

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:

Guam Long-term Coral Reef Monitoring Program Coral Colony Size and Condition Surveys since 2010

1.2. Summary description of the data:

The Government of Guam's Comprehensive Long-term Monitoring at Permanent Sites in Guam project, also known as the Guam Long-term Coral Reef Monitoring Program (GLTMP), is a NOAA-funded project currently coordinated through the University of Guam Marine Laboratory. The program involves the regular, intensive collection of data for a suite of coral reef ecosystem health parameters at high priority reef areas (HPRAs) around Guam, as well as critical support for coral bleaching response and other activities carried out by the multi-partner Guam Coral Reef Response Team. The program currently utilizes a split-panel sampling approach, whereby a mix of permanent and non-permanent sampling stations (one sampling station = one transect) are visited within each HPRA. The HPRAs were selected by an advisory body comprised of reef managers, researchers, and technicians; these reef areas were not intended to be representative of Guam's reefs more broadly. The locations of the sampling stations within each HPRA are generated randomly using GIS software. Various coral reef surveys are carried out on an annual basis along the seaward slope between 7 and 15 m depth in the Tumon Bay Marine Preserve and in East Agana Bay, while surveys are carried out biennially within the Piti Bomb Holes Marine Preserve, the Achang Reef Flat Marine Preserve, the eastern side of the Cocos Barrier Reef (Cocos-East), and Fouha Bay. Surveys were also carried out along reef margin (1-2 m) and slope (2-15 m) of Western Shoals, in Apra Harbor, in 2011. The surveys, which are currently conducted by University of Guam Marine Laboratory biologists, and which were supported by NOAA PIRO through 2019, currently include benthic photo transects, stationary point count fish surveys, macroinvertebrate belt transects, and chain-length rugosity surveys. The GLTMP has conducted surveys at the Tumon and East Agana HPRAs since 2010 and the Piti HPRA since 2012. Data collection for the Achang and Cocos-East HPRAs began in 2014 and at the Fouha Bay HPRA in 2015. Baseline data is available for the Western Shoals HPRA from 2011 but this site has not been re-visited since its establishment due to shifting management priorities.

Corals are the main contributor to coral reef accretion, provide critical habitat for numerous reef organisms, and serve as a food source for some reef organisms. In recognition of the critical important of corals, coral colony size and condition surveys were carried out by the GLTMP at several HPRAs on a regular basis between 2010 and 2019. Nearly all of the coral quadrat surveys were carried out by a single observer. The size and condition are assessed for all coral colonies found within quadrats placed every 5 meters along 30-m transects (15-m transects for the Western Shoals HPRAs, 25 m for other HPRAs prior to 2018). These monitoring data on coral communities provide results on coral colony density, size, condition, and diversity; allow for exploration of community structure by functional group and size; and can be used to detect changes in coral communities over time. The coral quadrat surveys were eliminated beginning in 2020 due to staff capacity limitations, but the nails marking the quadrat locations at some sampling stations have been maintained opportunistically.

IMPORTANT NOTE: The plate-and-pillar coral, *Porites rus*, was excluded from the coral quadrat survey during the 2019 and 2020 field seasons due to the considerable time required to properly assess the size and condition of this abundant species and the limited availability of the program coordinator to carry out the specialized survey.

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:

2010-08-04 to 2010-09-03, 2012-09-05 to 2012-11-19, 2014-09-03 to 2014-09-09, 2015-06-23 to 2015-07-01, 2017-04-10 to 2017-05-17, 2018-10-23, 2019-07-02 to 2019-08-23, 2010-09-07 to 2010-11-26, 2012-11-16 to 2012-11-28, 2014-09-10 to 2014-09-16, 2016-02-16 to 2016-04-05, 2017-07-12 to 2017-07-20, 2019-09-05 to 2019-09-06, 2011-07-11 to 2011-08-19, 2012-07-23 to 2012-08-31, 2014-09-17 to 2014-11-13, 2017-11-15 to 2017-12-15, 2018-03-01 to 2018-03-09, 2014-10-22 to 2014-10-27, 2018-07-26 to 2018-08-09, 2014-10-27 to 2014-10-28, 2018-08-24, 2015-05-06 to 2015-10-27, 2019-06-04

1.5. Actual or planned geographic coverage of the data:

W: 144.784502, E: 144.795528, N: 13.512988, S: 13.508506

These bounding coordinates pertain to the original Tumon Bay site surveyed in 2010. The site boundaries were modified prior to the 2012 surveys; the coordinates of the modified site boundaries are presented in a separate Geographic Area above.

W: 144.789408, E: 144.798507, N: 13.517207, S: 13.510711

These bounding coordinates pertain to the Tumon Bay site boundaries modified after the 2010 survey effort and prior to the 2012 survey effort; these are the current boundaries for the Tumon Bay monitoring site.

W: 144.758065, E: 144.766983, N: 13.491396, S: 13.483792

These bounding coordinates pertain to the current boundaries for the East Agana Bay site, which has been monitored since 2010

W: 144.653292, E: 144.656443, N: 13.454042, S: 13.449599

These bounding coordinates pertain to the Western Shoals monitoring site in Apra Harbor. The Western Shoals site has not been re-surveyed since 2011 due to a shift in management priorities.

W: 144.683913, E: 144.697634, N: 13.47632, S: 13.468317

These bounding coordinates pertain to the Piti (Tepungan) Bay site, which has been surveyed since 2012.

W: 144.69765, E: 144.712233, N: 13.242611, S: 13.239282

These bounding coordinates pertain to the current Achang monitoring site boundaries, which were established in 2014.

