Joe Ponessa

May 16, 2014
UROP Narrative Report

Using Time of Day as an Indicator for Animal Activity and Interactions with Fisher (*Martes pennanti*) Natal Dens

Background and research questions

The 20th century marked a turning point for conservation efforts aimed at protecting and restoring many perceivably threatened or endangered species in North America. The fisher (*Martes pennanti*) is one species that has been heavily impacted by humans, resulting in damaged population densities and even extirpation from many regions of North America due to extensive trapping and habitat degradation. In contemporary times, fisher conservation occurs on a much larger scale but is still greatly unstudied. Beneath the seemingly harmless blanket of fisher restoration in North America lives an unforeseen and unpredictable biological implication: infectious disease. Interpreting and monitoring the impact of infectious disease on wildlife is critical to the success of both residential and reintroduced species (Beckstead et al. 2011).

Due to the fact that several other mustelids are highly susceptible to Canine Distemper Virus (CDV), it can be expected that fishers are just as likely to inherit the infectious disease (Brown et al. 2006). Infectious disease research is of critical importance to carnivore conservation programs because the appearance of infectious diseases will become regionally important, especially with restoration efforts that transfer individuals to balance and boost fisher population densities (Cottrell et al. 2010).

Unlike social wildlife species such as deer and lions, contact between individual fishers occurs almost exclusively during the breeding season (mid-March to early April), limiting the potential for intraspecific disease spread to that time period. Because of this, I believe that natal den trees serve as hotspots for both inter- and intraspecific disease spread by facilitating direct and indirect contact between many individual fishers and other native wildlife species.

The goal of this research is to quantify the number interactions at fisher natal dens with other species as a function of time of day, thereby providing an index of

the potential likelihood of intraspecific or interspecific spillover disease transmission. I strongly believe and predict that the most frequent time of day for interspecific interactions to occur will be midday hours (0600-1400hrs) for all species, and more specifically, prey interactions will decrease during nighttime hours (2200-0600 & 1400-2200) as a result of predator avoidance.

Study Area

This study will occur within three different managed forests across northern Minnesota - Land O' Lakes State Forest near Outing, MN, Camp Ripley near Little Falls, MN, and Superior National Forest near Fairbanks, MN. The primary habitat of the three study areas is comprised of mixed conifer-hardwood and aspen-birch stands.

Methods

To answer my research question, there will be three distinct parts to my UROP: (1) Identification of den sites via standard ground telemetry techniques and placing of camera traps prior to the onset of the 2014 breeding season, (2) using recorded images from camera traps to assess the time and duration of all animal interactions, and (3) analyzing contact rates per den site across the study area to investigate the connections between time of day, total animal activity, predator and prey interactions, and to evaluate the most frequent types of animal interactions surrounding natal den trees.

Results

Upon retrieving cameras from the fisher den sites and viewing the camera footage, I was able to capture a wide range of animal interactions from multiple species across the three designated time intervals (2200-0600, 0600-1400, 1400-2200hrs) (Table 1, Figure 1). As predicted, the midday hours (0600-1400) drew the most frequent interactions at natal den sites for all species, including prey species, also as predicted, and for whitetail deer (Figures 2 and 3). Initially, it was hypothesized that non-predator or non-prey species, such as whitetail deer, would show no preference for time of day. However, after running a chi-square test for time preference of whitetail deer, I rejected my null hypothesis, as deer activity levels were highest during daytime hours around natal dens ($\chi^2 = 0.0004$, $p = 0.005$,

d.f. = 3). Fisher activity showed little variation across the three designated time periods for all natal den locations (Figure 4).

Discussion

As predicted, species activity and interactions surrounding natal fisher dens proved to be highest during the daytime hours for all photo-captured individuals. Interestingly, the studied female fishers who occupied natal dens showed zero preference for time of day. As a result of this finding, I conclude that during the breeding and rearing season, the process of feeding, caring, and protecting a litter is a primary factor behind this increased level of activity throughout the day.

In addition the these findings, whitetail deer proved to be the most frequent visitor to fisher den trees and statistical analysis shows that there is a clear preference for midday activity (0600-1400). Predator activity and interactions, although limited, were largely unaffected by time of day. However, as predicted, prey species avoided interaction and activity during nighttime and displayed the highest activity levels during daytime hours (0600-1400). Therefore, I assume that prey species maintained a heightened level of awareness while traveling near fisher den trees and are keen at predator avoidance by remaining most active during daylight hours.

Acknowledgements

The capability to study our radio-collared fishers was largely due to the cooperation of the Minnesota DNR and I sincerely thank them for their patience and assistance throughout the course of this study. I am also very grateful to Sergey Berg and James Forester of the University of Minnesota Fisheries, Wildlife, and Conservation Biology department for accepting my research application as well as providing a guiding hand throughout my data collection, revision, and analysis, which proved to be crucial to the completion of this UROP.

