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

June 26, 2015

Board of Land
and Natural Resources
Honolulu, Hawaii

Request for Approval of Special Activity Permit 2016-14 for
Michael Blum, Tulane University, Department of Ecology & Evolutionary Biology, for
use of electro-fisher to collect non-native freshwater species in streams on Oahu.

The applicant proposes to conduct activities relating to the use of an electrofishing device to capture and remove aquatic invasive species (AIS) in experimental stream reaches on Oahu. All native amphidromous fishes and invertebrates (e.g., *Macrobrachium* shrimp and *Neritina* snails) will be captured by hand-netting prior to electrofishing and be held in low densities in nearby refuge tanks. Following removal of AIS species, the native species will be tagged and returned to their place of capture. This study will test the hypothesis that removal of invasive predatory fishes and invasive competitive fishes (i.e., *loricariid* catfishes that sequester nutrients) from sample stream reaches will result in genetic-to-ecosystem conditions that promote greater population densities of native fishes within a watershed. These aquatic invasive species (i.e., *poeciliid* livebearers and *loricariid* catfishes) consume early life stages of native species and sequester nutrients competing with native species through predation and food supply.

A few concerns have been raised by DAR Aquatic Biologists over the risks and impacts of the use of this electrofishing method for stream sampling. The special conditions within the permit are intended to determine and minimize the impacts of this sampling method and to optimize any potential benefits of the information derived from this analysis.

The following concerns have been raised by DAR Aquatic Biologists (Oahu).

1. Concern: Electrofishing in Hawaiian streams may harm or kill native species.

Response: Electrofishing experimental reaches in each stream will consist of 100m long reaches which constitute a small portion of the overall length of an average stream on Oahu. Electrofishing activity will be targeted on AIS species only. All native amphidromous fishes and invertebrates (e.g., *Macrobrachium* shrimp and *Neritina* snails) will be captured by hand-netting previous to electrofishing and be held at low densities in nearby refuge tanks. Following removal of all the AIS species, native species will be returned to their place of capture. In cases where native species are missed by initial hand-netting process, researchers have been instructed to cease all electrofishing if there is mortality of native species (>5). After termination of electrofishing, DAR will be contacted by researchers and the electrofishing protocol will be reassessed. Because best

management practices have been included in the permit conditions to prevent mass mortality of native species, the value of the data on electrofishing is considered to outweigh the risk to the overall health of the stream.

Electrofishing Research Report: This research will also provide documentation of the use of electrofishing as a means to eradicate non-native/AIS species in streams on Oahu. The permittee will document the effects of electrofishing on native species during the project by assessing lethal outcomes through necropsies and tracking sub-lethal effects (e.g., growth, body condition) through mark-recapture of individuals that were inadvertently captured through electro-fishing (after initial hand-net removal). The permittee will document initial and subsequent adjusted electrofisher settings along with associated mortalities of organisms. The first phase of this electrofishing research will consist of a "pilot" removal effort conducted in a 100 meter stream reach within 1 watershed to track outcomes for 5-6 months prior to proceeding with proposed invasive species removals in 12 watersheds. The second phase of this electrofishing research will consist of the documentation of effects across a range of hydrological conditions via the assessment of lethal outcomes through necropsies and tracking sub-lethal effects of subsequent electro-fishing in the next 12 watersheds. The first phase will inform and guide execution of the second phase, and the second phase will serve to better inform how electrofishing can be conducted to minimize adverse effects across a range of hydrological conditions on native species.

RECOMMENDATION:

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 the Chairperson to approve, with stated conditions, the proposed special activity permit.

Respectfully submitted,

ALTON MIYASAKA
Acting Administrator

APPROVED FOR SUBMITTAL:

SUZANNE D. CASE
Chairperson

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

KEKOA KALUHIWA
FIRST DEPUTY

W. ROY HARDY
ACTING DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 26, 2015

TO: Division of Aquatic Resources File

THROUGH: Suzanne D. Case, Chairperson

FROM: Alton Miyasaka, Acting Administrator
Division of Aquatic Resources

Re: Special Activity Permit to Michael Blum, Tulane University, Department of Ecology & Evolutionary Biology.

