

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

10/8/15 by William "Tim" Bean for N/A
(date) (faculty project leader) (course # if appropriate)

Check whether the work described in this protocol will be supported by funding administered by the
() HSU Foundation, ☒ another administrative unit -list Statewide, 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: bean@humboldt.edu, x3658

Project Title: Porcupine habitat selection in Northern California

♦ **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 10/8/15 **REVIEW**

No. 1516.W.32 A

- () 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.



Requires Health Assurance

[Signature]
Signature, IACUC Member

9 Oct 15
Date

[Signature]
Signature, IACUC Member

12 Oct 15
Date

[Signature]
Signature, IACUC Chair

13 Oct 15
Date

☒ Approved

() Denied

☒ Approved

() Denied

☒ Approved

() Denied

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

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.

1. Course Number (if applicable).

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

Porcupine habitat selection in Northern California

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

Name Tim Bean

Department Wildlife

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

Cara Appel is a graduate student in Bean's lab. She has multiple seasons of field work experience and recently completed a wildlife techniques course that included units on animal restraint and telemetry methods. She will be properly trained on all procedures prior to working independently.

Dr. Rick Brown, Ph.D., D.V.M., is the campus veterinarian and will be training Bean and Appel

on all animal handling procedures.

Mourad Gabriel, M.S., Ph.D., is Executive Director and Senior Ecologist at the Integral Ecology Research Center. He may be providing assistance in the field.

Greta Wengert M.S., Ph.D., is Assistant Director and Senior Ecologist at the Integral Ecology Research Center. She may be providing assistance in the field.

Ian Axsom and Pairsa Belamaric, undergraduates majoring in wildlife. They will be involved primarily in radio telemetry relocations and have been trained in wildlife-related courses including WLDF 311 (Wildlife Techniques) and WLDF 422 (Mammals Management).

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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.

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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
<i>Erethizon dorsatum</i>	North American porcupine	Both	Adults and juveniles

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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.

We will capture and radio-collar a maximum of **20** porcupines. Based on review of literature, the minimum number of porcupines used for habitat selection studies has been 12 animals^{1,2}, but the mean from 7 recent studies that we identified was **20 animals**.

In addition to the VHF radio collar we will attach a small GPS collar to **up to 15** individuals.

We will also capture and mark up to **50** additional individuals in order to study population dynamics and collect genetic samples.

¹ Zimmerling, T. N., and C. D. Croft. 2001. Resource selection by porcupines: winter den site location and forage tree choices. *Western Journal of Applied Forestry* 16:53–57.

² Mally, K. A. 2008. Hierarchical summer habitat selection by the North American porcupine in western Montana. Thesis, University of Montana, Missoula, USA.

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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.

The study area consists of Tolowa Dunes State Park and Lake Earl Wildlife Area, north of Crescent City in Del Norte County, California.

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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 currently wild animals will be maintained in captivity for greater than 12 hours. Animals will only be held long enough to be processed and to recover from anesthesia before they can safely be released. We will check traps frequently to ensure that animals are not in traps for extended periods of time.

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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.**

Goals and objectives: We aim to understand habitat selection and resource use of porcupines in coastal areas of Northern California. Porcupines occur throughout North America and their habitat and diet preferences vary by region, but no research on porcupine ecology has been conducted in Northern California or similar temperate regions. Furthermore, porcupine populations are in decline throughout the state, and any future management and conservation practices will require an understanding of porcupine ecology in this region. Because porcupines often feed on the cambium and other parts of trees, knowledge of porcupine habitat selection characteristics will be of interest to timber companies and land managers. Porcupines are known to be important prey for the Pacific fisher (*Martes pennanti*) in other areas where their ranges overlap, so this research will also be informative to ongoing fisher research in this area.

