Biogeography Branch seafloor characterization of the U.S. Caribbean (Source: http://ccma.nos.noaa.gov/ecosystems/coralreef/usvi_nps.aspx).

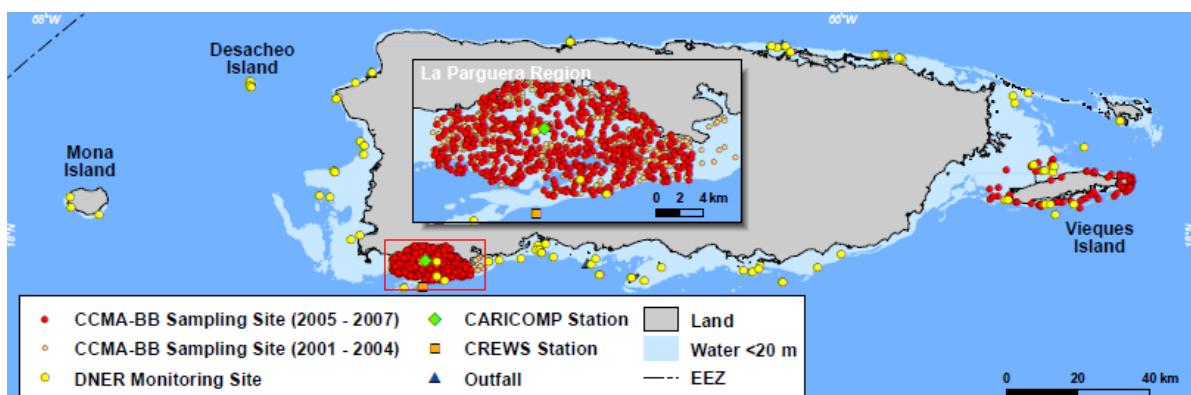


Figure 34. Monitoring locations of the CCMA-BB throughout Puerto Rico (Source: K. Buia)

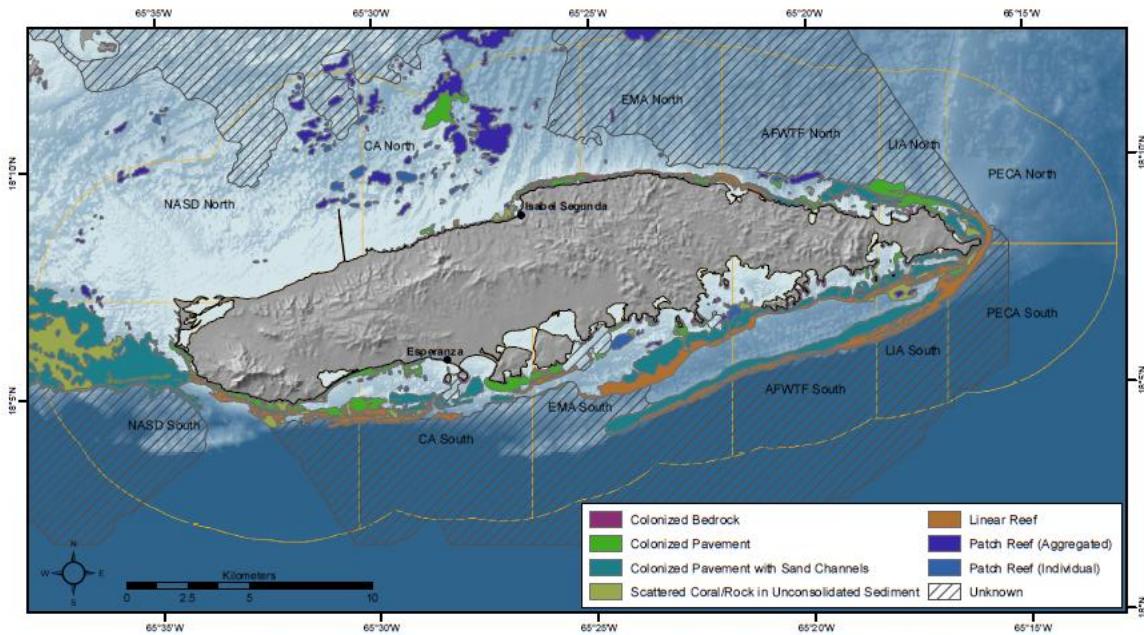


Figure 5.1a. Distribution of reef/hardbottom habitat around Vieques relative to historical land use. Benthic habitat data from Kendall et al. (2001).

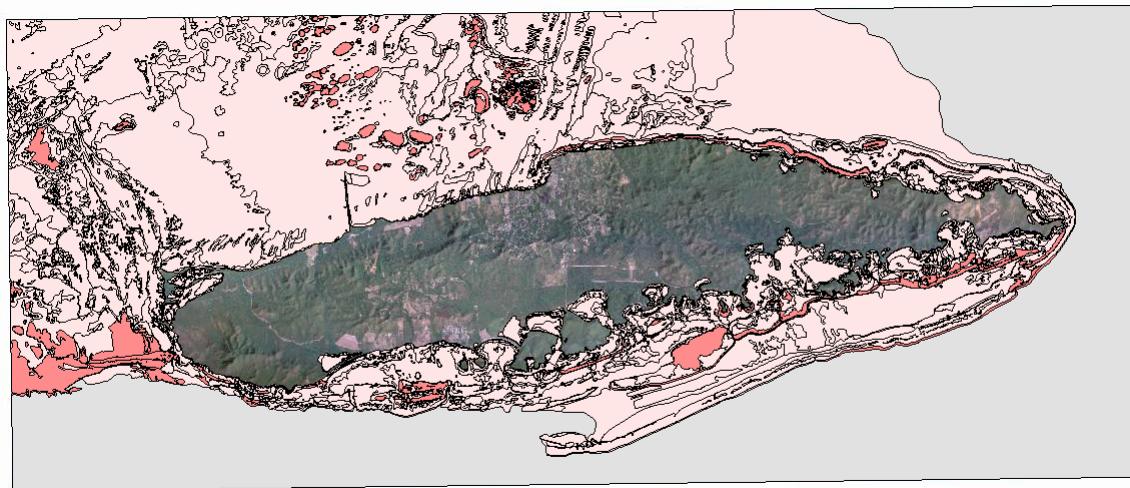


Figure 35. Coral habitat maps around Vieques. Sources: Kendall (2001) in Bauer et al (2010) (upper panel) and Vieques Biomapper (bottom panel)
[\(<http://ccma.nos.noaa.gov/explorer/biomapper/biomapper.html?id=Vieques>\)](http://ccma.nos.noaa.gov/explorer/biomapper/biomapper.html?id=Vieques)

