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Lt. Governor

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Board of Agriculture & Biosecurity

DEAN M. MATSUKAWA
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State of Hawai'i
DEPARTMENT OF AGRICULTURE & BIOSECURITY
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February 27, 2026

TO: Advisory Committee on Plants and Animals

FROM: Jennifer Samson, Ph.D.
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Pacific Islands Fisheries Science Center
Ecosystem Sciences Division
NOAA Daniel K. Inouye Regional Center

THROUGH: Trenton T. Yasui
Invertebrate and Aquatic Biota Specialist
Plant Quarantine Branch (PQB)
Department of Agriculture and Biosecurity (DAB)

SUBJECT: Request to: (1) Allow the Collection and Possession of the Following Organisms on the List of Restricted Animals (Part A): *Anemonia manjano*, an Anemone, *Bartholomea annulata*, an Anemone, *Diadumene lineata*, an Anemone, *Discosoma nummiforme*, a Corallimorph, an Unidentified Corallimorph in the Family *Discosomatidae*, *Capnella spicata*, a Coral, *Carijoa riisei*, a Coral and *Unomia stolonifera*, a Coral, by Permit, for Scientific Research, by the National Oceanic and Atmospheric Administration, National Marine Fisheries Service; and

(2) Establish Permit Conditions for the Collection and Possession of the Following Organisms on the List of Restricted Animals (Part A): *Anemonia manjano*, an Anemone, *Bartholomea annulata*, an Anemone, *Diadumene lineata*, an Anemone, *Discosoma nummiforme*, a Corallimorph, an Unidentified Corallimorph in the Family *Discosomatidae*, *Capnella spicata*, a Coral, *Carijoa riisei*, a Coral and *Unomia stolonifera*, a Coral, by Permit, for Scientific Research, by the National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

I. Summary Description of the Request

PQB NOTES: *The Plant Quarantine Branch (PQB) submittal for requests for import or possession permits, as revised, distinguishes information provided by the applicant from procedural information presented by the PQB. With the exception of PQB notes, hereafter "PQB NOTES," the text shown below in section II from page 3 through page 15 of the submittal was taken directly from the National Oceanic and Atmospheric Administration's application and subsequent written communications provided by the applicant, Dr. Jennifer Samson. This approach for PQB submittals aims for greater applicant participation in presenting intrastate transfer or import requests in order to move these requests to the Board of Agriculture and Biosecurity (Board) more quickly, while distinguishing applicant-provided information from PQB information. The portion of the submittal prepared by PQB, including the summary description of the request and proposed possession permit conditions, are identified as sections I and IV of the submittal, which start at pages 2 and 16 respectively.*

We have a request to review the following:

COMMODITY: ***Anemonia manjano*** (25 whole specimens)
Bartholomea annulata (1 whole specimen, tissue samples (<1cm) from 2 specimens)
Diadumene lineata (1 whole specimen, tissue samples (<1cm) from 2 specimens)
Discosoma nummiforme (1 whole specimen, tissue samples (<1cm) from 2 specimens)
Unidentified Corallimorph in the Family *Discosomatidae* (25 whole specimens)
Capnella spicata (25 whole colonies (5-10 cm length))
Carijoa riisei (1 whole specimen, tissue samples (<1cm) from 2 specimens)
Unomia stolonifera (25 whole colonies (5-10 cm length))

SHIPPER: Samples will be collected by the applicant's staff from marine areas of Pearl Harbor through SCUBA diving operations.

APPLICANT: Dr. Jennifer Samson**,** NOAA/NMFS/Pacific Islands Fisheries Science Center/ Ecosystem Sciences Division, NOAA Daniel K. Inouye Regional Center, 1845 Wasp Boulevard., Bldg. #176, Honolulu, Hawaii 96818. Phone: (808) 725-5469;
Email: Jennifer.Samson@noaa.gov

CATEGORY: *Anemonia manjano*, *Bartholomea annulata*, *Diadumene lineata*, *Discosoma nummiforme*, Unidentified species in the Family *Discosomatidae*, *Capnella spicata*, *Carijoa riisei* and *Unomia*

stolonifera are all found on the List of Restricted Animals (Part A). Pursuant to the Hawaii Administrative Rules chapter 4-71-6.5(b)(2), the aforementioned organisms may be imported and possessed for research, medical or scientific purposes as determined by the board, by universities, government agencies, or other institutions approved by the board, for exhibition in government zoos or government-affiliated aquariums, or for other purposes as specified in this chapter.

II. Information Provided By the Applicant in Support of the Application

PROJECT: National Oceanic and Atmospheric Administration (NOAA) Fisheries Pacific Islands Fisheries Science Center Ecosystem Sciences Division conducts multidisciplinary research, monitoring, and analysis of integrated environmental and living resource systems in coastal and offshore waters of the Pacific Ocean. The project aims to collect the proposed organisms to develop environmental DNA (eDNA) markers for screening for non-native species in Hawaiian waters and assess potential impacts on native species.

OBJECTIVE: Over the last four years, multiple non-native species have been detected in Pearl Harbor. These potential Alien Invasive Species (AIS) could have substantial detrimental effects on Hawaiian coral reefs and the native species they support, including many endangered and protected animals. However, the distribution and environmental impacts of these non-native species are currently unknown. Our project supports multiple parallel objectives to (i) assess the risk that non-native marine species pose to Hawaii's unique marine ecosystems, and (ii) develop tools for managers and users to more effectively prevent the spread of non-native species and control invasions.

To assess pulse coral (*Unomia* stolonifera) impacts on native species we will conduct surveys in Pearl Harbor. During our surveys, SCUBA divers will assess the spread of pulse coral and when it is encountered, record the substrate it is growing on as well as score the outcomes of competitive interactions with any native species within 10 cm of the pulse coral (e.g., coral mortality, overgrowth, etc.). Additionally, we will establish long term monitoring sites in Pearl Harbor at eight sites where pulse corals are present, and eight sites on Oahu reefs where they are absent. These sites will be monitored throughout the project to track changes in pulse coral abundance and the community composition of native species. This data will allow us to better understand rates of spread of pulse coral, their impacts on

native species, and factors that may make native communities more vulnerable or resistant to pulse coral invasion. During these surveys, divers will also collect eDNA samples by filtering water at each site to help test and validate our eDNA tools.

To develop eDNA-based tools for non-native species detection, we will obtain DNA sequences from vouchered specimens in collections as well as tissue samples from targeted native and non-native fauna collected from the field. These sequences will be combined with data from existing DNA sequence repositories (e.g., Barcode of Life, NCBI, Genbank) to develop custom primers for qPCR assays and establish markers and a reference library for metabarcoding. Once we have developed our primers and reference library, we will collect targeted native and non-native species from Pearl Harbor to maintain 'mock communities' of known composition in controlled aquarium facilities for lab testing. We will then focus on developing efficient protocols for eDNA extraction from these mock communities to validate non-native detection and assess detection limits.

Collections are proposed to occur between January 5th, 2026 - June 1, 2026, and development of eDNA based tools would occur between April 1 – September 30, 2026.

PROCEDURE: Organisms will be collected from the wild within the waters of Joint Base Pearl Harbor Hickam. All organisms will be hand collected by NOAA scientific divers.

For each species listed cuttings < 1 cm in length will be collected from up to 3 colonies, with one of the colonies collected and placed in molecular grade ethanol. Cuttings will be used for DNA extraction and destroyed during the process and the ethanol preserved sample will be kept as a voucher specimen.

Additionally, for *U. stolonifera*, *A. manjano*, C. spicata, and a currently unidentified corallimorph from the Family Discosomatidae and additional 24 whole colonies will be collected for aquarium-based studies. Animals will be kept in recirculating aquaria at the Pacific Islands Fisheries Science Center until study completion, after which they will be transferred to fresh water for 60-minutes to cause mortality, dried, and disposed of with the laboratory specialized waste collection.

DISCUSSION:

1. **Person Responsible:** Dr. Andrew Shantz, NOAA/NMFS/Pacific Islands Fisheries Science Center/ Ecosystem Sciences Division, NOAA Daniel K. Inouye Regional Center, 1845 Wasp Boulevard., Bldg. #176, Honolulu, Hawaii 96818; phone: (808) 725-5423, email: andrew.shantz@noaa.gov**. (**See Appendix 2 for Dr. Shantz's CV).

   Dr. Shantz is a coral reef ecologist with 20 years of experience as an aquarist and more than a decade of experience working with marine organisms in research labs. He has completed annual Institutional Biosafety Committee training courses through the University of Hawai'i on Biosafety, Transportation of Biological Materials, and the CITI course on Animal Biosafety, among others, as well as the UH Institutional Animal Care and Use Committee's required training. Please see the attached CV for more details on Dr. Shantz's background.

2. **Safeguard Facility and Practices:** NOAA/NMFS/Pacific Islands Fisheries Science Center, NOAA Daniel K. Inouye Regional Center, 1845 Wasp Boulevard, Bldg. #176, Honolulu, Hawaii 96818. (See Attachment B, C and D for facility map, campus aerial view and lab space respectively).

   Organisms will be kept in up to ten individual 75 L aquaria with recirculating artificial seawater. Each system will be equipped with a Pentair Aquatics 40-watt UV Sterilizer and Eheim 350 canister filter for filtration. Temperature will be controlled with redundant, 50 W titanium aquarium heaters. Each week, the systems will receive a 10% water change. Water removed from tanks holding non-native species will be passed through a Number 30 sieve (600 µm size) into a single, 200 L container and combined with bleach to reach a 20% bleach concentration. Any biological material caught in the sieve will be disposed of as described in Section 3. The bleach-seawater solution will be left for 48 hours, after which any remaining bleach be neutralized before the water is disposed of.

   Biosecurity:

   The facility is on a secured military installation within a controlled access Federal building. Only employees with DoD Common Access Cards (CAC) are allowed in office and laboratory areas of the facility. Front desk security is required to check all employees for active CACs. After passing through security, laboratory spaces must be accessed by scanning CACs at entry points, and only staff with programmed access for specific areas are allowed in those spaces.

   Endangered Hawaiian Monk Seals and threatened sea turtles have previously

been kept in secured settings at the IRC facility. Also, see attached Biosafety Plan for IRC Labs (See Attachment A).

3. Method of Disposition: Voucher specimens will be stored in ETOH for preservation with Bishop Museum & Smithsonian Museum of Natural History. DNA will be preserved at -80 C at Pacific Islands Fisheries Science Center. All remaining tissue or live colonies will be submerged in 30% bleach/freshwater solution for 3 hours, air dried for 24 hours and disposed of with other bio-hazardous waste generated at the IRC facility.

Species will be held in recirculating aquaria (i.e. all water or other contents of the aquaria that come in contact with collected species will be contained and not introduced to the wild).

4. Abstract of Organisms:

***Anemonia manjano*:**

Classification:
Phylum: Cnidaria
Class: Hexacorallia
Order: Actiniara
Family: Actiniidae
Genus: *Anemonia*
Species: *manjano*
Common names: Manjano anemone

Life History:
Sessile invertebrate. Reaches up to 3 cm diameter. Spawns annually during summer months, releasing sperm and eggs into the water column. Can reproduce asexually via pedal laceration (aka inverse budding) or longitudinal fusion.

Habitats:
Tolerant of wide range of conditions on tropical and semi-tropical reefs.

Native range:
Native to the Indian Ocean but has been recorded in the Philippines and Western Pacific, likely due to releases from aquariums. Present in Pearl Harbor and Kaneohe Bay HI.

Establishment potential:
Yes, common aquarium pest, tolerant of wide range of conditions. Can grow rapidly with few known predators. Capable of colonizing multiple substrates, including rock, rubble, and sand, as well as both live and dead coral. Cryptic

nature makes detection and removal challenging.

Invasiveness:
Yes, widely considered pest species. Has been found in Oahu waters.

Host range:
N/A.

Highly domesticated, cultivated or cultured for commercial purposes:
No

Impacts in native range:
None.

Diseases and pests:
None.

Toxicity and pathogenicity:
None.

Bartholomea annulata:

Classification:
Phylum: Cnidaria
Class: Hexacorallia
Order: Actiniara
Family: Aiptasiidae
Genus: *Bartholomea*
Species: *annulata*
Common names: Corkscrew anemone

Life History:
Reaches up to 30 cm diameter. Spawns annually releasing sperm and eggs into the water column. Can reproduce asexually via pedal laceration (aka inverse budding) or longitudinal fusion.

Habitats:
Tolerant of wide range of conditions on tropical and semi-tropical reefs.

Native range:
Common throughout Caribbean and Gulf of Mexico. Has been found in Hawaiian waters, likely due to releases from aquariums.

Establishment potential:
Yes, although not generally considered invasive DLNR first reported species in Hawaiian waters in 2019. Like other anemones, may overgrow native corals.

Invasiveness:
Yes. Found in Hawaiian waters in 2019, follow up surveys by DLNR in 2020 showed little change in distribution range.

Host range:
N/A.

Highly domesticated, cultivated or cultured for commercial purposes:
No.

Impacts in native range:
None.

Diseases and pests:
None.

Toxicity and pathogenicity:
No.

Diadumene lineata:

Classification:
Phylum: Cnidaria
Class: Hexacorallia
Order: Actiniara
Family: Aiptasiidae
Genus: *Diadumene*
Species: *lineata*
Common names: Corkscrew anemone

Life History:
Reaches up to 30 cm diameter. Spawns annually releasing sperm and eggs into the water column. Can reproduce asexually via pedal laceration (aka inverse budding) or longitudinal fusion.

Habitats:
Tolerant of wide range of conditions on tropical and semi-tropical reefs.

Native range:
Common throughout Caribbean and Gulf of Mexico. Has been found in Hawaiian waters, likely due to releases from aquariums.

Establishment potential:
Yes, although not generally considered invasive DLNR first reported species in Hawaiian waters in 2019. Like other anemones, may overgrow native corals.

Invasiveness:
Yes. Found in Hawaiian waters in 2019, follow up surveys by DLNR in 2020 showed little change in distribution range.

Host range:
N/A

Highly domesticated, cultivated or cultured for commercial purposes:
No.

Impacts in native range:
No

Diseases and pests:
None.

Toxicity and pathogenicity:
No.

***Discosoma nummiforme**:*

Classification:
Phylum: Cnidaria
Class: Hexacorallia
Order: Corallimorpharia
Family: Discosomidae
Genus: *Discosoma*
Species: *nummiforme*
Common names: smooth mushroom coral

Life History:
Sessile invertebrate, popular in aquarium hobby. Reaches up to 5 cm diameter. Spawns annually during summer months, releasing sperm and eggs into the water column. Can reproduce asexually via pedal laceration (aka inverse budding) or longitudinal fusion.