Methods: We will use radio telemetry to study habitat selection of 20 porcupines in and around Tolowa Dunes State Park in Del Norte County, California. First, porcupines will be captured in traps, immobilized using chemical anesthesia, and fitted with very high frequency (VHF) radio collars. After being held for a proper recovery time, porcupines will be released. Over the course of several months (up to two years), porcupines will be tracked and located using a radio receiver and antenna. We will periodically recapture porcupines to re-weigh them to assess seasonal changes in body condition. Before the end of the collars' expected battery life, the porcupines will be captured again and the collars will be removed. We will also affix a modified GPS tracker to these animals in addition to the VHF collar to test its efficacy in wildlife research.

Additionally, we will capture and mark some individuals that are not radio-collared to study population dynamics and genetics.

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10. **Provide a complete and detailed 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 trap porcupines, administer anesthesia, take measurements and blood samples, fit them with radio collars, administer a reversal drug, and observe them for full recovery before releasing them. Porcupines will subsequently be tracked and located using radio telemetry periodically for up to two years. In addition, they will be periodically be recaptured, weighed, and released to assess seasonal changes in body condition.

Because we have not previously trapped and handled porcupines, our study will require training and revision of our methods during the first few trapping sessions. Therefore, Bean and Appel will be accompanied by Dr. Rick Brown, campus veterinarian, for the first session and will receive training on all aspects of handling, including administering drugs, collecting blood samples, and monitoring vital signs and recovery. After this session, we will judge the need for additional supervision and may be accompanied further by Dr. Brown, Dr. Mourad Gabriel, or Dr. Greta Wengert.

For the first trapping session, we will set only one or two traps at a time and check them frequently. After we are trained and are familiar with the amount of time required to trap and process each animal, we will modify our trapping schedule accordingly. Porcupines are primarily nocturnal but are also often observed to be active during the day. Therefore, traps will initially be set during the day and monitored frequently, but if this does not result in successful captures, then we will instead set traps in the early evening.

For trapping, we will follow methods used in previous studies (Mally 2008; K. Elder, personal communication) to place traps at the base of known used trees, with temporary fencing to form a complete enclosure around the trunk. This has been successful in capturing porcupines when they climb down from rest trees in the evening to forage. We will use 36" x 10" x 30" Havahart 2-door cage traps (Woodstream Corporation; Lititz, Pennsylvania) and will bait them with apples, which have been used successfully in previously studies.

Because of the vegetation in our study area, fencing may not be feasible. Willow patches, sitka spruce, and shore pines grow too close together to fence off effectively. Further, many of the porcupines that we have encountered in the study area have been moving on the ground. We therefore propose to use a trash can and/or dip net to capture and re-capture porcupines in the study. Porcupines on the ground will be approach with light-weight fiberglass rods (e.g. 48" driveway reflectors) and an open trashcan. They will be gently harassed into the trashcan, and then we will place the can upright and secure the lid on top. The trashcan will have holes punched in the bottom and sides to allow for air flow and allow urine to drain. If a porcupine is found in a tree branch that is low enough to reach, we will attempt to capture the porcupine with a large dip net. The porcupine will then be transferred to the ground and encouraged into the trash can. These methods have been used successfully and safely before in other porcupine studies.

Upon successful capture of a porcupine, we will weigh it in the trap in order to adjust drug dosage. We will reconfigure the temporary fencing to form a small enclosure around the trap, excluding the base of the tree so that the porcupine cannot climb. The porcupine will then be released from the trap into this enclosure, and we will use the tail capture method described in

Fowler³ to get the animal in-hand. This involves approaching the animal from behind, holding down the tail with a wooden stick or boot, and grasping the underside of the tail, which is free of quills. The animal can then be lifted by sliding a hand between the hind legs to support the abdomen⁴. This method has been used successfully in several previous studies and is preferable to administering anesthesia through a pole syringe (jab stick), which can cause severe lacerations due to muscle contractions⁵. If a porcupine is captured in a trash can, we will rotate the can and/or the porcupine to gain access to the tail. We will grasp guard hairs on the end of the tail and grasp the underside of the tail. The porcupine will be injected in the base of the tail with anesthesia.

