Eastern Tiger Salamander Tracking and Monitoring Techniques

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Abstract
Various methods are used for the tracking and monitoring of the New York State Endangered Species, the Eastern Tiger Salamander (Ambystoma tigrinum). Such techniques as radio tracking, drift fencing, seining, and the use of an artificial egg-laying substrate, allow for the collection of data on several species currently existing around Brookhaven National Lab (BNL). This decrease in tiger salamander habitat is widely attributed to development and human impact on the land. Through the tracking and monitoring of this New York State endangered species, one can survey the impact of development on an area, and what can be done to preserve the natural habitat of the animals which reside there.

Methods and Materials
1.) Drift Fence Surveys
Drift fences serve as a means of monitoring salamanders in their natural habitat. Fences are constructed around the pond in an effort to sample the salamander as they move to and from aquatic breeding sites. Traps are checked daily for salamanders that have been captured. Animals found are then processed at the site, as weight, length, air and water temperature, pond water depth, and time are all taken into account.

2.) Egg Mass Grids
Egg mass grids are used to detect the presence of tiger salamanders, by serving as artificial oviposition sites at ponds and vernal pools. Grids are assembled from polyvinyl chloride (PVC) tubing and nylon cord. PVC is connected in a rectangular shape and holes are drilled at intervals, which the nylon cord is then drawn through, and woven in 10 cm squares. Foam pipe insulation is attached to one end to facilitate relocation. Additionally, GPS coordinates are taken, as well as date, time, air temperature, wind speed, and humidity.

3.) Seining
Seining is used to assess the species richness of animals in a pond, also allowing for detection of tiger salamanders. In addition, seining allows for the removal of salamander larvae and metamorphs from the water in order to count and identify (figure 4). Seining is best performed at night, when larvae rise up in the water column to feed. For small ponds, it is most effective to seine directly across the entire pond from shore to shore. In larger ponds, it is most effective to seine in towards shore in one continuous sweep. The bottom of the seine should be held to the pond floor by lead weights, to ensure an accurate survey of species richness and pond diversity. Each side of the net is attached to a seine pole, allowing the user to drag the net through the water, while keeping the bottom edge on the pond floor.

4.) Radio Tracking
After being found in vernal pools and ponds, by way of previously mentioned methods the salamanders are marked by a transmitter during a short surgery. During the approximately twenty minute operation, the salamander is anesthetized by an anesthetic known as MS-222 (tricaine methanesulfonate). A small incision is made on the abdomen, and the transmitter is inserted into the coelomic cavity (figure 7). If an individual already carries a transmitter, it must be removed in order to accommodate a new transmitter. At the end of the surgery, animals with remaining transmitters should be found in order to remove transmitters. The incision made on the animal is closed with a non-dissolvable polyviolene suture (figure 5). The animal is rinsed with water so that any remaining anesthetic is removed, and revives about 2 to 3 hours after the surgery. The animal is placed in a plastic container, kept moist by a wet paper towel, and recovers within hours, ready to return to its natural habitat.

Tracking the animal back in its natural habitat is performed using handheld radio receivers attached to the 3-element yagi antenna. This system detects radio signals which become progressively stronger as the animal becomes closer. When a signal is tracked to a specific point, it is marked by flagging in the field to facilitate relocation. Additionally, GPS coordinates are taken, as well as date, time, air temperature, wind speed, and humidity.

Results
1.) Drift Fence Surveys
As a year round survey, drift fences provide information as to when tiger salamanders move to and from breeding sites as well as when movements due to weather occur. Metamorphs began emergence in late June and have continued through August.

2.) Egg Mass Grids
Egg mass grids were constructed or repaired, and placed at ponds in preparation for the tiger salamander breeding season, which begins around January, ending in April, with most activity generally taking place in March.

3.) Seining
Seining attempts produced confirmation of the presence of tiger salamanders in various ponds at BNL (figure 6). Seining in mid to late July indicated that metamorph emergence was nearing completion, as seining attempts provided less animals.

4.) Radio Tracking
Approximately 40 tiger salamanders are currently being tracked at 4 different ponds on lab property. Thus far, there have been no known mortalities due to transmitter implants. When dug up to change transmitters, one transmitter was found showing evidences of predation, potentially by a short tailed shrew. It was also confirmed that tiger salamanders are more prone to movement during and soon after precipitation. (Faccio, 2003) The premature loss of some signals was suspected to be due to predation, transmitter failure, or length of migration.

Discussion/Conclusion
By tracking and monitoring the tiger salamander, one can determine during which periods migration to and from breeding pools occur, at what point metamorphosis of tiger salamander larvae is complete, and the distance of migration after breeding or emergence. Knowledge of movements and habitat preferences is essential to the preservation of this endangered amphibian.

Literature Cited
http://www.dec.state.ny.us/website/dfwmr/wildliferf/herp/ eatisala.gif

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Introduction
Once traced to Albany, tiger salamander populations are now found in New York State solely in Nassau and Suffolk counties on Long Island (figure 1). This decrease in tiger salamander habitat is widely attributed to development and human impact on the land. Through the tracking and monitoring of this New York State endangered species, one can survey the impact of development on an area, and what can be done to preserve the natural habitat of the animals which reside there.

Due to the fragile breeding habitat which tiger salamanders employ, this species serves as an indicator to the condition of the surrounding environment. Although tiger salamanders spend the majority of their time upland in a fossorial environment, the condition of the habitat in which they breed is of great importance to their survival as a species.