For Use of Electrofisher to Collect Non-Native Freshwater Species in Streams on Oahu.

Declaration of Exemption from the Preparation of Environmental Assessment, Hawaii Revised Statutes, §§343-5 and -6; HAR §11-200-8

The following permitted activities are determined to be exempt from the requirement to prepare an Environmental Assessment pursuant to Hawaii Revised Statutes, §§343-5 and -6; HAR §11-200-8.

Project Title: Special Activity Permit to Michael Blum, Tulane University, Department of Ecology & Evolutionary Biology, for use of electrofisher to collect non-native freshwater species in streams on Oahu.

Permit Number: SAP 2016-14.

Project Description: The goal of the project is to conduct sampling using an electrofisher, drift nets, and hand nets in twelve streams to collect adult, juvenile, post larval and larval specimens of freshwater native and non-native species to research the rate of recolonization of non-native species after complete removal by electrofisher. Surveys in 2009 and 2011 of streams across Hawai'i revealed that populations of native amphidromous fishes are depressed across Oahu despite considerable variation in land use and stream habitat quality. Studies also found that the highest densities of non-native fishes occur in streams on Oahu. Findings from

mark-recapture studies indicate that populations of native fishes are likely depressed because non-native fishes constrain recruitment through predation and competition. This current research will test the hypothesis that removal of invasive predatory fishes (i.e., poeciliid livebearers that consume early life stages of native species) and invasive competitive fishes (i.e., loricariid catfishes that sequester nutrients) from sample stream reaches results in genetic-to-ecosystem conditions that promote greater population densities of native fishes within a watershed. The project will additionally assess how outcomes of aquatic invasive species (AIS) removal vary according to the magnitude of surface flow and prevailing surface flow management regimes.

AIS removal approach: Researchers will undertake experimental AIS removals following a protocol that involves steps taken to reduce risk or injury to native species of concern. Researchers will capture and remove AIS species by electrofishing in removal reaches, but prior to electrofishing, all native amphidromous fishes and invertebrates (e.g., *Macrobrachium* shrimp and *Neritina* snails) will be captured by hand-netting. With minimal handling, native species will be held at low densities in nearby refuge tanks. Following removal of AIS, native species will be returned to their place of capture.

Electrofishing Research Report: The permittee will document the effects of electrofishing during project by assessing lethal outcomes through necropsies and tracking sub-lethal effects (e.g., growth, body condition) through mark-recapture of individuals that were inadvertently captured through electro-fishing (after initial hand-net removal). The permittee will document initial and subsequent adjusted electrofisher settings along with associated mortalities of organisms. The first phase of electrofishing research will consist of a "pilot" removal effort conducted in a 100 meter stream reach within 1 watershed to track outcomes for 5-6 months prior to proceeding with proposed invasive species removals in 12 watersheds. The second phase of electrofishing research will consist of the documentation of effects across a range of hydrological conditions via the assessment of lethal outcomes through necropsies and tracking sub-lethal effects of subsequent electro-fishing in the next 12 watersheds. The first phase will inform and guide execution of the second phase, and the second phase will serve to better inform how electro-fishing can be conducted to minimize adverse effects across a range of hydrological conditions.

Study objectives and outcomes: This research is intended to (a) demonstrate an approach to AIS removal in Hawaiian streams that incorporates precautionary steps to reduce risks and promote the survival of native species; (b) advance understanding of genes-to-ecosystem responses to AIS removal; and (c) determine whether the outcomes of AIS removal vary according to natural hydrological variability. Future

proposed research will determine (a) whether flow restoration offsets impacts of AIS on at-risk native fishes, thereby providing an alternative to removal; and (b) whether flow mitigation augments responses to AIS removal. Together, these two studies will demonstrate whether AIS removal, mitigation, or some combination thereof foster conditions favorable to the recovery of key ecological processes and at-risk native fishes. These two studies will support a third study focusing on the development of model-based decision tools that couple information on hydrology and fish demography to help resource managers minimize expenditures (e.g., water use and costly interventions) and maximize in-stream conditions favorable to native species.

