GUIDELINES FOR USE OF LIVE AMPHIBIANS AND REPTILES IN FIELD RESEARCH

compiled by

American Society of Ichthyologists and Herpetologists (ASIH)
The Herpetologists' League (HL)
Society for the Study of Amphibians and Reptiles (SSAR)

[available only online]

Introduction

Consistent with our long standing interests in conservation, education, research and the general well-being of amphibians and reptiles, the ASIH, HL and SSAR support the following guidelines and principles for scientists conducting field research on these animals. As professional biologists specializing in herpetology and concerned with the welfare of these animals, we recognize that guidelines for the laboratory care and use of domesticated stocks of amphibians and reptiles are frequently impossible to apply without endangering the well-being of wild-caught animals. Such guidelines may also preclude techniques or types of investigations known to have minimal adverse effects on individuals or populations (1, 20), and which are necessary for the acquisition of new knowledge.

The humane treatment of wild vertebrates in field research is both an ethical and a scientific necessity. Traumatized animals may exhibit abnormal physiological, behavioral and ecological responses that defeat the purposes of the investigation (21, 25). It is of particular importance that animals which are captured and marked be returned to the wild without impairment to resuming their normal activities, and that habitats essential for these activities not be rendered unsuitable in the course of capture efforts.

Due to the very considerable range of adaptive diversity represented by the over 8,000 species of amphibians and reptiles, no concise or specific compendium of approved methods for field research is practical or desirable. Rather, the guidelines presented below build on the most current information to advise the investigator, who will often be an authority on the biology of, the species under study, as to techniques that are known to be humane and effective in the conduct of field research. Ultimate responsibility for the ethical and scientific validity of an investigation and the methods employed must rest with the investigator. To those who adhere to the principles of careful field research these guidelines will simply be a formal statement of precautions already in place.

General Considerations

Each investigator should provide written assurance in applications and proposals that field research with amphibians and reptiles will meet the following criteria:

a. Procedures should avoid or minimize distress to the animals consistent with sound research design.

b. Procedures that may cause more than momentary or slight distress to the animals should be performed with appropriate sedation, analgesia, or anesthesia, except when justified for scientific reasons by the investigator.

c. Animals that would otherwise experience severe or chronic distress that cannot be relieved will be euthanized at the end of the procedure or, if appropriate, during the procedure.

d. Methods of euthanasia will be consistent with recommendations of the American Veterinary Medical Association (AVMA) Panel on Euthanasia (13) unless deviation is justified for scientific reasons by the investigator. The AMVA recommendations cannot be taken rigidly for ectotherms; the methods suggested for endotherms are often not applicable to ectotherms with significant anaerobic capacities.

e. The living conditions of animals held in captivity at field sites should be appropriate for that species and contribute to their health and well-being. The housing, feeding, and nonmedical care of the animals will be directed by a scientist (generally the investigator) trained and experienced in the proper care, handling, and use of the species being maintained or studied. Some experiments (e.g., competition studies) will require the housing of mixed species, possibly in the same enclosure. Mixed housing is also appropriate for holding or displaying certain species.

Additional general considerations that should be incorporated into any research design using wild amphibians or reptiles include the following:

f. The investigator must have knowledge of all regulations pertaining to the animals under study, and must obtain all permits necessary for carrying out proposed studies. (Most applicable regulations are referenced in publications of the Association of Systematics Collections [2, 3, 4].) Researchers working outside the United States should ensure that they comply with all wildlife regulations of the country in which the research is being performed. Work with many species is regulated by the provisions of the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES; see "CITES" references in 2, 3). Regulations affecting a single species may vary with country. Local regulations may also apply.

g. Individuals of endangered or threatened taxa should neither be removed from the wild (except in collaboration with conservation efforts), nor imported or exported, except in compliance with applicable regulations.