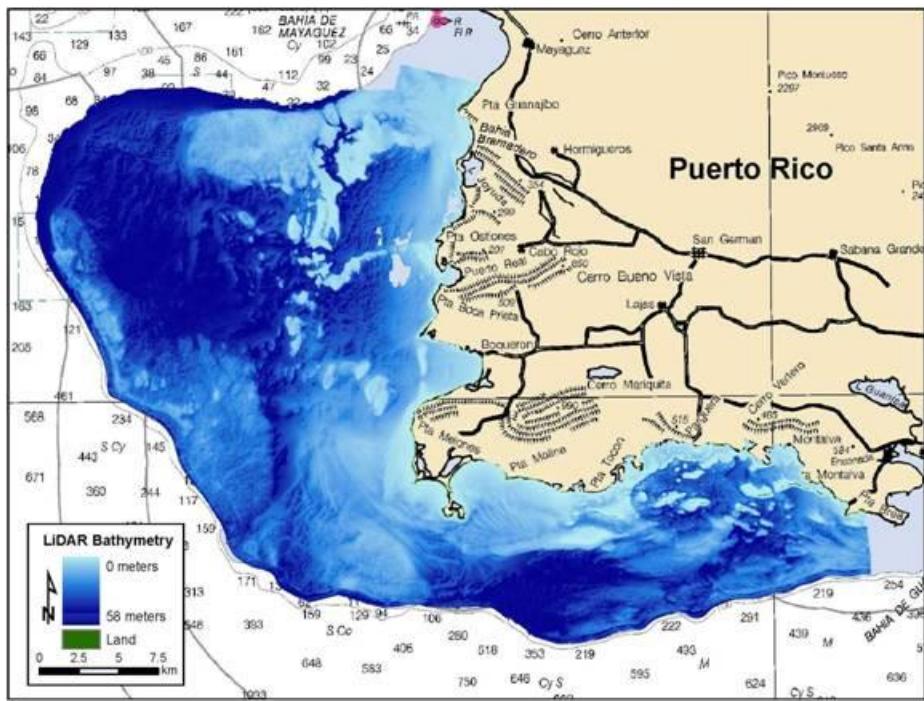


Figure 36. LiDAR Bathymetry of Southwest Puerto Rico. Source: Pittman et al (2009), http://ccma.nos.noaa.gov/products/biogeography/lidar_pr/default.aspx

Benthic maps from SSS mosaics

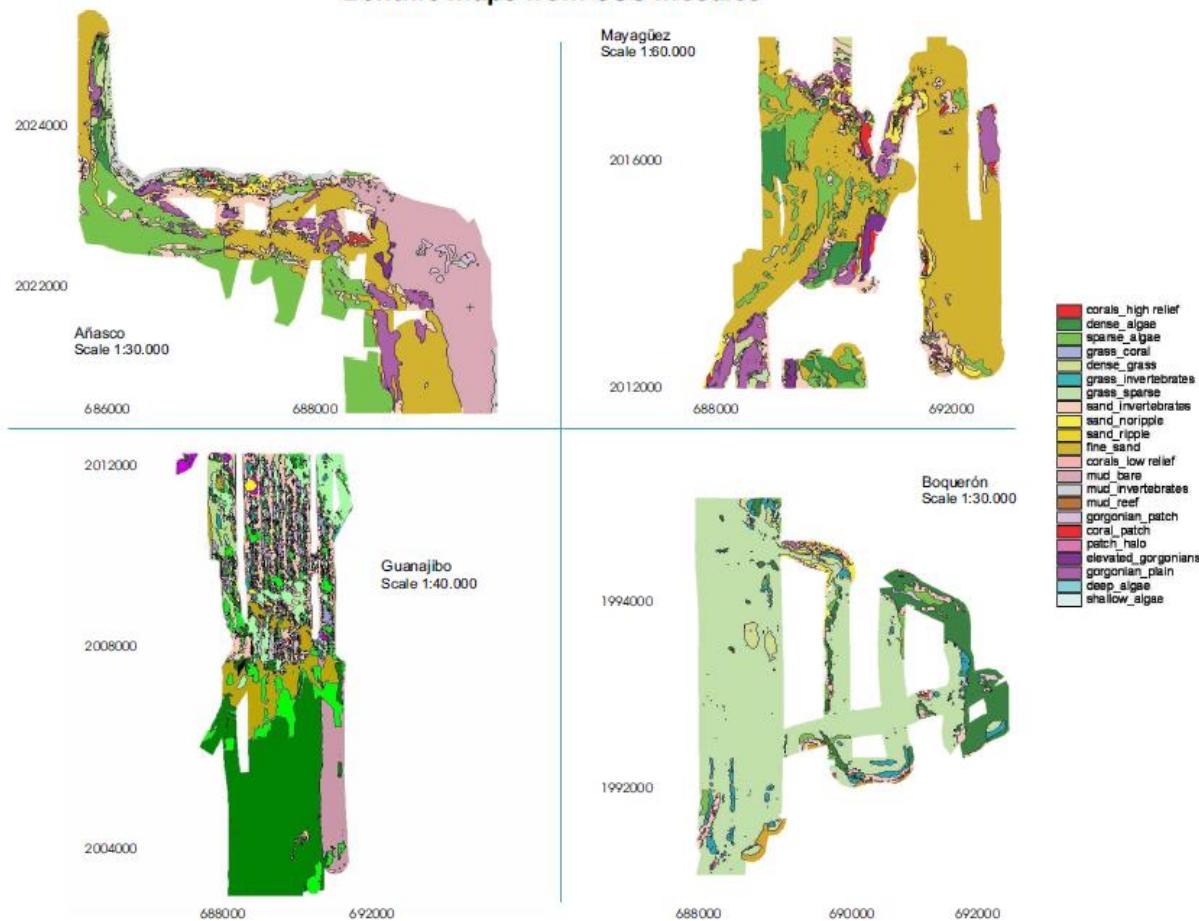


Figure 37. Benthic maps from Side Scan Sonar (SSS) mosaics. Sources: Rivera (2007) and Prada and Rivera (2008).

