

Please provide the following information, and submit to the NOAA DM Plan Repository.

Reference to Master DM Plan (if applicable)

As stated in Section IV, Requirement 1.3, DM Plans may be hierarchical. If this DM Plan inherits provisions from a higher-level DM Plan already submitted to the Repository, then this more-specific Plan only needs to provide information that differs from what was provided in the Master DM Plan.

URL of higher-level DM Plan (if any) as submitted to DM Plan Repository:

1. General Description of Data to be Managed

1.1. Name of the Data, data collection Project, or data-producing Program:

Seafloor substrate (hard and soft bottom) maps at select islands and atolls in American Samoa, the Mariana Archipelago, and the Pacific Remote Island Areas

1.2. Summary description of the data:

Seafloor substrate (i.e., hard vs. soft bottom) maps from 0 to up to 50 m depths around select islands and atolls in American Samoa, the Mariana Archipelago, and the Pacific Remote Island Areas were produced by the NOAA Fisheries Ecosystem Sciences Division (ESD). The islands and atolls include Tutuila, Ofu and Olosega, Tau, and Rose in American Samoa; Anatahan, Maug, Aguijan, Pagan, Rota, Tinian, Saipan, and Guam in the Mariana Archipelago; and Howland, Jarvis, Kingman, Palmyra, and Johnston in the Pacific Remote Island Areas. This is a preliminary product, derived from integrating two existing map products: hard and soft seafloor substrate maps derived from an unsupervised classification of multibeam backscatter and bathymetry derivatives produced by ESD, and shallow-water benthic habitat maps generated by the NOAA Centers for Coastal Ocean Science. The resulting maps were then updated with ESD's groundtruth data, including biological survey data and benthic cover data derived from the analysis of seafloor images. The final maps were interpolated to fill in gaps and smoothed to remove isolated pixels, and the substrate data were constrained up to 50-m depths. For the Pacific Remote Island Areas where no benthic habitat maps were available, hard and soft substrate maps were newly generated from high spatial resolution satellite images.

1.3. Is this a one-time data collection, or an ongoing series of measurements?

One-time data collection

1.4. Actual or planned temporal coverage of the data:

2003 to 2010, 2001 to 2003, 2008 to 2018, 2002 to 2012, 2010, 2011 to 2016

1.5. Actual or planned geographic coverage of the data:

W: -170.92, E: -168.115, N: -14.1, S: -14.57

Rose Atoll and Tutuila, Ofu/Olosega, and Tau Islands in American Samoa.

W: 144.55, E: 146, N: 18.3, S: 13.2

Guam, Saipan, Aguijan, Rota, Pagan, Anatahan, and Maug Islands in the Mariana Archipelago.

W: -176.63, E: -159.995, N: 16.8, S: -0.395

Johnston and Palmyra Atolls, Howland and Jarvis Islands, and Kingman Reef in the Pacific Remote Island Areas.

1.6. Type(s) of data:

(e.g., digital numeric data, imagery, photographs, video, audio, database, tabular data, etc.)
Map (digital)

1.7. Data collection method(s):

(e.g., satellite, airplane, unmanned aerial system, radar, weather station, moored buoy, research vessel, autonomous underwater vehicle, animal tagging, manual surveys, enforcement activities, numerical model, etc.)

1.8. If data are from a NOAA Observing System of Record, indicate name of system:

1.8.1. If data are from another observing system, please specify:

2. Point of Contact for this Data Management Plan (author or maintainer)

2.1. Name:

Brooke Olenski

2.2. Title:

Metadata Contact

2.3. Affiliation or facility:

2.4. E-mail address:

brooke.olenski@noaa.gov

2.5. Phone number:

3. Responsible Party for Data Management

Program Managers, or their designee, shall be responsible for assuring the proper management of the data produced by their Program. Please indicate the responsible party below.

3.1. Name:

Michael W Akridge

3.2. Title:

Data Steward

4. Resources

Programs must identify resources within their own budget for managing the data they produce.

4.1. Have resources for management of these data been identified?

Yes

4.2. Approximate percentage of the budget for these data devoted to data management (specify percentage or "unknown"):

Unknown

5. Data Lineage and Quality

NOAA has issued Information Quality Guidelines for ensuring and maximizing the quality, objectivity, utility, and integrity of information which it disseminates.