h. Before initiating field research, investigators must be familiar with the target species and its response to disturbance, sensitivity to capture and restraint and, if necessary, requirements for captive maintenance to the extent that these factors are known and applicable to a particular study. Special concern should be shown for species known to remain with nests or young in certain seasons. Removal from the wild of potentially tending individuals of species known to tend nests should, as a general principle, be avoided during the nesting season unless justified for scientific reasons.

i. Every effort should be made prior to removal of animals (if any) to under stand the population status (abundant, threatened, rare, e etc.) of the taxa to be studied, and the numbers of animals removed from the wild must be kept to the minimum the investigator determined is necessary to accomplish the goals of the study. This statement should not be interpreted as proscribing study and/or collection of uncommon species. Indeed, collection for scientific study can be crucial to understanding why a species is uncommonly observed.

j. The numbers of specimens required for an investigation will vary greatly, depending upon the questions being explored. As discussed later in these guidelines, certain kinds of investigations require collection of relatively large numbers of specimens, though the actual percent of any population taken will generally be very small. Studies should use the fewest animals necessary to answer reliably the questions posed. Use of adequate numbers to assure

reliability is essential, as inadequate studies will ultimately require repetition, thus wasting any benefit derived from any animal distress necessarily incurred during the study.

Numerous publications exist that will assist investigators and animal care committees in implementing these general guidelines; a number of such journals, monographs, etc., are listed in Appendix A.

Role of the Institutional Animal Care and Use Committee (IACUC)

Field resources for the care and use of wild vertebrates are very different from laboratory resources, and the role of the IACUC necessarily is limited to considerations that are practical for implementation at locations where field research is to be conducted. Prevailing conditions may prevent investigators from following these guidelines to the letter at all times. Investigators must, however, make every effort to follow the spirit of these guidelines. The omission from these guidelines of a specific research or husbandry technique should not be interpreted as proscription of the technique.

The IACUC must be aware that whereas vertebrates typically used in laboratory research represent a small number of species with well understood husbandry requirements, the classes Amphibia and Reptilia contain at least 8,000 distinct species with very diverse and often poorly known behavioral, physiological and ecological characteristics. This diversity, coupled with the diversity of field research situations, requires that each project be judged on its own merits. Techniques that are useful and fitting for one taxon, experiment, or field situation may, in another time, place or design be counter-productive. Therefore, in most cases, it is impossible to generate specific guidelines for groups larger than a few closely related species. Indeed, the premature stipulation of specific guidelines would severely inhibit humane care as well as research" (23). The IACUC must note the frequent use of the word "should" throughout these guidelines, and be aware that this is in deliberate recognition of the diversity of animals and situations covered by the guidelines. Investigators, on the other hand, must be aware that the use of the word "should" denotes the ethical obligation to follow these guidelines when realistically possible.

Field investigations very commonly involve studies of interactions among many related or sympatric species, of which a large proportion may be very poorly known. There is sound scientific merit in exploratory work, and ample reason for investigators to propose studies of a rather general nature, where opportunity and the flexibility to pursue unanticipated observations may become crucial to the success of the undertaking. New species continue to be discovered in this fashion, and the discovery of novel attributes of known species is to be expected as a consequence of the investigation. The IACUC should recognize that the acquisition of such new knowledge constitutes a major justification for any investigation, and that a corollary of this approach is that protocols may list a large number of individual species, or may refer to taxa above the species level.

When field studies on wild vertebrates are to be reviewed, the IACUC must include personnel who can provide an understanding of the nature and impact of the proposed field investigation, the housing of the species to be studied, and knowledge concerning the risks associated with maintaining certain species of wild vertebrates in captivity. Each IACUC should therefore include at least one institution-appointed member who is experienced in zoological field investigations. Such personnel may be appointed to the committee on an *ad hoc* basis to provide necessary expertise. When sufficient personnel with the necessary expertise in this area are not available within an institution, this *ad hoc* representative may be a qualified member from another institution.

