

## **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:** Dr. Christopher Winn and Dr. Samuel E. Kahng

**Affiliation:** Hawaii Pacific University

**Permit Category:** Research

**Proposed Activity Dates:** July 23, 2012 through August 20, 2012

**Proposed Method of Entry (Vessel/Plane):** vessel

**Proposed Locations:** The waters surrounding several islands within the Monument including Nihoa, Necker, French Frigate, Gardner Pinnacles, Maro Reef, Laysan, Lisianski, Pearl and Hermes, Midway and Kure Atoll

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

7

**Estimated number of days in the Monument:** 30

**Description of proposed activities:** (complete these sentences):

a.) The proposed activity would...

help Monument managers monitor the monument to assess and understand the impact of ocean acidification. As a part of that work we are assessing calcite saturation state in the waters surrounding the monument as well as the concentrations of carbon system parameters and their variation in space and time. This will provide detailed knowledge of the state of the seawater CO<sub>2</sub> system at the current time, and, with repeated sampling, will monitor the impact of changing chemistry on monument ecosystems as a result of anthropogenic activity.

Standard hydrographic methods will be employed to collect water samples and physical data of seawater temperature, salinity and oxygen concentrations, as well as some optical qualities of the water column. Titration alkalinity and pH will be measured on all of the water samples collected and these two chemical parameters will be used to compute the remaining two parameters of the seawater CO<sub>2</sub> system (i.e., total dissolved inorganic carbon and the partial pressure of CO<sub>2</sub>) as well as several other parameters including calcite and aragonite saturation state and bicarbonate and carbonate concentrations.

At the present time our goals are two-fold. First, we would assess the impact of organic matter production and coral reef calcification on the waters surrounding the archipelago.

Second, we would characterize reef metabolism by assessing diurnal changes in both DIC and alkalinity over the reef crests.

b.) To accomplish this activity we would .... collect water samples from the research vessel and small boats. Samples would be collected from the research vessel along "transects" from shallow water to distances of up to 15 kilometers from the reef. In this context shallow water is at a depth of about 60 meters. We are limited to this as a minimum depth given the safe operational limits of the research vessel. Our sampling takes advantage of available time on the research vessel and our CTD operations are therefore conducted at night. However, our specific sampling locations are dependent upon the islands that the research vessel will visit and therefore we cannot specify exact station locations at this time. All of our sampling will be done in the water column and we will not disturb the seafloor at any location.

In addition, we would use small boats during the day to collect discrete water samples at various locations over the reef. These water samples would also be measured for titration alkalinity and pH and these data would be used to characterize reef metabolism throughout the monument. We would also measure water temperature and salinity at the time of sample collection. Our sampling would be from the water column only and will not disturb the seafloor in any way.

We anticipate collecting no more than 600 250 ml water samples during the month-long cruise to the NWHI. The exact number will depend on the sampling opportunities that other ship operations will allow.

c.) This activity would help the Monument by ... assessing and documenting changing seawater carbonate chemistry with the monument. It is well known that many calcium carbonate producing organisms are threatened by the ongoing decrease in ocean pH and some evidence suggests that corals, even at low latitudes, may have already begun to be impacted. However, sufficient data to assess the rate of change in carbonate chemistry in the monument is not available. At present, our research is attempting to provide the baseline information on carbon system dynamics within the monument so that a well planned and effective long-term monitoring program can be implemented.

**Other information or background:**