

State of Hawaii
DEPARTMENT OF LAND AND NATURAL RESOURCES
Division of Aquatic Resources
Honolulu, Hawaii 96813

May 12, 2017

Board of Land
and Natural Resources
Honolulu, Hawaii

Request for Approval of Special Activity Permit 2018-35 for
Dr. Mary Hagedorn, University of Hawaii-Hawaii Institute of Marine Biology (HIMB),
to Conduct Research by Collecting Select Amounts of State Regulated Fishes,
Invertebrates (Including Corals and Live Rock) and Algae in Kaneohe Bay, Oahu, to
Barcode the DNA of All Organisms Found in Kaneohe Bay to Populate a Global, Open-
Source Data Repository of Organisms Maintained by the Smithsonian Institute for Public
Reference.

The applicant proposes to conduct activities relating to research on DNA barcoding and documenting of organisms in Kaneohe Bay, Oahu, in collaboration with the Smithsonian Institute and their Marine Global Earth Observatory (MarineGEO) research program. The MarineGEO research program is the first and only network of worldwide coastal observation and research sites to focus on understanding changes at the land-sea interface with one of its' initiatives focusing on biodiversity and the factors that create resilience to stressors. Kaneohe Bay has been chosen as the MarineGEO site in Hawaii. MarineGEO employs long-term standardized observations and experimentation to build the first comprehensive worldwide database on physical characteristics and biodiversity.

The research involves the collection of representative samples of each species of fish, invertebrate (including coral and live rock) and algae in Kaneohe Bay and the documenting of these organisms by photographing and collecting select amounts of voucher specimens for morphological comparison, genetic characterization (DNA barcoding) and cryopreservation (fish only). Collection of each species of fish will vary depending on rarity but will range from five (5) to twenty (20) specimens of each species, including those below minimum size. Shark juveniles will be collected in lower numbers (≤ 5 per species/3 species total). Collection of each species of invertebrate will vary depending populations and amounts yielded from ARMS or collection plots or opportunistic searches but will average between twenty (20) and fifty (50) per species, including those that are below minimum size, female or within closed seasons. Collection of each species of algae will vary depending on rarity but will average fifteen (15) pieces (each 20 cm) of each species. The specimens of fish and algae will be collected using standard legal fishing gear or by hand. Fish and algae will be collected opportunistically with various methods, using a wide range of sampling areas and techniques to try to collect a comprehensive sample. Invertebrates will be randomly and opportunistically sampled from either existing (already deployed) ARMs (Autonomous Reef Monitoring Structures), from rubble collection plots that are hand-sorted and

roaming surveys. All vouchered specimens of fish will be curated into the Smithsonian's National Museum of Natural History and will be catalogued for permanent storage in the collections of the Division of Fishes and the NMNH Biorepository. A subset will be deposited in the Bishop Museum. All vouchered specimens of algae will be curated into the botany collections of the US National Herbarium and the University of Hawaii and all vouchered specimens of invertebrates will be curated into Smithsonian's National Museum of Natural History. Area of collection will be Kaneohe Bay, including the regulated area of Coconut Island Marine Laboratory Refuge (MLR). All data and results will be made available online in a global, open-source data repository and provide users with a comprehensive guide to the marine flora and fauna heretofore unavailable.

The special conditions within the permit have been designed to minimize the impact of this sampling method and optimize the potential benefits. No threatened or endangered species are being collected. This permit is being brought before the board in an effort to be transparent about this comprehensive study.

RECOMMENDATION: The Department Recommends

Based on the Departments exemption determination (attached) and the application and record in this matter, the Board DECLARES, FINDS, and DECIDES:

- 1) That the actions covered by this permit will have little or no significant effect on the environment and is therefore exempt from the preparation of an environmental assessment;
- 2) To delegate the Chairperson to sign the declaration of exemption on behalf of the Board, for purposes of recordkeeping requirements of chapter 343, HRS, and chapter 11-200, HAR; and
- 3) To authorize and approve, with stated conditions, the proposed special activity permit.