Field research on native amphibians and reptiles usually requires permits from state and/or federal wildlife agencies. These agencies review applications for their scientific merit and their potential impact on native populations, and issue permits that authorize the taking of specified numbers of individuals, the taxa and methods allowed, the period of study, and often other restrictions which are designed to minimize the likelihood that an investigation will have deleterious effects. Permission to conduct field research rests with these agencies by law, and the IACUC should seek to avoid infringement on their authority to control the use of wildlife species.

If manipulation of parameters of the natural environment (daylength, etc.) is not part of the research protocol, field housing for wild vertebrates being held for an extended period of time should approximate natural conditions as closely as possible while adhering to appropriate standards of care (e.g., 16, 17, 28). Caging and maintenance should provide for the safety and well-being of the animal, while adequately allowing for the objectives of the study.

Field Activities with Wild Amphibians and Reptiles

1. Collecting

Field research with amphibians and reptiles frequently involves capture of specimens, whether for preservation, data recording, marking, temporary confinement, or relocation. While certain of these activities are treated separately below, they form a continuum of potential field uses of amphibians and reptiles.

The collection of samples for museum preparation from natural populations is critical to: 1) understanding the biology of animals throughout their ranges and over time; 2) recording the biotic diversity, over time and/or in different habitats; and 3) establishing and maintaining taxonomic reference material essential to understanding the evolution and phylogenetic relationships of amphibians and reptiles. The number of specimens collected should be kept to the minimum the investigator determines necessary to accomplish the goal of a study. Some studies (e.g., diversity over geographic range or delineation of variation of new species) require relatively large samples.

Museum Specimens and Other Killed Specimens. - The collection of live animals and their preparation as museum specimens is necessary for research and teaching activities in Systematic zoology, and for many other types of studies. Such collections should further our understanding of these animals in their natural state and do not serve merely as tools for teaching specimen preparation techniques. Herpetological collecting techniques and representative practices of collection management have been compiled (5), as have references to field techniques (32). Whenever amphibians or reptiles are collected for museum deposition, specimens should be fixed and preserved according to accepted methods (6, 7) to assure the maximum utility of each animal and to minimize the need for duplicate collecting. In principle, each animal collected should serve as a source of information on many levels of organization from behavior to DNA sequence. Whenever practical, blood and other tissues should be collected for karyotypic and molecular study prior to formalin fixation of the specimen.

Formalin fixation of dead specimens is acceptable practice; however, killing unanesthetized specimens by immersion in a formalin solution is unacceptable, unless justified for scientific reasons. Formalin immersion of unanesthetized animals may, however, be the only way to adequately fix certain details of morphology critical to the successful completion of research. Adult amphibians (A) and reptiles (R) may be painlessly killed by use of a chemical anesthetic such as sodium pentobarbitol (R), hydrous chiorobutanol (A), MS-222 (A) (Tricaine methane sulfonate, marketed as Finquel(tm) by Ayerst, Inc.), urethane-ethyl-carbamate (A) (referred to hereafter as urethane), 10% ethanol (A) or similar anesthetics. The euthanasia agent T-61 (National Laboratories) is very effective on reptiles (27). Use of such chemicals requires little additional time and effort, adds little to the bulk or weight of collecting equipment, and allows for preparation of better quality specimens. Urethane is carcinogenic, and caution should be observed with its use and field disposal. Other anesthetics may also be acceptable, especially since new agents are frequently developed. Gunshot is an acceptable and often necessary collecting technique, and is also recognized for euthanasia (13).

When special circumstances require that specimens (very small or larval animals, for example) be formalin-fixed without prior anesthetic killing, prior light anesthetization with an anesthetic such as MS-222 is recommended (31).

Live Capture. - Investigators should be familiar with herpetological capture techniques (5) and should choose a method suited to both the species and the study. Live-capture techniques should prevent or minimize damage to the animal.

