

STANDARD OPERATING PROCEDURE
ENVIRONMENTAL ENRICHMENT FOR TURTLES AND TORTOISES
USED IN RESEARCH AND TEACHING

1.0 PURPOSE:

- 1.1 This standard operating procedure (SOP) describes the methods for environmental enrichment of turtles and tortoises (*Testudines/Chelonia*) used for research and teaching purposes.
- 1.2 These methods are intended to improve the well-being of these animals by increasing species-specific behaviors and reducing maladaptive behaviors.
- 1.3 This SOP is part of the UGA Environmental Enrichment Program that fully complies with the requirements of the National Research Council, *Guide for the Care and Use of Laboratory Animal*, ed8 available at <http://grants.nih.gov/grants/olaw/Guide-for-the-Care-and-Use-of-Laboratory-Animals.pdf> and the Animal Welfare Act and Regulations: Public Law 99-198 – The Improved Standards for Laboratory Animal Act available at <http://www.nal.usda.gov/awic/legislat/awa.htm>.

2.0 STANDARDS:

2.1 Natural Behavior:

Most tortoises and turtles are reptiles from the family *Testudines* or super-Order *Chelonia*. (Ernst and Lovich, 2009; Dergus, 2007) The entire group is often known as chelonians. The earliest known chelonians date from 220 million years ago, making them one of the oldest reptile groups. (Li et al, 2008) Most land-dwelling species are known as tortoises, while most water-dwelling species are known as turtles. Both animals are shielded by a shell, from which the head and limbs may be withdrawn but the whole body can never detach. Tortoises commonly have large, domed shells, while turtle shells are often nearly flat and more streamlined. Like all reptiles, chelonians are ectotherms, their internal temperatures varying with the temperature of the ambient environment. Tortoises will often use mud pits or vegetation shade to regulate their body temperatures. They often require wet substrate or misting for internal water regulation. Turtles will use varying water temperatures to regulate their body temperature. Many turtles will also have webbed feet with claws. These reptiles tend to be reclusive and shy in nature. Most tortoises are found in Asia and Africa but some species exist in the Americas. Turtles are more common to Africa and the Americas, but can exist in oceans and seas throughout the world. Most tortoises are herbivores but some will eat live insects. However, too much protein can be deleterious, leading to shell deformities and other medical problems. (Foster & Smith, 2011) Most turtles are omnivores, commonly eating fruits, vegetation, small fish and invertebrates. Due to the wide range of diets, it is necessary to investigate nutritional requirements for each individual species. All chelonians have very long life-spans, (80-150 years for tortoises and 20-40 years for turtles). (Angier, 2012) The social behavior of turtles has not been well studied. There is little paternal care for hatchlings but turtles can and do interact with each other during feeding, courtship and basking. Nevertheless, detailed studies of social dynamics are lacking. Some early studies do indicate that chelonians form dominance hierarchies and are found to preferentially affiliate and interact with individuals of their own species. (Davis, 2009)

- 2.2 Environmental enrichment must be evaluated by taking into account the following:
- 2.2.1 The Natural Behavior and needs of turtles and tortoises (see above)
 - 2.2.2 Social Enrichment – Housing of compatible co specific might offer some level of enrichment. Every effort will be made socially house social species. If social housing is not possible, animals should be housed in a manner that allows for as much tactile, auditory, visual or olfactory contact as possible. Social housing is a recognized and important part of the Environment Enrichment Program but should not be viewed as the sole means of meeting the enrichment needs of animals.
 - 2.2.3 Physical Enrichment (devices, toys, etc) – Physical enrichment can be an important part of the Environmental Enrichment Program. However the selection of physical enrichment should take into account the safety of the device, its ability to stimulate and maintain the animal’s interest and its impact on the research being conducted. Physical enrichment should be carefully monitored to assess its impact of the goals of increasing natural behaviors.
 - 2.2.4 Activity/Food Enrichment – Activity/food enrichment can be an important part of the Environmental Enrichment Program. However, the selection of activity/food enrichment should take into account the health of the animal, the limitations of its confines and its impact on the research being conducted. Any activity/food enrichment should be planned in consultation with the Attending Veterinarian (AV) and the Principal Investigator (PI).
- 2.3 The enrichment program is carried out by University Research Animal Resources (URAR). Specific needs and requirements should be communicated to the Assistant Director of the Animal Resources (AR) Unit.
- 2.4 Unless specifically justified by the PI in the Animal Use Proposal (AUP), all animals will receive enrichment. It is recognized that animal enrichment can be a research variable. In caring for the psychological well-being of animals, it is important to recognize limitations and use a balanced approach in providing the best possible care and allowing for the expression of species-typical behavior within a functioning research environment.
- 2.5 Abnormal Behaviors:

The Environmental Enrichment Program is a dynamic process. Ongoing evaluation is a necessary component to meeting the goal of more species-specific natural behaviors. University Research Animal Resources (URAR) will regularly monitor all enrichment, in part, by looking for stereotypical behaviors that might indicate animal stress or maladaptation to the laboratory environment.