Joe Ponessa

UROP Narrative Report: Discussion

Over the past two semesters I have developed a much deeper understanding of the processes by which field research is conducted by the University of Minnesota's Conservation Biology department due to my participation in the UROP program. Initially, I was to examine intraspecific interactions (only between fishers), however due to smaller than predicted sample sizes I was forced to alter the scope of my project towards examining fisher natal den interactions for all native species. The effectiveness of the field strategies and flexible data analyses developed by Sergey Berg were outstanding and I have acquired a much greater extent of field- and investigative research knowledge as a result of working so closely with a qualified graduate faculty member. In addition, I feel as if my written skills have been both tested and sharpened, as I not only gained valuable field experience, but also learned how to translate those events and interactions onto paper. The experiences I have gained as a result of my participation in the UROP program are those that I will never forget as I move towards graduation this month and I regard my involvement in the program as a highlight of my undergraduate career at the University of Minnesota – Twin Cities.

TOTALS	2200-0600hrs	0600-1400hrs	1400-2200hrs	SUM (animals)
Deer	0	13	4	17
Squirrel	0	6	0	6
Raccoon	4	0	3	7
Porcupine	0	0	2	2
Small Bird	0	2	1	3
Turkey	0	2	1	3
Coyote	1	0	1	2
Pine Marten	0	2	0	2
Fisher	10	9	10	29
Bear	0	1	0	1
SUM	**15**	**35**	**21**	**71**
Non-Deer	**15**	**22**	**18**	**55**
Prey	**0**	**8**	**3**	**11**
Predators	**11**	**12**	**11**	**34**

Table 1: 71 total instances at 6 camera locations.

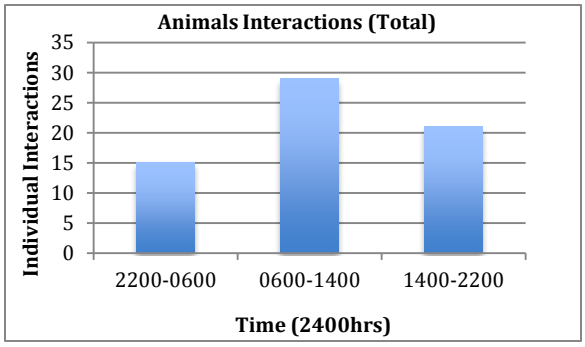

Figure 1: Temporal distribution of 71 animals.

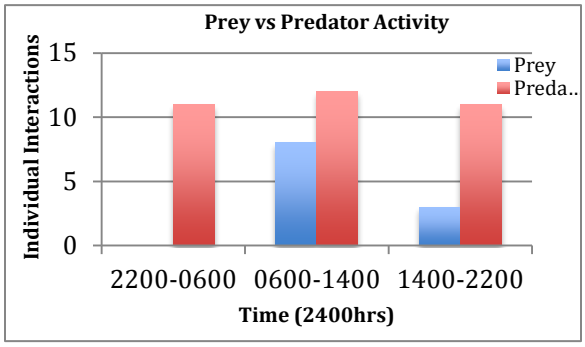

Figure 2: Prey = Blue, Predators = Red.

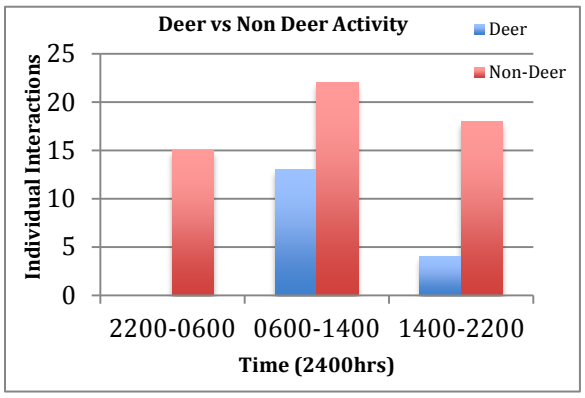

Figure 3: Whitetail deer activity highest during daylight.

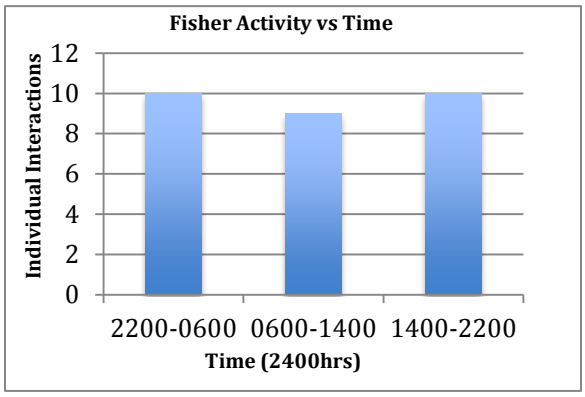

Figure 4: Fisher activity remained constant.

References

Beckstead, R., Dubey, J., Gabriel, M., Gerhold, R., Humphreys, J., Larkin, J., et al. (2011). Prevalence to Toxoplasma gondii and Sarcocystis spp. in a Reintroduced Fisher (Martes pennanti) Population in Pennsylvania . *Journal of Parasitology*, *97*(3), 425-429.

Brown, R., Foley, J., Gabriel, M., Higley, J., Matthews, S., & Wengert, G. (2006). Fecally Transmitted Viruses Associated with Pacific Fishers (Martes pennanti) In Northwestern California. *Transactions of the Western Section of the Wildlife Society*, *42*, 40-46.

Cottrell, W. O., DeVivo, M. T., Larkin, J. L., & Wester, J. C. (2010). Documentation of Rabies Virus in Free-Ranging Fisher (Martes pennanti) in Pennsylvania. *Northeastern Naturalist*, *17*(4), 523-530.