5.1. Processing workflow of the data from collection or acquisition to making it publicly accessible

(describe or provide URL of description):

Lineage Statement:

The steps in this analysis included: 1) re-categorizing all data to simple hard/soft substrates, 2) integrating all data following data prioritization rules established by an accuracy assessment, 3) filling gaps in data using interpolation, and 4) extracting the data to known depth ranges for the coral species in question. Biogeography Program shallow-water benthic habitat maps and ESD backscatter-derived hard-soft substrate maps were unavailable for several locations in the Pacific Remote Island Areas. Satellite images were processed for these places using the method described in Mumby and Edwards (2000) and then unsupervised classification was applied to derive hard and soft substrates for these places.

Process Steps:

- 2016-05-31 00:00:00 - First, the accuracy of two primary maps for three islands - Tutuila in American Samoa, Guam and Saipan in Mariana Archipelago were examined using the ground truthing data. Due to a wide area of overlap between the two datasets, it was necessary to make a decision on how to treat the two datasets in these areas. As the two datasets were produced from different methods, and from different underlying data (multibeam bathymetry versus satellite imagery) there were naturally discrepancies between the two datasets. Examination of the ground truthing data showed that the Biogeography Program shallow-water benthic habitat map provided better representations of overall classifications for all three islands. For both maps, the sand classes produced poor accuracy. This might be due to the disparity of the data acquisition time among the datasets, and the sand cover might be greatly shifted over time. Based on the accuracy assessments and uncertainties, a pragmatic decision was taken to integrate all the datasets following data prioritization rules: 1. Hard classes from ground truthing data 2. Biogeography Program shallow-water benthic habitat map 3. ESD backscatter-derived hard-soft substrate map These data prioritization rules are applied to the rest of the islands. ESD backscatter-derived hard-soft substrate

maps are only available for Tutuila, Ofu/Olosega and Tau islands, and Rose Atoll in American Samoa; and Guam, Saipan, Tinian, and Pagan islands in Mariana Archipelago. For Rota, Aguijan, Maug, and Anatahan islands in Mariana Archipelago and Palmyra Atoll in Pacific Remote Islands, only the Biogeography Program shallow-water benthic habitat map and available ground truthing data were used. The pixel resolution is dependent on the available datasets: if ESD hard-soft substrate maps are available, the pixel resolution of the products inherits the resolution of the ESD hard-soft substrate maps. Otherwise it will inherit the resolution of the Biogeography Program shallow-water benthic habitat map.

- 2016-05-31 00:00:00 - For the Biogeography Program shallow-water benthic habitat map, polygons were first deleted that were not required for this product; the polygons where the Major Reef Structure (M_STRUCTURE) was either 'Unknown' or 'Other Delineations' were deleted, leaving only polygons where M_STRUCTURE was 'Coral Reef and Hardbottom' or 'Unconsolidated Sediment.' The polygon shapefile was then converted into an ArcGIS Raster, using the ArcGIS tool, 'Polygon To Raster'. The raster values were checked to ensure that the same value was equivalent to hard substrate as in the ESD backscatter-derived hard-soft map, where 'Coral Reef and Hardbottom' was classed as 'hard' and 'Unconsolidated Sediment' was classed as 'soft'.

- 2016-05-31 00:00:00 - For the ESD backscatter-derived hard-soft substrate, no data area was removed.

- 2016-05-31 00:00:00 - To combine the two maps and ground truthing data, all layers were mosaiced, using the ArcGIS tool, 'Mosaic To New Raster.' Based on the data prioritization rules, the two maps were first mosaiced using the 'FIRST' method of the ArcToolbox Tool 'Mosaic to new raster' where the Biogeography Program shallow-water benthic habitat map was the 'first' raster in the mosaic. This meant that where there was overlap between the two datasets, the Biogeography Program shallow-water benthic habitat map was used, and the ESD backscatter-derived hard-soft substrate map was used to fill in gaps. Then, the ground truthing data were mosaiced with the combined map using the 'FIRST' method where the ground truthing data was the 'first' raster in the mosaic to update the combined map. However, even using this method, artifacts in the data remain. It should also be borne in mind that the sand areas may be problematic for both primary maps; The Biogeography Program shallow water benthic habitat map may misrepresent high reflective hard substrate areas as sand, whereas the ESD backscatter-derived hard-soft map may under-represent soft sediment at the surface, particularly if there is rocky substrate underlying the soft sediment.

