

Papahānaumokuākea Marine National Monument Permit Application Cover Sheet

This Permit Application Cover Sheet is intended to provide summary information and status to the public on permit applications for activities proposed to be conducted in the Papahānaumokuākea Marine National Monument. While a permit application has been received, it has not been fully reviewed nor approved by the Monument Management Board to date. The Monument permit process also ensures that all environmental reviews are conducted prior to the issuance of a Monument permit.

Summary Information

Applicant Name: Haunani Hi'ilani Kane

Affiliation: National Science Foundation Postdoctoral Fellow at the University of Hawai'i at Hilo

Permit Category: Research

Proposed Activity Dates: July 2020

Proposed Method of Entry (Vessel/Plane): SSV Makani Olu

Proposed Locations: French Frigate Shoals, and Nihoa

Estimated number of individuals (including Applicant) to be covered under this permit:
20

Estimated number of days in the Monument: 15

Description of proposed activities: (complete these sentences):

a.) The proposed activity would...

Assess impacts of Hurricane Walaka upon islands and the shallow marine environment at French Frigate Shoals. Our survey techniques will use a non-invasive method to collect high resolution imagery to document island sediment and shallow reef lost and subsequent recovery following Hurricane Walaka. Our island and nearshore sediment data collection method will enable shifts in dominant sediment types and sources from the nearshore reef to be identified. This will enable estimates for future sediment production and replenishment to islands following environmental stressors. The proposed activities will improve the understandings of the potential loss and timescales for recovery of critical habitat following extreme storm events. The proposed activities will also improve understandings of how future sea level rise will impact essential habitats for priority species (e.g. sea turtles, monk seals, and various seabirds).

b.) To accomplish this activity we would

1.) Use a remotely operated vehicle (ROV), to map and quantify the impacts of Hurricane Walaka upon 10 nearshore shallow reefs at Nihoa (2 reefs) and at FFS (8 reefs). 2.) Collect GPS data and aerial imagery using an unmanned aerial system (UAS) at three islands within FFS. 3.) Collect sediment samples (total: 200, ¾ cup

volume) from the shallow marine environment (80, $\frac{3}{4}$ cup volume), and modern beach face (100, $\frac{3}{4}$ cup volume) at three islands within FFS. 3D digital reconstructions of the nearshore reef habitat, and island environments will be derived from ROV and UAS imagery. These models will be compared to 3D models of island environments collected in 2018 by Dr. Fletcher's team (includes Dr. Kane, McDonald, and Dominique-Tavares listed on this permit), and supplement reef models collected at deeper depths by Dr. John Burns. Comparing 2018 & 2020 3D island models and sediment composition will enable sediment budgets for each island to be quantified by both sediment source, and sediment volume. 3D models of the shallow reef will enable dominant sediment sources (including but not limited to calcareous red algae, *Halimeda*, coral) to be mapped and quantified. Ultimately we will obtain detailed data on the impacts of extreme storm events, and the capacity of atoll islands to naturally recover from environmental stressors. This research will allow us to decipher important characteristics of reduced resiliency affecting islands and critical island habitats across PMNM.

c.) This activity would help the Monument by ...

Providing detailed analyses of island habitat and nearshore reefs is useful for determining the severity and prevalence of Hurricane Walaka impacts across FFS. By resurveying sites visited in 2018 (Gin and East Island) we will provide visual representations of island recovery and loss. The 3D island reconstructions will provide useful data for assessing island elevation, and island sedimentary budgets. Both are useful metrics for predicting future time scales of vulnerability to storms and sea level rise. Furthermore analyses of island sediments will reveal the dependency of islands upon the adjacent nearshore reef for sediment replenishment following environmental stressors. Our research will provide PMNM staff with guidance for responsive management of critical ecosystems and endangered species in a future of elevated sea-level.

Other information or background:

Obtaining a better understanding of the fate of reef islands is vital for understanding the future of critical habitats at FFS and also for depicting what impacts we may foresee for cultural, natural, and historic resources of the PMNM as a whole. Our island surveying methods have proved useful for determining the impacts of past and future sea level rise and storms. Combining a geologic sedimentary approach with cutting edge 3D reconstruction techniques will produce excellent data products that will enhance our understandings of the bio-geological parameters that govern reef-island resiliency and vulnerability to climate related stressors. This research will ultimately provide useful information for managers such as the spatial and temporal dynamics of island evolution and recovery, keystone island sediment species that disproportionately contribute to island composition, and the ability to identify and map the source of keystone species upon adjacent reefs.