JUL 14 2014

College of Natural Resources & Sciences
Humboldt State University

HUMBOLDT STATE UNIVERSITY

INSTITUTIONAL ANIMAL CARE AND USE

PROTOCOL ROUTING SLIP

The attached protocol for the humane care and use of live vertebrate animals was submitted on

7/14/14 ~~4/21/14~~ (date) by William "Tim" Bean (faculty project leader) for N/A (course # if appropriate)

Check whether the work described in this protocol will be supported by funding administered by the (X)HSU Foundation, ( ) another administrative unit -*list* _____,or ( ) will be unfunded.

Animals used for this project will be housed in the following facilities (please check all that apply):
( ) Animal Rooms; ( ) Fish Hatchery; ( ) Game Pens; ( ) Telonicher Marine Lab;
( ) Natural History Museum; ( ) Other, specify site and room _____

Person / phone number (or e-mail) to contact: Tim Bean (bean@humboldt.edu)

Project Title: Waterfowl and shorebird response to unmanned aircraft systems

♦ **ROUTE FIRST TO THE CHAIR OF THE IACUC** BRING THIS FORM TO THE COLLEGE OF NATURAL RESOURCES AND SCIENCES (RM. 101 IN THE FORESTRY BUILDING). Please allow ten working days for review of proposals to conduct minimally invasive procedures and an excess of one month for review of proposals to conduct invasive procedures; note that these time periods are minimal and assume that no revisions will be necessary prior to approval. ALWAYS VERIFY APPROVAL (OFFICE OF THE CHAIR OF THE IACUC; 826-3256) BEFORE STARTING YOUR PROJECT.

THE REMAINDER OF THIS PAGE IS FOR THE USE OF THE INSTITUTIONAL ANIMAL CARE AND USE COMMITTEE

Date 1st Received 4/24/14 **REVIEW** No. 13/14.W.106-E

(✓) E- Procedures are exempt from full IACUC review because they are purely observational, non-invasive, and produce no perceptible discomfort or they concern only the use of tissues from dead animals. To be considered exempt, tissues from dead animals must be obtained from animals euthanatized or otherwise killed by means, and for purposes, unrelated to the proposed project. The procedure may be approved by the Chair one additional member of the IACUC.

( ) A- Procedures will be minimally invasive or produce relatively little discomfort. Protocols may involve, bleeding, injections, minimal sampling, anesthesia or humane euthanasia without prior invasive manipulation. The procedure may be approved by the Chair and two additional members of the IACUC. Project topics will be reviewed by the IACUC at the next scheduled meeting.

( ) B- Procedures will involve prolonged manipulation or be invasive. Protocols may involve surgical or other stimuli inducing pain or distress, but all pain or distress will be mitigated with appropriate anesthetics or analgesics. The procedure may be initially approved by the Chair, the Campus Veterinarian and one additional member of the IACUC. Protocols will be reviewed by the IACUC at the next scheduled meeting.

( ) C- Procedures will be invasive and may cause prolonged physiological or psychological stress. Pain, considerable distress, or discomfort may be induced and not mitigated by anesthesia or adequate analgesia (e.g. LD50 experiments, long-term food or water deprivation, etc.). These protocols will be reviewed thoroughly by the IACUC prior to commencement of the project.

Joseph M. Szewczak 7/23/2014
Signature, IACUC Member — Date — (✓) Approved ( ) Denied

8.28.14
Signature, IACUC Member — Date — (✓) Approved ( ) Denied

9-19-14
Signature, IACUC Chair — Date — ( ) Approved ( ) Denied

Routing slip revision 05/09

cc: ( ) Project Leader, ( ) Animal Facility Supervisor, ( ) Department Chair

PROTOCOL FOR THE HUMANE CARE AND USE OF LIVE VERTEBRATE ANIMALS

Federal animal welfare regulations require that an Institutional Animal Care and Use Committee (IACUC) review and approve all activities involving the use of vertebrate animals prior to their initiation. This includes any animals used for the development of experimental methodologies, instructional purposes, research, etc. Approved protocols for ongoing and recurrent activities must be reviewed by the IACUC on an annual basis. However, extensions and amendments requiring an abbreviated application process may be granted for a total of three consecutive years. Compliance with animal welfare regulations is mandatory and is the responsibility of all individuals (including faculty and students) who choose to work with live vertebrate animals.