- 2016-05-31 00:00:00 - For ground-truthing data, to estimate the survey areas, 30-m radius buffers were generated around the locations of the reef fish surveys* and coral demographic surveys and 15-m radius buffers for the image locations of hard classes from the TOAD. All polygons were assigned as 'hard'. Similar to the Biogeography Program shallow-water benthic habitat map, the buffer polygons were then converted into an ArcGIS Raster. *Locations of reef fish surveys are included as ground-truth data because NOAA ESD only surveys hard bottom coral

reef habitats as part of its standard operating procedures to conduct reef fish surveys.

- 2016-05-31 00:00:00 - Gaps were filled with interpolation in ArcGIS environment. ‘Focal statistics’ was used in ‘Raster Calculator’ tool to calculate majority value within three by three cell neighborhood for each cell location where there is no value. ‘Majority filter’ was then applied to remove isolated single pixels.

- Neither the Biogeography Program shallow-water benthic habitat nor the ESD backscatter-derived hard-soft substrate maps were available for Howland and Jarvis islands, Johnston Atoll and Kingman Reef in the Pacific Remote Island Areas. WorldView-2 images were processed for these places using the method described in Mumby and Edwards (2000). Then, unsupervised classification was applied in ArcGIS desktop to derive Hard and Soft substrate maps. (Citation: Mumby, P. J., Edwards, A. J. Water column correction techniques. In Remote Sensing Handbook for Tropical Coastal Management. Green, E. P., Mumby, P. J., Edwards, A. J., Clark, C. D., Eds. UNESCO: Paris, France, 2000. Pp. 121-128.)

- Both interpolated and non-interpolated Integrated hard-soft maps and the satellite-derived substrate maps were extracted using the known depth contours for ESA species using 'Extract by Mask' tool in ArcGIS. (Citation: Depth Contours for select locations across the U.S. Pacific Islands)

5.1.1. If data at different stages of the workflow, or products derived from these data, are subject to a separate data management plan, provide reference to other plan:

5.2. Quality control procedures employed (describe or provide URL of description):

Tier 1 and Tier 2 method: The accuracy of the two existing map products used in the analysis---1) hard and soft seafloor substrate maps derived from an unsupervised classification of multibeam backscatter and bathymetry derivatives produced by ESD, and 2) shallow-water benthic habitat maps generated by NOAA National Centers for Coastal Ocean Science Biogeography Program---were assessed with ESD's in-situ surveys and benthic data derived from the analysis of seafloor images. Once all data were integrated, the products were visually inspected by ESD's researchers.

Primary Tier 3 method: the method was developed initially for an area in West Hawaii where multiple sources of accurate, reliable data were available. Applying the method to islands in the Pacific Remote Island Areas, the process and resulting classifications were quality controlled by a group of team members before the products were finalized.

6. Data Documentation

The EDMC Data Documentation Procedural Directive requires that NOAA data be well documented, specifies the use of ISO 19115 and related standards for documentation of new data, and provides links to resources and tools for metadata creation and validation.

6.1. Does metadata comply with EDMC Data Documentation directive?

No

6.1.1. If metadata are non-existent or non-compliant, please explain:

Missing/invalid information:

- 1.7. Data collection method(s)

6.2. Name of organization or facility providing metadata hosting:

NMFS Office of Science and Technology

6.2.1. If service is needed for metadata hosting, please indicate:

6.3. URL of metadata folder or data catalog, if known:

<https://www.fisheries.noaa.gov/inport/item/34310>

6.4. Process for producing and maintaining metadata

(describe or provide URL of description):

Metadata produced and maintained in accordance with the NOAA Data Documentation Procedural Directive: https://nosc.noaa.gov/EDMC/DAARWG/docs/EDMC_PD-Data_Documentation_v1.pdf

7. Data Access

NAO 212-15 states that access to environmental data may only be restricted when distribution is explicitly limited by law, regulation, policy (such as those applicable to personally identifiable information or protected critical infrastructure information or proprietary trade information) or by security requirements. The EDMC Data Access Procedural Directive contains specific guidance, recommends the use of open-standard, interoperable, non-proprietary web services, provides information about resources and tools to enable data access, and includes a Waiver to be submitted to justify any approach other than full, unrestricted public access.

7.1. Do these data comply with the Data Access directive?

Yes

7.1.1. If the data are not to be made available to the public at all, or with limitations, has a Waiver (Appendix A of Data Access directive) been filed?

