

Identification_Information:

Citation:

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Originator: National Oceanic and Atmospheric Association (NOAA)/National Ocean Service (NOS)/National Centers for Coastal Ocean Science (NCCOS)/Center for Coastal Monitoring and Assessment (CCMA)/Biogeography Branch

Publication_Date: 20121025

Title: Benthic Community Characterization on Shallow (<30m) Hardbottom Shelf Habitats in St. Croix, USVI. A preliminary field survey to assess operational and logistical approaches to implement the National Coral Reef Monitoring Program (NCRMP) in the USVI.

Publication_Information:

Publication_Place: Silver Spring, MD

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Online_Linkage: http://ccma.nos.noaa.gov/ecosystems/coralreef/reef_fish/

Description:

Abstract:

Reef fish populations are a conspicuous and essential component of USVI coral reef ecosystems. Yet despite their importance, striking population and community level changes have occurred in the recent past due to fishing pressure and habitat degradation. The monitoring methodologies described in this document are necessary for understanding how natural and anthropogenic stressors are changing reef fish populations and communities and will be critical for their sustainable management.

A collaborative research effort between the NOAA's National Centers for Coastal Ocean Science, Center for Coastal Monitoring and Assessment's Biogeography Branch (BB) and the National Park Service (NPS) has been used to inventory and assess reef fish populations in reef and reef-associated habitats in the northeast region of St. Croix from 2001-2011. The survey method previously used has been refined to enable broader region-wide coverage at the scale of the USVI yet maintains high precision at the Marine Protected Area (MPA) spatial level. Region-wide population metric estimates are required to effectively manage reef fisheries but are also imperative for spatial management and understanding ecosystem-level processes. For example, the ability to place protected fish resources in the context of the greater region not only allows for the evaluation of management actions but it also provides the ability to determine the ecological role of an MPA in the greater ecosystem.

The monitoring method previously used by the Biogeography Branch and other partners in St. Croix and other regions within the USVI and Puerto Rico will be used to characterize and establish baseline data for future monitoring. St. Croix was chosen to serve as the first area to implement the protocol and to evaluate the logistics necessary to implement a long term monitoring program in the USVI as part of the National Coral Reef Monitoring Program (NCRMP).

Characterization and monitoring of fish communities requires a quantitative measure of the spatial distribution and variation of those communities. These measures will enable managers to make targeted management decisions (e.g. where to allow mooring or where to allow recreational activities such as snorkeling and SCUBA diving). Additionally, the spatial setting, both within and outside protected regions allows managers to assess the impact, if any, of a change in regulation such as the prohibition of fishing. It also enables analysis of any differential

effect (i.e. the effect may be the same throughout the region or it may be more effective toward an edge or center of a management area).

To quantify patterns of spatial distribution and make meaningful interpretations, we must first have knowledge of the underlying variables determining species distribution. The basis for this work therefore, is the nearshore benthic habitats maps (less than 100 ft depth) created by NOAA's Biogeography Program in 2001 and NOS' bathymetry models. The sampling domain includes all hardbottom habitats around St. Croix at depths less than 30m. The benthic habitat map and a habitat classification scheme were used to create a sample frame constructed with 50 x 50 m grids. Grids were stratified based on three variables: Hardbottom habitat type, depth zone, and region/management area. Habitat within these grids was stratified into 5 habitat categories (scattered coral/ rock, pavement, bedrock, patch reef and linear reef) each with two depth classifications (shallow (0-11.9 m) and deep (12- 30m)). Further stratification was assigned based on management zones and region of the island. There are three managed areas in St. Croix. Two federal marine protected areas are managed by the Department of Interior's National Park Service: Buck Island Reef National Monument and Salt River Bay National Historical Park and Ecological Reserve. The St. Croix East End Marine Park is a territorial marine protected area managed by the USVI Department of Planning and Natural Resources. Other strata include specific regions of St. Croix: North, East, West, and South shores. Overall there were 70 possible strata: 5 habitat types, 2 depth zones and 8 management areas/regions.

The monitoring objectives of this protocol are to determine status, trends, and variability in exploited reef fish species and communities within the USVI region and inside vs. outside different management zones, using measures such as relative abundance (density), spatial distribution, size structure and diversity.

The survey design is optimized for nine economically and ecologically important species in the USVI: blue tang (*Acanthurus coeruleus*), queen triggerfish (*Balistes vetula*), coney (*Cephalopholis fulva*), red hind (*Epinephelus guttatus*), foureye butterflyfish (*Chaetodon capistratus*), French grunt (*Haemulon flavolineatum*), yellowtail snapper (*Ocyurus chrysurus*), stoplight parrotfish (*Sparisoma viride*) and threespot damselfish (*Stegastes planifrons*). These species were chosen to include a broad range of life history traits as well as a variety of habitat utilization patterns. The sample design is optimized with the respect to these species, but because all fish species are recorded, monitoring efforts also obtain important information about many non-targeted species, the overall trophic structure, and form the scientific basis for effective management actions.