Habitats:
Under ledges and shaded areas on warm ocean waters.

Native range:
Originally described from shallow reefs in western Australia, found from the Red Sea to French Polynesia. Not naturalized in Hawaiian waters.

Establishment potential:
Yes, common aquarium species tolerant of wide range of marine conditions. Has been found in Hawaiian waters.

Invasiveness:
Yes. Considered invasive in Hawaii by the Hawai'i DLNR DAR.

Host range:
No host.

Highly domesticated, cultivated or cultured for commercial purposes:
Popular in saltwater aquarium hobby.

Impacts in native range:
None.

Diseases and pests:
None known.

Toxicity and pathogenicity:
No.

Capnella spicata

Classification:
Phylum: Cnidaria
Class: Octocorallia
Order: Malacalcyonacea
Family: Capnellidae
Genus: *Capnella*
Species: *spicata*
Common names: Kenya tree coral

Life History:
Sessile invertebrate, popular in aquarium hobby. Believed to be a gonochoric broadcast spawner but also reproduces asexually via budding.

Habitats:
Tropical, fully marine waters. Found in exposed reefs as well as protected lagoons. Thrives in bright light but can acclimate to lower light levels.

Native range:
Indo-Pacific regions from East Africa through the western Pacific.

Establishment potential:
Yes, common aquarium species tolerant of wide range of marine conditions. Currently found in Pearl Harbor where active eradication efforts are underway.

Invasiveness:
Yes. Considered invasive in Hawaii by the Hawai'i DLNR DAR.

Host range:
No host.

Highly domesticated, cultivated or cultured for commercial purposes:
Popular in the saltwater aquarium hobby.

Impacts in native range:
None.

Diseases and pests:
None known

Toxicity and pathogenicity:
No.

Carijoa riisei

Classification:
Phylum: Cnidaria
Class: Octocorallia
Subclass:
Order: Malacalcyonacea
Family: Clavulariidae
Genus: *Carijoa*
Species: *riisei*
Common names: Snowflake coral, branched pipe coral

Life History:
Sessile invertebrate found in tropical and semi-tropical waters. C. riisei is a non-photosynthetic coral that can grow at depths up to 500 m. Broad temperature tolerance but likely outcompeted by most shallow, zooxanthellate corals. Not found on shallow, well-lit reefs but frequently found in dimly lit shallow areas such as caves, ports, and under docks. Gonochoric spawner that reproduces year-round rather than in synchronous spawning events. Eggs tend to sink, which may indicate benthic larval phase.

Habitats:
Tropical, fully marine waters. Found in exposed reefs as well as protected lagoons. Thrives in bright light but can acclimate to lower light levels.

Native range:
Originally thought to be native to semi-tropical western Atlantic but recent genetic work suggests Indo-Pacific native that has invaded western Atlantic, Caribbean, and Gulf of Mexico. Has also been found in Australia and is widely distributed and frequently associated with shipping ports. Species was first detected in Hawaii in 1972 and has since spread to all other islands in the archipelago.

Establishment potential:
Yes, currently established in Hawaii since 1970's. Restricted to deep reefs and ports with low light penetrance. On deep reefs, known to overgrow and kill native black corals.

Invasiveness:
Yes. Considered invasive in Hawaii by the Hawai'i DLNR DAR.

Host range:
No host.

Highly domesticated, cultivated or cultured for commercial purposes:
No.

Impacts in native range:
None.

Diseases and pests:
None known.

Toxicity and pathogenicity:
No.

Unomia stolonifera

Classification:
Phylum: Cnidaria
Class: Octocorallia
Subclass:
Order: Malacalcyonacea
Family: Xeniidae
Genus: *Unomia*
Species: *stolonifera*
Common names: Pulse coral

Life History:
Sessile invertebrate, popular in aquarium hobby. Spawns annually during summer months, releasing sperm and eggs into the water column. Can reproduce asexually via pedal laceration (aka inverse budding) or longitudinal fusion. Have been documented to release from substrate and move passively with currents.

Habitats:
Warm ocean waters, require fully marine habitat. Have been documented between 1 m to > 30 m depth.

Native range:
Indonesia and coral triangle region. Not naturalized in Hawaiian waters.
Establishment potential:
Yes, common aquarium species tolerant of wide range of marine conditions. Has been found in Hawaiian waters.

Invasiveness:
Yes. Considered invasive in Hawaii by the Hawai'i DLNR DAR.

Host range:
No host.

Highly domesticated, cultivated or cultured for commercial purposes:
Popular in the saltwater aquarium hobby.

Impacts in native range:
None.

Diseases and pests:
None known.

Toxicity and pathogenicity:
No.

5. Effects on the Environment:

All of the organisms listed will be collected from the wild and are present within Pearl Harbor and Hawaiian waters. As such, this project is not likely to impact the establishment or spread of any of the targeted species.

The impacts of *U. stolonifera* (pulse coral) have not been assessed in Hawaiian waters, but this soft coral has been reported to rapidly overgrow invaded reefs in the Caribbean. However, the extent of *U. stolonifera* currently documented in Pearl

Harbor suggests the species has the potential to overgrow large swaths of Hawaiian reefs should it escape from the bay, with potential negative impacts on protected coral species.

Similarly, *C. spicata* and Corallimorphs such as the unidentified Discosomatidae we plan to collect have been reported to overgrow sections of reef in the Pacific, particularly under nutrient enriched conditions, although spread has generally been slower and limited in spatial extent.

In contrast, the effects of *A. manjano, B. annulate, D. lineata,* and *D. nummiforme* are expected to be minimal. These species have all been documented in Hawai'i and have the potential to negatively impact other corals or cnidarians in their immediate vicinity but rapid spread and major adverse impacts on reefs and reef-dependent species have not been observed.
None of the species targeted for this study have been reported to adversely impact fish communities in the Pacific or pose any threat to human health. Because all of the target species already exist in Hawai'i and will be collected from Pearl Harbor, there is no chance of introducing novel pathogens or associated organisms that would further negatively impact the environment.

6. Alternatives:

None. Primary goals of this project are i) to develop tools to accurately detect non-native species via screening environmental DNA; and ii) assess the impacts of these species on native Hawaiian fauna. While initial primers and markers can be developed from museum specimens or existing DNA databases for some species, others such as *U. stolonifera*, lack adequate genetic data for accurate barcoding and identification. Furthermore, all of the target species lack the necessary data on DNA shedding and decay rates needed for accurate, quantitative detections.

Likewise, understanding whether native Hawaiian corals have the potential to limit the spread of non-native cnidarians requires observing interactions between these groups. Intentionally transplanting non-natives next to competitors to track interaction outcomes, even within the current invasion zone, poses unacceptable risks. As an alternative, our project seeks to complete these studies in a controlled lab environment.

7. References:

None provided.

III. <u>Environmental Assessment (EA) Issue</u>

Pursuant to a May 2008 Hawaii Intermediate Court of Appeals decision

(Ohana Pale Ke Ao v. Board of Agriculture, 118 Haw. 247 (Haw. App. 2008), the Department of Agriculture's (Department's) import permit process is subject to the requirements of the Hawaii Environmental Protection Act (HEPA), chapter 343, Hawaii Revised Statutes. Under this decision, the requirement for an EA as a condition of the import permit or related authorization applies in those circumstances where the underlying permit activity for the importation initiates a "program or project" and where the use of state or county funds or state or county lands is involved.

The proposed site for this request (Joint Base Pearl Harbor Hickam) is federal property. Compliance with the National Environmental Policy Act (NEPA) and the Hawaii Environmental Policy Act (HEPA) is the responsibility of NOAA, as the applicant for this request.

IV. Advisory Subcommittee Review

This request was submitted to the Advisory Subcommittee on Invertebrate and Aquatic Biota for their review and recommendations. Their recommendations and comments are as follows:

1. **I recommend approval ___ / ___ disapproval to allow the Collection and Possession of the Following Organisms on the List of Restricted Animals (Part A): *Anemonia manjano*, an Anemone, *Bartholomea annulata*, an Anemone, *Diadumene lineata* an Anemone, *Discosoma nummiforme*, a Corallimorph, an Unidentified Corallimorph in the Family *Discosomatidae*, *Capnella spicata*, a Coral, *Carijoa riisei*, a Coral and *Unomia* stolonifera, a Coral, by Permit, for Scientific Research, by the National Oceanic and Atmospheric Administration, National Marine Fisheries Service.**

   Mr. Jesse Boord: No response

   Dr. Micah Brodsky: No response.

   Dr. Kauaoa Fraiola: Recommends approval.

   "In the "safeguard facility and practices" sub-section (in section 2 of the Discussion) they should make sure they specify that the aquarium will be labeled so that people unfamiliar with the project won't do anything that might accidentally spread the species, like release untreated tank water or contaminate equipment that might ultimately come into contact with waters outside the lab."

   "The "biosecurity" sub-section in section 2 of the Discussion, seems more like basic security rather than biosecurity. Relatedly, the "Biosafety Plan" they submitted in the "biosecurity" sub-section seems to be oriented toward

pathogens and infectious diseases, like microorganisms. Do they have a protocol for larger multi-cellular invasive organisms? Protocols for large multi-cellular bio threats may differ from pathogen-oriented biosecurity protocols. It would be good for them to explicitly state they think the pathogenic-oriented biosecurity protocol they provided will be sufficient to cover all the possible issues they might encounter with these animals and why. It would help show that they are aware of the unique challenges to keeping their study species secure vs a pathogen of some sort. For example, the pathogen-oriented "biosafety Plan" has no reference to aquariums or the equipment related to caring for organisms in aquarium. Things that would directly affect the kinds of biosecurity protocols you would have."

Mr. LeRoy Thom: Recommends approval.
Comments:

"I'd absolutely recommend approval for the collection of these restricted organisms. The scientific study to control or safely eradicate these organisms is extremely critical for the preservation of our fragile ecosystem in Hawaii."

"It is also possible that these organisms were hitch-hikers on the hulls of ships which traveled to and from unknown locations."

2. **I recommend approval ___ / ___ disapproval to establish permit conditions for the Possession of the Following Organisms on the List of Restricted Animals (Part A): *Anemonia manjano*, an Anemone, *Bartholomea annulata*, an Anemone, *Diadumene lineata* an Anemone, *Discosoma nummiforme*, a Corallimorph, an Unidentified Corallimorph in the Family *Discosomatidae*, *Capnella spicata*, a Coral, *Carijoa riisei*, a Coral and *Unomia* stolonifera, a Coral, by Permit, for Scientific Research, by the National Oceanic and Atmospheric Administration, National Marine Fisheries Service.**

Mr. Jesse Boord: No comment.

Dr. Micah Brodsky: No comment.

Dr. Kauaoa Fraiola: Recommends approval.

Mr. LeRoy Thom: Recommends approval.

Comments:

"Permit conditions adequate and destruction process outstanding."

V. Proposed Possession Permit Conditions

1. The restricted article(s), anemone, *Anemonia manjano*; anemone, *Bartholomea annulata*; anemone, *Diadumene lineata*; corallimorph, *Discosoma nummiforme*, unidentified corallimorph in the Family *Discosomatidae*; coral, *Capnella spicata*; coral, *Carijoa riisei* and coral, *Unomia stolonifera*, including any progeny thereof, shall be collected and possessed for scientific research, a purpose approved by the Board of Agriculture and Biosecurity (Board). The sale, transfer and/or release of the restricted article(s) is prohibited.

2. This permit is valid only for the restricted article(s) collected from the wild within the State, and progeny thereof.

3. The permittee, Dr. Jennifer Samson, National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Pacific Islands Fisheries Science Center (PIFSC), Ecosystem Sciences Division (ESD), 1845 Wasp Boulevard, Bldg. #176, Honolulu, HI 96818, shall be responsible and accountable for the restricted article(s), from the time of its arrival at the approved site until its final disposition.

4. The restricted article(s) shall be safeguarded and maintained at the NOAA Daniel K. Inouye Regional Center, 1845 Wasp Boulevard, Bldg. #176, Honolulu, HI 96818, a site inspected and approved by the Plant Quarantine Branch (PQB) prior to possession. A site inspection and written approval by the PQB chief is required prior to the movement of the restricted article(s) by the permittee to another site, including sites that are owned or leased by the permittee.

5. The restricted article(s) shall be maintained by the responsible person, Dr. Andrew Shantz, NOAA, NMFS, PIFSC, NOAA Daniel K. Inouye Regional Center, 1845 Wasp Boulevard, Bldg. #176, Honolulu, HI 96818 or by trained or certified personnel designated by Dr. Jennifer Samson.

6. The restricted article(s) shall be safeguarded and maintained in a closed aquatic system at all times.

7. All water used to transport and/or maintain the restricted article(s) shall be screened by passing it through a 600 µm screen, then combined with bleach to attain a 20% bleach concentration. The bleach-treated water must then be held for a minimum duration of 30 minutes, then neutralized with sodium thiosulfate, another approved neutralizing agent, or by holding the solution for a minimum of 48 hours prior to disposal into an individual wastewater system, municipal sewer system or other PQB approved system.

8. Effluent from the permittee's system(s) that contain the restricted article(s) shall not be discharged to or have a direct connection to the ocean or any other body of water, such as ponds, estuaries, reservoirs, rivers and/or streams.

9. The permittee shall adhere to the use, facility, equipment, procedures, and safeguards described in the permit application, and as approved by the Board and the PQB chief.

10. The permittee shall have a biosecurity manual available for review and approval by the PQB at the time of the initial site inspection and any subsequent post-entry inspection(s), which identifies the practices and procedures to be adhered to by the permittee and the permittee's employees, that mitigates the risks of theft, escape, exposure, contamination and/or accidental release of the restricted article(s), including the risk of introduction and spread of diseases and pests associated with the restricted article(s) to the environment. The permittee and/or anyone authorized by the permittee to handle and/or maintain the restricted organism(s) shall adhere to all practices and procedures stated in the biosecurity manual at all times.

11. The approved site, restricted article(s) and records pertaining to the restricted article(s), may be subject to post-entry inspections by the PQB and/or the Department of Agriculture and Biosecurity's Animal Disease Control Branch (ADCB), upon arrival of the restricted article(s) at the permittee's facility. The permittee shall make the permitted site, restricted article(s), and records pertaining to the restricted article(s) available for inspection upon request by the PQB and/or the ADCB.

12. All restricted article(s) shall be subjected to requisite post-collection treatments and quarantines specified by the ADCB.