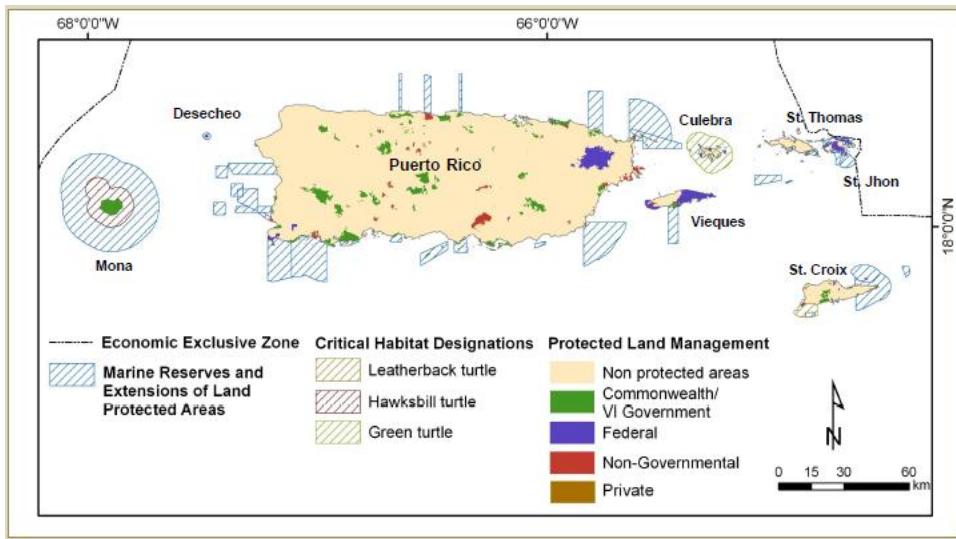


Figure 38. Sea Turtle study areas included in the PR-USVI GAP analysis project (protected coastal, marine reserves, federal, and critical areas). Source: Rincón-Díaz et al. (2011).

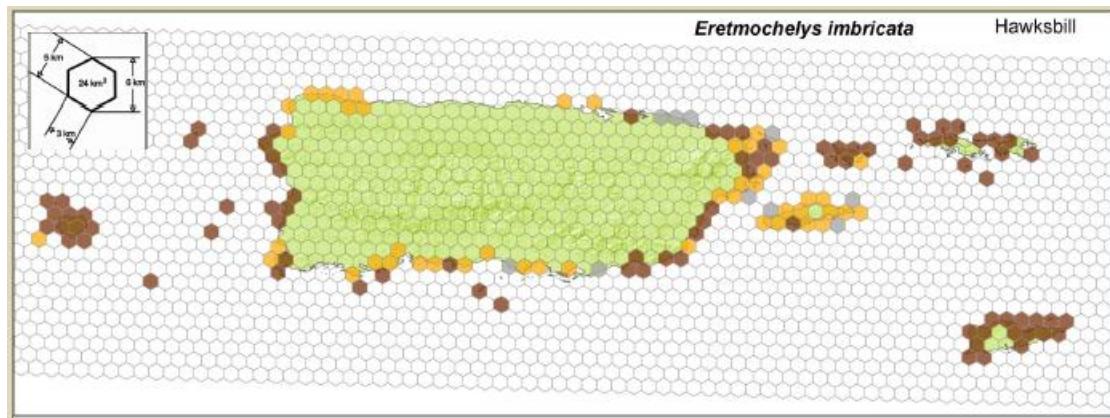


Figure 39. Hexagon map of species occurrence records for Hawksbill turtle in Puerto Rico. Source: Rincón-Díaz et al. (2011)

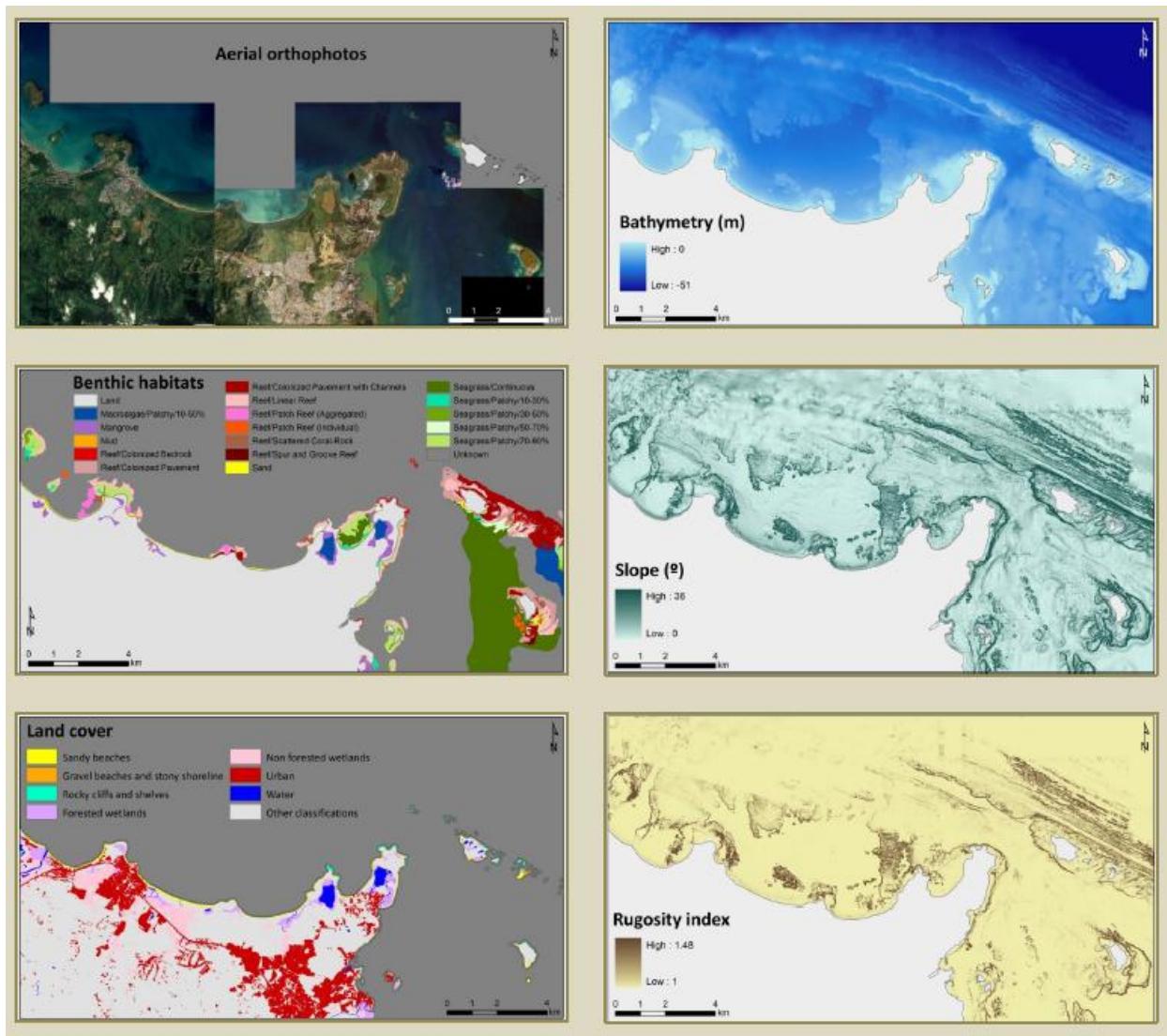


Figure 40. Land and seascape feature patterns used in the PR-USVI GAP analysis for sea turtles.
Source: Rincón-Díaz et al. (2011).