As such, the sample allocation for this mission is based upon the existing community metrics and the above species specific distribution from the northeast region of St. Croix. It was determined that 250 samples among the various strata would be sufficient to characterize hard bottom habitats around the island and have comparable coefficient of variation (CV) to values observed in the northeast region of St. Croix. The goal was to survey as many of the 250 sites as possible in a two week time period. We organized a strong science field team and completed 286 fish and benthic surveys around the island.

Purpose: To determine status, trends, and variability in exploited reef fish species, and fish and benthic communities within the USVI region and inside vs. outside different management zones, using measures such as relative abundance (density), spatial distribution, size structure and diversity.

Supplemental_Information: This work is being conducted in collaboration with the NOAA's Biogeography Branch, Southeast Fisheries Science Center, Department of Interior National Park

Service, Virgin Islands Department of Planning and Natural Resources, The Nature Conservancy, the University of the Virgin Islands and the University of Miami.

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Ending_Date: 20120519

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Maintenance_and_Update_Frequency: none

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West_Bounding_Coordinate: -64.965

East_Bounding_Coordinate: -64.433

North_Bounding_Coordinate: 17.860

South_Bounding_Coordinate: 17.616

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Theme:

Theme_Keyword_Thesaurus: NOS Data Explorer Topic Category

Theme_Keyword: Environmental Monitoring

Theme:

Theme_Keyword_Thesaurus: CoRIS Discovery Thesaurus

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Theme_Keyword_Thesaurus: ISO 19115 Topic Category

Theme_Keyword: biota

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Theme:

Theme_Keyword_Thesaurus: CoRIS Theme Thesaurus

Theme_Keyword: EARTH SCIENCE > Biosphere > Zoology > Corals > Reef monitoring and assessment > Baseline studies

Theme_Keyword: EARTH SCIENCE > Biosphere > Zoology > Corals > Reef monitoring and assessment > Benthos analysis

Theme_Keyword: EARTH SCIENCE > Biosphere > Zoology > Corals > Reef monitoring and assessment > Benthos analysis > Transect monitoring

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Theme_Keyword: EARTH SCIENCE > Biosphere > Zoology > Corals > Reef monitoring and assessment > In situ biological

Theme_Keyword: EARTH SCIENCE > Oceans > Marine Biology > Marine Invertebrates > Census > Population density

Theme_Keyword: EARTH SCIENCE > Oceans > Marine Biology > Marine Invertebrates > Macroinvertebrates

Theme_Keyword: EARTH SCIENCE > Biosphere > Vegetation > Algae > Algal cover

Theme_Keyword: EARTH SCIENCE > Biosphere > Vegetation > Algae > Calcareous macroalgae

Theme_Keyword: EARTH SCIENCE > Biosphere > Vegetation > Algae > Coralline algae

Theme_Keyword: EARTH SCIENCE > Biosphere > Vegetation > Algae > Crustose coralline algae

Theme_Keyword: EARTH SCIENCE > Biosphere > Vegetation > Algae > Encrusting macroalgae

Theme_Keyword: EARTH SCIENCE > Biosphere > Vegetation > Algae > Fleshy macroalgae

Theme_Keyword: EARTH SCIENCE > Biosphere > Vegetation > Algae > Turf algae

Theme_Keyword: EARTH SCIENCE > Oceans > Coastal Processes > Coral Reefs

Theme_Keyword: EARTH SCIENCE > Oceans > Coastal Processes > Coral Reefs > Coral Reef Ecology > Biodiversity

Theme_Keyword: EARTH SCIENCE > Oceans > Coastal Processes > Coral Reefs > Coral Reef Ecology > Coral cover

Theme_Keyword: EARTH SCIENCE > Oceans > Coastal Processes > Coral Reefs > Coral Reef Ecology > Hard coral cover

Theme_Keyword: EARTH SCIENCE > Oceans > Coastal Processes > Coral Reefs > Coral Reef Ecology > Hard coral cover Live percentage

Theme_Keyword: EARTH SCIENCE > Oceans > Coastal Processes > Coral Reefs > Coral Reef Ecology > Hard coral cover Dead percentage

Theme_Keyword: EARTH SCIENCE > Oceans > Coastal Processes > Coral Reefs > Coral Reef Ecology > Octocoral cover