This research includes the lethal take of 240 *Awaous stamineus* young-of-year / post larvae to assess life history and trophic responses of native fish to AIS removal. Researchers will also conduct larval drift sampling, which involves collection and take of emigrating larvae of native fishes and invertebrates. These elements are critical to achieving goals of (1) understanding how ecological processes in Hawaiian streams have been altered by nonnative species, and (2) identifying and characterizing restoration approaches that foster the recovery of at-risk native species. Additionally researchers will conduct non-lethal marking and fin clipping of adult and juvenile *Awaous stamineus* to understand genetic, individual (e.g., growth), and demographic responses to AIS removal. This permit authorizes the sacrifice of non-native and invasive specimens from targeted study reaches using MS-222 (tricaine mesylate).

Lethal take of *Awaous stamineus* post larvae and larvae: Each individual will be used for otolith-based life history analysis and for stable isotope-based trophic analysis. Our previous analyses of otolith microchemistry indicates that a large proportion of *A. stamineus* larvae remain in natal freshwater or local near-shore environments rather than undergo marine dispersal. We are seeking to examine young-of-year / post-larval otoliths to determine whether life-history variation is a plastic response to AIS removal (i.e., more larvae may remain in their natal watershed in response to more favorable local conditions). We are proposing to use the same individuals to conduct nitrogen isotope assays to measure food web shifts following AIS removal because our prior work has shown that the trophic level of *A. stamineus* increases with in-stream degradation. Tissue analysis will show whether improvement of local conditions reduces competition for dietary resources. We are also requesting approval to collect monthly larval drift samples, which can include larvae of native fish and invertebrates. We are aiming to conduct quantitative surveys of larval productivity and longitudinal transport to determine whether AIS removal alleviates predation on early life stages of native fish. This will also enable us to compare measures of larval productivity to estimates of predation rates from the gut

contents of poeciliids (i.e., to assay consumption of native fish larvae and post-larvae) removed from experimental reaches.

Non-lethal catch of adult and juvenile *Awaous stamineus*: Researchers will conduct a long-term mark-recapture study to assess individual and population level response to AIS removal. The mark-recapture data will be used to derive site and watershed-specific estimates of individual growth, body condition, approximate age distributions, as well as apparent survival and recruitment over time. ***No individuals will be sacrificed to complete this work.***

Genetic variation may increase in native fish populations as a consequence of population-level responses to removal of invasive fish. For example, genetic variation would be expected to increase if population size increases due to greater survival that might result from greater availability of limiting resources or nutrients (i.e., greater phosphorus availability in the absence of loricariid catfish). Genetic variation might also increase if recruitment of immigrating postlarvae increases, as removal of poeciliids is expected to reduce predation on early life stages of native fishes.

Researchers will hand-net and then fin-clip adult and juvenile (≥45mm total length) *A. stamineus* from each study reach in each watershed during the first year of the study. Researchers will fin clip a total of ≤960 adults and juveniles during the first year of the study, with ≤40 individuals clipped from a reference reach and ≤40 individuals clipped from the experimental removal reach per watershed. These individuals will be the same as those that are marked for the mark-recapture study described above.

The use of electrofishing devices to take aquatic life is prohibited under Section 188-23, Hawaii Revised Statutes (HRS) and Section 13-75-6, Hawaii Administrative Rules (HAR), without a permit issued under Section 187A-6, HAR.

The permit, as described above, would authorize sampling using an electrofisher, drift nets, and hand nets in twelve streams on Oahu to collect specimens of freshwater native and non-native species to research the rate of recolonization of non-native species after complete removal by electrofisher from June 26, 2015 through June 25, 2016.