Trapping. - Traps of various kinds are often necessary to obtain unbiased samples of secretive, nocturnal or infrequently

active species. The interval between visits to traps should be as short as possible, although it may vary with species, weather, objectives of the study, and the type of trap. Traps should be checked at least daily when weather conditions threaten survival of trapped animals. Investigators must make every effort to prevent trap deaths from exposure, drowning, cardiogenic shock, or capture myopathy (1). Traps should be sheltered from direct sunlight, and care should be taken to reduce predation in pitfall traps (29). Pitfall traps set during extremely dry periods should have some moisture provided to prevent desiccation of captured amphibians. Traps should be tightly covered between sampling periods and removed at conclusion of a study.

Habitat and Population Considerations. - Whether collecting for future release or for museum preparation, each investigator should observe and pass on to students and co-workers a strict ethic of habitat conservation. Because many essential details of life history will remain unknown until a study is well along, collecting always should be conducted so as to leave habitat as undisturbed as possible. Permanent removal of more than 50% of the animals from any breeding or hibernation aggregation should be avoided unless justified in writing for scientific reasons by the investigator. Similarly, relatively large collections of gravid females from any population for destructive sampling should be avoided unless justified for scientific reasons. When permanent, destructive human alteration of habitat is imminent (construction, water impoundment, etc.), removal of entire populations may be justified. Systematists should investigate extant collections for suitable specimens before conducting field work.

2. Restraint and Handling

General Principles. - The decision to use physical or chemical restraint of wild amphibians or reptiles should be based upon design of the experiment, knowledge of behavior of the animals, and availability of facilities. Investigators should determine and use the least amount of restraint necessary to do the job in a humane manner. Because amphibians or reptiles, especially venomous species (including those with to)dc skin secretions), may be capable of inflicting serious injury either on themselves or those handling them, some form of restraint often is prudent. Species should not be confined with others (other than food prey) that they may injure. The well-being of the animal under study is of paramount importance; improper restraint, especially of frightened animals, can lead to major physiological disturbances that can result in deleterious or even fatal consequences.

Animals are best handled quietly and with the minimum personnel necessary. Darkened conditions tend to alleviate stress and quiet the animals and are recommended whenever appropriate. When handling large reptiles, netting, or maneuvering or dropping them into a bag via hook, tongs, etc., is preferable inasmuch as they may suffer disproportionately great damage during struggling.

Administration of a tranquilizer to an animal that is restrained in a body squeeze may prevent injury to the animal and/or persons working with it. A brief review of restraint techniques for venomous snakes is available (15). Techniques often vary with size and species of the animal being handled.

In some cases, administration of general anesthesia for restraint in the field may be advisable. If so, the anesthetic chosen should be a low-risk one that permits rapid return to normal physiological and behavioral state. The animal must be kept under observation until complete recovery occurs. The relatively unpredictable and potentially delayed response of some ectotherms to immobilants or anesthetics may contraindicate use of these chemicals under field conditions. Investigators must understand the specific action of restraint chemicals on the taxa studied.

Hazardous Species. - Venomous snakes and lizards, certain large non-venomous lizards and snakes, some colubrid snakes (35), highly poisonous frogs, crocodilians, and some large turtles potentially are dangerous, and require special methods of restraint as a compromise between potential injury to handlers and injurious restraint of the animal. The particular method chosen will vary with species and the purpose of the project. Adherence to the following general guidelines is recommended when working with hazardous species (36):

a. Procedures chosen should minimize the amount of handling time required, and reduce or eliminate contact between handler and animal.

b. Those handling venomous snakes or lizards should be knowledgeable concerning the proper method of handling those animals. They should be aware of emergency procedures to be instituted in case of accidental envenomation. Location of a reasonably nearby supply of antivenin and of a physician with knowledge of envenomation treatment should be ascertained in advance.

c. One should avoid working alone. A second person, knowledgeable of capture/handling techniques and emergency measures, should be present whenever possible.

d. Prior consultation with workers experienced with these species, and review of the relevant literature, is of particular importance here since much of the information on handling dangerous species is not published, but is passed simply from one investigator to another.