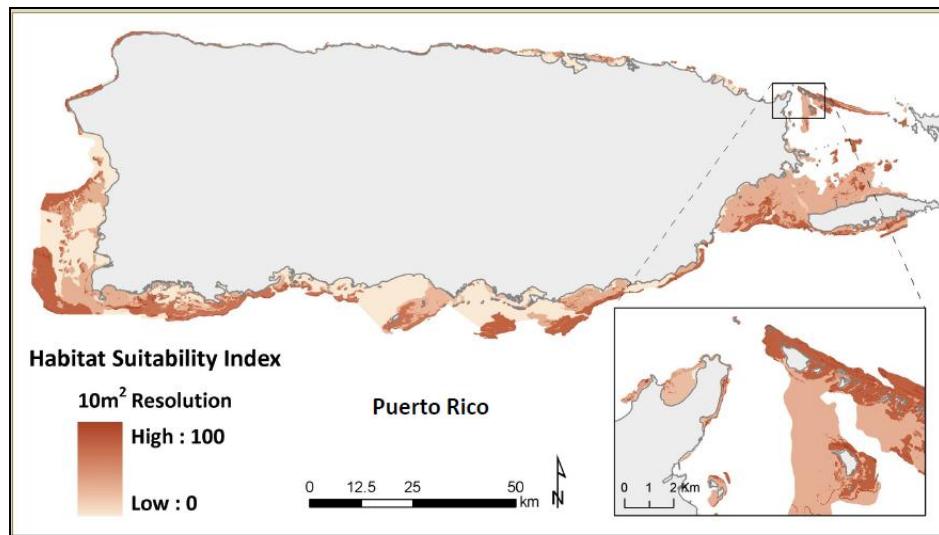


Figure 41. Predicted habitat map for Hawksbill turtle based on a habitat suitability model developed by the PR-USVI GAP Project. Habitat affinity variables include bathymetry, structure, reef zone and rugosity. Source: Rincón-Díaz et al. (2011).

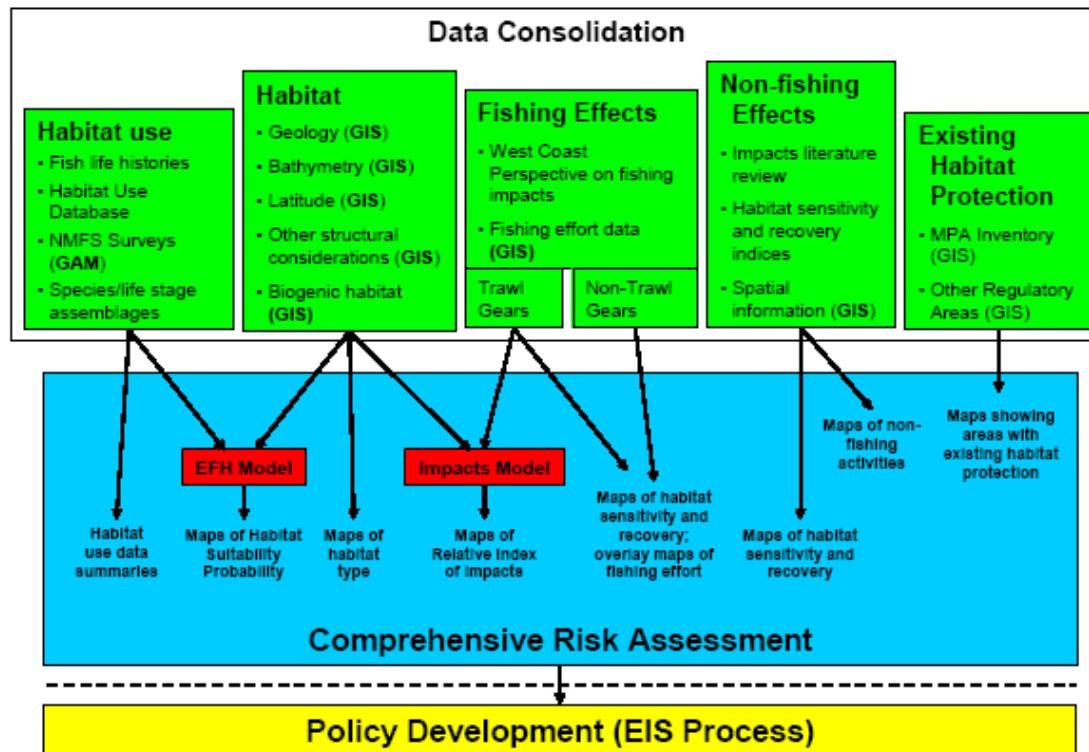


Figure 42. Decision-making framework for the assessment stage of the Pacific Coast Groundfish EFH EIS showing data inputs and separation of the assessment and policy components (Source: MRAG Americas 2004).

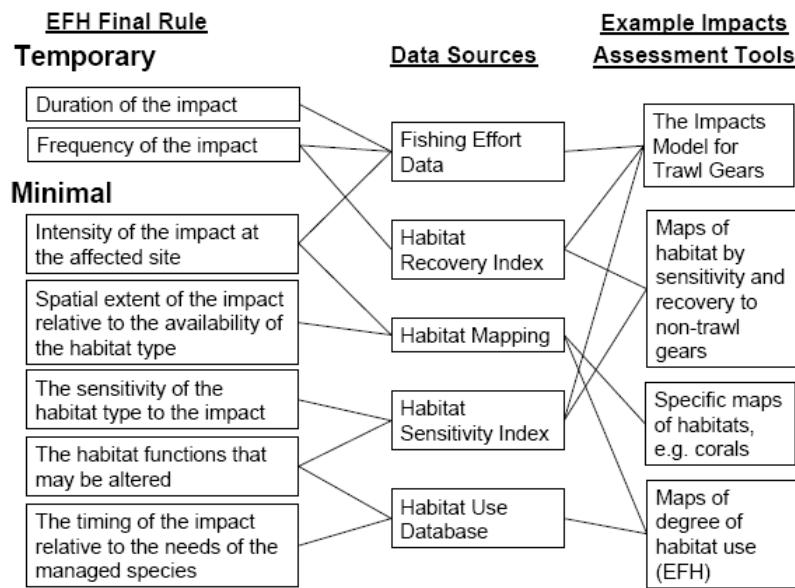


Figure 43. Assessment of impacts to EFH: factors listed in the EFH Final Rule, types of data available and types of impacts assessment tools (Source: MRAG Americas, 2004).