Consulted Parties: Glenn Higashi, Aquatic Biologist, DAR, Oahu

Exemption Determination: After reviewing §11-200-8, HAR, exemptions and significance under §11-200-2, HAR, DLNR concludes that the activities under this Permit will 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 for the reasons set forth below:

1. All activities associated with this permit have been evaluated as a single action. Since this permit involves 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 research on animals, such as those being proposed.

The activities under consideration are exempt under Exemption Class #1, Exempt Items #7 which include "maintenance of existing parks, fishing areas, ..." Department of Land and Natural Resources, Exemption List for the Division of Fish and Game, approved January 19, 1976.

In addition, the activities under consideration are exempt under Exemption Class #5, Exempt Items #4, and #5, respectively, which include "wildlife and game surveys, censuses, inventories, studies..." and "...marine surveys and research activities...." Department of Land and Natural Resources, Exemption List for the Division of Fish and Game, approved January 19, 1976.

The proposed activities here appear to fall squarely under the exemption class identified under §11-200-8(a)(5), HAR. As discussed below, the temporary use of State submerged lands will cause no significant disturbance to any environmental resource. Therefore, the proposed actions are exempt from the requirement to prepare an Environmental Assessment.

3. Cumulative Impacts of Actions in the Same Place and Impacts with Respect to the Environment Will Not be Significant. Even if a categorical exemption covers a proposed action, the action is not 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.

No significant cumulative impacts are anticipated as a result of this activity. Numerous safeguards will ensure that the environment will not be significantly affected. All activities will be conducted in a manner that protects and does not diminish marine resources, qualities, and ecological integrity, or have any indirect, secondary, cultural, or cumulative effects.

Since no significant cumulative impacts or significant impacts are anticipated, the categorical exemptions identified above apply.

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 activities covered by this Permit will be carried out with strict safeguards (see attached permit) for the natural, historic, and cultural resources of the area.

CONCLUSION.

After reviewing the historical and factual situation on this matter, the general and special terms of the Permit, and the potential benefits and impacts of the proposed activities, as provided under HRS §§ 343-5 and 6, HAR §11-200-8, it is hereby determined that that the project will probably have minimal or no significant effect on the environment.

Therefore, the Department determines that this project is exempt from the requirement to prepare an Environmental Assessment under HRS chapter 343.

_____ _____

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

Special Activity Permit
No. 2016-14

Department of Land & Natural Resources
DIVISION OF AQUATIC RESOURCES
1151 Punchbowl Street, Room 330
Honolulu, Hawaii 96813

Date Issued: June 26, 2015

Valid not longer than: June 25, 2016

SPECIAL ACTIVITY PERMIT

The Department of Land and Natural Resources hereby grants permission for certain activities involving aquatic organisms belonging to the people of Hawaii, under Section 187A-6, Hawaii Revised Statutes, and other applicable laws.

The Permittee is

Name: Michael Blum
Affiliation: Tulane University

Address: Tulane University
Department of Ecology & Evolutionary Biology
New Orleans, LA 70118

This permit is issued, subject to the general and special conditions, to conduct sampling using an electrofisher, larval drift-nets, and hand-nets in twelve streams to collect adult, juvenile, post larval and larval specimens of the following freshwater native and non-native species listed in the table below to research the rate of recolonization of non-native species after complete removal by collection with hand-nets and electrofisher. Specifically the study will test the hypothesis that removal of invasive predatory fishes (i.e., *poeciliid* livebearers that consume early life stages of native species) and invasive competitive fishes (i.e., *loricariid* catfishes that sequester nutrients) from sample stream reaches results in genetic-to-ecosystem conditions that promote greater population densities of native fishes within a watershed.

This permit authorizes the **TAKE** of non-native specimens, the **CATCH** and select **TAKE** of native young-of-year /post-larvae (*A. stamineus*), the select **CATCH** for non-lethal tagging and genetic tissue sampling of native juveniles / adults (*A. stamineus*), and the select **TAKE** of native larval specimens collected through larval drift sampling. This permit authorizes the sacrifice of non-native specimens from targeted study reaches and the sacrifice of select native species (as listed in Table 1).