13. If the restricted article(s) is no longer needed, if the restricted article(s) expires, and/or upon completion of the project, the restricted article(s) shall be immersed in a 30% bleach solution for a minimum of 3 hours, then air dried for a minimum of 24 hours, then disposed of as biohazard waste.

14. The permittee shall submit an annual report of all the restricted article(s) covered under this permit for the calendar year by January 31st of the following year. The report shall include:

    a. The permit number, scientific name, and quantity of the restricted article(s) collected and/or possessed.
    b. The status of use and possession of the restricted article(s).
    c. A summary of any significant changes to the permittee's operation, facility, personnel, and/or procedures.

d. Any significant events that occurred at the permittee's site, e.g., theft, vandalism, trespassing, power outage, etc.

15. The permittee shall immediately notify the PQB chief by phone: (808) 832-0566 and by email: hdoa.pqaqua@hawaii.gov, under the following circumstances:

    a. If escape, theft, release, disease outbreaks, and/or mass mortalities occur involving the restricted article(s). In this instance, the PQB may capture, confiscate and/or destroy any restricted article(s) covered under this permit, at the expense of the owner, pursuant to the HRS §150A-7(c).

    b. Prior to any changes made to the approved site(s), facility(s) or container(s) used to hold the restricted article(s).

    c. If the permittee is found in violation of any municipal, state or federal policies, rules and/or laws, pertaining to the restricted article(s).

    d. If the permittee will no longer possess the restricted article(s) authorized under this permit. In this circumstance, the permittee shall inform the PQB chief of the final disposition of the restricted article(s) in writing, submit a final report on the method of destruction of the restricted article(s) to the PQB chief within 30 days of completion of the project and/or termination of the use of the restricted article(s), and the permit shall be cancelled.

16. The permittee shall submit to the PQB chief a copy of all valid licenses, permits, certificates or other similar documents required by other agencies for the restricted article(s). The permittee shall immediately notify the PQB chief in writing when any of the required documents are suspended, revoked, or terminated. This permit may be amended, suspended or cancelled by the PQB chief in writing, upon suspension, revocation, or termination of any required license, permit, certificate or similar document for the restricted article(s).

17. It is the responsibility of the permittee to comply with all applicable requirements of municipal, state, or federal law pertaining to the restricted article(s).

18. The permittee is responsible for all costs, charges, or expenses incident to the inspection, treatment or destruction of the restricted article(s) under this permit as provided in Act 173, Session Laws of Hawaii 2010, section 13, including, if applicable, charges for overtime wages, fixed charges for personnel services, and meals.

19. Any violation of the permit conditions may result in citation, cancellation of the permit, and enforcement of any or all of the penalties set forth in HRS §150A-14.

20. A cancelled permit is invalid and upon written notification from the PQB chief, all restricted article(s) covered under this permit shall be treated pursuant to permit condition no. 13. In the event of permit cancellation, any restricted article(s) possessed including progeny may be moved, seized, treated, quarantined, destroyed, or sent out of State at the discretion of the PQB chief. Any expense or loss in connection therewith shall be borne by the permittee.

21. The permit conditions are subject to cancellation or amendment at any time due to changes in statute or administrative rules restricting or disallowing the possession of the restricted article(s) or due to Board action disallowing a previously permitted use of the restricted article(s).

22. These permit conditions are subject to amendment by the PQB chief in the following circumstances:

    a. To require disease screening, quarantine measures, and/or to place restrictions on the intrastate movement of the restricted article(s), as appropriate, based on scientifically validated risks associated with the restricted article(s), as determined by the PQB chief, to prevent the introduction or spread of disease(s) and/or pests associated with the restricted article(s).

    b. To conform to more recent Board approved permit conditions for the restricted article(s), as necessary to address scientifically validated risks associated with the restricted article(s).

23. The permittee shall agree in advance to defend and indemnify the State of Hawaii, its officers, agents, employees and the Board of Agriculture and Biosecurity members, for any and all claims against the State of Hawaii, its officers, agents, employees and the Board of Agriculture and Biosecurity members, that may arise from or be attributable to any of the restricted article(s) that are possessed under this permit. This permit condition shall not apply to a permittee that is a federal or State of Hawaii entity or employee, provided that the state or federal employee is a permittee in the employee's official capacity.

ADVISORY COMMITTEE REVIEW: May we request your recommendation and comments at the next meeting of the Advisory Committee on Plants and Animals.

Appendix 1

PQ-7 (01/04)

State of Hawaii
Department of Agriculture
PLANT QUARANTINE BRANCH
1849 Auiki Street, Honolulu, HI 96819-3100
Phone: (808) 832-0566, FAX: (808) 832-0584

For Office Use Only

Fee: $ 200- Receipt No. 2429

☐ Approve Permit No. _____ Date: _____

☐ Disapprove ☐ Other _____

Processed by: _____ Date: _____

PERMIT APPLICATION FOR RESTRICTED COMMODITIES INTO HAWAII

Date: _____

In accordance with the provision of Chapter 71, Hawaii Administrative Rules of the Division of Plant Industry, Department of Agriculture, a permit is requested for the following commodities:

Please type or print clearly.

Quantity	Commodity	Scientific Name
Up to 3 whole specimen:	Mushroom coral	Actinodiscus nummiformis
Twenty-five whole speci	Majano anemone	Anemonia manjano
3 specimens	Ringed anemone	Bartholomea annulata
one whole specimen and	Orange striped green sea anemone	Diadumene lineata
one whole specimen and	Discosoma nummiforme (no common name)	Discosoma nummiforme
Twenty-five whole speci	no common name	Unidentified corallimorph (Family - Discosomatidae)
Twenty-five whole colo	Kenya tree octocoral	Capnella spicata
1 whole specimen & san	Snowflake coral	Carijoa riisei
Twenty-five whole colo	Pulsing coral	Unomia stolonifera

PAID
Amount: $200 Chk: 1017
Date: 5/9/25 Initial: TSY

RECEIVED
MAY 09 2025
PLANT QUARANTINE BRANCH

Name and address of shipper: Not applicable. Samples will be collected by the applicant's staff from marine areas of Pearl Harbor through SCUBA diving operations and retained at NOAA's Daniel K. Inouye Regional Center on Ford Island, Joint Base Pearl Harbor Hickam.

(Mainland or Foreign address)

Approximate date of arrival: June/July 2025

Mode of Shipment: ☐ Mail ☐ Air Freight ☑ Boat

Type of Permit:
- --- Import
  - ☐ one time only ☑ multi-shipments
- --- Intrastate shipment
  - ☐ one time only ☑ multi-shipments
- ☑ Possession

Object of importation:
- ☐ Kept caged at all time
- ☐ Used for propagation
- ☐ Imported for exhibition
- ☐ Imported for liberation
- ☑ Other purposes - specify: Develop eDNA markers for tracking alien species in support of DoD eradication efforts in Pearl Harbor

Please type or print clearly.

Applicant's Name: Jennifer Samson

Company Name: NOAA NMFS Pacific Islands Fisheries Science Center (if applicable)

Hawaii Mailing Address: 1845 Wasp Blvd, Building 176
Honolulu, HI 96818

Telephone number: 808 725-5469

Facsimile number: _____

Fee Amount Enclosed (cash, check or mail order) $: 200.00

(complete reverse side)

PLEASE COMPLETE THE FOLLOWING INFORMATION (attach extra sheet if necessary)

1. State in detail the reasons for introduction (include use or purpose).

   Samples will be used for research to develop environmental DNA (eDNA) markers for screening for non-native species in Hawaiian waters, and assess potential impacts on native species. Mitogenomes and regions of genomic DNA will be sequenced. Whole specimens, when collected, will be preserved as voucher specimens. Additional colonies of U. stolonifera, A. manjano, and Rhodactix sp. 1 to be maintained in secure, recirculating aquaria at the Pacific Islands Fisheries Science center to assess ability to out-compete and overgrow native species.

2. Person responsible for the organism (include name, address and phone number).

   Dr. Jennifer Samson
   NOAA/NMFS/Pacific Islands Fisheries Science Center/ Ecosystem Sciences Division
   NOAA Daniel K. Inouye Regional Center
   1845 Wasp Boulevard., Bldg. #176
   Honolulu, Hawaii 96818
   ph (808) 725-5469; email: Jennifer.Samson@noaa.gov
   For Questions of this Application Please Contact PIFSC's Permit Coordinator POC at Justin.Rivera@noaa.gov

3. Location(s) where the organism will be kept and used (include address, contact and phone number).

   Dr. Andrew Shantz
   NOAA/NMFS/Pacific Islands Fisheries Science Center/ Ecosystem Sciences Division
   NOAA Daniel K. Inouye Regional Center
   1845 Wasp Boulevard., Bldg. #176
   Honolulu, Hawaii 96818; ph:(808) 725-5423, email: andrew.shantz@noaa.gov
   NOTE: The location is on a secured military installation within a controlled access Federal building

4. Method of disposition.

   Voucher specimens stored in ETOH for preservation with Bishop Museum & Smithsonian Museum of Natural History. DNA will be preserved at -80 C at Pacific Islands Fisheries Science Center. All remaining tissue or live colonies will be submerged in 30% bleach/freshwater solution for 3 hours, air dried for 24, and disposed of with other bio-hazardous waste generated at the PIFSC facility.

5. Give an abstract of the organism with particular reference to potential impact on the environment of Hawaii (include impact to plants, animals and humans).

   All species listed have been detected in Pearl Harbor or Hawaiian waters and and will be collected within Hawai'i. All species are sessile benthic invertebrates that have the ability to monopolize space after settlement and displace native Hawaiian fauna. Impacts on native fish and invertebrate habitat use are unknown. In other regions, U. stolonifera and Discosomatidae species have been reported to rapidly expand and overgrow native species.

   Species will be held in recirculating aquaria (i.e. all water or other contents of the aquaria that come in contact with collected species will be contained and not introduced to the wild) and will be disposed of as described above.

****

I request permission to import the articles as listed on the permit application and further, request that the articles be examined by an authorized agent of the Department of Agriculture upon arrival in Hawaii.

I agree that I, as the importer, will be responsible for all costs, charges or expenses incident to the inspection or treatment of the imported articles.

I further agree that damages or losses incident to the inspection or the fumigation, disinfection, quarantine, or destruction of the articles, by an authorized agent of the Department of Agriculture, shall not be the basis of a claim against the department or the inspectors for the damage or loss incurred.

Signature SAMSON.JENNIFER.CARMEL.1406711257 Digitally signed by SAMSON.JENNIFER.CARMEL.1406711257 Date: 2025.04.25 12:24:23 -10'00' **Date** 04/25/2025

(Applicant)

Andrew A. Shantz

3/15/2025

Education

Ph.D. Biology 2016

Department of Biology, Florida International University, Miami, FL.
*Individual and Interactive effects of nitrogen and phosphorus enrichment on coral reefs**
Dr. Deron Burkepile, advisor.

M.S. Marine Biology 2010

Department of Biology, Northeastern University, Boston, MA.
Impacts of corallivorous fishes on Pacific coral reefs.
Dr. Josh Idjadi, adviser.

B.A. Anthropology 2005

Department of Anthropology, University of Colorado, Boulder, Boulder CO.

**Received Florida International University award for Best Dissertation in the STEM Fields*

Professional Appointments

Cooperative Institute for Marine & Atmospheric Research, Honolulu, HI. USA. 2023 – *Current*
Supervisory Coral Reef Ecologist

- Plan and conduct original research, secure funding, analyze data, and present findings through publications, conferences, and outreach.
- Supervise research staff in planning, execution, analysis, and publication of research projects.
- Lead fish surveys on research cruises with the US National Coral Reef Monitoring Program.
- Engage managers, non-profit, and user groups to share information relevant to the management and conservation of marine ecosystems.

Florida State University, Tallahassee, FL. USA – 2021 – *Current*
Assistant Research Professor (currently Courtesy Faculty)

- Plan and conduct original research, secure funding, analyze data, and present findings through publications, conferences, and outreach.
- Mentor postdocs, graduate, and undergraduate students.
- Contribute to academic community as editor and reviewer for grants and manuscripts.

New York University Abu Dhabi, Abu Dhabi, UAE – 2020
Post-Doctoral Research Associate

Pennsylvania State University, State College, PA. USA, 2017 – 2019
Eberly Research Fellow

University of California, Santa Barbara, California USA, 2016 – 2017
Post-Doctoral Researcher

Peer Reviewed Publications (Google Scholar Citations: **3718**; H-index: **27**; i10-index: **32**)

Denotes manuscripts on which I am a senior or corresponding author

40. ***Shantz, A.A.** and M.C. Ladd. 2024. Shifting patterns in parrotfish corallivory after 12 years of decline on coral depauperate reefs in the Florida Keys, USA. *Coral Reefs* 43:1359-1373.

39. Ladd, M.C., **A.A. Shantz**, C. Harrell, N.K. Hayes, D.S. Gilliam, E.M. Muller, K.L. O'neil, B. Reckenbeil, Z. Craig and D. Lirman. 2024. Acclimation and size influence predation, growth and survival of sexually produced *Diploria labyrinthiformis* used in restoration. *Scientific Reports* 14:26362.

38. ***Shantz, A.A.,** T.L. Lopez, K.G. Campo, R. Iglesias-Prieto and M. Medina. 2024. Reassessing the Role of Herbivores on Urban Coral Reefs: A Case Study from a Heavily Impacted Reef near Cartagena Bay, Colombia. *Urban Ecosystems* 27:689-697.

37. Couch C.S., B. Huntington, J.A. Charendoff, C. Amir, M. Asbury, I. Basden, V. Brown, M. Lamirand, D. Torres-Pulliza, and **A.A. Shantz**. 2024. Coral reef community recovery trajectories vary by depth following a moderate heat stress event at Swains Island, American Samoa. *Marine Biology* 171:218.

36. ***Shantz, A.A.,** M.C. Ladd, R.J. Schmitt, S.J. Holbrook, L. Ezzat, E. Schmeltzer, R.V. Thurber and D. E. Burkepile. 2023. Positive interactions between corals and damselfish increase coral resistance to temperature stress. *Global Change Biology* 29:417-431.

35. Pine, W.E., J. Brucker, M. Davis, S. Geiger, R. Gandy, **A.A. Shantz,** T. Stewart-Merrill, and E.V. Camp. 2023. Collapsed oyster populations in large Florida estuaries appear resistant to restoration using traditional clutching methods – Insights from ongoing efforts in multiple systems. *Marine and Coastal Fisheries* 15:e10249.

