

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. Scott A. Shaffer

Affiliation: University of California, Santa Cruz and San Jose State University

Permit Category: Research

Proposed Activity Dates: December 31 2011 - December 31 2015

Proposed Method of Entry (Vessel/Plane): USFWS chartered plane or vessel

Proposed Locations: Tern Island, French Frigate Shoals (FFS); Sand or Eastern Island, Midway Atoll NWR (MA)

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

7

Estimated number of days in the Monument: 90-120 days PER year PER site, during incubation and the mid-late stages of breeding (Dec. to early Apr.) in chick-rearing great frigatebirds. We also understand that the timing of our visits will depend on availability of flights or ship transport to the islands, USFWS schedules, and weather.

Description of proposed activities: (complete these sentences):

a.) The proposed activity would...

study the foraging ecology of great frigatebirds by monitoring 1) the movement patterns, at-sea distribution, and habitat use of breeding birds from FFS or MA using tracking tags (e.g. satellite transmitters or GPS data loggers), 2) the diet of great frigatebirds by collecting opportunistic samples when/if birds regurgitate when handled, 3) short and long term diet signals based on stable isotope analysis of blood and feathers, and 4) stress levels as indicated by corticosterone levels in blood samples collected when the bird is captured for tag deployment AND removal. The foraging ecology of the birds would be studied in relation to environmental conditions that can be monitored with remotely sensed data (e.g. wind patterns, sea surface temperature, chlorophyll-a concentration). Because we already conduct similar studies on Laysan and Black-footed albatrosses at these locations, this work would be an extension of our research program on albatrosses. The study would also take a comparative approach to examine sex differences in foraging ecology which are commensurate with differences in life history patterns of great frigatebirds.

b.) To accomplish this activity we would
at EACH location (i.e. FFS and MA) PER breeding season, we would deploy 20 g satellite transmitters or GPS loggers on up to 20 breeding great frigatebirds during the chick-rearing phase (see Collection Table). Each bird would be studied once but handled twice: 1) to attach the tracking tag, collect 0.5 mL of blood, and to weigh the bird during logger deployment, and 2) to remove the tracking tag, collect 0.5 mL of blood, weigh the bird, and collect up to 3 body feathers during recovery. In addition, we would opportunistically collect any diet samples regurgitated by the bird during handling. In summary, we would study up to 20 individuals at EACH site PER breeding season. In all likelihood, our numbers of tag deployments would be much lower because of limitations on tracking tags, funding, number of personnel in the field, etc. Trip durations will be measured on both equipped and non-equipped birds to test for gear-effects (we have done this in previous seasons as well and have not found any affects).

c.) This activity would help the Monument by ...
providing the Refuge/Monument managers with a greater understanding of the habitat use by great frigatebirds within the Monument. A pilot study of six great frigatebirds in 2005 found that great frigatebird parents rearing young chicks (4-12 days old) foraged 50-250 km from Tern Island, and these foraging trips were both inside and outside the boundaries of the Monument. These movements are in contrast to our study on albatrosses which forage predominantly outside of the Monument. Thus, these studies would enhance our understanding of resource utilization by species that breed and may predominately feed within the Papahānaumokuākea Marine National Monument. We may find that certain sectors of the Monument are more important to great frigatebirds than others, which could dictate further management, protection, or study. Great frigatebirds are also unique in that they rely heavily on sub-surface predators like tuna and sharks that drive prey like flying fish or squid to the surface. Thus, studies that focus on the foraging ecology and subsequent breeding performance of great frigatebirds could also provide information about the abundance of sub-surface predators within Monument waters. Finally, great frigatebirds may act as a conduit between the marine and terrestrial environments by transferring nutrients between ecosystems. Great frigatebirds, which are tree nesters, could be a key species that provides nutrients to the limited tree species that exist within the Monument.

Other information or background:

Background and Rationale:

As top marine predators, seabirds are known to intensify their foraging effort in oceanic habitats where biological productivity concentrates their prey along upwelling regions, eddies, and frontal zones. Numerous studies recognize the potential to use seabirds as bioindicators of marine habitats and biological productivity, thus allowing researchers to determine “hot spots” for the conservation of marine ecosystems. Seabirds are probably the only component of marine ecosystems that are easy to study because they are fundamentally constrained by the fact that they commute between terrestrial colonies where they breed and marine habitats where they feed. As a result, breeding success is closely coupled with the temporal and spatial variability of food in the marine environment. One of the keys to understand how seabirds integrate environmental variability is to couple information on where birds find food with indices of the

physical environment in which they inhabit. The present study investigates this by remotely tracking great frigatebirds at sea and comparing bird locations and behaviour to oceanic conditions to determine and/or evaluate “hotspot” regions around the Monument and surrounding seascape.

Biological productivity is known to be low in tropical/subtropical seas; however, many seabird species breed prolifically on islands throughout tropical and subtropical latitudes. For example, there are large colonies of great frigatebirds on several islands within the Northwest Hawaiian Island chain. Almost nothing is known about the at-sea behaviour of great frigatebirds beyond that which has been determined from at sea surveys. Recent studies on great frigatebirds breeding elsewhere show that foraging ranges from breeding colonies can be extensive (up to a few hundred km), but that population-specific differences in foraging behaviors exist. A small pilot study of great frigatebird tracking in 2005 from Tern Island also found individual variation in foraging behaviors around the Monument, but regardless, the areas to which great frigatebirds travel, and the oceanographic features with which they associate around or beyond the Monument are largely unknown. Lastly, great frigatebirds are known to rely extensively on their associations with sub-surface predators like tunas, sharks, and marine mammals to find food. This trophic interaction makes great frigatebirds even more interesting bio-indicators of marine ecosystems because fisheries can influence this relationship. The time to conduct such a study is more important than ever because the conservation of marine habitats around the globe has become a priority due to the numerous threats such as the development of fisheries and putative long-term changes in climate.

In the present study, we seek to examine the foraging ecology of great frigatebirds using either satellite transmitters or GPS loggers and remotely sensed oceanographic data, to elucidate whether these seabirds use specific oceanographic features or “hotspots” to find food within the Monument and surrounding seascape. The fine resolution (in space and time) of the GPS tags will also allow us to evaluate whether great frigatebirds exhibit foraging behavior that is consistent with associations of subsurface predators like marine mammals, sharks, and tunas. Previous research conducted in the Indian Ocean using similar tracking devices suggests that specific flight patterns (straight line trajectories, slow flight speeds) of great frigatebirds measured with tracking devices are consistent with visual observations of birds feeding amongst dolphins and tunas. The tracking devices will also allow us test the hypothesis that throughout the 14-month breeding cycle, foraging strategies of great frigatebirds reflect seasonal fluctuations in available prey, resulting in colony-specific variations in foraging site fidelity, travel, and gene flow. Overall, the results of this research will shed new light on the ecological and environmental factors that affect the abundance and diversity of tropical seabirds in the Monument. More importantly, these results will provide a basis with which to more fully manage the natural resources of the Monument.