Common Name	Scientific Name	Number Samples Authorized	Sampling Locations
Bristlenosed armored catfish	*Ancistrus cf. temminckii*	All specimens Encountered/ Collected (per 100 m experimental reaches per stream/ 2 experimental reaches per Stream)	From the following streams: Manoa, Hakipu'u, He'eia, Ka'a'awa, Kawa, Maunawili, Kea'ahala, Waiahole, Waikane, Kipapa, Waimanalo, Waimea (Oahu) See Special Conditions II. A-G
Suckermouth armored catfish	*Hypostomus watwata*	"	"

Guppy	*Poecilia reticulata*	"	"
Molly	*Poecilia sphenops*	"	"
Green swordtail	*Xiphophorus helleri*	"	"
Common Platy	*Xiphophorus maculatus*	"	"
Various incidental fish species	*Various (may include: Archocentrus nigrofasciatus (convict cichlid), Carassius auratus (goldfish), Clarias fuscus (walking catfish), Hemichromis elongates (banded jewel cichlid), Micropterus dolomieu (smallmouth bass), Misgurnus anguillicaudatus (dojo), Monopterus albus (Asian swamp eel), Sarotherodon melanotheron (blackchin tilapia), Tilapia sp. (various strains of introduced tilapia).*	"	"
'O'opu nakea	*Awaous stamineus*	10 individuals (25-65mm total length) per 100 m experimental reach (2 experimental reaches per Stream) (240 total young-of-year or post larval size)	"
Goby larvae	*Awaous stamineus*	All specimens collected in larval drift net after three hours of deployment per stream	"
Various invertebrate larvae (native/ non-native)	*Species will be documented after collection*	All specimens collected in larval drift net after three hours of deployment per stream	

O'opu nakea	*Awaous stamineus*	≤40 individuals (>45mm total length) tagged and clipped (**no take**) per 100 m experimental reach per stream/ 2 experimental reaches per stream ≤960 total individuals (>45mm total length)	From the following streams: Manoa, Hakipu'u, He'eia, Ka'a'awa, Kawa, Maunawili, Kea'ahala, Waiahole, Waikane, Kipapa, Waimanalo, Waimea (Oahu) See Special Conditions II. A-G

I. GENERAL CONDITIONS:

A. This permit does not make the Department of Land and Natural Resources or the State of Hawaii liable in any way for any claim of personal injury or property damage to the permittee or assistants which may occur during any activity conducted under this permit; moreover, the permittee and all assistants agree to hold the State harmless against any and all claims of personal injury, death or property damage resulting from activities of the permittee or any assistant.

B. This permit conveys a privilege to engage in only those activities under the jurisdiction of the Department of Land and Natural Resources. The permittee is responsible for complying with all applicable County, State, and Federal requirements. The permit does not convey any privilege of access over or through private property.

C. The primary permittee and designated assistants are required to obtain permission before entering upon lands or waters not under the jurisdiction of the Department (see "C", General Conditions, page 2 of this permit).

D. The permittee and each assistant are individually responsible and accountable for their actions while conducting activities authorized under this permit; additionally, the permittee is responsible and accountable for the actions of the permittee's assistants.

E. This permit is not transferable or assignable. Any person whose name does not appear on this permit and is conducting any activity described herein is subject to prosecution for violation of State laws.

F. The permittee may request changes to the permit. Any such request to make changes to the permit must be made in writing and received by the Department at least thirty days prior to the change. The addition of new assistants will require each individual to sign the Attachment on page 10 stating that they have read, understood, and agree to abide by all general and special permit conditions. No change may be implemented without written approval from the Department.

G. The permittee may request to:
   1. Add assistants to the permit;
   2. Add another permittee or replace an existing permittee in the manner stated above; and

3. Change the activities authorized under this permit.

H. The permittee or their assistant(s) must have with them a copy of this permit while conducting activities authorized by this permit.

I. This permit authorizes collection of organisms protected by Federal law only with prior appropriate Federal authority, which must be described on Page 1 of this permit (if applicable).