W: 144.674888, E: 144.685944, N: 13.23992, S: 13.235939

These bounding coordinates pertain to the current Cocos-East site, which was established in 2014

W: 144.653677, E: 144.656082, N: 13.305903, S: 13.303514

These bounding coordinates pertain to the current Fouha Bay monitoring site, which was established in 2015

1.6. Type(s) of data:

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

Table (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:

David R Burdick

2.2. Title:

Metadata Contact

2.3. Affiliation or facility:

2.4. E-mail address:

burdickd@triton.uog.edu

2.5. Phone number:

671-735-2175

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:

David R Burdick

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 Coral Colony Size and Condition (or Coral Quadrat) Survey methodology, employed by the Guam Long-term Coral Reef Monitoring Program since 2010

Process Steps:

- Coral colony size and condition surveys are carried out at all sampling stations when program capacity is sufficient to do so. All sampling stations have been selected in hard-bottom habitats using a stratified random sampling design, and the stations have been designed using the split-panel approach (combination of fixed and non-fixed transects).
- Each sampling station is located using a GPS receiver. Upon reaching a given station, a small weight and line tied to a buoy is carefully lowered to the ocean floor. In optimal situations where four divers are available, two divers enter the water first to carry out the fish surveys. Starting at the weight tied to the buoy, a 30 m transect is laid out [25 m-long transects were used prior to 2017]. The transect is laid out in a clockwise direction relative to the island, following the depth contour if it is readily determined; if the area is relatively flat and a depth contour is not

readily discernible the transect is laid at an angle parallel to the reef margin (which is determined prior to entering the water). Compact digital point and shoot cameras and housings are used by individual observers to document unknown organisms, incidences of coral disease, and species/behaviors of special interest. For the initial establishment of fixed sampling stations, 24 inch rebar is installed at the beginning of the transect and 12 inch rebar is installed at the center and end of the transect; four-inch concrete nails are installed in at least two of the corners of each quadrat used for coral size and condition surveys. For the Western Shoals site, rebar and concrete nails were not used and instead a small PVC float was tied to dead coral with a line at the beginning of the transect and large zip ties were placed at the beginning, middle, and end of the transect. Two small zip ties were used to mark two corners of each permanent quadrat location. To minimize diver disruptions, the two divers conducting the benthic surveys enter the water after the fish team has finished enumerating fish. In situations where only three divers are available, all three divers enter the water at the same time and remain as a three-person buddy team to ensure diver safety throughout the survey. A fish diver partners with a benthic diver when two fish divers are not available. In this situation, the fish diver lays the transect and conducts the first SPC at 22.5 m while the benthic diver works from 0-15 m; they then switch positions along the transect so that the fish diver can carry out the second SPC.

- Shortly after a benthic team diver begins the photo transect on the left side of the transect, another diver then identifies and measures all coral colonies within a 0.5 x 0.5 m quadrat (1 x 0.75 m quadrat for the Western Shoals and Fouha Bay sites) placed at 0 m, 5 m, 10 m, 15 m, 20 m and 25 m along the right side of the transect. In rare instances time limitations prevented data collected for all six quadrat positions, and when 25 m-long transects were used (prior to 2017) quadrats were usually not placed at the 25 m mark. For each quadrat location, the bottom-left corner of the quadrat is coincident with the appropriate meter mark (0 m, 5 m, etc.) along the transect. Only those colonies whose geometric center is within the quadrat are counted. Percent old dead, percent recent dead, and disease type and severity are recorded for each colony. The cause of tissue mortality is also noted if it can be determined with a reasonable degree of confidence. Measurements of the longest dimension and the width of the colony perpendicular to the longest dimension are made. An effort is made to carefully count all visible colonies, including recruits/juvenile corals. Care is taken to prevent the count of remnants of larger colonies as coral recruits/juvenile corals. Any tissue isolate suspected of being a remnant of a larger colony is noted as such, in order to prevent the calculation of erroneous coral colony density. At least two planar view photos are taken of each quadrat in order to maintain a photographic record of all quadrats. Photos are also taken of corals for which species identification is uncertain, of unidentified sources of mortality, or of species or conditions of particular interest.

- Raw data include individual colony records with the corresponding methodological information and physical data that reflect the description of the site. An individual colony record for all corals includes colony species/genus

identification; maximum diameter (cm); perpendicular diameter (cm); percent old dead; percent recent dead; and condition type and severity; photo (y/n); collected (y/n); fragment (y/n), tissue remnant (y/n); and additional comments. The physical and methodological data for all records includes the following: site, station, station type, date (day, month, year), latitude (dd), longitude (dd), transect number, transect length, quadrat, quadrat size, depth (m), habitat.

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):

All observations entered into the database through the online data entry system are compared against observations recorded on the raw data sheet. Once all database records are verified the quality control process is marked as complete for all observations associated with a given station/sampling period. This process is currently carried out by the Program Coordinator or the full-time field technician. It should also be noted that the data management system employs hard and soft validation to minimize data entry errors.

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)
- 7.2. Name of organization of facility providing data access
- 7.2.1. If data hosting service is needed, please indicate

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/47781>

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:

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

7.2.2. URL of data access service, if known:

<https://accession.nodc.noaa.gov/accession#>

7.3. Data access methods or services offered:

Data can be accessed online via the NOAA National Centers for Environmental Information (NCEI) Ocean Archive or by contacting David Burdick at burdickd@triton.uog.edu.

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)

NCEI_MD

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):

University of Guam Marine Laboratory - Mangilao, GU

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 Guam Marine Lab 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.