34. Adam, T.C., S.J. Holbrook, D.E. Burkepile, K.E. Speare, A.J. Brooks, M.C. Ladd, **A.A. Shantz**, R. Vega Thurber and R.J. Schmitt. 2022. Priority effects in coral-macroalgae interactions can drive alternate community paths in the absence of top-down control. *Ecology* 103:*e3831.*

33. Burkepile D.E., T.C. Adam, J.E. Allgeier and **A.A. Shantz**. 2022. Functional diversity in herbivorous fishes on Caribbean reefs: the role of macroalgal traits in driving interspecific differences in feeding behavior. *Food Webs* 33:e00255.

32. ***Shantz, A.A.**, M.C. Ladd and D.E. Burkepile. 2020. Overfishing and the ecological impacts of extirpating large parrotfish from Caribbean coral reefs. *Ecological Monographs* 90:e01403.

31. *Ladd, M.C. and **A.A. Shantz**. 2020. Trophic interactions in coral reef restoration: A review. *Food Webs* 24:e00149.

30. Donovan, M.K., T.C. Adam, **A.A. Shantz**, K.E. Speare, K.S. Munsterman, M.M. Rice, R.J. Schmitt, S.J Holbrook and D.E. Burkepile. 2020. Nitrogen pollution interacts with heat stress to increase coral bleaching across the seascape. *Proceedings of the National Academy of Sciences USA* 10:5351-5357.

29. Rice, M.M., R.L. Maher, A.M.S. Correa, H.V. Moeller, N.P. Lemoine, **A.A. Shantz**, D.E. Burkepile, and N.J. Silbiger. 2020. Macroborer presence on corals increases with nutrient input and promotes parrotfish corallivory. *Coral Reefs* 39:409-418.

28. Parkinson, J.E., A.C. Baker, I. Baums, S.W. Davies, A.G. Grottoli, S.A. Kitchen, T.C. LaJeunesse, M.V. Matz, M.W. Miller, **A.A. Shantz**, and C. Kenkel. 2020. Molecular tools for coral reef restoration: beyond biomarker discovery. *Conservation Letters* 13*: e12687*.

27. Maher R.L., E. Schmeltzer, S. Meiling, R. McMinds, L. Ezzat, **A.A. Shantz,** T.C. Adam, R.J. Schmitt, S.J. Holbrook, D.E. Burkepile and R Vega Thurber. 2020. Coral microbiomes demonstrate flexibility and resilience through a reduction in community diversity following a thermal stress event. *Frontiers in Ecology and Evolution* 8:e10.3389.

26. Burkepile, D.E., **A.A. Shantz,** T.C. Adam, K.S. Munsterman, K.E. Speare, M.C. Ladd, M.M. Rice, S. McIlroy, A.J. Brooks, R.J. Schmitt and S.J. Holbrook. 2020. Nitrogen source drives differential impacts of nutrients on coral bleaching prevalence, duration, and mortality. *Ecosystems* 23:798-811.

25. Baums, I.B., A.C. Baker, S.W. Davies, A.G. Grottoli, C.D. Kenkel, S.A. Kitchen, I.B. Kuffner, T.C. LaJeunesse, M.V. Matz, M.W. Miller, S.R. Palumbi, J.E. Parkinson and **A.A. Shantz.** 2019. Considerations for maximizing the adaptive potential of restored coral populations in the Western Atlantic. *Ecological Applications* 29:e01978.

24. Klinges, J.C., S.M. Rosales, R. McMinds, E.C. Shaver, **A.A. Shantz**, E.C. Peters, D.E. Burkepile, B.R. Silliman, R. Vega Thurber. 2019. Phylogenetic, genomic, and biogeographic analyses of a novel and ubiquitous marine invertebrate-associated Rickettsiales parasite, *Candidatus* Marinoinvertebrata rohwerii, gen. nov., sp. nov. *ISME J.* 13:2938-2953.

23. Ladd, M.C., **A.A. Shantz** and D.E. Burkepile. 2019. Newly dominant benthic invertebrates reshape competitive networks on contemporary Caribbean reefs. *Coral Reefs* 38:1317-1328.

22. *Ladd, M.C., D.E. Burkepile and **A.A. Shantz**. 2019. Near-term impacts of coral restoration on target species, coral reef community structure, and ecological processes. *Restoration Ecology* 27:1166-1176.

21. Rodrigues-Casariego, J., M.C. Ladd, **A.A. Shantz,** C. Lopez, M.S. Cheema, B. Kim, S. Roberts, J. Fourqurean, J. Ausio, D.E. Burkepile and J. Eirin-Lopez. 2018. Epigenetic modifications in the staghorn coral *Acropora cervicornis* during exposure to nutrient stress: impaired histone H2A.X phosphorylation and changes in DNA methylation trends. *Ecology and Evolution* 23:12193-12207.

20. Wang L., **A.A. Shantz,** J.P. Payet, T.J. Sharpton, A. Foster, D.E. Burkepile and R.L. Vega-Thurber. 2018. Corals and their microbiomes are differentially affected by exposure to elevated nutrients and a natural thermal anomaly. *Frontiers in Marine Science* 5:101.

19. Duran, A., **A.A. Shantz,** D.E. Burkepile, L. Collado-Vides, V.M. Ferrer, L. Palma, A. Ramos and S.P. Gonzalez-Diaz. 2018. Fishing, pollution, climate change, and the long-term decline of coral reefs off Havana, Cuba. *Bulletin of Marine Science* 94:213-228.

18. ***Shantz, A.A.,** M.C. Ladd and D.E. Burkepile. 2017. Algal nitrogen and phosphorus content drive inter- and intraspecific differences in herbivore grazing on a Caribbean reef. *Journal of Experimental Marine Biology and Ecology* 497:164-171.

17. Collado-Vides, L., A. Duran, E. Armenis, L. Palma, V. Cassano, **A.A. Shantz,** J. Diaz-Larrea, A. Senties and M.T. Fujii. 2017. Seasonal recruitment and survival strategies of *Palisada cervicornis* comb. nov. (Ceramiales, Rhodophyta) in coral reefs. *Journal of Phycology* 53:1087-1096.

16. Shaver, E.C., **A.A. Shantz,** R. McMinds, D.E. Burkepile, R.L. Vega Thurber and B.R. Silliman. 2017. Effects of predation and nutrient enrichment on the success and microbiome of a foundational coral. *Ecology* 98:830-839.

15. Ladd, M.C., **A.A. Shantz,** E. Bartels and D.E. Burkepile. 2017. Thermal stress reveals a genotype-specific tradeoff between growth and tissue loss in restored *Acropora cervicornis*. *Marine Ecology Progress Series* 572:129-139.

14. ***Shantz, A.A.,** N.P. Lemoine and D.E. Burkepile. 2016. Nutrient loading alters the performance of key nutrient exchange mutualisms. *Ecology Letters* 19:20-28.

13. Ladd, M.C., **A.A. Shantz,** K. Nedimyer and D.E. Burkepile. 2016. Density dependence determines success of *Acropora cervicornis* restoration on a Caribbean coral reef. *Frontiers in Marine Science* 3:261.

12. *Lemoine, N.P. and **A.A. Shantz.** 2016. Increased temperature causes protein limitation by reducing the efficiency of nitrogen digestion in the ectothermic herbivore Spodoptera exigua. *Physiological Entomology* 41:143-151.

11. Zaneveld, J., D.E. Burkepile, **A.A. Shantz,** C.E. Pritchard, R. McMinds, J.P. Payet, R. Welsh, A.M.S. Correa, N.P. Lemoine, S. Rosales, C. Fuchs, and R.L. Vega Thurber. 2016. Overfishing, pollution, and thermal stress interact to disrupt coral reefs down to a microbial scale. *Nature Communications* 7, 11833.

10. *Ladd, M.C. and **A.A. Shantz.** 2016. Novel enemies - previously unknown predators of the bearded fireworm. *Frontiers in Ecology and Evolution* 14:342-343.

9. ***Shantz, A.A.,** M. Ladd, E. Schrack and D.E. Burkepile. 2015. Fish-derived nutrient hotspots shape coral reef benthic communities. *Ecological Applications* 25:2142-2152.

8. Stroud J.T., M.R. Bush, M.C. Ladd, R.J. Nowicki, **A.A. Shantz,** and J. Sweatman. 2015. Is a community still a community? Reviewing definitions of key terms in community ecology. *Ecology and Evolution* 5:4757-4765.

7. ***Shantz, A.A.,** and D.E. Burkepile. 2014. Context-dependent effects of nutrient loading on the coral-algal mutualism. *Ecology* 95:1995-2005. *^Recipient of Florida International University Provost Award for Best Student Manuscript in the STEM field.*

6. Catano, L.B., **A.A. Shantz** and D.E. Burkepile. 2014. Predation risk, competition, and territorial damselfishes as drivers of herbivore foraging on Caribbean coral reefs. *Marine Ecology Progress Series* 511:193-207.

5. Staaterman, E.R., A.A. Bhandiwad, P.M. Gravinese, P.M. Moeller, Z.C. Reichenbach, **A.A. Shantz,** D.S. Shiffman, L.T. Toth, A.M. Warneke and A.J. Gallagher. 2014. Lights, camera, science: The utility and growing popularity of film festivals at scientific meetings. *Ideas in Ecology and Evolution* 7:11-16.

4. Vega-Thurber, R., D.E. Burkepile, C. Fuchs, **A.A. Shantz,** R. McMinds and J.R. Zaneveld. 2014. Chronic nutrient enrichment increases prevalence and severity of coral disease and bleaching. *Global Change Biology* 20:544-554.

3. Burkepile, D.E., J.E. Allgeier, **A.A. Shantz,** C. Pritchard, N. Lemoine, L. Bhatti, and C.A. Layman. 2013. Nutrient supply from fishes facilitates macroalgae and suppresses corals in a Caribbean coral reef ecosystem. *Scientific Reports,* 3:1493.

2. Vega-Thurber, R., D.E. Burkepile, A.M.S. Correa, **A.A. Shantz,** R.M. Welsh, C. Pritchard, and S. Rosales. 2012. Macroalgae decrease growth and alter microbial community structure of the reef-building coral *Porites astreoides*. PLoS ONE 7: e44246.

1. ***Shantz, A.A.,** A.C. Stier and J.A. Idjadi. 2011. Coral density and predation affect growth of a reef-building coral. *Coral Reefs* 30:363-367.

Publications In Review & Preparation (Drafts available upon request)

Carmignani A., G. Skrzypek, R.G. Brooker, M.G. Meekan, T.J. Chase, **A.A. Shantz**, and D.R. Barneche. *In Revision* at *Coral Reefs*. The relationship between nutrient supply from resident fishes and the growth, condition, and thermal tolerance of corals.

Smith, J., J. Verstaen, A.A. Shantz, M.S. Lamirand, B. Vargas-Angel. *In Review* at *Marine Pollution Bulletin.* Land-based sources of pollution impact coral reefs in American Samoa.

Baums I.B, A. Baker, S.W. Davies, A. Grottoli, C.D. Kenkel, S.A. Kitchen, I.B. Kuffner, M.V. Matz, M.W. Miller, J. Parkinson, C. Prada, and **A.A. Shantz.** *In Prep. Managing expectations for breeding "super corals".* Open Science Framework draft available here.

Baker A.C., I.B. Baums, S.W. Davies, A.G. Grottoli, C.D. Kenkel, S.A. Kitchen, I.B. Kuffner, M.V. Matz, M.W. Miller, E.M. Muller, J.E. Parkinson, C. Prada, **A.A. Shantz**, R. van Hooidonk and R.S. Winters. *In Prep.* Proactive assisted gene flow for Caribbean corals in an era of rapid coral reef decline.

Schmeltzer E.R., K.S.I. Bistolas, L.I. Howe-Kerr, **A.A. Shantz**, *et al*. *In Prep.* The Mo'orea Virus Project: island-wide spatiotemporal variability of coral virus communities across seasonal reefscapes in Mo'orea, French Polynesia.

Non-Peer Reviewed Publications

Baums I.B., A. Baker, S.W. Davies, A. Grottoli, C.D. Kenkel, S.A. Kitchen, I.B. Kuffner, M.V. Matz, M.W. Miller, J. Parkinson, C. Prada, **A.A. Shantz** and S. Winters. Safeguarding Florida's Coral Reefs: The Urgency of Assisted Gene Flow for Elkhorn Coral Conservation. Coral Restoration Consortium Gentics Working Group; https://zenodo.org/records/14920439

Pollock F.J., G. Asner, R. Carr, E. Conklin, C. Couch, D. Demartini, A. Garcia, M. Hixon, K. Hughes, B. Huntington, R. Okano, T. Olivers, A.A. Shantz & S. Ruseborn. Hawai'i Reef Restoration Monitoring Guide. The Nature Conservancy.

Research Cruises

2025 US National Coral Reef Monitoring Program, Wake Island, Guam, and the Common Wealth of the Marianas, Rapid Ecological Assessment Survey Team Lead; Towed Dive Lead (45 days planned, March – May 2025)

2024 US National Coral Reef Monitoring Program, Main Hawaiian Islands and Papahānaumokeakea Marine Monument Assessment, Rapid Ecological Assessment Survey Team Lead; 60 days, July – September 2024.

2023 US National Coral Reef Monitoring Program Reef Assessment & Mapping in the Central Pacific, American Samoa and Pacific Remote Island Areas (PRIAs), Survey Scientist; 30 days, July – August 2023.

2017 ECOGIG II: Jewels of the Gulf, Ocean Intervention II, Gulf of Mexico; 10 days, June 2017.

Selected Grants & Fellowships (>$3,600,000 awarded to date)

2024 Department of Defense Strategic Environmental Research and Development Program (**$2,340,000).** *Developing novel genetic and AI-assisted tools to facilitate detection, tracking, and eradication of aquatic invasive species in Pearl Harbor*. PI Shantz with co-PI's J. Whitney, K. Tanaka, and C. Couch.

2023 NOAA Coral Reef Conservation Program (**$679,800**). *Characterizing interactions between land-based sources of pollution, coral growth, and herbivory to set targets for coastal runoff.* PI Shantz with co-PI's J. Johansen and L. McManus.

2023 NOAA Coral Reef Conservation Program (**$181,900**). *Improving Pacific coral reef restoration through coordinated experimental restoration*. PI Shantz.

2022 US Fish & Wildlife Services (**$131,700**). *Minimizing fish predation on massive coral outplants for restoration.* PI Shantz with co-PI M. Ladd (Award declined due to change in positions).

2022 National Marine Sanctuaries Foundation (**$81,500**). Increasing long-spined urchin production to restore Florida *Diadema* populations. PI Shantz.