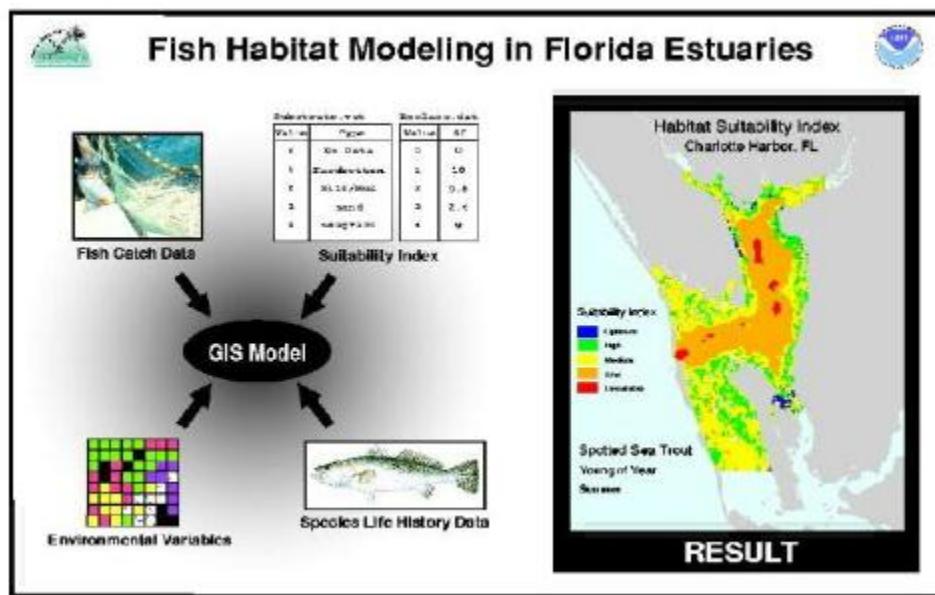


Figure 44. Fish habitat modeling in Florida estuaries (Source: Florida Fish and Wildlife Conservation Commission, <http://myfwc.com/research/gis/projects/biogeographic/habitat-suitability-modeling-fl-estuaries/>).

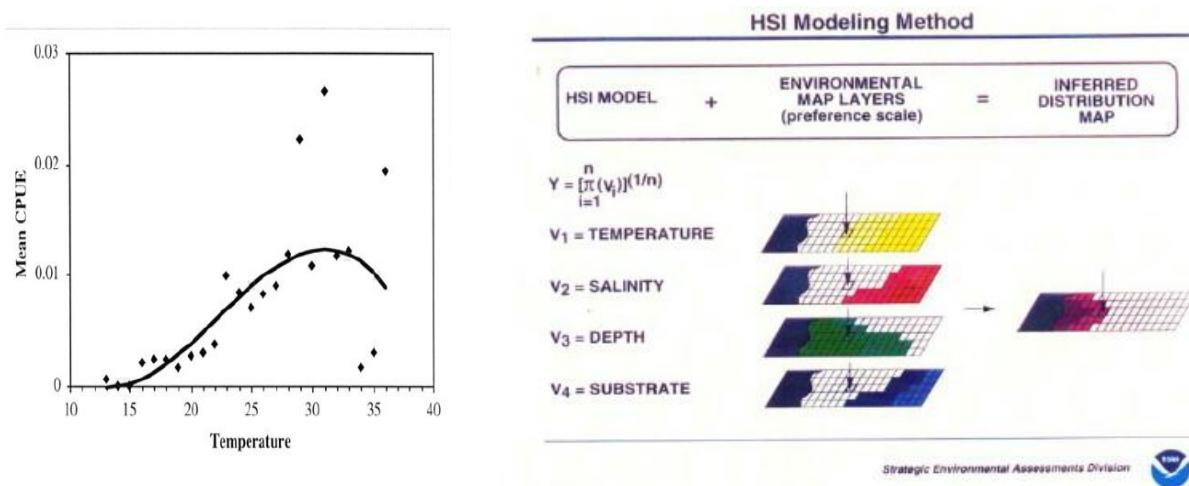


Figure 45. a) Fitted polynomial regressions to mean CPUE across environmental gradients. (b) Habitat layers and seasonal distribution map by species life stage (Source: FWC 2011 , <http://myfwc.com/research/gis/projects/biogeographic/habitat-suitability-modeling-fl-estuaries/>)

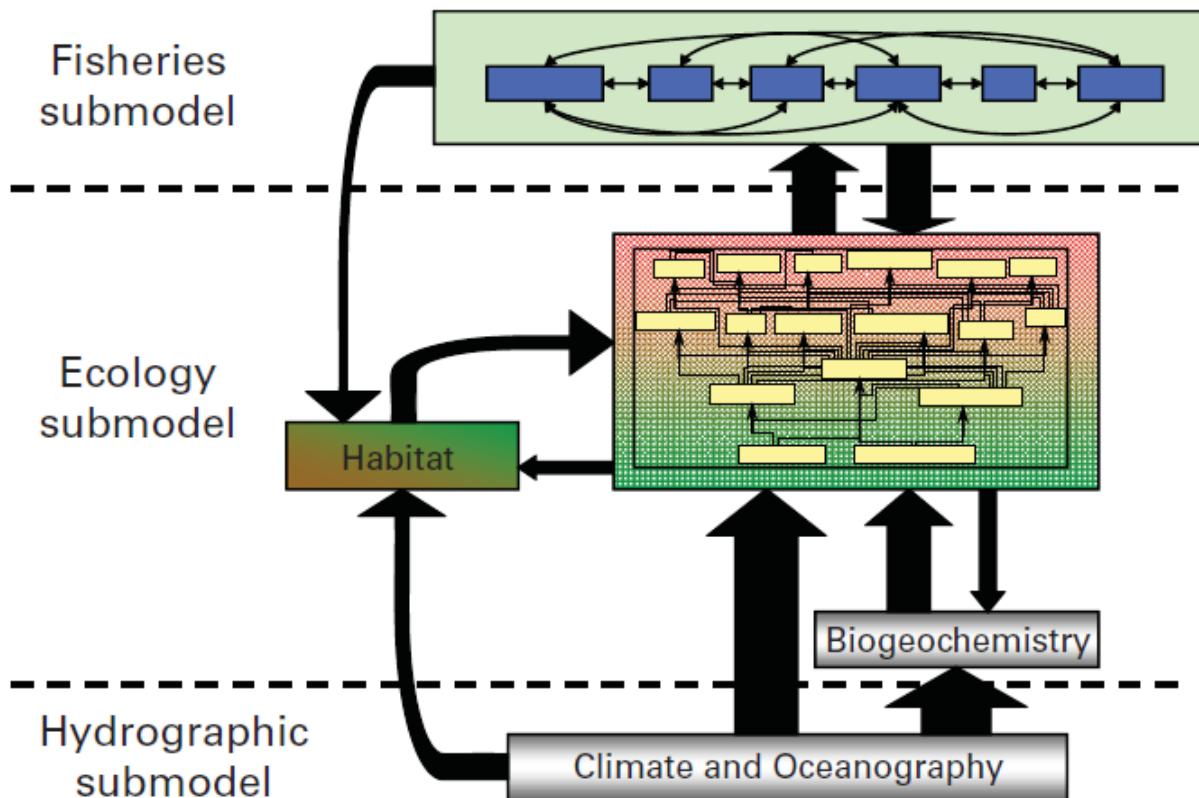


Figure 46. Schematic of the Atlantis ecosystem model, which simulates oceanography, ecology (including habitat effects), and fishing. NMFS 2010.