Chemical Restraint. - Many chemicals used for restraint or immobilization of amphibians or reptiles are controlled by the Federal Bureau of Narcotics and Dangerous Drugs/Drug Enforcement Administration (DEA). A DEA permit is required for purchase or use of these chemicals. Extensive information on these substances and their use is available (8-10), and permit application procedures are available from regional DEA offices.

The potent drugs available for wildlife immobilization when properly used are, with the exception of succinylcholine, safe for target animals but can be extremely dangerous if accidentally administered to humans. The degree of danger varies according to the drug, and users must be aware of the appropriate action to take in the event of accident (11). Neuromuscular blocking agents do not render animals unconscious, and subsequent handling may be traumatic. More effective chemicals are available for immobilizing most amphibians and reptiles (9). Several common local anesthetics (e.g., Tetracaine, Lidocaine, Piperocaine, etc.) have temporary, but severe, myotoxic effects on mammals (34). Their effect on ectotherms is unknown, but animals treated with these should be observed before release to the wild to be certain that behavior approximates normal. Investigators should choose the chemical for immobilization with consideration of the effects of that chemical on the target organism. Because of the uncertainty of chemical actions on ectotherms, certain minor procedures may in the long run be less traumatic to animals when anesthetics are not used.

Certain chemicals produce initial excitement before anesthesia, suggesting their use in conjunction with tranquilizers. An increasing body of knowledge (e.g., 33) indicates that pain perception of the many species of vertebrates is not uniform over the various homologous portions of their bodies. Therefore, broad extrapolation of pain perception across taxonomic lines should be avoided. What causes pain and distress to a mammal does not necessarily affect a reptile or amphibian equivalently.

3. Animal Marking

Marking animals for field recognition is an essential technique in biological research. Important considerations in choosing a marking technique concern effects on behavior, physiology, and survival of the animal. The utility of any technique varies with the species under study; tissue-removal techniques may pose less long-term survival threat to some species than certain tagging methods. Marking techniques for amphibians and reptiles have been reviewed extensively (12). Although field observation indicates that individual wild animals can survive extensive tissue damage from natural causes (30), the effect of most tissue-removal marking techniques on survival and fitness is not adequately known and is a topic worth investigating.

When choosing an acceptable marking technique, investigators must consider the nature and duration of restraint, the amount of tissue affected, whether pain is momentary or prolonged, whether the animal will be at greater than normal predation risk, whether the animal's ability to mate is reduced, and whether the risk of infection is minimal. Careful

testing of marking techniques on captive animals before use on free-ranging animals may reveal potential problems and is recommended. It may be desirable to use redundant techniques to assure accuracy during a study.

Toe Clipping. - Toe clipping should be used only for general marking of free-ranging animals when toe removal is not judged (by observation of captives or of a closely-related species) to impair the normal activities of the marked animal. Toes essential to animals for activities such as burrowing, climbing, amplexus, or nest excavation, should never be removed. No more than two non-adjacent toes per foot should ever be removed. If behavior or survival of the animal is likely to be seriously impaired, alternate marking techniques should be used. Clarke (24) reported adverse effect of toe-clipping on survival of *Bufo woodhousei.* Critical study of the effects of this technique on fitness would be a valuable contribution.

Scale ClippinglBranding. - Removal of subcaudal or ventral scutes according to a standardized numerical code provides a good permanent marking system for snakes which does not appear to increase mortality or impair locomotion (26). The scute is removed with small surgical scissors, or by rapid cauterization; healing usually is rapid, and infection is rare. Electrocauterization of a number or letter on the skin, in which deep layers of skin are cauterized to prevent regeneration, is comparable. Brand marks may not be visible in amphibians after a few months. The use of a local anesthetic (aerosols containing benzocaine, such as Cetacaine, may be applied) is urged with branding or electrocauterization. The less permeable skin of reptiles reduces the effectiveness of topical products.