7.1.2. If there are limitations to public data access, describe how data are protected from unauthorized access or disclosure:

7.2. Name of organization of facility providing data access:

Pacific Islands Fisheries Science Center (PIFSC)

7.2.1. If data hosting service is needed, please indicate:

7.2.2. URL of data access service, if known:

ftp://ftp.soest.hawaii.edu/pibhmc/website/data/amsamoa/benthichabitatlayers/ofu_5m_hardsoft.zip
ftp://ftp.soest.hawaii.edu/pibhmc/website/data/amsamoa/benthichabitatlayers/ros_5m_hardsoft.zip

ftp://ftp.soest.hawaii.edu/pibhmc/website/data/amsamoa/benthichabitatlayers/tau_5m_hardsoft.zip
 ftp://ftp.soest.hawaii.edu/pibhmc/website/data/amsamoa/benthichabitatlayers/tut_5m_hardsoft.zip
 ftp://ftp.soest.hawaii.edu/pibhmc/website/data/cnmi-guam/benthichabitatlayers/agu_4m_hardsoft.zip
 ftp://ftp.soest.hawaii.edu/pibhmc/website/data/cnmi-guam/benthichabitatlayers/ana_4m_hardsoft.zip
 ftp://ftp.soest.hawaii.edu/pibhmc/website/data/cnmi-guam/benthichabitatlayers/gua_5m_hardsoft.zip
 ftp://ftp.soest.hawaii.edu/pibhmc/website/data/cnmi-guam/benthichabitatlayers/mau_4m_hardsoft.zip
 ftp://ftp.soest.hawaii.edu/pibhmc/website/data/cnmi-guam/benthichabitatlayers/pag_5m_hardsoft.zip
 ftp://ftp.soest.hawaii.edu/pibhmc/website/data/cnmi-guam/benthichabitatlayers/rot_4m_hardsoft.zip
 ftp://ftp.soest.hawaii.edu/pibhmc/website/data/cnmi-guam/benthichabitatlayers/sai_5m_hardsoft.zip
 ftp://ftp.soest.hawaii.edu/pibhmc/website/data/cnmi-guam/benthichabitatlayers/tin_5m_hardsoft.zip
 ftp://ftp.soest.hawaii.edu/pibhmc/website/data/pria/benthichabitatlayers/how_2m_hardsoft.zip
 ftp://ftp.soest.hawaii.edu/pibhmc/website/data/pria/benthichabitatlayers/jar_2m_hardsoft.zip
 ftp://ftp.soest.hawaii.edu/pibhmc/website/data/pria/benthichabitatlayers/joh_2m_hardsoft.zip
 ftp://ftp.soest.hawaii.edu/pibhmc/website/data/pria/benthichabitatlayers/kin_2m_hardsoft.zip
 ftp://ftp.soest.hawaii.edu/pibhmc/website/data/pria/benthichabitatlayers/pal_hardsoft.zip

7.3. Data access methods or services offered:

Data can be accessed online via the Pacific Islands Benthic Habitat Mapping Center website via the FTP link provided in the distribution section.

7.4. Approximate delay between data collection and dissemination:

Unknown

7.4.1. If delay is longer than latency of automated processing, indicate under what authority data access is delayed:

8. Data Preservation and Protection

The NOAA Procedure for Scientific Records Appraisal and Archive Approval describes how to identify, appraise and decide what scientific records are to be preserved in a NOAA archive.

8.1. Actual or planned long-term data archive location:

(Specify NCEI-MD, NCEI-CO, NCEI-NC, NCEI-MS, World Data Center (WDC) facility, Other, To Be Determined, Unable to Archive, or No Archiving Intended)

OTHER

8.1.1. If World Data Center or Other, specify:

8.1.2. If To Be Determined, Unable to Archive or No Archiving Intended, explain:

8.2. Data storage facility prior to being sent to an archive facility (if any):

Pacific Islands Fisheries Science Center - Honolulu, HI

8.3. Approximate delay between data collection and submission to an archive facility:

Unknown

8.4. How will the data be protected from accidental or malicious modification or deletion prior to receipt by the archive?

Discuss data back-up, disaster recovery/contingency planning, and off-site data storage relevant to the data collection

University of Hawaii School of Ocean and Earth Science and Technology, NOAA IRC and NOAA Fisheries ITS resources and assets.

9. Additional Line Office or Staff Office Questions

Line and Staff Offices may extend this template by inserting additional questions in this section.