the Swept Area Seabed Impact (SASI) model

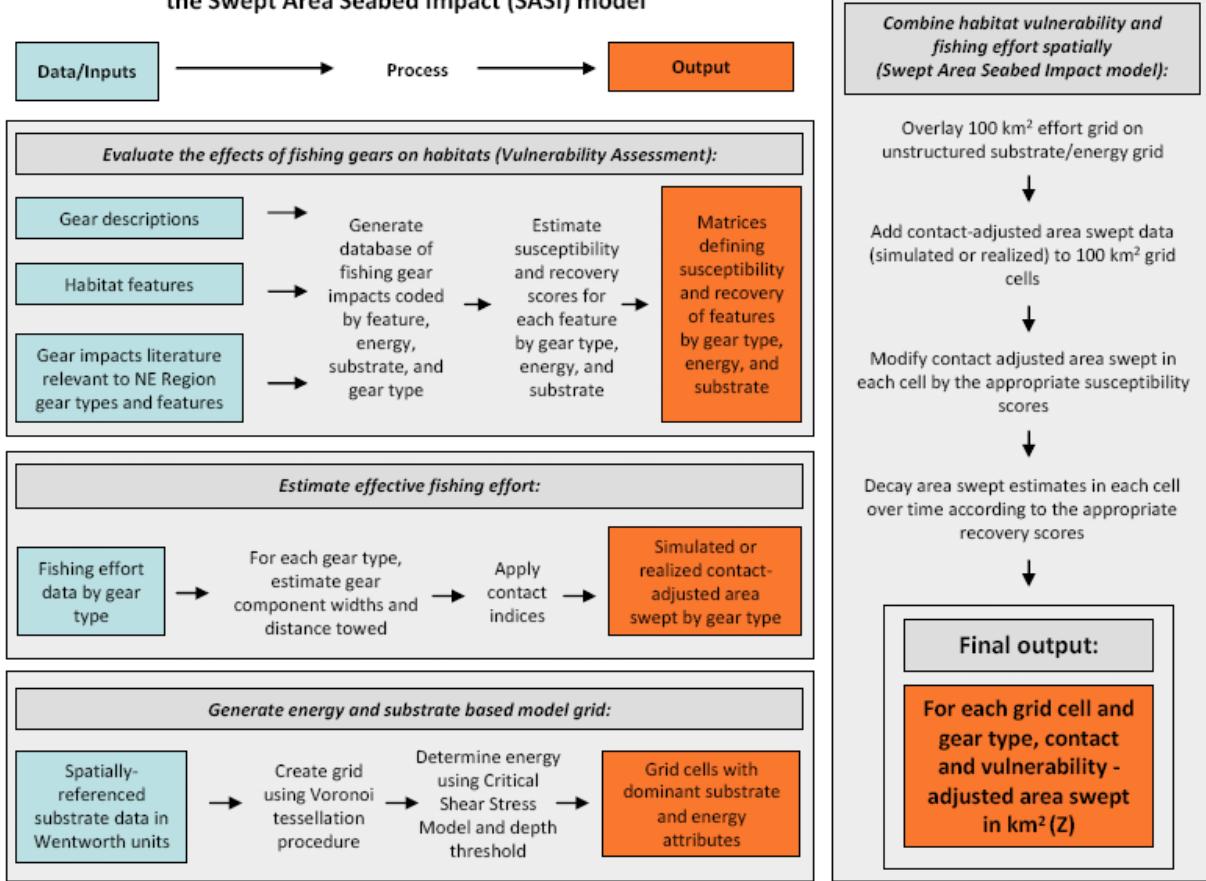


Figure 47. SASI model flowchart (Source: NEFMC, 2010)