We will immobilize porcupines using intramuscular injection of Ketamine (5 mg/kg) and Dexmedetomidine (0.025 mg/kg), delivered by hand syringe (1 or 3 cc) fitted with a 23-25 gauge needle. Alternatively, porcupines may be immobilized with Ketamine (5 mg/kg) and Xylazine (2 mg/kg or adjusted as needed), which has been used previously for North American porcupines⁶. Injection will be administered into the muscles at the base of the tail⁷. While animals are under anesthesia, we will monitor their heart rate, capillary refill time, pupil response, and respiration rate using a stethoscope. Body temperature will be monitored using a flexible thermometer. We will then administer eye drops to prevent their eyes from drying out.

All animals will be weighed and routine morphometric measurements will be recorded. We will sex animals by palpating the genital area to expose the penis⁸. We will obtain blood samples from animals by venipuncture of the jugular vein, the femoral vein, or cephalic vein, depending on which is deemed easiest and safest by Dr. Brown during the first capture session, using a 3 cc syringe fitted with a 23-gauge needle. A small sample of hair will also be collected for future genetics analysis.

Blood samples will be separated in the field (half of the samples with anticoagulant; the other half will be allowed to clot and centrifuged to remove the serum) and returned to HSU for storage.

PIT tags will be injected under the skin between the shoulder blades.

Finally, animals will be fitted with 30g radio collars (Holohil Systems Ltd.; Carp, Ontario). These weigh less than 1% of the body weight of an adult porcupine (5-15kg), which is below the maximum suggested collar weight of 3-5%. We have chosen a Tygon tubing for the collars because it is commonly used for radio collar designs and appears to provide some level of protection from abrasions. Collars will have a battery life of approximately 2 years, and near the end of this time period (or when signal becomes weaker, indicating battery failure), we will attempt to recapture the animals and remove the collars.

³ Fowler, M. 1995. Restraint and handling of wild and domestic animals. Second edition. Iowa State University Press, Ames, USA.

⁴ *Ibid.*

⁵ *Ibid.*

⁶ Morin, P., and D. Berteaux. 2003. Immobilization of North American porcupines (*Erethizon dorsatum*) using ketamine and xylazine. *Journal of Wildlife Diseases* 39:675–682.

⁷ *Ibid.*

⁸ Dodge, W. E. 1982. Porcupine (*Erethizon dorsatum*). Pages 355–366 in J. A. Chapman and G. A. Feldhamer, editors. *Wild mammals of North America: biology, management, and economics*. Johns Hopkins University Press, Baltimore, Maryland, USA.

We will modify a GPS tracker (such as the consumer models i-gotU GT-600 or i-gotU GT-120) so that it fits onto the Holohil VHF collar. Specifically, we will remove the GPS tracker, accelerometer and logic board from the case, solder a 6600 mAh Li-Ion battery to it and seal in silicon spray and epoxy. We will follow recommendations by Allan et al. to construct this collar⁹. We are also testing designs using the original unit and battery with a customized bracket made on a 3D printer. Regardless of design, the total package, including VHF transmitter, GPS tracker and collar is expected to weigh less than 300g, approximately 3% body weight.

If animals show signs of becoming active while under anesthesia, we will administer an additional half dose of anesthesia. When we are finished handling the animal, we will administer a reversal drug, Atipamezole (Antisedan; 5 mg/ml), if Dexmedetomidine was used. If Xylazine was used, we will administer either Yohimbine or Tolazoline as a reversal (dosage to be determined by R. Brown and changed as needed). Animals will then be monitored and allowed to recover in the temporary enclosure. If we do not use fencing for capture, we will place the porcupine back in the trashcan and observe it periodically to ensure it has fully recovered. Specifically, we will slowly rotate the trashcan to test whether the porcupine can right itself. Because porcupines have a relatively slow metabolism and face additional risks from climbing, extra care will be needed to ensure that they are fully recovered from anesthesia before being released. All animals will be released at the site of capture.

