

**Papahānaumokuākea Marine National Monument**  
RESEARCH Permit Application

**NOTE: *This Permit Application (and associated Instructions) are to propose activities to be conducted in the Papahānaumokuākea Marine National Monument. The Co-Trustees are required to determine that issuing the requested permit is compatible with the findings of Presidential Proclamation 8031. Within this Application, provide all information that you believe will assist the Co-Trustees in determining how your proposed activities are compatible with the conservation and management of the natural, historic, and cultural resources of the Papahānaumokuākea Marine National Monument (Monument).***

**ADDITIONAL IMPORTANT INFORMATION:**

- Any or all of the information within this application may be posted to the Monument website informing the public on projects proposed to occur in the Monument.
- In addition to the permit application, the Applicant must either download the Monument Compliance Information Sheet from the Monument website OR request a hard copy from the Monument Permit Coordinator (contact information below). The Monument Compliance Information Sheet must be submitted to the Monument Permit Coordinator after initial application consultation.
- Issuance of a Monument permit is dependent upon the completion and review of the application and Compliance Information Sheet.

**INCOMPLETE APPLICATIONS WILL NOT BE CONSIDERED**

Send Permit Applications to:  
NOAA/Inouye Regional Center  
NOS/ONMS/PMNM/Attn: Permit Coordinator  
1845 Wasp Blvd, Building 176  
Honolulu, HI 96818  
nwhipermit@noaa.gov  
PHONE: (808) 725-5800      FAX: (808) 455-3093

**SUBMITTAL VIA ELECTRONIC MAIL IS PREFERRED BUT NOT REQUIRED. FOR ADDITIONAL SUBMITTAL INSTRUCTIONS, SEE THE LAST PAGE.**

## 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:** Fanny Cusset

**Affiliation:** Littoral, Environment and Societies (LIENSs), La Rochelle University, La Rochelle (France)

**Permit Category:** Research

**Proposed Activity Dates:** During the breeding season of sooty terns (April-September 2021)

**Proposed Method of Entry (Vessel/Plane):** None

**Proposed Locations:** Midway Atoll (priority 1) and other potential sites (if possible): Nihoa Island, Laysan Island, French Frigate Shoals, Pearl and Hermes Atolls- precise location at the discretion of the Monument staff.

**Estimated number of individuals (including Applicant) to be covered under this permit:** 2

**Estimated number of days in the Monument:** None

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

a.) The proposed activity would...

... use sooty terns (*Onychoprion fuscatus*) as bioindicator of mercury (Hg) contamination of the intertropical region. More specifically, we want to document the spatial variations of Hg in the Pacific Ocean. To do so, sooty tern feathers will be collected on their breeding colony on the three proposed sites by the Monument staff, as part of their wildlife monitoring program. (Cf. Project outline in 'Other information or background' below)

b.) To accomplish this activity we would ....

... collect a limited number of feathers per bird. Specifically, we would need cover feathers (i.e. breast) collected on sooty terns nesting on the six proposed sites in 2021. Feathers should be sampled on both breeding adults (n=30) and chicks (n=30), in order to compare global (annual) and local (seasonal) contamination, respectively (Cf. Project outline in 'Other information or background' below). A minimum of 5 individuals is required for potential/additional sites (i.e. all except Midway Atoll).

c.) This activity would help the Monument by ...  
... providing valuable information on levels, hotspots and coldspots of Hg contamination in the Pacific Ocean, on both global and local scale. Thus, results will help identifying potential risks to coastal communities that rely on marine food resources in tropical regions and will provide additional information for wildlife conservation and management policy on PMNM sites and its surrounding waters.

**Other information or background:**

**Project outline:**

Mercury (Hg) is a very toxic metal and its impact on Human health is a major concern. On the global scale, the amount of Hg released in the environment has steadily increased since the Industrial Revolution. Since Hg is primarily emitted in the atmosphere by both natural and human sources, it disperses all over the globe before it deposits in all ecosystems. Consequently, even remote oceanic areas are affected by this global pollutant. Once into the sea, Hg is transformed into methyl-Hg, which bioaccumulates in marine organisms (concentrations increase over time in their tissues) and biomagnifies in the food chains (concentrations increase at each trophic level) up to top predators, resulting in elevated concentrations in top predators such as seabirds. Methyl-Hg is highly toxic and can impair reproduction, behavior and survival of predators with consequences on their population.

Seabirds are relevant bioindicators of Hg contamination in the Ocean. With their high position in marine food webs and their relatively long lifespan, they are highly exposed to Hg. Because they integrate and reflect the contamination of the entire food chain on which they rely, their study provides information about contamination of lower trophic levels. In contrast to temperate and polar regions, seabirds from the tropical areas have been poorly used to document temporal and spatial trends of Hg. However, tropical regions (i) have experienced an increase of oxygen depleted areas, which are favourable to the formation of the toxic methyl-Hg; and (ii) concentrate most countries where artisanal and small-scale gold mining occurs, known as the largest sector of Hg emissions, accounting for more than 35% of total global anthropogenic emissions of Hg.

In this context, **the aim of this project is to use sooty terns as bioindicator of Hg contamination of the intertropical region.** More specifically, we want to document the spatial variations of Hg in the tropical ecosystems across ocean basins. Overall, only a very limited number of studies have directly quantified Hg in tropical seabirds, and to the best of our knowledge, the present project will be the first to map Hg contamination worldwide.

To do so, we will use bird feathers, as they constitute a Hg storing tissue, and hence a relevant proxy of Hg body burden in seabirds. Specifically, we would need cover feathers, preferentially from the breast, collected on sooty terns nesting on Midway Atoll, Nihoa Island, Laysan Island, Frigate Shoals, Pearl and Hermes Atolls in 2021. Feathers should be sampled on both breeding adults and chicks, in order to compare global (annual) and local (seasonal) contamination, respectively. Samples must be placed in individual plastic or paper bags (e.g., envelope) clearly

identifying the individual to allow their easy identification and shipment. On each individual, a few cover feathers (5-10) will be used for Hg analyses (with Advanced Mercury Analysers), which will be coupled with stable isotope analyses to investigate the role of trophic ecology in bird Hg contamination. These samples from PMNM sites are highly valuable, since they would complement our overall sample set that includes several colonies across the Pacific Ocean, thus allowing a global picture of Hg contamination in tropical oceans.

**Potential impacts of the proposed research:**

Since sooty terns at PMNM sites are routinely monitored, feather sampling required for this project would not cause any additional handling or damage than is usually required for the monitoring program. Only a limited number of feathers will be collected on each individual, in order to minimise any disturbance as much as possible. This limited number is the minimum required for proper chemical analyses and scientific relevance.