Tattoos and Dye Markers. - Tattooing has been used with success on both amphibians and reptiles' Two potential problems should be resolved prior to tattooing: 1) selection of a dye which will contrast with the normal skin pigmentation; and 2) loss of legibility due to diffusion or ultraviolet degradation of the dye.

Paint should not be used to mark the moist and permeable skin of amphibians. Various vital stains are more suitable. Reptile skin permeability is quite variable, and paint or paint solvents may be absorbed and cause death of the animal. Paints with non-toxic pigments, bases, and solvents must be used. When toxicity is unknown, laboratory trials, even if limited, should be done before field use. Very tenacious paints may, if applied across shell sutures, severely distort ' the normal shell growth of turtles, especially sub-adults. Paint should not be applied to sutures of turtle shells.

Banding and Tagging. - The size, shape and placement of tags should be appropriate to permit normal behavior of the animal marked. Bands and tags projecting from the body may produce physical impairment or enhance the risk of entanglement in undergrowth or aquatic cover. Brightly colored tags also may compromise an animal's camouflage. Raney and Lachner (21) documented growth cessation in jaw-tagged toads. Graham (19) cautioned that Petersen discs may cause mortality when used on freshwater turtles; they therefore must be used with great care in this application. Their use on marine turtles less exposed to the hazards cited by Graham may be less risky. Colored mylar ribbon tags 1-2" long may prove an acceptable alternative for freshwater turtles. Colored discs and tags conceivably could function as predator attractants.

Shell Marking. - In most species of turtles, the bony shell can be marked by cutting notches or small holes in the marginal scutes of the carapace. In addition, disc-type tags and clamp-on ear-type tags (see cautionary remarks above) have been applied to those soft-shelled turtles that lack bony scutes and to sea turtles.

Radiotelemetry. - Radiotelemetry is a specialized form of animal marking, and the same general caveats apply. Transmission is regulated by the Federal Communications Commission, and investigators should inquire about the availability of the frequencies they plan to use. General telemetry techniques are summarized in (14), and new ones are continuously becoming available.

There are differences of opinion regarding maximum recommended ratios for transmitter weight to animal weight. Most agreement seems to settle around 10%, and most of this weight will be battery where long transmitter life is necessary; in practice, component miniaturization allows ratios of about 6% for many applications. Smaller (and hence shorter-lived)

batteries presently are the only means of achieving these ratios with small animals. Researchers intending to use radiotelemetry on amphibian or reptilian species should consider the following guidelines and comments:

a. Force-Fed and Implanted Transmitters. - Force-fed packages should be small enough to pass through the gut without greatly impairing the passage of food. Force-fed or implanted packages should be coated with an impervious, biologically inert material before use. Force-fed packages should not be secured within the animal by suturing the gut. If secured within the animal via body-band, the band should be removed periodically to allow resumption of feeding.

The size and placement of implanted transmitters should not interfere with the function(s) of the organs surrounding them or with normal behavior. For intracoelomic or subcutaneous implants, suturing the transmitter package in place may be necessary to prevent its movement or interference with vital organs. Implants should be done in aseptic conditions.

b. Externally Attached Transmitters. - Consideration must be given to the effect of the package on behavioral interactions between tagged animals and other individuals. For example, the transmitter should neither conceal nor enhance the appearance of behaviorally important dorsal crests or gular flaps. Transmitters should be shaped and attached so as to eliminate or minimize the risk of entanglement with vegetation or other obstructions. Transmitter attachments that can be expected to greatly impair reproduction, locomotion or other normal activity of the animal should be avoided.