For the next 1-2 years, animals will be periodically tracked using radio telemetry. Generally, animals will not be located more than 2 times within a 24-hour period, although occasionally an animal may be observed for an extended period of time for collection of additional behavioral data. Each time an animal is located using telemetry, we will approach close enough to obtain a visual observation of the animal, in order to record its specific location and behavior. No animal will intentionally be disturbed during this process, as doing so would negatively affect the quality of data for our study. Reports in the literature indicate that even during extended periods of close observation by researchers, porcupines do not appear to be disturbed to the point of altering their behavior or abandoning feeding¹⁰.

At the beginning of fall (October, 2015), during winter (December and January, 2015-2016) and the beginning of summer, 2016, we will attempt to recapture all porcupines to reweigh them. Specifically, we will utilize a trashcan or dip net to capture them, and then place the porcupine in a trashcan, cover with a lid, and weight them. Porcupines will be immediately released at site of capture after weighing. We will not otherwise immobilize or anesthetize them for these captures.

An additional subset of individuals (up to 50) will be captured, marked, and released without radio collars. If we encounter an individual without a collar, we will attempt to capture it using the trash can method described above. We will then weigh the porcupine in the trash can, extract a hair sample for genetics analysis, and attempt to determine its sex. Additionally, we will mark these porcupines by spraying the quills on the back or tail with a nontoxic enamel paint in unique color combinations, as has been done previously on porcupines^{11,12}. Porcupines will be handled

⁹ Allan, B.M., Arnould, J.P.Y., Martin, J.K., and E.G. Ritchie. 2013. A cost-effective and informative method of GPS tracking wildlife. *Wildlife Research* 40:345-348.

¹⁰ Roze, U. 2009. *The North American porcupine*. Second edition. Cornell University Press, Ithaca, New York, USA.

¹¹ Sweitzer, R. A., and J. Berger. 1992. Size-related effects of predation on habitat use and behavior of porcupines (*Erethizon dorsatum*). *Ecology* 73:867-875.

using the tail grab method in order to facilitate hair collection, sexing, and marking. These animals will not be given anesthesia and will be released at the site of capture. This subset of individuals will include juvenile porcupines for the purpose of collecting genetics samples and marking them for future identification. We do not believe that handling juveniles in this limited manner will be harmful, as they are precocial and regularly spend periods of time away from their mothers¹³. Further, mothers do not appear to show defensive behavior on behalf of their offspring nor neglect them after capture¹⁴.

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- 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.**

We emphasize that great care will be taken to minimize pain and stress of animals involved in our study. All animals will receive anesthesia before having blood drawn or collars attached. No animal will be held longer than necessary, but we will ensure that all animals are fully recovered from anesthesia before they are released.

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- 12. For researchers, 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). For instructors, 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.**

To the best of our knowledge, no scholarly articles on porcupines in California have been published since 1971, when Charles Yocom, a former HSU professor, described his observations of increased porcupine abundance in Humboldt and Del Norte counties since the 1950s. He attributed this trend to increased forage opportunities provided by forest succession following intensive logging of old growth on the coast¹⁵. However, although researchers and land managers have noticed decreasing porcupine populations throughout California since the 1990s^{16,17}, no research has been published on porcupine ecology in this region. Furthermore, we are aware of no current research efforts that duplicate our work. This is confirmed by recent literature searches conducted by Appel (as of March 9, 2015) in JSTOR, Web of Science, and Google Scholar, using the keywords “*Erethizon dorsatum*” and “California.”

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- 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.**

¹² Sweitzer, R. A. 1996. Predation or starvation: consequences of foraging decisions by porcupines (*Erethizon dorsatum*). *Journal of Mammalogy* 77:1068–1077.

¹³ Roze 2009

¹⁴ *Ibid.*

¹⁵ Yocom, C. F. 1971. Invasion of Humboldt and Del Norte Counties of northwestern California by porcupines. *The Murrelet* 52:1–6.