J. This permit does not by implication authorize the primary permittee or any designated assistant to engage in any other activity that is in violation of any other State, Federal or County law, regulation or ordinance.

K. This permit does not authorize the sale of any collected organism or part therefrom.

L. **OWNERSHIP OF BIOGENETIC RESOURCES.** The State holds legal title to the natural resources and biogenetic resources gathered from state lands, including submerged lands. See Haw. Op.Atty.Gen. Opinion No. 03-03 (April 11, 2003). Biogenetic resources refers to the genetic material or composition of the natural resources and other things connected to, or gathered from public lands. See Davis v. Green, 2 Haw. 327 (1861); United States v. Gerber, 999F.2d 1112 (7th Cir. 1993).

M. This permit expires on the date indicated on Page 1. Within 30 days post expiration of the permit, the permittee must return this permit to the address listed on the upper left corner of Page 1 with brief and concise information on all activities authorized under this permit, on the attached Activity Report form.

N. **Annual Report**: Upon 90 days post expiration of the permit, the permittee must provide to DAR a final written report summarizing the results of the collection activity carried out under this permit and (if available) analysis of the data.

1) The annual report should provide a written explanation as to how the collection of a regulated freshwater species for scientific study is benefiting the State of Hawai'i in general and specifically, the improved management of the species.

2) The final report must include;

a. Species name and total quantities/sizes, of all regulated and non-regulated specimens collected under this permit,
b. GPS coordinates or geographic description of location of each sample taken or action conducted.
c. **Photo-documentation** of a representative sample of the total collection of native and non-native species from each 100 m experimental reach in each stream; and **photo-documentation** of a representative sample of contents of larval drift-net collection in each 100 m experimental reach in each stream); and **photo-documentation** of a representation of each **sampling method (electro-shocker, hand-net and larval drift-net)**.
d. Dispositions of the samples (e.g. on display; released/returned to the ocean or stream; preserved/died).
e. **Electrofishing Research Report**. Permittee will document the effects of electrofishing during project by assessing lethal outcomes through necropsies and tracking sub-lethal effects (e.g., growth, body condition) through mark-recapture of individuals that were inadvertently captured through electro-fishing (after initial hand-net removal). Permittee will document initial and subsequent adjusted electrofisher settings along with associated

mortalities of organisms. First phase of electrofishing research will consist of a "pilot" removal effort conducted in a 100 meter stream reach within 1 watershed to track outcomes for 5-6 months prior to proceeding with proposed invasive species removals in 12 watersheds. Second phase of electrofishing research will consist of the documentation of effects across a range of hydrological conditions via the assessment of lethal outcomes through necropsies and tracking sub-lethal effects of subsequent electro-fishing in the next 12 watersheds. The first phase will inform and guide execution of the second phase, and the second phase will serve to better inform how electro-fishing can be conducted to minimize adverse effects across a range of hydrological conditions.

3) An inventory of the regulated organisms (dead or alive) kept by the permittee, or any assistant, at the end of the report period, must accompany the annual report.

4) **The annual report is due at DAR's Honolulu office not later than three months (90 days) after the expiration of the permit, and is required prior to any renewal of the permit.**

O. The permittee and assistants agree to provide access to data obtained under authority of this permit upon request of the Division of Aquatic Resources, and to provide to the Division a copy of each report, published for distribution, prepared with data obtained under this permit. The permittee agrees to provide the Division of Aquatic Resources access to organisms obtained and held under this permit for on-site inspection.

P. The permittee agrees to notify the island office of the Division of Conservation and Resources Enforcement at least 24 hours prior to any authorized activity being conducted in the field. Please provide the permittee name, the permit number, the date, time, and location of the planned activity, and contact information.

Q. A violation of any terms or condition of this permit or any violation of State law not covered by this permit may result in revocation of the permit and other penalties as provided by law. The permit may not be reissued if the permittee is not in compliance with the terms and conditions of this permit or any other permit issued to the permittee by the department of land and natural resources.