Respectfully submitted,



Bruce S. Anderson, Ph.D.
Administrator

APPROVED FOR SUBMITTAL:



SUZANNE D. CASE
Chairperson

DAVID Y. IGE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

SUZANNE D. CASE
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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

May 12, 2017

TO: Division of Aquatic Resources File

THROUGH: Suzanne D. Case, Chairperson

FROM: Bruce S. Anderson, Ph.D., Administrator
Division of Aquatic Resources

A handwritten signature in black ink, appearing to read "Bruce S. Anderson".

SUBJECT: Declaration of Exemption from the Preparation of an Environmental Assessment under the Authority of Chapter 343, HRS, and Chapter 11-200, HAR, for a Special Activity Permit to Dr. Mary Hagedorn, University of Hawaii (UH)-Hawaii Institute of Marine Biology (HIMB), Affiliate Faculty.

The following permitted activities are found to be exempted from preparation of an environmental assessment under the authority of Chapter 343, HRS and Chapter 11-200, HAR:

Project Title: Special Activity Permit to Dr. Mary Hagedorn, University of Hawaii (UH)-Hawaii Institute of Marine Biology (HIMB), Affiliate Faculty, for the collection of select amounts of voucher specimens of each regulated and non-regulated species of fish, invertebrate and algae for morphological comparison and genetic characterization to document, cryopreserve gonads (fish only) and obtain the DNA barcode for species identification.

Permit Number: SAP 2018-35

Project Description: The research permit, as described below, would authorize the collection of select amounts of voucher specimens (below minimum size/regulated sex/exceeding bag limit/in closed season/in regulated area) of each species of fish, invertebrate and algae in the waters of Kaneohe Bay, Oahu, to collect select amounts of voucher specimens (some below minimum size) of each species of fish, invertebrate and algae for genetic analysis to inventory, cryopreserve gonads, and obtain the DNA barcodes for species identification and future reference, from May 12, 2017 through May 11, 2018. The taking of various sizes of fish spp. are prohibited under chapter 13-95 Hawaii Administrative Rule (HAR), the taking of corals and live rock is prohibited under sections 13-95-70 and 13-95-71 HAR respectively, and the taking of various spp./sizes/sexes of invertebrates such as crabs, mollusks, and sea cucumbers are prohibited under chapter 13-95 and sections 13-86.1 and 13-83.1 HAR respectively, unless authorized by a permit issued under section 187A-6, Hawaii Revised Statutes (HRS).

Detailed information about marine biodiversity in the coastal zone has been identified as data that can help determine the impacts, risks or recovery potential of increasing ocean acidification, accelerating sea level rise and warming oceans. Diversity of marine organisms may lead to potential resilience to changing environmental variables and documentation for this diversity is integral to conducting a comprehensive evaluation of an ecosystem. To meet this challenge and in support of the Smithsonian institution's grand challenge to Understand and Sustain a Biodiverse Planet, the institute has launched the MarineGEO (Marine Global Earth Observatory) program, coordinated by the Smithsonian's Tennenbaum Marine Observatories Network (TMON), a unique network of field sites conducting global, long-term research on ocean life in the coastal zone across the world's climate gradients. TMON is standardizing measurements of biological change over time, and combining both a diversity of disciplines (biology, physical monitoring, paleontology, anthropology, archaeology, geology), and experimentation to create the first integrative systems approach to understanding coastal ecosystems.

The researcher proposes to conduct activities relating to research on DNA barcoding and documenting of organisms in Kaneohe Bay, Oahu, in collaboration with the Smithsonian Institute and their MarineGEO research program. The MarineGEO research program is the first and only network of worldwide coastal observation and research sites to focus on understanding changes at the land-sea interface with one of its' initiatives focusing on biodiversity and the factors that create resilience to stressors. Kaneohe Bay, Oahu, has been chosen as the MarineGEO site in Hawaii. MarineGEO employs long-term standardized observations and experimentation to build the first comprehensive worldwide database on physical characteristics and biodiversity.