2021 Florida Department of Environmental Protection ($298,700; **$21,200** for Shantz). *Methods to improve the success of SCTLD-susceptible coral species outplanted for restoration: From nursery to reef.* Co-PI Shantz w/ PI D. Lirman & Co-PI's E. Muller, J. Figueiredo, M. Ladd.

2020 Atlantis Aquarium & Resort, Dubai Research Award (**$85,000; $20,000** for Co-PI Shantz). *Effects of Ammonium enrichment on coral nitrate uptake and bleaching during thermal stress.* PI J. Burt.

2017 Pennsylvania State University Eberly Scholars Fellowship (**$210,000**)

2015 Paul M. Angell Foundation (**$44,400**) *Impacts of sharks on coral reef ecosystems: Immersive research complemented by innovative educational outreach* w/ M. Heithaus, K. Boswell & T. Potts

Scientific Presentations (Presenting author only)

2024 Restoring with intent: Site-specific planning scenarios for coral reef restoration in Pacific Islands and territories. **Reef Futures 2024, Quintana Roo, Mx**

2024 Status and trends of coral reefs at Lalo (French Frigate Shoals). **Invited Speaker, Papahānaumokuākea Marine National Monument Management Board**

2024 Using novel technology and genetics to assist in invasive species management. **Invited Speaker, United States Invasive Species Advisory Committee**

2021 Herbivory, diet selectivity, and the stability of Caribbean coral reefs. **Invited Speaker, Florida State University, Tallahassee FL. USA.**

2019 The effects of nutrients on reef-building corals: How changing nutrient regimes can erode or enhance the resilience of tropical coastal ecosystems. **Invited Speaker, Florida State University, Tallahassee FL. USA.**

2019 Impacts of Artisanal fisheries on Caribbean coral reef communities. **Invited Speaker, University of Aberdeen, Aberdeen Scotland.**

2018 Incorporating phenotypic traits in coral restoration. **Reef Futures 2018, Key Largo, FL. USA.**

2017 Methods in scientific diving. **Pennsylvania State University, University Park PA. USA.**

2016 Too much of a good thing: How changing nutrient regimes affect coral reefs. **Invited speaker, Mote Marine Lab & Aquarium, Sarasota, FL. USA.**

2016 Fish-derived nutrient hotspots shape coral reef communities. **International Coral Reef Symposium, Honolulu, HI. USA.**

2016 A preliminary assessment of overfishing and nutrient pollution across the reefs of Havana. **Invited speaker, University of Havana, Havana, Cuba.**

2016 Methods in marine ecology. Invited speaker, **University of Havana, Havana, Cuba.**

2015 Impacts of fish-derived nutrients on coral reef communities. **2015 Association of Marine labs of the Caribbean, Willemstad, CW.** ***Winner of Best Student Presentation***

2015 The effects of nutrient loading on foundational mutualisms. **2015 Benthic Ecology Conference, Quebec City, QC, CA.** ***Winner of Outstanding Student Presentation***

2014 Global nutrient loading jeopardizes the performance of key nutrient-sharing mutualisms. **2014 Western Society of Naturalists, Tacoma, WA, USA.*** *Winner of Best Student Presentation*

2013 When the sh*t hits the (sea)fan: The impact of fish derived nutrients on coral reef benthic communities. **Western Society of Naturalists 2013 Annual Meeting, Oxnard, CA, USA.**

2013 Impact of nutrients on the growth and physiology of reef building corals. **42nd Benthic Ecology Conference, Savannah, GA, USA.**

2012 Macronutrients influence foraging in an herbivorous fish community. **2012 International Coral Reef Symposium, Cairns, Queensland, AU.**

Mentoring, Supervising, and Teaching

Postdocs Mentored

Fabio Prior-Caltabellota PhD. 2022 – 2023
FSU Postdoctoral Research Associate

Graduate Students Mentored

Donaven Baughman (PhD student, *FSU*) 2021 – *Current*
**2022 NSF GRFP Recipient*
Benton Jaco (MSc student, *FSU*) 2021 – 2023
**2021 NSF GRFP Recipient*

Professional Staff Supervised

Kira Turnham, PhD. 2024 – *Current*
CIMAR Marine Ecosystem Research Analyst
Corrine Amir, MS. 2023 – *Current*
CIMAR Marine Ecosystem Research Coordinator
Rebecca Weible, MS. 2023 – *Current*
CIMAR Marine ecosystem research Coordinator for carbonate chemistry
Jessica Perleman, PhD. 2023 – 2024
CIMAR Marine Ecosystem Research Analyst
John Morris, PhD. 2023
CIMAR Marine Ecosystem Research Analyst
Shannon Murphy, MS. 2022 – 2023
FSU laboratory technician
Benton Jaco 2020 – 2021
FSU laboratory technician

Courses Taught

Instructor of Record, Environmental Science 2018
Pennsylvania State University, University Park, PA. USA

Guest Instructor, Tropical Coastal Ecology Field Course 2015 – 2016
Organization for Tropical Studies, Bocas del Drago, Panama

Teaching Assistant, General Biology I & II 2011, 2015
Florida International University, Miami, FL. USA

Teaching Assistant, Ecology 2011
Florida International University, Miami, FL. USA

Teaching Assistant, Invertebrate Zoology 2010
Florida International University, Miami, FL. USA

Teaching Assistant, Marine Birds & Mammals 2010
Northeastern University at *Friday Harbor Labs, Friday Harbor, WA. USA*

Certifications and Technical Skills

- American Academy of Underwater Sciences & NOAA diver (>3,500 dives).
- Dive Master (NAUI), Rescue Diver (NAUI), Nitrox (NAUI), and Cave (PSAI) certifications, with experience in hard-hat and saturation diving.
- DAN O_2 provider, First Aid, AED, and CPR certifications.
- Former Emergency Medical Technician (EMT-I)
- MOCC and RYA International Powerboat boating certification w/ >500 hours piloting small vessels.
- Software & Coding Platforms: R, Python, ArcGIS, ImageJ, Metashape, MS Suite.

Professional Commitments and Services

- **Associate Editor** for *Journal of Tropical Ecology* and *PeerJ*
- **Science Advisor** and core member of the *Coral Restoration Consortium* working group on Restoration Science & Genetics (2019 – Current)
- **Advisor** for the Coral Scientific and Statistical committee for the Gulf of Mexico Fishery Management Council (2020 – 2023)
- **Memberships:** International Coral Reef Society; Ecological Society of America; Western Society of Naturalists; Middle East Coral Reef Society; New York Academy of Sciences; Society for Ecological Restoration
- **Reviewer:** I typically review 8-12 journal articles and grant proposals a year and have served as a reviewer for over 30 ISI and SCI indexed journals, including *Coral Reefs, Ecology, Ecology Letters, Ecological Applications, Ecological Monographs, Functional Ecology, Global Change Biology, J. of Experimental Biology, Nature Communications, Oecologia, PLoS ONE, Proc. of the Royal Society, B.; Proc. of the National Academies of Sciences (USA);*

References

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NOAA Daniel K. Inouye Regional Center
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Laboratory Biosafety Plan

Version 1.3

(Working Version)

Previous version issued June 7, 2024. See revision history.

Revision History for this Document

The most recent revision is listed first, with subsequent revisions following.

Date of Revision	Areas Revised	Revision Description
ongoing	Entire doc	
7 JUN 2024	Entire doc	(Ver 1.3) Updated points of contact. See file [Biosafety_Plan_IRC_Labs_2024.06.07.signed.pdf]
4 APR 2023	Entire doc	(Ver 1.2) Updated points of contact. Checked links. See file [Biosafety_Plan_IRC_Labs_2023.04.04.signed.pdf]
4 JAN 2022	Entire doc	(Ver 1.1) Document released. See file [Biosafety_Plan_IRC_Labs_2022.01.04.signed.pdf]
9 DEC 2021	Entire doc	(Ver 1.0) Draft released for comments.

Introduction

Employees and affiliates working with biological material must use this biosafety plan to provide guidance for safe laboratory practices. Supervisors and Principal Investigators must regularly review and update standard operating procedures applicable to their specific laboratory processes and operations.

Managers, supervisors, and sponsors – at all levels – are accountable for managing workplace health and safety with strong leadership and credibility. At the same time, staff involvement is indispensable to establish and maintain safety and health in the workplace. Respect for safety principles, standards and procedures is a fundamental aspect of everyone's job.

As a member of our workplace community, each of you is empowered to challenge any unsafe acts you see or perceive and to put a task on hold, if you judge that safety is not adequate.

_____ _____

Mr. Chad Yoshinaga Date
PIFSC Environmental Safety and Occupational Health Manager
NOAA Pacific Islands Fisheries Science Center

Contents

Scope

This plan supplements the NOAA Inouye Regional Center (IRC) Occupant Emergency Plan, the IRC Laboratories Chemical Hygiene Plan, and the standard operating procedures (SOP) prepared by principal investigators and supervisors which are specific to their projects being conducted within IRC workspaces.

This laboratory biosafety plan specifically addresses infectious biological material hazards. For information on general facility emergency procedures, general laboratory procedures, first aid, chemical spills, and other related items, refer to the above referenced plans. (Links to these plans can be found in the "Additional Resources for Information" section below.)

Laboratory spaces at the IRC are currently used by the NOAA Pacific Islands Fisheries Science Center (PIFSC), NOAA Pacific Islands Regional Office (PIRO), NOAA Papahānaumokuākea Marine National Monument (PMNM), Pacific Islands Water Science Center (PIWSC), and the Research Corporation of the University of Hawaii (RCUH). Where differences exist in procedures between the various entities, workers must follow the more conservative safety protocols.

Emergency Contact Information

Call 911 for emergencies.

Emergency medical care facilities are located at:

Kaiser Permanente Moanalua Medical Center

3288 Moanalua Road
Honolulu, HI 96819
Phone: 808-432-0000
Hours: 7 days, including holidays open 24 hours

Pali Momi Medical Center

98-1079 Moanalua Rd
Aiea, HI 96701
Phone: 808-486-6000
Hours: 7 days, including holidays open 24 hours

Enter via Moanalua Road to Second driveway.
Drop-off and short-term parking are available.

Points of Contract for Laboratory Staff

Points of Contact for Laboratory Staff (Report all laboratory emergencies, injuries, and near misses to the lab manager, ESOHM, and your supervisor.)			
Name	**Affiliation**	**Phone**	**Areas of responsibility**
Chad Yoshinaga	PIFSC/OMID; PIFSC Environmental Safety, and Occupational Health Manager (ESOHM)	808-725-5391 808-222-1072(c)	Overall PIFSC Safety Program
Kerry Reardon	PIFSC/OMID; Laboratory Manager	808-725-5465 305-393-9429(c)	Overall PIFSC Laboratory Spaces
Justin Weeks	PIFSC/OMID; Deputy Laboratory Manager	808-725-5424 404-822-4919(c)	Overall PIFSC Laboratory Spaces
For facility issues, contact the lab manager or deputy lab manager. If they are not available contact the following:			
Kevin Wong	PIFSC/OMID; Science Support Services (S3) Program Manager	808-725-5433	PIFSC Scientific Facilities
Jason P. Beaman	IRC; Safety, Environmental, and Security Specialist	808-725-6198	Overall IRC campus
Michelle Delaney	IRC; Site Manager	808-725-6211	Overall IRC campus
For questions specific to Cooperative Institute staff, contact the following:			
Brittany Huntington	CIMAR; Deputy Director for PIFSC Projects	808-725-5438	CIMAR Staff (RCUH/UH) and CIMAR Project Management
Kyle Koyanagi	PIFSC/OMID; PIFSC Science Operations Manager	808-725-5481	CIMAR Operational Activities

Biological Hazards

Our laboratories do not intentionally work with any organisms categorized as risk group 2 organisms. Collection, pathogen isolation, culturing, or other types of microbiological work are NOT conducted with any of the biological agents (bacterial, fungal, parasitic, rickettsial, viral, arboviruses, toxins, or prion) listed in Section VIII of the Biosafety in Microbiological and Biomedical Laboratories (BMBL) 6th Edition (Centers for Disease Control and Prevention) https://www.cdc.gov/labs/BMBL.html

Bloodborne pathogens (BBP) are pathogenic microorganisms that are present in human blood; these and other potentially infectious materials (OPIM) can cause disease. Examples include hepatitis B (HBV), hepatitis C (HCV) and human immunodeficiency virus (HIV). Human feces, nasal secretions, saliva, sputum, sweat, tears, urine, and vomitus are not considered to be a risk

for BBP transmission unless there is visible blood in them (CDC, 2013). Due to the nature of the laboratory work at the IRC, participation in the laboratory activities at the IRC does not create a reasonably anticipated exposure to human blood, tissues, cell lines and other pathogenic agents that are present in human blood.

However, biological hazards include the potential for zoonotic disease transmission from wild populations of marine mammals, marine turtles, or other species. These include *Brucella spp*. (BMBL categorized), *Mycoplasma spp.* (not categorized in the BMBL) and group A streptococcal bacteria which can contribute to erysipelas, an infection of the upper layers of the skin (superficial).

While still a rare incidence, *Brucella* exposure can result in flu-like symptoms, chronic arthritis, or fatigue and in some cases neurologic disease. Transmission of disease from marine mammals is unlikely, but possible. Proper personal protective equipment (PPE) will be provided to all personnel involved in necropsies or sample handling. Additionally, personnel will receive training and information regarding likely symptoms should an exposure occur. Staff will be instructed to consult their physician should symptoms arise after an incident of potential exposure. To date, no Laboratory activities at the University of Hawaii Stranding Lab, University of Hawaii Cooperative Institute for Marine and Atmospheric Research, or at the NOAA Pacific Islands Fisheries Science Center have resulted in zoonotic disease transmission. Hunt et al. (2008) present a discussion of health risks for marine mammal workers. Warwick et al. (2013) discuss health implications associated with exposure to farmed and wild sea turtles.

Site Control Measures

The Pacific Islands Fisheries Science Center laboratory facility is located on Joint Base Pearl Harbor Hickam, an active military installation not open to the general public and with entry control points. Access to the lab building is secured by controlled access doors and a security desk staffed during business hours. Access to lab rooms is further limited to authorized lab users with appropriately programmed access cards or individually issued keys.

Access by Others (non Laboratory Users)

Laboratory guests must be cleared by the laboratory manager and hosted by a member of the Laboratory Users and Safety Committee (or other laboratory personnel approved by the laboratory manager). The host is responsible for the overall safety of the visitor and the visitor's behavior. It is the responsibility of the host to notify visitors of the relevant hazards associated with their visit to a laboratory space and to make visitors aware of basic life and safety protocols such as emergency exits and muster locations. Note that any person who engages in any laboratory activity (other than organized tours) is considered a laboratory user and must undergo the training and safety briefings required by lab users.