Theme_Keyword: EARTH SCIENCE > Oceans > Coastal Processes > Coral Reefs > Coral Reef Ecology > Rugosity

Theme_Keyword: EARTH SCIENCE > Oceans > Coastal Processes > Coral Reefs > Coral Reef Ecology > Biodiversity

Theme_Keyword: EARTH SCIENCE > Oceans > Coastal Processes > Coral Reefs > Coral Reef Ecology > Habitats

Theme_Keyword: EARTH SCIENCE > Biosphere > Zoology > Corals > Coral Diseases

Theme_Keyword: EARTH SCIENCE > Biosphere > Aquatic Habitat > Reef Habitat > Description

Theme_Keyword: EARTH SCIENCE > Biosphere > Aquatic Habitat > Benthic Habitat

Theme_Keyword: EARTH SCIENCE > Oceans > Marine Biology > Marine Plants > Seagrass

Theme_Keyword: EARTH SCIENCE > Biosphere > Zoology > Corals > Coral Diseases > Bleaching

Theme_Keyword: EARTH SCIENCE > Biosphere > Zoology > Corals > Reef monitoring and assessment > Damage assessment > visual

Theme_Keyword: EARTH SCIENCE > Biosphere > Zoology > Corals > Reef monitoring and assessment > Damage assessment > photographic

Theme_Keyword: EARTH SCIENCE > Biosphere > Zoology > Sponges

Theme_Keyword: EARTH SCIENCE > Biosphere > Zoology > Sponges > Boring

Theme_Keyword: EARTH SCIENCE > Biosphere > Zoology > Sponges > Encrusting

Theme_Keyword: EARTH SCIENCE > Biosphere > Zoology > Sponges > Erect

Place:

Place_Keyword_Thesaurus: CoRIS Place Thesaurus

Place_Keyword: COUNTRY/TERRITORY > United States of America > U. S. Virgin Islands > St. Croix > St. Croix (17N064W0003)

Place_Keyword: OCEAN BASIN > Atlantic Ocean > Caribbean Sea > Virgin Islands > Virgin Islands > St. Croix (17N064W0003)

Access_Constraints: None

Use_Constraints: Please reference NOAA/NOS/NCCOS/CCMA/Biogeography Branch when utilizing these data in a report or peer reviewed publication. Additionally, knowledge of how this dataset has been of use and which organizations are utilizing it is of great benefit for ensuring this information continues to meet the needs of the management and research communities. Therefore, it is requested but not mandatory, that any user of this data supply this information to the Program Manager: Randy Clark (Randy.Clark@noaa.gov) or Chris Jeffrey (email: chris.jeffrey@noaa.gov).

Point_of_Contact:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: NOAA/NOS/NCCOS/CCMA/Biogeography Branch

Contact_Position: Land-sea characterization of East End Marine Park to evaluate zones and support management plan review

Contact_Address:

Address_Type: Mailing and Physical Address

Address: 1305 East-West Hwy. (SSMC4, N/SCI-1)

City: Silver Spring

State_or_Province: MD

Postal_Code: 20910

Country: USA

Contact_Voice_Telephone: 301-713-3028

Contact_Electronic_Mail_Address: randy.clark@noaa.gov or chris.jeffrey@noaa.gov

Hours_of_Service: 9:00 - 5:00

Data_Set_Credit: This is a cooperative effort between NOAA's Biogeography Branch, Southeast Fisheries Science Center, Department of the Interior National Park Service, Virgin Islands Department of Planning and Natural Resources, The Nature Conservancy, the University of the Virgin Islands and the University of Miami.

Data_Quality_Information:

Logical_Consistency_Report: Not applicable

Completeness_Report: This data consists of fish community surveys across all shallow (<30m) hardbottom marine habitats around St. Croix, US Virgin Islands. Sites were selected using a stratified random survey design.

Lineage:

Process_Step:

Process_Description:

Once on site, divers are deployed and maintain contact with each other throughout the entire census. One diver is responsible for collecting data on the benthic composition. The habitat diver follows the belt-transect diver and records data on small-scale benthic habitat composition and structure along the 25m transect. The habitat diver places a 1m² quadrat divided into 100 (10 x 10cm) smaller squares (1 square equals 1 percent cover) at five random positions along the transect. Each position is randomly chosen before entering the water such that there is one random point within every 5m interval along the transect. Percent cover is obtained as if looking at the quadrat in a two dimensional plane (i.e. a photograph) vs. three dimensions where percent cover could add up to greater than 100%.

Data are collected on the following:

1) Logistic information - diver name, dive buddy, date, time of survey, site code, and meter numbers at which the quadrat is placed.