Abnormal behaviors in chelonians include:

- Inactivity
- Anorexia
- Irregular locomotion: walking or swimming
- Abnormal shell development

When these behaviors are observed, URAR will evaluate the need for additional environmental enrichment. All changes to enrichment will be approved by the AV and the PI. Enrichment changes will be made for all animals on study, in order to minimize research variability, even if all of the animals are not showing the stereotypical behavior.

3.0 PROCEDURES:

- 3.1 Social Enrichment – Chelonians will be group housed if possible. Until proven otherwise in the literature, it will be assumed that chelonians are social species.
- 3.2 Physical Enrichment for Tortoises- in order of preference
 - 3.2.1 Box with substrate appropriate for the species
 - 3.2.2 Regular misting and shelter for hiding as appropriate for species and size of animals
 - 3.2.3 Ramp for climbing
- 3.3 Physical Enrichment for Turtles - in order of preference
 - 3.3.1 Water enrichment large enough to swim (75-78 degrees F) and dry, warm site for basking with ramp (~90 degrees F) Note: No artificial plants!
- 3.4 Activity/Food Enrichment for Tortoises - in order of preference
 - 3.4.1 Leaves, stems, fruits, flowers and seeds for foraging
- 3.5 Activity/Food Enrichment for Turtles - in order of preference
 - 3.5.1 Aquatic plants for foraging
 - 3.5.2 Small fish or invertebrates for foraging

4.0 RECORDS:

The Animal Care Staff will log provision of enrichment daily according to their facility specific documentation records.

5.0 DEFINITIONS AND REFERENCES:

- 5.1 Definitions:
 - 5.1.1 Animal Use Proposal (AUP): a detailed written description of the procedures involving the use of animals in a research or instructional project.
 - 5.1.2 Attending Veterinarian (AV): the veterinarian responsible for the health and well-being of all laboratory animals used at the institution
 - 5.1.3 Enrichment: a method of providing animals with the opportunity to behave as they do in the wild, playing, foraging, grooming, and interacting in other ways with one another.
 - 5.1.4 Principal Investigator (PI): the scientist who plans and coordinates all phases of the research or instructional work and the protocol.
 - 5.1.5 Standard Operating Procedure (SOP): a set of standardized instructions for dealing with routine laboratory procedures

5.2 References:

- Angier, N. (2012) *All but Ageless, Turtles Face Their Biggest Threat: Humans*. The New York Times
- Animal Welfare Act and Regulations: Public Law 99-198 – The Improved Standards for Laboratory Animal Act (<http://www.nal.usda.gov/awic/legislat/awa.htm>)
- Boyer, T.H. and Boyer, D.M. (1996) *Turtles, tortoises, and terrapins: Reptile Medicine and Surgery*. W.B. Saunders Co.
- Davis, K. (2009) *Sociality, Cognition and Social Learning in Turtles (Emydidae)*. Trace: Tennessee Research and Creative Exchange
- de Vosjoli, P. (1999) *Designing environments for captive amphibians and reptiles: The Veterinary Clinics of North America: Exotic Animal Practice*. W.B. Saunders
- Dergus, Charles (2007) *Turtles: Wild Guide*. Stackpole books
- Donoghue, S. and McKeown, S. (1999) *Nutrition of captive reptiles: The Veterinary Clinics of North America: Exotic Animal Practice*. W.B. Saunders
- Ernst, C. and Lovich J. (2009) *Turtles of the United States and Canada*. JHU Press
- Foster & Smith, Inc. (2011) *Shells: Anatomy and Diseases of Turtle and Tortoise Shells*. Veterinary and Aquatic Services Department
- Highfield, A.C. (1996) *Practical Encyclopedia of Keeping and Breeding Tortoises and Freshwater Turtles*. Carapace Press
- Li, C. et al. (2008) *An ancestral turtle from the Late Triassic of southwestern China*. Nature
- Kaplan, M. (1994) *Red-eared slider* www.anapsid.org/redslider
- McArthur, S., Wilkinson, R. and Barrows, M. (2002) *Tortoises and turtles: British Small Animal Veterinary Association Manual of Exotic Pets, 4th ed.* BSAVA
- Meyer, Rachelle (2013) *Gopherus agassizii* at www.fs.fed.us/database/feis/animals/reptile/goag/all.html
- National Research Council, *Guide for the Care and Use of Laboratory Animals*, ed 8 available at <http://grants.nih.gov/grants/olaw/Guide-for-the-Care-and-Use-of-Laboratory-Animals.pdf>
- Vause, Kathy (2013) *Reptile Enrichment at the Riverbanks Zoo*. www.reptilebehavior.com/riverbankspaper.htm