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:**
> Corallivory, or coral predation, data derived from Structure-from-Motion imagery and in-situ surveys of coral reefs off of O'ahu, Hawai'i from 2021 to 2022

> **1.2. Summary description of the data:**
> The data described here are raw corallivory, or coral predation, data from in situ visual surveys as well as derived corallivory data from Structure-from-Motion (SfM) imagery collected during diver transect surveys between 2021 and 2022. These surveys were conducted by a graduate student researcher from the University of Hawaii at Manoa, and funded by NOAA's Coral Reef Conservation Program (CRCP), with support from scientists of the Ecosystem Sciences Division (ESD) at the Pacific Islands Fisheries Science Center (PIFSC) of NOAA. This data was funded by CRCP Project number 31349 titled: 'Determining whether herbivore-focused management strategies enhance critical ecosystem functions provided by fishes'. The source SfM imagery will be accessible via Google Cloud bucket (see URLs).
>
> 39 sites off of O'ahu, Hawai'i were established for this project. At each site, a 3x20m haphazardly placed transect was surveyed and imaged using underwater cameras. Along each transect, seven 1x1m quadrats spaced 3m apart were first surveyed for corallivory bite marks. After the survey was conducted, the same 3x20m transect was imaged using an underwater camera. Photographs were processed using Agisoft Metashape software to generate 2D orthomosaics. These orthomosaics were uploaded to ArcGIS Pro to be annotated for corallivory estimates.
>
> In water bite counts and estimates derived from SfM annotations will be compared with visual survey data to better understand the accuracy at which SfM annotations capture corallivory.

> **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:**
> 2021-06-29 to 2022-10-28

1.5. Actual or planned geographic coverage of the data:
W: -158.2251, E: -157.691881, N: 21.649219, S: 21.268008
Extent of sites where in-situ corallivory data and imagery for Structure-from-Motion
was collected across O'ahu in 2021-2022.

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:
Lori H Luers

2.2. Title:
Metadata Contact

2.3. Affiliation or facility:

2.4. E-mail address:
lori.luers@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:
Roseanna Lee

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:
Structure from Motion (SfM) techniques are increasingly being used to extract coral health metrics. In 2021 and 2022, new methods were developed, executed and tested to extract corallivory estimates from SfM models at sites around Oahu, Hawaii. At each site, a 3x20m haphazardly placed transect was surveyed for corallivory marks and imaged using underwater cameras. Seven 1x1m quadrats spaced 3m apart were first surveyed for corallivory bite marks along each transect. Spray painted fishing weights were used to mark placement of each quadrat. After the survey was completed, the same 3x20m transect was imaged using an underwater camera. Photographs were processed using Agisoft Metashape software to generate 2D orthomosaics. These orthomosaics were uploaded to ArcGIS Pro and were annotated for corallivory bite marks.

Process Steps:
- Most of the surveys were conducted with SCUBA, with the exception of a few shallow sites where surveys were conducted with snorkeling gear. Sites were accessed either by boat or from shore. Divers used diver propulsion vehicles (DPVs) to search for appropriate places to conduct the surveys. Transect locations were selected haphazardly. Because of the nature of the study, sites were selected with different levels of coral cover and rugosity. Transects (20m) were laid out parallel to shore in order to ensure the same depth was maintained throughout the transect. This is with the exception of spur and groove sites where transects were laid along the top of the groove. Once the transect was deployed, three ground control points were placed 0.5 meters from the transect line at 0, 10 and 20 meters and depth measurements were taken at each point. Other metadata such as surveyor codes and reef habitat type were also recorded.
- Along each transect, seven 1mx1m quadrats were surveyed for corallivory, or coral predation bite marks. Quadrats were spaced out every 3m starting at the 1m mark (with some exceptions). Every time a quadrat was surveyed, a fishing weight, spray painted pink, was placed in the middle of the quadrat along the edge facing the 0m mark. Within each quadrat, the surveyor recorded coral species, bite mark

category, overlap score, and healing condition. Descriptions of these can be found in Appendix 1 of the "Quantifying Corallivory from Structure-from-Motion Model" SOP. (Citation: Escontrela Dieguez D, Lee R, Kindinger TL, Couch CS, Charendoff J. 2023. Quantifying corallivory from Structure-from-motion models. U.S. Dept. of Commerce, NOAA Technical Memorandum NMFS-PIFSC-149, 8182 p. doi: 10.25923/c64k-gh75)