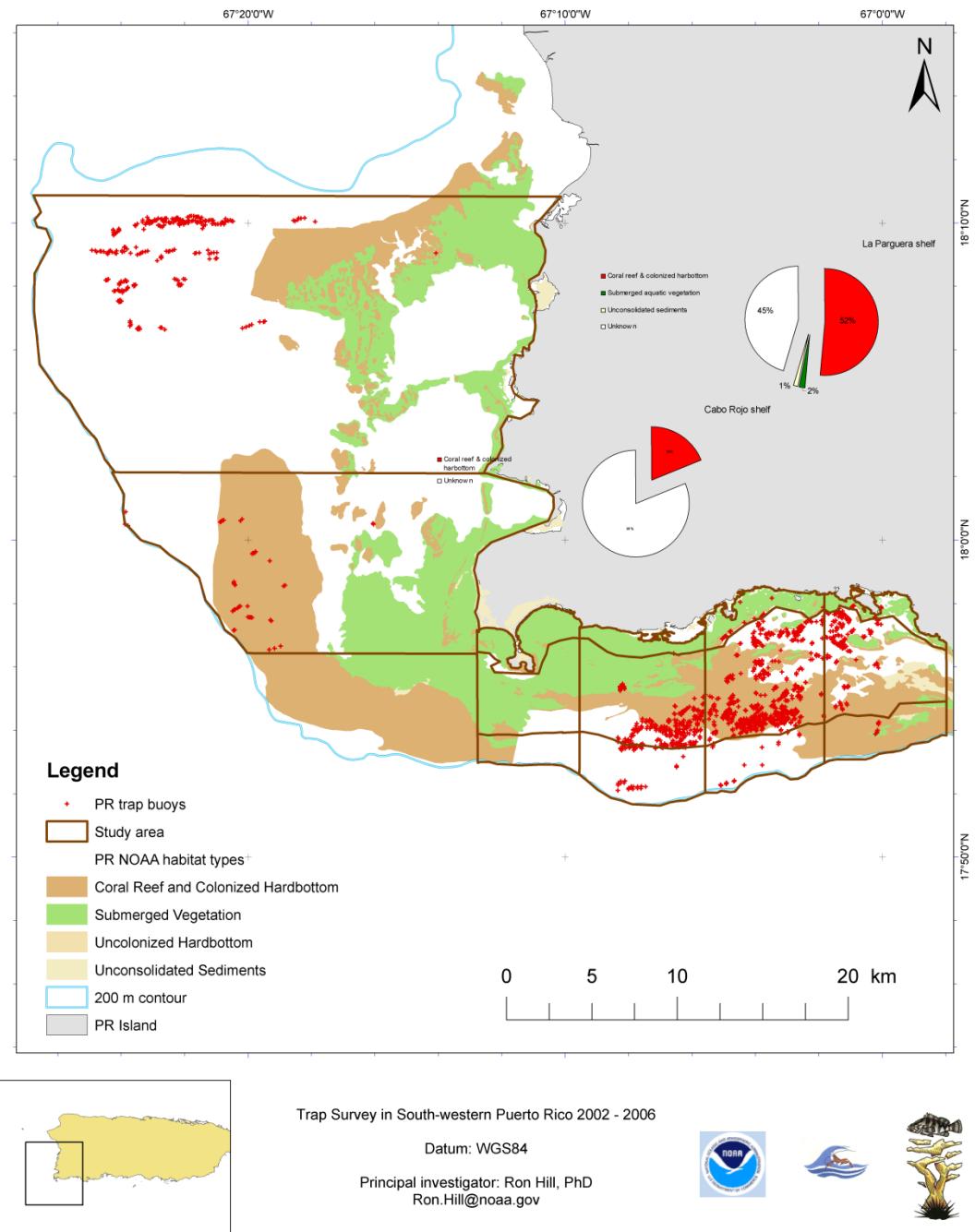


Figure 48. Location of trap buoys on 2001 NOAA\NOS Biogeography team benthic habitat map. Minimum mapping unit of the benthic map is ~4000m². Location of trap buoys on 2001 NOAA\NOS/ BB benthic habitat map. Source: Hill et al. (in prep).

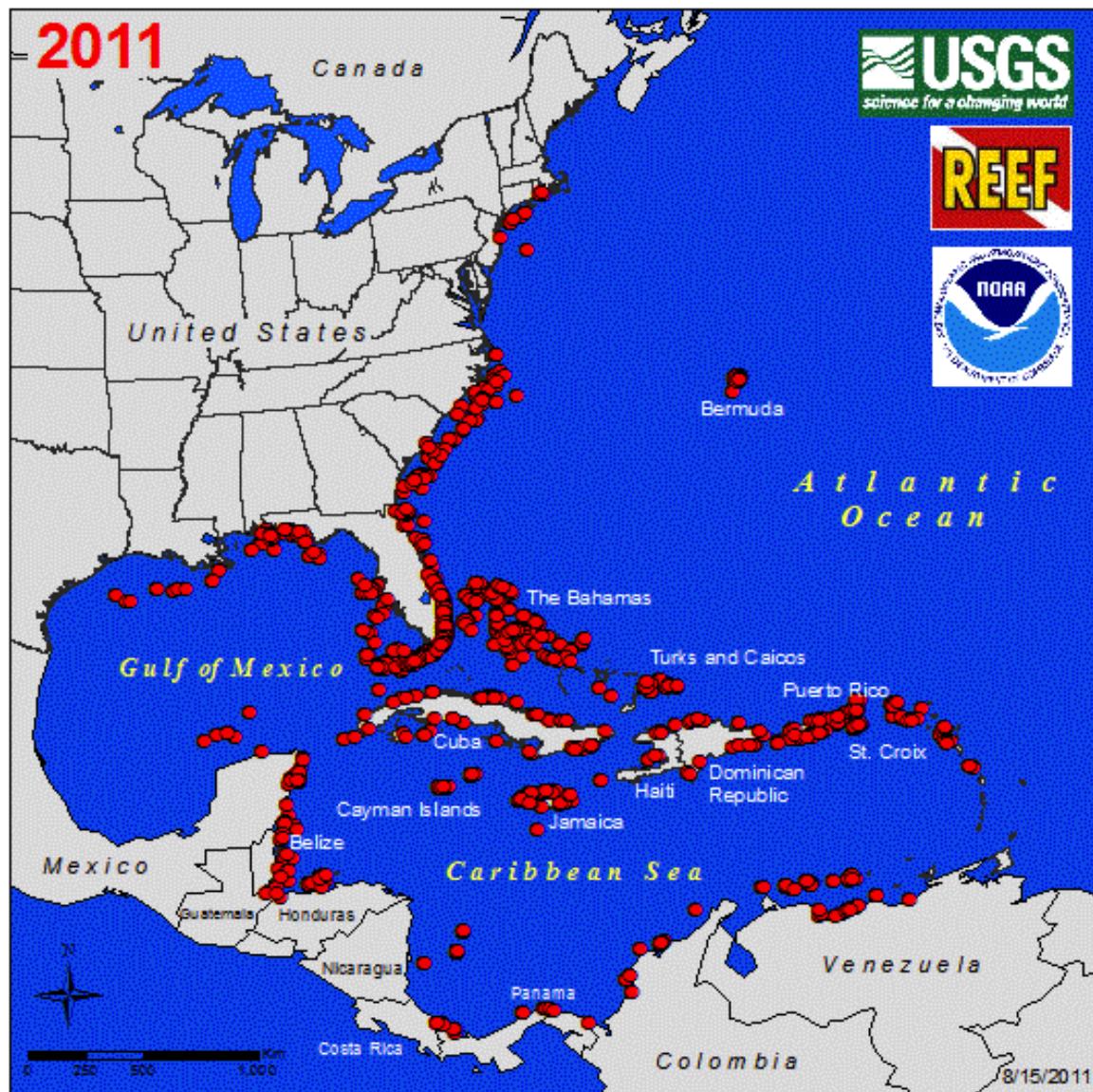


Figure 49. Current distribution map of introduced lionfish. (Source: USGS, <http://nas.er.usgs.gov/taxgroup/fish/Lionfishanimation.gif>).