Marine biodiversity surveys, such as MarineGEO, not only provide a scientific record of the biota but also an accessible photographic field guide for regional users and all specimen data will be made available online through collection databases. DNA sequences generated from identified species in the survey will also provide a library against which environmental DNA samples can be compared and interpreted – so samples in such surveys can be identified to species. Kaneohe Bay, despite a long history of study, holds many unrecorded and unknown species, and few of the species recorded are represented in collections to allow study, and an even smaller number have been photographed or sequenced for DNA.

The research involves the collection of representative samples of each species of fish, invertebrate (including coral and live rock) and algae in Kaneohe Bay and the documenting of these organisms by photographing and collecting select amounts of voucher specimens for morphological comparison, genetic characterization (DNA barcoding) and cryopreservation (fish only). Collection of each species of fish will vary depending on rarity but will range from five (5) to twenty (20) specimens of each species, including those below minimum size. Shark juveniles will be collected in lower numbers (≤ 5 per species). Collection of each species of invertebrate will vary depending populations and amounts yielded from ARMS or collection plots or opportunistic searches but will average between twenty (20) and fifty (50) per species, including those that are below minimum size, female or within closed seasons. Collection of each species of algae will vary depending on rarity but will average fifteen (15) pieces (each 20 cm) of each species. The specimens of fish and algae will be collected using standard legal fishing gear or by hand. Fish and algae will be collected opportunistically with various methods, using a wide range of sampling areas and techniques to try to collect a comprehensive sample. Invertebrates will be randomly and opportunistically sampled from either existing (already deployed) ARMs (Autonomous Reef Monitoring Structures) or from rubble collection plots that are hand-sorted.

All vouchered specimens of fish will be curated into the Smithsonian's National Museum of Natural History and will be catalogued for permanent storage in the collections of the Division of Fishes and the NMNH Biorepository. A subset will be deposited in the Bishop Museum. All vouchered specimens of algae will be curated into the botany collections of the US National Herbarium and the University of Hawaii and all vouchered specimens of invertebrates will be curated into US National Museum of Natural History. Area of collection will be Kaneohe Bay, including the regulated area of Coconut Island Marine Laboratory Refuge (MLR). All data and results will be made available online in a global, open-source data repository and provide users with a comprehensive guide to the marine flora and fauna heretofore unavailable.

Fish collections – Dr. Lynne Parenti (Smithsonian National Museum of Natural History)

There are a little over 200 fish species known currently from Kaneohe Bay (see collection spreadsheet). The researcher plans to collect an average of ten (10) specimens of each species, or an estimated total 2,000 specimens. Rare or introduced species will be collected in smaller numbers, no more than five (5) per species. Common species will be collected in higher numbers (up to twenty 20 per species) and, as possible, include males and females and a range of size classes, as permitted. Shark juveniles will be collected in lower numbers (≤ 5 per species/3 species total). Fishes will be collected using seine nets (2 inches or greater mesh size), dipnets and scoop nets (no greater than 3 feet in any dimension), throw nets, gillnets, spears and traps; the gear will comply with all Hawaii Department of Natural Resources regulations as specified at <http://dlnr.hawaii.gov/dar/fishing/fishing-regulations/gear-restrictions/>. The fishes will be euthanized using buffered 0.2% MS222 solution. A tissue sample will be removed for molecular study and preserved in 95% ethanol; the rest of the specimen will be fixed in 10% formalin. Gonads will be removed from select specimens for cryopreservation. All specimens and their tissue samples will be transported to the Smithsonian's National Museum of Natural History and will be catalogued for permanent storage in the collections of the Division of Fishes and the NMNH Biorepository. A subset will be deposited in the Bishop Museum. Formalin-fixed specimens will be transferred to 75% ethanol and tissue samples will be frozen for long term storage. These specimens and their data will be used to document the fish biota of Kaneohe Bay, including description of any new species, and in future research studies (e.g., DNA sequencing, comparative morphology, and general biodiversity studies).