To avoid the proliferation of submissions, please provide generic descriptions (including multiple routes of compound administrations, minor procedural variations, similar laboratory exercises from a single course, routine exercises used in several courses, etc). When multiple vertebrate species are to be used, please clearly describe all procedures, and all variations thereof, to be used with each individual species.

Once completed, signed, and dated, please submit your protocols to the Chair of the IACUC, Dean of the College of Natural Resources and Sciences, Forestry Bldg, Room 101. All protocols should be submitted on the most recent version of the forms. For your convenience, protocol forms are available in several software formats from the Chair of the IACUC, from several department offices and stockrooms, and they can be downloaded from the IACUC web page (http://www.humboldt.edu/~iacuc). You can expedite the review process by following these formatting rules: avoid changing the format of the routing slip unless minor reformatting is necessary to keep it to a single page; leave an extra blank line between your answers and the questions; leave questions in bold-face type; type your answers in regular (non-bold) type; and format the final signature page so that it begins with the final question. Please contact the Campus Veterinarian, Dr. Richard Brown, (by phone-826-3320, or e-mail- RNB2@humboldt.edu) with questions concerning protocol preparation and submission.

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1. **Course Number** (if applicable).

   Project Title (note that this title must match the title shown on the routing slip).

   Waterfowl and shorebird response to unmanned aircraft systems

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2. **Responsible Faculty Member: Instructor, Principal Investigator or Project Director.**

   Name Tim Bean

   Department Wildlife

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3. **Names of others involved in animal use activity and their qualifications to perform the procedures indicated.**

   David Marshall, licensed pilot – will fly the unmanned aerial vehicle
   Sharon Dulava – observer, will count waterfowl and shorebirds on the ground

4. **Proposed starting date (the starting date cannot precede date of approval, and note that *all* protocols must be renewed or extended annually).** The Annual Protocol Review Form must be approved on or before the anniversary of the approval date to indicate termination of the project or to request extension of the dates of approval; annual review is automatic and you no longer need to submit an end date.

   Upon IACUC Approval, approximately 03/01/15

5. **Scientific name, common name, and characteristics of all species to be used. List multiple species separately to explain variation in use. For field studies, please list all target species, species listed as protected, threatened, or endangered by the USFWS or the state in which the work will be conducted, and any non-target species that are likely to be impacted.**

Latin binomial	Common name	Sex	Age or Weight Range

   SEE ATTACHED

6. **Number of animals to be used. Explain why a smaller number would not allow you to meet your objectives (please provide clarification if based on statistical reasoning).** If this is a field project, and you cannot predict the exact number of animals to be sampled, please give your best estimate and an explanation of the variables that will determine your sample size. Write N/A if this protocol covers only the transportation, use, and/or storage of carcasses or tissues.

   No more than 2,500 birds. We will target small flocks of waterfowl and shorebirds, but the precise number is unknown.

7. **Source of the animals (or tissues) to be used or the study area(s) for field studies.** For transportation, storage, and use of tissues from carcasses, explain the circumstances of death. If this information is unknown, provide the name and contact information for the person or company from which the samples are to be obtained.

   This project will take place in wetlands around Humboldt Bay.

8. **If live animals are to be maintained in captivity for greater than 12 hours, explain where and how the animals will be housed and who will be responsible for their daily care.** If no animals will be maintained in captivity, please clearly state that to be the case. Write N/A if this protocol covers only the transportation, use, and/or storage of carcasses or tissues.

   No animals will be maintained in captivity.

9. Provide a non-technical description of the proposed goals, general methods, and the educational or scientific objectives that the proposed use is designed to meet.

Unmanned aircraft systems (UAS) have the potential to revolutionize ecological studies. Current methods for monitoring waterbirds (waterfowl and shorebirds) rely on manned aerial surveys, a technique that may be unreliable, inaccurate, dangerous, and expensive. Surveys conducted with UAS using high-resolution digital photography may reduce costs, reduce risk to pilots/observers, and are more reliable in the event of low cloud or fog cover. More importantly, due to the reduced size and noise levels, surveys conducted by UAS are expected to reduce disturbance to wildlife populations in comparison to larger, human-driven aircraft. However, the behavioral response to UAS has thus far not been well-investigated. Here, we propose to test the use of UAS in survey for waterbirds, and estimate at what distance we may detect a behavioral response to the aircraft. A licensed pilot will control the aircraft from the ground, maintaining visual contact at all times. While in the air, the aircraft will record geographic locations with a geographic positioning system (GPS), and take photographs at consistent time intervals. Imagery will be collected at increasingly close distances to the waterbirds, until trained observers on the ground detect a behavioral response.