Authorized janitorial staff provide limited services to the lab areas such as removal of regular (unregulated) waste bins and floor sweeping. Cleaning of all benchtops and other horizontal surfaces in the lab are the responsibility of lab users.

Building maintenance contractors can enter lab areas to service building utilities and systems. To the extent practicable, building maintenance activities shall not be conducted concurrent with laboratory activities. Prolonged, invasive, or otherwise atypical building maintenance activities shall be coordinated with the laboratory manager.

Disposal and Decontamination Procedures

Review and follow the standard practices listed below.

Disposable Supplies

Disposable supplies (gloves, aprons, etc.), which may have contacted contaminated marine mammal specimens during monk seal necropsies and other procedures, shall be appropriately stowed and then disposed of by an authorized medical waste disposal contractor such as NCNS Environmental, Inc. or Hawaii Bio-Waste Systems, Inc. Contact the Laboratory Manager for more information.

Sharps

Place sharps in the biohazard sharps containers. Do not fill past the max fill-line. These are disposed of by the laboratory's medical waste disposal contractor. Contact the Laboratory Manager for more information.

Reusable Equipment

Reusable equipment that may have contacted contaminated biological material shall be disinfected using the disinfection protocol described in this plan.

Large biowaste

Biological wastes such as monk seal carcasses are cremated. Large biological wastes suspected of being contaminated/infectious are disposed of as medical waste by an authorized contractor.

Liquid Cultures

Not applicable. (Live culture work and similar microbiological procedures are not conducted at the IRC laboratories.)

Petri Dishes (for microbial cultures)

Not applicable. (Live culture work and similar microbiological procedures are not conducted at the IRC laboratories.)

Biological Spill Clean-up (general)

Report spills to your supervisor and to the lab manager.

For spills of biological samples that have been preserved in formalin, also refer to the clean up procedures outlined in the Chemical Hygiene Plan. https://sites.google.com/noaa.gov/pifsc-labs/bio-chem-labs/chp

The following general procedure is for biological materials typically handled at the IRC laboratories. This includes animal carcasses (fish, seals, turtles, cetaceans) and biological samples obtained from other marine animals.

1. Remove potentially contaminated clothing.
2. Wash hands and any other contaminated skin thoroughly with soap and water.
3. Those not needed for spill cleanup should stay away from the spill area.
4. Wear appropriate personal protection equipment. At a minimum, disposable gloves, eye protection, and lab clothing should be worn.
5. Remove sharp contaminated objects from the spill area using mechanical means (e.g. tongs, brush/dustpan), never with hands.
6. Paper towels can be used to absorb as much of the spilled material as possible. Bag or otherwise contain any large pieces of biological material.
7. Disinfect the area of the spill using Rescue Disinfectant (**concentrated at 1:16 or 8 oz. of product per gallon of water**). Working from the outside of the spill toward the center avoids spreading contamination. Leave the disinfectant in place for the manufacturer's recommended five (5) minute contact time. The surface should be visibly wet for the contact time.
8. Absorb disinfectant with paper towels. A final wipe-down should be done with clean paper towels soaked with disinfectant. Be sure to disinfect any equipment, walls or other areas likely to have been splashed by the spill.
9. Wash hands thoroughly with soap and water.

Biological Spill Clean-up (blood)

In the event that a lab worker is injured, seek assistance and medical attention as necessary.

If (human or animal) blood is present in a workspace, there are 10 basic steps to cleaning up blood spills. You will need the following items.

- registered disinfectant product with a broad spectrum kill claim (e.g. Rescue Disinfectant)

- personal protective equipment
- cloth towels / paper towels
- biohazard bags
- biohazard labels
- leak-proof sharps container (e.g., bucket with lid)
- brush and dustpan or tongs/forceps

1. *Equip.* Equip yourself with protective materials: gloves are essential, and you may want to consider a gown and protective eyewear in case of any splashing. Make sure the protective wear fits snugly and does not have any holes or other concerns of being compromised.

2. *Remove.* Use the brush and dustpan or tongs/forceps to remove broken glass or other pointed shards that could break through your protective wear. Place each piece into a leak-proof sharps container. Under no circumstances should you ever remove these objects by hand.

3. *Clean Once.* Cover the spill in durable cloth towels to soak up as much blood as possible. The registered disinfectant product with a broad spectrum kill claim will not properly disinfect if the surface is still covered in blood. Discard the used cloth towels into a biohazard bag.

4. *Clean Twice.* First, make sure there is proper ventilation if the spill isn't in an open room. Disinfect the area of the spill using Rescue Disinfectant (**concentrated at 1:16, i.e. 8 oz. of product per gallon of water**). Working from the outside of the spill toward the center avoids spreading contamination. Leave the disinfectant in place for the manufacturer's recommended five (5) minute contact time. The surface should be visibly wet for the contact time. Once this time has elapsed, you should work from the outside toward the center while scrubbing the area with durable cloth towels. Place the towels in the biohazard bag.

5. *Clean Thrice.* Now, dampen some more cloth towels with disinfectant and treat the area of the blood spill once more. Discard these towels in a biohazard bag as well. Allow the area to dry.

6. *Dispose.* Carefully dispose of your personal protective equipment into the plastic bag: gloves, gown, and glasses. This is a smart preventive measure. Be sure that other surfaces are not contaminated during this process. You should seal the bag and place it into a second bag, then seal it and mark it with a biohazard label.

7. *Decontaminate.* Use the registered disinfectant product with a broad spectrum kill claim to decontaminate any reusable equipment, such as dustpans, brooms, buckets, tongs, et cetera. After you've allowed the registered disinfectant product with a broad spectrum kill claim to soak for the recommended time, you should proceed to scrub the equipment and wash it off with fresh water.

8. *Check.* Do a last check of your body for any contamination. Whether blood managed to splash onto your shirt or the back of your elbow, it's important to recognize if you've been exposed. It is strongly recommended that you have a colleague or manager assist you with this step of the procedure.

9. *Wash Hands.* Thoroughly wash your hands and arms with warm water and disinfectant soap. After a vigorous washing, you may even want to consider using disinfectant wipes as a secondary measure.

10. *Report.* You or your supervisor are required to fill out an incident report. Instructions for filing an incident report are at the following URL: https://sites.google.com/noaa.gov/pifsc-intranet/safety/report-an-incident

Avoid Production of Bioaerosols

Centrifuge Operations

Background: The Hawaiian Monk Seal Research and Marine Turtle Biology and Assessment Programs use centrifuges to spin down blood tubes to be able to aliquot serum and plasma from whole blood. The microhematocrit centrifuge as well as adapters for regular centrifuges are also utilized for calculating hematocrits for seal and turtle patient care. The Marine Turtle Biology and Assessment Program also uses a centrifuge to separate hormone extracts from their original samples using chemical solvents. Plastic tubes are typically not suitable for hormone analysis as hormones (or hormone analogs) can leach from the plastic and contaminate the sample. The Ecosystem Sciences Division Programs use centrifuges extensively in genetics benchwork for spinning down materials, which include nucleic acids, proteins, and organic solvents in buffer solutions.

Centrifuge practices:

- Use unbreakable tubes, to the extent practicable
- Avoid overfilling tubes
- Use caps or stoppers on tubes
- Ensure that the centrifuge is balanced
- Always use the safety lid
- Do not open lid until after centrifuge stops completely
- Disinfect exposed surfaces before and after use

Pipettes

- Fill gently
- Gently expel contents
- Don't contaminate suction device
- Mouth suction for pipetting is prohibited

Transfer Loops

Not applicable. (Live culture work and similar microbiological procedures are not conducted at the IRC laboratories.)

Biosafety Standard Practices

The standard practices listed below shall be followed by all staff when working with well-characterized non-pathogenic agents that pose minimal risk to lab personnel or the environment. This type of work is generally conducted on open bench tops using standard microbiological practices with no requirement for special containment equipment.

Standard Practices 1

1. Laboratory management (lab manager, program supervisors) enforce the institutional policies that control safety in and access to the laboratory.
2. Laboratory management (lab manager, program supervisors) ensure that laboratory personnel receive appropriate training regarding their duties, potential hazards, manipulations of infectious agents, necessary precautions to minimize exposures, and hazard/exposure evaluation procedures, and that appropriate records are maintained.
3. An IRC laboratory biosafety plan is available, accessible, and periodically reviewed and updated as necessary.
4. Lab personnel review and follow safety procedures/practices.
5. Eating, drinking, smoking, handling contact lenses, applying cosmetics, and storing food for human consumption are not permitted in laboratory areas. Food is stored outside the laboratory area.
6. Closed toe shoes are worn in laboratory areas.
7. Long hair is restrained so that it cannot contact hands, specimens, containers, or equipment.
8. Gloves are worn to protect hands from exposure to hazardous materials. (Glove selection is based on an appropriate risk assessment. Gloves are not worn outside the laboratory. Change gloves when contaminated, glove integrity is compromised, or when otherwise necessary. Do not wash or reuse disposable gloves, and dispose of used gloves with other contaminated laboratory waste.)
9. Gloves and other PPE are removed in a manner that minimizes personal contamination and transfer of infectious materials outside of the areas where infectious materials and/or animals are housed or manipulated.
10. Lab personnel wash hands after handling viable materials, chemicals, removing gloves, or leaving the lab.
11. Mechanical pipetting devices are used (i.e., no mouth pipetting).
12. Sharps are disposed of in proper containers.
13. Procedures minimize splashes/aerosols.
14. PPE is used when performing procedures that pose a splash or spray risk.
15. Work surfaces are decontaminated at least daily and/or at completion of work.
16. Work surfaces are decontaminated after any spill/splash of viable material or hazardous chemical.

17. Cultures and materials contacting cultures are decontaminated (e.g., autoclaving, bleach) before disposal.
18. Glass is disposed of in proper containers.
19. Broken glassware is only handled by mechanical means.
20. Chemicals are handled and disposed of properly (see “Chemical Hygiene Plan” for more info).
21. An integrated pest management program is in place for the IRC facility.
22. Animals and plants not associated with the work being performed are not permitted in the laboratory.
23. Spills/accidents are immediately reported to the lab manager.
24. Accidental exposures are documented.

Standard Practices 2

The additional practices listed below are required when working with pathogenic agents that pose a moderate risk to lab personnel or the environment. Lab access is restricted when work is in progress. Extreme precautions are taken regarding the use of sharps. Procedures that may generate infectious aerosols or splashes are performed in a biosafety cabinet or physical containment equipment.

1. Biohazard signage posted at lab entrance when infectious materials are present.
2. Lab access is limited/restricted when work with infectious materials is in progress.
3. Protective laboratory coats, gowns, or uniforms designated for laboratory use are worn while working with hazardous materials and removed before leaving for non-laboratory areas (e.g., cafeteria, library, and administrative offices). Protective clothing is disposed of appropriately or deposited for laundering by the institution. Laboratory clothing is not taken home.
4. Contaminated materials are disinfected or properly disposed of by the end of the work day.
5. Lab equipment is decontaminated prior to sending it for repair/maintenance, or packaging it for shipment.
6. Needle/syringe use is kept to a minimum.
7. Disposable needles are not bent, recapped, removed from disposable syringes, or otherwise manipulated prior to disposal.
8. Procedures that could generate infectious aerosols are not conducted.

Additional Resources for Information

CDC-NIH (2020) Biosafety in Microbiological and Biomedical Laboratories (BMBL), 6th edition. https://www.cdc.gov/labs/BMBL.html

CDC (2013), Blood/Body Fluid Exposure Option
https://www.cdc.gov/nhsn/pdfs/hps-manual/exposure/3-hps-exposure-options.pdf

Fleming, Diane O. & Hunt, Debra L., Biological safety: principles and practices. 3rd. ed. Washington, ASM Press, 2000. 784p. ilus. ISBN 1-55581-180-9. (Link to book review)

Hunt TD, Ziccardi MH, Gulland FMD, Yochem PK, Hird DW, Rowles T, Mazet JAK (2008) Health risks for marine mammal workers. Dis Aquat Org 81:81-92. https://doi.org/10.3354/dao01942

NOAA Inouye Regional Center (IRC) Laboratories Chemical Hygiene Plan
https://sites.google.com/noaa.gov/pifsc-labs/bio-chem-labs/chp

NOAA Inouye Regional Center (IRC), Occupant Emergency Plan
https://sites.google.com/noaa.gov/pifsc-intranet/safety

OSHA Bloodborne Pathogens Standard Fact Sheet
https://www.osha.gov/OshDoc/data_BloodborneFacts/bbfact01.pdf

University of Hawai‘i, Office of Research Compliance, Biosafety Program
https://research.hawaii.edu/orc/programs/biological-safety/

Warwick C, Arena PC, Steedman C, (2013) Health implications associated with exposure to farmed and wild sea turtles, JRSM Short Reports, Jan; 4(1):8, doi: 10.1177/2042533313475574

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Appendix A: Abbreviations

BMBL	Biosafety in Microbiological and Biomedical Laboratories, 6th Edition
CAC	Common Access Card
CDC	Centers for Disease Control
CIMAR	Cooperative Institute for Marine and Atmospheric Research
DOC	Department of Commerce
ESD	Ecosystem Sciences Division (A division of the PIFSC)
ESHOM	Environmental, Safety, and Occupational Health Manager
FMB	Facilities Management Branch (also IRC/FMB)
FRMD	Fisheries Research and Monitoring Division (A division of the PIFSC)
HMSRP	Hawaii Monk Seal Research Program
IRC	Inouye Regional Center (aka NOAA Daniel K. Inouye Regional Center)
JBPHH	Joint Base Pearl Harbor Hickam
MIL	Marine Instrumentation Laboratory
MTBAP	Marine Turtle Biology and Assessment Program
NIH	National Institutes of Health
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
	OMID Operations, Management, & Information Division (A division of the PIFSC)
PI	Principal Investigator
PIFSC	Pacific Islands Fisheries Science Center, NOAA NMFS
POC	Point of Contact
PPE	Personal protective equipment
PSD	Protected Species Division (A division of the PIFSC)
RCUH	Research Corporation of the University of Hawaii
SOP	Standard operating procedure
SPP	Species (plural)
UH	University of Hawaii
URL	Universal Resource Locator (i.e. web address)

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Appendix B: Biological Exposure Control Plan

1. Purpose

This plan describes how exposure to biological agents, blood, or other potentially infectious materials can be eliminated or minimized.