2) Habitat structure - to characterize the benthic habitats of the dive site, the habitat diver first categorizes the habitat structure of the site: hard or soft.

3) Transect depth profile - the depth at each quadrat position. Depth is measured with a digital depth gauge to the nearest 1ft.

4) Abiotic footprint - defined as the percent cover (to the nearest 1 percent) of sand, rubble, hard bottom, and fine sediments within each quadrat position. Rubble refers to rocks and coral fragments that are moveable; immovable rocks are considered hard bottom. The percent cover given as a part of the abiotic footprint should total 100 percent. In a seagrass area for example, despite the fact that seagrass may provide 50 percent cover, the underlying substrate is 100 percent sand so this is what is recorded. To estimate percent cover, the habitat diver first positions the quadrat at the chosen meter mark along one side of the transect tape, alternating sides of the transect for subsequent quadrats. Next, the habitat diver lays the quadrat along the substrate (regardless of the slope) and estimates percent cover based on a two-dimensional (planar) view (e.g. if bottom is sloping, the quadrat is not held horizontally). Also, the diver should try to use the same planar view for all estimates of percent cover. The habitat diver then estimates, for each quadrat, the height (in cm) of the hardbottom from the substrate to get a sense of bottom relief. Note: Height is collected for all hardbottom substrates, excluding rubble; height is not collected for softbottom substrate.

5) Biotic footprint - defined as the percent cover (to the nearest 0.1 percent) of algae, seagrass, live corals, sponges, gorgonians, and other biota (tunicates, anemones, zooanthids, and hydroids) within each quadrat position. The remaining cover is recorded as bare substrate to bring the total to 100 percent. Again, the diver must use a planar view to estimate percent cover of the biota. Seagrasses and gorgonians should not be stacked upright. For example, if a single

seagrass blade crosses 10 squares, then total seagrass coverage should be the sum of the area taken up by that blade in all 10 squares instead of the area covered if the blade was held upright. Species covering less than 0.1 percent of the area are not recorded. Taxa are identified to the following levels: stony coral-species, algae-morphological group (macro, turf, crustose, rhodolith, filamentous, cyanobacteria), sponge-morphological group, and gorgonians-morphological group. When estimating percent cover, it is important to realize there is a balance between precision and time. For stony corals, the approximate area covered by living coral tissue is recorded. Coral skeleton (without living tissue) is usually categorized as turf algae or uncolonized substrate. Data on the condition of coral colonies are also recorded. When coral is noticeably bleached, the entire colony is considered affected and is recorded to the nearest 0.1 percent. Coral colonies are reported as entirely bleached if they contain any portion of white, blotchy, mottled, or pale tissue. This protocol assumes stress throughout the colony and estimates maximum bleaching impact. Diseased/dead coral refers to coral skeleton that has recently lost living tissue because of disease or damage that is still visible, and has not yet been colonized by turf algae. Turf algae include a mix of short (less than 1cm high) algae that colonize dead coral substrate.

6) Maximum canopy height - for each soft biota type (e.g., gorgonians, seagrass, algae), structure is recorded to the nearest 1cm at the quadrat level.

7) Number of individuals - for sponges, gorgonians and "other" biota type (non-encrusting anemones and non-encrusting hydroids) the number of individuals at the quadrat level is recorded.

8) Rugosity - measured by placing a 6-m chain at two randomly selected positions along the 25m belt transect. The chain is placed such that it follows the substrate's relief along the centerline of the belt transect. Two divers measure the straight-line horizontal distance covered by the chain. The chain is placed on top of any hard substrate encountered, but not on top of soft corals or sponges since we are measuring hard bottom rugosity. Data on rugosity are collected for reef sites only. Rugosity measurements typically are made by the point-count and belt-transect divers while awaiting the completion of other benthic habitat measurements by the habitat diver. Upon completion of the dive, the rugosity data are transferred from the fish data sheet to the habitat data sheet by the habitat diver.

9) Abundance and maturity of queen conchs (*Eustrombus gigas*) - a count of the total number of conch encountered within the 25 x 4m belt transect are enumerated. The maturity of each conch is determined by the presence or absence of a flared lip and labeled mature or immature, respectively.

If conch abundance is counted by a fish diver, the data are then reported to the habitat diver. The decision of who will collect conch data should be made prior to entering the water.

10) Abundance of spiny lobsters (*Panulirus argus*) - a count of the total number of lobsters encountered within the 25 x 4m belt transect. No measurements are taken. If lobster abundance is counted by a fish diver, the data are then reported to the habitat diver. The decision of who will collect lobster data should be made prior to entering the water.