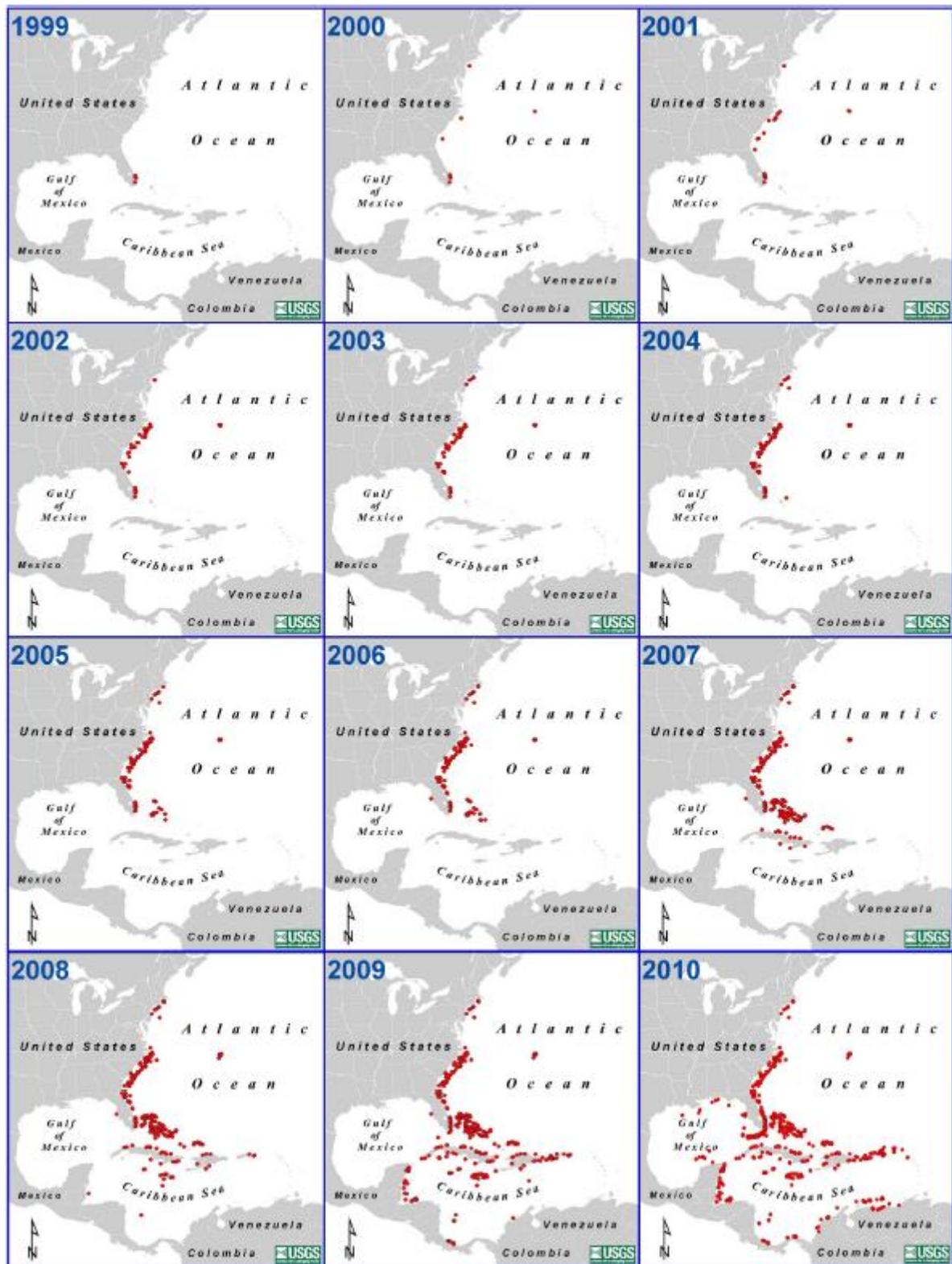


Figure 50. Expansion of lionfish invasions in the North and Central Western Atlantic Ocean from 1999 to 2010. . (Source: USGS, <http://nas.er.usgs.gov/taxgroup/fish/Lionfishanimation.gif>).

2010

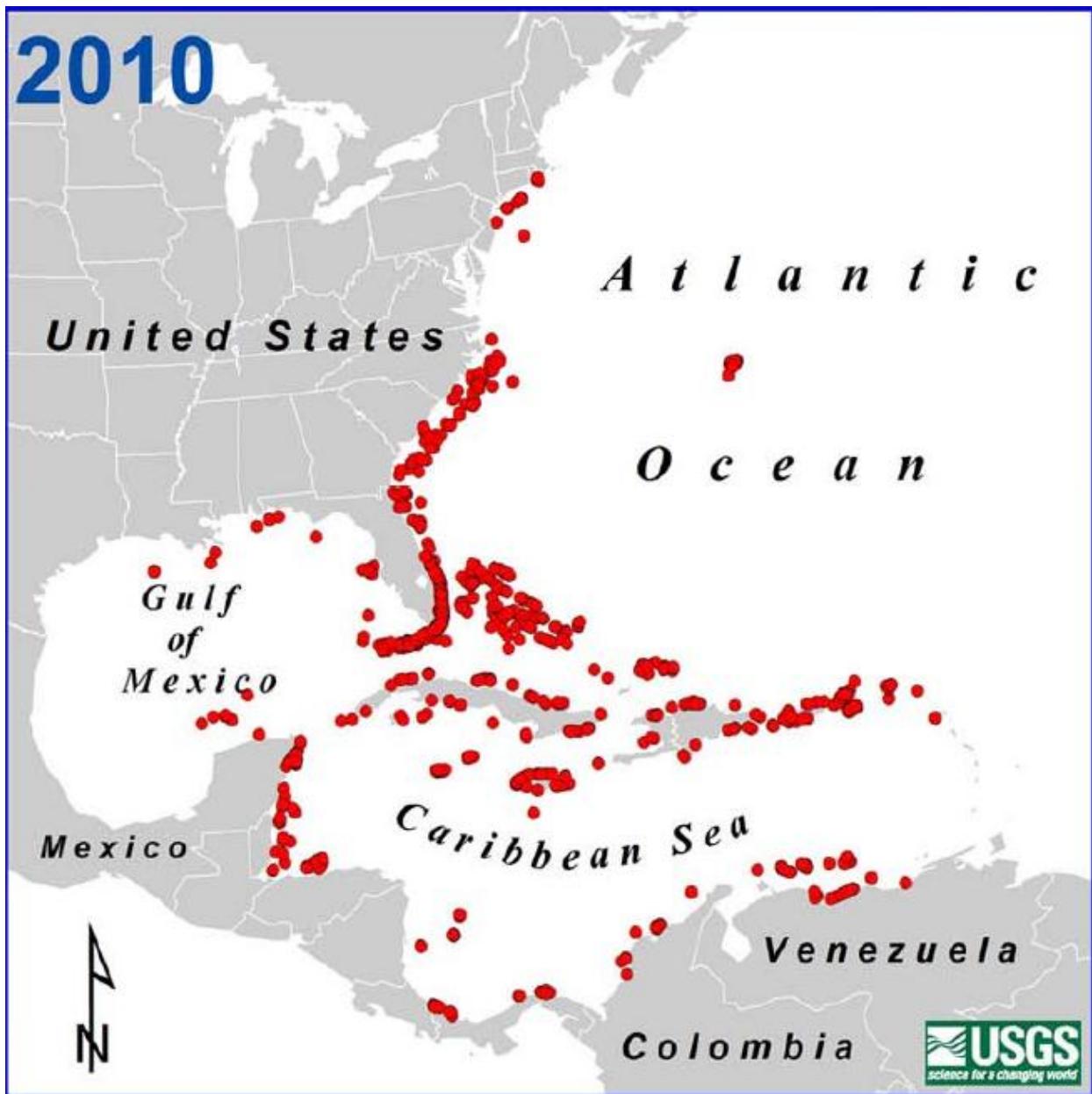


Figure 51. Confirmed lionfish occurrences in the Western North Atlantic and Caribbean Sea October 2010. (USGS-NAS 2010 in Schofield 2010).



Figure 52. Lionfish Invasion stage map. Source: Johnston and Purkis (2011).