Researcher will combine the visual assessment data that is collected at the CRAMP sites with collection data from their own team and that obtained from local fishermen to gauge what species are rare and/or cryptic. Researcher will make efforts to distribute take over a large area and collect at different sites throughout the bay so as not to consolidate collections in one area. Seine nets will be checked visually every two hours to remove any unintended bycatch. Seine nets will not be deployed for more than four hour per day.

Entanglement Prevention: Efforts will be made by researcher and authorized assistants to utilize best management practices to eliminate any potential for incidental entanglement of any marine organism. Entanglement prevention practices will include but are not limited to: minimizing the amount of structures or components that may potentially cause entanglement during research operations (loops, holes, slack lines). Researcher will immediately notify DAR and the appropriate federal agency to report the entanglement of any protected species if incidental entanglement occurs.

Invertebrate rubble collections – Dr. Gustav Paulay (Florida Museum of Natural History)

The goal of the invertebrates team will be to document the marine invertebrate macrofauna of the Kaneohe Bay reef ecosystem across all habitats and taxa. The researcher will use diverse tools to capture as much of the species diversity as possible, and document every species with photographs, voucher specimens, and tissues for genetic characterization (DNA barcoding). All results will be made available online and provide users a comprehensive guide to the fauna in the future. Mass samples will be picked for invertebrates, and together with hand samples will be sorted to morphospecies (sorted by morphology). Each morphospecies will be photographed and subsampled for DNA sequencing, and representative specimens fixed for more detailed examination and identification. Samples will be deposited in the Florida Museum of Natural History (FLMNH), US National Museum of Natural History, and Bishop Museum, where they will be available for study by interested parties. Specimens will be cataloged into these representative collections, and specimen data will be made available online through collection databases. Tissues will be extracted and the COI DNA barcoding region sequenced; sequences will be made publicly available through public databases, such as BOLD and GenBank. Photographs will be curated and made available online through the FLMNH collection database and Smithsonian's Encyclopedia of Life.

Rubble collection plots: Researchers will collect by two methods – taking environmental samples to look through in the lab and searching by specialists for individual specimens. The first method will be limited to a small plot – typically ¼-1/2 m². The latter is roaming survey; the diver moves to look for animals and typically covers 10's of meters. Approximately three (3) plots or locations per day, will be sampled per day over a fourteen-day (14) period, totaling about forty-two (42) plots or locations for the study. Most sampling will be in 0-10 m, with limited work to 30 m.

Invertebrate collections: Autonomous Reef Monitoring Structures (ARMS) – Dr. Laetitia Plaisance (Smithsonian National Museum of Natural History)

Autonomous Reef Monitoring Structures (ARMS) are a standardized sampling device that enables broad comparisons of the benthic cryptofauna associated with coral reefs (and other ecosystems). They are passive samplers designed to mimic the structural complexity of a coral reef and attract colonizing motile and sedentary marine taxa. They have been adopted by NOAA's National Coral Reef Monitoring Program and other partners worldwide as a standardized method to assess and monitor the abundance, distribution, and diversity of the cryptofauna community through morphometric and genetic tools. In 2016, the researcher deployed ARMS at thirteen (13) sites with replicate sets of six (6) ARMS each, in 10-12 m depth on seven (7) reef and six (6) mangrove habitats in Kaneohe Bay. During the 2017 MarineGEO bioassessment, the researcher will retrieve three (3) ARMS units from each site. The ARMS units will be brought back to HIMB and the organisms that have settled on the plates will be sorted, photographed and subsampled for DNA sequencing, and representative specimens fixed for more detailed examination and identification, and added to the collections.

Marine algae collections – Dr. Barrett Brooks and Dr. Celia Smith (Smithsonian National Museum of Natural History and UH)

There are 79-targeted species of marine algae in Kaneohe Bay (see collection spreadsheet). A maximum of 15 specimens from each species (≤ 20 cm) will be collected by hand. The specimens will be curated into the botany collections of the US National Herbarium and the University of Hawaii as three components: herbarium sheets, formalin preserved samples, and archival tissue samples in silica gel.