Most amphibians and reptiles, including adults, may continue to grow throughout life. External transmitters must be removed or designed to be lost after a time, or they may constrict or irritate the animals. External transmitters can be attached to crocodilians and turtles by collars, clamps, or adhesives. Rigid adhesives and paints extensively applied across sutures of shells of young turtles may impair normal growth if left in place over several years. Special consideration must be given to soft-shelled species to prevent abrasion (18).

Radioisotopes. - The use of radioisotopes as markers in natural systems is valuable, and may be the only means of adequately gathering data on movements of very small species; the technique, however, should be undertaken with caution. Special training and precautions are required of researchers by federal and, frequently, state law (22). A license, which specifies safety procedures for laboratory use, is required for release of isotopes into natural systems and for disposal of waste material. The pros and cons of using strong emitters must be assessed in terms of possible deleterious effects on the animal, to predators that might ingest isotope-labeled animals, and potential hazard to the public.

Housing and Maintenance at Field Sites

Because the biological needs of each species and the nature of individual projects vary widely, only the most general recommendations on housing wild vertebrates in the field can be made. When dealing with unfamiliar species, testing and comparing several methods of housing to find the method most appropriate for the needs of the animal and the purposes of the study may be necessary. Restraint and ease of maintenance by animal keepers should not be the prime determinant of housing conditions.

Normal field maintenance should incorporate, as far as possible, those aspects of natural habitat deemed important to the survival and well-being of the animal. Adequacy of maintenance can be judged, relative to the natural environment, by monitoring a combination of factors such as changes in growth and weight, survival rates, breeding success, activity levels, general behavior, and appearance. Consideration should be given to providing an environment that includes features such as natural materials, refuges, perches, and water baths. Natural foods should be duplicated as closely as possible, as should natural fight and temperature conditions unless alterations of these are factors under investigation.

Frequency of cage cleaning should represent a compromise between the level of cleanliness necessary to prevent disease,

and the amount of stress imposed by frequent handling and exposure to unfamiliar surroundings and bedding. Applied knowledge of animal ethology can assist the investigator to provide optimum care and housing.

Disposition Following Studies

Upon completion of studies, researchers should release field trapped specimens whenever this is practical and ecologically appropriate. Exceptions are: if national, state or local laws prohibit release, or if release might be detrimental to the existing gene pools in a specific geographic area. Obviously, some specimens will be deposited as voucher specimens in an appropriate reference collection to document that the identification was appropriate and to provide a basis for comparison among studies.

As a general rule, field-trapped animals should be released only:

a. At the original site of capture, unless conservation efforts or safety considerations dictate otherwise. For these latter exceptional circumstances, prior approval of relocation should be obtained from appropriate state and/or federal agencies, and approved relocations should be noted in subsequent publication of research results.

b. If their ability to survive in nature has not been irreversibly impaired.

c. Where there is reasonable expectation that the released animal will re- establish its former social status.

d. When local and seasonal conditions are conducive to survival.

Captive animals that cannot be released should be disposed of properly, either by distribution to colleagues for further study, or by preservation and deposition as teaching or voucher specimens in research collections.

In both the field and laboratory, the investigator must be careful to ensure that animals subjected to euthanasia procedure are dead before disposal. in those rare instances where specimens are unacceptable for deposition as vouchers or teaching purposes, disposal of carcasses must be in accordance with acceptable practices as required by applicable regulations. Animals containing administered toxic substances or drugs (including euthanasia agents like T-61) must not be disposed of in areas where they may become part of the natural food web.

Preparation and Revisions of These Guidelines

The initial draft of these guidelines was prepared by George R. Pisani (SSAR), Stephen D. Busack (HL) and Herbert C. Dessauer (ASIH). Victor H. Hutchison prepared the formal copy and Gary D. Schnell the camera-ready copy. The final product represents the collective efforts of over 60 persons and the societies extend sincere thanks to all participants.

Periodic revision of these guidelines is expected. Investigators are encouraged to send constructive criticisms or applicable new information to officers of the societies.

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APPENDIX A
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