

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: Donald Potts

Affiliation: Institute of Marine Sciences, University of California, Santa Cruz

Permit Category: Research

Proposed Activity Dates: 1 June 2009 - 31 December 2010

Proposed Method of Entry (Vessel/Plane): USFWS charter flights to/from Honolulu

Proposed Locations: Two patch adobe reef sites in the Midway Atoll lagoon (shown in Fig. 1):

1. Patch reefs north and west of Rusty Bucket and West Beach.
2. Patch reefs at northwestern end of deep lagoon.

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

Variable: 2 primary people plus assistance from 6-8 people on Midway under existing permit PMNM-2008-056.

Estimated number of days in the Monument: Up to 120 days

Description of proposed activities: (complete these sentences):

a.) The proposed activity would...

... investigate and seek to explain the pattern of high recruitment but very low adult abundance of the black-lipped pearl oyster (*Pinctada margaritifera*) at Midway Atoll, using field experiments to: a) identify major predators and measure their rates of predation on juvenile oysters, and b) measure rates of natural survival, growth and mortality under several predation regimes. The immediate goal is to determine whether reducing or eliminating predation can increase survival and growth rates of juveniles.

b.) To accomplish this activity we would

... measure survival and growth rates of newly-settled, juvenile pearl oysters under three predation regimes (Uncaged; Caged with Large Mesh; Caged with Small Mesh) that expose the oysters to different size classes of pelagic (e.g. fish) and benthic (e.g. snails, crustaceans, starfish) predators. We will use juvenile pearl oysters that settle on existing spat collectors (under permit PMNM-2008-056) and transplant them to

ceramic tiles placed on the reef. We will record survival and growth of each individual at 2-4 week intervals.

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

... providing the first quantitative data on rates of juvenile survival, growth and mortality due to predation for the black-lipped pearl oyster on any PMNM reef, and by providing baseline data for evaluating potential methods for, and the likelihood of success for, future efforts to restore a species that is identified in the Monument Management Plan as over-exploited, and which is not recovering on its own (Keenan et al. 2006). Because large bivalve mollusks provide an important ecosystem service by removing particulates, contaminants, and plankton while filtering large volumes of water each day, successful restoration and monitoring of *Pinctada margaritifera* would also provide a viable bio-indicator of ecosystem health.

Other information or background:

This activity directly addresses the goals of Activity HMC-1 of the Monument Management Plan, namely “restoring the health and biological diversity of the shallow reefs and shoals where anthropogenic disturbances are known to have changed the ecosystem ...“

This activity is a direct outgrowth from our existing data on recruitment and distribution of pearl oysters at Midway that we collected in 2007 (permit PMNM-2007-013) and 2008 (permit PMNM-2008-056). Our previous results show that *Pinctada margaritifera* larvae are recruiting from the plankton onto many parts of the Midway reef, but that subsequent juvenile survival is very poor, and live adults are both rare and restricted to limited parts of the reef (So far, we have seen only six live and three long-dead adults). We have identified two areas with high juvenile recruitment rates, both in habitats that appear suitable for both juveniles and adults, although we have found live adults in only one of these areas.

We hypothesize that the most likely factor reducing survival of newly-settled pearl oysters and leading to low adult abundance is predation on small juveniles. We also propose that understanding the nature and magnitude of predation, and how its effects may be reduced, is a necessary precursor for any future effort to restore pearl oysters on Midway Atoll or other PMNM reefs.