II. SPECIAL CONDITIONS

A. **Activities and Location.** This permit authorizes the **TAKE** and **CATCH of** the listed amounts of adult, juvenile and post-larval specimens of the listed species on Table 1, page 1 from Manoa, Hakipu'u, He'eia, Ka'a'awa, Kawa, Maunawili, Kea'ahala, Waiahole, Waikane, Kipapa, Waimanalo, Waimea (Oahu) ONLY. All native specimens not utilized for mark/recapture efforts, otolith and tissue analysis or larval sampling collections will be returned to the river at the site of collection as soon as possible.

B. **Gear.** This permit authorizes the use of an electrofisher or hand net to **TAKE** or **CATCH** the listed amounts of adult, juvenile and post-larval specimens of the non-native and native species on Table 1, page 1 from listed streams on Oahu ONLY. Researchers will optimize and monitor electrofisher output frequency, output current, duty cycle, output voltage, amperage and waveform combinations to reduce potential harm to any individuals remaining in the experimental reaches. Researchers will adjust electrofisher output settings as listed above after any incidence of mortality of native or non-native organisms. Researchers will document initial and subsequent adjusted electrofisher settings along with associated mortalities of organisms. If repeated incidences of mortality of native species

occurs (mortality native species > 5), electrofishing will be terminated, DAR will be notified (808-587-2277) and electrofishing protocol and methodology will be reevaluated by DAR.

This permit authorizes the use of hand-nets, dip nets, minnow seines, and minnow traps to **CATCH or TAKE** the listed amounts of native species on Table 1, page 1 and the use of a larval drift-net to **TAKE** the listed amounts of larval specimens of the native species on Table 1, page 1 from listed streams on Oahu ONLY. Prior to electrofishing, researchers will capture all native amphidromous fishes and invertebrates (e.g., *Macrobrachium* shrimp and *Neritina* snails) by hand-netting. With minimal handling, native species will be held at low densities in nearby refuge tanks. Following removal of AIS, native species not sampled for otoliths and tissue analysis for will be returned to their place of capture.

C. **Mark/Recapture.** This permit authorizes the use of 8mm sub-dermal PIT tags for mark-recapture and the non-lethal sampling of 10-30 mg of tissue from the second dorsal fin for genetic sampling of select native species on Table 1, page 1 from listed streams on Oahu ONLY. The samples may only be taken from the first or second dorsal fin of the fish to not affect swimming efficiency and feeding. The permittee agrees to take all reasonable steps to minimize infections on sampled animals from the sampling regime and from handling, including fungicide treatments of sampled animals. Tools used to take samples must be sterilized to prevent secondary infection in the sample areas on each specimen sampled.

D. This permit authorizes the sacrifice of **non-native specimens** using MS-222 (tricaine mesylate) at site of collection. In addition, this permit authorizes the sacrifice of **select native specimens** using MS-222 (tricaine mesylate) at site of collection. All fixatives will be applied away from stream.

E. All collection activities (including any by-catch) will be documented by photos, written description, and GPS. This information will be made available to the Department after the collection activity.

F. The permittee agrees to take all reasonable steps to minimize negative impacts to aquatic life in the stream due to the sampling regime and handling.

G. The permittee shall report, as required under General Conditions M (on the form provided in this permit) and N (in format provided by researcher).

H. An approved alien species protocol will be filed with DAR prior to initiation of collection activities in Oahu. Protocol will include mechanisms for ensuring that the individuals listed on this permit do NOT serve as vectors for the transport or introduction of alien (invasive) species through their activities.

I. Collecting generally - the permittee must give notice, by email or phone call, to the DAR office (808) 587-2277 or catherine.a.gewecke@hawaii.gov *and* to the Department's Division of Conservation and Resources Enforcement (DOCARE) (808) 643-3567, at least 24 hours prior to initial commencement of any collection activity under this permit.

