



Overwintering in Pennsylvania

a herps tale

A warm raining night in early springtime is marked by deafening amphibian calls and increased amphibian activity. This sharp contrast in noise and activity levels following the relative silence of fall and winter brings up the question where do all the herpetofauna (snakes, lizards, frogs, toads and turtles) go over the winter?

Herpetofauna are ectothermic (cold blooded) animals which regulate their body temperatures based on the temperature of the environment. Because winters in Pennsylvania bring cold temperatures, snow, ice, soil freezing, and the reduction of food supplies, the herpetofauna who live in Pennsylvania and other cold climates must change their lifestyles during the winter months in order to survive.

For some species such as the aquatic and mole salamanders their habitats protect them from the harsh and drastic climate changes of winter allowing them to continue to function throughout the year. The mole salamanders are a class of salamander which spends most of the year below ground in tunnels which they have created. These subterranean tunnels maintain a microclimate that is changes less drastically then the

surface climate. Likewise the aquatic salamanders are protected in winter by the water body in which they live. Large bodies of water have two qualities which help protect all ectotherms which live in them; first they gradually warm and cool with the changes of the season allowing the animals time to acclimate and secondly an ice layer at the surface insulates the warmer water below from the below freezing air temperatures. While these species may maintain active throughout the year usually there is a reduction in activity to conserve energy and oxygen.

Some species of herpetofauna are required to drastically change their activity and location in order to survive the winter months. For these species the types of hibernacula (the habitat where an animal overwinters) that they use greatly depends upon both internal and external factors. The internal factors are the animal's physical ability to change its surroundings or its physiological ability to change how its body adapts to the environment. The external factors include the local climate and availability of environmental elements such as the presence of a specific type of ground cover or flowing water.

Most turtles, the true frogs and some salamander species whose active seasons are related to a dependence on a water source such as a pond, stream or seep choose to return to these water sources in the winter. Once in the water these animals will hibernate in the mud or sand substrate until the warmer water temperature return conserving energy and protecting their body tissues freezing.

For the more terrestrial animals whose active seasons do not depend on a water source their choice of hibernaculum greatly depends on their ability to create or find a suitable habitat. Toads and certain species such as the box turtle, gray tree frog, spring peeper and the chorus frog will either dig an underground habitat or create one in the debris layer of its surroundings. Some but not all of these terrestrial hibernators have another protection mechanism which allows their body to tolerate being partially frozen for a short period of time. This becomes especially useful if the hibernaculum is not below the frost level which can be as deep as 40 inches in Pennsylvania or is compromised allowing exposure to the elements. Protection mechanisms vary but all function to achieve the same goal, to control ice crystal formation within body tissues. Uncontrolled ice crystal formation causes living cells to rupture and die. By reducing the amount of water body tissues and increasing the amounts of solutes (commonly sugars) in the remaining fluid makes it harder for large ice crystals to form. The controlled formation in of small ice crystals in noncritical body areas for short periods of time is survivable for some herpetofauna.

Other terrestrial animals whose body structure does not allow them to dig or create habitats become oppor-

tunistic hibernacula seekers. Crevices in rocks, caves and burrows built by other animals or tree stumps that create an area protected from the surface climate are ideal places for animals such as snakes and lizards to hibernate, often communally.

While we know that communal hibernation may partially be a result of limited adequate winter hibernacula it is also likely that this practice has a biological benefit for the individual which has yet to be widely described by herpetologists.

The overwintering survival strategies are not known for all of the species of herpetofauna in Pennsylvania and there is a degree of variation in species depending on their specific location and available resources. We do know that for all ectothermic animals the survival of each individual is dependent on the effectiveness of their choice of hibernaculum, protecting them from long-term exposure to the cold of winter. Choices the animal makes such as emerging too soon from their hibernaculum in response to a midwinter warm spell or not making a terrestrial hole deep enough can result in the death of the animal.

While encountering herpetofauna during a Pennsylvania winter is obviously more difficult than during the other seasons. Experienced field herpetologists report that they commonly have located terrestrial salamanders under cover and occasionally spot turtles and snakes basking on sunny days. While rare, some individuals have even discovered frozen frogs. For each successful animal, the long winter inevitably leads to spring when they can be active again.