- Once the in water survey was completed, SfM images were taken along the entire transect, covering a total area of 20mx3m. A Canon SL2 with Ikelite underwater housing was used to take the pictures. Before image collection began, the camera was white balanced using an 18% gray card. Pointing the camera straight down, the diver took continuous photographs of the reef along the transect, making three passes on each side of the transect. Detailed methods regarding image collecting for SfM models, including camera settings, can be found in the "Processing Photomosaic Imagery of Coral Reefs Using Structure-from-Motion Standard Operating Procedures" SOP. (Citation: Suka R, Asbury M, Couch C, Gray A, Winston M, Oliver T. 2019. Processing Photomosaic Imagery of Coral Reefs Using Structure-from-Motion Standard Operating Procedures. U.S. Dept. of Commerce, NOAA Technical Memorandum NOAA-TM-NMFS-PIFSC-93, 54 p. doi:10.25923/h2q8-jv47)

- Images were sorted and assessed for quality before model building began. Any gray card photos or images with blue water or fins were stored in a separate folder. Once an initial quality control was completed, Agisoft was used to build the 3D point cloud and 2D orthomosaic for each transect. Once these were built, underlying images were linked to the 3D point cloud in Viscore. Detailed methods for image processing and model building can be found in the "Processing Photomosaic Imagery of Coral Reefs Using Structure-from-Motion Standard Operating Procedures" SOP (Citation: Suka R, Asbury M, Couch C, Gray A, Winston M, Oliver T. 2019. Processing Photomosaic Imagery of Coral Reefs Using Structure-from-Motion Standard Operating Procedures. U.S. Dept. of Commerce, NOAA Technical Memorandum NOAA-TM-NMFS-PIFSC-93, 54 p. doi:10.25923/h2q8-jv47)

- Before annotations began, a geodatabase was created. A geodatabase is used to create the attribute domains which will provide annotators with standard drop down menus to pick from.   Next, the 2D orthomosaic was imported into ArcGIS Pro. Transect lines and quadrats were then added, using the pink fishing weight as a reference for their placement. The geodatabase was then added to the project. The models were annotated for fish predation using the multipoint tool. A new line was created in the attribute table for each new coral species/bite mark category/healing condition combination within each quadrat. Once all the models were annotated, the annotations data was extracted from ArcGIS Pro. Detailed descriptions of the bite mark categories, healing conditions, and overlap scores and step by step instructions for setting up models in ArcGIS Pro and doing annotations can be found in the "Quantifying Corallivory from Structure-from-Motion Model" SOP. (Citation: Escontrela Dieguez D, Lee R, Kindinger TL, Couch CS, Charendoff J. 2023. Quantifying corallivory from Structure-from-motion models. U.S. Dept. of Commerce, NOAA Technical Memorandum NMFS-PIFSC-149, 8182 p. doi: 10.25923/

c64k-gh75)

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):
Prior to generating the 3D dense point clouds and 2.5D digital elevation model , the JPEG imagery was evaluated for image quality and images deemed unsatisfactory (e.g. overexposed, images of blue water or images of divers, or images not taken perpendicular to the reef) were removed from the image set. Once images were uploaded to Agisoft, the "Estimate Image Quality" feature was used to further eliminate images with an image quality of less than 0.5. In some instances, if the majority of the images had a quality score of less than 0.5, images were eliminated with a quality of less than 0.4.

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/68015

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:
NOAA National Centers for Environmental Information (NCEI)

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

7.2.2. URL of data access service, if known:
http://accession.nodc.noaa.gov/0286084
http://accession.nodc.noaa.gov/0286084
http://accession.nodc.noaa.gov/0286084
http://accession.nodc.noaa.gov/0286084
http://accession.nodc.noaa.gov/0286084

7.3. Data access methods or services offered:
Data can be accessed online via the NOAA National Centers for Environmental Information (NCEI) Ocean Archive.

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):
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
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.