Habitat Conservation Fund Final Report

Mercury(Hg) in Nova Scotia river otter (*Lutra canadensis*)

Previous studies in southwestern Nova Scotia, using otter carcasses, determined that otter from inland habitats had significantly higher Hg levels then otter from coastal habitats (Burgess et al. 1999). In my study I used both live captured radio tagged otter as well as carcasses. First, using the live captured otter I studied home range data to determine if otter used either coastal or inland habitats or a combination of the two habitats. I tested for a difference in fur Hg from inland versus coastal habitats. I also tested whether females and males differed in Hg and whether this was influenced by home range. Since exposure to Hg may depend on the size of an area in which an otter travels, I tested for a difference in size between coastal versus inland home range areas.

To carry out these objectives I live trapped otter from both coastal and inland habitats in Yarmouth/Digby counties, fitted them with radio implants, removed a fur sample for Hg analysis and released the animal at it's place of capture. Each otter was then tracked on a weekly basis by helicopter and GPS locations were recorded. Using these GPS locations a home range was determined for each otter and compared to the Hg analysis.

My results showed that most otter (7 of 10) used either a distinct coastal or inland habitat. The remaining 3 used both habitats equally. Inland otter had significantly higher Hg levels then coastal otter based on home range location. Hg did not differ between male and female otter and there was no significant difference between male and female home range area, or coastal versus inland home range area.

Using trapper provided otter carcasses. I tested for a difference in Hg between older versus younger otter and I tested if age ratio of populations was affected by Hg. This was accomplished by removing a fur sample from each carcasses for Hg analysis and extracting a canine tooth for age analysis.

I also used Hg analysis from collected fur to get a Hg profile for Nova Scotia and to determine if otter less than 10 km from the coast have lower Hg then those further away from the coast. Since Hg is naturally occurring in the earth's crust, especially in granite and related rocks, and acid erosion can leach this Hg into overlying watersheds, I tested if otter from the Meguma Terrane (composed highly of granite and found mostly in southwestern and parts of central Nova Scotia) had higher Hg then those from the Avalon Terrane (composed mainly of tightly compacted sedimentary rocks and found in eastern Nova Scotia). Previous studies have shown that Hg increases in watersheds dammed to provide power (Kelly et al. 1997). To this end, I tested if otter from watersheds with a Nova Scotia Power dam had higher fur Hg then those from un-dammed watersheds. For these objectives I compared the location in which the otter was trapped with fur Hg.

Results using carcasses showed adult otter to have higher Hg then juvenile otter. The Hg profile for the province showed the western region to have the highest Hg, followed by the central region and finally the eastern region. Regions were based on the Department of Natural Resources classification system. Otter less than 10 km from the coast had significantly lower fur Hg then those further from the coast. I found significantly higher Hg in otter from the Meguma Terrane versus the Avalon Terrane and in watersheds with a power dam versus un-dammed watersheds. Fifty-one percent of the variation in mercury levels can be explained by the distance and otter lives from the coast, the underlying bedrock and the presence/absence of a power dam.

The major achievement that resulted from this study is that I successfully defended by masters thesis at Acadia University in October 2006. Secondly, I was able to work with many different people including students, trappers, technicians, conservation officers, veterinarians and biologists from many different departments and universities. The networking opportunities provided by this project will be valuable in my career development. Thirdly, since there are many things about Hg and how it effects wildlife and humans, this project continued previous work by many researchers, providing more pieces to add to the Hg puzzle. Finally, at the beginning of this project we had some mortality. By talking to many researchers who have worked with otter and changing a number of procedures in our animal care protocol we were able to overcome these setbacks. The intent is to publish our difficulties and how they were resolved so these deaths can be prevented in the future.

To date, there remain a few otter with active radio tags which I am tracking as time allows. Some otter with radio tags have been trapped during the regular trapping season over the last couple of years. These carcasses are returned to me and I am removing another fur sample for Hg analysis. The original fur sample is then compared to the second sample in order to study Hg accumulation over time.

During the course of this study the possible interaction of selenium (Se) with Hg in order to lessen the uptake of Hg by wildlife was suggested as one reason why Hg is less in some otter then in others. In some studies Se has been added successfully to lakes in order to decrease Hg in fish (Paulsson et al.1991). I believe studying the availability of Se in different habitats and the Hg:Se interaction would be a good place to start if further research is to be conducted.

Thank You for this great opportunity,
Sincerely,

Sarah Spencer

References

Burgess NM, O'Brien MS, Hobson KA (1999) Differences in mercury, selenium, and stable carbon and nitrogen isotopes between freshwater and saltmarsh otters in Nova Scotia. Poster presented at 20th annual meeting of the society of Environmental Toxicology and chemistry, 14-18 Nov 1999, Philadelphia.

Kelly CA, Rudd JWM, Bodaly RA, Roulet ND, St. Louis VL, Heyes A, Moore TT, Schiff S, Aravena R, Scott KJ, Harris R, Warner B, Edwards G (1997) Increase in fluxes of greenhouse gases and methymercury following flooding of an experimental reservoir. Environmental Science and Technology. 31:1334-1344.

Paulsson K, Friske PWB, Lundberg K, Garett RG (1991) Treatment of mercury contaminated fish by selenium addition. Water, Air and Soil Pollution. 56:833-841.