10. Provide a <u>complete and detailed</u> description of all procedures to be performed involving live vertebrate animals. Your response should address the handling and restraint of non-anesthetized animals; deprivation of food or water for a period that is atypical for this species; use of chemical or biological agents; the drawing of blood; the use of anesthetics, analgesics, sedatives or tranquilizers; surgical procedures; exposure to radioactive materials, known carcinogens, or highly toxic substances; and any post-operative procedures. Write N/A if this protocol covers only the transportation, use, and/or storage of carcasses or tissues.

We will survey twice at five study locations around Humboldt Bay. On each occasion, a licensed pilot will remotely control a "hexacopter" aircraft (a helicopter with six separate rotors). This aircraft will be equipped with two digital cameras with the capability to record geolocation. The pilot will fly the UAS in linear transects across each study site, in a square area approximately 1,000 m on a side. The pilot will begin to collect imagery at approximately 500 m. Decibel levels for the aircraft is expected to be approximately 50 db at 1m. Assuming a 6 db loss per distance doubled, the copter will be noiseless (to humans) at ~250m. We therefore expect no behavioral response at 500 m. After transects have been flown at 500 m over the entire study area, the process will be repeated at lower elevations, every 100 m, until the first species is observed flushing from the site in response to the hexacopter. We will also note the elevation at which a behavioral response is first observed.

11. Will any of these procedures cause pain or distress (other than that necessitated by collection, injection, and otherwise mild, momentary discomforts)? If so, please explain. Write N/A if this protocol covers only the transportation, use, and/or storage of carcasses or tissues.

No additional pain or distress is expected.

12. **<u>For researchers</u>, explain how you determined that this protocol does not unnecessarily duplicate previously published observations or experiments (cite the type of literature searches as well as any other resources used). <u>For instructors</u>, explain the value of the lesson that merits using live animals.** Write N/A if this protocol covers only the transportation, use, and/or storage of carcasses or tissues.

A Google Scholar search for combinations of keywords "UAS" "UAV" "waterfowl" "waterbirds" and "shorebirds" returned just one relevant result (Chabot and Bird 2012, detailed below). I examined all citations included in this publication, and papers citing this paper, but found no other research on waterbird behavioral response to UAS. The National Park Service, in collaboration with United States Geological Survey and National Oceanic and Atmospheric Administration, have conducted similar research on colonial nesting seabirds around the Olympic Peninsuala, Washington (S. Thomas and S. Dulava, pers. comm.). At distances as close as 50 m, they found little behavioral response.

UAS are a novel technology, with few studies having been conducted on wildlife. Chabot and Bird (2012) suggested that an "off-the-shelf" UAS was not as reliable as ground counts of Canada geese and snow geese. Their flights were conducted at 183 m altitude, and at that height they did not detect any behavioral response from birds in the area. They utilized a plane-style aircraft, which may be slightly quieter, but less stable, producing blurrier imagery. We therefore believe this research will provide a stronger understanding of waterbird response to a UAS.

13. **Provide alternative procedures that were considered and rejected as well as a brief explanation of why the alternative procedures were rejected.** Write N/A if this protocol covers only the transportation, use, and/or storage of carcasses or tissues.

We considered flying a UAS directly at targeted species until they elicited a behavioral response, to mimic typical flushing experiments conducted on the ground. This seemed unduly aggressive, and unrepresentative of a typical aerial imagery collection flight plan. We also considered examining literature on waterbird acoustic sensitivity, and comparing this with noise levels measured at various distances from the hexacopter. However, we rejected this, as it would only account for acoustic signals that may cause a disturbance, while not allowing for visual response to an object moving in the sky.

14. **Identify serious human health risks (expected exposures to disease agents, toxic chemicals used, dangerous environmental conditions, etc.) to which any participants might be exposed during the routine performance of the duties proposed herein, and describe steps taken to mitigate those risks.**

The UAS presents the most serious danger if mishandled or flown incorrectly. Marshall, a licensed pilot who is currently gaining experience flying smaller UAS, will control all flights. In addition, we will erect a net in front of all observers to prevent the UAS from flying into them.