2. Background

This plan shall be reviewed annually. In addition, whenever changes in tasks, procedures, or employee positions affect or create new occupational exposure, the existing plan shall be reviewed and updated accordingly. All infection control policies and procedures will be consistent with the intent of this Plan.

3. Responsibilities

Directorates

Director of the NOAA Pacific Islands Fisheries Science Center (PIFSC) has overall responsibility for laboratory safety for PIFSC employees and affiliates.

Director of the Cooperative Institute for Marine and Atmospheric Research (CIMAR) has overall responsibility for laboratory safety for CIMAR employees.

The directorates will be responsible for the integrated compliance of actions (such as engineering controls, work practice modifications, appropriate use of personal protective equipments, training and education, vaccination, prophylaxis, and exposure follow-up) to prevent or reduce the risk of employees' exposure to biological agents, blood, and other potentially infectious materials. The CIMAR directorate will also be responsible for keeping the UH Environmental Health and Safety Office - Biological Safety Program (EHSO-BSP) informed of any occupational exposure incident involving UH employees.

Laboratory Manager

Laboratory managers shall oversee laboratory operations, chemical storage/logistics/hygiene, assignment and use of laboratory space, and serve as a point-of-contact for overall lab related matters. Laboratory managers shall support supervisors and the Environmental, Safety, and Occupational Health Manager (ESOHM) in responding to and investigating biosafety incidents.

PIFSC Environmental, Safety, and Occupational Health Manager (ESOHM)

The ESHOM shall investigate reports of injuries, biosafety incidents, and near misses. The ESHOM shall work with laboratory managers, supervisors, and laboratory users to develop and implement appropriate safety policies and practices.

Supervisors

The supervisor will assure that all personnel (employees, students, volunteers) are aware of and are following this plan. Supervisors will identify and direct specific work practices that facilitate meeting the provisions of this Plan and immediately notify the administrator of any occupational exposure incident.

Employees

Employees, students, and volunteers will be responsible for complying with procedures established by their work supervisors in accordance with this Plan to prevent or minimize their risk. They are also responsible to promptly report any worksite exposure incident to their supervisor.

4. Exposure Determination

Staff involved with the following activities have a potential risk of occupational exposure to biological agents, blood and other potentially infectious materials. They may be exposed to these materials regardless of whether they wear or use protective equipment.

- Handling or examining live animals.
- Biological sample collection from live animals, such as blood, tissues, stomach contents, epibiotics, fin clips, etc.
- Collection of biological material left in the shoreline or marine environment by an animal (scat & spew, molt, placenta, eggs, nests).
- Moving or handling animal carcasses.
- Performing or assisting with necropsy procedures.

5. Standard Precautions

“Standard Precautions” is an approach to infection control. According to the concept of standard precautions, all human blood and certain human body fluids are treated as if known to be infectious for hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), or other bloodborne pathogens.

The concept of standard precautions is applicable when handling any potentially infectious substance. Practicing "standard precautions" consists of the following CDC recommendations:

1. Appropriate barrier precautions should be routinely used to prevent skin and mucous membrane exposure with contact with biological agents, blood, or other potentially infectious materials.

a. Gloves should be worn: for touching biological agents, blood and other potentially infectious materials, mucous membranes, or non-intact skin, for handling items or surfaces soiled with biological agents, blood or other potentially infectious materials, and for performing venipuncture and other vascular access procedures. Gloves should be changed after contact with each material and hands must be washed.

b. Masks and protective eyewear (safety goggles) and face shields should be worn during procedures that are likely to generate droplets, aerosols, splashes of potentially infectious materials that may be exposed to the worker's mucous membranes (mouth, nose, eyes or open wounds).

2. Hands and other skin surfaces should be washed immediately and thoroughly if contaminated with biological agents, blood or other potentially infectious materials. Hands should be washed immediately after personal protective gloves are removed.

3. All "touch and splash" surfaces must be carefully disinfected with an intermediate or higher level EPA registered, hospital-grade disinfectant.

4. Contaminated and potentially contaminated waste must be properly decontaminated and disposed of.

6. Specific Engineering and Work Practices

Engineering Controls

- ➔ Laboratories have self-closing and locking doors that are only accessible to authorized personnel.
- ➔ All laboratories have a sink for handwashing and an eyewash station and emergency shower are readily available.
- ➔ Laboratory spaces, benches, cabinets and equipment are set up for easy cleaning. There are no carpets or rugs in the labs. The laboratory is designed so that it can be easily cleaned.
- ➔ Laboratory furniture can support anticipated loads and uses. Benchtops are impervious to water and resistant to heat and chemicals. Chairs used in laboratory work are covered with a non-porous material that can be easily cleaned and disinfected.
- ➔ Laboratory windows do not open to the exterior.
- ➔ Illumination is adequate for all activities and avoids reflections and glare that could impede vision.

➔ Red-colored sharps disposal containers are puncture resistant and leak proof (especially sides and bottom) and appropriately labeled.

Work Practice Controls

1. Fish collection: The programs do not intentionally conduct research on injured or diseased fish and collaborators do not provide samples of injured or diseased fish. Typically fish caught live during NOAA permitted fishing operations are landed by contracted fishermen, fishing gear removed, placed into a salt-brine bath (seawater and ice), and then brought into the lab frozen in leak-proof coolers. If fish are obviously deteriorated (due to prolonged periods at elevated temperatures due to lack of ice), staff will handle with appropriate PPE (gloves) and hygiene protocols. Equipment and work areas will be disinfected after handling.

2. Marine mammals and marine turtles: When working with animals that are obviously diseased, or with samples from animals that are obviously deteriorated due to microbiological activity, staff will handle with appropriate PPE (e.g., gloves, lab wear, eye protection) and hand hygiene protocols. Equipment and work areas will be disinfected after handling.

3. Specimens of biological agents, blood, or potentially infectious materials are kept in leak-proof containers during collection, handling, processing, storage, transport, or shipping. Any specimen that could puncture a primary container will be placed within a secondary container that is puncture resistant.

4. Regulated biological contaminated wastes require special disposal.

- In addition to needles and syringes, regulated wastes include used biological contaminated disposable gloves, blood contaminated items, or pathologic and microbiological wastes containing biological agents, blood, or other potentially infectious materials (lancet, glass slide, covers slip, pipette tips, capillary tubes etc.).

- Waste generated during the course of work with potentially infectious materials, other than sharps, will be immediately transferred upon generation into a red biohazard bag held within a closable, leak-proof secondary container with biohazard labeling or color-coding. Bags will be closable, constructed to contain all contents and prevent leakage during handling, storage, transport, or shipping. They will be closed prior to removal to prevent spillage or protrusion of contents at any time.

5. The following items will have a biohazard label or be stored in a red bag or red container: regulated biological contaminated waste that has not been decontaminated, refrigerators, freezers, storage cabinets used to store biological agents, blood or other potentially infectious material, and equipment or containers used to store, move, or ship biological agents, blood, or other potentially infectious materials.

6. Equipment and instruments that may become contaminated will be inspected for biological agents, blood, or other potentially infectious materials on a regular basis and decontaminated if necessary. If not decontaminated on a regular basis, it must be appropriately labeled with the Universal Biohazard Symbol. The schedule and procedures are identified in the unit's policy manual. All equipment that is to be serviced, must be decontaminated prior to repair or maintenance. If it cannot be decontaminated, the service department must be notified.

7. Handwashing facilities are readily accessible throughout the laboratory workspaces. Handwashing should be done with soap and running water as soon as feasible after contamination, between research materials, and after removal of gloves or other personal protective equipment.

8. In the event of contact with biological agents, blood, or other potentially infectious materials to the eyes, nose, mouth, or open wound, these mucous membranes will be flushed with water immediately or as soon as feasible.

9. Sharp containers will be maintained up-right during use. They will be located as close as possible to where sharps are used. They shall be examined on a regular schedule and replaced when the containers are 7/8 filled. They are not reusable containers. These containers will be closed if they are moved to prevent spillage. In the event that a sharps container appears to be leaking, it should be placed inside another closable, leak proof container with the appropriate color-coding or label. Red sharps containers are only for biological contaminated sharps.

10. Contaminated needles and other contaminated sharps will not be bent, sheared, or purposely broken. Recapping is permitted if a procedure does not have a feasible alternative and the action is required by the specific veterinary procedure. If needle removal or recapping is necessary, removal or recapping must be done either by one-handed scooping (passive recapping) or through a removal device. One-handed scoop method for recapping needles:

- Place the cap on a horizontal surface
- Hold the syringe with attached needle in 1 hand
- Use the needle to scoop up the cap without use of the other hand
- Secure the cap by pushing it against a hard surface

11. Reusable sharps that are contaminated with biological agents, blood or other infectious materials are stored and processed in a way that does not require anyone to reach, by hand, into the containers where these sharps have been placed.

12. Mouth pipetting, or mouth suctioning of biological agents, blood, or other potentially infectious materials, is prohibited.

13. All procedures involving biological agents, blood, or other potentially infectious materials must be performed in such a manner as to minimize splashing, spraying, splattering and generation of droplets of these substances.

14. Eating, drinking, smoking, applying cosmetics or lip balm, or handling contact lenses are prohibited in work areas where there is any risk of occupational exposure.

15. Food and drink shall not be kept in laboratory refrigerators, freezers, shelves, and cabinets or on counter-tops or bench tops where biological agents, blood or other potentially infectious materials are present.

16. Warning labels containing the universal biohazard symbol and the word "BIOHAZARD" will be used to warn employees who may have contact with areas and containers of the potentially hazardous materials. Labels are not required when red bags are used.

17. In the event of a biological agent or blood spill, laboratory specific contingency spill plan must be initiated.

7. Personal Protective Equipment (PPE) for biosafety

Personal protective equipment (PPE) will be used when appropriate to protect employees from potential occupational exposure incidents. PPE will be chosen based upon the type of anticipated exposure to biological agents, blood, or other potentially infectious materials. The specific equipment for a situation will be determined by each supervisor in which the potential for occupational exposure occurs and may include gowns, aprons, lab coats, disposable gloves, utility gloves, chin-length face shields, face masks, respirators, eye protection (safety goggles), shoe covers, surgical caps, and mouthpieces or pocket masks. Note: Regular safety glasses will not provide protection if aerosols occur.

Personal protective equipment will be considered appropriate only if it does not permit biological agents, blood, or other potentially infectious material to pass through or reach the worker's clothing, skin, eyes, mouth, or other mucous membranes under normal conditions of use and for the duration of time that the protective equipment will be used.

All PPE will be cleaned, laundered, or properly disposed of by the programs. All garments that are penetrated by biological agents, blood, or other infectious materials shall be removed as soon as feasible and laundered or properly disposed of. Contaminated clothing will not be sent home with the worker for cleaning, unless the person has been properly trained on proper transporting and laundering.

Personnel will discard any disposable equipment after use in the appropriate receptacles and properly decontaminate prior to disposal. Reusable PPE will be decontaminated and cleaned prior to storage in a designated area for future use. All PPE will be removed prior to leaving the work area.

8. Housekeeping

Laboratory workspaces must be maintained in a clean and sanitary condition at all times. Each program leader will implement an appropriate written schedule for the manner in which and the time when their areas are cleaned and disinfected. This schedule will also include an explanation of the cleaning and decontamination of equipment, which has been in contact with biological agents, blood, or other potentially infectious materials.

Schedule for Cleaning and Method of Decontamination

Item or Area	Method of decontamination	Schedule
Work surfaces	Wash with 1:10 bleach solution, Virox Rescue, or other approved disinfectant.	After the completion of procedures or end of the work shift that involved contaminated biological material. When surfaces become obviously contaminated.
Surgical instruments used for veterinary procedures	Wash with soap and water and then autoclave	After each use.
Biopsy tips (Cetacean Research Program)	Soak and scrub with warm soapy water. Fresh water rinse. Soak in 10% bleach solution for 30 minutes, fresh water rinse, followed by autoclave. When autoclave is not available in the field, follow the second fresh water rinse with a 70% isopropyl alcohol or ethyl alcohol soak.	After each use.

Work surfaces must be decontaminated, with a wide-spectrum bactericidal, fungicidal, and virucidal disinfectant, after completion of procedures, immediately or as soon as feasible after any spill of biological agents, blood, or other potentially infectious materials, as well as the end of the work shift if the surface may have become contaminated since the last cleaning.

Disinfectant used at IRC Labs:

Rescue Concentrate (Virox Technologies Inc.)
EPA Reg. No. 74559-4

Product information sheet
https://learnaboutrescue.com/rescue-concentrate/

Reference Sheet and Directions for Use
https://learnaboutrescue.com/wp-content/uploads/2018/11/Reference-Sheet_Rescue-Concentrate.pdf

Safety Data Sheet
https://learnaboutrescue.com/wp-content/uploads/2019/02/Rescue_Concentrate_SDS.pdf

Reusable receptacles

Reusable receptacles, such as bins, pails, and cans that have a likelihood for becoming contaminated, must be inspected and decontaminated with a hospital-grade disinfectant or autoclaved on a regular basis. When contamination is visible, receptacles should be cleaned and decontaminated as soon as feasible.

Broken glassware and other sharps

Any broken glassware or other sharps that may be contaminated will not be picked up directly with the hands. Tools that are used in the clean-up of broken glass (brush, dust pan, forceps, and/or tongs) must be decontaminated after use and the contaminated broken glass should be placed in a red sharps container. Vacuum cleaners are not appropriate for use in the cleanup of biological hazardous or contaminated broken glass.

9. Laundry

(The following is adapted from the "Model Infection Control Plan for Veterinary Practices, 2015, National Association of State Public Health Veterinarians, Veterinary Infection Control Committee.)

Wear gloves and protective outerwear when handling soiled laundry. Check for sharps before items are laundered. Wash animal bedding and other laundry in the facility with standard laundry detergent, and completely machine dry at the highest temperature suitable for the material. Use separate storage and transport bins for clean and dirty laundry. Outerwear to be laundered at home should be transported in a plastic bag, kept separate from household items, washed separately and then thoroughly machine dried.

10. Exposure Incident Reporting

All employees, affiliates, students, and volunteers are required to report incidents that result in injury or potential exposure (e.g., needle stick, mucous membrane, or open wound contamination) using the NOAASafe system.

https://sites.google.com/noaa.gov/pifsc-intranet/safety/report-an-incident

The NOAASafe system will trigger an investigation by the NOAA Safety Office. Incident reporting includes documenting the date, time, location, person(s) injured or exposed, vaccination status of injured person(s), other persons present, description of the incident, whether health-care providers and public health authorities were consulted, the status of any animals involved (e.g., vaccination history, clinical condition, and diagnostic information), first aid provided, and plans for follow-up.