The best practice for DNA barcoding is to sequence vouchered specimens (identify the barcode in conjunction with preserving that same specimen for future observation of morphological features). The Marine Geo project for Kaneohe Bay will attempt to accomplish both tasks for every single species present in the bay that can be obtained during the collection period and provide this information through a global, open-source data repository of organisms maintained by the Smithsonian Institute for public reference.

Consulted Parties: Dr. Cindy Hunter, Associate Professor, Department of Biology and Director, Marine Option Program, University of Hawaii at Manoa (Oahu), Dr. Robert Toonen, Research Professor, Hawaii Institute of Marine Biology (HIMB), University of Hawaii at Manoa (Oahu), and Dr. Alan Friedlander, Scientist, National Geographic Society and Director, Fisheries Ecology Research Lab (FERL).

Exemption Determination: After reviewing §11-200-8, HAR, including the criteria used to determine significance under §11-200-12, HAR, DLNR has concluded that the activities under this permit would have minimal or no significant effect on the environment and that issuance of the permit is categorically exempt from the requirement to prepare an environmental assessment based on the following analysis:

1. All activities associated with this permit have been evaluated as a single action. Since this permit involves an activity that is precedent to a later planned activity, i.e., the same study methodology used throughout the permit period, the categorical exemption determination here will treat all planned activities as a single action under §11-200-7, HAR.

2. The Exemption Class for Scientific Research with no Serious or Major Environmental Disturbance Appears to Apply. §11-200-8(a)(5), HAR, exempts the class of actions that involve “basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource.” This exemption class has been interpreted to include the study, as proposed.

The proposed activities here appear to fall squarely under the exemption class identified under §11-200-8(a)(5), HAR, and as described under the 2015 DLNR exemption list class #5, item #13 and #15. As discussed below, no significant disturbance to any environmental resource is anticipated. Thus, so long as the below considerations are met, an exemption class should include the action now contemplated.

3. Cumulative Impacts of Actions in the Same Place and Impacts with Respect to the Potentially Particularly Sensitive Environment Will Not be Significant. Even where a categorical exemption appears to include a proposed action, the action cannot be declared exempt if “the cumulative impact of planned successive actions in the same place, over time, is significant, or when an action that is normally insignificant in its impact on the environment may be significant in a particularly sensitive environment.” §11-200-8(b) HAR To gauge whether a significant impact or effect is probable, an

exempting agency must consider every phase of a proposed action, any expected primary and secondary consequences, the long-term and short-term effects of the action, the overall and cumulative effect of the action, and the sum effects of an action on the quality of the environment. §11-200-12 HAR.

Significant cumulative impacts are not anticipated as a result of this activity, and numerous safeguards further ensure that the potentially sensitive environment of the project area will not be significantly affected. All activities will be conducted in a manner that does not diminish marine resources, qualities, and ecological integrity, or have any indirect, secondary, cultural, or cumulative effects. The small number of samples and the source of the targeted species suggest that the project will not have significant cumulative impacts.

Since no significant cumulative impacts or significant impacts with respect to any particularly sensitive aspect of the project area are anticipated, the categorical exemptions identified above should remain applicable.

4. Overall Impacts will Probably have a Minimal or No Significant Effect on the Environment. Any foreseeable impacts from the proposed activity will probably be minimal, and further mitigated by general and specific conditions attached to the permit. Specifically, all research activities covered by this permit will be carried out with strict safeguards for the natural, historic, and cultural resources, other applicable law and agency policies and standard operating procedures.

Conclusion. Upon consideration of the permit to be approved by the Board of Land and Natural Resources, the potential effects of the above listed project as provided by Chapter 343, HRS, and Chapter 11-200, HAR, have been determined to be of probable minimal or no significant effect on the environment and exempt from the preparation of an environmental assessment.

Suzanne D. Case, Chairperson
Board of Land and Natural Resources

Date