15. **Describe the fate of the animals upon completion of the protocol. Include the procedure for euthanasia (if chemical, include drug, route, and dosage) and the method of verification (whether necessary as an experimental termination or in the case of**

unanticipated, accidental injury). Note (1) that you must justify the scientific necessity for any variations from the established guidelines for euthanasia (2000 Report of the AVMA Panel on Euthanasia as published in the Journal of the American Veterinary Medical Association, 2001, 218(5): 669-696 or its replacement in the Code of Federal Regulations), (2) that you must report unexpected deaths to the IACUC as soon as possible to consider options, and (3) that you may write N/A only if this protocol covers only the transportation, use, and/or storage of carcasses or tissues.

We do not expect any injuries caused by our activities. However, if an injured bird is observed in the course of the study, we will alert the Humboldt Wildlife Care Center, and follow their instructions. If immediate euthanization is required, Bean will perform a cervical dislocation, verified by observing the bird for more than 3 minutes to confirm a lack of movement, heart beat, and respiration.

16. **I certify that the above information is accurate and complete, that I have read and agree to abide by the "Principles for the Utilization and Care of Vertebrate Animals Used in Testing, Research, and Training at HSU," that I will make copies of these principles and other pertinent guidelines available to those persons who work under my supervision, and that deviations from this protocol, including any unanticipated injuries or death of animals, will be reported to the IACUC. Further, my level of supervision will be such that these procedures will be carried out in a humane and a scientifically acceptable manner as described herein. I understand that, as the research supervisor, I take responsibility for the conduct of anyone working under this approved protocol, and I will supervise the research to ensure that no work is conducted that is not covered herein or in a separate approved protocol. I am aware that my research might require permits from federal and/or state agencies that regulate the harassment, capture, transport, captive maintenance, handling and manipulation of live vertebrate animals, and I have marked all boxes pertaining to the relevant laws (and state permits) governing the species used in my research. I certify that my research will be conducted in accordance with all relevant federal and state laws.**

I am aware that the following Acts apply to my study (check all that may apply):

(X) **Animal Welfare Act**
( ) **State of California Fish and Game Commission** (Title 14) - Scientific Collecting Permit(s)
( ) **Endangered Species Act**
( ) **Fishery Conservation and Management Act**
( ) **Lacey Act**
( ) **Marine Mammal Protection Act**
( ) **Convention on International Trade in Endangered Species of Wild Fauna and Flora**
( ) **Other: please list** _____

_____ 7/14/14
Signature, Responsible Faculty Member Date

Review by the IACUC Attending Veterinarian (if necessary):

_____
Signature, HSU Veterinarian Date ( ) Approved ( ) Denied
Explanation of denial:

Final Committee Decision. All protocols must be approved prior to the start of research.

_____ 9-9-14
Signature, IACUC Chair Date (✓) Approved ( ) Denied
Explanation of denial:

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI)

IACUC MODULE FOR FACULTY AND STUDENTS CURRICULUM COMPLETION REPORT

Printed on 09/07/2014

LEARNER	David Marshall (ID: 4206910) 1 Harpst St Arcata CA 95521 USA
DEPARTMENT	CNRS
PHONE	7079263957
EMAIL	dem1@humboldt.edu
INSTITUTION	Humboldt State University-Sponsored Programs Foundation
EXPIRATION DATE	09/06/2017

IACUC MODULE FOR FACULTY AND STUDENTS

COURSE/STAGE:	Stage 1/1
PASSED ON:	09/07/2014
REFERENCE ID:	13616945

REQUIRED MODULES	DATE COMPLETED
Introduction to Working with the IACUC	07/31/14
Working with the IACUC	07/31/14
Federal Mandates	07/31/14
The Veterinary Consultation	08/01/14
Getting Started	08/01/14
Alternatives	08/01/14
Avoiding Unnecessary Duplication	08/01/14
USDA Pain/Distress Categories	09/07/14
Personnel Training and Experience	09/07/14
Making Changes after You Receive Approval	09/07/14
Reporting Misuse, Mistreatment, or Non-Compliance	09/07/14
Final Comments	09/07/14
Euthanasia	09/07/14
Occupational Health and Safety	09/07/14

For this Completion Report to be valid, the learner listed above must be affiliated with a CITI Program participating institution or be a paid Independent Learner. Falsified information and unauthorized use of the CITI Program course site is unethical, and may be considered research misconduct by your institution.

Paul Braunschweiger Ph.D.
Professor, University of Miami
Director Office of Research Education
CITI Program Course Coordinator