11) Abundance of long-spined urchin (*Diadema antillarum*) - a count of the total number of urchins encountered within the 25 x 4m belt transect. No measurements are taken. If urchin abundance is counted by a fish diver, the data are then reported to the habitat diver. The decision of who will collect urchin data should be made prior to entering the water.

NOTE: If rugosity, conch, lobster or urchin data are collected by a fish diver, data must be transferred to the habitat data sheet. The habitat diver is responsible for transferring the data to their data sheet; however, the fish diver should assist the habitat diver with this task by reporting the data once the dive concludes.

12) Marine debris - type of marine debris within the transect is noted. The size of the marine debris and the area of affected habitat is also recorded along with a note identifying any flora or fauna that has colonized the debris.

13) Acropora presence - mark if *A. palmata* or *A. cervicornis* are seen along the transect or at the site.

14) Photography - habitat diver will take at least two photos in different directions at each site to maintain an anecdotal and permanent visual description of the sites that were sampled. Proper care and maintenance is necessary for all camera and camera housings. It is important to maintain the cameras and housings before, after and in between dives.

Data Caveats: Site selection is different from prior Caribbean Coral Reef Ecosystem Monitoring Program (CCREMP) data collection. This data set is the first time a sampling frame has been used to do site selection. CCREMP surveys (2000-2011) had stations on hard- and soft- bottom habitats; this dataset is from hardbottom sites only. CCREMP surveys were conducted only in the northeast portion of St. Croix; primarily waters less than 30 m from Green Cay to Point Udall. This dataset reflects surveys from hardbottom habitats in waters less than 30m around the entirety of St. Croix.

More detailed information on the protocols for collecting habitat data in St. Croix can be found at: http://ccma.nos.noaa.gov/ecosystems/corealreef/reef_fish/protocols.html

Process Date: 20121025

Process_Date: Not complete

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:

Geographic:

Latitude_Resolution: 0.00001

Longitude_Resolution: 0.00001

Geographic_Coordinate_Units: Decimal degrees

Entity_and_Attribute_Information:

Overview_Description:

Entity_and_Attribute_Overview: We supply percent cover, relative abundance, size, and composition of benthic communities. This information is collected across all nearshore hardbottom habitat types. In addition, we provide photographs of many of the taxa. For specific information please see the data dictionary available on the database website.

Entity_and_Attribute_Detail_Citation: NOAA/NOS/NCCOS/CCMA/Biogeography Branch
Distribution_Information:

Distributor:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: NOAA/NOS/NCCOS/CCMA/Biogeography Branch

Contact_Position: Caribbean Coral Reef Ecosystem Monitoring Database Manager

Contact_Address:

Address_Type: Mailing and Physical Address

Address: 1305 East-West Hwy. (SSMC4, N/SCI-1)

City: Silver Spring

State_or_Province: MD

Postal_Code: 20910

Country: USA

Contact_Voice_Telephone: 301-713-3028

Contact_Electronic_Mail_Address: tom.mcgrath@noaa.gov

Hours_of_Service: 9:00 - 5:00

Resource_Description: Downloadable data

Distribution_Liability: These data were prepared by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, make any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference therein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. Any views and opinions expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof. Although all data have been used by NOAA, no warranty, expressed or implied, is made by NOAA as to the accuracy of the data and/or related materials. The act of distribution shall not constitute any such warranty, and no responsibility is assumed by NOAA in the use of these data or related materials.

Standard_Order_Process:

Digital_Form:

Digital_Transfer_Information:

Format_Name: tab delimited text file

Digital_Transfer_Option:

Online_Option:

Computer_Contact_Information:

Network_Address:

Network_Resource_Name:

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Format_Name: .jpg

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Network_Address:

Network_Resource_Name:

http://www8.nos.noaa.gov/biogeo_public/habitat_photos.aspx

Fees: None

Metadata_Reference_Information:

Metadata_Date: 20121025

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Metadata_Contact:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: NOAA/NOS/NCCOS/CCMA/Biogeography Branch

Contact_Position: Western Atlantic and Caribbean Coral Reef Ecosystem Monitoring

Managers

Contact_Address:

Address_Type: Mailing and Physical Address

Address: 1305 East-West Hwy. (SSMC4, N/SCI-1)

City: Silver Spring

State_or_Province: MD

Postal_Code: 20910

Country: USA

Contact_Voice_Telephone: 301-713-3028

Contact_Electronic_Mail_Address: randy.clark@noaa.gov or chris.jeffrey@noaa.gov

Hours_of_Service: 9:00 - 5:00

Metadata_Standard_Name: Content Standard for Digital Geospatial Metadata

Metadata_Standard_Version: FGDC-STD-001-1998