J. Use of any chemical substances pursuant to Section 188-23, Hawai'i Revised Statutes, electrical shocking devices (**OTHER THAN AS AUTHORIZED UNDER SPECIAL CONDITIONS, SECTION B. GEAR**), or explosives remains expressly prohibited. Legally-acquired chemicals may be used to disinfect tools and preserve samples once taken, with the condition that such actions do not take place in the water, or on any private property (without written permission form the landowner).

K. **USE OF BIOPSIES OR TISSUE SAMPLES**: Tissue samples taken under authority of this permit may be used only for scientific study or educational purposes **ONLY**, except as authorized by prior written approval of DAR.

a. **THIS PERMIT AUTHORIZES** Michael Blum to **TRANSPORT** tissue samples or sacrificed specimens of Goby species listed in Table 1 from streams of Oahu to Tulane University/New Orleans/Louisiana for stable isotope-based trophic analysis.

b. **THIS PERMIT AUTHORIZES** Michael Blum to **TRANSPORT** otoliths obtained from Goby species listed in Table 1 out of Hawai'i to the following institutions and **AUTHORIZES** the following institutions to **RECEIVE** otoliths obtained from Goby species listed in Table 1. from **MICHAEL BLUM**:

i. Tulane University/New Orleans/Louisiana

ii. Texas A&M University Corpus Christi/Corpus Christi/Texas

K. **Use of Tissue Samples and Biogenetic Resources**: Tissue samples taken under authority of this permit may be used only for scientific study or educational purposes **ONLY**, except as authorized by prior written approval of DAR.

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

cc: (x) DOCARE

SIGNATURES AND AGREEMENT

By my signature below, I acknowledge receipt and understanding of the general and special conditions of this Special Activity Permit. Further, I agree to abide by all of these conditions when conducting activities authorized by this permit.

PRINCIPAL PERMITTEES: _____

Michael Blum

DESIGNATED ASSISTANTS:

Signature:	_____	Signature:	_____
Print Name:	Kauaoa Fraiola, PhD	Print Name:	Roderick Gagne, PhD
Signature:	_____	Signature:	_____
Print Name:	Christine Hayes, BA	Print Name:	Heidi Heim, BA
Signature:	_____	Signature:	_____
Print Name:	Peter Lisi, PhD	Print Name:	Kristine Moody, PhD
Signature:	_____	Signature:	_____
Print Name:	Annessa Musgrove, MS	Print Name:	Jenn Summers, BA
Signature:	_____	Signature:	_____
Print Name:	James Derek Hogan, PhD	Print Name:	Peter McIntyre, PhD
Signature:	_____	Signature:	_____
Print Name:	James Gilliam, PhD	Print Name:	_____
Signature:	_____	Signature:	_____
Print Name:	_____	Print Name:	_____

ACTIVITY REPORT

Results of all activities performed under authority of this permit must be reported on this form (or copies) within one month after the permit expires (see first page). Use as many sheets as you need. Submit the report to the Division of Aquatic Resources at 1151 Punchbowl Street, Room 330, Honolulu, HI 96813.

Date	Location	Common or Scientific Name	Quantity Collected*	Disposition of Specimens

Permittee Signature

Michael Blum _____ _____
Name Signature Date

*If salvaged (collected because the specimen was dead or injured already), please detail circumstances: condition (dead, or describe extent of injury), how or from whom the specimen was obtained.

ATTACHMENT FOR DESIGNATED ASSISTANTS ONLY

Primary Permittee: Michael Blum

I, being the primary permittee, hereby acknowledge the addition of the following designated assistants.

_____ _____
Michael Blum Date

ADDITIONAL DESIGNATED ASSISTANTS

We, the undersigned, have read, understand, and agree to all conditions stipulated in the above Special Activity Permit.

Signature _____ Print Name: _____

Signature _____ Print Name: _____

Signature _____ Print Name: _____

Signature _____ Print Name: _____

Signature _____ Print Name: _____

Signature _____ Print Name: _____

Signature _____ Print Name: _____

Signature _____ Print Name: _____

Signature _____ Print Name: _____

Signature _____ Print Name: _____