There are currently four recognized genera of the icosahedrally symmetric iridoviruses that infect both invertebrates (Iridoviridae and Chorizoviridae) and poikilothermic vertebrates (Lymphocystiviridae and Ranaviridae). While Lymphocystiviruses have only been found in freshwater and marine fishes, Ranaviruses have been isolated from fish, reptiles, and amphibians.

Ranaviruses have only been documented in a relatively few number of reptiles when compared to the number of viruses that have been documented in amphibians and fish [4]. The majority of ranaviruses have been observed in herpetofauna. Of important note are the multiple occurrences of iridovirus infections in Eastern box turtles (Terrapene carolina carolina). A ranavirus (TV3) may be responsible for box turtle epizootics as early as 1991. The current investigation focuses specifically on the discovery of an iridovirus infection in two wild box turtles which were found at Brookhaven National Laboratory in Suffolk County, New York (USA) on 2 August 2005. The turtles exhibited ocular discharge and swelling, aural abscesses, and yellow caseous plaques. Later histopathology, PCR, and virus isolation confirmed a ranavirus infection [8]. This finding poses a threat to box turtles in surrounding areas since the species is listed as Special Concern by the New York State Department of Conservation. According to De Vos et al. (2004), “under appropriate environmental or host circumstances, this ranavirus [TV3] may be capable of causing considerable morbidity and mortality in eastern box turtles.” [7]

In investigating ranavirus transmission in Eastern box turtles at Brookhaven National Laboratory, the determination of home range, among other parameters, was necessary in order to evaluate the potential spread of the virus within the turtle population. Three techniques are generally used to study the movements and home ranges of box turtles: the mark-recapture protocol, tracking, and radiotelemetry. Radiotelemetry provides a reasonably accurate assessment of habitat use and movement patterns over a long time span [6]. Habitat quality, structure, diversity, and individual preference all account for variation in size and spatial distribution of home ranges. This explains the wide array of box turtle home range estimations that vary from 1 to 9.77 ha [6]. Due to this variability, it is necessary to determine home range size and spatial structure of box turtle home ranges. Due to this variability, it was crucial to determine home range size specific to the study area in question. Radiotransmitters were attached to 5 box turtles inhabiting the area of Ranavirus discovery and their daily movements and habitat preferences were recorded. Geographic Information Systems (GIS) was used to digitally map home range area in order to determine Ranavirus dynamics and the potential for disease spread within the box turtle population. Preliminary results indicate that the virus is likely present in the box turtle population at Brookhaven National Laboratory. Home ranges of turtles appear to be relatively small but overlapping which suggests favorable conditions for virus spread, depending on encounter rates and modes of transmission.

RESULTS

Fig. 11- Map representing encounter locations, directional movements, and home range overlap of radio tracked turtles using minimum convex polygons

We were not able to successfully isolate or amplify either turtle or iridovirus DNA from the oral and cloacal swabs so the distribution of non-infected and infected turtles could be not spatially mapped and analyzed. Two turtles were found during this study (one in the study area) that exhibited viral symptoms including caecal abscesses. Both were taken to a rehabilitator and one died shortly after. The abscess on the deceased turtle was tested for turtle and viral DNA but also yielded no results.

DISCUSSION AND CONCLUSION

Preliminary results suggest iridovirus is still present in the population of Eastern box turtles at Brookhaven National Laboratory because two turtles found exhibited advanced signs of infection. The technique used for DNA isolation and amplification is not successful thus far with oral and cloacal swabs. Swabbing may not be an adequate means of collecting DNA or the PCR product may have become contaminated. A different thermal cycling regime was followed and a previous experiment was previously described which may also be the source of error. Data from the five radio tracked turtles confirms that box turtles have well-defined home ranges that often grossly overlap and are considerably smaller than was previously described in iridovirus isolation which may also be the source of error.

REFERENCES


ACKNOWLEDGEMENTS

I would like to thank the Department of Energy and staff of Brookhaven National Laboratory for the opportunity to participate in the Student Leadership Internship Program (SLIP). I would especially like to send thanks to my mentor, Valerie Titus, for her guidance, expertise and patience throughout the project. Finally I would like to thank Donn Jevi in the High School Research Program for her help collecting data in the field and enduring the ticks.

Home Range Analysis

In order to determine box turtle home range specific to the study site, radiocollared turtles were attached to 5 box turtles inhabiting the area of Ranavirus discovery. Transmitters were attached to the carapace and encased using Oatey epoxy putty, which was later colored black to ensure camouflage.

Turtles were tracked daily and location was recorded using a Global Positioning System (GPS). Weather and vegetation plot data was also collected for future analysis of habitat preference.

Using Geographic Information Systems (GIS) daily and total movements and minimum convex polygons were used to analyze the home range of individual turtles and to determine average home range and chance of encounter between turtles.