¹⁶ Allen, M. L., and D. S. Casady. 2012. Recent observations of porcupines in El Dorado County, California. *California Fish and Game* 98:175–177.

¹⁷ Weiser, M. 2012. Porcupines an increasingly rare sight in California forests, scientists say. *The Sacramento Bee* 3 March 2012. Sacramento.

We previously tried a non-invasive method of studying porcupine occurrence and habitat use by distributing salt-saturated wood blocks to collect tooth marks (IACUC #13/14.W.59-A), but this has not been validated nor widely applied. Regardless, this method would not give the level of detail needed for habitat selection analysis.

We incorporated a collar design recommended to reduce abrasions (i.e., nylon tubular webbing instead of leather and metal).

Finally, many drug options are available for inducing anesthesia in porcupines. The combination of Ketamine and Xylazine has been tested and shown to be safe for porcupines¹⁸ and is the most commonly used method in the literature^{19,20,21,22}. As an alternative to Xylazine, we may use Medetomidine, which has also been safely used in porcupines²³. Both Xylazine and Medetomidine have the advantage of being reversible, which affords porcupines the best chance for quick and complete recovery before they are released. We also considered using Isoflurane gas, but due to concerns about recovery time we decided against it.

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 primary risk involved with this work will be driving to access the field sites. All field workers will have taken the Driver Safety course through HSU and will follow proper procedures. Because field workers may be working at night or alone (although we will work in pairs when possible), a ResQLink GPS personal locator beacon will be carried in case of emergency.

Field workers risk being stuck by porcupine quills. Porcupines are not known to be aggressive and the most risky period during handling will be before animals are anesthetized. Capture by tail grabbing has proven to be safe for handlers, but personal protective equipment will be available, including boots and heavy leather or PVC-coated gloves. While animals are anesthetized, careful handling will limit the risk of being stuck by quills. Furthermore, injury by porcupine quills is not known to cause harm other than temporary discomfort, if treatment is undertaken promptly.

There is a small chance of encountering other wild animals while tracking in the field. All workers will be trained to be aware of their surroundings, carry bear spray, and work in pairs when possible.

Porcupines are not known to carry diseases that are transmittable to humans, including rabies. However, reasonable precaution will be taken when handling animals to avoid direct contact with bodily fluids. Ticks may be present, and field workers will be instructed to carefully and regularly search for ticks on themselves and each other. Field crews will carry first aid kits.

¹⁸ Morin and Berteaux 2003

¹⁹ Sweitzer 1996

²⁰ Zimmerling and Croft 2001

²¹ Morin, P., D. Berteaux, and I. Klvana. 2005. Hierarchical habitat selection by North American porcupines in southern boreal forest. *Canadian Journal of Zoology* 83:1333–1342.

²² Mally 2008

²³ Elder et al., unpublished data


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- 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.

Extreme care will be taken to ensure no harm to animals involved in this study. However, in preparation for an unanticipated, accidental injury, Dr. Brown will train Appel and Bean on euthanasia protocols. If an animal is mortally injured in a trap, it will be anesthetized to a deep plane of anesthesia and subsequently euthanized with an injection of potassium chloride (4+ mEq / estimated per liter of blood volume) or sodium pentobarbital (>120mg/kg) delivered by IV or IC and followed by a second dose if the first fails to provide desired effects. Death will be verified by auscultation of the chest for prolonged absence of any signs of breathing and heartbeat. If an injured porcupine is encountered in the field, we will contact the Humboldt Wildlife Care Center for consultation. Deceased animals will be transported to the Wildlife Museum at Humboldt State University.

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):

- ☒ [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 _____



Signature, Responsible Faculty Member

10/8/15

Date

Review by the IACUC Attending Veterinarian (if necessary):

Signature, HSU Veterinarian

Date

☐ Approved ☐ Denied

Explanation of denial:

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