CIMAR staff are required to also report the incident to RCUH or UH, according to the respective policies. More information, forms, and reporting guidance can be found at the following URL:

https://sites.google.com/noaa.gov/pifsc-intranet/cimar/cimar-safety?authuser=0

CIMAR/RCUH Employees:
Accidents/Injuries must be reported to the CIMAR Supervisor immediately, and the Supervisor must complete the RCUH Supervisor's Report of Industrial Injury Form. The reporting form must be signed by the employee and Supervisor and sent to cimarhr@soest.hawaii.edu or faxed to the CIMAR Administrative Office at (808) 956-4104 within 24 hours of injury/illness occurrence. If the CIMAR Supervisor is not present on the date of injury, incidents or injuries should be reported to the Supervisor's authorized/acting designee or to Brittany Huntington (brittany.huntington@noaa.gov).

CIMAR/UH Employees and UH Volunteers:
Accidents/Injuries must be reported to the CIMAR Supervisor immediately. Employees complete Section I (Employee's Statement) of the UH Form 79 - UH Report of Work-Related Injury/Illness form, and Supervisors will complete Section II (Supervisor's Statement). After both employee and Supervisor have signed the form, it must be sent to cimarhr@soest.hawaii.edu or faxed to the CIMAR Administrative Office at (808) 956-4104 as soon as possible or within 24 hours of injury/illness occurrence. If the Supervisor is not present on the date of injury, incidents or injuries should be reported to the Supervisor's authorized/acting designee or to Brittany Huntington (brittany.huntington@noaa.gov).

CIMAR affiliates should contact Nicole Wakazuru-Yoza (nwakazur@hawaii.edu; (808) 956-9465) for more information and guidance.

11. Labels and Signs

Each section supervisor shall ensure for their work section that biohazard labels shall be affixed to entry doorway, containers, refrigerators, storage areas, and freezers containing biological

agents, blood materials, other potentially infectious materials, and other containers used to store, transport, or ship biological agents, blood, and other potentially infectious materials.

Red bags or red sharp containers may substitute for labels. However, regulated wastes must be handled in accordance with applicable rules and regulations of the State Department of Health and county's waste regulations.

12. Information and Training

Supervisors will be responsible for ensuring that personnel receive training at the time of initial assignment (within 10 days of assignment) to tasks where occupational exposure may occur, and that training shall be updated every twelve months.

When modifications of tasks or procedures occur after the training, the supervisor shall provide for additional necessary training. When necessary, the training program will be modified to accommodate the educational or language level of the employee.

Training will be done at no cost to the employee and will be conducted during working hours of the employee

Training records shall be maintained for three years from the date of training.

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Appendix C: Autoclave Procedures

Introduction

An autoclave unit (Tuttnauer model 2340M) is located in the vet lab (Room 1041).

This document provides general instructions and standard operating procedures. All users shall review and follow the detailed instructions provided in the manufacturer's User Manual.

Only authorized lab personnel trained in this SOP may conduct this procedure. To request training for this SOP contact the Laboratory Manager.

Potential Hazards

- Hot glassware and scalding liquids may cause burns and serious harm.
- Splash or other airborne droplets of hot liquid or steam (hot vapor) may cause eye injury.
- Broken glass or other sharp objects may cause injuries.
- Lifting of awkward loads when loading or unloading may cause injuries.
- Wet floors or objects on the floor may cause slips/trips/falls.

Personal Protective Equipment (PPE)

- When removing hot items from the autoclave, wear a rubber apron, heat resistant mitts and a face shield.

Important Safety Practices

- Do not leave the autoclave unattended while in operation!
- If there are any autoclave alarms or malfunctions during the sterilization process, alert your supervisor or lab manager immediately. Pressure and hot water do not create a safe situation to troubleshoot any issue. DO NOT attempt to open the autoclave.
- Load the autoclave properly per the manufacturer recommendations.
- Request assistance from another person when loading/unloading heavy or awkward items.
- Don't load plastic materials that are not compatible with the autoclave.
- Individual glassware pieces should be within a heat resistant plastic tray on a shelf or rack, and never placed directly on the autoclave bottom or floor.
- Make sure the door of the autoclave is fully closed and the correct cycle has been selected before starting.
- Before removing autoclaved items, wait 5 minutes for loads containing only dry glassware, and 10 minutes for autoclaved liquid loads.
- When cracking the autoclave door open after a run and when removing items from the autoclave, wear appropriate PPE.

- Remove the load and let the glassware cool for 15 minutes before touching it with ungloved hands.
- Be alert for autoclaved liquid bottles which are still bubbling. Let liquid loads stand in an out-of-the-way place for a full hour before touching with ungloved hands.
- Hot glassware and scalding liquids will cause burns and serious harm.
- Clean up any liquids spilled onto the floor.
- Do not leave objects on the floor.
- When transporting items in or out of the room, plan your route and have a location prepared where you will set down the items at your destination. Request assistance from another person to help navigate doors and hallways. Use door stops as necessary to avoid carrying objects with one hand and opening a door with the other hand. Use a transport cart.

Recordkeeping

The following records regarding autoclave use must be kept:

- Maintenance records (to be available on site or via the lab information system).
- Autoclave use log (Each load of material inactivated shall be logged as follows:)
  - Date, time, and operator's name
  - Description of load
  - Indicator results
  - Record the temperature and length of time the load is sterilized.
- The [Autoclave Log] file can be printed and used as a template.

Operation

The following are abbreviated instructions. All users shall review the complete instructions provided in the manufacturer's User Manual, in particular pages 25-29.

Prior to operation, make sure there is enough distilled water in the reservoir:

- Ensure the drain valve is in the closed position.
- Remove the water reservoir cover.
- Pour **distilled water** into the reservoir through the opening on top of the autoclave, until it reaches the base of the safety valve holder. (DO NOT fill any higher.) Make sure the water levels are above the cooling coil.

1) Move the ON/OFF switch to ON position. (green power light will turn on)

2) Turn the red tracking needle on the pressure gauge counterclockwise to 0 psi.

3) Open the front door of the autoclave and set the Multi-purpose valve knob to the FILL WATER position. (the multi-purpose knob should only turn clockwise)

a) The water will now flow into the chamber.

b) The water should cover the bottom of the chamber to the groove in the front.

4) When the water reaches the mark at the front of the autoclave, set the multi-purpose valve knob to the STERILIZE position.

5) Load the autoclave.

6) Shut the door, move the Door Closing Device into position and tighten, making sure that the Door Switch is activated. Do not over-tighten the bolt.

7) Turn the Thermostat Knob to the desired sterilization temperature. (273 degrees F)

8) Set the timer to the desired sterilization cycle time.

Unwrapped Instruments	Wrapped Instruments	Single Instrument
Cold Start: 27 min.	Cold Start: 31 min.	Cold Start: 12 min.
Hot Start: 13 min	Hot Start: 17 min.	Hot Start: 9 min.

9) If **unwrapped instruments**, no drying is required.

a) Once the Timer has reached 0 min, turn the Multi-purpose valve knob promptly to the Exhaust/Dry position. This will allow steam and leftover water to return to the reservoir.

b) When the white needle on the pressure gauge has reached 0 psi, the door can be opened.

c) now turn the Multi-purpose valve knob to the "0" or off position.

10) If **wrapped instruments**, drying is required.

a) Once the timer has reached 0 min, immediately turn the Multi-purpose valve knob to the Exhaust/Dry position. This will allow the steam and leftover water to return to the reservoir. Do not allow the pressure to drop below 10 psi before beginning this procedure.

If the pressure has dropped below 10 psi, leave the unit in the STERILIZE position, leave the door closed and locked. Now reset the timer to 10 minutes. When the timer reaches 0 minutes, the pressure should be above 10 psi, turn the multi-purpose knob to Exh/Dry

b) When the white needle on the pressure gauge has reached 0 psi the door can be opened.

c) Unscrew the Door Closing Device, but **do not move it to the side**. (This will allow the door to be open ¾ of an inch.

d) Leave the Multi-purpose knob in Exh/Dry position

e) Reset the Timer for drying, 20-30 minutes, the Dry Light will come on

f) When the timer reaches 0 minutes, the drying is complete and the Dry Light will turn off.

g) Unscrew the door and move it to the side. Remove instruments.

h) Turn Multi-purpose knob to “0” or off position. And turn ON/OFF switch to OFF position.

Operational quality control

Tape indicators and/or integrated chemical indicator strips are to be included with each autoclave load. The results of the indicator tests shall be recorded on the autoclave log.

Biological indicator tests shall be run every 6 months. The results of the indicator tests shall be recorded on the autoclave log.

If either the chemical or biological indicator fails, the autoclave cycle will be repeated. If the indicator fails again the autoclave will not be used until service has been conducted and the validation test passes.

Background

Tape indicators

Tape indicators are adhesive-backed paper tape with heat sensitive, chemical indicator markings. Tape indicators change color or display diagonal stripes, the words “sterile” or “autoclaved” when exposed to autoclave temperatures (typically 121°C / 250 °F). Tape indicators are typically placed on the exterior of the load. If the temperature sensitive tape does not indicate that a temperature of at least 121°C (250 °F) was reached during the sterilization process, the load is not considered decontaminated. If tape indicators fail on two consecutive loads, service the autoclave. Autoclave should not be used until service has been conducted and the validation test passes. Tape indicators are not designed nor intended to prove that organisms have actually been killed. They indicate that a temperature of 121°C (250 °F) has been achieved within the autoclave.

Integrated Chemical Indicator Strips

Integrated chemical indicator strips provide a limited validation of temperature and time by displaying a color change after exposure to normal autoclave operating temperatures for several minutes. If the chemical indicators fail on two consecutive loads, service the autoclave. Autoclave should not be used until service has been conducted and the validation test passes.

Biological indicators

Biological indicators are test systems containing viable microorganisms providing a defined resistance to a specific sterilization process. A biological indicator provides information on whether necessary conditions were met to kill a specified number of microorganisms for a given sterilization process, providing a level of confidence in the process. Endospores, or bacterial spores, are the microorganisms primarily used. They are considered some of the toughest ones to kill.

The biological indicator is exposed to the sterilization process and then incubated under defined growth conditions to determine whether any spores survived the process. If no spores survive, none grow and the test is a pass. If growth is detected, the test is a fail. The most common type is self-contained biological indicators (SCBI). These indicators combine the carrier material with spore and growth medium into a single vial, eliminating the need for aseptic transfer. Following sterilization, the vial is activated allowing the spores to mix with the growth medium and incubated to allow spore growth. Some SCBI designs use an enzyme-based detection system that can detect enzyme activity faster, with shorter incubation times. Follow the manufacturer's instructions when using a biological indicator to monitor sterilization processes.

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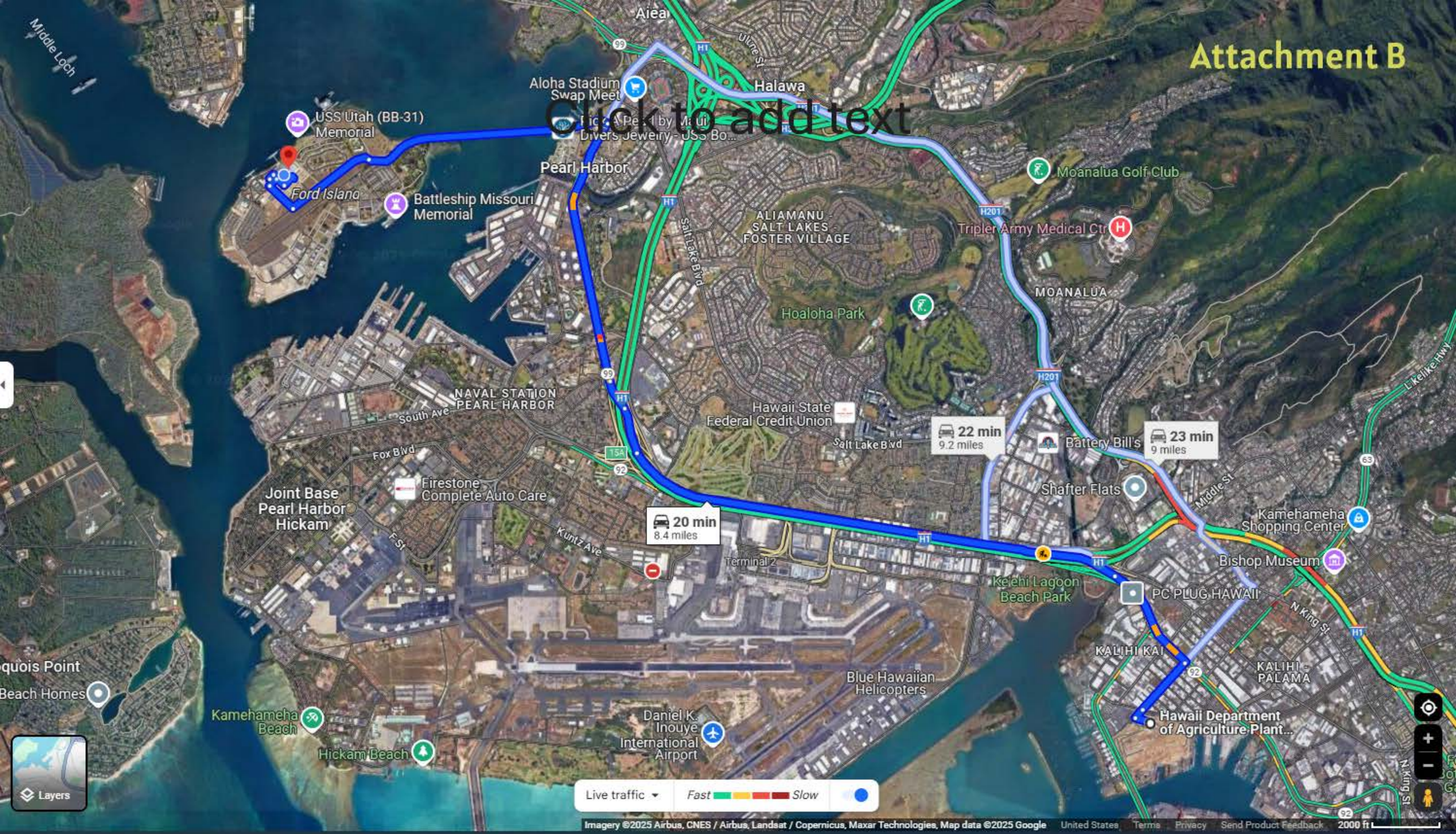
Attachment B

Click to add text



Attachment C


Attachment D